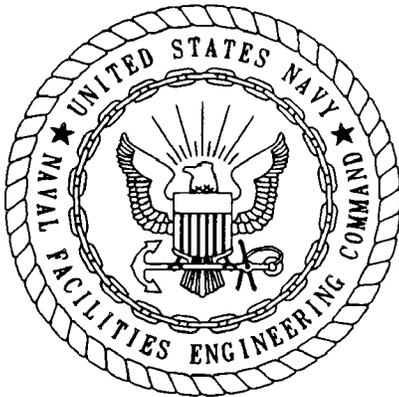


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SITE SPECIFIC HEALTH AND SAFETY PLAN FOR CONTAMINATION ASSESSMENT
INVESTIGATION AT BUILDING 460 AND 1587 NS MAYPORT FL
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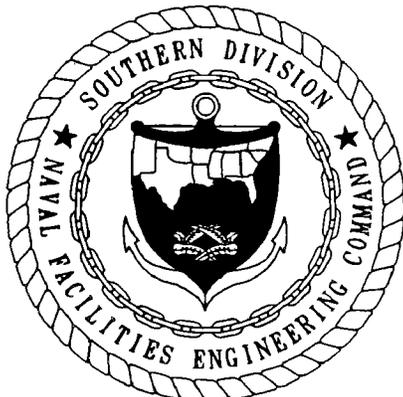


**SITE-SPECIFIC HEALTH AND SAFETY PLAN
CONTAMINATION ASSESSMENT INVESTIGATION
BUILDING 460 AND BUILDING 1587**

**NAVAL STATION MAYPORT
MAYPORT, FLORIDA**

**UNIT IDENTIFICATION CODE: N60201
CONTRACT NUMBER N62467-89-D-0317/119**

MAY 1995



**SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010**

SITE-SPECIFIC HEALTH AND SAFETY PLAN
CONTAMINATION ASSESSMENT INVESTIGATION
BUILDING 460 AND BUILDING 1587
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

Unit Identification Code: N60201

Contract Number N62467-89-D-0317/119

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May 1995

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REFERENCES

The following chapters of the Comprehensive Long-Term Environmental Action, Navy (CLEAN) Program District I Generic Health and Safety Plan (HASP) are applicable for the work anticipated at the site:

- 2.0 AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL
- 3.0 TRAINING PROGRAM
- 4.0 MEDICAL SURVEILLANCE PROGRAM
- 5.0 ENGINEERING CONTROLS
- 6.0 PERSONAL PROTECTIVE LEVEL DETERMINATION
- 7.0 MONITORING EQUIPMENT
- 8.0 ZONATION
- 9.0 WORK PRACTICES
- 10.0 CONFINED SPACE ENTRY PROCEDURES
- 11.0 EXCAVATION AND TRENCHING
- 12.0 TEMPERATURE EXTREMES
 - HEAT STRESS
 - COLD STRESS
- 13.0 DECONTAMINATION
- 14.0 EMERGENCY PLANNING
- 15.0 HEALTH AND SAFETY FORMS AND DATA SHEETS
 - HEALTH AND SAFETY AUDIT FORM
 - ACCIDENT REPORT FORM
 - HSO CHECKLIST FOR FIELD OPERATIONS
 - MATERIAL SAFETY DATA SHEETS
 - LIQUI-NOX
 - ETHYL ALCOHOL (denatured)
 - TRISODIUM PHOSPHATE
 - OSHA POSTER
 - DAILY HEALTH AND SAFETY AUDIT FORM
- 16.0 RESPIRATORY PROTECTION PROGRAM
- 17.0 OTHER
 - ILLUMINATION
 - SANITATION
 - HEALTH AND SAFETY AUDIT PROCEDURES

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
CA	Contamination Assessment
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
EIC	Engineer-in-Charge
FAC	Florida Administrative Code
FID	flame ionization detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
IRA	Initial Remedial Action
LEL	lower explosive limit
NAVSTA	Naval Station
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PPE	personal protective equipment
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leaching Procedure
TL	Technical Lead
TOM	Task Order Manager
TRPH	total recoverable petroleum hydrocarbon
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
V	volt
VOA	volatile organic aromatic

1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the generic HASP developed under the Comprehensive Long-Term Environmental Action, Navy (CLEAN) District I Contract (CLEAN HASP) and is intended to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, this HASP addresses activities associated with field operations for the Contamination Assessment (CA) at Building 460 and Building 1587, Naval Station (NAVSTA) Mayport, Mayport, Florida. Compliance with this HASP is required for all ABB Environmental Services, Inc. (ABB-ES), personnel, contractor personnel, and third parties entering the site.

1.2 PROJECT PERSONNEL.

1.2.1 Task Order Manager The Task Order Manager (TOM) is the individual with overall project management responsibilities. Those responsibilities, as they relate to health and safety, include provisions for the development of this site-specific HASP, the necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements, and the means and materials necessary to resolve any health and safety issues that are identified or that develop during the project.

1.2.2 Field Operations Leader The Field Operations Leader (FOL) is either the project Technical Lead (TL) or the TOM's designee who is onsite and has vested authority to carry out day-to-day site operations, including interfacing with the site Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The Health and Safety Officer (HSO) for Building 460 and Building 1587 has been designated by the TOM with concurrence of the Health and Safety Supervisor (HSS) or Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM through the HSS for the duration of this assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the CLEAN HASP. The HSO will investigate all accidents, illnesses, and incidents occurring onsite. The HSO will also conduct safety briefings and site-specific training for onsite 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 or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.3 TRAINING. Training is defined under the CLEAN HASP, and all personnel entering potentially contaminated areas at Building 460 and Building 1587 must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 3.0 of the CLEAN HASP for additional information.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the ABB-ES generic HASP. Personnel who have not received medical clearance will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 4.0 of the CLEAN HASP for additional information.

2.0 FACILITY SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. Building 460 and Building 1587 are located at NAVSTA Mayport, Mayport, Duval County, Florida. The base is located about 15 miles east-northeast of downtown Jacksonville, Florida (see Figure 2-1). The Naval Station was established in 1942 on approximately 700 acres of land. The original mission of the station included use of patrol craft and target and rescue boats. Today NAVSTA Mayport is primarily involved in intermediate level maintenance of equipment, ships, and aircraft, and also houses other support units assigned to that part of the Second Fleet stationed at the facility.

2.2 SITE HISTORY AND LAYOUT.

2.2.1 Building 460 Building 460 is located in the northeast area of NAVSTA Mayport, east-southeast of the turning basin and west of Baltimore Street. The area adjacent to Building 460 includes baseball fields to the west, the base chapel to the east, and the base clinic to the south. Water lines and a 110-volt (V) electric power line are located underground near the site.

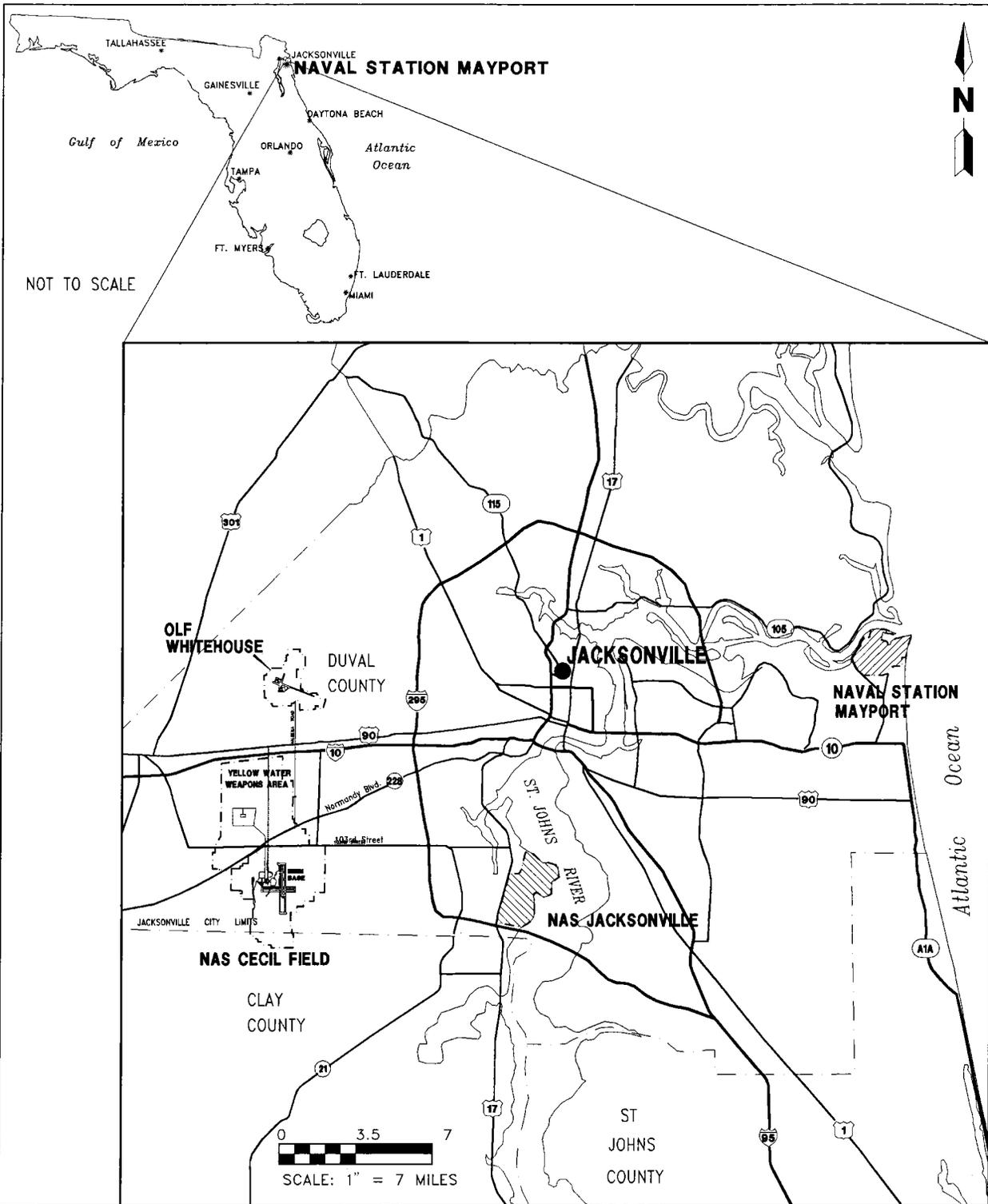
On March 24, 1994, petroleum contamination was discovered during excavation and removal of Tank 460 and Tank 460G. Tank 460 was a 1,000-gallon coated steel underground storage tank (UST) that contained No. 2 heating oil and diesel fuel. The tank was installed in 1970. The tank leak was reportedly due to several areas of corrosion. The quantity of heating oil or diesel fuel released from the tank is unknown.

Tank 460G was a 1,000-gallon steel UST that contained diesel fuel. Tank 460G was an emergency generator tank located next to Building 460. A Discharge Reporting Form and Closure Assessment Form were submitted to the City of Jacksonville, Water Quality Division, on March 24, 1994, and May 2, 1994, respectively.

As an Initial Remedial Action (IRA), V & W Construction & Service Company removed approximately 230 cubic yards of contaminated soil in accordance with Chapter 62-770, Florida Administrative Code (FAC). According to Navy personnel, free product was visible in the excavation after Tank 460 and Tank 460G were removed. Soil samples were collected from the excavation during the tank removals. A total of seven soil samples were collected from various locations in the excavation for laboratory analysis. The soil samples were analyzed for USEPA Methods 5030/8021 for volatile organic aromatics (VOAs), USEPA Method 9073 for total recoverable petroleum hydrocarbons (TRPH), and USEPA Methods 1311/6010 and 1311/7471 for Toxicity Characteristic Leaching Procedure (TCLP) of the 8 Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver).

TRPH concentrations in all seven soil samples exceeded the State regulatory standard of 10 parts per million (ppm).

2.2.2 Building 1587 Building 1587 is located in the northeast area of NAVSTA Mayport, east of the Mayport turning basin and west of Baltimore Street. Building 1587 is a housing complex for Navy personnel. The area adjacent to Building 1587 includes a baseball field and track to the west, a parking area to



**FIGURE 2-1
FACILITY LOCATION MAP**



**HEALTH AND SAFETY PLAN,
BACHELORS ENLISTED
QUARTERS SITE**

**NAVSTA MAYPORT
MAYPORT, FLORIDA**

the east, and Building 1586 to the south. Water lines and a 110-V electric power line are located underground at the site.

The UST at Building 1587 was installed in 1985 and contains No. 2 fuel oil which is used to heat the building. The UST is asphalt-coated steel and has a capacity of 4,000 gallons. Petroleum contamination was discovered by a contractor attempting to install cathodic protection on the UST. Visible soil staining was discovered on the walls of the excavation when the UST was uncovered. Work to install the cathodic protection was stopped and the tank was taken out of service. A temporary aboveground mobile storage tank was placed approximately 50 feet from Building 1587 to provide fuel for heating until Tank 1587 is repaired or replaced. Plastic sheeting and sandbags have been placed around the mobile tank to form a containment dike.

2.3 SCOPE OF WORK (WORKPLAN). ABB-ES will conduct a CA at the sites to evaluate the horizontal and vertical extent of potential petroleum contamination in soil and groundwater. The field investigation at Building 460 will consist of the installation and sampling of approximately 20 soil borings, 7 permanent shallow monitoring wells, and 1 permanent deep monitoring well.

The field investigation at Building 1587 will consist of the installation and sampling of approximately 30 soil borings, 11 permanent shallow monitoring wells, and 1 permanent deep monitoring well.

3.0 HAZARD ANALYSIS

3.1 INVASIVE SAMPLING. Invasive sampling at Building 460 and Building 1587 will include soil borings and monitoring well installation.

The potential hazards to workers are mainly physical ones related to manual labor, such as that involved in drilling operations, but limited hazards exist for exposure to chemical compounds that are suspected to be present in the soil at the site. A potential for exposure may exist during intrusive activities, such as drilling and sampling, when the ground surface and subsurface soil are disturbed. Elevated ambient levels of organic vapors and particulates may be encountered during these periods. However, the field drilling and sampling activities will not involve large-scale earth-moving equipment, and personnel exposures are expected to be minimal. Air monitoring will be conducted to assess the need for increasing levels of personal protection.

Contamination of soil and groundwater at the site may have occurred from reported spillage of petroleum products associated with the operation and maintenance activities at the site. The purpose of this field investigation is to assess the extent of that contamination. Caution and awareness should be exercised during drilling and sampling operations pending further definitions of chemical hazards. Any condition encountered that has not been discussed in training should be brought to the attention of the HSO, FOL, and TOM immediately.

The potential presence of chemicals poses exposure hazards in addition to respiratory hazards. All efforts should be made by field personnel to avoid exposure to chemicals via inhalation, ingestion, or absorption through the skin. All efforts must be taken to implement use of safe personal work practices, personal protective equipment (PPE), and decontamination procedures.

3.2 SITE RISKS. The following health and safety hazards may be encountered at Building 460 and Building 1587 sites.

3.2.1 Health Hazards Health hazards include those hazards that personnel may be exposed to that are related to petroleum contamination. The contaminants of concern known or suspected to be present on the site, along with established exposure limits for those substances, are listed in Table 3-1.

3.2.2 Safety Hazards Safety hazards include those hazards that personnel may be exposed to that are unrelated to the contaminants of concern: heat stress, operation and presence around heavy equipment, lifting of objects, and vehicle traffic. Extreme caution should be exhibited by all personnel while conducting work around drill rigs and other heavy equipment. During hot days, personnel should increase fluid intake and take care to avoid overheating and symptoms related to heat stress.

Lifting of heavy objects must be done with caution. Personnel should assist one another with moving heavy objects or use appropriate equipment to accomplish these tasks. Power substations, power lines, underground utilities, and underground pipelines are to be avoided during drilling operations. Necessary work permits for activities at Building 460 and Building 1587 must be obtained.

**Table 3-1
Contaminants of Concern**

Site-Specific Health and Safety Plan
Building 460 and Building 1587
NAVSTA Mayport, Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit	Threshold Limit Value (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Benzene	4.7	1	1	Colorless to light yellow liquid; pleasant aromatic odor.	Moderate skin irritant.	Inhalation of large amounts attacks central nervous system; chronic poisoning may cause leukemia and/or decreases circulating levels of blood cells.
Ethylbenzene	140	100	100	Colorless liquid; gasoline like odor.	Moderate skin irritant.	Liquid blisters skin; inhalation results in dizziness and depression.
Toluene	0.17	100	50	Colorless liquid; pleasant aromatic odor.	Mild skin irritant.	Ingestion or aspiration can cause pulmonary edema and depressed respiration.
Xylene	0.05	100	100	Colorless liquid; aromatic odor.	Moderate skin irritant.	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.
Naphthalene	-	10	10	Colorless to brown solid with an odor of mothballs.	Moderate skin irritant.	Inhalation causes headache and confusion; vapors irritate eyes.

Notes: ppm = parts per million.
OSHA = Occupational Safety and Health Administration.

3.2.3 Conclusions and Risk Assessment Based on available information (nature of the work, potential on-site chemicals and their properties, exposure limits, etc.), hazards associated with conducting the described field work are considered to be low, assuming appropriate health and safety practices are maintained.

3.3 PROTECTIVE MEASURES. The following protective measures will be used at the site.

3.3.1 Engineering Controls (General) When needed, engineering controls (e.g., fans to blow volatilized chemicals away from the work area) will be used.

3.3.2 Levels of Protection (General) The initial level of petroleum will be a Level D work uniform. Level D protection should only be used when the atmosphere contains no known hazard, potential airborne contaminants can be monitored, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical. Because of the threat of heat stress, Level D PPE will consist of a shirt, long pants, steel-toed work boots, and protective gloves. A Tyvek™ suit may be worn. When invasive work is being conducted, safety glasses or goggles will be worn. When working around heavy equipment, such as a drill rig, a hard hat will be worn. Hearing protection should be worn when working in the vicinity of the drill rig and near the flight line.

The following upgrade/downgrade action levels will be used at the site.

Level D is acceptable if:

- OVA reads \leq background at the source (i.e., split spoon) and
- benzene 0.5/c Dräger tube reads < 0.5 ppm.

Modified Level D (includes Tyvek™) is required if:

- FID reads $>$ background at the source and
- benzene 0.5/c Dräger tube reads < 0.5 ppm.

Level C is required if:

- FID reads between 25 and 170 ppm, and/or
- benzene 0.5/c Dräger tube reads between 0.5 and 50 ppm.

Level B is required if:

- FID reads ≥ 170 ppm, and/or
- benzene 0.5/c Dräger tube reads ≥ 50 ppm, and
- LEL/O₂ meter reads ≤ 19.5 percent.

In addition, if the LEL reads ≥ 10 percent, use non-sparking tools. If the LEL reads ≥ 20 percent, stop work, evacuate the site, and contact the HSO or HSM.

3.4 MONITORING (GENERAL). It is intended that real-time monitoring instrumentation will be used to monitor the work environment in order to provide the appropriate level of protection for the site team.

3.4.1 Air Sampling (General) To the extent feasible, the presence of airborne contaminants will be monitored through the use of direct reading instrumentation. Information gathered will be used to ensure that the levels of protection used at the site are adequate. In addition, these data may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO. During operations, air monitoring with a flame ionization detector (FID) or OVA will be conducted regularly in the breathing zone. If the FID readings show a persistent rise above background levels, monitoring with Dräger tubes will be initiated. The following sampling equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

1. HeathTech PORTA-FID II™
2. Dräger Tube:
 - benzene 0.5/c
3. LEL/O₂ Meter

3.4.2 Personal Monitoring (General) Personnel monitoring will not be conducted at the site to evaluate the exposure to the high risk worker. In addition, all personnel onsite will wear a thermoluminescent dosimetry body badge to measure possible exposure to radiation.

4.0 DATA SHEETS

The Chemical Hazard Data Sheets for the chemicals that may likely be encountered at Building 460 and Building 1587 sites are attached.

LEAD		Pb
PHYSICAL AND CHEMICAL DESCRIPTION	<p>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.</p>	
USES	<p>Lead is used in electroplating, radiation protection devices, plastics, electronic equipment, storage batteries, gasoline anti-knock additives, and pigments.</p>	
TOXICITY IN WATER	<p>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 (FAC 17-22) for lead is 50 $\mu\text{g}/\ell$.</p> <p>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 CaCO_3, the concentrations of lead should not exceed 0.75, 3.8, and 20 $\mu\text{g}/\ell$, respectively. To protect saltwater life, lead should not exceed 25 $\mu\text{g}/\ell$ (EPA, 1979).</p>	
CLASSIFICATION	<p>Hazardous Substance (EPA) Hazardous Waste Constituent (EPA) Priority Toxic Pollutant (EPA)</p>	

BENZENE

BNZ

Common Symptoms	Watery liquid	Colorless	Gasoline-like odor
Benzol Benzole	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 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. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area 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		2. LABEL	
(See Response Methods Handbook) Issue warning-high flammability Restrict access		2.1 Category: Flammable liquid 2.2 Class: 3	
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS	
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		4.1 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; LD50 = 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 smarting and reddening of the skin. 5.10 Odor Threshold: 4.68 ppm 5.11 IDLH Value: 2,000 ppm			

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.3%-7.8% 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: 1087°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</p> <p style="text-align: center;">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 style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 6 ppm/6 hr/minnow/lethal/distilled water 20 ppm/24 hr/sunfish/TL₅₀/tap water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days 8.4 Food Concentration Potential: None</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Industrial pure 99 + % Thiophene-free 98 + % Nitration 98 + % Industrial 90% 85 + % Reagent 99 + % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-T-U-V-W</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAH Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health Vapor Irritant 1 Liquid or Solid Irritant 1 Poisons 3 Water Pollution Human Toxicity 3 Aquatic Toxicity 1 Aesthetic Affect 3 Reactivity Other Chemicals 2 Water 1 Self Reaction 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 2 Flammability (Red) 3 Reactivity (Yellow) 0</p> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 178°F = 80.1°C = 363.3°K 12.4 Freezing Point: 42.0°F = 5.6°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/m² 12.7 Specific Gravity: 0.879 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.289 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35 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 = 84.1 cal/g = 3.94 X 10⁶ J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 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: 30.45 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia</p> <p style="text-align: center;">NOTES</p>
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BNZ

BENZENE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
55	55.330	45	.394	75	.988	55	.724
60	55.140	50	.396	80	.981	60	.693
65	54.960	55	.398	85	.975	65	.665
70	54.770	60	.400	90	.969	70	.638
75	54.580	65	.403	95	.962	75	.612
80	54.400	70	.405	100	.956	80	.588
85	54.210	75	.407	105	.950	85	.566
90	54.030	80	.409	110	.944	90	.544
95	53.840	85	.411	115	.937	95	.524
100	53.660	90	.414	120	.931	100	.505
105	53.470	95	.416	125	.925	105	.487
110	53.290	100	.418	130	.919	110	.470
115	53.100			135	.912	115	.453
120	52.920			140	.906	120	.438
125	52.730			145	.900		
130	52.540			150	.893		
135	52.360			155	.887		
140	52.170			160	.881		
145	51.990			165	.875		
150	51.800			170	.868		
155	51.620						
160	51.430						
165	51.250						
170	51.060						
175	50.870						

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.180	50	.681	50	.01258	0	.204
		60	1.171	60	.01639	25	.219
		70	1.535	70	.02109	50	.234
		80	1.989	80	.02681	75	.248
		90	2.547	90	.03371	100	.261
		100	3.227	100	.04196	125	.275
		110	4.049	110	.05172	150	.288
		120	5.033	120	.06317	175	.301
		130	6.201	130	.07652	200	.313
		140	7.577	140	.09194	225	.325
		150	9.187	150	.10960	250	.337
		160	11.060	160	.12980	275	.349
		170	13.220	170	.15270	300	.360
		180	15.700	180	.17850	325	.371
		190	18.520	190	.20750	350	.381
		200	21.740	200	.23970	375	.392
		210	25.360	210	.27560	400	.402
						425	.412
						450	.421
						475	.431
						500	.440
						525	.449
						550	.457
						575	.465
						600	.474

o-CRESOL

CRO

<p>Common Synonyms</p> <p>o-Hydroxytoluene 2-Methylphenol o-Toluid 2-Cresol</p>	<p>Solid crystals or liquid Colorless to yellow Sweet tarry odor</p> <p>Sinks and mixes slowly with water.</p>
<p>Avoid contact with liquid or solid. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Notify local health and pollution control agencies. Isolate and remove discharged material.</p>	
Fire	<p>COMBUSTIBLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water fog, dry chemical, foam or carbon dioxide. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID OR SOLID Will burn skin and eyes. Poisonous if swallowed, inhaled or if skin is exposed. 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.</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>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-water contamination, poison. Restrict access. Should be removed. Chemical and physical treatment.</p>	<p>2. LABEL</p> <p>2.1 Category: Corrosive 2.2 Class: 8</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Phenols, cresols 3.2 Formula: C₇H₈O 3.3 IMO/UN Designation: 6.1/2078 3.4 DOT ID No.: 2078 3.5 CAS Registry No.: 95-48-7</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Colorless to yellow. 4.3 Odor: Phenolic, tarry</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Chemical goggles or face shields. Full protective clothing including boots and gloves, and respiratory protective apparatus.</p> <p>5.2 Symptoms Following Exposure: INHALATION, INGESTION OR SKIN ABSORPTION: Central nervous system depression, muscular weakness, gastroenteric disturbances, convulsions and death. EYES: can cause burns. SKIN: Corrosive action may produce severe burns.</p> <p>5.3 Treatment of Exposure: Call a doctor. INHALATION: Move to fresh air. Oxygen inhalation for respiratory distress. If needed, give artificial respiration. EYES: Irrigate with copious quantities of running water for 15 min. Hold eyelids open. If physician not available irrigate for an additional 15 min. SKIN: Remove all contaminated clothing. Wash with soap and water until all odor is gone. Then wash contaminated areas with alcohol or glycerin. Then use more water. INGESTION: Drink large quantities of liquid (salt water, weak sodium bicarbonate solution, milk or gruel) followed by demulcent such as raw egg white or corn starch paste. Induce vomiting, if not spontaneous. Keep up until vomiting is free of Cresol odor.</p> <p>5.4 Threshold Limit Value: 5 ppm. Skin absorption can contribute to exposure.</p> <p>5.5 Short Term Inhalation Limits: 10 ppm.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 - 500 mg/kg.</p> <p>5.7 Late Toxicity: May produce neoplasms or act as tumor promoters. Central nervous system damage. Chronic gastritis, possible liver and kidney damage, and lesions of heart and brain. Dermatitis may result.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact.</p> <p>5.10 Odor Threshold: 0.65 ppm detection in water 0.26 ppm recognition in air.</p> <p>5.11 IDLH Value: 250 ppm</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 178°F C.C. 6.2 Flammable Limits In Air: 1.35% 6.3 Fire Extinguishing Agents: Water may be used to blanket fire. CO₂, dry chemical, foam, water spray. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Emits highly toxic fumes. 6.6 Behavior in Fire: Vapors form explosive mixtures with air. 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 style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">SS</p>								
<p style="text-align: center;">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: Will not occur. 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 21</p>	<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Corrosive material 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 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>3</td> </tr> <tr> <td>Flammability (Red).....</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue).....	3	Flammability (Red).....	2	Reactivity (Yellow).....	0
Category	Classification								
Health Hazard (Blue).....	3								
Flammability (Red).....	2								
Reactivity (Yellow).....	0								
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 49.1-19 ppm/24-96 hr/goldfish/TL₅₀/soft water 22.2-20.8 ppm/24-96 hr/bluegill/TL₅₀/soft water 18-13.4 ppm/24-96 hr/fathead minnow/TL₅₀/hard water 18-50 ppm/24-96 hr/guppy/TL₅₀/hard water 8.2 Waterfowl Toxicity: Chronic water fowl toxic limit is 25 ppm. 8.3 Biological Oxygen Demand (BOD): 1.64 lb/lb, 5 days. 8.4 Food Chain Concentration Potential: None</p>	<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 108.134 12.3 Boiling Point at 1 atm: 376°F = 191°C = 464.2°K 12.4 Freezing Point: 88°F = 31°C = 304.2°K 12.5 Critical Temperature: 795.9°F = 424.4°C = 697.6°K 12.6 Critical Pressure: 726.0 psi = 49.4 atm = 5.00 MN/m² 12.7 Specific Gravity: 1.05 at 20°C. 12.8 Liquid Surface Tension: 40.3 dynes/cm = 0.0403 N/m at 20°C. 12.9 Liquid Water Interfacial Tension: 32.7 dynes/cm = 0.0327 N/m at 20°C. 12.10 Vapor (Gas) Specific Gravity: 3.72. 12.11 Ratio of Specific Heats of Vapor (Gas): > 1. 12.12 Latent Heat of Vaporization: 178.4 Btu/lb = 99.12 cal/g = 4.15 X 10⁴ J/kg. 12.13 Heat of Combustion: -13994 Btu/lb = -7774 cal/g = -325 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 style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: 80-98% containing 2-20% phenol, 99.2% with 0.2% phenol and 0.6% meta and para isomers. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	<p style="text-align: center;">NOTES</p>								

CRO

o- CRESOL

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
70	65.459	20	555	90	1.055	104	4.490
75	65.235			95	1.052	105	4.380
80	65.025			100	1.050	106	4.270
85	64.829			105	1.047	107	4.180
90	64.643			110	1.045	108	4.050
95	64.466			115	1.042	109	3.940
100	64.301			120	1.040	110	3.830
105	64.141			125	1.037	111	3.720
110	63.991			130	1.035	112	3.610
115	63.846			135	1.032	113	3.500
120	63.708			140	1.030		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F
	M	100	.020	90	.00024	80	.290
	I	120	.046	95	.00030	100	.298
	S	140	.101	100	.00037	120	.306
	C	160	.192	105	.00044	140	.315
	I	180	.340	110	.00053	160	.323
	B	200	.566	115	.00063	180	.331
	L	220	.899	120	.00074	200	.339
	E	240	1.370	125	.00087	220	.347
		260	2.018	130	.00101	240	.355
		280	2.890			260	.363
		300	4.036			280	.371
		320	5.518			300	.379
		340	7.401			320	.387
		360	9.761			340	.395
						360	.403
						380	.411
						400	.420
						420	.428
						440	.436

ETHYLENE DIBROMIDE

EDB

<p>Common Synonyms</p> <p>1,2-Dibromoethane Ethylene bromide Bromolene sym-Dibromoethane Dow-Tune 40, W-10, W-15, W-40 Glycol dibromide</p>	<p>Liquid</p> <p>Colorless</p> <p>Sweet odor</p>
<p>Sinks in water. Poisonous vapor is produced. Freezing point is 50°F.</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.</p> <p>POISONOUS GASES ARE PRODUCED WHEN HEATED.</p> <p>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).</p> <p>Cool exposed containers with water.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED.</p> <p>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.</p> <p>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 if possible.</p>
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. 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) 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: Halogenated hydrocarbon 3.2 Formula: $\text{BrCH}_2\text{CH}_2\text{Br}$ 3.3 IMO/UN Designation: 6.1/1805 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>

5. HEALTH HAZARDS

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; $\text{LD}_{50} = 50$ to 500 mg/kg

5.7 Late Toxicity: Data not available

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: Data not available

5.11 IDLH Value: 400 ppm

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: 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

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: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: 18 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

9. SHIPPING INFORMATION

9.1 Grade of Purity: Commercial

9.2 Storage Temperature: Ambient

9.3 Inert Atmosphere: No requirement

9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE
(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: CFRM-A

11.2 NAB Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	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

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

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: 49.6°F = 9.8°C = 283.0°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 = 45.6 cal/g = 1.91 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: 13.79 cal/g

12.18 Limiting Value: Data Not Available

12.19 Reid Vapor Pressure: 0.4 psia

NOTES

EDB

ETHYLENE DIBROMIDE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise
55	135.900	60	.173	50	.776	60	1.818
60	135.900	70	.173	55	.771	70	1.676
65	135.900	80	.174	60	.767	80	1.549
70	135.799	90	.174	65	.763	90	1.436
75	135.799	100	.175	70	.758	100	1.335
80	135.699	110	.175	75	.754	110	1.244
85	135.699	120	.176	80	.750	120	1.162
90	135.699	130	.176	85	.745	130	1.088
95	135.599	140	.177	90	.741	140	1.021
100	135.599	150	.178	95	.737	150	.960
105	135.599	160	.178	100	.732	160	.905
110	135.500	170	.179	105	.728	170	.854
115	135.500	180	.179	110	.724	180	.808
120	135.500	190	.180	115	.719	190	.765
		200	.180	120	.715	200	.726
		210	.181	125	.711	210	.690
				130	.706		
				135	.702		
				140	.698		
				145	.693		
				150	.689		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.270	60	.155	60	.00521	0	.100
		70	.209	70	.00690	25	.103
		80	.279	80	.00904	50	.105
		90	.368	90	.01172	75	.108
		100	.481	100	.01504	100	.111
		110	.623	110	.01914	125	.113
		120	.799	120	.02414	150	.116
		130	1.018	130	.03020	175	.118
		140	1.285	140	.03749	200	.121
		150	1.609	150	.04620	225	.123
		160	2.002	160	.05653	250	.126
		170	2.473	170	.06872	275	.128
		180	3.034	180	.08301	300	.130
		190	3.700	190	.09966	325	.132
		200	4.484	200	.11900	350	.135
		210	5.404	210	.14120	375	.137
		220	6.476	220	.16680	400	.139
		230	7.722	230	.19590	425	.141
		240	9.160	240	.22910	450	.143
		250	10.810	250	.26670	475	.145
		260	12.710	260	.30900	500	.147
		270	14.870	270	.35660	525	.149
		280	17.320	280	.40980	550	.150
		290	20.100	290	.46910	575	.152
		300	23.220	300	.53500	600	.154

ETHYLBENZENE

ETB

Common Symptoms	Liquid	Colorless	Sweet, gasoline-like odor
Phenylethane EB	Floats on water. Flammable, irritating vapor is produced.		
<p>Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. 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. 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. Cook 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 and/or difficult breathing. Move to fresh air. If breathing has 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. Fouling 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		2. LABEL	
(See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2.1 Category: Flammable liquid	2.2 Class: 3
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS	
3.1 CG Compatibility Class: Aromatic Hydrocarbon	3.2 Formula: C ₈ H ₁₀	3.3 IMO/JUN Designation: 3.3/1176	3.4 DOT ID No.: 1176
3.5 CAS Registry No.: 100-41-4	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 ill effects occur, remove 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 pneumonia. 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 Limits: 200 ppm for 30 min.		
5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.6 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 smarting 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	
6.1 Flash Point: 80°F O.C.; 59°F. C.C.	6.2 Flammable Limits in Air: 1.0%-6.7%
6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.	
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent	
6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.	
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.	
6.7 Ignition Temperature: 860°F	6.8 Electrical Hazard: Not pertinent
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 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
8. WATER POLLUTION	
8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL ₅₀ /fresh water	8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 6 days	8.4 Food Concentration Potential: None
9. SHIPPING INFORMATION	
9.1 Grades of Purity: Research grade: 99.98%; pure grade: 99.0%	
9.2 Storage Temperature: Ambient	
9.3 Inert Atmosphere: No requirement	
9.4 Venting: Open (flame arrester) or pressure-vacuum.	
NOTES	

10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)	
A-T-U	
11. HAZARD CLASSIFICATIONS	
11.1 Code of Federal Regulations: Flammable liquid.	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 Affect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0
11.3 NFPA Hazard Classification:	
Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0
12. PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Physical State at 15°C and 1 atm: Liquid	12.2 Molecular Weight: 106.17
12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K	12.4 Freezing Point: -139°F = -96.0°C = 178°K
12.5 Critical Temperature: 661.0°F = 343.9°C = 617.1°K	12.6 Critical Pressure: 623 psia = 36.6 atm = 3.61 MN/m ²
12.7 Specific Gravity: 0.867 at 20°C (liquid)	12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°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: 144 Btu/lb = 80.1 cal/g = 3.36 X 10 ⁴ J/kg
12.13 Heat of Combustion: -17,780 Btu/lb = -9877 cal/g = -413.5 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: 0.4 psia	

ETB

ETHYLBENZENE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- Inch per hour- square foot-F	Temperature (degrees F)	Centipoise
40	54.990	40	.402	-90	1.065	40	.835
50	54.680	50	.404	-80	1.056	50	.774
60	54.370	60	.407	-70	1.047	60	.719
70	54.060	70	.409	-60	1.037	70	.670
80	53.750	80	.412	-50	1.028	80	.626
90	53.430	90	.414	-40	1.018	90	.586
100	53.120	100	.417	-30	1.009	100	.550
110	52.610	110	.419	-20	1.000	110	.518
120	52.500	120	.421	-10	.990	120	.488
130	52.190	130	.424	0	.981	130	.461
140	51.870	140	.426	10	.971	140	.436
150	51.560	150	.429	20	.962	150	.414
160	51.250	160	.431	30	.953	160	.393
170	50.940	170	.434	40	.943	170	.374
180	50.620	180	.436	50	.934	180	.356
190	50.310	190	.439	60	.924	190	.340
200	50.000	200	.441	70	.915	200	.325
210	49.690	210	.443	80	.906	210	.311
				90	.896		
				100	.887		
				110	.877		
				120	.868		
				130	.859		
				140	.849		
				150	.840		
				160	.830		

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	.020	80	.202	80	.00370	-400	-.007
		100	.370	100	.00654	-350	.026
		120	.644	120	.01099	-300	.060
		140	1.071	140	.01767	-250	.093
		160	1.713	160	.02734	-200	.125
		180	2.643	180	.04087	-150	.157
		200	3.953	200	.05926	-100	.187
		220	5.747	220	.08363	-50	.217
		240	8.147	240	.11520	0	.246
		260	11.290	260	.15510	50	.274
		280	15.320	280	.20490	100	.301
		300	20.410	300	.26570	150	.327
		320	26.730	320	.33910	200	.353
		340	34.460	340	.42620	250	.377
		360	43.800	360	.52850	300	.401
		380	54.950	380	.64720	350	.424
						400	.446
						450	.467
						500	.487
						550	.507
						600	.525

MINERAL SPIRITS

MNS

<p>Common Synonyms Petroleum spirits Naphtha</p>		<p>Watery liquid</p>	<p>Colorless</p>	<p>Gasoline-like 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 water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>		
<p>Exposure</p>		<p>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 EYES: hold eyes open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. DO NOT INDUCE VOMITING.</p>		
<p>Water Pollution</p>		<p>Effect of low concentrations on aquatic life is unknown. 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) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>		
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1300 3.4 DOT ID No.: 1300 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline</p>		
<p>5. HEALTH HAZARDS 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 Limit: 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 smearing and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>				

6. FIRE HAZARDS

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

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

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)

10. HAZARD ASSESSMENT CODE
(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Combustible liquid
11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	2
Reactivity (Yellow)	0

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: 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.) 1.030
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
12.17 Heat of Fusion: Data not available
12.18 Limiting Value: Data not available
12.19 Reid Vapor Pressure: 0.13 psia

NOTES

MNS

MINERAL SPIRITS

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour- square foot-F	Temperature (degrees F)	Centipoise (estimate)
50	48.690	10	.433	10	.925	50	9.343
52	48.690	15	.435	20	.919	52	8.841
54	48.690	20	.438	30	.914	54	8.370
56	48.690	25	.440	40	.908	56	7.927
58	48.690	30	.443	50	.903	58	7.511
60	48.690	35	.445	60	.897	60	7.119
62	48.690	40	.448	70	.892	62	6.751
64	48.690	45	.450	80	.886	64	6.404
66	48.690	50	.453	90	.881	66	6.078
68	48.690	55	.455	100	.875	68	5.770
70	48.690	60	.458	110	.869	70	5.481
72	48.690	65	.460	120	.864	72	5.207
74	48.690	70	.462	130	.858	74	4.950
76	48.690	75	.465	140	.853	76	4.707
78	48.690	80	.467	150	.847	78	4.477
80	48.690	85	.470	160	.842	80	4.260
82	48.690	90	.472	170	.836	82	4.056
84	48.690	95	.475	180	.831	84	3.862
86	48.690	100	.477	190	.825	86	3.679
88	48.690	105	.480	200	.820	88	3.506
90	48.690			210	.814	90	3.342
92	48.690			220	.808	92	3.187
94	48.690			230	.803	94	3.040
96	48.690			240	.797	96	2.901
98	48.690			250	.792	98	2.770
100	48.690			260	.786	100	2.645

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch (estimate)	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	90	.094		N		N
	N	100	.124		O		O
	S	110	.163		T		T
	O	120	.211				
	L	130	.272		P		P
	U	140	.347		E		E
	B	150	.440		R		R
	L	160	.553		T		T
	E	170	.691		I		I
		180	.856		N		N
		190	1.054		E		E
		200	1.290		N		N
		210	1.569		T		T
		220	1.897				
		230	2.281				
		240	2.728				
		250	3.247				
		260	3.846				
		270	4.535				
		280	5.323				
		290	6.221				
		300	7.241				
		310	8.394				
		320	9.695				
		330	11.160				
		340	12.790				

TETRAETHYL LEAD

TEL

Common Symptoms	Oily liquid	Colorless, but generally dyed red	Fruity odor
TEL Lead tetraethyl	Sinks in water. Poisonous, flammable vapor is produced.		
<p>AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing. 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>			
Fire	<p>Combustible. POISONOUS GASSES 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 chemicals, foam, or carbon dioxide. Cool exposed containers with water.</p>		
Exposure	<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.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected area 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>		
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		2. LABEL	
(See Response Methods Handbook) Issue warning-poison, water contaminant Restrict access Should be removed Chemical and physical treatment		2.1 Category: Poison 2.2 Class: 6	
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS	
3.1 CG Compatibility Class: Not listed 3.2 Formula: Pb(C ₂ H ₅) ₄ 3.3 IMO/UN Designation: 6.1/1649 3.4 DOT ID No.: 1649 3.5 CAS Registry No.: 78-00-2		4.1 Physical State (as shipped): Liquid 4.2 Color: Dyed red or other distinctive color. 4.3 Odor: Sweet	
5. HEALTH HAZARDS			
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.			
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.			
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.			
5.4 Threshold Limit Value: 0.1 mg/m ³			
5.5 Short Term Inhalation Limits: 0.15 mg Pb/m ³ for 30 min.			
5.6 Toxicity by Ingestion: Oral rate LD ₅₀ = 17 mg/kg			
5.7 Late Toxicity: Lead poisoning			
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: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.			
5.10 Odor Threshold: Data not available			
5.11 IDLH Value: 40 mg/m ³			

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 200°F C.C.; 285°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>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-X-Y</p>
<p style="text-align: center;">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 style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Poison B</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 3 Flammability (Red) 2 Reactivity (Yellow) 3</p>
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 0.20 mg/l/98 hr/biogill/T_L/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 Concentration Potential: Data not available</p>	<p style="text-align: center;">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: Decompose</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 = 0.285 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 style="text-align: center;">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 style="text-align: center;">NOTES</p>

TEL	TETRAETHYL LEAD
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
46	103.400	50	.597		N	28	1.247
48	103.200	52	.597		O	30	1.222
50	103.099	54	.597		T	32	1.199
52	102.900	56	.597			34	1.175
54	102.799	58	.597		P	36	1.153
56	102.599	60	.597		E	38	1.131
58	102.500	62	.597		R	40	1.109
60	102.299	64	.597		T	42	1.088
62	102.200	66	.597		I	44	1.068
64	102.000	68	.597		N	46	1.048
66	101.900	70	.597		E	48	1.029
68	101.700	72	.597		N	50	1.010
70	101.599	74	.597		T	52	.992
72	101.400	76	.597			54	.974
74	101.299	78	.597			56	.957
76	101.099	80	.597			58	.940
78	101.000	82	.597			60	.924
80	100.799	84	.597			62	.908
82	100.700	86	.597			64	.892
84	100.500	88	.597			66	.877
86	100.400	90	.597			68	.862
88	100.200	92	.597			70	.847
90	100.099	94	.597			72	.833
92	99.929	96	.597			74	.819
94	99.780	98	.597			76	.806
96	99.629	100	.597			78	.793

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	35	.001	35	.00000		N
	N	40	.001	40	.00001		O
	S	45	.002	45	.00001		T
	O	50	.002	50	.00001		
	L	55	.003	55	.00001		P
	U	60	.003	60	.00001		E
	B	65	.004	65	.00002		R
	L	70	.005	70	.00002		T
	E	75	.007	75	.00003		I
		80	.008	80	.00003		N
		85	.010	85	.00004		E
		90	.012	90	.00005		N
		95	.015	95	.00006		T
		100	.018	100	.00007		
		105	.022	105	.00009		
		110	.027	110	.00010		
		115	.032	115	.00012		
		120	.039	120	.00015		
		125	.047	125	.00017		
		130	.056	130	.00021		
		135	.066	135	.00024		
		140	.079	140	.00029		
		145	.093	145	.00034		
		150	.110	150	.00039		
		155	.129	155	.00046		

TOLUENE

TOL

Common Symptoms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	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. 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. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cook exposed containers with water.</p>		
Exposure	<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 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>		
1. RESPONSE TO DISCHARGE		2. LABEL	
(See Response Methods Handbook) Issue warning-high flammability Evacuate area		2.1 Category: Flammable liquid 2.2 Class: 3	
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS	
3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C ₆ H ₅ CH ₃ 3.3 IMD/JUN Designation: 3.2/1294 3.4 DOT ID No.: 1294 3.5 CAS Registry No.: 108-88-3		4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like; distinct, pleasant	
5. HEALTH HAZARDS			
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, griping, 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 style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 40°F C.C.; 65° 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. 6.11 Stoichiometric Air to Fuel Ratio: Data not available. 6.12 Flame Temperature: Data not available.</p> <p style="text-align: center;">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 style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 1180 mg/l/96 hr/sunfish/TL/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 Concentration Potential: None</p> <p style="text-align: center;">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; 80/120: 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 style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-T-U</p> <p style="text-align: center;">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;"> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> <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>3</td> </tr> <tr> <td> Aesthetic Affect</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> <tr> <td>11.3 NFPA Hazard Classification:</td> <td></td> </tr> <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>0</td> </tr> </table> <p style="text-align: center;">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: -139°F = -96.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°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 = 9686 cal/g = -4.055 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 style="text-align: center;">NOTES</p>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant ..	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Affect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	11.3 NFPA Hazard Classification:		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
Category	Rating																																						
Fire	3																																						
Health																																							
Vapor Irritant	1																																						
Liquid or Solid Irritant ..	1																																						
Poisons	2																																						
Water Pollution																																							
Human Toxicity	1																																						
Aquatic Toxicity	3																																						
Aesthetic Affect	2																																						
Reactivity																																							
Other Chemicals	1																																						
Water	0																																						
Self Reaction	0																																						
11.3 NFPA Hazard Classification:																																							
Category	Classification																																						
Health Hazard (Blue)	2																																						
Flammability (Red)	3																																						
Reactivity (Yellow)	0																																						

TOL	TOLUENE
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
-30	57.180	0	.396	0	1.026	0	1.024
-20	56.870	5	.397	10	1.015	5	.978
-10	56.550	10	.399	20	1.005	10	.935
0	56.240	15	.400	30	.994	15	.894
10	55.930	20	.402	40	.983	20	.857
20	55.620	25	.403	50	.972	25	.821
30	55.310	30	.404	60	.962	30	.788
40	54.990	35	.406	70	.951	35	.757
50	54.680	40	.407	80	.940	40	.727
60	54.370	45	.409	90	.929	45	.700
70	54.060	50	.410	100	.919	50	.673
80	53.750	55	.411	110	.908	55	.649
90	53.430	60	.413	120	.897	60	.625
100	53.120	65	.414	130	.886	65	.603
110	52.810	70	.415	140	.876	70	.582
120	52.500	75	.417	150	.865	75	.562
		80	.418	160	.854	80	.544
		85	.420	170	.843	85	.526
		90	.421	180	.833	90	.509
		95	.422	190	.822	95	.493
		100	.424	200	.811	100	.477
		105	.425	210	.800		
		110	.427				
		115	.428				
		120	.429				
		125	.431				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	.050	0	.038	0	.00070	0	.228
		10	.057	10	.00103	25	.241
		20	.084	20	.00150	50	.255
		30	.121	30	.00212	75	.268
		40	.172	40	.00296	100	.281
		50	.241	50	.00405	125	.294
		60	.331	60	.00547	150	.306
		70	.449	70	.00727	175	.319
		80	.600	80	.00954	200	.331
		90	.792	90	.01237	225	.343
		100	1.033	100	.01584	250	.355
		110	1.332	110	.02007	275	.367
		120	1.700	120	.02518	300	.378
		130	2.148	130	.03127	325	.389
		140	2.690	140	.03850	350	.400
		150	3.338	150	.04700	375	.411
		160	4.109	160	.05691	400	.422
		170	5.018	170	.06840	425	.432
		180	6.083	180	.08162	450	.443
		190	7.323	190	.09675	475	.453
		200	8.758	200	.11400	500	.462
		210	10.410	210	.13340	525	.472
						550	.482
						575	.491
						600	.500

m-XYLENE

XLM

Common Symptoms 1,3-Dimethylbenzene Xyloil	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 foam, 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 ₆ H ₄ (CH ₃) ₂ 3.3 IMO/UN 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 Limits: 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 or 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%-6.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water 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: 986°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	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">Vapor Irritant</td> <td>1</td> </tr> <tr> <td style="padding-left: 20px;">Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td style="padding-left: 20px;">Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">Human Toxicity</td> <td>1</td> </tr> <tr> <td style="padding-left: 20px;">Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td style="padding-left: 20px;">Aesthetic Affect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td style="padding-left: 20px;">Other Chemicals</td> <td>1</td> </tr> <tr> <td style="padding-left: 20px;">Water</td> <td>0</td> </tr> <tr> <td style="padding-left: 20px;">Self Reaction</td> <td>0</td> </tr> </table> 11.3 NFPA Hazard Classification: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">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>0</td> </tr> </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 Affect	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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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 Causes: 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	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: -64.2°F = -47.9°C = 226.3°K 12.5 Critical Temperature: 650.8°F = 343.8°C = 617.0°K 12.6 Critical Pressure: 513.8 atm = 34.85 psia = 3,640 MN/m ² 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 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 ⁶ J/kg 12.13 Heat of Combustion: -17,654 Btu/lb = -9762.4 cal/g = -406.31 x 10 ⁶ 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																																				
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 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																																				
NOTES																																					

XLM	m-XYLENE
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
15	55.400	40	.387	35	.962	15	.938
20	55.260	50	.393	40	.953	20	.898
25	55.130	60	.398	45	.944	25	.862
30	54.990	70	.404	50	.935	30	.827
35	54.850	80	.410	55	.926	35	.794
40	54.710	90	.415	60	.917	40	.764
45	54.570	100	.421	65	.908	45	.735
50	54.430	110	.426	70	.899	50	.708
55	54.290	120	.432	75	.890	55	.682
60	54.160	130	.437	80	.881	60	.658
65	54.020	140	.443	85	.873	65	.635
70	53.880	150	.448	90	.864	70	.613
75	53.740	160	.454	95	.855	75	.592
80	53.600	170	.460	100	.846	80	.572
85	53.460	180	.465			85	.554
90	53.320	190	.471				
95	53.180	200	.476				
100	53.050	210	.482				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	K	60	.090	60	.00172	0	.247
	N	70	.127	70	.00238	25	.260
	S	80	.177	80	.00324	50	.273
	O	90	.242	90	.00435	75	.286
	L	100	.325	100	.00577	100	.299
	U	110	.434	110	.00754	125	.311
	B	120	.571	120	.00975	150	.324
	L	130	.743	130	.01247	175	.336
	E	140	.955	140	.01577	200	.348
		150	1.219	150	.01977	225	.360
		160	1.538	160	.02455	250	.371
		170	1.924	170	.03023	275	.383
		180	2.358	180	.03691	300	.394
		190	2.939	190	.04473	325	.406
		200	3.590	200	.05382	350	.417
		210	4.355	210	.06431	375	.427
		220	5.247	220	.07635	400	.438
		230	6.262	230	.09009	425	.449
		240	7.476	240	.10570	450	.459
		250	8.845	250	.12330	475	.469
		260	10.410	260	.14310	500	.479
						525	.489
						550	.499
						575	.508
						600	.517

o-XYLENE

XLO

Common Symptoms 1,2-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor	Floats on water. Flammable, irritating vapor is produced.
<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. Wear 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>	
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	4. OBSERVABLE CHARACTERISTICS	
3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: o-C ₈ H ₁₀ (CH ₃) ₂ 3.3 IMO/JUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-8	4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; 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 600 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 or 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 style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 63°F C.C.; 75°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water 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: 869°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 style="text-align: center;">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 style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: > 100 mg/l/96 hr/D, magna/TL₁₀₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 6 days; 2.5% (theor.), 8 days 8.4 Food Concentration Potential: Data not available</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99% Pure: 99.7% Commercial: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No action 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <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>3</td> </tr> <tr> <td> Aesthetic Affect</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> </table> <p>11.3 NFPA Hazard Classification: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">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>0</td> </tr> </table> </p> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 291.9°F = 144.4°C = 417.6°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 674.8°F = 357.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 36.84 paia = 3.732 MN/m² 12.7 Specific Gravity: 0.880 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.63 dynes/cm = 0.03063 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.058 12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 x 10⁵ J/kg 12.13 Heat of Combustion: -17,658 Btu/lb = -9754.7 cal/g = -408.41 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: 30.64 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.28 paia</p> <p style="text-align: center;">NOTES</p> </p>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Affect	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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XLO	o-XYLENE
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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
15	56.460	35	.389	35	1.043	15	1.328
20	56.330	40	.391	40	1.035	20	1.263
25	56.190	45	.394	45	1.027	25	1.202
30	56.050	50	.396	50	1.018	30	1.145
35	55.910	55	.398	55	1.010	35	1.092
40	55.770	60	.400	60	1.002	40	1.042
45	55.630	65	.402	65	.993	45	.995
50	55.490	70	.404	70	.985	50	.952
55	55.360	75	.406	75	.977	55	.911
60	55.220	80	.408	80	.969	60	.873
65	55.080	85	.411	85	.960	65	.836
70	54.940	90	.413	90	.952	70	.802
75	54.800	95	.415	95	.944	75	.770
80	54.660	100	.417	100	.935	80	.740
85	54.520					85	.712
90	54.380						
95	54.250						
100	54.110						

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	.071	60	.00135	0	.261
	N	70	.101	70	.00188	25	.274
	S	80	.141	80	.00258	50	.287
	O	90	.194	90	.00349	75	.299
	L	100	.263	100	.00464	100	.311
	U	110	.352	110	.00611	125	.323
	B	120	.465	120	.00794	150	.335
	L	130	.609	130	.01021	175	.347
	E	140	.767	140	.01298	200	.358
		150	1.007	150	.01634	225	.370
		160	1.227	160	.02038	250	.381
		170	1.605	170	.02520	275	.392
		180	1.999	180	.03090	300	.403
		190	2.469	190	.03759	325	.414
		200	3.028	200	.04539	350	.424
		210	3.656	210	.05443	375	.435
		220	4.456	220	.06484	400	.445
		230	5.352	230	.07674	425	.455
		240	6.369	240	.09030	450	.465
		250	7.581	250	.10560	475	.475
		260	8.947	260	.12290	500	.485
						525	.494
						550	.504
						575	.513
						600	.522

p-XYLENE

XLP

Common Symptoms	Watery liquid	Colorless	Sweet odor
1,4-Dimethylbenzene Xylol	Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.		
<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. Wear 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 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>		
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>		
1. RESPONSE TO DISCHARGE		2. LABEL	
(See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		2.1 Category: Flammable liquid	2.2 Class: 3
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS	
3.1 CG Compatibility Class: Aromatic Hydrocarbon	3.2 Formula: p-C ₆ H ₄ (CH ₃) ₂	3.3 IMO/UN Designation: 3.2/1307	3.4 DOT ID No.: 1307
3.5 CAS Registry No.: 106-42-3	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 Limits: 300 ppm for 30 min.	5.6 Toxicity by Ingestion: Grade 3; LD50 = 50 to 600 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			

6. FIRE HAZARDS

6.1 Flash Point: 81°F C.C.
6.2 Flammable Limits in Air: 1.1%-6.6%
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: 870°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 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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 22 ppm/96/hr/ bluegill/TL₅₀/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days
8.4 Food Concentration Potential: Data not available

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE
(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Flammable liquid

11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	1
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	1
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Affect	2
Reactivity	1
Other Chemicals	1
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

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: 280.9°F = 138.3°C = 411.5°K

12.4 Freezing Point: 56.9°F = 13.3°C = 286.6°K

12.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K

12.6 Critical Pressure: 509.4 atm = 34.65 psia = 3.510 MN/m²

12.7 Specific Gravity: 0.861 at 20°C (liquid)

12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C

12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°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: 150 Btu/lb = 81 cal/g = 3.4 x 10⁵ J/kg

12.13 Heat of Combustion: -17,559 Btu/lb = -8754.7 cal/g = -406.41 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: 37.63 cal/g

12.26 Limiting Value: Data not available

12.27 Reid Vapor Pressure: 0.34 psia

NOTES

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12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit- inch per hour- square foot-F	Temperature (degrees F)	Centipoise
60	53.970	60	.412	60	.935	60	.678
65	53.830	70	.418	65	.928	65	.654
70	53.690	80	.424	70	.921	70	.631
75	53.550	90	.429	75	.914	75	.610
80	53.410	100	.435	80	.907	80	.590
85	53.270	110	.440	85	.900	85	.571
90	53.140	120	.446	90	.892	90	.552
95	53.000	130	.451	95	.885	95	.535
100	52.860	140	.457	100	.878	100	.519
105	52.720	150	.462			105	.503
110	52.580	160	.468			110	.488
115	52.440	170	.474			115	.474
120	52.300	180	.479			120	.460
		190	.485				
		200	.490				
		210	.496				
		220	.501				
		230	.507				
		240	.512				
		250	.518				
		260	.524				
		270	.529				
		280	.535				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	60	.096	60	.00183	0	.246
	N	70	.135	70	.00252	25	.259
	S	80	.187	80	.00343	50	.272
	O	90	.255	90	.00459	75	.285
	L	100	.343	100	.00607	100	.297
	U	110	.455	110	.00792	125	.309
	B	120	.599	120	.01022	150	.321
	L	130	.777	130	.01303	175	.333
	E	140	.998	140	.01646	200	.345
		150	1.270	150	.02059	225	.357
		160	1.600	160	.02553	250	.368
		170	1.998	170	.03138	275	.380
		180	2.475	180	.03826	300	.391
		190	3.041	190	.04629	325	.402
		200	3.710	200	.05561	350	.413
		210	4.493	210	.06636	375	.424
		220	5.407	220	.07867	400	.435
		230	6.465	230	.09270	425	.445
		240	7.693	240	.10860	450	.456
		250	9.080	250	.12650	475	.466
		260	10.670	260	.14670	500	.476
						525	.486
						550	.496
						575	.505
						600	.515

5.0 SITE CONTROL

5.1 ZONATION. Due to the nature of the work (multiple soil borings and monitoring well sampling throughout the study area) and the properties of the potential chemicals found onsite, typical exclusion, contamination reduction, and support zones are not necessary or practical at all locations. Therefore, where appropriate, a "floating" exclusion zone at the perimeter of the sampling site will be established to eliminate access to the area by the individuals not working on the project or involved in the assignment work. The perimeter will be at least 20 feet in radius and moved accordingly with the sampling locations.

5.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

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

5.3 WORK PRACTICES. General work practices to be used during ABB-ES projects are described in Chapter 9.0 of the CLEAN HASP. Work at the site will be conducted according to these established protocol and guidelines for the safety and health of all involved. Specific work practices necessary for this project or those that are of significant concern are described as follows.

- Work and sampling will be conducted in level D clothing and equipment.
- Use the buddy system.
- Smoking, eating and drinking in the work area prior to decontamination is not permitted.
- Heat stress must be considered in planning work schedules and breaks.
- Hearing protection must be considered when working in the immediate vicinity of the drill rig and the aircraft flight line.
- All personnel must minimize contact with excavated or contaminated materials. Do not place equipment on the ground. Do not sit or kneel on the ground in the Exclusion Zone. Avoid standing in or walking through puddles or stained soil.
- Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.
- Personnel must be observant not only of their 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.
- Contact lenses are not allowed to be worn onsite; if corrosive or lachrymose substances enter the eyes, proper flushing is impeded.

6.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination, which will take place in the Contamination Reduction Zone (CRZ). General decontamination practices used during ABB-ES projects are described in Chapter 13.0 of the CLEAN HASP.

6.1 PERSONNEL DECONTAMINATION. All personnel leaving the investigation area are subject to decontamination (as necessary). The decontamination procedure required will be determined by the nature and level of contamination found at the sites. At a minimum, site personnel will remove loose soil from boots and clothing before leaving the site. More thorough decontamination procedures will be observed as dictated by site conditions. These procedures are described in Chapter 13.0 of the CLEAN HASP.

6.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be cleaned in the field between samples with soapy water (Alconox™), rinsed with clean water, rinsed with an approved Quality Assurance/Quality Control solvent, and given a final rinse with organic free water.

6.1.2 Heavy Equipment Decontamination Drilling rigs and other heavy equipment will be cleaned with high-pressure water or steam. Loose material will be removed with a brush. Downhole tools and heavy equipment will be similarly decontaminated.

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. Investigation-derived wastes will be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. Potentially contaminated materials (e.g., clothing, gloves, etc.) will be bagged or drummed as necessary and segregated for disposal. Contaminated waste materials shall be disposed of as required by the provisions included in the contract and consistent with NAVSTA and regulatory provisions. All non-contaminated materials will be collected and bagged for appropriate disposal as normal domestic waste.

7.0 EMERGENCY AND CONTINGENCY PLAN

This chapter identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP. The following sections present site-specific emergency and contingency planning information.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both onsite and offsite will be directed through the HSO or designee. Emergency telephone numbers are listed in Section 9.5.

7.2 EVACUATION. In the event of an emergency situation such as fire, explosion, significant release of toxic gases, etc., an air horn or other appropriate device will be sounded for three long blasts indicating the initiation of evacuation procedures. All personnel will evacuate the work area. The location of safe areas will be upwind of the site. For efficient and safe site evacuation and assessment of the emergency situation, the HSO will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO must see that access for emergency equipment is provided and that all combustible apparatus has been shut down once the alarm has been sounded.

The HSO will notify local fire and police departments and other appropriate emergency response groups if lower explosive limit (LEL) values are above 20 percent in the work zone, or if an actual fire or explosion has taken place.

7.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured onsite will be rendered first aid as appropriate and transported to competent medical facilities for further examination and treatment. Designated emergency medical facilities and routes from the site are listed in Section 9.6. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transportation will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 SAFE WORK PRACTICES

All personnel onsite are required to promote and follow prudent work practices to provide a safe working environment. All individuals are to follow the guidelines given below for their specific work activities.

8.1 DRILL RIG SAFETY PROCEDURES. The ABB-ES FOL will observe drilling and well installation procedures and provide air monitoring, as needed, for specific activities. The FOL will remain outside the immediate work area around the rig, whenever possible, to avoid interference with drilling activities. In addition, drilling subcontractors are responsible for maintaining safe, fully operational drilling equipment in the field, and should conduct regular safety inspections of equipment and working conditions.

8.2 SAMPLING SAFETY PROCEDURES. Safety practices for sampling activities provide worker protection from chemical hazards associated with the sample materials, preservatives, and chemicals that may be required for equipment decontamination. In addition, the following points of good field practice should be implemented.

- Specified USEPA Region IV sampling techniques should be used.
- Good judgment should be used in collecting and handling samples. (If a proposed sampling site is not readily accessible or the sampling method is unfeasible, sample collection should not be attempted. The TOM and FOL should be contacted to select an alternate sampling site.)
- Spills, dirt, and residue from sampling should be cleaned up immediately.
- Damaged sampling gear or equipment should be repaired or replaced immediately.
- The sampling area should be evacuated if any symptoms of overexposure are detected, and such incidents should be reported to the HSO and TOM.
- Unnecessary physical contact with sample material should be avoided.
- Exposure and environmental monitoring should be performed as required by the safety plan.
- Contact with chemicals used for sample preservation or decontamination of sampling equipment should be avoided.
- Safety plan requirements should be adhered to when handling or packaging hazardous samples. Packaging, labeling, and shipping should conform with the Department of Transportation regulations.

9.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in this HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: Building 460 and Building 1587, NAVSTA Mayport

9.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the support zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: Building 460 and Building 1587, NAVSTA Mayport, Mayport, Florida

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

Do you wear contact lenses? Yes () No ()

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

9.5 EMERGENCY TELEPHONE NUMBERS

Police Department	911
Ambulance	911
Primary Hospital - Baptist Medical Center	(904) 247-2900
Local Fire Department	9-911
Offsite Emergency Services	911
Poison Control Center	(800) 282-3171
National Response Center	(800) 424-8802
Site HSO: <u>Mark Joop</u>	(904) 269-7012
Field Operations Leader: <u>Joe Fugitt</u>	(904) 656-1293
Task Order Manager: <u>Peter Redfern</u>	(904) 269-7012
ABB Environmental HSS: <u>Meg MacLeod</u>	(800) 341-0460 x3380 (207) 799-4271 (home)
ABB Environmental HSM: <u>C.E. Sundquist</u>	(800) 341-0460 x3309 (207) 892-4402 (home)
SOUTHNAVFACENGCOM Engineer-in-Charge (EIC): <u>Byas Glover</u>	(803) 743-0651

9.6 ROUTES TO EMERGENCY MEDICAL FACILITIES

The primary source of medical assistance for the site is as follows.

Facility Name: Baptist Medical Center Beaches

Address: 1350 13th Ave. South, Jacksonville, Florida

Telephone Number: (904) 247-2900

Directions to primary source of medical assistance (Figure 9-1):

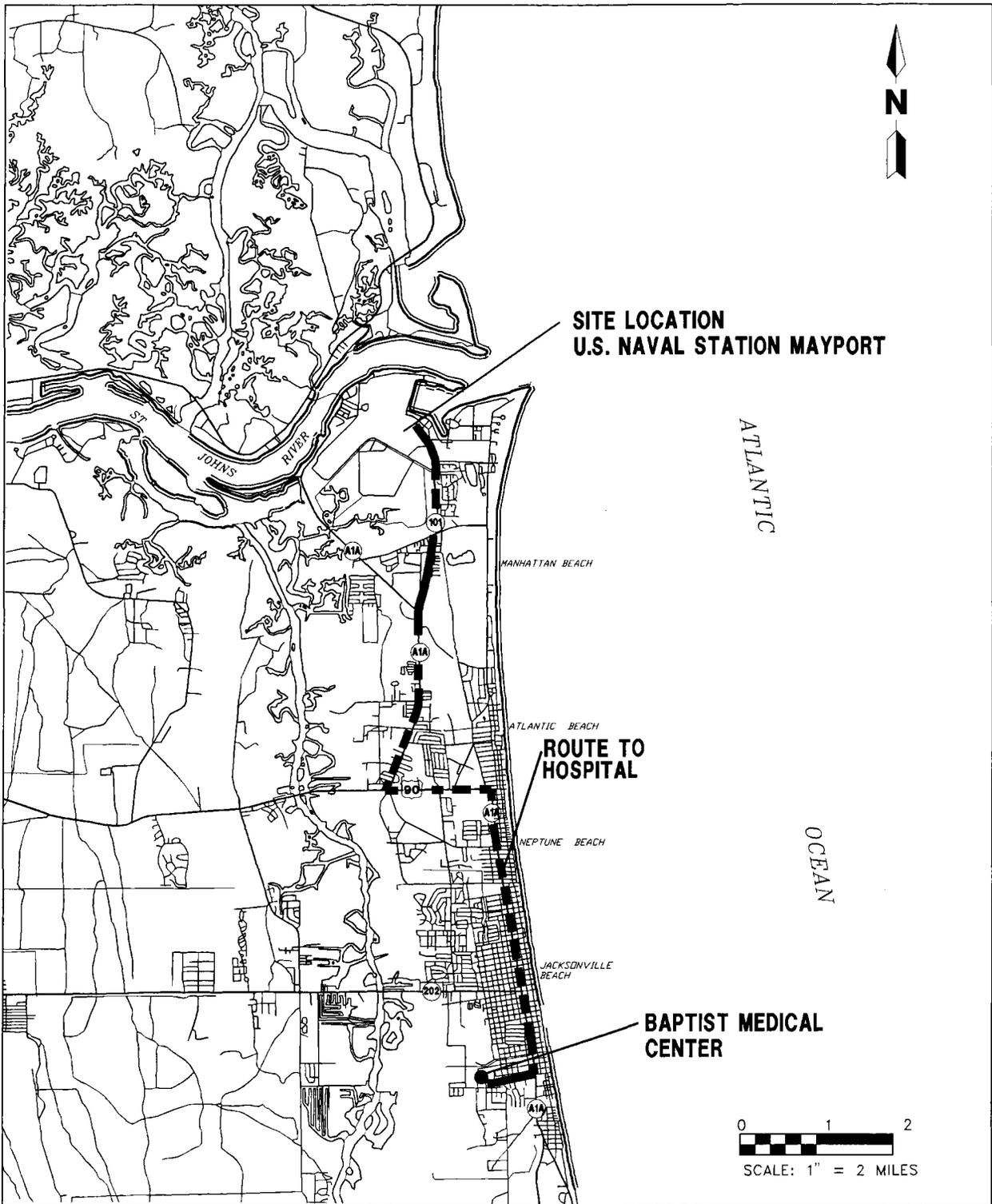
Travel approximately 7.8 miles south on Highway 101, which becomes AlA, from NAVSTA Mayport to 13th Avenue, turn right, travel approximately 0.6 mile, the hospital is on the left. See Figure 9-1.

The alternate source of medical assistance is:

St. Luke's Hospital
4201 Belfort Road
Jacksonville, FL
(904) 296-3700

Directions to alternate hospital:

Travel south from NAVSTA Mayport to Atlantic Blvd., turn west (right) on Atlantic. Proceed to St. John's Bluff Road, turn south (left) onto St. John's Bluff and follow to Belfort Road. St. Luke's Hospital is located at the corner of Butler and Belfort. See Figure 9-1.



**FIGURE 9-1
ROUTE TO BAPTIST MEDICAL CENTER**



**HEALTH AND SAFETY PLAN,
BACHELORS ENLISTED
QUARTERS SITE**

**NAVSTA MAYPORT
MAYPORT, FLORIDA**

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 orders 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 discriminatory action.

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 civil penalties against employers of up to \$7,000 for each serious violation and for optional penalties of up to \$7,000 for each nonserious violation. Penalties of up to \$7,000 per day may be proposed for failure to correct violations within the proposed time period and for each day the violation continues beyond the prescribed abatement date. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$70,000 for each such violation. A violation of posting requirements can bring a penalty of up to \$7,000.

There are also provisions for criminal penalties. Any willful violation resulting in the death of any employee, upon conviction, is punishable by a fine of up to \$250,000 (or \$500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment. Falsifying records, reports, or applications is punishable by a fine of \$10,000 or up to six months in jail or both.

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.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control employee exposure to workplace hazards. 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.

VOLUNTARY ACTIVITY

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. These programs are usually administered by the State labor or Health department or a State university.

POSTING INSTRUCTIONS

Employees in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or facsimile) in a conspicuous place where notices to employees are customarily posted.

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	(404) 347-3573
Boston, Massachusetts	(617) 565-7164
Chicago, Illinois	(312) 353-2220
Dallas, Texas	(214) 767-4731
Denver, Colorado	(303) 844-3061
Kansas City, Missouri	(816) 426-5861
New York, New York	(212) 337-2378
Philadelphia, Pennsylvania	(215) 596-1201
San Francisco, California	(415) 744-6670
Seattle, Washington	(206) 442-5930

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OSHA 2203

Lynn Martin, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

To report suspected fire hazards, imminent danger safety and health hazards in the workplace, or other job safety and health emergencies, such as toxic waste in the workplace, call OSHA's 24-hour hotline: 1-800-321-OSHA.