Prepared for

Chevron U.S.A. Inc.
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PROJECT HEALTH AND SAFETY PLAN
HOUGHTON BEACH PARK REMEDIATION
KIRKLAND, WASHINGTON

by

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PREFACE

The purpose of this project Health and Safety Plan (HASP) is to provide guidance and procedures to ensure the physical well being of Applied Geotechnology Inc. (AGI) personnel involved in field activities at the Houghton Beach Park site (Site) located in Kirkland, Washington. This HASP applies only to AGI personnel working within the scope outlined in this document.

If, during the course of work, information is obtained indicating additional hazards or a change in the scope of work, fieldwork should be temporarily halted, information regarding potential hazards should be reevaluated, and this HASP should be updated/modified as necessary. Only after AGI field personnel are notified of the modification to the HASP should work resume.

1.0 GENERAL INFORMATION

1.1 Contact Personnel

Chevron U.S.A. Inc.	Bob Brinkmann	(206) 628-4551
AGI Project Manager	Stephen Reimers	(206) 453-8383
AGI Health and Safety Manager	Monica Beckman	(206) 453-8383
AGI Site Safety Manager	Ross Stainsby	(206) 453-8383
AGI Occupational Physician	Dr. Susan Berg (Virginia Mason)	(206) 822-3651

1.2 Site Location and Description

Houghton Beach Park, owned by the City of Kirkland, is a 3.8-acre property located approximately one mile south of downtown Kirkland along the eastern shore of Lake Washington. The park is bounded on the east by Lake Washington Boulevard, on the west by Lake Washington, and on the north and south by commercial and residential properties, respectively. Site dimensions are approximately 850 feet north-south and 200 feet east-west. Existing park features are shown on the Site Plan included as Figure 1.

1.3 Site History

Chevron, Shell, and Signal oil companies operated bulk fuel storage terminals on portions of the property from about 1917 to 1970. Operations at the terminals ceased in 1970 and these portions of the property were purchased by the City of Kirkland. The City has operated a public park on all portions of the property since that time.

During park improvements in April 1991, petroleum hydrocarbons were discovered in Site soils. Environmental site assessments, performed by AGI and GeoEngineers, indicate soil and groundwater underlying portions of the Site are contaminated with petroleum hydrocarbons. Contaminated soil is expected to maximum depths of eight (8) feet below ground surface.

1.4 Scope of Work

This HASP describes the procedures to be followed and the personal protective equipment to be used during field activities associated with work at the Site. Fieldwork, to be conducted as part of this project, includes the following tasks:

- Construct the treatment cell.
- Install temporary erosion protection along portions of the shoreline.
- Excavate contaminated soil using conventional heavy equipment.
  - Move heavy equipment and contaminated soil throughout the Site.
  - Collect soil samples for chemical analysis.

- o Extract, treat, and dispose groundwater.
  - Transport and unload equipment.
  - Install treatment system.
  - Discharge treated water to sanitary sewer system.
- o Solid Phase Treat contaminated soil.
  - Screen excavated soil.
  - Add nutrients.
  - Till soil.
  - Irrigate soil.
- o Sample treatment cell soils.
- o Replace treated soil.
  - Transport material back to excavation.
  - Perform soil compaction and testing.
- o Remove groundcover from remaining portions of the Site and observe for hydrocarbon contamination.
- o Demobilize treatment cell and support facilities.

AGI personnel will be responsible for managing site work. Other contractors and subcontractors performing site work will be responsible for the health and safety of their respective employees.

2.0 HAZARD ASSESSMENT

2.1 Chemical Hazards

AGI employees may be exposed to hazardous chemicals during field operations at the Site. Exposure could be the result of physical contact with contaminated soil, physical contact with contaminated groundwater, or inhalation of compounds volatilizing from contaminated soil or groundwater during excavation and screening activities.

Environmental samples were collected and analyzed previously by AGI and GeoEngineers. According to analytical reports, soils and groundwater underlying portions of the property are contaminated with petroleum hydrocarbons.

The most common routes of exposure for contaminants include inhalation and skin contact/absorption. Acute short-term exposure to petroleum hydrocarbons may result in eye, nose, skin, and upper respiratory tract irritation. Mild narcosis is an indication of severe exposure. Some petroleum hydrocarbon constituents (e.g., benzene) are considered carcinogenic; therefore, exposure should be minimized. Observable symptoms in personnel may indicate permissible exposure levels are being exceeded; work should cease and a reevaluation of conditions made. For further information concerning site contaminants, see the Material Safety Data Sheets (MSDSs) included in Appendix A.

2.2 Fire and Explosion Hazards

The risk of fire or explosion exists, but is anticipated to be minimal during field activities. A combustible gas meter (CGM) may be utilized during field activities (see section 4.1, Air Monitoring). If percent Lower Explosive Levels (LEL) reach 20 percent in the general area, work should cease and the tasks should be reevaluated.

2.3 Oxygen Deficiency Hazards

It is not expected that an oxygen depleted atmosphere will be encountered during site activities. Confined space entries are considered a last resort and require an addendum to this HASP.

2.4 Electrical Hazards

Prior to beginning excavation activities, personnel should determine whether underground utilities are located in the area. No overhead powerlines are located on the property.

2.5 Physical Hazards

The principal safety hazards are anticipated to be those associated with excavation activities and heavy equipment movement. During field operations, AGI personnel should wear hard hats, safety glasses, and steel-toe work boots. In addition, hearing protection is recommended due to the likelihood of high decibel output near heavy equipment.

Excavated soil should be placed and maintained a minimum of two (2) feet from the edge of an excavation. Most trenches and excavations greater than four (4) feet deep are considered confined spaces and should only be entered by AGI personnel as a last resort. In addition, entrance should not be permitted while heavy equipment operations are actively progressing. Work involving trenches or excavations should be performed in accordance with applicable regulations. AGI personnel should not enter excavations that do not meet state and Federal guidelines.

When equipment is being loaded/unloaded from trucks, personnel should stand clear to prevent injuries should the load fall. AGI personnel should be aware of moving equipment at the Site and stay out of its way; particular attention should be paid when backup alarms are sounding because operator visibility in the direction of travel may be decreased. AGI personnel should remain outside the swing radius of heavy equipment whenever practical. When required to approach heavy equipment, AGI personnel should first make eye contact with the operator. AGI personnel should not ride on the outside of heavy equipment. During equipment maintenance work, lockout procedures should be followed. At the end of each work period, heavy equipment should be left with buckets on the ground, the cab locked, and the keys removed.

Additional personnel may be necessary to direct traffic during operations involving an increase in vehicular traffic, such as soil transport to and from the Site. These personnel should be properly trained and utilize appropriate safety equipment (i.e., orange vest, hard hat, and hand-held sign.) If personnel are required to cross Lake Washington Boulevard, they should cross at established crosswalks and comply with pedestrian rules.

Additional hazards during fieldwork can be a result of temperature extremes ranging from hypothermia to heat stress. Appropriate clothing and a heated rest area should be available if outside temperatures fall below 40°F for more than two hours. If symptoms of hypothermia (e.g., uncontrolled shivering, feeling disoriented, etc.) are noted, personnel should stop work and seek warm shelter. Personnel performing physical labor while wearing protective clothing at temperatures above 70°F are subject to developing heat-related disorders. Employee temperatures and radial pulse rates should be monitored to ensure an adequate work/rest regimen.

3.0 PERSONNEL PROTECTION

This section describes the personal protective equipment (PPE) to be worn by personnel performing field operations at the Site. Appropriate PPE was determined using information in section 2.0, Hazard Assessment. The following PPE should be worn by personnel working in the exclusion zones (i.e., the land treatment unit containing contaminated material and the north portion of the park during excavation and screening of contaminated soil):

- Head protection - Hard hats should be worn.

- Eye and face protection - Safety glasses should be worn, except with full-face respirators. Face shields should also be worn when there is a high splash potential.

- Foot protection - Steel toe and shank work boots should be worn. Work boots should be made of rubber, or "nuke booties" may be worn over leather boots.

- Skin protection - Cotton coveralls should be worn. If direct contact with contaminated material is anticipated, grey-colored tyvek coveralls should also be worn. If the probability of being splashed or coming in contact with wet contaminants is high, personnel should wear pvc rainsuits or saranax-coated tyvek. For operations in the general area (e.g., site supervision), regular work clothing should provide adequate protection.

- Hand protection - During activities which provide for potential contact with contaminated soil or groundwater, personnel should wear chemically protective gloves. An inner surgical-type glove should be worn to lessen the chance of cross contamination during decontamination activities. Outer gloves should be made of Neoprene, Nitrile, or a mixture of these (e.g., Trionic). If necessary, heavy-duty work gloves may also be worn. If work gloves are worn over chemically protective gloves, they should be considered disposable. An alternative is to wear the work gloves under the outer chemically protective gloves.

- Respiratory protection - If air monitoring using an organic vapor meter (OVM) or colorimetric tubes indicate breathing zone organic vapor concentrations are reaching the action levels (see section 4.1), engineering controls (e.g., ventilation) should be used to minimize employee exposures. Personnel should also be instructed to stay upwind during field operations as much as possible.

If vapor levels cannot be controlled utilizing engineering and administrative controls, personnel should wear NIOSH approved, properly fitted half-face respirators. Respirators should be equipped with combination organic vapor/high efficiency particulate (OV/HEPA) cartridges. Cartridges should be changed a minimum of once per day or more often if breakthrough is suspected. Half-face respirators yield a protection factor of 10 times the Permissible Exposure Limit (PEL). When breathing zone concentrations exceed 10 ppm benzene, personnel should upgrade to full-face respirators equipped with the same type cartridge.

Personnel working outside the exclusion zones or in these areas before or after contaminated material is present should not be required to wear protective clothing or respirators. Hard hats, safety glasses, and steel-toe boots should be worn if heavy equipment operations are progressing in the area.

In general, the following levels of protection have been assigned to field tasks:

- Constructing the treatment cell - Level D.
- Installing temporary erosion protection - Level D.
- Excavating contaminated soil - Levels C or D (as determined onsite.)
- Screening excavated soil - Levels C or D (as determined onsite.)
- Treating contaminated soil - Levels C or D (as determined onsite.)
- Extracting treating, and disposing of groundwater - Levels C or D (as determined on site.)
- Sampling treatment cell soils - Levels C or D (as determined onsite.)
- Backfilling treated soils - Level D.
- Removing groundcover and investigating for areas of contamination - Level D.
- Demobilizing treatment cell and support facilities - Level D.

Level D is considered general work clothing while Level C is considered general work clothing with the addition of chemically protective clothing and respirators. In some cases, personnel may wear chemically protective clothing and no respirator; this is usually referred to as Modified Level D protection.

4.0 AIR MONITORING AND SAMPLING

Air monitoring and sampling should be conducted during operations having a high potential for airborne chemical exposure to document exposure levels and assure necessary precautions are taken to protect onsite personnel and the public. Monitoring and sampling equipment should be calibrated daily in accordance with the manufacturer's requirements. Calibration data, wind direction, background readings, air monitoring readings, and air sampling information should be recorded as part of the daily field logs.

4.1 Air Monitoring

4.1.1 Personnel

Personnel action levels for the OVM, colorimetric tubes, and CGM have been established for work at the Site. Personnel action levels are based on readings in the breathing zone which is considered to encompass a circle of 1-foot radius around the worker's nose during normal work operations. During operations having a potential for generating volatile organic compounds, breathing zone organic vapor concentrations should be measured a minimum of five (5) times during the work day and the results recorded in the daily field log. Breathing zone air monitoring should be conducted on a random basis for each AGI employee. Additional air monitoring may be conducted at the discretion of the Site Safety Manager (SSM).

A conservative personnel action level for organic vapors was established with particular attention given to the percent BETX composition of petroleum hydrocarbons (i.e., 4 percent BETX compounds) because the OVM measures total organic vapors and cannot readily distinguish between compounds. Consideration was also given to potential concentrations of the BETX compound with the lowest PEL (i.e., Benzene has a PEL of 1 ppm and reportedly is present in gasoline at concentrations of 1 percent). It was assumed the OVM would only monitor BETX compounds and the percentage of each (BETX) compound would remain constant relative to the others over time and weathering (i.e., even though the overall percentage of BETX compounds in the soil may change, the percent benzene of this mixture would remain constant.) Based on these assumptions, the benzene PEL could be reached when total organic vapor concentrations measured utilizing the OVM reach 4 ppm in the breathing zone. **The personnel organic vapor action level should be a sustained (5 minutes) reading on the OVM of 4 ppm greater than background, measured in the breathing zone.**

If the personnel organic vapor action level is reached, personnel should upgrade to half-face respirators and utilize colorimetric tubes to determine the presence and concentration of benzene in the breathing zone. **If colorimetric tubes indicate the benzene concentration has reached 1 ppm, personnel should implement engineering controls or continue to wear half-face respirators; if benzene concentrations exceed 10 ppm, additional engineering controls should be implemented or full-face respirators should be worn; and if benzene concentrations exceed 50 ppm, work should cease, personnel should evacuate the Site, and engineering controls should be implemented.**

If real-time air monitoring utilizing the OVM indicates breathing zone organic vapor concentrations greater than 150 ppm (1/2 the Threshold Limit Value (TLV) for gasoline), but no benzene concentrations are detected; engineering controls should be implemented or personnel should wear half-face respirators. At concentrations greater than 300 ppm, personnel should upgrade to full-face respirators and at concentrations greater than 1,000 ppm, work should cease. Additional engineering controls may be implemented to lower organic vapor concentrations to levels below the established action levels for upgrading to full-face respirators or stopping work.

Combustible gas monitoring should be conducted when OVM readings exceed 2,000 ppm (i.e., approximately 15 percent of the LEL for gasoline) near work operations (outside the breathing zone) to prevent personnel from continuing to work in potentially explosive atmospheres. **The combustible gas action level considered the industry standard is 20 percent of the LEL.** If the percent LEL reaches 20 percent near a work operation, work should cease, personnel should evacuate the area, and engineering controls should be implemented. Personnel may reenter the area when measured explosive levels fall below 10 percent of the LEL.

4.1.2 Area

Perimeter air monitoring should be conducted utilizing the OVM during work operations at the Site. Perimeter air monitoring is usually conducted at the property boundary to document offsite emissions. Prior to conducting perimeter air monitoring, background organic vapor concentrations should be established and should be considered equal to organic vapor concentrations measured utilizing the OVM upwind of the Site.

Organic vapor concentrations should be monitored at the site perimeter a minimum of four times per day during operations having a potential for generating volatile organic compounds. Perimeter air monitoring should be conducted in the morning, before lunch, and in the afternoon while field work is actively progressing. In addition, perimeter air monitoring should be conducted at the end of each day, after field work has ceased. Additional air monitoring may be performed at the discretion of the SSM.

Conservative action levels have been established for perimeter air monitoring to protect the public from exposures and objectionable odors. The perimeter organic vapor action level is a sustained (5 minutes) reading on the OVM of 1 ppm above background. If objectionable odors are noticed or the perimeter action level is exceeded, engineering controls should be implemented. Colorimetric tubes should be used to ensure benzene vapors are not migrating from the site if organic vapor concentrations exceed 4 ppm at the perimeter. If benzene concentrations or organic vapor concentrations exceed 1 ppm or 300 ppm, respectively, work should cease and additional engineering controls should be implemented.

4.2 Air Sampling

Air sampling should be performed to document personnel exposures and off-site emissions of benzene. 3M-brand organic vapor diffusion badges (OVD badges) should be utilized for conducting air sampling. Upon sampling completion, the sample media should be collected and sealed, exposure times recorded, and the OVD badges sent to Galson Laboratories.

For personnel sampling, the sample media should be placed within 1 foot of the individuals' breathing zone and exposed eight (8) to ten (10) hours. OVD badges may be exposed shorter durations if personnel leave the exclusion zone. Personnel air samples should be collected for individuals on-site during the first day of excavation and soil screening of each contaminated area. Personnel air samples should be analyzed for benzene by NIOSH Reference Method 1501. Additional air sampling may be performed at the discretion of the SSM or Health and Safety Manager (HSM).

Perimeter air samples should be obtained by placing OVD badges around the perimeter of the Site, noting the wind direction, and exposing the OVD badges eight (8) to ten (10) hours. Additional samples may be collected near residential structures. Perimeter samples should be analyzed for total petroleum hydrocarbons (NIOSH Reference Method 1500) and peaks over 1 ppm identified and quantified. Perimeter samples should be collected at the discretion of the Project Manager (PM) and SSM.

5.0 SITE CONTROL

5.1 Site Security

No one should be allowed to enter the Site unless they have been given permission by the SSM and otherwise follow all portions of this HASP or another HASP prepared specifically for work at this site by their employer. AGI personnel should read this project specific HASP and sign the Field Team Review Form, provided in Appendix B, before performing field work outlined in the scope discussed in Section 1.4. Completed copies of the Field Team Review Form should be forwarded to the HSM. Copies of this HASP are available from the PM and HSM.

5.2 Site Work Zones

Work zones should be established at the Site to control possible exposure to bystanders and should be considered restricted areas. Only authorized personnel (i.e., those meeting training and medical requirements) should be allowed to enter. Three work zones should be established at the Site as follows:

- Exclusion Zone - The areas which contain or are suspected of containing contaminated soil. The land treatment area should be considered an exclusion zone once contaminated soil has been placed in it. The land treatment area should cease being an exclusion zone when bioremediation of the soil is complete. The north portion of the park should also be considered part of the exclusion zone while soil is being excavated. The exclusion zone should be delineated by a "hotline" and posted. Only authorized personnel may enter the exclusion zone.

- Contamination Reduction Zone (CRZ/Decontamination Area) - This zone should be established adjacent to the exclusion zone to act as a transition area for decontamination of personnel and equipment. A personnel decontamination area should be established at the south end of the land treatment unit. An equipment decontamination area should be established northeast of the land treatment unit, west of Lake Washington Boulevard.

- Support Zone - The area which is not contaminated. This area is used to stage clean equipment and other support facilities and should be located at the south end of the Site.

5.3 Decontamination Procedures

In order to assure contamination is controlled and not spread from the Site, decontamination procedures should be employed for both equipment and personnel. Contact with contaminated material should be limited. Methods to achieve minimization of contamination include using plastic covers over field equipment, and minimizing personnel contact rates and areas.

5.3.1 Personnel

Personnel should don protective equipment before entering the exclusion zone and should decontaminate after contact with contaminated material, before re-entering the support zone. Decontamination should consist of the following steps:

- Wash and rinse boots, gloves, and outer clothing (if applicable.) A phosphate-based detergent and water solution should be used for the wash.
- Remove outer gloves.
- Remove protective suit (if applicable.)
- Remove respirator, remove cartridges, and clean respirator.
- Remove inner gloves.
- Wash hands and face using "wet ones."
- Shower as soon as possible.

Sampling equipment should be brought through the decontamination line with personnel and cleaned. Used disposable protective equipment should be packaged for off-site disposal.

Partial decontamination may be necessary or desirable in situations such as heavy contamination prior to site egress, between sampling locations/collections, changing respirator cartridges, consultation with personnel outside the exclusion zone, or rest breaks. In such circumstances, field personnel may initiate the following partial decontamination procedures:

- Wash and rinse boots, gloves, or outer clothing (if applicable) depending on the reason for leaving the exclusion zone.
- Remove necessary equipment. Note that outer gloves should be removed prior to removal of outer clothing or a respirator.
- Perform necessary reason for leaving the exclusion zone.
- Redress prior to entering the exclusion zone or continue decontamination if entering the support zone.

5.3.2 Equipment

Heavy equipment should be decontaminated before leaving the Site. Service vehicles leaving the exclusion zone (e.g., dump trucks and delivery trucks) should also be decontaminated. In addition, heavy equipment and other types of vehicles should be verified clean before being allowed to enter the Site.

Heavy equipment is difficult to decontaminate, therefore certain pieces

should be dedicated to the project and should not leave the exclusion zone until the project is complete. The methods generally used to decontaminate heavy equipment include brushing off visible material and washing the equipment with high pressure water or steam. Particular care should be given to tires, buckets, and other components in possible direct contact with contaminated material. Service vehicles should be cleaned of visible material by first brushing exposed surfaces; if additional decontamination is required, water or steam should then be used.

5.4 General Safe Work Practices

Employees should comply with the following safe work practices and report unsafe conditions and practices to the SSM or HSM.

- A first-aid kit and fire extinguisher should be within 50 feet of the work operation.
- Personnel should utilize a buddy system at the Site. If working alone, AGI personnel should periodically check-in with the PM.
- Personnel should not eat, drink, chew gum or tobacco, smoke, or perform any other practice that increases the probability of hand-to-mouth contact in the exclusion or contamination reduction zones.
- The use of controlled substances or alcohol is forbidden at the Site. In addition, personnel should not work at the Site while under the influence of such substances.
- Personnel should wear appropriate PPE when at the Site.
- Personnel should not lift or move heavy objects in a manner that could lead to injury of themselves or other individuals. The large muscles of the leg should be used when lifting heavy equipment.
- Personnel should not adjust, repair, or service operating equipment.
- Air hoses should be bled before disconnecting them from a compressor.
- Personnel should not enter excavations when digging is actively progressing or heavy equipment is within two (2) feet of the edge of the excavation. In addition, personnel should remain two (2) feet from the edge of an excavation.

6.0 EMERGENCY PROCEDURES

Emergency response procedures have been developed for extraordinary events that could occur during field operations. These events include accidents and/or injuries, chemical exposure, spills, and fires.

In general, the following actions should be implemented in the event of an emergency:

- Firstaid or other appropriate initial action should be administered by those closest to the accident/event. This assistance should be coordinated by the SSM and conducted so those rendering assistance are not placed in a situation of unacceptable risk.

- The PM and HSM should be contacted. The PM should notify the Chevron U.S.A. Inc. PM.

- An accident/incident report should be completed by the injured individual or witness and forwarded to the HSM. Any necessary changes to the operation should be made to prevent the same accident or near miss situation from occurring in the future.

6.1 Accidents and Injuries

The following procedures should not be considered inflexible. Every accident presents a unique event that should be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident/unusual event, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk.

6.1.1 Accident/Injury in Contaminated Areas

If a person working in a contaminated area is physically injured, Red Cross firstaid procedures should be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, they should be taken to the edge of the work area where contaminated clothing may be decontaminated and removed, emergency first aid administered, and transportation to an emergency medical facility awaited.

6.1.2 Accident/Injury in Noncontaminated Areas

The procedures above should be followed with the exception that the injured individual should not be moved and the removal of contaminated clothing would not be necessary.

6.2 Chemical Exposure

If the injury to the worker is chemical in nature, the following first-aid procedures should be followed:

6.2.1 Eye Exposure

If contaminated solid or liquid enters the eyes, they should be flushed with large amounts of clean water while lifting the upper and lower eye lids occasionally. Medical attention should be obtained.

6.2.2 Skin Exposure

If contaminated material contacts the skin, the affected area should be washed with soap and water. If contaminated materials penetrate through clothing or protective equipment, the items should be removed and affected skin areas washed. Medical attention should be obtained if symptoms warrant.

6.2.3 Inhalation

If a person breathes a large volume of potentially toxic vapors, he/she should be moved to fresh air. If breathing has stopped, artificial respiration should be performed. Medical attention should be obtained.

6.2.4 Ingestion

If contaminated material is swallowed, medical attention should be obtained and the poison control center contacted for further instructions.

6.3 Fires

Fire extinguishers should be available on-site and in vehicle cabs. In the case of a fire at the Site, the following actions should be taken:

- Evacuate personnel from the area, preferably to an upwind location.
- Notify the fire department and emergency response agencies.
- Attempt to extinguish the fire using portable fire extinguishers or by smothering (ONLY IF SMALL).
- Notify the PM and HSM.
- The PM should notify the Chevron U.S.A. PM.

6.4 Uncontrolled Release of Hazardous Materials

The primary considerations during a hazardous materials spill are to ward off unsuspecting personnel, contain existing spillage, and prevent further spillage. The discovery of a spill of stored material (except potable water) should be reported to the SSM and the following actions taken:

- Evacuate personnel from the area.
- Summon emergency medical or fire services if the spill involves extremely toxic or flammable materials.
- Contain the spill with absorbent booms and block off the area. Drains, sewers, etc. should be blocked to prevent material from entering.
- Attempt to stop the flow of material from the container.
- The SSM should notify the PM.
- The PM should contact the Chevron U.S.A. PM.

6.5 Emergency Services

A telephone is located on the Site as indicated on the Site Plan included as Figure 1. In the case of an on-site emergency or injury requiring outside services (e.g., ambulance, fire), field personnel should telephone the emergency medical system at 911. Personnel should notify the PM and HSM at (206)453-8383 after the situation is stabilized. If medical attention is needed but the situation is not an emergency, the injured employee may be transported to Virginia Mason Clinic by other field personnel.

6.5.1 Hospital Route

Figure 2 shows the location of Virginia Mason Clinic with respect to the Houghton Beach Park site. Driving directions are as follows:

> From the Site, turn right onto Lake Washington Boulevard and continue south to Northup Way, turn left. Continue southeast on Northup Way and cross under Highway 520. At 116th Avenue N.E., turn left. Virginia Mason Clinic will be located on the right side of the road at 2630 116th Avenue N.E., Suite 100.

In cases involving severe emergencies, personnel should await emergency medical transport.

6.5.2 Emergency Telephone Numbers

Emergency telephone numbers should be posted at the Site and include the following:

Fire	911
Ambulance	911
Paramedics	911
Police	911
Poison Control Center	526-2121 or 911
Virginia Mason Clinic	822-3651

7.0 TRAINING

AGI employees working at the Site should have received the required 40 hour training for work at hazardous waste sites in accordance with Federal and Washington State regulations. Personnel should also take part in project specific training and sign the Field Team Review Form prior to the commencement of fieldwork. Project specific training should include the material presented in this HASP. Training records should be maintained by the HSM.

8.0 MEDICAL SURVEILLANCE

AGI employees working at the Site should participate in AGI's Medical Surveillance Program. Direct hire and new employees should be given a baseline physical and current employees should be up-to-date with respect to their annual exam. The examining physician should verify in writing whether the individual is fit to work at hazardous waste sites and utilize protective equipment, including respirators. Such documentation should be maintained by the HSM.

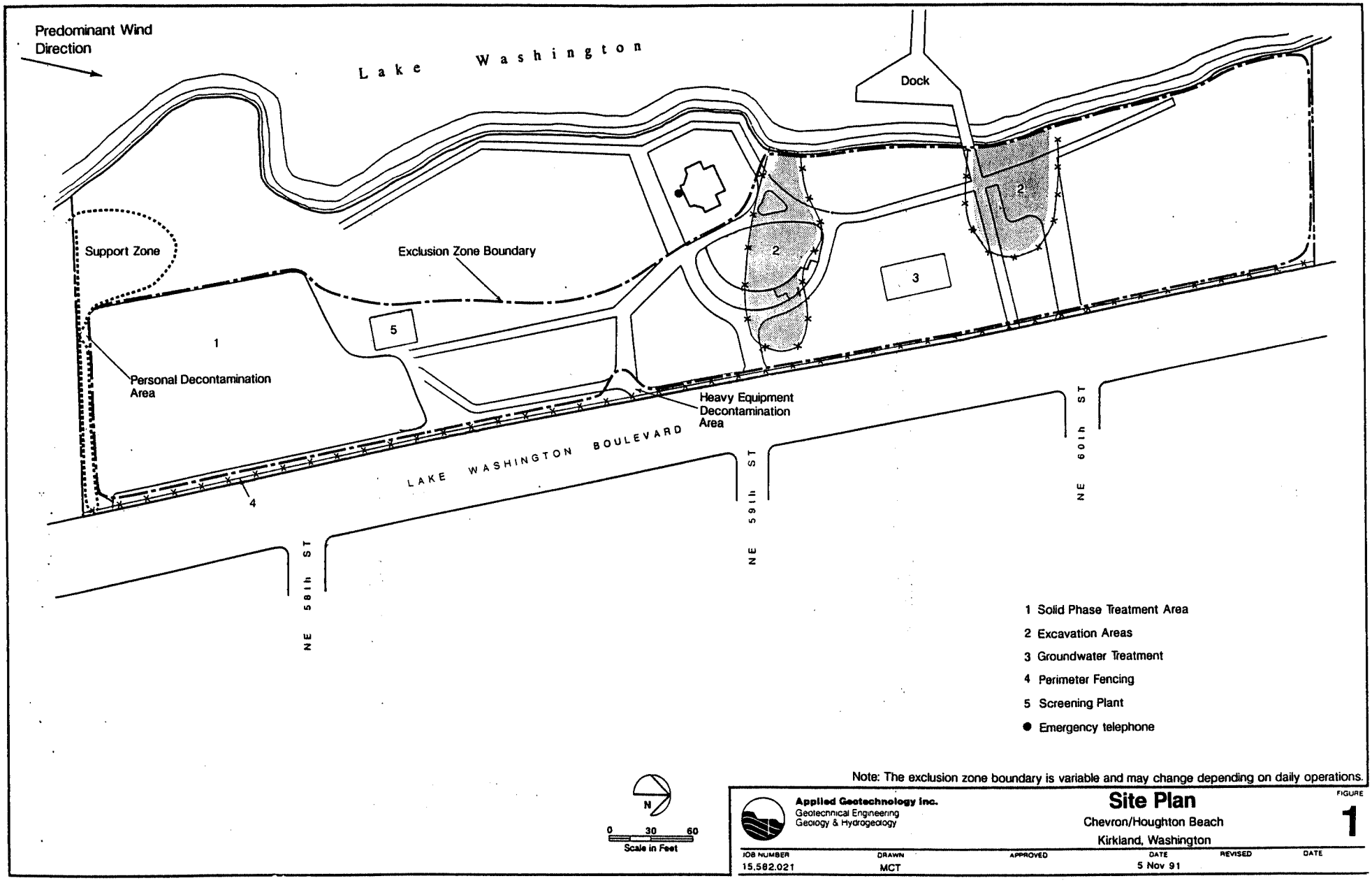
Additional medical exams may be required during the course of the project if overexposure to site contaminants or an injury occurs. In addition, exit physicals may be required upon project completion or an employee's termination. Such exams are usually performed at the discretion of the examining physician if the previous exam was conducted less than six months prior.

9.0 HASP MODIFICATIONS

This project HASP should be reviewed and amended, if necessary, whenever:

- Applicable regulations are revised.
- Additional information concerning site contaminants, operations, personnel, emergency services, etc. is gained.
- Site operations are revised.

When the HASP is revised, personnel should review the changes and file a new Field Team Review Form with the HSM.



Note: The exclusion zone boundary is variable and may change depending on daily operations.

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

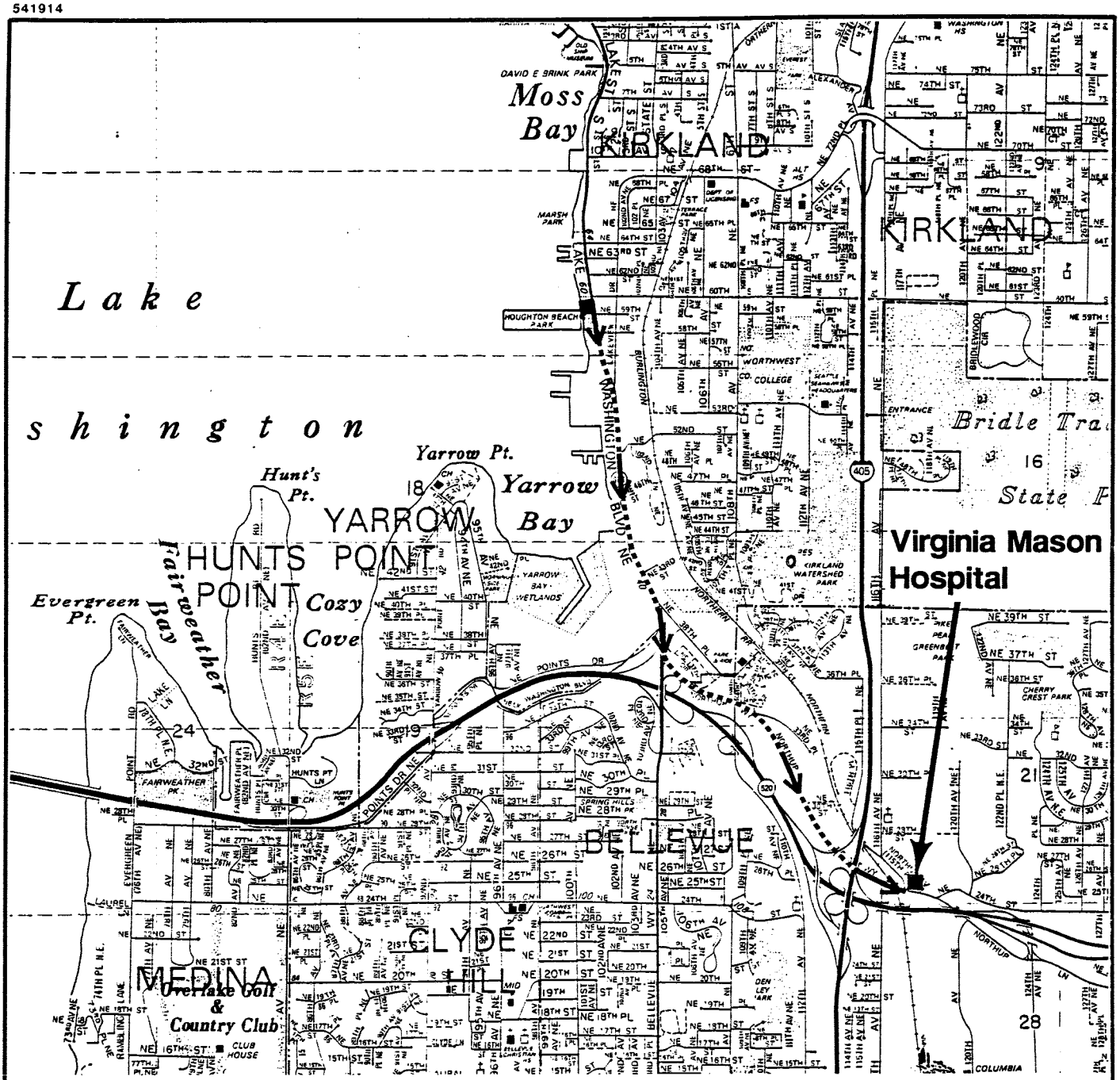
Site Plan

Chevron/Houghton Beach
Kirkland, Washington

FIGURE **1**

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15.582.021	MCT		5 Nov 91		

541914



Reference: "The Thomas Guide", King Co., copyright 1989.

Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Hospital Route

Chevron/Houghton Beach
Kirkland, Washington

FIGURE
2

JOB NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
15,582.021	CEG		27 Nov. 91		

APPENDICES

APPENDIX A

Material Safety Data Sheets (MSDSs)

(B) The employer's copy of the physician's written opinion on the initial, periodic, and special examinations, including results of medical examinations and all tests, opinions, and recommendations;

(C) Any employee medical complaints related to exposure to benzene;

(D) A copy of the information provided to the physician as required by subsection (9)(f)(ii) through (v) of this section; and

(E) A copy of the employee's medical and work history related to exposure to benzene or any other hematologic toxins.

(iii) The employer shall maintain this record for at least the duration of employment plus thirty years, in accordance with Part B, Access to records, WAC 296-62-052 through 296-62-05223.

(c) Availability.

(i) The employer shall assure that all records required to be maintained by this section shall be made available upon request to the director for examination and copying.

(ii) Employee exposure monitoring records required by this subsection shall be provided upon request for examination and copying to employees, employee representatives, and the director in accordance with WAC 296-62-05201 through 296-62-05209 and 296-62-05213 through 296-62-05217.

(iii) Employee medical records required by this subsection shall be provided upon request for examination and copying, to the subject employee, to anyone having the specific written consent of the subject employee, and to the director in accordance with WAC 296-62-052.

(d) Transfer of records.

(i) The employer shall comply with the requirements involving transfer of records set forth in WAC 296-62-05205.

(ii) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the director, at least three months prior to disposal, and transmit them to the director if required by the director within that period.

(12) Observation of monitoring.

(a) Employee observation. The employer shall provide affected employees, or their designated representatives, an opportunity to observe the measuring or monitoring of employee exposure to benzene conducted pursuant to subsection (5) of this section.

(b) Observation procedures. When observation of the measuring or monitoring of employee exposure to benzene requires entry into areas where the use of protective clothing and equipment or respirators is required, the employer shall provide the observer with personal protective clothing and equipment or respirators required to be worn by employees working in the area, assure the use of such clothing and equipment or respirators, and require the observer to comply with all other applicable safety and health procedures.

(13) Dates.

(a) Engineering and work practice controls required by subsection (6)(a) of this section shall be implemented no later than December 10, 1989.

(b) Coke and coal chemical operations may comply with (b)(ii) of this subsection or alternately include within the compliance program required by subsection (6)(b) of this section, a requirement to phase in engineering controls as equipment is repaired and replaced. For coke and coal chemical operations choosing the latter alternative, compliance with the engineering controls requirements of subsection (6)(a) of this section shall be achieved no later than December 10, 1992. Substantial compliance with the engineering control requirements shall be achieved no later than December 10, 1990.

(14) Appendices. The information contained in WAC 296-62-07525, Appendices A, B, C, and D is not intended, by itself, to create any additional obligations not otherwise imposed or to detract from any existing obligations. The protocols on respiratory fit testing in Appendix E are mandatory. [Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07523, filed 10/6/88, effective 11/7/88.]

* **WAC 296-62-07525 Appendix A substance safety data sheet--Benzene.** (1) Substance identification.

(a) Substance: Benzene.

(b) Permissible exposure: Except as to the use of gasoline, motor fuels, and other fuels subsequent to discharge from bulk terminals and other exemptions specified in WAC 296-62-07523 (1)(b):

(i) Airborne: The maximum time-weighted average (TWA) exposure limit is one part of benzene vapor per million parts of air (1 ppm) for an eight-hour workday and the maximum short-term exposure limit (STEL) is 5 ppm for any fifteen-minute period.

(ii) Dermal: Eye contact shall be prevented and skin contact with liquid benzene shall be limited.

(c) Appearance and odor: Benzene is a clear, colorless liquid with a pleasant, sweet odor. The odor of benzene does not provide adequate warning of its hazard.

(2) Health hazard data.

(a) Ways in which benzene affects your health. Benzene can affect your health if you inhale it, or if it comes in contact with your skin or eyes. Benzene is also harmful if you happen to swallow it.

(b) Effects of overexposure.

(i) Short-term (acute) overexposure: If you are overexposed to high concentrations of benzene, well above the levels where its odor is first recognizable, you may feel breathless, irritable, euphoric, or giddy; you may experience irritation in eyes, nose, and respiratory tract. You may develop a headache, feel dizzy, nauseated, or intoxicated. Severe exposures may lead to convulsions and loss of consciousness.

(ii) Long-term (chronic) exposure. Repeated or prolonged exposure to benzene, even at relatively low concentrations, may result in various blood disorders, ranging from anemia to leukemia, an irreversible, fatal disease. Many blood disorders associated with benzene exposure may occur without symptoms.

(3) Protective clothing and equipment.

(a) Respirators. Respirators are required for those operations in which engineering controls or work practice controls are not feasible to reduce exposure to the permissible level. However, where employers can document that benzene is present in the workplace less than thirty days a year, respirators may be used in lieu of engineering controls. If respirators are worn, they must have joint Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) seal of approval, and cartridge or canisters must be replaced before the end of their service life, or the end of the shift, whichever occurs first. If you experience difficulty breathing while wearing a respirator, you may request a positive pressure respirator from your employer. You must be thoroughly trained to use the assigned respirator, and the training will be provided by your employer.

(b) Protective clothing. You must wear appropriate protective clothing (such as boots, gloves, sleeves, aprons, etc.,) over any parts of your body that could be exposed to liquid benzene.

(c) Eye and face protection. You must wear splash-proof safety goggles if it is possible that benzene may get into your eyes. In addition, you must wear a face shield if your face could be splashed with benzene liquid.

(4) Emergency and first aid procedures.

(a) Eye and face exposure. If benzene is splashed in your eyes, wash it out immediately with large amounts of water. If irritation persists or vision appears to be affected see a doctor as soon as possible.

(b) Skin exposure. If benzene is spilled on your clothing or skin, remove the contaminated clothing and wash the exposed skin with large amounts of water and soap immediately. Wash contaminated clothing before you wear it again.

(c) Breathing. If you or any other person breathes in large amounts of benzene, get the exposed person to fresh air at once. Apply artificial respiration if breathing has stopped. Call for medical assistance or a doctor as soon as possible. Never enter any vessel or confined space where the benzene concentration might be high without proper safety equipment and at least one other person present who will stay outside. A life line should be used.

(d) Swallowing. If benzene has been swallowed and the patient is conscious, do not induce vomiting. Call for medical assistance or a doctor immediately.

(5) Medical requirements. If you are exposed to benzene at a concentration at or above 0.5 ppm as an 8-hour time-weighted average, or have been exposed at or above 10 ppm in the past while employed by your current employer, your employer is required to provide a medical examination and history and laboratory tests within sixty days of the effective date of this standard and annually thereafter. These tests shall be provided without cost to you. In addition, if you are accidentally exposed to benzene (either by ingestion, inhalation, or skin/eye contact) under emergency conditions known or suspected to constitute toxic exposure to benzene, your employer is required to make special laboratory tests available to you.

(6) Observation of monitoring. Your employer is required to perform measurements that are representative of your exposure to benzene and you or your designated representative are entitled to observe the monitoring procedure. You are entitled to observe the steps taken in the measurement procedure, and to record the results obtained. When the monitoring procedure is taking place in an area where respirators or personal protective clothing and equipment are required to be worn, you or your representative must also be provided with, and must wear the protective clothing and equipment.

(7) Access to records. You or your representative are entitled to see the records of measurements of your exposure to benzene upon written request to your employer. Your medical examination records can be furnished to yourself, your physician, or designated representative upon request by you to your employer.

(8) Precautions for safe use, handling, and storage. Benzene liquid is highly flammable. It should be stored in tightly closed containers in a cool, well ventilated area. Benzene vapor may form explosive mixtures in air. All sources of ignition must be controlled. Use nonsparking tools when opening or closing benzene containers. Fire extinguishers, where provided, must be readily available. Know where they are located and how to operate them. Smoking is prohibited in areas where benzene is used or stored. Ask your supervisor where benzene is used in your area and for additional plant safety rules. [Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07525, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07527 Appendix B substance technical guidelines—Benzene. (1) Physical and chemical data.

(a) Substance identification.

(i) Synonyms: Benzol, benzole, coal naphtha, cyclohexatriene, phene, phenyl hydride, pyrobenzol. (Benzin, petroleum benzin and Benzine do not contain benzene.)

(ii) Formula: C6H6 (CAS Registry Number: 71-43-2).

(b) Physical data.
(i) Boiling point (760 mm Hg): 80.1 C (176 F).
(ii) Specific gravity (water=1): 0.879.
(iii) Vapor density (air=1): 2.7.
(iv) Melting point: 5.5 C (42 F).
(v) Vapor pressure at 20 C (68 F): 75 mm Hg.
(vi) Solubility in water: .06%.
(vii) Evaporation rate (ether=1): 2.8.
(viii) Appearance and odor: Clear, colorless liquid with a distinctive sweet odor.
(2) Fire, explosion, and reactivity hazard data.
(a) Fire.
(i) Flash point (closed cup): -11 C (12 F).
(ii) Autoignition temperature: 580 C (1076 F).
(iii) Flammable limits in Air. % by volume: Lower: 1.3%, Upper: 7.5%.
(iv) Extinguishing media: Carbon dioxide, dry chemical, or foam.
(v) Special fire-fighting procedures: Do not use solid stream of water, since stream will scatter and spread fire. Fine water spray can be used to keep fire-exposed containers cool.
(vi) Unusual fire and explosion hazards: Benzene is a flammable liquid. Its vapors can form explosive mixtures. All ignition sources must be controlled when benzene is used, handled, or stored. Where liquid or vapor may be released, such areas shall be considered as hazardous locations. Benzene vapors are heavier than air; thus the vapors may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which benzene is handled.
(vii) Benzene is classified as a 1 B flammable liquid for the purpose of conforming to the requirements of WAC 296-24-330. A concentration exceeding 3,250 ppm is considered a potential fire explosion hazard. Locations where benzene may be present in quantities sufficient to produce explosive or ignitable mixtures are considered Class I Group D for the purposes of conforming to the requirements of WAC 296-24-95613.
(b) Reactivity.
(i) Conditions contributing to instability: Heat.
(ii) Incompatibility: Heat and oxidizing materials.
(iii) Hazardous decomposition products: Toxic gases and vapors (such as carbon monoxide).
(3) Spill and leak procedures.
(a) Steps to be taken if the material is released or spilled. As much benzene as possible should be absorbed with suitable materials, such as dry sand or earth; benzine remaining must be flushed with large amounts of water. Do not flush benzene into a confined space, such as a sewer, because of explosion danger. Remove all ignition sources. Ventilate enclosed places.
(b) Waste disposal method. Disposal methods must conform to other jurisdictional regulations. If allowed, benzene may be disposed of:
(i) By absorbing it in dry sand or earth and disposing in a sanitary landfill;
(ii) If small quantities, by removing it to a safe location from buildings or other combustible sources, pouring it in dry sand or earth and cautiously igniting it; and
(iii) If large quantities, by atomizing it in a suitable combustion chamber.
(4) Miscellaneous precautions.
(a) High exposure to benzene can occur when transferring the liquid from one container to another. Such operations should be well ventilated and good work practices must be established to avoid spills.
(b) Use nonsparking tools to open benzene containers which are effectively grounded and bonded prior to opening and pouring.
(c) Employers must advise employees of all plant areas and operations where exposure to benzene could occur. Common operations in which high exposures to benzene may be encountered are: The primary production and utilization of benzene, and transfer of benzene. [Statutory Authority: Chapter 49.17 RCW. 88-21-002 (Order 88-23), § 296-62-07527, filed 10/6/88, effective 11/7/88.]

WAC 296-62-07529 Appendix C medical surveillance guidelines for benzene. (1) Route of entry.
Inhalation; skin absorption.
(2) Toxicology. Benzene is primarily an inhalation hazard. Systemic absorption may cause depression of the hematopoietic system, pancytopenia, aplastic anemia, and leukemia. Inhalation of high concentrations can affect central nervous system function. Aspiration of small amounts of liquid benzene immediately causes pulmonary edema and hemorrhage of pulmonary tissue. There is some absorption through the skin. Absorption may be more rapid in the case of abraded skin, and benzene may be more readily absorbed if it is present in a mixture or as a contaminant in solvents which are readily absorbed. The defatting action of benzene may produce primary irritation due to repeated or prolonged contact with the skin. High concentrations are irritating to the eyes and the mucous membranes of the nose, and respiratory tract.

DATE ISSUED: 08/31/89
SUPERSEDES DATE: 06/01/89

MATERIAL SAFETY DATA SHEET

A. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME
DIESEL 1

PRODUCT CODE
071000 - 00700

CHEMICAL NAME
Kerosene

CAS NUMBER
8008-20-6

PRODUCT APPEARANCE AND ODOR
Clear water-white liquid
Mild kerosene odor

MEDICAL EMERGENCY TELEPHONE NUMBER
(713) 656-3424

B. COMPONENTS AND HAZARD INFORMATION

COMPONENTS	CAS NO. OF COMPONENTS	APPROXIMATE CONCENTRATION
Kerosene, ASTM Grade 2-K	8008-20-6	100%

This product is not suitable for use in flueless space heaters.

This product and all components are listed on the U.S. TSCA inventory.

See Section E for Health and Hazard Information.

See Section H for additional Environmental Information.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	Flammability	Reactivity	BASIS
1	2	0	Recommended

EXPOSURE LIMIT FOR TOTAL PRODUCT — **BASIS**
100 ppm (735 mg/m3) for an 8-hour workday — Recommended

C. PRIMARY ROUTES OF ENTRY AND EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN
In case of skin contact, remove any contaminated clothing and wash skin thoroughly with soap and water.

INHALATION
If overcome by vapor, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION
If ingested, DO NOT induce vomiting; call a physician immediately.

D. FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT (MINIMUM)
COMBUSTIBLE - Per DOT 49 CFR 173.115
38°C (100°F)
ASTM D 56, Tag Closed Cup

NOTE: Minimum may be higher where required by applicable laws or regulations.

AUTOIGNITION TEMPERATURE
Approximately 210°C (410°F)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) - HAZARD IDENTIFICATION

Health	Flammability	Reactivity	BASIS
0	2	0	Recommended by the National Fire Protection Association

HANDLING PRECAUTIONS
This liquid is volatile and gives off invisible vapors. Either the liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources where they may ignite or explode.

Keep product away from ignition sources, such as heat, sparks, pilot lights, static electricity, and open flames.

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 0.9% Upper Flammable Limit 7%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.

The following procedures for this type of product are based on the recommendations in the National Fire Protection Association's "Fire Protection Guide on Hazardous Materials", Eighth Edition (1984):

Use water spray, dry chemical, foam or carbon dioxide to extinguish the fire. Use water to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to provide protection for men attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, aldehydes and other decomposition products, in the case of incomplete combustion.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated operations.

E HEALTH AND HAZARD INFORMATION

VARIABILITY AMONG INDIVIDUALS
Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)
Prolonged or repeated liquid contact with the skin will dry and defat the skin, leading to possible irritation and dermatitis.
High vapor concentrations (greater than approximately 1000 ppm) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

NATURE OF HAZARD AND TOXICITY INFORMATION
Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

Lifetime skin painting studies conducted by the American Petroleum Institute, Exxon and others have shown that similar products boiling between 175-370°C (350-700°F) usually produce skin tumors and/or skin cancer in laboratory mice. The degree of carcinogenic response was weak to moderate with a relatively long latent period. The implications of these results for humans have not been determined.

Limited studies on oils that are very active carcinogens have shown that washing the animals' skin with soap and water between applications greatly reduces tumor formation. These studies demonstrate the effectiveness of cleansing the skin after contact.

Potential risks to humans can be minimized by observing good work practices and personal hygiene procedures generally recommended for petroleum products. See Section I for recommended protection and precautions.

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same naphtha boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats and male and female mice and in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. It is therefore highly unlikely that the kidney effects observed in male rats have significant implications for humans exposed at or below the recommended vapor limits in the workplace.

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

Inhalation of components of exhaust from burning, such as carbon monoxide, may cause death at high concentrations.
Long-term repeated exposure of laboratory animals to whole diesel exhaust has resulted in an increased incidence of lung cancer.
Exposure to exhaust from burning and diesel exhaust should be minimized.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

F. PHYSICAL DATA

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
160-290°C (320-550°F)

VAPOR PRESSURE
Less than 5 mm Hg @ 20°C

SPECIFIC GRAVITY (15.6 C/15.6 C)
0.82

MOLECULAR WEIGHT
Approximately 180

pH
Essentially neutral

POUR, CONGEALING OR MELTING POINT
-34°C (-30°F)
Pour Point by ASTM D 97

VISCOSITY
1.7 cSt @ 40°C

VAPOR DENSITY (AIR = 1)
4.7

PERCENT VOLATILE BY VOLUME
100

EVAPORATION RATE @ 1 ATM. AND 25 C (77 F)
(n-BUTYL ACETATE = 1)
0.04

SOLUBILITY IN WATER @ 1 ATM. AND 25 C (77 F)
Negligible; less than 0.1%

G. REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite or calcium hypochlorite.

H. ENVIRONMENTAL INFORMATION

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.
Assure conformity with applicable governmental regulations. Continue to observe precautions for volatile, combustible vapors from absorbed material.

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

REPORTABLE QUANTITY (RQ), EPA REGULATION 40 CFR 302 (CERCLA Section 102)
No RQ for product or any constituent greater than 1% or 0.1% (carcinogen).

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355 (SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
No toxic chemical is present greater than 1% or 0.1% (carcinogen).

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)

EPA HAZARD CLASSIFICATION CODE:	Acute Hazard	Chronic Hazard	Fire Hazard	Pressure Hazard	Reactive Hazard	Not Applicable
	XXX	XXX	XXX			

I. PROTECTION AND PRECAUTIONS

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. No smoking, flame or other ignition sources.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES.
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor, mist or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

J. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents, DOT P 5800.3.

DOT IDENTIFICATION NUMBER
Kerosene / Combustible Liquid / UN 1223

OSHA REQUIRED LABEL INFORMATION
In compliance with hazard and right-to-know requirements, the following OSHA Hazard Warnings should be found on a label, bill of lading or invoice accompanying this shipment.

DANGER!

COMBUSTIBLE

LONG-TERM, REPEATED EXPOSURE MAY
CAUSE SKIN CANCER

Note: Product label will contain additional non-OSHA related information.

DATE ISSUED: 08/15/89
SUPERSEDES DATE: 06/01/89

MATERIAL SAFETY DATA SHEET

A. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME
DIESEL 2

PRODUCT CODE
072700 - 00787

CHEMICAL NAME
Petroleum Distillate Fuel

CAS NUMBER
68476-34-6

PRODUCT APPEARANCE AND ODOR
Clear liquid, yellow color
Faint petroleum hydrocarbon odor

MEDICAL EMERGENCY TELEPHONE NUMBER
(713) 656-3424

B. COMPONENTS AND HAZARD INFORMATION

COMPONENTS	CAS NO. OF COMPONENTS	APPROXIMATE CONCENTRATION
Diesel Fuel No. 2	68476-34-6	100%

This product and all components are listed on the U.S. TSCA inventory.

See Section E for Health and Hazard Information.

See Section H for additional Environmental Information.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	Flammability	Reactivity	BASIS
1	2	0	Recommended

EXPOSURE LIMIT FOR TOTAL PRODUCT — **BASIS**
100 ppm (900 mg/m3) for an 8-hour workday — Recommended

C. PRIMARY ROUTES OF ENTRY AND EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN
In case of skin contact, remove any contaminated clothing and wash skin thoroughly with soap and water.

INHALATION
Overexposure may cause gasping, nausea and disorientation.

Vapor pressure is very low. Vapor inhalation under ambient conditions is normally not a problem. If overcome by vapor from hot product, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION
If ingested, DO NOT induce vomiting; call a physician immediately.

D. FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT (MINIMUM)
COMBUSTIBLE - Per DOT 49 CFR 173.115
60°C (140°F)
ASTM D 93, Pensky Martens Closed Cup

NOTE: Non-marine product may be 52°C (125°F) minimum flash to meet No. 2 Diesel Fuel Oil (ASTM D 975). Seasonal blends may be as low as 38°C (100°F).

AUTOIGNITION TEMPERATURE
Greater than 204°C (400°F)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) - HAZARD IDENTIFICATION

Health	Flammability	Reactivity	BASIS
0	2	0	Recommended by the National Fire Protection Association

HANDLING PRECAUTIONS
This liquid is volatile and gives off invisible vapors. Either the liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources where they may ignite or explode.

Keep product away from ignition sources, such as heat, sparks, pilot lights, static electricity, and open flames.

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 0.9% Upper Flammable Limit 7%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.

The following procedures for this type of product are based on the recommendations in the National Fire Protection Association's "Fire Protection Guide on Hazardous Materials", Eighth Edition (1984):

Use dry chemical, foam or carbon dioxide to extinguish the fire. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

NOTE: The inclusion of the phrase "water may be ineffective" is to indicate that although water can be used to cool and protect exposed material, water may not extinguish the fire unless used under favorable conditions by experienced fire fighters trained in fighting all types of flammable liquid fires.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, aldenydes and other decomposition products, in the case of incomplete combustion.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated

operations.

E. HEALTH AND HAZARD INFORMATION

VARIABILITY AMONG INDIVIDUALS
Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)
Prolonged or repeated liquid contact with the skin will dry and defat the skin, leading to possible irritation and dermatitis.
High vapor concentrations (greater than approximately 1000 ppm, attainable at temperatures well above ambient) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

NATURE OF HAZARD AND TOXICITY INFORMATION
Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

Lifetime skin painting studies conducted by the American Petroleum Institute, Exxon and others have shown that similar products boiling between 175-370°C (350-700°F) usually produce skin tumors and/or skin cancer in laboratory mice. The degree of carcinogenic response was weak to moderate with a relatively long latent period. The implications of these results for humans have not been determined.

Limited studies on oils that are very active carcinogens have shown that washing the animals' skin with soap and water between applications greatly reduces tumor formation. These studies demonstrate the effectiveness of cleansing the skin after contact.

Potential risks to humans can be minimized by observing good work practices and personal hygiene procedures generally recommended for petroleum products. See Section I for recommended protection and precautions.

Laboratory animal studies have shown that prolonged and repeated inhalation exposure to light hydrocarbon vapors in the same naphtha boiling range as this product can produce adverse kidney effects in male rats. However, these effects were not observed in similar studies with female rats and male and female mice and in limited studies with other animal species. Additionally, in a number of human studies, there was no clinical evidence of such effects at normal occupational levels. It is therefore highly unlikely that the kidney effects observed in male rats have significant implications for humans exposed at or below the recommended vapor limits in the workplace.

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

Inhalation of components of exhaust from burning, such as carbon monoxide, may cause death at high concentrations.
Long-term repeated exposure of laboratory animals to whole diesel exhaust has resulted in an increased incidence of lung cancer.
Exposure to exhaust from burning and diesel exhaust should be minimized.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

F. PHYSICAL DATA

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
160-350°C (320-650°F)

SPECIFIC GRAVITY (15.6 C/15.6 C)
0.86

MOLECULAR WEIGHT
Approximately 212 average

pH
Essentially neutral

POUR, CONGEALING OR MELTING POINT
-18°C (0°F)
Pour Point by ASTM D 97

VISCOSITY
2.7 cSt @ 40°C

VAPOR PRESSURE
Less than 1 mm Hg @ 20°C

VAPOR DENSITY (AIR = 1)
Greater than 5

PERCENT VOLATILE BY VOLUME
100

EVAPORATION RATE @ 1 ATM. AND 25 C (77 F)
(n-BUTYL ACETATE = 1)
0.02

SOLUBILITY IN WATER @ 1 ATM. AND 25 C (77 F)
Negligible; less than 0.1%

G. REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite or calcium hypochlorite.

H. ENVIRONMENTAL INFORMATION

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.
Assure conformity with applicable governmental regulations. Continue to observe precautions for volatile, combustible vapors from absorbed material.

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

REPORTABLE QUANTITY (RQ), EPA REGULATION 40 CFR 302 (CERCLA Section 102)
No RQ for product or any constituent greater than 1% or 0.1% (carcinogen).

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355 (SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
No toxic chemical is present greater than 1% or 0.1% (carcinogen).

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)

EPA HAZARD CLASSIFICATION CODE:	Acute Hazard	Chronic Hazard	Fire Hazard	Pressure Hazard	Reactive Hazard	Not Applicable
		XXX	XXX			

I. PROTECTION AND PRECAUTIONS

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor, mist or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

J. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents, DOT P 5800.3.

DOT IDENTIFICATION NUMBER
Fuel Oil, No. 2 / Combustible Liquid / NA 1993

OSHA REQUIRED LABEL INFORMATION
In compliance with hazard and right-to-know requirements, the following OSHA Hazard Warnings should be found on a label, bill of lading or invoice accompanying this shipment.

DANGER!

COMBUSTIBLE

LONG-TERM, REPEATED EXPOSURE MAY
CAUSE SKIN CANCER

Note: Product label will contain additional non-OSHA related information.

TOXICITY DATA:	CODEN:
ims-rat TDLo:50 mg/kg:ETA	CNREA8 29,506,69

THR: An experimental tumorigen. When heated to decomposition it emits acrid smoke and irritating fumes.

EGP500 ***HR: 2***

ETHYL BENZENE

CAS: 100-41-4 NIOSH: DA 0700000
DOT: 1175
mf: C_8H_{10} mw: 106.18

PROP: Colorless liquid, aromatic odor. Misc in alcohol and ether, insol in NH_3; sol in SO_2. Bp: 136.2°, fp: −94.9°, flash p: 59°F, d: 0.8669 @ 20°/4°, autoign temp: 810°F, vap press: 10 mm @ 25.9°, vap d: 3.66, lel: 1.2%, uel: 6.8%.

SYNS:

AETHYLBENZOL (GERMAN)	ETILBENZENE (ITALIAN)
EB	ETYLOBENZEN (POLISH)
ETHYLBENZEEN (DUTCH)	NCI-C56393
ETHYLBENZOL	PHENYLETHANE

TOXICITY DATA:	CODEN:
skn-rbt 15 mg/24H open MLD	AIHAAP 23,95,62
eye-rbt 100 mg	AJOPAA 29,1363,46
sce-hmn:lym 1 mmol/L	MUREAV 116,379,83
ihl-rat TCLo:97 ppm/7H (15D preg):REP	BATTL* JAN,81
ihl-rat TCLo:985 ppm/7H (1-19D preg):TER	BATTL* JAN,81
ihl-rat TCLo:96 ppm/7H (1-19D preg):TER	BATTL* JAN,81
ihl-hmn TCLo:100 ppm/8H: EYE,CNS,PUL	AIHAAP 31,206,70
orl-rat LD50:3500 mg/kg	AMIHAB 14,387,56
ihl-rat LCLo:4000 ppm/4H	AIHAAP 23,95,62
ihl-mus LCLo:50 g/m3/2H	GTPZAB 5(5),3,61
ipr-mus LD50:2272 mg/kg	ARTODN 58,106,85
skn-rbt LD50:17800 mg/kg	FCTXAV 13,803,75
ihl-gpg LCLo:10000 ppm	PHRPA6 45,1241,30

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm (skin)
ACGIH TLV: TWA 100 ppm; STEL 125 ppm; BEI: 2 g/L (mandelic acid in urine at end of shift)
DFG MAK: 100 ppm (440 mg/m^3)

DOT Classification: Flammable Liquid, Label: Flammable Liquid

THR: Moderately toxic by ingestion and intraperitoneal route. Mildly toxic by inhalation and skin contact. An experimental teratogen. Human systemic effects by inhalation: eye, sleep and pulmonary changes. An eye and skin irritant. Human mutagenic data. The liquid is an irritant to the skin and mucous membranes. A concentration of 0.1% of the vapor in air is an irritant to human eyes, and a concentration of 0.2% is extremely irritating at first, then causes dizziness, irritation of the nose and throat and a sense of constriction in the chest. Exposure of guinea pigs to 1% concentration has been reported as causing ataxia, loss of consciousness, tremor of the extremities and finally death through respiratory failure. The pathological findings were congestion of the brain and lungs with edema. No data are available regarding the effect of chronic exposure.

A very dangerous fire and explosion hazard when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. For further information, see Vol. 2, No. 6 of *DPIM Report*.

EGQ000 ***HR: 2***

α-ETHYLBENZENEMETHANOL

CAS: 93-54-9 NIOSH: DO 5470000
mf: $C_9H_{12}O$ mw: 136.21

SYNS:

EJIBIL	PHENICOL
α-ETHYLBENZYL ALCOHOL	PHENYCHOLON
ETHYL PHENYL CARBINOL	PHENYLAETHYLCARBINOL (GERMAN)
FELICUR	1-PHENYLPROPANOL
FELITROPE	1-PHENYL-1-PROPANOL
FENICOL	1-PHENYLPROPYL ALCOHOL
α-HYDROXYPROPYLBENZENE	SH 261
LIVONAL	

TOXICITY DATA:	CODEN:
orl-rat LD50:1600 mg/kg	ARZNAD 12,347,62
orl-mus LD50:500 mg/kg	AIPTAK 116,154,58
scu-mus LD50:700 mg/kg	AIPTAK 116,154,58

THR: Moderately toxic by ingestion and subcutaneous route. When heated to decomposition it emits acrid smoke and irritating fumes.

EGR000 ***HR: 2***

ETHYL BENZOATE

CAS: 93-89-0 NIOSH: DH 0200000
mf: $C_9H_{10}O_2$ mw: 150.19

PROP: Colorless, aromatic liquid. Mp: −34.6°, bp: 213.4°, flash p: >204°F, d: 1.048 @ 20°/20°, vap press: 1 mm @ 44.0°, vap d: 5.17, autoign temp: 914°F. Insol in water; misc in petroleum, alcohol, chloroform, and ether.

SYNS:

BENZOIC ETHER	ESSENCE OF NIOBE

TOXICITY DATA:	CODEN:
skn-rbt 10 mg/24H open MLD	AMIHBC 10,61,54
eye-rbt 500 mg open	AMIHBC 10,61,54
orl-rat LD50:2100 mg/kg	JPETAB 84,358,45
skn-cat LDLo:10 g/kg	JPETAB 84,358,45
orl-rbt LD50:2630 mg/kg	JPETAB 84,358,45

Reported in EPA TSCA Inventory.

TOLUENE

TOL

Common Synonyms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	Floats on water. Flammable, irritating vapor is produced.		

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.

Fire

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.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

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

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.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Evacuate area

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic Hydrocarbon
3.2 Formula: $C_6H_5CH_3$
3.3 IMO/UN Designation: 3.2/1294
3.4 DOT ID No.: 1294
3.5 CAS Registry No.: 108-88-3

4. OBSERVABLE CHARACTERISTICS

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; LD_{50} = 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

6. FIRE HAZARDS

6.1 Flash Point: 40°F C.C.; 55°F O.C.
6.2 Flammable Limits in Air: 1.27%-7%
6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 997°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 5.7 mm/min.
6.10 Adiabatic Flame Temperature: Data not available

(Continued)

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: 1180 mg/l/96 hr/sunfish/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor), 8 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

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	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

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: 92.14
12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K
12.4 Freezing Point: —139°F = —95.0°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/m^2
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 = 3.61×10^5 J/kg
12.13 Heat of Combustion: —17,430 Btu/lb = —9686 cal/g = -405.5×10^5 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

6. FIRE HAZARDS (Continued)

6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

TOL	TOLUENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
—30	57.180
—20	56.870
—10	56.550
0	56.240
10	55.930
20	55.620
30	55.310
40	54.990
50	54.680
60	54.370
70	54.060
80	53.750
90	53.430
100	53.120
110	52.810
120	52.500

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.396
5	.397
10	.399
15	.400
20	.402
25	.403
30	.404
35	.406
40	.407
45	.409
50	.410
55	.411
60	.413
65	.414
70	.415
75	.417
80	.418
85	.420
90	.421
95	.422
100	.424
105	.425
110	.427
115	.428
120	.429
125	.431

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
0	1.026
10	1.015
20	1.005
30	.994
40	.983
50	.972
60	.962
70	.951
80	.940
90	.929
100	.919
110	.908
120	.897
130	.886
140	.876
150	.865
160	.854
170	.843
180	.833
190	.822
200	.811
210	.800

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
0	1.024
5	.978
10	.935
15	.894
20	.857
25	.821
30	.788
35	.757
40	.727
45	.700
50	.673
55	.649
60	.625
65	.603
70	.582
75	.562
80	.544
85	.526
90	.509
95	.493
100	.477

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.050

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
0	.038
10	.057
20	.084
30	.121
40	.172
50	.241
60	.331
70	.449
80	.600
90	.792
100	1.033
110	1.332
120	1.700
130	2.148
140	2.690
150	3.338
160	4.109
170	5.018
180	6.083
190	7.323
200	8.758
210	10.410

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
0	.00070
10	.00103
20	.00150
30	.00212
40	.00296
50	.00405
60	.00547
70	.00727
80	.00954
90	.01237
100	.01584
110	.02007
120	.02518
130	.03127
140	.03850
150	.04700
160	.05691
170	.06840
180	.08162
190	.09675
200	.11400
210	.13340

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.228
25	.241
50	.255
75	.268
100	.281
125	.294
150	.306
175	.319
200	.331
225	.343
250	.355
275	.367
300	.378
325	.389
350	.400
375	.411
400	.422
425	.432
450	.443
475	.453
500	.462
525	.472
550	.482
575	.491
600	.500

TGK750 ***HR: 3***

TOLUENE

CAS: 108-88-3 NIOSH: XS 5250000

mf: C_7H_8 mw: 92.15

DOT: 1294

PROP: Colorless liquid; benzol-like odor. Mp: −95 to −94.5°, bp: 110.4°, flash p: 40°F (CC), ulc: 75-80, lel: 1.27%, uel: 7%, d: 0.866 @ 20°/4°, autoign temp: 996°F, vap press: 36.7 mm @ 30°, vap d: 3.14. Insol in water; sol in acetone; misc in absolute alc, ether, chloroform.

SYNS:

ANTISAL 1a
METHACIDE
METHYLBENZENE
METHYLBENZOL
NCI-C07272
PHENYLMETHANE
RCRA WASTE NUMBER U220
TOLUEEN (DUTCH)
TOLUEN (CZECH)
TOLUOL
TOLUOL (DOT)
TOLUOLO (ITALIAN)
TOLU-SOL

TOXICITY DATA:

eye-hmn 300 ppm
skn-rbt 435 mg MLD
skn-rbt 500 MOD
eye-rbt 870 µg MLD
eye-rbt 2 mg/24H SEV
eye-rbt 100 mg/30S rns MLD
ims-grh-ihl 562 mg/L
uns-rat:lvr 30 umol/L
cyt-rat-ihl 5400 µg/m³/16W-I
cyt-rat-scu 12 g/kg/12D-I
imt-mus-orl 200 mg/kg
imt-mus-ipr 433 µg/kg/24H
ihl-rat TCLo:1500 mg/m³/24H (1-8D preg):TER
rl-mus TDLo:9 g/kg (6-15D preg):TER
ihl-hmn TCLo:200 ppm: BRN,CNS,BLD
il-man TCLo:100 ppm: CNS
orl-rat LD50:5000 mg/kg
ihl-rat LCLo:4000 ppm/4H
ipr-rat LDLo:800 mg/kg
orn-rat LD50:1960 mg/kg
unr-rat LD50:6900 mg/kg
ihl-mus LC50:5320 ppm/8H
ipr-mus LD50:1120 µg/kg
scu-mus LD50:2000 mg/kg
skn-rbt LD50:12124 mg/kg
ihl-gpg LCLo:1600 ppm
scu-frg LDLo:920 mg/kg

CODEN:

JIHTAB 25,282,43
UCDS** 7/23/70
FCTOD7 20,563,82
UCDS** 7/23/70
28ZPAK -,23,72
FCTOD7 20,573,82
MUREAV 113,467,83
SinJF# 26OCT82
GTPZAB 25(7),33,81
GTPZAB 17(3),24,73
MUREAV 147,294,85
ARTODN 58,106,85
TXCYAC 11,55,78
TJADAB 19,41A,79
JAMAAP 123,1106,43
WEHRBJ 9,131,72
AMIHAB 19,403,59
AIHAAP 30,470,69
TXAPA9 1,156,59
MELAAD 54,486,63
GISAAA 45(12),64,80
JIHTAB 25,366,43
AGGHAR 18,109,60
GISAAA 45(12),64,80
AIHAAP 30,470,69
JIDHAN 10,261,28
AEPPAE 130,250,28

Community Right To Know List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 200 ppm; CL 300; Pk 500/10M

ACGIH TLV: TWA 100 ppm; STEL 150 ppm; BEI: toluene in venous blood end of shift 1 mg/L

FG MAK: 100 ppm (375 mg/m³); BAT: blood end of shift 340 µg/dl

NIOSH REL: (Toluene) TWA 100 ppm; CL 200 ppm/10M

DOT Classification: Flammable Liquid; Label: Flammable Liquid

THR: Poison by intraperitoneal route. Moderately toxic by intravenous, subcutaneous and possibly other routes. Mildly toxic by inhalation. An experimental teratogen. Human systemic effects by inhalation: CNS recording changes, hallucinations or distorted perceptions, motor activity changes, antipsychotic, psychophysiological test changes and bone marrow changes. Experimental reproductive effects. Mutagenic data. A human eye irritant. An experimental skin and severe eye irritant.

Toluene is derived from coal tar, and commercial grades usually contain small amounts of benzene as an impurity. Inhalation of 200 ppm of toluene for 8 hours may cause impairment of coordination and reaction time; with higher concentrations (up to 800 ppm) these effects are increased and are observed in a shorter time. In the few cases of acute toluene poisoning reported, the effect has been that of a narcotic, the workman passing through a stage of intoxication into one of coma. Recovery following removal from exposure has been the rule. An occasional report of chronic poisoning describes an anemia and leucopenia, with biopsy showing a bone marrow hypoplasia. These effects, however, are less common in people working with toluene, and they are not as severe. At 200-500 ppm, headache, nausea, eye irritation, loss of appetite, a bad taste, lassitude, impairment of coordination and reaction time are reported, but are not usually accompanied by any laboratory or physical findings of significance. With higher concentrations, the above complaints are increased and in addition, anemia, leukopenia and enlarged liver may be found in rare cases. A common air contaminant.

A very dangerous fire hazard when exposed to heat, flame or oxidizers. Explosive in the form of vapor when exposed to heat or flame. Explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid; H_2SO_4 + HNO_3; N_2O_4; $AgClO_4$; BrF_3; UF_6. Forms an explosive mixture with tetranitromethane. Can react vigorously with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. For further information, see Vol. 7, No. 5 of *DPIM Report*.

TGL500 ***HR: 3***

TOLUENEDIAMINE

CAS: 25376-45-8 NIOSH: XS 9445000

mf: $C_7H_{10}N_2$ mw: 122.19

DOT: 1709

SYNS:

ar-METHYLBENZENEDIAMINE
DIAMINOTOLUENE
METHYLPHENYLENEDIAMINE
TOLYLENEDIAMINE

Community Right To Know List. Reported in EPA TSCA Inventory.

m-XYLENE

XLM

Common Synonyms
1, 3-Dimethylbenzene
Xylol

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-$C_6H_4(CH_3)_2$
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 on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.05 ppm
5.11 IDLH Value: 10,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 84°F C.C.
6.2 Flammable Limits in Air: 1.1%-6.4%
6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 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

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/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

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	1
Liquid or Solid Irritant	1
Poisons	2
Water Polution	
Human Toxicity	1
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)	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: 269.4°F = 131.9°C = 405.1°K
12.4 Freezing Point: —54.2°F = —47.9°C = 225.3°K
12.5 Critical Temperature: 650.8°F = 343.8°C = 617.0°K
12.6 Critical Pressure: 513.8 atm = 34.95 psia = 3.540 MN/m²
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 10^5 J/kg
12.13 Heat of Combustion: —17,554 Btu/lb = —9752.4 cal/g = —408.31 X 10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 26.01 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.34 psia

NOTES

XLM	m-XYLENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
15	55.400
20	55.260
25	55.130
30	54.990
35	54.850
40	54.710
45	54.570
50	54.430
55	54.290
60	54.160
65	54.020
70	53.880
75	53.740
80	53.600
85	53.460
90	53.320
95	53.180
100	53.050

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
40	.387
50	.393
60	.398
70	.404
80	.410
90	.415
100	.421
110	.426
120	.432
130	.437
140	.443
150	.448
160	.454
170	.460
180	.465
190	.471
200	.476
210	.482

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
35	.962
40	.953
45	.944
50	.935
55	.926
60	.917
65	.908
70	.899
75	.890
80	.881
85	.873
90	.864
95	.855
100	.846

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
15	.938
20	.898
25	.862
30	.827
35	.794
40	.764
45	.735
50	.708
55	.682
60	.658
65	.635
70	.613
75	.592
80	.572
85	.554

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	I
	N
	S
	O
	L
	U
	B
	L
	E

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
60	.090
70	.127
80	.177
90	.242
100	.326
110	.434
120	.571
130	.743
140	.956
150	1.219
160	1.538
170	1.924
180	2.388
190	2.939
200	3.590
210	4.355
220	5.247
230	6.282
240	7.476
250	8.846
260	10.410

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
60	.00172
70	.00238
80	.00324
90	.00435
100	.00577
110	.00754
120	.00975
130	.01247
140	.01577
150	.01977
160	.02455
170	.03023
180	.03691
190	.04473
200	.05382
210	.06431
220	.07635
230	.09009
240	.10570
250	.12330
260	.14310

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.247
25	.260
50	.273
75	.286
100	.299
125	.311
150	.324
175	.336
200	.348
225	.360
250	.371
275	.383
300	.394
325	.406
350	.417
375	.427
400	.438
425	.449
450	.459
475	.469
500	.479
525	.489
550	.499
575	.508
600	.517

o-XYLENE

XLO

Common Synonyms
1, 2-Dimethylbenzene
Xylol

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

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.

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: o-$C_6H_4(CH_3)_2$
3.3 IMO/UN Designation: 3.2/1307
3.4 DOT ID No.: 1307
3.5 CAS Registry No.: 95-47-6

4. OBSERVABLE CHARACTERISTICS

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 Limits: 300 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 Late Toxicity: Kidney and liver damage.
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.05 ppm
5.11 IDLH Value: 10,000 ppm

6. FIRE HAZARDS

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 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: 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

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

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No reaction
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	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

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: 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 psia = 3.732 MN/m^2
12.7 Specific Gravity: 0.880 at 20°C (liquid)
12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.03053 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): 1.068
12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 X 10^5 J/kg
12.13 Heat of Combustion: −17,558 Btu/lb = −9754.7 cal/g = −408.41 X 10^5 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 psia

NOTES

XLO	o-XYLENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
15	56.460
20	56.330
25	56.190
30	56.050
35	55.910
40	55.770
45	55.630
50	55.490
55	55.360
60	55.220
65	55.080
70	54.940
75	54.800
80	54.660
85	54.520
90	54.380
95	54.250
100	54.110

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
35	.389
40	.391
45	.394
50	.396
55	.398
60	.400
65	.402
70	.404
75	.406
80	.408
85	.411
90	.413
95	.415
100	.417

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
35	1.043
40	1.035
45	1.027
50	1.018
55	1.010
60	1.002
65	.993
70	.985
75	.977
80	.969
85	.960
90	.952
95	.944
100	.935

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
15	1.328
20	1.263
25	1.202
30	1.145
35	1.092
40	1.042
45	.995
50	.952
55	.911
60	.873
65	.836
70	.802
75	.770
80	.740
85	.712

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	I N S O L U B L E

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
60	.071
70	.101
80	.141
90	.194
100	.263
110	.352
120	.465
130	.609
140	.787
150	1.007
160	1.277
170	1.605
180	1.999
190	2.469
200	3.028
210	3.686
220	4.456
230	5.352
240	6.389
250	7.581
260	8.947

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
60	.00135
70	.00188
80	.00258
90	.00349
100	.00464
110	.00611
120	.00794
130	.01021
140	.01298
150	.01634
160	.02038
170	.02520
180	.03090
190	.03759
200	.04539
210	.05443
220	.06484
230	.07674
240	.09030
250	.10560
260	.12290

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.261
25	.274
50	.287
75	.299
100	.311
125	.323
150	.335
175	.347
200	.358
225	.370
250	.381
275	.392
300	.403
325	.414
350	.424
375	.435
400	.445
425	.455
450	.465
475	.475
500	.485
525	.494
550	.504
575	.513
600	.522

p-XYLENE

XLP

Common Synonyms
1, 4-Dimethylbenzene
Xylol

Watery liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced.
Freezing point is 56°F.

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 dizziness, 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, 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:** $p\text{-}C_6H_4(CH_3)_2$
3.3 **IMO/UN Designation:** 3.2/1307
3.4 **DOT ID No.:** 1307
3.5 **CAS Registry No.:** 106-42-3

4. 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 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/TL$_m$/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0 lb/lb in 5 days
8.4 **Food Chain 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	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

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:** 55.9°F = 13.3°C = 286.5°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 10^5 J/kg
12.13 **Heat of Combustion:** −17,559 Btu/lb = −9754.7 cal/g = −408.41 X 10^4 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 37.83 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.34 psia

NOTES

XLP	p-XYLENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
60	53.970
65	53.830
70	53.690
75	53.550
80	53.410
85	53.270
90	53.140
95	53.000
100	52.860
105	52.720
110	52.580
115	52.440
120	52.300

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
60	.412
70	.418
80	.424
90	.429
100	.435
110	.440
120	.446
130	.451
140	.457
150	.462
160	.468
170	.474
180	.479
190	.485
200	.490
210	.496
220	.501
230	.507
240	.512
250	.518
260	.524
270	.529
280	.535

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
60	.935
65	.928
70	.921
75	.914
80	.907
85	.900
90	.892
95	.885
100	.878

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
60	.678
65	.654
70	.631
75	.610
80	.590
85	.571
90	.552
95	.535
100	.519
105	.503
110	.488
115	.474
120	.460

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	I
	N
	S
	O
	L
	U
	B
	L
	E

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
60	.096
70	.135
80	.187
90	.255
100	.343
110	.456
120	.599
130	.777
140	.998
150	1.270
160	1.600
170	1.998
180	2.475
190	3.041
200	3.710
210	4.493
220	5.407
230	6.465
240	7.683
250	9.080
260	10.670

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
60	.00183
70	.00252
80	.00343
90	.00459
100	.00607
110	.00792
120	.01022
130	.01303
140	.01646
150	.02059
160	.02553
170	.03138
180	.03826
190	.04629
200	.05561
210	.06636
220	.07867
230	.09270
240	.10860
250	.12650
260	.14670

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.246
25	.259
50	.272
75	.285
100	.297
125	.309
150	.321
175	.333
200	.345
225	.357
250	.368
275	.380
300	.391
325	.402
350	.413
375	.424
400	.435
425	.445
450	.456
475	.466
500	.476
525	.486
550	.496
575	.505
600	.515

ivn-rat LD50:24 mg/kg	YACHDS 12(Suppl 6),969,84
orl-mus LD50:325 mg/kg	YACHDS 12(Suppl 6),969,84
scu-mus LD50:284 mg/kg	YACHDS 12(Suppl 6),969,84
ivn-mus LD50:28 mg/kg	YACHDS 12(Suppl 6),969,84
orl-dog LD50:405 mg/kg	YACHDS 12(Suppl 6),969,84
ivn-dog LD50:9200 µg/kg	YACHDS 12(Suppl 6),969,84
orl-rbt LD50:425 mg/kg	YACHDS 12(Suppl 6),969,84

THR: Poison by ingestion, subcutaneous and intravenous routes. When heated to decomposition it emits toxic fumes of NO_x and HCl.

XGA725 ***HR: 3***

XILOBAM

CAS: 50528-97-7 NIOSH: YT 8850000

mf: $C_{14}H_{19}N_3O$ mw: 245.36

SYNS:

N-(2,6-DIMETHYLPHENYL)-N'-(1-METHYL-2-PYRROLIDINYLIDENE)UREA

MCN-3113

1-(1-METHYL-2-PYRROLIDINYLIDENE)-3-(2.6-XYLYL)UREA

TOXICITY DATA:

orl-rat LD50:830 mg/kg	AIPTAK 233,326,78
ipr-rat LD50:128 mg/kg	AIPTAK 233,326,78
orl-mus LD50:320 mg/kg	JMCMAR 21,1044,78
ipr-mus LD50:110 mg/kg	AIPTAK 233,326,78

THR: Poison by ingestion and intraperitoneal routes. When heated to decomposition it emits toxic fumes of NO_x.

XGS000 ***HR: 2***

XYLENE ✳

CAS: 1330-20-7 NIOSH: ZE 2100000

DOT: 1307

mf: C_8H_{10} mw: 106.18

PROP: A clear liquid. Bp: 138.5°, flash p: 100°F (TOC), d: 0.864 @ 20°/4°, vap press: 6.72 mm @ 21°. Composition: as nonaromatics 0.07%, toluene 14%, ethyl benzene 19.27%, p-xylene 7.84%, m-xylene 65.01%, o-xylene 7.63%, C9 and aromatics 0.04% (TXAPA9 33,543,75).

SYNS:

DIMETHYLBENZENE
KSYLEN (POLISH)
METHYL TOLUENE
NCI-C55232
RCRA WASTE NUMBER U239
VIOLET 3
XILOLI (ITALIAN)
XYLENEN (DUTCH)
XYLOL (DOT)
XYLOLE (GERMAN)

TOXICITY DATA:

eye-hmn 200 ppm	JIHTAB 25,282,43
skn-rbt 100% MOD	AMIHAB 14,387,56
skn-rbt 500 mg/24H MOD	28ZPAK -,24,72
eye-rbt 87 mg MLD	AMIHAB 14,387,56
eye-rbt 5 mg/24H SEV	28ZPAK -,24,72
cyt-smc 1 mmol/tube	HEREAY 33,457,47
ihl-rat TCLo:1000 mg/m³/24H (9-14D preg):TER	TXCYAC 11,55,78
orl-mus TDLo:31 mg/kg (6-15D preg):REP	JTEHD6 9,97,82
ihl-mus TCLo:2000 ppm/6H (6-12D preg):TER	TJADAB 28,22A,83
ihl-hmn TCLo:200 ppm:NOSE,EYE,PUL	JIHTAB 25,282,43
ihl-man LCLo:10000 ppm/6H	BMJOAE 3,442,70
orl-rat LD50:4300 mg/kg	AMIHAB 14,387,56
ihl-rat LC50:5000 ppm/4H	NPIRI* 1,123,74
scu-rat LD50:1700 mg/kg	NPIRI* 1,123,74
ipr-mus LD50:1548 mg/kg	AGGHAR 18,109,60
ipr-gpg LDLo:2000 mg/kg	AIHAAP 35,21,74
ipr-mam LDLo:2000 mg/kg	AJHYA2 7,276,27

Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program. Community Right To Know List.

OSHA PEL: TWA 100 ppm

ACGIH TLV: TWA 100 ppm; STEL 150 ppm; BEI: methyl hippuric acids in urine end of shift 1.5 g/g creatinine

DFG MAK: (all isomers) 100 ppm (440 mg/m³); BAT: blood end of shift 150 µg/dl, urine 2 g/l

NIOSH REL: (Xylene) TWA 100 ppm; CL 200 ppm/10M

DOT Classification: Flammable Liquid; Label: Flammable Liquid; Flammable or Combustible Liquid; Label: Flammable Liquid

THR: Moderately toxic by intraperitoneal and subcutaneous routes. Mildly toxic by ingestion and inhalation. An experimental teratogen. Human systemic effects by inhalation: olfactory changes, conjunctiva irritation and pulmonary changes. Experimental reproductive effects. Mutagenic data. A human eye irritant. An experimental skin and severe eye irritant. Some temporary corneal effects are noted, as well as some conjunctival irritation by instillation (adding drops to the eyes one at a time). Irritation can start at 200 ppm. A very dangerous fire hazard when exposed to heat or flame; can react with oxidizing materials. To fight fire, use foam, CO_2, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes. See also other xylene entries. For further information, see Vol. 6, No. 4 of *DPIM Report*.

XHA000 ***HR: 3***

m-XYLENE

CAS: 108-38-3 NIOSH: ZE 2275000

DOT: 1307

mf: C_8H_{10} mw: 106.18

PROP: Colorless liquid. Mp: −47.9°, bp: 139°, lel: 1.1%, uel: 7.0%, flash p: 77°F, d: 0.864 @ 20/4°, vap press: 10 mm @ 28.3°, vap d: 3.66, autoign temp: 986°F. Insol in water; misc with alc, ether and some organic solvents.

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

Common Synonyms	Watery liquid	Colorless to pale brown or pink	Gasoline odor
Motor spirit Petrol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea or vomiting.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

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
Disperse and flush

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: (Mixture of hydrocarbons)
3.3 IMO/UN Designation: 3.1/1203
3.4 DOT ID No.: 1203
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to brown
4.3 Odor: Gasoline

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective goggles, gloves.
5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat.
5.3 Treatment of Exposure: INHALATION: maintain respiration and administer oxygen; enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.
5.4 Threshold Limit Value: 300 ppm
5.5 Short Term Inhalation Limits: 500 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg.
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.25 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: —36°F C.C.
6.2 Flammable Limits in Air: 1.4%-7.4%
6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 853°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 4 mm/min.
6.10 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: 90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 mg/1/24 hr/juvenile American shad/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 8%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Various octane ratings; military specifications
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

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	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

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: 140—390°F = 60—199°C = 333—472°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.7321 at 20°C (liquid)
12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019—0.023 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049—0.051 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 3.4
12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054
12.12 Latent Heat of Vaporization: 130—150 Btu/lb = 71—81 cal/g = 3.0 — 3.4 X 10^5 J/kg
12.13 Heat of Combustion: —18,720 Btu/lb = —10,400 cal/g = 435.1 X 10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.4 psia

NOTES

GAT GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

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 (estimate)	Temperature (degrees F)	Centipoise
45	46.270	10	.459	40	.909	46	.521
50	46.130	15	.462	50	.900	48	.514
55	46.000	20	.464	60	.891	50	.507
60	45.850	25	.467	70	.883	52	.500
65	45.710	30	.470	80	.874	54	.494
70	45.560	35	.472	90	.865	56	.487
75	45.400	40	.475	100	.856	58	.481
80	45.240	45	.478	110	.847	60	.475
85	45.080	50	.480	120	.838	62	.469
90	44.910	55	.483	130	.829	64	.463
95	44.750	60	.486	140	.821	66	.457
100	44.570	65	.488	150	.812	68	.451
105	44.390	70	.491	160	.803	70	.446
110	44.210	75	.494	170	.794	72	.440
115	44.030	80	.496	180	.785	74	.435
		85	.499	190	.776	76	.430
		90	.502			78	.424
		95	.504			80	.419
		100	.507			82	.414
		105	.510			84	.410
						86	.405
						88	.400
						90	.396
						92	.391
						94	.387
						96	.382

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
	INSOLUBLE		DATA NOT AVAILABLE		NOT PERTINENT		DATA NOT AVAILABLE

APPENDIX B

Field Team Review Form

APPENDIX B

Field Team Review Form

I have read and reviewed the most recent revision dated December 4, 1991, of the Project Health and Safety Plan (HASP) for the Houghton Beach Park site. I have been given a chance to ask questions regarding the HASP and understand all information contained therein. I agree to comply with all aspects of the HASP.

Name: _____

Signature: _____

Date: _____

Completed copies of this form should be forwarded to the AGI Health and Safety Manager.