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May 18, 1992

VIA FEDERAL EXPRESS

Mr. Paul Smith
Senior Hazardous Materials Specialist
Alameda County Health Care Agency
Hazardous Materials Division
80 Swan Way, Suite 200
Oakland, CA 94621

Re: 1432 Harrison Street Garage

Dear Paul:

I have enclosed copies of the Site Assessment and Site Safety Plan prepared by RGA.

Very truly yours,

Randall D. Morrison

RDM:ma

Enclosures

cc: Mark Thomson, Esq.
Deputy District Attorney

Alvin Bacharach

Mr. Robert Gils

ENVIRONMENTAL INC.

May 8, 1992

92

Paul Smith
Senior Hazardous Materials Specialist
80 Swan Way, Room 200
Oakland, CA 94612

Re: Harrison Street Garage

Dear Paul:

Attached find copies of the preliminary Site Assessment and the Site Safety Plan for the Harrison Street Garage. Pending your review of the Site Safety Plan and approval of the owner, we will complete adjustments as needed.

Sincerely yours,

Robert E. Gils
CIH #1151

ENVIRONMENTAL CONSULTANTS
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INDUSTRIAL HYGIENISTS

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TABLE OF CONTENTS

Section III: Appendix

1.	Agreement Statement	Appendix A
2.	Site Safety Plan Agreement	Appendix B
3.	Hazard Waiver	Appendix C
4.	Hazard Evaluation Guidelines	Appendix D
5.	Accident/Incident/Near Miss	Appendix E
6.	Project Personnel	Appendix F

Section IV: Material Safety Data Sheets

1. Benzene
2. Ethylbenzene
3. Gasolines: Automotive
4. Kerosene
5. Oils, Fuel 1-D
6. Oils, Fuel 2-D
7. Polychlorinated Biphenyl
8. Toluene
9. m-Xylene
10. o-Xylene
11. p-Xylene

Section V: Site Description and History - _____ Engineers

1. Introduction

The Harrison Garage Project will be divided into five phases as follows:

1. Phase I: Removal of two subsurface gasoline tanks and associated piping and pumps.
2. Phase II: Removal of hydraulic lifts in the service area garage (Harrison Street).
3. Phase III: Removal of two waste oil tanks, an asbestos lagged pipe and possibly the removal of an additional hydraulic lift in the basement (Alice Street).
4. Phase IV: Scoping of subsurface contamination.
5. Phase V: Remediation of contamination.

This Site Safety Plan is applicable to all phases. The starting and sequence of each phase will depend on the arrangement among the interested parties.

1.1 Background

Alvin Bacharach and Barbara Jean Borsuk have retained _____ to assess site conditions and provide a Site Safety Plan at 1432-1434 Harrison Street and 1435 Alice Street Garages, Oakland, California (Section 5). The purpose of the Site Safety Plan (SSP) is to provide _____ Engineers, _____ field personnel and subcontractors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are performed.

This SSP describes the procedures to be followed to reduce employee exposure to potential health hazards that may be present on the project site. The emergency response procedures necessary to respond to such hazards are also described within this SSP. The SSP is primarily designed to guide project personnel on how to respond to normal or extreme conditions that may arise during the project execution. Some of the site characterizations contained in the SSP are based on the site assessment reports of Subsurface Consultant, SCS Engineers, and RGA. Data from Chromolab laboratory analyses and results of samples from the subject site were also considered. See Appendix G for detailed site assessment reports.

Normal conditions are when the petroleum hydrocarbon vapors in the ambient air are below 50 ppm as monitored with an OVA. Conditions are extreme when the petroleum hydrocarbon vapors in the ambient air are above 50 ppm as monitored with an OVA.

1.2 Objective

The primary objective is to ensure the well being of observers, field personnel and the community surrounding the subject property. To do this, project staff, client personnel and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, all personnel assigned to this project shall read this SSP and sign the Agreements and Acknowledgement Statement (Appendix A)

to certify that they have read, understood and agreed to abide by this SSP and its provisions.

_____ personnel have the authority to stop work activities and evacuate the area. _____ personnel will consult with _____ hygienists on site during the removal process to determine conditions and the need to discontinue the work of their subcontractors if any of the work is not executed according to the requirements of the Site Safety Plan.

1.3 Amendments

Any changes in the scope of work of this project and/or site conditions must be amended in writing on the Site Safety Plan Amendment Sheet (Appendix B) and approved by the Health and Safety Manager.

2. Hazard Evaluation

2.1 Site Conditions

General site conditions at the site include soil impacted with hydrocarbons (see Section 5 of this Plan).

2.2 Site Tasks

The field tasks at this site may include:

- Excavation
- Well Placement
- Lift Removal
- Soil Sampling
- Tank Removal
- Water Sampling
- Asbestos Removal
- Drilling
- Tanks, Hydraulic Lifts, Soil, and Asbestos Removal

2.3 Project Task Hazards

2.3.1 All field task hazards are site specific.

The following hazards may be encountered:

- Organic Vapors: The inhalation of volatile organic vapor during all operations can pose a potential health hazard. Hazard reduction procedures include monitoring the ambient air with OVA and use of personal protection equipment (Table 1). Workers shall use personal protective equipment including Tyveck suits, respirators (full face respirators equipped with organic vapor cartridges), boots and gloves during removal of the waste oil tanks in the basement area and during the excavation work in the Harrison Street side of the garage. Workers should stand upwind of the source of contamination whenever possible.

- Flammable Vapors: The presence of flammable vapors can pose a potential fire and health hazard. Hazard reduction procedures include monitoring the

ambient air with an O_2/LEL meter. If the LEL reading exceeds 20%, leave the site immediately and contact the fire department.

- Contamination: Contact with contaminated surface or surfaces suspected of being contaminated should be avoided. This includes working through, kneeling or placing equipment in puddles, mud, discolored surfaces or on drums and other containers. Eating, smoking, drinking and/or the application of cosmetics is prohibited on this site in the immediate work area. This reduces the likelihood of contamination by ingestion.

- Falling Objects: Hard hats must be worn by all project staff and observers whenever construction activity is taking place (i.e., drilling, excavation, etc.).

- Vehicle Traffic: All project staff and observers will be required to wear a fluorescent safety vest at all times while on site. In addition, use flags, tapes, barricades and cones to designate restricted areas.

- Explosion Protection: Explosion-proof lighting will be used in the basement area during all work. Explosion-proof ventilation equipment will be used to control airborne contaminant levels during all work within the garage area. See Table II for the location of ventilation equipment and other precautions needed.

2.3.2 Well Installation, Development, Gauging, Baling, Sampling

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Butyl nitrile rubber or neoprene gloves and approved safety goggles should be worn when contact with contaminated substance and/or splash is possible.

2.3.3 Samples Preservation

When hydrochloric acid (HCL) is used, skin and eye contact can occur. This hazard can be reduced with the use of butyl nitrile rubber or neoprene gloves and the use of safety goggles.

2.3.4 Cleaning Equipment

Skin and eye contact with trisodium phosphate, methanol or other cleaning substances can occur while cleaning equipment. This hazard can be reduced with the use of butyl nitrile rubber or neoprene gloves and the use of safety goggles.

Table I
Hazard Summary - Non Confined Areas

Job Task / PPE level	Instrument	Frequency
Soil Boring Samples/Excavation	PID/FID & OVA	At start of work and 30 minutes to continuously
Monitoring Well Installation	PID/FID & OVA	At start of work and 30 minutes to continuously
Monitoring Well Survey	PID/FID & OVA	Start up of work at each well location
Monitoring Well Development	PID/FID & OVA	Start up of work at each well location
Groundwater Monitoring/Sampling	PID/FID & OVA	Start up of work at each location

Table II
Hazard Summary - Confined Areas

Job Task / PPE Level	Instrument	Frequency
Samples/Excavation	PID/FID & OVA, CO meter, O_2 meter and Draiger Tubes	At start of work and 30 minutes to continuously
Monitoring Well Installation	PID/FID & OVA, CO meter, O_2 meter and Draiger Tubes	At start of work and 30 minutes to continuously
Monitoring Well Survey	PID/FID & OVA, CO meter, O_2 meter and Draiger Tubes	Start up of work at each well location
Monitoring Well Development	PID/FID & OVA, CO meter, O_2 meter and Draiger Tubes	Start up of work at each well location
Groundwater Monitoring/Sampling	PID/FID & OVA, CO meter O_2 meter and Draiger Tubes	Start up of work at each location

3. Personnel Protective Equipment

3.1 Acceptable Levels

Level D is the minimum acceptable level for this site in non-confined areas. Level C is acceptable for this site in confined areas.

Modified **Level D/Sidewalk**:

- Cover-alls work uniform
- Steel toe and shank boots
- Butyl nitrile rubber or neoprene gloves (optional)
- Splash goggles/safety glasses if potential for splash
- Hard hat
- Fluorescent vest
- Tyvek suit (optional)
- Hearing protection (as appropriate)

Level C/Inside Building (Confined Areas):

- full face respirator, NIOSH approved, with organic vapor cartridges
- Tyvek suits (if splash hazard is possible, a coated suit must be worn)
- Butyl nitrile rubber or neoprene gloves
- Steel toe and shank boots
- Outer Boots/chemical resistant
- inner disposable gloves (two pair recommended)
- hard hat
- fluorescent vest
- hearing protection (as appropriate)

Level B:

- air supplied respirator
- coated Tyvek suit, such as Saranex
- Butyl nitrile rubber or neoprene gloves
- Inner latex or vinyl gloves
- Steel toe and shank boots
- Outer boots/chemical resistant
- Hard hat
- Fluorescent vest
- Hearing protection (as appropriate)

Level A: This is the highest level of skin and respiratory protection. It includes all of Level B.

4. Decontamination Procedures

4.1 Procedures

All operations conducted at this site have the potential to contaminate monitoring equipment and personnel protective equipment (PPE). To prevent the transfer of contamination to vehicles, administrative areas and personnel, the following procedures must be followed:

4.1.1 Equipment Decontamination

Whenever possible, monitoring equipment should be decontaminated with a solution of Alconox and thoroughly rinsed with water prior to leaving the site. This must be done outside a five foot radius of any work area.

4.1.2 Personal Decontamination

Level D/Sidewalk:

- segregated equipment drop
- wash/rinse outer boot (as appropriate)
- wash/rinse chemical resistant outer glove, then remove (as appropriate)
- remove hard hat, goggles/safety glasses/faceshield
- remove and throw out inner disposable gloves in designated lined receptacles (as appropriate)

Level C/Basement (Confined Areas):

- segregated equipment drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves, then remove
- remove outer boots and place to dry (if reusable)
- remove chemical resistant suit (remove by rolling down the suit)
- remove first pair(s) of disposable gloves
- remove respirator/hard hat/face shield, dispose of cartridges and wash respirator
- remove last pair of disposable gloves

Level B:

- segregated equipment drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves, then remove
- cross hotline (into clean area) and change air tanks, then redress or
- cross hotline (into clean area)
- remove boots and gloves
- remove SCBA, if worn over chemical resistant suit
- if SCBA is worn under the suit, remove the chemical resistant suit, then the SCBA
- remove hard hat

5. Chemicals of Concern

5.1 Health Effects

Potential health effects from a chemical exposure are dependant on several exposure factors such as toxicity of substances, duration of exposure, concentration during exposure and the overall health of the person exposed.

The chemicals found at this site are: gasoline, benzene, toluene, ethylbenzene, xylene, asbestos, diesel, and PCBs. Additional information on these chemicals can be found in

1\ chlorinated solvents

the Material Safety Data Sheets located in Section 4. The following is a health analysis of these chemicals:

Gasoline constituents can be divided into five major groups: alkanes, alkenes, cycloalkanes, aromatics and additives. The aromatics are the constituents generally regarded to be of the greatest toxic concern. The major aromatics in gasoline are benzene, toluene, ethyl benzene and xylene. Of these, benzene is considered the most toxic. One characteristic effect of gasoline and its aromatic constituents is their ability to irritate the skin when repeated or prolonged exposure occurs.

Benzene

Benzene can enter the body through inhalation, ingestion and skin contact. Studies have noted that chronic exposure to benzene vapor can produce neurotoxic and hemotopoietic (blood system) effects. Other effects can include headache, dizziness, nausea, convulsions, coma and possible death if exposure is not reversed. One significant effect from chronic benzene exposure is bone marrow toxicity. There is also an association between chronic exposures to benzene and the development of certain types of leukemia.

Toluene

Inhalation exposure to toluene vapor can produce effects such as central nervous system depression. Depending on exposure factors signs and symptoms can include headache, dizziness, fatigue, muscular weakness, incoordination, drowsiness, collapse and possible coma. Toluene can be a skin and mucous membrane irritant and studies have shown that high levels of toluene exposure can cause liver and kidney damage.

Ethylbenzene

Exposure to ethyl benzene at high vapor concentrations may produce irritation to the skin, eyes and upper respiratory tract. Overexposure to ethyl benzene vapors can produce central nervous system depression with symptoms of headache, nausea, dizziness, shortness of breath and unsteadiness. Prolonged skin exposure to ethyl benzene may result in drying and cracking of the skin (dermatitis). Solvent resistant gloves should be worn during sampling to prevent exposure to the skin.

Xylenes

Depending on exposure factors, inhalation exposure to xylene vapor may produce central nervous system excitation followed by depression. Exposure to xylene vapor can produce dizziness, staggering, drowsiness and unconsciousness. At very high concentrations, xylene vapor may produce lung irritation, nausea, vomiting and abdominal pain. Xylene is not known to possess the chronic bone marrow toxicity of benzene, but liver enlargement and nerve-cell damage have been noted from chronic overexposure.

Diesel/Kerosene

Diesel and kerosene fuel components are less volatile than gasoline. Alphatic hydrocarbons may be saturated or unsaturated open chain, branched or unbranched molecule. Health precautions include ventilation for confined spaces. Symptoms of over exposure include nausea, vomiting, lung irritation and headache.

Metals, Pb, Cr, Se

Polychlorinated Biphenyls (PCBs)

PCB compounds may penetrate into the human body following skin contact, inhalation or ingestion. A broad spectrum of health effects have been reported to be associated with PCB. These include enzyme inhibition, skin and mucous membrane swelling and burning sensation in the skin, irritation of the upper respiratory tract, abdominal pain, headache, dizziness and depression. Experiments have also shown the carcinogeny of PCBs in animals.

Carbon Monoxide

Carbon monoxide is formed as the result of the combustion of fuels. The gas powered vehicles to be used in this project will create carbon monoxide. Symptoms of exposure include headache, nausea and vomiting.

6. Gas/Vapor Monitoring Procedures

6.1. Potential Hazards

The greatest potential hazards to safety and health at this site are:

- exposure to chemical vapors through inhalation
- exposure to chemical contamination through skin contact and ingestion.

6.2 Monitoring Procedures

Continuous air monitoring (portable gas chromatograph, draiger tubes, CO meter, combustible gas meter, O_2 meter) will be completed by an industrial hygienist during all work in enclosed areas. The hygienist will provide data to ensure that vapor concentrations and combustation gas levels are within acceptable ranges and will provide selection criteria for increased levels of protection if needed.

Ongoing air monitoring by an industrial hygienist[2] during project tasks will provide data to ensure that vapor concentrations and combustion gas levels are within acceptable ranges and will provide adequate selection criteria for respiratory and dermal protection.

- If OVA readings exceed 100 ppm within any unsecured area of the garage during excavation that area shall be categorized a regulated area and NIOSH approved air-purifying respirator with organic vapor cartridges and protective equipment must be worn. Workers not directly affiliated with the project will be directed to leave the area.

- If OVA readings exceed 750 ppm, Level B protection will be required. Personnel must leave the site immediately and contact site safety officer of Health and Safety Manager for further instructions.

- Respirator cartridges will be changed twice per day at a minimum. This can be done at a scheduled time or during respirator decontamination. If odor breakthrough is detected while wearing the respirator or breathing becomes difficult, change cartridges immediately.

---

2. Reporting to a Certified Industrial Hygienist (CIH).

Tasks Performed Within a Confined Space

- The scope of work for this project does not include confined space entry such as tanks, but will entail work within a building which, for the purposes of this plan, is considered a confined area. All work within confined areas requires the use of Level C protective equipment (see Section 3.0).

  All monitoring equipment must be calibrated and maintained in accordance with manufacturer's recommendations.

7. Health and Safety Requirements

7.1 Medical Monitoring Program

All _____ and _____ field personnel must have annual medical evaluations in accordance with the company's Health and Safety Program policy. Additional reevaluation will be considered in the event of chemical over-exposure while working on this project.

The petrochemicals typical of petroleum hydrocarbons can affect specific organ systems producing characteristic health effects. The medical evaluation will, therefore, focus on the liver, kidney, nervous system, blood systems, and skin and lung function. Laboratory testing will include complete blood count, and applicable kidney and liver-function tests. Other tests include skin examinations.

7.2 Training

All personnel working on tank removal at this site should have received a minimum of 40 hours of initial hazardous waste activity instruction and a minimum of three days of field experience under the direct supervision of a trained, experienced person. Personnel assigned to the site are also required to have eight hours refresher training per year. On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations are required to have had an additional eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response regulation, 29 CFR 1910.120.

The initial 40-hour training and the 8 hour annual refresher training includes specific details on the following:

- Regulatory Requirements
- First Aid/CPR
- Confined Space Entry
- Respiratory Protection
- Air Monitoring
- Decontamination Procedures
- Hazard Communication
- Toxicology

These specifics are then complimented with actual hands-on experience with use of personal protective equipment and air monitoring equipment.

7.3 Work Zones Access

Access within a 5 foot radius of any on-site operation is prohibited to all but _____, _____ field personnel, subcontractors and designated personnel.

7.4 Emergency Equipment

Vehicles used for site work will be equipped with a first aid kit and safety equipment including:

- fluorescent vests
- cones
- flags (as needed)
- barricades (as needed)
- fire extinguisher-dry chemical ABC-type extinguisher
- flashlight
- water, suitable for drinking
- portable eye wash
- appropriate emergency bandage material
- air horn to be used to signal an emergency

7.5 Drilling Procedures

A digsafe authorization number must be obtained prior to drilling. During the drilling operation, two persons (one designated as "driller" and the other as "helper") must be present at all times. Every attempt must be made to keep unauthorized personnel from entering the work area. If this is not possible, the operation should be shut down until the area is cleared. The area where the operation is taking place shall be cordoned off with a barricade. The Site Safety Officer or the Field Team Leader has the authority and the responsibility to shut down operations whenever a hazardous situation is deemed present.

If a drilling rig is used, the mast of the drilling rig must maintain a minimum clearance of 20 feet from any overhead electrical cables. All drilling operations will cease immediately during hazardous weather conditions such as high winds, heavy rain or lightning.

Hard hats shall be worn at all times. Hearing protection shall be worn during noisy operations.

7.6 Electrical Equipment and Ground-Fault Circuit Interrupters.

All electrical equipment and power cables in and around wells or structures suspected of containing chemical contamination must be intrinsically safe and equipped with a three-wire ground lead, rated explosion-proof for hazardous atmospheres. According to OSHA 29 CFR 1926.404, approved ground fault circuit interrupters (GFCI) must be used for all 120 volt, single phase, 15 and 20 ampere receptacle outlets on the site that are not in use by employees. Receptacles on the ends of extension cords are not part of the permanent wiring and, therefore, must be protected by GFCIs whether or not the extension cord is plugged into permanent wiring.

The GFCI is a fast-acting circuit breaker that senses small imbalances in the circuit caused by current leakage to ground, and in a fraction of a second shuts off the electricity. However, the GFCI will not protect the employee from line-to-line contact hazards (such as a person holding two "hot" wires or a hot and neutral wire in each

hand). The GFCI does provide protection against the most common form of electrical shock hazard, the ground fault. It also provides protection against fires, overheating, and destruction of insulation on wiring.

GFCIs can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCIs - interruption of current flow - can be caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCIs or shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits. (Adapted from OSHA 3007; Ground-Fault Protection on Construction Sites, 1987).

7.7 Fire Prevention

During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of LEL, then the Site Safety Officer or designated field worker should immediately shut down all operations.

Only Factory Mutual (FM) approved fire safety cans will be used to transport and store flammable liquids.

All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filling.

Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

7.8 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation, or ingestion of toxic substances exists.

Drinking alcoholic beverages is prohibited. Drinking alcoholic beverages and driving is prohibited at any time. Driving at excessive speeds is always prohibited.

Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion.

It is recommended that contact lenses not be worn by persons working on the site.

7.9 MSDS Information

Material Safety Data Sheets (MSDS) on chemical substances encountered at the site shall be made available to all persons (including subcontractors) working at the site. The MSDSs shall be enclosed within this Site Safety Plan in Section 4).

For emergency situations not specifically addressed by this site safety plan, refer to MSDS recommendations for action information.

8. Project Personnel

**** more overview of responsibilities unresolved lines of communication and responsibility.**

8.1 Management Structure

_____'s site Health & Safety hygienist will report to _____ Designated Site Safety officer relating to hazardous conditions and remedial measures. _____ will oversee and act accordingly during all phases of the project. The following management structure will be instituted to successfully and safely complete this project.

8.1.1 Project Manager - _____

The project manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project.

8.1.2 Health & Safety - (_____ Environmental Hygienists)

The Health and Safety Hygienist (_____'s CIH) shall be responsible for the coordination and overseeing of the following aspects of the Site Safety Plan: vapor, combustion gas, particulate, dermal exposure and ventilation.

8.1.3 Site Safety Officer - _____

The Site Safety Officer shall be responsible for the implementation of this Site Safety Plan on site and assuring that all other applicable local, state and federal regulations are complied with.

8.1.4 Field Team Engineer

In the event that the Project Manager and the Site Safety Officer are not on site, the Field Team Leader will assume all responsibility of the Site Safety Officer.

8.1.5 Other Field Personnel

The technical staff is responsible for system maintenance, calibration, and system operation. Records of site visits documenting system conditions are maintained by the technicians. All field personnel shall be responsible for acting in compliance with all safety procedures outlined in the Site Safety Plan. Any hazardous work situations or procedures should be reported to the Site Safety Officer so that corrective steps can be taken.

Hazard: Fire

Guideline	Explanation
Flashpoint (Flash P)	The lowest temperature at which the vapor or a combustible liquid can be made to ignite momentarily in air.

9. Emergency Response

9.1 Emergency Response Procedure

In the event of an accident or emergency, immediate action must be taken by the first person to recognize the event. First aid equipment is located on site inside the vehicle. Notify (1) the Site Safety Officer and (2) the Project Manager and Health and Safety Manager about the situation immediately after emergency procedures are implemented.

9.2 Emergency Telephone Numbers:

Emergency:	Phone
Local Police	911
Fire	911
State Police	911
Ambulance	911
Underground Service Alert (USA)	(800) 642-2444
Gas Company	834-1234
Electric Company	834-1234
Telephone Company	811-9000

Primary Hospital:

Peralta Hospital
450 30th Street
Oakland, CA
(510) 451-4900

Directions: From the site, go west on 14th Street to Martin Luther King, Jr. Way. Go north on Martin Luther King, Jr. Way to 20th Street. Go east on 20th Street to Telegraph Avenue, from here go north to the intersection of Telegraph Avenue and 30th Street. The hospital is the right side of the street.

Back-up Hospital:

Merrit Hospital
Hawthorne & Webster Street
Oakland, CA
(510) 655-4000

Directions: From the site, go west on 14th Street to Broadway. Turn right on Broadway. Turn left (west) on 34th Street. Proceed for about one and one half blocks. The hospital is on the left side of the street.

Environmental Emergency:	Phone
Poison Control Center	476-6600/(800) 523-2222
_____ Engineering	(510) 829-0661
_____ (_____)	xxxxxxxxxxxxx
National Response Center (NRC)	(800) 424-8802
U.S. EPA (24 hour hotline)	(800) 424-9346
State Regulatory Agency Alameda County Health Care	(415) 271-4320
Services Agency	(510) 820-8468
Client (Alvin Bacharach and Barbara Jean Borsuk)	(510) 676-4498
Contact (Mr. Borsuk)	(415) 922-4740

9.3 Encountering Hazardous Situations (Requiring Evacuation)

In the event of an emergency, i.e. fires, explosives or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility, the team member that observes this condition shall give an emergency alarm.

Actions taken will be dictated by the emergency. All appropriate local emergency response agencies shall be notified immediately. The police, fire department, emergency response teams and ambulance may be reached via telephone by dialing 911.

The nearest hospital and additional emergency contacts are listed above (section 8.1).

Personnel encountering a hazardous situation shall instruct others on site to evacuate the vicinity immediately and call the (1) Site Safety Officer, (2) the Project Manager, and (3) the Health & Safety Hygienist for instructions.

The attached site plan indicates the primary evacuation route and the alternate evacuation routes to be used in an emergency situation.

The site must not be re-entered until back-up help, monitoring equipment, and personal protective equipment are on hand.

9.4 Usual Procedures for Injury

1. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital.

2. Send/take this SSP with the attached MSDSs to the medical facility with injured person.

3. If the injury is minor, proceed to administer first aid.

4. Notify the Site Safety Officer, Project Manager, and the Health & Safety Hygienists of all accidents, incidents and near-miss situations.

5. Complete Accident/Incident/Near-Miss Form found in Appendix F.

9.5 Emergency Treatment

When transporting an injured person to a hospital, bring this Site Safety Plan to assist medical personnel with diagnosis and treatment. In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Four different routes of exposure and their respective first aid/poison management procedures are outlined below:

9.5.1 Ingestion:

DO NOT INDUCE VOMITING. Transport person to nearest hospital immediately.

9.5.2 Inhalation/Confined Space:

DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED WITH A SELF-CONTAINED BREATHING APPARATUS AND HAVE A STANDBY PERSON.

9.5.3 Inhalation/Other:

Remove the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.

9.5.4 Skin Contact/Non-Caustic Contaminant (Petroleum, Gasoline, etc.)/PCBs:

Wash off skin with a large amount of water immediately. Remove any contaminated clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.

9.5.5 Skin contact/Corrosive Contaminant (Acids, Hydrogen Peroxide):

Wash off skin with a large amount of water immediately. Remove any contaminated clothing and rewash skin with water. Transport person to a medical facility if necessary.

9.5.6 Eyes:

Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. If possible, have the person remove his/her contact lenses (if worn). Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

10. Tank Removal in the Basement

10.1 Basement Tank Removal Procedure

Tank removal in the basement includes the pipings and other associated items. For this activity, the basement is considered a confined space. To minimize hazards and maintain a normal working environment, the following items must be supplied, in addition to observing the health and safety guidelines contained herein.

1. Adequate general ventilation: Explosion-proof fans and exhaust fans will be located in the basement. The locations will be selected to take advantage of any available air ducts.

2. Vacuum Truck: Any unexpected encounter with pool of product during the tank excavation and removal will be vacuumed by the vacuum truck. The truck will be stationed on the sidewalk on Alice street to reduce exhaust emissions in the immediate work area. All vacuumed product will be sent to a recycling facility.

3. Shoring Facilities: The tank removal contractor should provide shoring equipment and details before excavation begins. In addition to shoring, the contractor should provide dewatering equipment if ground water is encountered and is interfering with the normal tank removal operations. All vacuumed liquid will be sent to a recycling facility.

4. Air Monitoring Equipment: Continuous air monitoring must be maintained in the basement at all times during the excavation and removal of the tanks, and all related activities. The OVA is more preferable to the Miran Gas Analyzer. The latter is a specific vapor analyzer, while the former screens all hydrocarbon compounds at low detection limit of 1 ppm. The OVA has a higher range than the Miran. The shortcomings of the OVA will be compensated with Draiger tubes and PCB kits for detecting benzene and PCBs respectively.

5. Safety Gear: All personnel entering all work areas at Harrison Garage should wear safety eye glasses, hard hat, ear plugs (optional), and steel toe boots or any foot wear that is suitable for wet surfaces.

   where will the stockpiled soil be placed ?

   During excavation, soil piles will be stock pilled on plastic sheets and be covered with same at the end of each work day. _____ will suggest the services of a mobile laboratory for speedy evaluation of contaminants in the tank pit and excavated soils. With such information, a decision could be made on the extent of chasing contamination in the soil, or if the limits of the contamination has been reached and effectively removed. The laboratory results will also be valuable in making prudent decision on manifesting and mode of soil piles disposal. ?

11. Removal of Lifts on the Ground Floor

11.1 Ground Floor Lifts Removal Procedure

Removal of hydraulic lifts on the ground floor includes the sump and other items associated with the lifts. Activities on this floor are considered to be taking place in a confined space. All health and safety considerations will be the same as in the basement. Due to reported high levels of TPH as gasoline in this area, vapor suppressing foam may ?

be used. The frequency of use may be at the discretion of the site safety manager. The use of a mobile laboratory here will have the same advantage as mentioned above.

12. Removal of Tanks on Harrison Street

12.1 Tank Removal Procedure

The removal of tanks on the Harrison street sidewalk includes the gasoline dispensers and associated pipings. Activities here are not considered to be in a confined space. Due to traffic and pedestrians, work area must be sealed with caution tapes and reflective cones. Items needed in this area will include OVA, vapor suppressing foam, trench plates, shoring and dewatering equipment. Conditions that will necessitate the use of shoring and dewatering equipment have been mentioned above. Trench plates will be needed when the tank excavation, cleaning and removal are not accomplished in a day's operation. In such a situation, trench plates will be used to cover the excavated pit. This will prevent accidents happening at any time when the pit is unattended. The OVA will be used to monitor the ambient air. The reading from the OVA will indicate the frequency at which the vapor suppressing foam will be used. The cut-off point will be 50 ppm, or at the discretion of the site safety manager. It is advisable that a vacuum truck be on standby should a pool of free product be encountered. The advantages of using a mobile laboratory here is the same as above.

13. Asbestos Removal in the Basement

13.1 Basement Asbestos Removal Procedure

Abatement of asbestos materials will be completed within the basement prior to any tank removal. Abatement will be completed via glove bag techniques.

APPENDIX A

Agreement and Acknowledgment Statement

Site Safety Plan Agreement

_____ personnel have the authority to stop work performed by their subcontractors at this site if any work is not performed in accordance with the requirements of this Site Safety Plan.

All _____ project personnel, observers and subcontractor personnel are required to sign the following agreement prior to conducting work at the site.

1. I have read and fully understand the Site Safety Plan and my individual responsibilities.

2. I agree to abide by the provisions of the Site Safety Plan.

Name/Company:

Signature:
Date:

APPENDIX B

Site Safety Plan Amendment Sheet

Project Name:

Project Number:

Location:

Changes in field activities or hazards:

Proposed Amendment:

Proposed By:
Date:

Approved By (Project Manager):
Date:

Approved By (Health & Safety Manager):
Date:

Declined By:
Date:

Amendment Number:
Amendment Effective Date:

May 8, 1992

Randall Morrison
Crosby, Heafey, Roach & May
1999 Harrison Street
Oakland, CA 94612

Re: Harrison Street Garage

Dear Mr. Morrison:

The owner of above referenced property is liable for the people on site who do not have proper training. To avoid a problem, I suggest that you write a waiver for people to sign (See Appendix C).

Sincerely yours,

Robert E. Gils, CIH #1151

APPENDIX D

Definition of Hazard Evaluation Guidelines

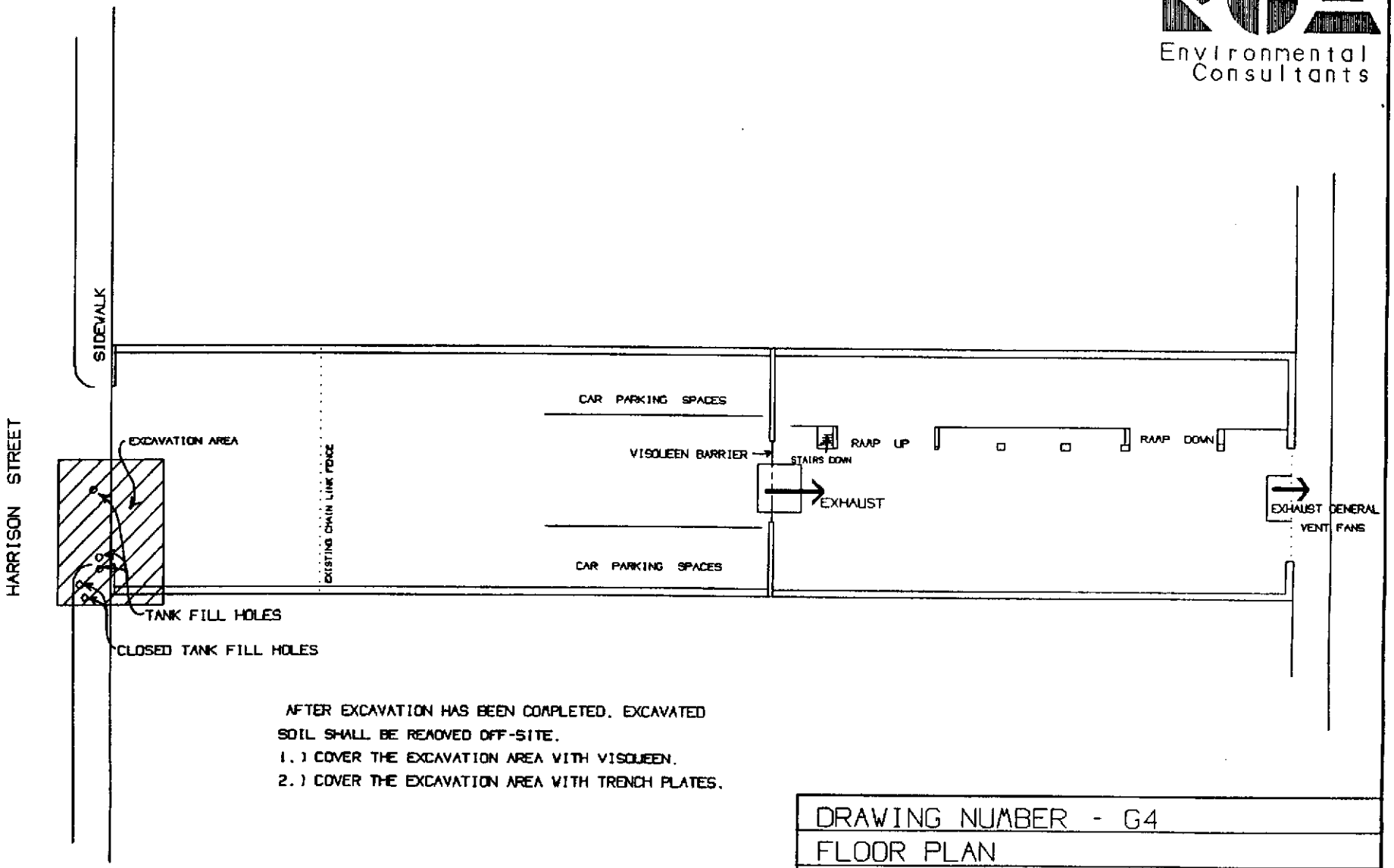
Hazard: Airborne Contaminants

Guideline	Explanation
Threshold Limit Value Time-Weighted Average (TLV-TWA)	The time weighted average concentration for a normal eight hour work day and a forty hour work week, to which nearly all workers may be repeatedly exposed without adverse effect.
Permissible Exposure Limit (PEL)	Time weighted average concentrations similar to (and in many cases derived from) the Threshold Limit Values.
Immediately Dangerous to Life and Health (IDLH)	"IDLH" or "Immediately dangerous to life or health" means any atmospheric condition that poses an immediate threat to life, or that is likely to result in acute or immediate severe health effects. This includes oxygen deficiency conditions.

Hazard: Explosion

Guideline	Explanation
Lower Explosive Limit (LEL)	The minimum concentration of vapor in air below which propagation of a flame will not occur in the presence of an ignition source.
Upper Explosive Limit (UEL)	The maximum concentration of vapor in air above which propagation of a flame will not occur in the presence of an ignition source.

Environmental Consultants



AFTER EXCAVATION HAS BEEN COMPLETED. EXCAVATED SOIL SHALL BE REMOVED OFF-SITE.

1.) COVER THE EXCAVATION AREA WITH VISQUEEN.

2.) COVER THE EXCAVATION AREA WITH TRENCH PLATES.

DRAWING IS SCHEMATIC

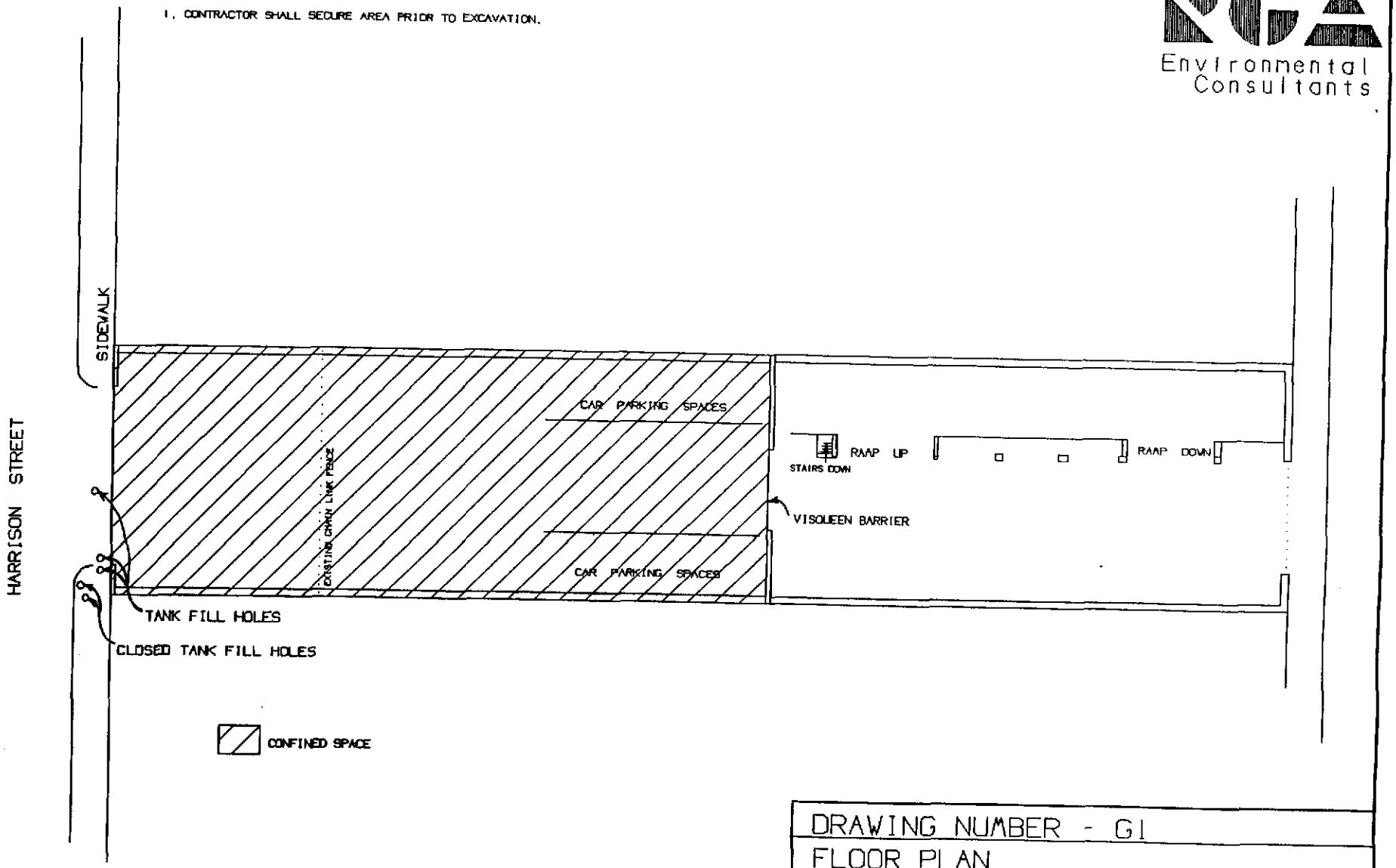
SCALE IS APPROXIMATE

LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G4
FLOOR PLAN
GROUND FLOOR
HARRISON STREET GARAGE
VENTILATION PLAN - TANK REMOVAL
APPROXIMATE SCALE: 1" = 40'

1. CONTRACTOR SHALL SECURE AREA PRIOR TO EXCAVATION.

RGA
Environmental
Consultants

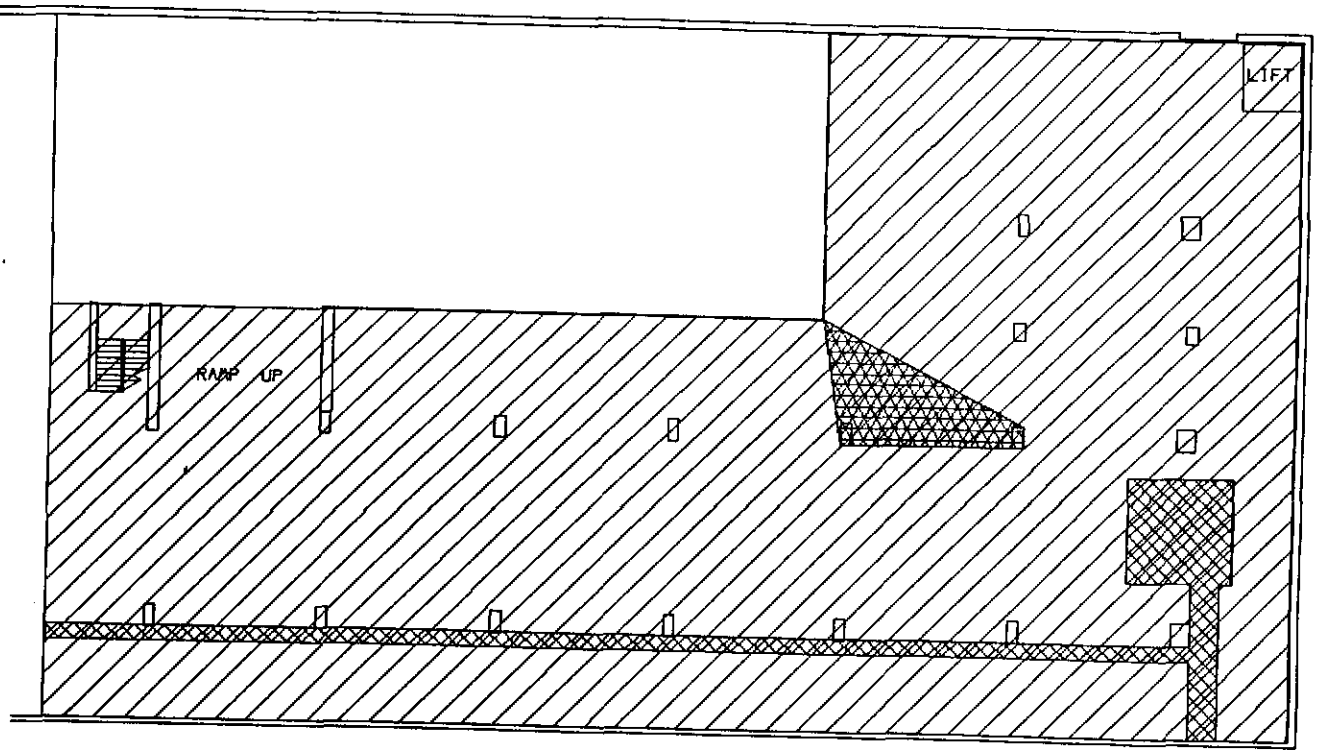


DRAWING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G1
FLOOR PLAN
GROUND FLOOR
HARRISON STREET GARAGE
CONFINED SPACES
APPROXIMATE SCALE: 1" = 40'

RGA
Environmental
Consultants

CONTRACTOR SHALL SECURE
AREA PRIOR TO EXCAVATION.



- AREA WHERE CONCRETE HAS BEEN CUT FROM SLAB
- AREA OF CONCRETE RUBBLE
- CONFINED SPACE

DRAWING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

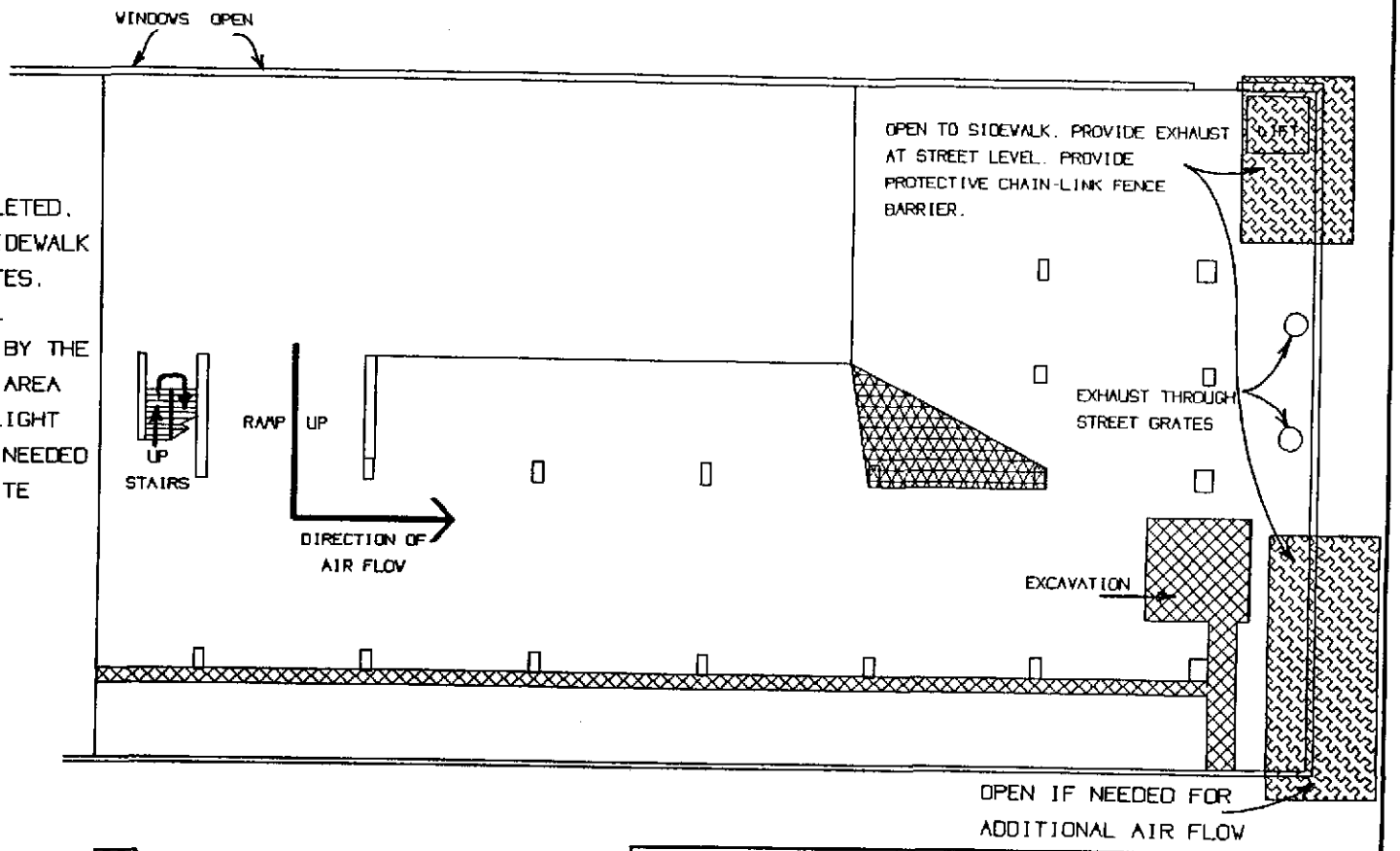
DRAWING NUMBER - G2
FLOOR PLAN
BASEMENT LEVEL
HARRISON STREET GARAGE
CONFINED SPACE
APPROXIMATE SCALE: 1" = 25'

RGA
Environmental
Consultants

AFTER EXCAVATION IS COMPLETED,

1.) RECOVER DEMOLISHED SIDEWALK AREA WITH TRENCH PLATES.

2.) CONTRACTOR SHALL SEAL OPENINGS AS DIRECTED BY THE SITE SAFETY OFFICER. AREA IS TO REMAIN UNDER SLIGHT NEGATIVE PRESSURE IF NEEDED AS DIRECTED BY THE SITE SAFETY OFFICER.



- AREA WHERE CONCRETE HAS BEEN CUT FROM SLAB

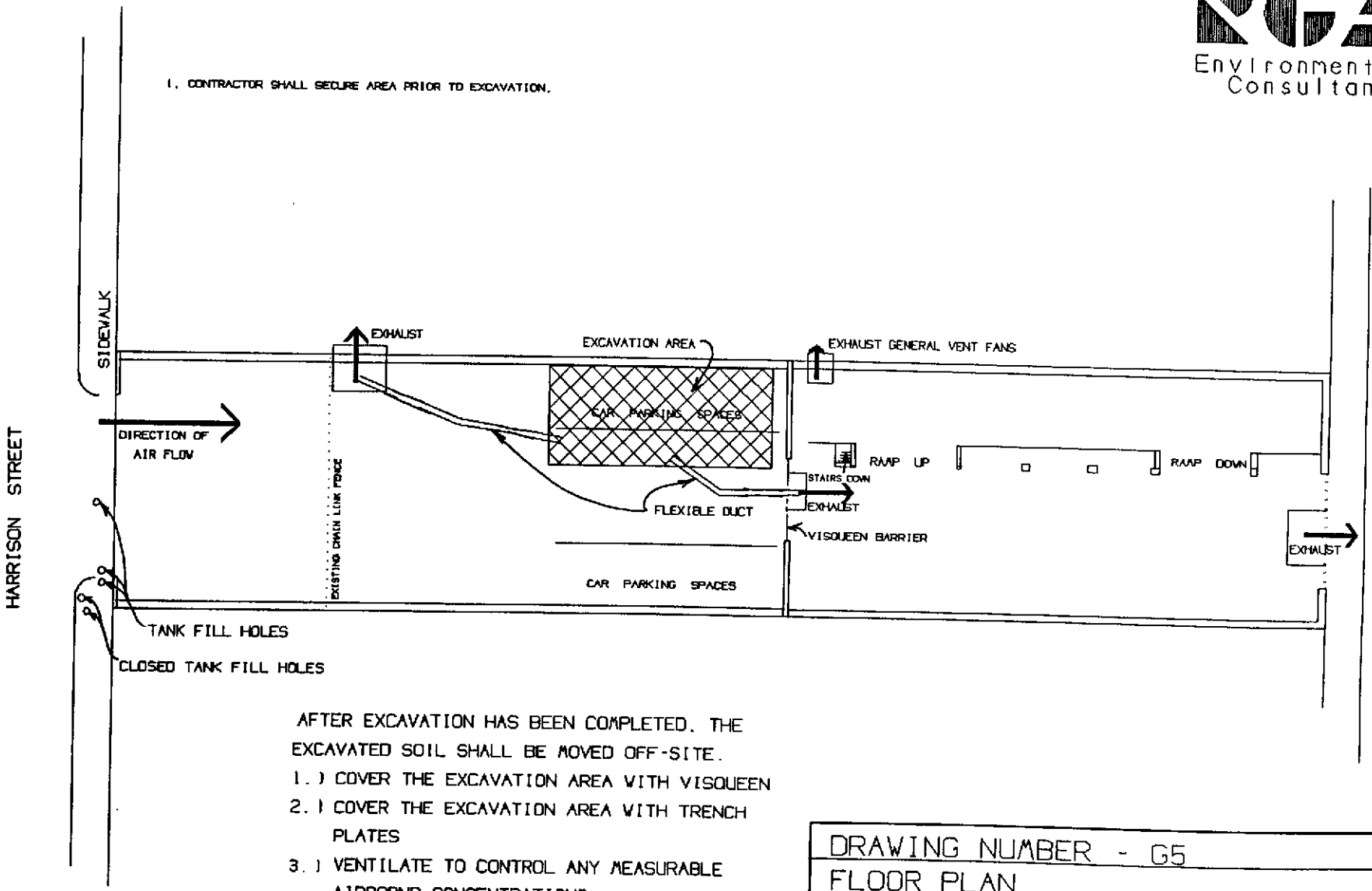
- AREA OF CONCRETE RUBBLE

DRAWING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G3
FLOOR PLAN
BASEMENT LEVEL
HARRISON STREET GARAGE
VENTILATION PLAN DURING EXCAVATION
APPROXIMATE SCALE: 1" = 25'

RGA
Environmental
Consultants

1. CONTRACTOR SHALL SECURE AREA PRIOR TO EXCAVATION.



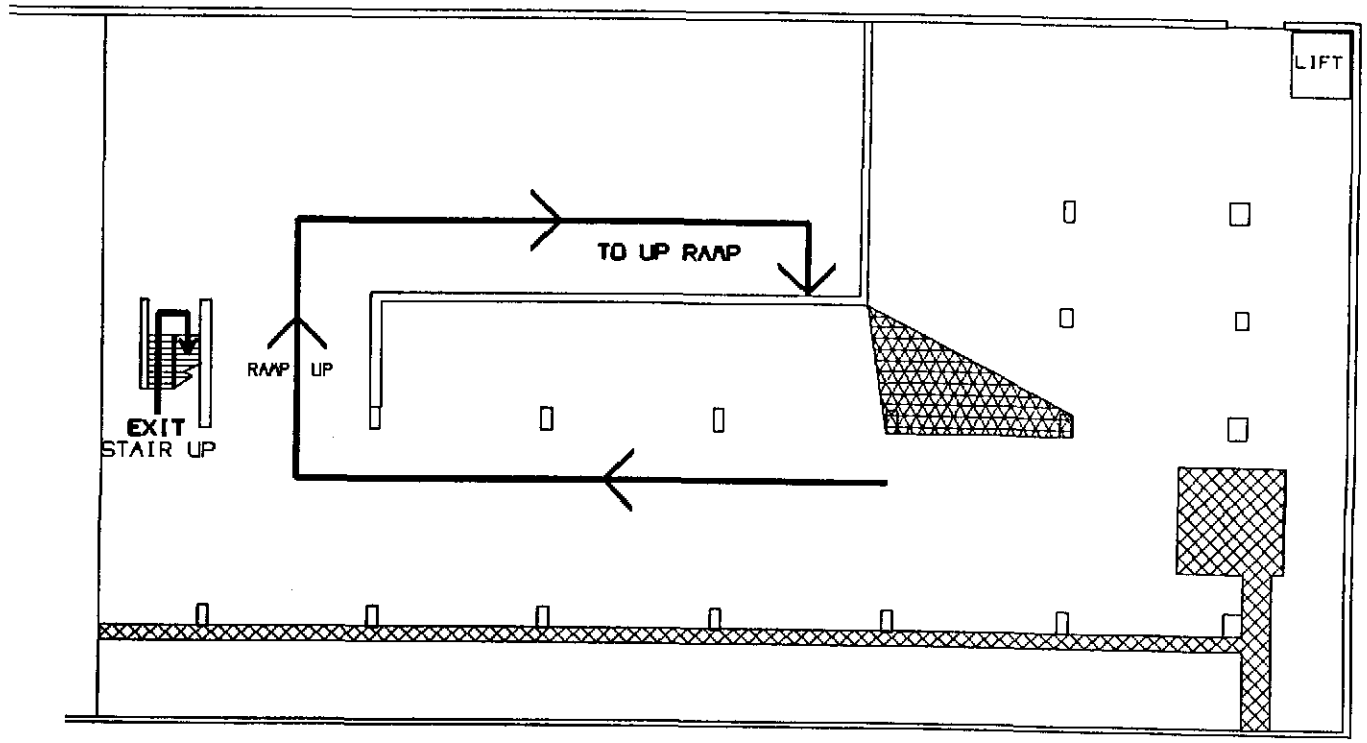
AFTER EXCAVATION HAS BEEN COMPLETED. THE EXCAVATED SOIL SHALL BE MOVED OFF-SITE.

1.) COVER THE EXCAVATION AREA WITH VISQUEEN
2.) COVER THE EXCAVATION AREA WITH TRENCH PLATES
3.) VENTILATE TO CONTROL ANY MEASURABLE AIRBORNR CONCENTRATIONS.

DRAVING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G5
FLOOR PLAN
GROUND FLOOR Sump Hoists Removal
HARRISON STREET GARAGE
VENTILATION PLAN
APPROXIMATE SCALE: 1" = 40'

RGA
Environmental
Consultants



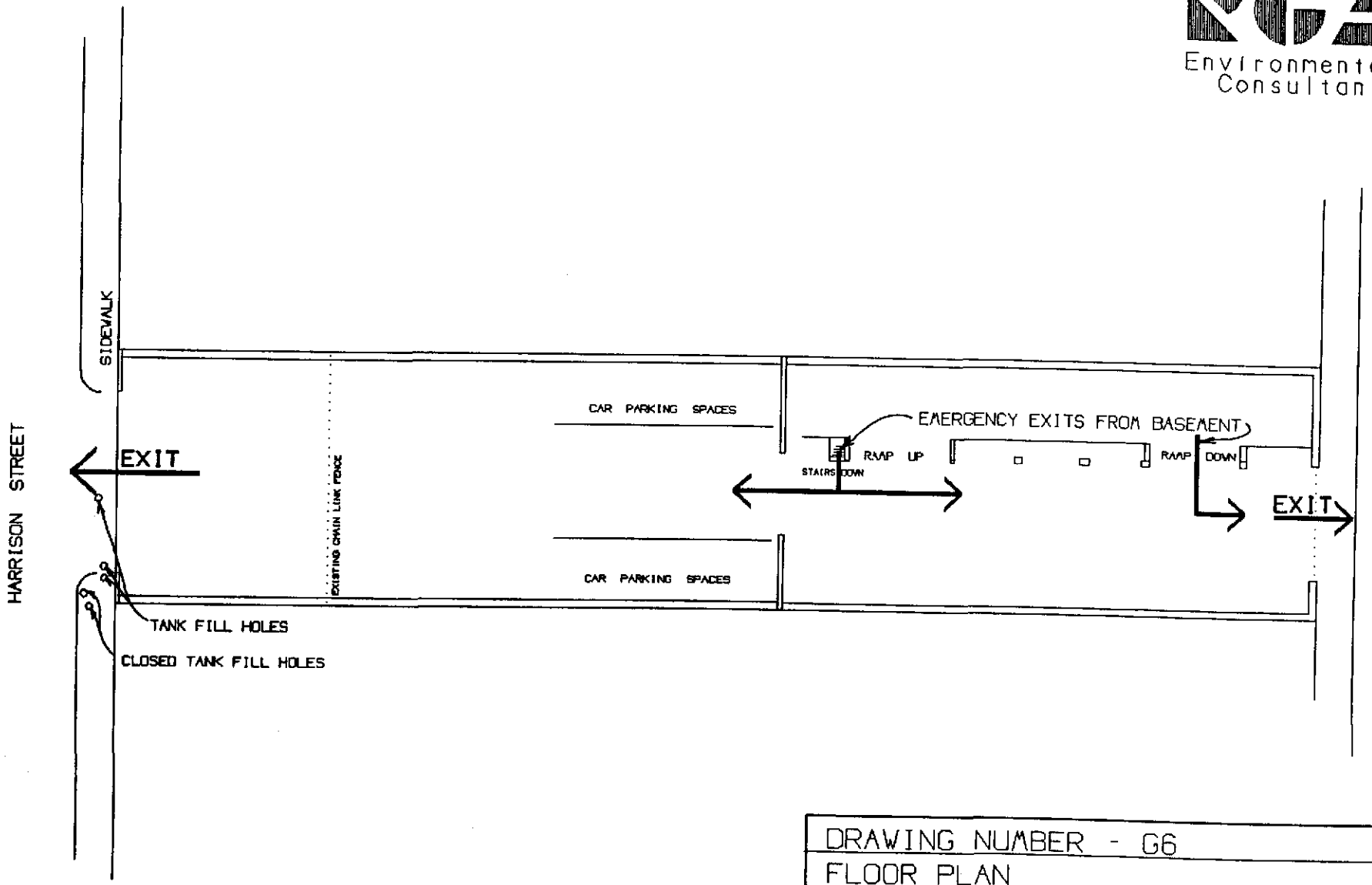
▨ - AREA WHERE CONCRETE HAS BEEN CUT FROM SLAB

▩ - AREA OF CONCRETE RUBBLE

DRAWING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G7
FLOOR PLAN
BASEMENT LEVEL
HARRISON STREET GARAGE
EMERGENCY EXITS FROM BASEMENT
APPROXIMATE SCALE: 1" = 25'

RGA
Environmental
Consultants



DRAWING IS SCHEMATIC
SCALE IS APPROXIMATE
LOCATIONS ARE APPROXIMATE

DRAWING NUMBER - G6
FLOOR PLAN
GROUND FLOOR
HARRISON STREET GARAGE
EMERGENCY EXITS
APPROXIMATE SCALE: 1" = 40'

ACCIDENT/INCIDENT/NEAR MISS

Date: _____
Time of incident: _____

Name of Individual Affected: _____

Description of Incident:

_____
_____
_____
_____
_____
_____
_____

Remedial Actions Taken:

_____
_____
_____
_____
_____

Hospital: _____

Witnesses (name and phone Number:

_____
_____
_____
_____

Signature of Person filling out this form:

_____

ACCIDENT/INCIDENT/NEAR MISS

Date: _____
Time of incident: _____

Name of Individual Affected: _____

Description of Incident:

_____
_____
_____
_____
_____
_____
_____

Remedial Actions Taken:

_____
_____
_____
_____
_____

Hospital: _____

Witnesses (name and phone Number:

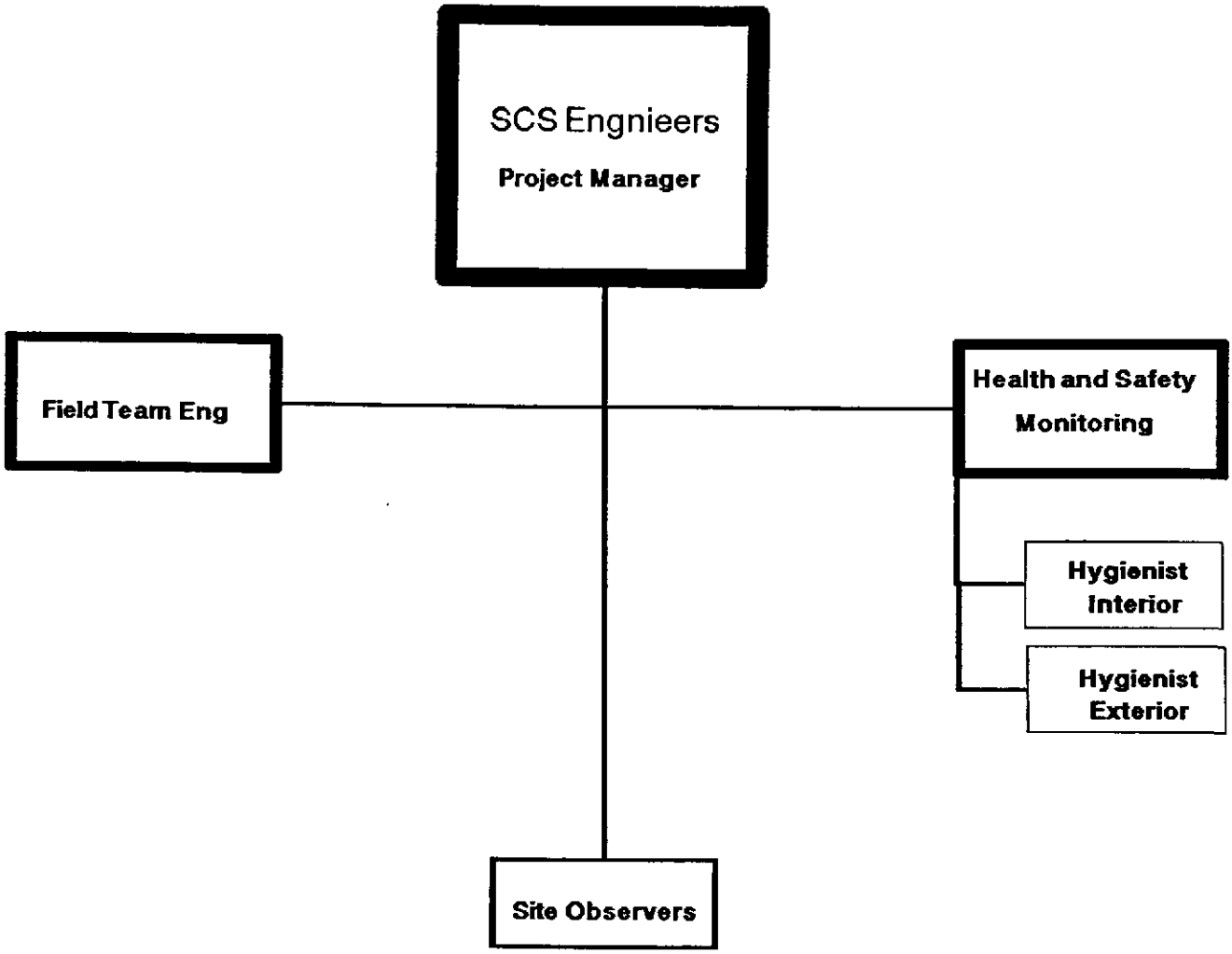
_____
_____
_____
_____

Signature of Person filling out this form:

_____

Appendix F

Project Personnel



BENZENE

BNZ

Common Synonyms	Watery liquid	Colorless	Gasoline-like odor
Benzol Benzole	Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

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 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.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Restrict access

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** C_6H_6
3.3 **IMO/UN Designation:** 3.2/1114
3.4 **DOT ID No.:** 1114
3.5 **CAS Registry No.:** 71-43-2

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic; rather pleasant aromatic odor; characteristic odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.
5.2 **Symptoms Following Exposure:** Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death.
5.3 **Treatment of Exposure:** SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
5.4 **Threshold Limit Value:** 10 ppm
5.5 **Short Term Inhalation Limits:** 75 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 **Late Toxicity:** Leukemia
5.8 **Vapor (Gas) Irritant Characteristics:** If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 4.68 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 12°F C.C.
6.2 **Flammable Limits in Air:** 1.3%-7.9%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 **Ignition Temperature:** 1097°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 6.0 mm/min
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

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:** 5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/TL_m/tap water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 1.2 lb/lb, 10 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:**
Industrial pure ..... 99+ %
Thiophene-free ..... 99+ %
Nitration ..... 99+ %
Industrial 90% ..... 95+ %
Reagent ..... 99+ %
9.2 **Storage Temperature:** Open
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** 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	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	0

11.3 **NFPA Hazard Classification:**

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 78.11
12.3 **Boiling Point at 1 atm:** 176°F = 80.1°C = 353.2°K
12.4 **Freezing Point:** 42.0°F = 5.5°C = 278.7°K
12.5 **Critical Temperature:** 552.0°F = 288.9°C = 562.1°K
12.6 **Critical Pressure:** 710 psa = 48.3 atm = 4.89 MN/m²
12.7 **Specific Gravity:** 0.879 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 28.9 dynes/cm = 0.0289 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 35.0 dynes/cm = 0.035 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 2.7
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.081
12.12 **Latent Heat of Vaporization:** 169 Btu/lb = 94.1 cal/g = 3.94 X 10⁵ J/kg
12.13 **Heat of Combustion:** −17,480 Btu/lb = −9698 cal/g = −406.0 X 10⁵ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 30.45 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 3.22 psia

NOTES

BNZ

BENZENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
55	55.330
60	55.140
65	54.960
70	54.770
75	54.580
80	54.400
85	54.210
90	54.030
95	53.840
100	53.660
105	53.470
110	53.290
115	53.100
120	52.920
125	52.730
130	52.540
135	52.360
140	52.170
145	51.990
150	51.800
155	51.620
160	51.430
165	51.250
170	51.060
175	50.870

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
45	.394
50	.396
55	.398
60	.400
65	.403
70	.405
75	.407
80	.409
85	.411
90	.414
95	.416
100	.418

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
75	.988
80	.981
85	.975
90	.969
95	.962
100	.956
105	.950
110	.944
115	.937
120	.931
125	.925
130	.919
135	.912
140	.906
145	.900
150	.893
155	.887
160	.881
165	.875
170	.868

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
55	.724
60	.693
65	.665
70	.638
75	.612
80	.588
85	.566
90	.544
95	.524
100	.505
105	.487
110	.470
115	.453
120	.438

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.180

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
50	.881
60	1.171
70	1.535
80	1.989
90	2.547
100	3.227
110	4.049
120	5.033
130	6.201
140	7.577
150	9.187
160	11.060
170	13.220
180	15.700
190	18.520
200	21.740
210	25.360

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
50	.01258
60	.01639
70	.02109
80	.02681
90	.03371
100	.04196
110	.05172
120	.06317
130	.07652
140	.09194
150	.10960
160	.12980
170	.15270
180	.17850
190	.20750
200	.23970
210	.27560

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.204
25	.219
50	.234
75	.248
100	.261
125	.275
150	.288
175	.301
200	.313
225	.325
250	.337
275	.349
300	.360
325	.371
350	.381
375	.392
400	.402
425	.412
450	.421
475	.431
500	.440
525	.449
550	.457
575	.465
600	.474

ETHYLBENZENE

ETB

Common Synonyms	Liquid	Colorless	Sweet, gasoline-like odor
Phenylethane EB	Floats on water. *Flammable*, irritating vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

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

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

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)

Mechanical containment.
Should be removed.
Chemical and physical treatment.

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic hydrocarbon
3.2 Formula: $C_6H_5CH_2CH_3$
3.3 IMO/UN Designation: 3.3/1175
3.4 DOT ID No.: 1175
3.5 CAS Registry No.: 100-41-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Aromatic

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles.
5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.
5.3 Treatment of Exposure: INHALATION: If ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly. If breathing stops, give artificial respiration. INGESTION: Induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.
5.4 Threshold Limit Value: 100 ppm
5.5 Short Term Inhalation Limits: 200 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 Odor Threshold: 140 ppm
5.11 IDLH Value: 2,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 80°F O.C.; 59°F C.C.
6.2 Flammable Limits in Air: 1.0%-6.7%
6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical.
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.
6.7 Ignition Temperature: 860°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 5.8 mm/min.
6.10 Adiabatic Flame Temperature: Data Not Available

(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: 29 ppm/96 hr/bluegill/TL$_m$/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research grade: 99.96%; pure grade: 99.5%; technical grade: 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	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 106.17
12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K
12.4 Freezing Point: −139°F = −95°C = 178°K
12.5 Critical Temperature: 651.0°F = 343.9°C = 617.1°K
12.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m²
12.7 Specific Gravity: 0.867 at 20°C (liquid)
12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.46 dynes/cm = 0.03546 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.071
12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.35 X 10⁵ J/kg
12.13 Heat of Combustion: −17,780 Btu/lb = −9877 cal/g = −413.5 X 10³ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data Not Available
12.26 Limiting Value: Data Not Available
12.27 Reid Vapor Pressure: 0.4 psia

6. FIRE HAZARDS (Continued)

6.11 Stoichiometric Air to Fuel Ratio: Data Not Available
6.12 Flame Temperature: Data Not Available

ETB ETHYLBENZENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
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
130	52.190
140	51.870
150	51.560
160	51.250
170	50.940
180	50.620
190	50.310
200	50.000
210	49.690

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
40	.402
50	.404
60	.407
70	.409
80	.412
90	.414
100	.417
110	.419
120	.421
130	.424
140	.426
150	.429
160	.431
170	.434
180	.436
190	.439
200	.441
210	.443

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—90	1.065
—80	1.056
—70	1.047
—60	1.037
—50	1.028
—40	1.018
—30	1.009
—20	1.000
—10	.990
0	.981
10	.971
20	.962
30	.953
40	.943
50	.934
60	.924
70	.915
80	.906
90	.896
100	.887
110	.877
120	.868
130	.859
140	.849
150	.840
160	.830

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
40	.835
50	.774
60	.719
70	.670
80	.626
90	.586
100	.550
110	.518
120	.488
130	.461
140	.436
150	.414
160	.393
170	.374
180	.356
190	.340
200	.325
210	.311

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
66.02	.020

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
80	.202
100	.370
120	.644
140	1.071
160	1.713
180	2.643
200	3.953
220	5.747
240	8.147
260	11.290
280	15.320
300	20.410
320	26.730
340	34.460
360	43.800
380	54.950

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
80	.00370
100	.00654
120	.01099
140	.01767
160	.02734
180	.04087
200	.05926
220	.08363
240	.11520
260	.15510
280	.20490
300	.26570
320	.33910
340	.42620
360	.52850
380	.64720

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
—400	—.007
—350	.026
—300	.060
—250	.093
—200	.125
—150	.157
—100	.187
—50	.217
0	.246
50	.274
100	.301
150	.327
200	.353
250	.377
300	.401
350	.424
400	.446
450	.467
500	.487
550	.507
600	.525

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.
[illegible] dry chemical, foam, 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, anaesthesia, 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:
48-51 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 10^4 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.4 psia

NOTES

GAT

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
45	46.270
50	46.130
55	46.000
60	45.850
65	45.710
70	45.560
75	45.400
80	45.240
85	45.080
90	44.910
95	44.750
100	44.570
105	44.390
110	44.210
115	44.030

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
10	.459
15	.462
20	.464
25	.467
30	.470
35	.472
40	.475
45	.478
50	.480
55	.483
60	.486
65	.488
70	.491
75	.494
80	.496
85	.499
90	.502
95	.504
100	.507
105	.510

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F (estimate)
40	.909
50	.900
60	.891
70	.883
80	.874
90	.865
100	.856
110	.847
120	.838
130	.829
140	.821
150	.812
160	.803
170	.794
180	.785
190	.776

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
46	.521
48	.514
50	.507
52	.500
54	.494
56	.487
58	.481
60	.475
62	.469
64	.463
66	.457
68	.451
70	.446
72	.440
74	.435
76	.430
78	.424
80	.419
82	.414
84	.410
86	.405
88	.400
90	.396
92	.391
94	.387
96	.382

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
	INSOLUBLE

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
	DATA NOT AVAILABLE

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
	NOT PERTINENT

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	DATA NOT AVAILABLE

KEROSENE

KRS

Common Synonyms	Watery liquid	Colorless	Fuel oil odor
Illuminating oil Kerosine Range oil Fuel oil No. 1 Jet Fuel JP-1	Floats on water.		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible
[illegible] Dry chemical, foam, fuel oil carbon dioxide
Water may be ineffective on fire
Cool exposed containers with water

Exposure

CALL FOR MEDICAL AID

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

Water Pollution

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)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Miscellaneous Hydrocarbon Mixtures
3.2 **Formula:** C_nH_{n+2}
3.3 **IMO/UN Designation:** 3.3/1223
3.4 **DOT ID No.:** 1223
3.5 **CAS Registry No.:** 8008-20-6

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Protective gloves; goggles or face shield.
5.2 **Symptoms Following Exposure:** Vapor causes slight irritation of eyes and nose. Liquid irritates stomach, if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema.
5.3 **Treatment of Exposure:** ASPIRATION: enforce bed rest, administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water.
5.4 **Threshold Limit Value:** 200 ppm
5.5 **Short Term Inhalation Limits:** 2500 mg/m³ for 60 min.
5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 5 to 15 g/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 1 ppm
5.11 **IDLH Value:** Data not available

6. FIRE HAZARDS

6.1 **Flash Point:** 100°F (min.)C.C.
6.2 **Flammable Limits in Air:** 0.7%-5%
6.3 **Fire Extinguishing Agents:** Foam, dry chemical, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 444°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 4 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

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:** 2990 ppm/24 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 53%, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Light hydrocarbon distillate: 100%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Combustible liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

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

11.3 **NFPA Hazard Classification:**

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** Not pertinent
12.3 **Boiling Point at 1 atm:** 392-500°F = 200—260°C = 473—533°K
12.4 **Freezing Point:** —50°F = —45.6°C = 227.6°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 0.80 at 15°C (liquid)
12.8 **Liquid Surface Tension:** 23-32 dynes/cm = 0.023-0.032 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 47-49 dynes/cm = 0.047-0.049 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
12.12 **Latent Heat of Vaporization:** 110 Btu/lb = 60 cal/g = 2.5 X 10^4 J/kg
12.13 **Heat of Combustion:** —18,540 Btu/lb = —10,300 cal/g = —431.24 X 10^4 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.1 psi

NOTES

KRS	KEROSENE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	50.810	0	.434	0	.926	—35	6.727
36	50.740	10	.439	10	.924	—30	6.065
38	50.670	20	.444	20	.921	—25	5.482
40	50.600	30	.449	30	.919	—20	4.965
42	50.530	40	.454	40	.917	—15	4.508
44	50.460	50	.459	50	.915	—10	4.101
46	50.390	60	.464	60	.913	—5	3.739
48	50.320	70	.469	70	.911	0	3.416
50	50.250	80	.474	80	.909	5	3.127
52	50.180	90	.479	90	.907	10	2.867
54	50.110	100	.484	100	.905	15	2.634
56	50.040	110	.489	110	.903	20	2.424
58	49.970	120	.494	120	.901	25	2.235
60	49.900	130	.499	130	.899	30	2.064
62	49.830	140	.504	140	.897	35	1.909
64	49.760	150	.509	150	.895	40	1.768
66	49.700	160	.514	160	.893	45	1.641
68	49.630	170	.519	170	.891	50	1.525
70	49.560	180	.524	180	.889	55	1.419
72	49.490	190	.529	190	.887	60	1.322
74	49.420	200	.534	200	.885	65	1.233
76	49.350	210	.539	210	.883	70	1.152
78	49.280					75	1.078
80	49.210						
82	49.140						
84	49.070						

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I	70	.041		N		D
	N	80	.056		O		A
	S	90	.075		T		T
	O	100	.099				A
	L	110	.130		P		
	U	120	.168		E		N
	B	130	.217		R		O
	L	140	.277		T		T
	E	150	.350		I		
		160	.440		N		A
		170	.548		E		V
		180	.679		N		A
		190	.835		T		I
		200	1.021				L
		210	1.241				A
		220	1.500				B
		230	1.802				L
		240	2.154				E
		250	2.562				
		260	3.033				
		270	3.573				
		280	4.192				
		290	4.896				
		300	5.695				

OILS, FUEL: 1-D

OOD

Common Synonyms	Oily liquid	Yellow-brown	Lube or fuel oil odor
Diesel oil (light)	Floats on water.		

Stop discharge if possible.
Call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemical, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID

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

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shorelines.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not applicable
3.3 IMO/UN Designation: 3.1/1270
3.4 DOT ID No.: 1270
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.3 Color: Light brown
4.3 Odor: Characteristic

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: INHALATION causes headache and slight giddiness. INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.
5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting; seek medical attention. ASPIRATION: enforce bed rest; administer oxygen. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.
5.4 Threshold Limit Value: No single value applicable.
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5-15 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Slight smarting of 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 skin.
5.10 Odor Threshold: 0.7 ppm
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 100°F C.C.
6.2 Flammable Limits in Air: 1.3%-6%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 350—625°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 33

8. WATER POLLUTION

8.1 Aquatic Toxicity: 204 mg/1/24 hr/juvenile American shad/TL_m/salt water
8.2 Waterfowl Toxicity: 20 mg/kg LD_{50} (mallard)
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Diesel fuel 1-D (ASTM)
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 360—660°F = 183—293°C = 466—566°K
12.4 Freezing Point: —30°F = —34°C = 240°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.81—0.85 at 15°C (liquid)
12.8 Liquid Surface Tension: 23—32 dynes/cm = 0.023—0.032 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 47—49 dynes/cm = 0.047—0.049 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: 110 Btu/lb = 80 cal/g = 2.5 X 10^5 J/kg
12.13 Heat of Combustion: —18,540 Btu/lb = —10,300 cal/g = —431.24 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
12.35 Heat of Fusion: Data not available
12.36 Limiting Value: Data not available
12.37 Reid Vapor Pressure: Data not available

NOTES

OILS, FUEL: 1-D

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
34	51.430	70	.469	50	.964	—30	6.065
36	51.360	75	.471	60	.964	—25	5.482
38	51.290	80	.474	70	.964	—20	4.965
40	51.220	85	.476	80	.964	—15	4.506
42	51.150	90	.479	90	.964	—10	4.101
44	51.080	95	.481	100	.964	—5	3.739
46	51.010	100	.484	110	.964	0	3.416
48	50.940	105	.486	120	.964	5	3.127
50	50.870	110	.489	130	.964	10	2.867
52	50.800	115	.491	140	.964	15	2.634
54	50.740	120	.494	150	.964	20	2.424
56	50.670	125	.496	160	.964	25	2.235
58	50.600	130	.499	170	.964	30	2.064
60	50.530	135	.501	180	.964	35	1.909
62	50.460	140	.504	190	.964	40	1.768
64	50.390	145	.506	200	.964	45	1.641
66	50.320	150	.509			50	1.525
68	50.250	155	.511			55	1.419
70	50.180	160	.514			60	1.322
72	50.110	165	.516			65	1.233
74	50.040	170	.519			70	1.152
76	49.970	175	.521			75	1.078
78	49.900	180	.524				
80	49.830	185	.526				
82	49.760	190	.529				
84	49.690	195	.531				

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	70	.041		NOT PERTINENT		NOT PERTINENT
		80	.056				
		90	.075				
		100	.099				
		110	.130				
		120	.168				
		130	.217				
		140	.277				
		150	.350				
		160	.440				
		170	.548				
		180	.679				
		190	.835				
		200	1.021				
		210	1.241				
		220	1.500				
		230	1.802				
		240	2.154				
		250	2.562				
		260	3.033				
		270	3.573				
		280	4.192				
		290	4.896				
		300	5.695				

OILS, FUEL: 2-D

OTD

Common Synonyms	Oily liquid	Yellow-brown	Lube or fuel oil odor
Diesel oil, medium	Floats on water.		

Stop discharge if possible
Call fire department
Avoid contact with liquid
Isolate and remove discharged material
Notify local health and pollution control agencies

Fire

Combustible.
Extinguish with dry chemical, foam, carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

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

Water Pollution

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)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
3.2 Formula: Not applicable
3.3 IMO/UN Designation: 3.1/1270
3.4 DOT ID No.: 1270
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Light brown
4.3 Odor: Characteristic

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: INGESTION causes nausea, vomiting, and cramping; depression of central nervous system ranging from mild headache to anesthesia, coma, and death; pulmonary irritation secondary to exhalation of solvent; signs of kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonitis; acute onset of central nervous system excitement followed by depression.
5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting; ASPIRATION: enforce bed rest; administer oxygen; seek medical attention. EYES: wash with copious quantity of water. SKIN: remove solvent by wiping and wash with soap and water.
5.4 Threshold Limit Value: No single TLV applicable.
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5-15 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Slight smarting of 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 skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 125°F C.C.
6.2 Flammable Limits in Air: 1.3%-6.0%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 490—545°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

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: 204 mg/l/24 hr/juvenile American shad/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Diesel fuel 2-D (ASTM)
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: 540—640°F = 282—338°C = 555—611°K
12.4 Freezing Point: 0°F = 18°C = 255°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.87—0.90 at 20°C (liquid)
12.8 Liquid Surface Tension: Data not available
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: —19,440 Btu/lb = —10,800 cal/g = —452.17 X 10^3 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

OILS, FUEL: 2-D

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)
50	54.310
52	54.310
54	54.310
56	54.310
58	54.310
60	54.310
62	54.310
64	54.310
66	54.310
68	54.310
70	54.310
72	54.310
74	54.310
76	54.310
78	54.310
80	54.310
82	54.310
84	54.310

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.414
5	.416
10	.419
15	.421
20	.424
25	.426
30	.428
35	.431
40	.433
45	.436
50	.438
55	.440
60	.443
65	.445
70	.448
75	.450
80	.452
85	.455
90	.457
95	.460
100	.462

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
35	.908
40	.908
45	.908
50	.908
55	.908
60	.908
65	.908
70	.908
75	.908
80	.908
85	.908
90	.908
95	.908
100	.908
105	.908
110	.908
115	.908
120	.908
125	.908

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
0	3.773
10	3.397
20	3.071
30	2.788
40	2.541
50	2.324
60	2.134
70	1.965
80	1.815
90	1.681
100	1.561
110	1.454
120	1.358
130	1.270
140	1.191
150	1.120
160	1.054
170	.995
180	.940
190	.890
200	.844
210	.802

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
55	.456
60	.474
65	.492
70	.510
75	.529
80	.548
85	.567
90	.587
95	.607
100	.627
105	.647
110	.668
115	.689
120	.711
125	.732
130	.754

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

POLYCHLORINATED BIPHENYL

PCB

Common Synonyms	Oily liquid to solid powder	Light yellow liquid, or white powder	Weak odor
PCB Chlorinated biphenyl Arochlor Halogenated waxes Polychloropolyphenyls	Sinks in water.		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and solid.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
[illegible]

Exposure

CALL FOR MEDICAL AID

LIQUID OR SOLID
Irritating to skin and eyes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $(C_{12}H_{10-x})Cl_x$
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2315
3.5 CAS Registry No.: 1336-36-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid or solid
4.2 Color: Pale yellow (liquid); colorless (solid)
4.3 Odor: Practically odorless

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Gloves and protective garments.
5.2 Symptoms Following Exposure: Acne from skin contact.
5.3 Treatment of Exposure: SKIN: wash with soap and water.
5.4 Threshold Limit Value: 0.5 to 1.0 mg/m³
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 2; oral rat LD_{50} = 3980 mg/kg
5.7 Late Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations.
5.9 Liquid or Solid Irritant Characteristics: Contact with skin may cause irritation.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: 5 to 10 mg/m³

6. FIRE HAZARDS

6.1 Flash Point: >266°F
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Irritating gases are generated in fires.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Data not available
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 0.278 ppm/96 hr/bluegill/TL_m/fresh water
0.005 ppm/336-1080 hr/pinfish/TL_m/salt water
8.2 Waterfowl Toxicity: LD_{50} 2000 ppm (mallard duck)
8.3 Biological Oxygen Demand (BOD): Very low
8.4 Food Chain Concentration Potential: High

9. SHIPPING INFORMATION

9.1 Grades of Purity: 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight)
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

II

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: ORM-E
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification: Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: Very high
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.3—1.8 at 20°C (liquid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

PCB

POLYCHLORINATED BIPHENYL

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot (estimate)	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	81.150		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT
69	81.150						
70	81.150						
71	81.150						
72	81.150						
73	81.150						
74	81.150						
75	81.150						
76	81.150						
77	81.150						
78	81.150						
79	81.150						
80	81.150						
81	81.150						
82	81.150						
83	81.150						
84	81.150						
85	81.150						

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		NOT PERTINENT		NOT PERTINENT		NOT PERTINENT

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 shorelines.
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; 80/120: less pure than industrial.
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

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/m²
12.7 Specific Gravity: 0.867 at 20°C (liquid)
12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.089
12.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 X 10^5 J/kg
12.13 Heat of Combustion: −17,430 Btu/lb = −9686 cal/g = −405.5 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: 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

m-XYLENE

XLM

Common Synonyms	Watery liquid	Colorless	Sweet odor
1, 3-Dimethylbenzene Xylol	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.
[illegible]
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.), 9 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 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: 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: 28.8 dynes/cm = 0.0288 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	Watery liquid	Colorless	Sweet odor
1, 2-Dimethylbenzene Xylol	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/m²
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: 0.26 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	Watery liquid	Colorless	Sweet odor
1, 4-Dimethylbenzene Xylol	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: 98.0%
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 = 3.4×10^5 J/kg
12.13 Heat of Combustion: −17,559 Btu/lb = −9754.7 cal/g = -408.41×10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.35 Heat of Fusion: 37.83 cal/g
12.36 Limiting Value: Data not available
12.37 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

CHLOROBENZENE

CRB

Common Synonyms	Watery liquid	Colorless	Sweet, almond odor
Monochlorobenzene Phenyl chloride Benzene chloride MCB	Sinks in water. Flammable vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Call fire department.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

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.

Exposure

CALL FOR MEDICAL AID

VAPOR
If inhaled, will cause coughing or dizziness.
Not irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

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: Halogenated hydrocarbon
3.2 Formula: C_6H_5Cl
3.3 IMO/UN Designation: 3.3/1134
3.4 DOT ID No.: 1134
3.5 CAS Registry No.: 108-90-7

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Mild amine odor; sweet, almond- like; aromatic

5. HEALTH HAZARDS

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

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

5.3 Treatment of Exposure: Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms. INHALATION: remove to clean air; administer oxygen as needed. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline laxative. EYES: flush thoroughly with water. SKIN: remove contaminated clothing, wash exposed area with soap and water.

5.4 Threshold Limit Value: 75 ppm
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg (rat, rabbit)
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.21 ppm
5.11 IDLH Value: 2,400 ppm

6. FIRE HAZARDS

6.1 Flash Point: 64°F C.C., 97°F O.C.
6.2 Flammable Limits in Air: 1.3%-7.1%
6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, foam or water spray
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Burning in open flame can form toxic phosgene and hydrogen chloride gases
6.6 Behavior in Fire: Heavy vapor can travel a considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 1184°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: (est.) 4.6 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: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: 20 ppm/96 hr/bluegill/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0.3 lb/lb, 5 days
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: 99.5%; technical
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-X

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	0
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: 112.56
12.3 Boiling Point at 1 atm: 270°F = 132°C = 405°K
12.4 Freezing Point: −50.1°F = −45.6°C = 227.6°K
12.5 Critical Temperature: 679°F = 359°C = 632°K
12.6 Critical Pressure: 656 psia = 44.6 atm = 4.52 MN/m²
12.7 Specific Gravity: 1.11 at 20°C (liquid)
12.8 Liquid Surface Tension: 33 dynes/cm = 0.033 N/m at 25°C
12.9 Liquid Water Interfacial Tension: 37.41 dynes/cm = 0.03741 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.084
12.12 Latent Heat of Vaporization: 135 Btu/lb = 75 cal/g = 3.140 X 10⁵ J/kg
12.13 Heat of Combustion: (est.) 12,000 Btu/lb = 6700 cal/g = 280 X 10³ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 20.40 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.5 psia

6. FIRE HAZARDS (Continued)

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

CRB

CHLOROBENZENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	70.419
40	70.230
45	70.040
50	69.849
55	69.660
60	69.469
65	69.270
70	69.080
75	68.889
80	68.700
85	68.500
90	68.309
95	68.120
100	67.919
105	67.730
110	67.530
115	67.339
120	67.139
125	66.950
130	66.750
135	66.559
140	66.360
145	66.169
150	65.969
155	65.770
160	65.580

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
40	.316
50	.317
60	.319
70	.321
80	.323
90	.325
100	.327
110	.329
120	.331
130	.333
140	.335
150	.337
160	.339
170	.341
180	.343
190	.345
200	.347
210	.349

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—20	.956
—10	.946
0	.937
10	.927
20	.917
30	.908
40	.898
50	.888
60	.879
70	.869
80	.859
90	.850
100	.840
110	.830
120	.821
130	.811
140	.801
150	.792
160	.782
170	.772

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
35	1.027
40	.987
45	.949
50	.914
55	.880
60	.848
65	.818
70	.790
75	.763
80	.738
85	.713
90	.690
95	.668
100	.648
105	.628
110	.609
115	.591
120	.574
125	.558
130	.542
135	.527
140	.513
145	.499
150	.486
155	.473

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.049

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
20	.032
30	.048
40	.069
50	.099
60	.140
70	.195
80	.269
90	.366
100	.492
110	.656
120	.865
130	1.130
140	1.464
150	1.880
160	2.394
170	3.026
180	3.797
190	4.731
200	5.856
210	7.203

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
20	.00071
30	.00102
40	.00145
50	.00204
60	.00283
70	.00386
80	.00522
90	.00698
100	.00923
110	.01207
120	.01565
130	.02010
140	.02560
150	.03233
160	.04051
170	.05039
180	.06224
190	.07636
200	.09309
210	.11280

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.178
25	.188
50	.198
75	.207
100	.217
125	.226
150	.235
175	.244
200	.252
225	.261
250	.269
275	.277
300	.285
325	.292
350	.300
375	.307
400	.314
425	.320
450	.327
475	.333
500	.340
525	.345
550	.351
575	.357
600	.362

DICHLOROMETHANE

DCM

Common Synonyms
Methylene chloride
Methylene dichloride

Watery liquid | Colorless | Sweet, pleasant odor

Sinks in water. Irritating vapor is produced.

Stop discharge if possible
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
Wear goggles and self-contained breathing apparatus.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

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

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Disperse and flush

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: CH_2Cl_2
3.3 IMO/UN Designation: 9.0/1593
3.4 DOT ID No.: 1593
3.5 CAS Registry No.: 75-09-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Pleasant, aromatic; like chloroform; sweet, ethereal

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor canister mask, safety glasses, protective clothing.
5.2 Symptoms Following Exposure: INHALATION: anesthetic effects, nausea and drunkenness. CONTACT WITH SKIN AND EYES: skin irritation, irritation of eyes and nose.
5.3 Treatment of Exposure: INHALATION: remove from exposure. Give oxygen if needed. INGESTION: no specific antidote. CONTACT WITH SKIN AND EYES: remove contaminated clothing; wash skin or eyes if affected.
5.4 Threshold Limit Value: 100 ppm
5.5 Short Term Inhalation Limits: 500 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 205-307 ppm
5.11 IDLH Value: 5,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: Not flammable under conditions likely to be encountered.
6.2 Flammable Limits in Air: 12%-19%
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Dissociation products generated in a fire may be irritating or toxic.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 1184°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

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: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: Not pertinent
8.2 Waterfowl Toxicity: Not pertinent
8.3 Biological Oxygen Demand (BOD): Not pertinent
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Aerosol grade; technical grade
9.2 Storage Temperature: Data not available
9.3 Inert Atmosphere: Inerted
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-P-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
ORM-A
11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 84.93
12.3 Boiling Point at 1 atm: 104°F = 39.8°C = 313.0°K
12.4 Freezing Point: −142°F = −96.7°C = 176.5°K
12.5 Critical Temperature: 473°F = 245°C = 518°K
12.6 Critical Pressure: 895 psia = 60.9 atm = 6.17 MN/m²
12.7 Specific Gravity: 1.322 at 20°C (liquid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: 2.9
12.11 Ratio of Specific Heats of Vapor (Gas): 1.189
12.12 Latent Heat of Vaporization: 142 Btu/lb = 78.7 cal/g = 3.30 X 10⁴ J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.17 Heat of Fusion: 16.69 cal/g
12.20 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 13.8 psia

NOTES

DCM

DICHLOROMETHANE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
—70	91.320
—60	90.700
—50	90.080
—40	89.450
—30	88.830
—20	88.200
—10	87.580
0	86.959
10	86.330
20	85.709
30	85.080
40	84.459
50	83.830
60	83.209
70	82.589
80	81.959
90	81.341
100	80.709

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
35	.274
40	.275
45	.276
50	.277
55	.278
60	.279
65	.279
70	.280
75	.281
80	.282
85	.283
90	.284
95	.284
100	.285

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—110	1.205
—100	1.192
—90	1.179
—80	1.166
—70	1.154
—60	1.141
—50	1.128
—40	1.115
—30	1.102
—20	1.090
—10	1.077
0	1.064
10	1.051
20	1.038
30	1.025
40	1.013
50	1.000
60	.987
70	.974
80	.961

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
	NOT PERTINENT

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	1.380

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
—10	.866
—5	1.013
0	1.180
5	1.370
10	1.586
15	1.830
20	2.105
25	2.414
30	2.762
35	3.151
40	3.585
45	4.068
50	4.606
55	5.201
60	5.860
65	6.588
70	7.389
75	8.270
80	9.237
85	10.300

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
—10	.01525
—5	.01763
0	.02031
5	.02333
10	.02671
15	.03050
20	.03472
25	.03941
30	.04462
35	.05039
40	.05676
45	.06376
50	.07149
55	.07996
60	.08922
65	.09934
70	.11040
75	.12240
80	.13540
85	.14960

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.126
10	.129
20	.131
30	.133
40	.135
50	.137
60	.139
70	.142
80	.144
90	.145
100	.147
110	.149
120	.151
130	.153
140	.155
150	.156
160	.158
170	.159
180	.161
190	.163
200	.164
210	.165
220	.167
230	.168
240	.169
250	.171

TETRACHLOROETHYLENE

TTE

Common Synonyms	Watery liquid	Colorless	Sweet odor
Tetracap Perclene Perchloroethylene Perk	Sinks in water. Irritating vapor is produced.		

Stop discharge if possible.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Poisonous gases are produced when heated.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing, or loss of consciousness.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $Cl_2C=CCl_2$
3.3 IMO/UN Designation: 6.1/1897
3.4 DOT ID No.: 1897
3.5 CAS Registry No.: 127-18-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Ethereal; like chloroform; mildly sweet

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.
5.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.
5.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: Induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.
5.4 Threshold Limit Value: 50 ppm
5.5 Short Term Inhalation Limits: 100 ppm for 60 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 throat if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 5 ppm
5.11 IDLH Value: 500 ppm

6. FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Dry cleaning and industrial grades: 95 + %
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: ORM-A
11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification: Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 165.83
12.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K
12.4 Freezing Point: −8.3°F = −22.4°C = 250.8°K
12.5 Critical Temperature: 657°F = 347°C = 620°K
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.63 at 20°C (liquid)
12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.116
12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10^4 J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

TTE

TETRACHLOROETHYLENE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
35	103.400
40	103.099
45	102.900
50	102.599
55	102.299
60	102.000
65	101.700
70	101.400
75	101.099
80	100.799
85	100.500
90	100.200
95	99.910
100	99.610
105	99.320
110	99.020
115	98.730
120	98.429
125	98.139
130	97.839
135	97.549
140	97.250
145	96.959
150	96.669
155	96.370
160	96.080

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.198
10	.200
20	.201
30	.202
40	.203
50	.204
60	.205
70	.206
80	.207
90	.208
100	.210
110	.211
120	.212
130	.213
140	.214
150	.215
160	.216
170	.217
180	.218
190	.220
200	.221
210	.222

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
55	.958
60	.929
65	.900
70	.873
75	.848
80	.823
85	.800
90	.777
95	.756
100	.736
105	.716
110	.698
115	.680
120	.663
125	.647
130	.631
135	.616
140	.601
145	.588
150	.574
155	.561
160	.549
165	.537
170	.526
175	.515

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.016

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
60	.236
70	.318
80	.425
90	.561
100	.732
110	.948
120	1.217
130	1.548
140	1.953
150	2.446
160	3.042
170	3.756
180	4.607
190	5.616
200	6.805
210	8.199
220	9.824
230	11.710
240	13.890
250	16.390
260	19.260
270	22.520
280	26.230

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
60	.00702
70	.00929
80	.01216
90	.01575
100	.02022
110	.02571
120	.03242
130	.04055
140	.05032
150	.06199
160	.07583
170	.09215
180	.11130
190	.13360
200	.15940
210	.18910
220	.22330
230	.26230
240	.30660
250	.35680
260	.41330
270	.47680
280	.54790

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.108
25	.110
50	.113
75	.116
100	.118
125	.120
150	.122
175	.125
200	.127
225	.129
250	.131
275	.132
300	.134
325	.136
350	.138
375	.139
400	.141
425	.142
450	.143
475	.144
500	.146
525	.147
550	.148
575	.148
600	.149

TRICHLOROETHANE

TCE

Common Synonyms
1,1,1-Trichloroethane
Methylchloroform
Aerothene
Chlorothene

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID.

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

LIQUID
Irritating to skin and eyes.
If swallowed, may produce nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: CH_3CCl_3
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2831
3.5 CAS Registry No.: 71-55-6

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Chloroform-like; sweetish

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection.

5.2 **Symptoms Following Exposure:** INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis.

5.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any other serious overexposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.

5.4 **Threshold Limit Value:** 350 ppm

5.5 **Short Term Inhalation Limits:** 1,000 ppm for 60 min. in man

5.6 **Toxicity by Ingestion:** Grade 1; LD_{50} = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 100 ppm

5.11 **IDLH Value:** 1,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** 7%-16%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 802°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** (est.) 2.8 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:** Reacts slowly, releasing corrosive hydrochloric acid.
7.2 **Reactivity with Common Materials:** Corrodes aluminum, but reaction is not hazardous.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
75-160 ppm/*/pinfish/TL_m/salt water
*Time period not specified.
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Uninhibited; inhibited; industrial inhibited; white rose; cold cleaning
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** ORM-A
11.2 **MAB Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
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)	1
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 18°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 133.41
12.3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K
12.4 **Freezing Point:** <−36°F = <−38°C = <234°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 1.31 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 25.4 dynes/cm = 0.0254 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 4.6
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.104
12.12 **Latent Heat of Vaporization:** 100 Btu/lb = 56 cal/g = 2.4 X 10^4 J/kg
12.13 **Heat of Combustion:** (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10^4 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 4.0 psia

NOTES

TCE

TRICHLOROETHANE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
0	85.419	55	.240		N	15	1.363
10	84.870	60	.242		O	20	1.295
20	84.309	65	.244		T	25	1.231
30	83.759	70	.246			30	1.172
40	83.200	75	.248		P	35	1.117
50	82.650	80	.250		E	40	1.065
60	82.089	85	.252		R	45	1.017
70	81.540	90	.254		T	50	.972
80	80.981	95	.256		I	55	.929
90	80.429	100	.258		N	60	.889
100	79.870	105	.260		E	65	.852
110	79.320	110	.262		N	70	.817
120	78.759	115	.264		T	75	.784
130	78.209	120	.266			80	.753
140	77.650	125	.268			85	.723
150	77.099	130	.270				
160	76.540	135	.272				
		140	.274				

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
68.02	.070	70	2.099	70	.04925	0	.146
		75	2.364	75	.05495	25	.150
		80	2.657	80	.06119	50	.155
		85	2.980	85	.06799	75	.159
		90	3.335	90	.07540	100	.163
		95	3.725	95	.08346	125	.167
		100	4.152	100	.09220	150	.171
		105	4.619	105	.10170	175	.175
		110	5.130	110	.11190	200	.179
		115	5.686	115	.12300	225	.183
		120	6.292	120	.13490	250	.186
		125	6.950	125	.14770	275	.190
		130	7.663	130	.16150	300	.193
		135	8.437	135	.17630	325	.196
		140	9.273	140	.19220	350	.199
		145	10.180	145	.20920	375	.202
		150	11.150	150	.22730	400	.205
		155	12.200	155	.24670	425	.208
		160	13.330	160	.26730	450	.210
		165	14.540	165	.28930	475	.213
		170	15.840	170	.31270	500	.215
		175	17.240	175	.33760	525	.217
		180	18.730	180	.36390	550	.219
		185	20.330	185	.39180	575	.222
		190	22.030	190	.42140	600	.223

CHLOROBENZENE

CRB

Common Synonyms
Monochlorobenzene
Phenyl chloride
Benzene chloride
MCB

Watery liquid | Colorless | Sweet, almond odor

Sinks in water. Flammable vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Stop discharge if possible.
Call fire department.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

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.

Exposure

CALL FOR MEDICAL AID.

VAPOR
If inhaled, will cause coughing or dizziness.
Not irritating to eyes, nose and throat.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

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:** Halogenated hydrocarbon
3.2 **Formula:** C_6H_5Cl
3.3 **IMO/UN Designation:** 3.3/1134
3.4 **DOT ID No.:** 1134
3.5 **CAS Registry No.:** 108-90-7

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Mild amine odor; sweet, almond- like; aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor-acid gas respirator where appropriate; neoprene or vinyl gloves; chemical safety spectacles, plus face shield where appropriate; rubber footwear; apron or impervious clothing for splash protection; hard hat.
5.2 **Symptoms Following Exposure:** Irritating to skin, eyes and mucous membranes. Repeated exposure of skin may cause dermatitis due to defatting action. Chronic inhalation of vapors or mist may result in damage to lungs, liver, and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to transient anesthesia and central nervous system depression.
5.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms. INHALATION: remove to clean air; administer oxygen as needed. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline laxative. EYES: flush thoroughly with water. SKIN: remove contaminated clothing, wash exposed area with soap and water.
5.4 **Threshold Limit Value:** 75 ppm
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat, rabbit)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors are nonirritating to the eyes and throat.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.21 ppm
5.11 **IDLH Value:** 2,400 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 84°F C.C.; 97°F O.C.
6.2 **Flammable Limits in Air:** 1.3%-7.1%
6.3 **Fire Extinguishing Agents:** Carbon dioxide, dry chemical, foam or water spray
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Burning in open flame can form toxic phosgene and hydrogen chloride gases
6.6 **Behavior in Fire:** Heavy vapor can travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 1184°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** (est.) 4.6 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:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 20 ppm/96 hr/bluegill/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.3 lb/lb, 5 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** 99.5%; technical
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-X

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	0
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:** 112.56
12.3 **Boiling Point at 1 atm:** 270°F = 132°C = 405°K
12.4 **Freezing Point:** −50.1°F = −45.6°C = 227.6°K
12.5 **Critical Temperature:** 676°F = 358°C = 632°K
12.6 **Critical Pressure:** 656 psa = 44.6 atm = 4.52 MN/m²
12.7 **Specific Gravity:** 1.11 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 33 dynes/cm = 0.033 N/m at 25°C
12.9 **Liquid Water Interfacial Tension:** 37.41 dynes/cm = 0.03741 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.094
12.12 **Latent Heat of Vaporization:** 135 Btu/lb = 75 cal/g = 3.140 X 10⁴ J/kg
12.13 **Heat of Combustion:** (est.) 12,000 Btu/lb = 6700 cal/g = 280 X 10⁴ J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 20.40 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 0.5 psa

6. FIRE HAZARDS (Continued)

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

CHLOROBENZENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	70.419
40	70.230
45	70.040
50	69.849
55	69.660
60	69.469
65	69.270
70	69.080
75	68.889
80	68.700
85	68.500
90	68.309
95	68.120
100	67.919
105	67.730
110	67.530
115	67.339
120	67.139
125	66.950
130	66.750
135	66.559
140	66.360
145	66.169
150	65.969
155	65.770
160	65.580

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
40	.316
50	.317
60	.319
70	.321
80	.323
90	.325
100	.327
110	.329
120	.331
130	.333
140	.335
150	.337
160	.339
170	.341
180	.343
190	.345
200	.347
210	.349

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—20	.956
—10	.946
0	.937
10	.927
20	.917
30	.908
40	.898
50	.888
60	.879
70	.869
80	.859
90	.850
100	.840
110	.830
120	.821
130	.811
140	.801
150	.792
160	.782
170	.772

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
35	1.027
40	.987
45	.949
50	.914
55	.880
60	.848
65	.818
70	.790
75	.763
80	.738
85	.713
90	.690
95	.668
100	.648
105	.628
110	.609
115	.591
120	.574
125	.558
130	.542
135	.527
140	.513
145	.499
150	.486
155	.473

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.049

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
20	.032
30	.048
40	.069
50	.099
60	.140
70	.195
80	.269
90	.366
100	.492
110	.656
120	.865
130	1.130
140	1.464
150	1.880
160	2.394
170	3.026
180	3.797
190	4.731
200	5.856
210	7.203

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
20	.00071
30	.00102
40	.00145
50	.00204
60	.00283
70	.00386
80	.00522
90	.00698
100	.00923
110	.01207
120	.01565
130	.02010
140	.02560
150	.03233
160	.04051
170	.05039
180	.06224
190	.07636
200	.09309
210	.11280

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.178
25	.188
50	.198
75	.207
100	.217
125	.226
150	.235
175	.244
200	.252
225	.261
250	.269
275	.277
300	.285
325	.292
350	.300
375	.307
400	.314
425	.320
450	.327
475	.333
500	.340
525	.345
550	.351
575	.357
600	.362

DICHLOROMETHANE

DCM

Common Synonyms	Watery liquid	Colorless	Sweet, pleasant odor
Methylene chloride Methylene dichloride	Sinks in water. Irritating vapor is produced.		

Stop discharge if possible.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS GASES ARE PRODUCED WHEN HEATED.
Wear goggles and self-contained breathing apparatus.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

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

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Disperse and flush

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: CH_2Cl_2
3.3 IMO/UN Designation: 6.0/1593
3.4 DOT ID No.: 1593
3.5 CAS Registry No.: 75-09-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Pleasant, aromatic; like chloroform; sweet, ethereal

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor canister mask, safety glasses, protective clothing.
5.2 Symptoms Following Exposure: INHALATION: anesthetic effects, nausea and drunkenness. CONTACT WITH SKIN AND EYES: skin irritation, irritation of eyes and nose.
5.3 Treatment of Exposure: INHALATION: remove from exposure. Give oxygen if needed. INGESTION: no specific antidote. CONTACT WITH SKIN AND EYES: remove contaminated clothing; wash skin or eyes if affected.
5.4 Threshold Limit Value: 100 ppm
5.5 Short Term Inhalation Limits: 500 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard, if spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 205-307 ppm
5.11 IDLH Value: 5,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: Not flammable under conditions likely to be encountered.
6.2 Flammable Limits in Air: 12%-19%
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Dissociation products generated in a fire may be irritating or toxic.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 1184°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

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: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: Not pertinent
8.2 Waterfowl Toxicity: Not pertinent
8.3 Biological Oxygen Demand (BOD): Not pertinent
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Aerosol grade; technical grade
9.2 Storage Temperature: Data not available
9.3 Inert Atmosphere: Inerted
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: ORM-A
11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 84.93
12.3 Boiling Point at 1 atm: 104°F = 39.8°C = 313.0°K
12.4 Freezing Point: −142°F = −96.7°C = 176.5°K
12.5 Critical Temperature: 473°F = 245°C = 518°K
12.6 Critical Pressure: 895 psia = 60.9 atm = 6.17 MN/m²
12.7 Specific Gravity: 1.322 at 20°C (liquid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: 2.9
12.11 Ratio of Specific Heats of Vapor (Gas): 1.199
12.12 Latent Heat of Vaporization: 142 Btu/lb = 78.7 cal/g = 3.30 X 10⁴ J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 15.89 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 13.9 psia

NOTES

JUNE 1985

DCM

DICHLOROMETHANE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
—70	91.320
—60	90.700
—50	90.080
—40	89.450
—30	88.830
—20	88.200
—10	87.580
0	86.959
10	86.330
20	85.709
30	85.080
40	84.459
50	83.830
60	83.209
70	82.589
80	81.959
90	81.341
100	80.709

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
35	.274
40	.275
45	.276
50	.277
55	.278
60	.279
65	.279
70	.280
75	.281
80	.282
85	.283
90	.284
95	.284
100	.285

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—110	1.205
—100	1.192
—90	1.179
—80	1.166
—70	1.154
—60	1.141
—50	1.128
—40	1.115
—30	1.102
—20	1.090
—10	1.077
0	1.064
10	1.051
20	1.038
30	1.025
40	1.013
50	1.000
60	.987
70	.974
80	.961

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68.02	1.380

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
—10	.866
—5	1.013
0	1.180
5	1.370
10	1.586
15	1.830
20	2.105
25	2.414
30	2.762
35	3.151
40	3.585
45	4.068
50	4.606
55	5.201
60	5.860
65	6.588
70	7.389
75	8.270
80	9.237
85	10.300

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
—10	.01525
—5	.01763
0	.02031
5	.02333
10	.02671
15	.03050
20	.03472
25	.03941
30	.04462
35	.05039
40	.05676
45	.06378
50	.07149
55	.07996
60	.08922
65	.09934
70	.11040
75	.12240
80	.13540
85	.14960

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.126
10	.129
20	.131
30	.133
40	.135
50	.137
60	.139
70	.142
80	.144
90	.145
100	.147
110	.149
120	.151
130	.153
140	.155
150	.156
160	.158
170	.159
180	.161
190	.163
200	.164
210	.165
220	.167
230	.168
240	.169
250	.171

TTE	TETRACHLOROETHYLENE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
35	103.400
40	103.099
45	102.900
50	102.599
55	102.299
60	102.000
65	101.700
70	101.400
75	101.099
80	100.799
85	100.500
90	100.200
95	99.310
100	99.610
105	99.320
110	99.020
115	98.730
120	98.429
125	98.139
130	97.839
135	97.549
140	97.250
145	96.959
150	96.669
155	96.370
160	96.080

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.198
10	.200
20	.201
30	.202
40	.203
50	.204
60	.205
70	.206
80	.207
90	.208
100	.210
110	.211
120	.212
130	.213
140	.214
150	.215
160	.216
170	.217
180	.218
190	.220
200	.221
210	.222

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
55	.958
60	.929
65	.900
70	.873
75	.848
80	.823
85	.800
90	.777
95	.756
100	.736
105	.716
110	.698
115	.680
120	.663
125	.647
130	.631
135	.616
140	.601
145	.588
150	.574
155	.561
160	.549
165	.537
170	.526
175	.515

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.016

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
60	.236
70	.318
80	.425
90	.561
100	.732
110	.948
120	1.217
130	1.548
140	1.953
150	2.446
160	3.042
170	3.756
180	4.607
190	5.616
200	6.805
210	8.199
220	9.824
230	11.710
240	13.890
250	16.390
260	19.260
270	22.520
280	26.230

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
60	.00702
70	.00929
80	.01216
90	.01575
100	.02022
110	.02571
120	.03242
130	.04055
140	.05032
150	.06199
160	.07583
170	.09215
180	.11130
190	.13360
200	.15940
210	.18910
220	.22330
230	.26230
240	.30660
250	.35680
260	.41330
270	.47680
280	.54790

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.108
25	.110
50	.113
75	.116
100	.118
125	.120
150	.122
175	.125
200	.127
225	.129
250	.131
275	.132
300	.134
325	.136
350	.138
375	.139
400	.141
425	.142
450	.143
475	.144
500	.146
525	.147
550	.148
575	.148
600	.149

TETRACHLOROETHYLENE

TTE

Common Synonyms
Tetracap
Perclene
Perchloroethylene
Perk

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Stop discharge if possible.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Poisonous gases are produced when heated.

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause difficult breathing, or loss of consciousness.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $Cl_2C=CCl_2$
3.3 IMO/UN Designation: 6.1/1897
3.4 DOT ID No.: 1897
3.5 CAS Registry No.: 127-18-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Ethereal; like chloroform; mildly sweet

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.
5.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.
5.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: Induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.
5.4 Threshold Limit Value: 50 ppm
5.5 Short Term Inhalation Limits: 100 ppm for 60 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 throat if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 5 ppm
5.11 IDLH Value: 500 ppm

6. FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic, irritating gases may be generated in fires.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Dry cleaning and industrial grades: 95+%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
ORM-A
11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification:
Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 165.83
12.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K
12.4 Freezing Point: −6.3°F = −22.4°C = 250.8°K
12.5 Critical Temperature: 657°F = 347°C = 620°K
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.63 at 20°C (liquid)
12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.116
12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10^4 J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.26 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

TRICHLOROETHANE

TCE

Common Synonyms
1,1,1-Trichloroethane
Methylchloroform
Aerothene
Chlorothene

Watery liquid | Colorless | Sweet odor

Sinks in water. Irritating vapor is produced.

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID.

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

LIQUID
Irritating to skin and eyes.
If swallowed, may produce nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: CH_3CCl_3
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2831
3.5 CAS Registry No.: 71-55-6

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Chloroform-like; sweetish

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection.

5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis.

5.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious overexposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.

5.4 Threshold Limit Value: 350 ppm
5.5 Short Term Inhalation Limits: 1,000 ppm for 60 min. in man
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig)
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 100 ppm
5.11 IDLH Value: 1,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: Data not available
6.2 Flammable Limits in Air: 7%-16%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 932°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: (est.) 2.9 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: Reacts slowly, releasing corrosive hydrochloric acid.
7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity:
75-150 ppm/*/pinfish/TL_m/salt water
*Time period not specified.
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Uninhibited; inhibited; industrial inhibited; white room; cold cleaning
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
ORM-A
11.2 MAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	1
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)	1
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 133.41
12.3 Boiling Point at 1 atm:
165°F = 74°C = 347°K
12.4 Freezing Point:
<−38°F = <−38°C = <234°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity:
1.31 at 20°C (liquid)
12.8 Liquid Surface Tension:
25.4 dynes/cm = 0.0254 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.)
45 dynes/cm = 0.045 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 4.6
12.11 Ratio of Specific Heats of Vapor (Gas):
1.104
12.12 Latent Heat of Vaporization:
100 Btu/lb = 55 cal/g =
2.4 X 10^5 J/kg
12.13 Heat of Combustion: (est.) 4700 Btu/lb
= 2600 cal/g = 110 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: 4.0 psia

NOTES

TGE

TRICHLOROETHANE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
0	85.419
10	84.870
20	84.309
30	83.759
40	83.200
50	82.650
60	82.089
70	81.540
80	80.981
90	80.429
100	79.870
110	79.320
120	78.759
130	78.209
140	77.650
150	77.099
160	76.540

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
55	.240
60	.242
65	.244
70	.246
75	.248
80	.250
85	.252
90	.254
95	.256
100	.258
105	.260
110	.262
115	.264
120	.266
125	.268
130	.270
135	.272
140	.274

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
15	1.363
20	1.295
25	1.231
30	1.172
35	1.117
40	1.065
45	1.017
50	.972
55	.929
60	.889
65	.852
70	.817
75	.784
80	.753
85	.723

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.070

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
70	2.099
75	2.364
80	2.657
85	2.980
90	3.335
95	3.725
100	4.152
105	4.619
110	5.130
115	5.686
120	6.292
125	6.950
130	7.663
135	8.437
140	9.273
145	10.180
150	11.150
155	12.200
160	13.330
165	14.540
170	15.840
175	17.240
180	18.730
185	20.330
190	22.030

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
70	.04925
75	.05495
80	.06119
85	.06799
90	.07540
95	.08346
100	.09220
105	.10170
110	.11190
115	.12300
120	.13490
125	.14770
130	.16150
135	.17630
140	.19220
145	.20920
150	.22730
155	.24670
160	.26730
165	.28930
170	.31270
175	.33760
180	.36390
185	.39180
190	.42140

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.146
25	.150
50	.155
75	.159
100	.163
125	.167
150	.171
175	.175
200	.179
225	.183
250	.186
275	.190
300	.193
325	.196
350	.199
375	.202
400	.205
425	.208
450	.210
475	.213
500	.215
525	.217
550	.219
575	.222
600	.223

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 19, 1990

ChromaLab File No.: 1090048

Attn:

RE: Six samples for Lead, Cadmium, Chromium, and Zinc analyses

Project Name: DAVIS PARKING
Date Sampled: Oct. 6, 1990
Date Submitted: Oct. 8, 1990
Date Extracted: Oct. 15-19, 1990
Date Analyzed: Oct. 15-19,1990

RESULTS:

Sample No.	Lead (mg/Kg)	Cadmium (mg/Kg)	Chromium (mg/Kg)	Zinc (mg/Kg)
CENTER FRONT DRIVE, UST	2.17	----	----	----
1428 DOOR UST	N.D.	----	----	----
MUNCK, UST	760	0.292	0.62	87.1
HYDLIFT-1.5/SKINNER	----	----	----	----
HOLMES-ABBAS	----	----	----	----
MULLER VENT	----	----	----	----
BLANK	N.D.	N.D.	N.D.	N.D.
SPIKED RECOVERY	94.5%	101.1%	100.0%	92.5%
DUP SPIKED RECOVERY	----	----	----	----
DETECTION LIMIT	0.05	0.005	0.05	0.005
METHOD OF ANALYSIS	7420	7130	7190	7950

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

OCT-19-90 FRI

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#5694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 19, 1990

ChromaLab File No.: 1090048

Attn:

RE: Six samples for Gasoline/BTEX analysis

Project Name: DAVIS PARKING
Date Sampled: Oct. 6, 1990
Date Extracted: Oct. 15-19, 1990
Date Submitted: Oct. 8, 1990
Date Analyzed: Oct. 15-19,1990

RESULTS:

Sample No.	Gasoline (mg/Kg)	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl Benzene (ug/Kg)	Total Xylenes (ug/Kg)
CENTER FRONT DRIVE, UST	----	130000000	52000000	27000000	41000000
1428 DOOR UST	----	140000000	61000000	29000000	44000000
MUNCK, UST	----	50	72	82	97
HYDLIFT-1.5/ SKINNER	35	N.D.	13	36	72
HOLMES-ABBAS	N.D.	N.D.	N.D.	N.D.	N.D.
MULLER VENT	N.D.	N.D.	N.D.	N.D.	N.D.
BLANK	N.D.	N.D.	N.D.	N.D.	N.D.
SPIKED RECOVERY	91.7%	98.6%	99.1%	103.5%	105.6%
DUP SPIKED RECOVERY	91.1%	89.3%	89.7%	90.0%	107.6%
DETECTION LIMIT	2.5	5	5	5	5
METHOD OF ANALYSIS	5030/ 8015	8020	8020	8020	8020

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File # 0990161 C

Client: _____ Attn: _____
Date Sampled: Sept. 28, 1990 Date Submitted: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990

Project Name: _____ Project No.: _____
Sample I.D.: LB #3
Method of Analysis: EPA 8240 Detection Limit: 200 mg/Kg*

COMPOUND NAME	mg/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	96.5% 98.2%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	950	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	6300	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	110.5% 102.5%
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYLBENZENE	1000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.3% 110.8%
TOTAL XYLENES	5900	---

*High detection limit due to presence of high concentration of compounds in sample.

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 D

Client:_____ Attn:_____
Date Sampled: Oct. 19, 1990 Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: LB-PP-D (OIL)
Method of Analysis: EPA 8240 Detection Limit: 75000ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	102.5% 82.3%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	90.5% 91.7%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	450,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	60,000	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	3,200,000	93.2% 88.4%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	94,000	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	1,000,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	91.5% 87.5%
TOTAL XYLENES	7,000,000	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1758 • Facsimile 415/831-8798
Federal ID #68-0140157

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E854)
- Drinking Water (#955)
- Waste Water
- Consultation

October 12, 1990

Chromalab File # 0990161 G

Client:_____ Attn:_____
Date Sampled: Sept. 28, 1990 Date Submitted: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990

Project Name:_____ Project No.:_____
Sample I.D.: MGF # 7
Method of Analysis: EPA 8240 Detection Limit: 10 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	18	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	96.5% 98.2%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	10	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	30	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	110.5% 102.5%
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	16	---
ETHYLBENZENE	10	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.3% 110.8%
TOTAL XYLENES	68	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 19, 1990

ChromaLab File # 1090048 C

Client: _____ Attn: _____
Date Sampled: Oct. 06, 1990 Date Submitted: Oct. 08, 1990
Date of Analysis: Oct. 19, 1990

Project Name: Davis Parking, 1432 Harrison, Oakland, CA
Sample I.D.: MUNCK UST (OIL)
Method of Analysis: EPA 8010 Detection Limit: 20 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	160	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	101.3% 92.5%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	108.3% 102.5%
TETRACHLOROETHENE	110	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.8% 96.5%

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

FAX TRANSMITTAL COVER SHEET

FROM:

SAN FRANCISCO, CA 94114-2751

TELEPHONE # AUTOSWITCHED FAX OR PHONE

(IF YOU CALL ON A FAX MACHINE HANDSET, PRESS THE NUMBER "1" ON YOUR HANDSET WHEN OUR LINE ANSWERS. THIS WILL SWITCH US FROM YOUR HANDSET TO YOUR FAX. THEN PUT YOUR HANDSET BACK ON ITS CRADLE AND PRESS START. THANK YOU.)

TO:

IN CARE OF:

OAKLAND, CA 94612

PHONE:
FAX #:

OF PAGES FOLLOWING THIS ONE = 3
DATE: October 31, 1990

7:37 PM: OCTOBER 31, 1990

JONATHAN:

HERE ARE THE RESULTS RETURNED BY THE LABORATORY FOR 3 SAMPLES:

#1 (SOIL) IS A SAMPLE TAKEN OF SOLID SCRAPED FROM THE CONCRETE SURROUNDING THE THE BASE OF THE PIPE EXTENDING FROM THE LOWER BASEMENT FLOOR TO THE CEILING OF THE LOWER BASEMENT. THIS PIPE APPEARS TO PIERCE THE CEILING AND TO EXTEND THROUGH IT TO THE SIDEWALK ABOVE, ON ALICE STREET. THE PIPE WAS WITHIN A COUPLE OF INCHES OF THE "ALICE STREET WALL" AND ABOUT SIX FEET FROM THE ROOM CORNER CLOSEST TO THE PARKING LOT ON THE 14TH STREET SIDE.

#2 (SOIL) WAS COLLECTED AT THE BASE OF AN OPEN PIPE ADJACENT TO THE PIPE REFERRED TO ABOVE. THIS PIPE IS ABOUT 15 INCHES LONG AND WAS ABOUT 18 INCHES FROM THE SAME CORNER. THIS PIPE IS ALSO WITHIN A COUPLE OF INCHES OF THE ALICE STREET WALL.

#3 WAS SOIL SCRAPED FROM THE OPEN HOLE IN THE CENTER OF THE LOWER BASEMENT FLOOR IN THE AUTO DRIVE PATH IMMEDIATELY ADJACENT TO THE OPEN GRILL CONTAINING AN OILY LIQUID WHICH APPEARS TO BE A DRAIN LINE FOR OILS, SOLVENTS, ETC.

ALL THREE SAMPLES SHOW SUBSTANTIAL CONCENTRATIONS OF BTEX. NO VOLATILE CHLORINATED HYDROCARBONS WERE FOUND IN ANY SAMPLE . PCB ANALYSES ON THESE SOIL SAMPLES HAVE NOT YET BEEN RETURNED TO ME. THE BTEX IN THESE 3 SOIL SAMPLES WOULD CERTAINLY HAVE BEEN IN EQUILIBRIUM WITH BTEX VAPORS IN THE AIR IN THESE AREAS AT THE TIME THE SAMPLE WAS COLLECTED, INCLUDING THE VOLUME OF AIR IN THE CENTER DRIVEWAY AREA OF THE LOWER BASEMENT. YOU SHOULD ALSO NOTE THAT THE APPEARANCE OF THE SOLID COLLECTED AT ALL THREE LOCATIONS WAS CONSISTENT WITH THE OILY APPEARANCE OF THE SURFACE OF THE PIPE EXTENDING TO THE CEILING (SAMPLING LOCATION #1), AND THAT THE PIPE HAS HAD THIS OILY APPEARANCE ON EVERY OCCASION THAT I HAVE BEEN IN THE LOWER BASEMENT.

FINALLY, I AM PREPARED TO STATE UNEQUIVOCALLY THAT THE SAMPLES WERE KEPT IN A SEALED COOLER, WERE COLLECTED AND MAINTAINED UNDER CHAIN OF CUSTODY, AND WERE MAINTAINED AT APPROXIMATELY 4 CELSIUS BY MEANS OF AN ICE-WATER SLURRY UNTIL THEY WERE RECEIVED AT THE LABORATORY WITHIN A FEW HOURS AFTER COLLECTION. IN ADDITION, THE SAMPLE JARS WERE FILLED AS FULL AS POSSIBLE TO MINIMIZE LOSS OF VOLATILES INTO JAR HEADSPACE.

YOURS TRULY,

OMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 31, 1990

ChromaLab File # 1090171 A

Client: _____ Attn: _____
Date Sampled: Oct. 25, 1990 Date Submitted: Oct. 25, 1990
Date of Analysis: Oct. 31, 1990

Project Name: 1432 Harrison
Sample I.D.: # 1 (soil)
Method of Analysis: 8240 Detection Limit: 1000 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	99.7% 95.6%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	98.2% 96.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	11,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	120,000	105.8% 95.2%
CIC-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	29,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	97.5% 96.8%
1,2-DICHLOROBENZENE	N.D.	---
TOTAL XYLENES	170,000	

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

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Federal ID #68-0140157

: 7-19-91 11:23AM : 4158295493→ 4152738832;#18

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Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

ChromaLab File # 1090171 B

October 31, 1990

Client:

Attn:

Date Sampled: Oct. 25, 1990

Date Submitted: Oct. 25, 1990

Date of Analysis: Oct. 31, 1990

Project Name: 1432 Harrison

Sample I.D.: # 2 (soil)

Method of Analysis: 8240

Detection Limit: 1000 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	99.7% 95.6%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	98.2% 96.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	31,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	280,000	105.8% 95.2%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	59,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.5% 96.8%
TOTAL XYLENES	350,000	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

11

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#5804)
- Drinking Water (#955)
- Waste Water
- Consultation

October 31, 1990

ChromaLab File # 1090171 D

Client: _____ Attn: _____
Date Sampled: Oct. 25, 1990 Date Submitted: Oct. 25, 1990
Date of Analysis: Oct. 31, 1990

Project Name: 1432 Harrison
Sample I.D.: # 4 (soil)
Method of Analysis: 8240 Detection Limit: 1000 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	99.7% 95.6%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	98.2% 96.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	29,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	230,000	105.8% 95.2%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	58,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.5% 96.8%
TOTAL XYLENES	350,000	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

November 1, 1990

ChromaLab File No.: 0990161

Attn:

RE: One soil and two oil samples for PCB's analysis

Date Sampled: Sept. 28, 1990
Date Extracted: Oct. 29-30,1990

Date Submitted: Sept. 28, 1990
Date Analyzed: Oct. 29-30,1990

RESULTS:

Sample No.	PCB's* (ug/Kg)
LB #1	N.D.
LB #3	5500
LB #6	640
BLANK	N.D.
SPIKED RECOVERY	92.5%
DUPLICATED SPIKED RECOVERY	98.9%
DETECTION LIMIT	100
METHOD OF ANALYSIS	8080

*PCB 1260

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam (by DD)

Eric Tam
Laboratory Director

CHROMALAB, INC.
Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

November 1, 1990

ChromaLab File No.: 1080171

Attn:

RE: One oil and three soil samples for PCB's analysis

Date Sampled: Oct. 25, 1990
Date Extracted: Oct. 29-31,1990

Date Submitted: Oct. 25, 1990
Date Analyzed: Oct. 29-31,1990

RESULTS:

Sample No.	PCB's* (ug/Kg)
1	1100
2	1100
3	2300
4	390
BLANK	N.D.
SPIKED RECOVERY	92.5%
DUPLICATED SPIKED RECOVERY	98.9%
DETECTION LIMIT	100
METHOD OF ANALYSIS	8080

*PCB 1260

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam (by DD)
Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E884)
- Drinking Water (#958)
- Waste Water
- Consultation

November 1, 1990

ChromaLab File # 1090171 C

Client: _____ Attn: _____
Date Sampled: Oct. 25, 1990 Date Submitted: Oct. 25, 1990
Date of Analysis: Nov. 01, 1990

Project Name: 1432 Harrison
Sample I.D.: # 3 (oil)
Method of Analysis: 8240 Detection Limit: 10000ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 99.5%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	95.8% 102.3%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	890,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	5,400,000	101.8% 103.5%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	990,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.2% 99.5%
TOTAL XYLENES	5,500,000	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#965)
- Waste Water
- Consultation

October 22, 1990 ChromaLab File No.: 10901137D

RE: 8080 analysis
Client Sample Number: LB-PP-D
Project Location: 1432 HARRISON STREET
Date Analyzed: October 22, 1990

CHLORINATED PESTICIDE ANALYSIS

COMPOUNDS	CONCENTRATION (ug/Kg)	DETECTION LIMIT (ug/Kg)	SPIKE RECOVERY
ALDRIN	N.D.	10	----
DIELDRIN	N.D.	10	----
ENDRIN ALDEHYDE	N.D.	50	----
ENDRIN	N.D.	10	102.0%
HEPTACHLOR	N.D.	10	----
HEPTACHLOR EPOXIDE	N.D.	10	----
p,o' - DDT	N.D.	50	101.6%
p,p' - DDE	N.D.	10	93.3%
p,p' - DDD	N.D.	50	----
ENDOSULFAN I	N.D.	50	107.7%
ENDOSULFAN II	N.D.	50	----
α - BHC	N.D.	10	----
β - BHC	N.D.	10	----
δ - BHC (LINDANE)	N.D.	10	103.6%
ε - BHC	N.D.	10	----
ENDOSULFAN SULFATE	N.D.	100	----
p,p' - METHOXYCHLOR	N.D.	100	----
TOXAPHENE	N.D.	100	----
PCB's*	21000	100	----
CHLORDANE	N.D.	100	98.1%

*PCB 1260

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
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- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 D

Client: Tech/Art
Attn: Lew Schalit
Date Sampled: Oct. 19, 1990
Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: LB-PP-D (OIL)
Method of Analysis: EPA 8240 Detection Limit: 75000ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	102.5% 82.3%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	90.5% 91.7%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	450,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	60,000	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	3,200,000	93.2% 88.4%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	94,000	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	1,000,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	91.5% 87.5%
TOTAL XYLENES	7,000,000	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798

EXHIBIT 5
BOWERS
10/23/90

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File No.: 1090137D

TECH-ART

Attn: Lew Schalit

RE: 8080 analysis
Client Sample Number: LB-PP-D
Project Location: 1432 HARRISON STREET
Date Analyzed: October 22, 1990

CHLORINATED PESTICIDE ANALYSIS

COMPOUNDS	CONCENTRATION (ug/Kg)	DETECTION LIMIT (ug/Kg)	SPIKE RECOVERY
ALDRIN	N.D.	10	----
DIELDRIN	N.D.	10	----
ENDRIN ALDEHYDE	N.D.	50	----
ENDRIN	N.D.	10	102.0%
HEPTACHLOR	N.D.	10	----
HEPTACHLOR EPOXIDE	N.D.	10	----
p,p' - DDT	N.D.	50	101.6%
p,p' - DDE	N.D.	10	93.3%
p,p. - DDD	N.D.	50	----
ENDOSULFAN I	N.D.	50	107.7%
ENDOSULFAN II	N.D.	50	----
α - BHC	N.D.	10	----
β - BHC	N.D.	10	----
δ - BHC (LINDANE)	N.D.	10	103.6%
δ - BHC	N.D.	10	----
ENDOSULFAN SULFATE	N.D.	100	----
p,p' - METHOXYCHLOR	N.D.	100	----
TOXAPHENE	N.D.	100	----
PCB's*	21000	100	----
CHLORDANE	N.D.	100	99.1%

*PCB 1260

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1768 • Facsimile 415/831-6798

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#958)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 C

Client: Tech/Art
Date Sampled: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Attn: Lew Schalit
Date Submitted: Oct. 19, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: LB-PP-C (AIR)
Method of Analysis: EPA 8240 Detection Limit: 4 ug/L

COMPOUND NAME	ug/L	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	110.8% 95.8%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	93.7% 92.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	106.2% 98.5%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.1% 103.1%
TOTAL XYLENES	4.4	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
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CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#965)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 B

Client: Tech/Art
Attn: Lew Schelit
Date Sampled: Oct. 19, 1990
Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: MGF-B-MUNCK (AIR)
Method of Analysis: EPA 8240 Detection Limit: 4 ug/L

COMPOUND NAME	ug/L	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	110.8% 95.8%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	93.7% 92.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	106.2% 98.5%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.1% 103.1%
TOTAL XYLENES	N.D.	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

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415/831-1768 • Facsimile 415/831-8798

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#958)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 D

Client: Tech/Art
Attn: Law Schalit
Date Sampled: Oct. 19, 1990
Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage; 1432 Harrison Street
Sample I.D.: LB-PP-D (OIL)
Method of Analysis: EPA 8240 Detection Limit: 75000ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	102.5% 82.3%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	90.5% 91.7%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	450,000	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	80,000	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	3,200,000	93.2% 88.4%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	94,000	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	1,000,000	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	---
TOTAL XYLENES	7,000,000	91.5% 87.5%

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-6798

EXHIBIT 2
BENDIX
10/24/90

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#965)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File No.: 1090137D

TECH-ART

Attn: Lew Schalit

RE: 8080 analysis
Client Sample Number: LB-PP-D
Project Location: 1432 HARRISON STREET
Date Analyzed: October 22, 1990

CHLORINATED PESTICIDE ANALYSIS

COMPOUNDS	CONCENTRATION (ug/Kg)	DETECTION LIMIT (ug/Kg)	SPIKE RECOVERY
ALDRIN	N.D.	10	----
DIELDRIN	N.D.	10	----
ENDRIN ALDEHYDE	N.D.	50	----
ENDRIN	N.D.	10	102.0%
HEPTACHLOR	N.D.	10	----
HEPTACHLOR EPOXIDE	N.D.	10	----
p,p' - DDT	N.D.	50	101.6%
p,p' - DDE	N.D.	10	93.3%
p,p' - DDD	N.D.	50	----
ENDOSULFAN I	N.D.	50	107.7%
ENDOSULFAN II	N.D.	50	----
α - BHC	N.D.	10	----
β - BHC	N.D.	10	----
δ - BHC (LINDANE)	N.D.	10	103.6%
ε - BHC	N.D.	10	----
ENDOSULFAN SULFATE	N.D.	100	----
p,p' - METHOXYCHLOR	N.D.	100	----
TOXAPHENE	N.D.	100	----
PCB's*	21000	100	----
CHLORDANE	N.D.	100	98.1%

*PCB 1260

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E894)
- Drinking Water (#D58)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 C

Client: Tech/Art
Attn: Lew Schalit
Date Sampled: Oct. 19, 1990
Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: LB-PP-C \ (AIR)
Method of Analysis: EPA 8240 Detection Limit: 4 ug/L

COMPOUND NAME	ug/L	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	110.8% 95.8%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	93.7% 92.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	106.2% 98.5%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.1% 103.1%
TOTAL XYLENES	4.4	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#5804)
- Drinking Water (#965)
- Waste Water
- Consultation

October 22, 1990

ChromaLab File # 1090137 B

Client: Tech/Art
Attn: Lew Schelit
Date Sampled: Oct. 19, 1990
Date Submitted: Oct. 19, 1990
Date of Analysis: Oct. 20, 1990

Project Name: S Davis Garage, 1432 Harrison Street
Sample I.D.: MGF-B-MUNCK (AIR)
Method of Analysis: EPA 8240 Detection Limit: 4 ug/L

COMPOUND NAME	ug/L	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	110.8% 95.8%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	93.7% 92.8%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	106.2% 98.5%
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYL BENZENE	N.D.	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	97.1% 103.1%
TOTAL XYLENES	N.D.	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

Rcd 22et 90

FAX TRANSMITTAL COVER SHEET

FROM: LEW SCHALIT

TECH/ART: 462 DOUGLASS STREET: SAN FRANCISCO, CA 94114-2761

TELEPHONE # (415)550-2436 AUTOSWITCHED FAX OR PHONE

(IF YOU CALL ON A FAX MACHINE HANDSET, PRESS THE NUMBER "9" ON YOUR HANDSET WHEN OUR LINE ANSWERS. THIS WILL SWITCH US FROM YOUR HANDSET TO YOUR FAX. THEN PUT YOUR HANDSET BACK ON ITS CRADLE AND PRESS START. THANK YOU.)

TO: JONATHAN REDDING

IN CARE OF:
MAUREEN GRAY
FITZGERALD, ABBOTT & BEARDSLEY
1221 BROADWAY, 21 FLOOR
OAKLAND, CA 94612

PHONE: 415-451-3300
FAX #: 415-451-1527

OF PAGES FOLLOWING THIS ONE = 6
DATE: October 17, 1990

MS. GRAY:

HERE IS AN EXPLANATION OF SAMPLE NOMENCLATURE:

1. LB#1 = LOWEST BASEMENT #1: OILY SAMPLE TAKEN FROM CENTER-OF-FLOOR DRAIN CHANNEL; CHECKED FOR BTEX ONLY

2. LB#2 = SAMPLE OF SOIL OVER RIGHT-HAND-MOST TANK OF THE TWO TANKS ADJACENT TO ALICE STREET WALL IN LOWEST BASEMENT; CHECKED FOR GASOLINE & BTEX

3. LB#3 = SAMPLE OF LIQUID FROM INTERIOR OF FILL PIPE OF LEFT-HAND-MOST OF TWO TANKS AS IN (2)ABOVE

4. LB#4 = SOLID REMOVED FROM CEILING PIPE IN LOWEST BASEMENT TO BE CHECKED FOR ASBESTOS CONTENT; RESULT NOT YET RETURNED TO ME

5. "CHUNK" = SOIL FROM SUMP IN BATHROOM IN ADJACENT BASEMENT OF TV SHOP

6. LB#5 = "SOIL" SAMPLE FROM OVER POTENTIAL "UST" IN CORNER OF LOWER BASEMENT CLOSEST TO ALICE STREET & TO PARKING LOT LEADING TO 14TH STREET; PIPES ON WALLS APPEAR TO BE A) A FILL PIPE (ALICE ST. WALL; B) VENT PIPES (14 ST WALL), AND C) PUMP PIPES (ADJACENT TO INTERIOR COLUMN)

7. MFG#7 = WATERY SOIL SAMPLE TAKEN FROM STREET-LEVEL CAR WASH ARE ADJACENT TO DRUM STORAGE IN HARRISON STREET BLDG AT CORNER BOUNDED BY WALL THAT PARKING GARAGE OFFICE AND WALL THAT ELEVATOR IS NEXT TO

YOURS TRULY,

Lew Schalit
LEW SCHALIT

END OF TRANSMISSION

9.1

EXHIBIT 9
BENDIX
10/24/90

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#965)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File No.: 0990181

TECH-ART

Attn: Lew Schalit

RE: Four soil samples for Gasoline/BTEX, and Oil & Grease analyses

Date Sampled: Sept. 28,1990
Date Extracted: Oct. 4-11, 1990
Date Submitted: Sept. 28, 1990
Date Analyzed: Oct. 4-11, 1990

RESULTS:

Sample No.	Gasoline (mg/Kg)	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl Benzene (ug/Kg)	Total Xylenes (ug/Kg)	Oil & Grease (mg/Kg)
floor drain LB #1	----	N.D.	7.3	6.9	21	----
LB #2	N.D.	N.D.	N.D.	N.D.	N.D.	----
CHUNK #5	----	----	----	----	----	N..D.
LB #8	N.D.	N.D.	N.D.	N.D.	N.D.	----
BLANK SPIKED	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
RECOVERY	91.7%	88.6%	99.1%	103.5%	105.6%	----
DUP SPIKED RECOVERY	91.1%	89.3%	89.7%	90.05	107.6%	----
DETECTION LIMIT	2.5	5	5	5	5	10
METHOD OF ANALYSIS	5030/ 8015	8020	8020	8020	8020	503 D&E

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

floor drain channel LB#1 B:T:E:X = 5:7:7:21 = ~ 1:1:3

4 tank lowest basement

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#1886)
- Drinking Water (#958)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File # 0990161 C

Client: Tech-Art
Date Sampled: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990
Attn: Lew Schalit
Date Submitted: Sept. 28, 1990

Project Name:
Sample I.D.: LB #3
Project No.:
Method of Analysis: EPA 8240
Detection Limit: 200 mg/Kg*

note high detection limit

COMPOUND NAME	mg/Kg	Spike Recovery
CHLOROMETHANE	N.D.	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	---
1,1-DICHLOROETHENE	N.D.	98.5% 97.2%
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	---
1,1,1-TRICHLOROETHANE	N.D.	96.5% 98.2%
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	950	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	---
CIS-1,3-DICHLOROPROPENE	6300	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	110.5% 102.5%
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYLBENZENE	N.D.	---
BROMOFORM	1000	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	---
TOTAL XYLENES	N.D.	92.3% 110.8%
	5900	---

*High detection limit due to presence of high concentration of compounds in sample.

ChromaLab, Inc. BTEX = 1:6:1:6 similar to soil near Harrison St.

David Duong
Senior Chemist

Eric Tam
Lab Director

B-3

2323 Camino Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

street level sale near elevator

- Environmental Analysis
- Hazardous Waste (#E804)
- Drinking Water (#D65)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File # 0990161 @

Client: Tech-Art
Attn: Lew Schalit
Date Sampled: Sept. 28, 1990
Date Submitted: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990

Project Name:
Project No.:
Sample I.D.: MGF # 7
Method of Analysis: EPA 8240
Detection Limit: 10 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D.	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	---
1,1-DICHLOROETHENE	N.D.	98.5% 97.2%
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	18	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	---
1,1,1-TRICHLOROETHANE	N.D.	96.5% 98.2%
CARBON TETRACHLORIDE	N.D.	---
BENZENE	N.D.	---
1,2-DICHLOROETHANE	10	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	N.D.	---
CIS-1,3-DICHLOROPROPENE	30	---
1,1,2-TRICHLOROETHANE	N.D.	---
TETRACHLOROETHENE	N.D.	110.5% 102.5%
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYLBENZENE	16	---
BROMOFORM	10	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	---
TOTAL XYLENES	68	92.3% 110.8%

ChromaLab, Inc

B:T:E:X = 1:3:1:7

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798
Federal ID #68-0142167

8.4

CHROMALAB, INC.

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1786 • Facsimile 415/831-8798

Chain of Custody

DATE 9/29/92 PAGE 1 OF 1

Q5

Q.A. MGR.	L. SCHALIT
COMPANY	TECH/ART
ADDRESS	462 DOUGLASS ST
	SAN FRANCISCO CA 94114
SAMPLERS (SIGNATURE)	PHONE NO.
Lew Schalit	415-550-2435

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB NO.	TPH - Gasoline (EPA 5030)	TPH - Gasoline (GCFID) WITH BTEX (EPA 602, 8020)	TPH - Diesel (EPA 3510, 3550)	PURGEABLE AROMATICS BTEX (EPA 602, 8020)	PURGEABLE HALOCARBONS (EPA 601, 8010)	VOLATILE ORGANICS (EPA 624, 8240)	BASE/NEUTRALS, ACIDS (EPA 625/627, 8270)	TOTAL OIL & GREASE (EPA 5520 E&F)	PESTICIDES/PCB (EPA 608, 8080)	PHENOLS (EPA 604, 8040)			METALS: Cd, Cr, Pb, Zn	CAM METALS (17) WET Ni	PRIORITY POLLUTANT METALS (13)							NUMBER OF CONTAINERS
A	9/29	10[15]	SOIL			X		Look for fuel Types & information																	1
BACK BASEMENT SOIL OVER CONCRETE								Take sample from geo tool																	
						1550																			

CHROMALAB FILE # 990165

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT: 732 HARRISON ST	TOTAL NO. OF CONTAINERS	1
P.O. NO.	CHAIN OF CUSTODY SEALS	
PROJ. MGR.	REC'D GOOD CONDITION/COLD	
	CONFORMS TO RECORD	
	LAB NO.	

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY 1.	RELINQUISHED BY 2.	RELINQUISHED BY 3.
(Signature) Lew Schalit 11[45] (Time)	(Signature) (Time)	(Signature) (Time)
(Printed Name) LEW SCHALIT 9/29/92 (Date)	(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)	(Company)
RECEIVED BY 1.	RECEIVED BY 2.	RECEIVED BY (LABORATORY) 3
(Signature) (Time)	(Signature) (Time)	(Signature) 11:5 (Time)
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)	(RAY)

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#965)
- Waste Water
- Consultation

October 12, 1990

basement

ChromaLab File # 0990165

Tech-Art

Attn: Lew Schalit

Re: One soil sample for Gasoline/BTEX analysis

Date Sampled: Sept. 29, 1990
Date Analyzed: Oct. 12, 1990 Date Submitted: Sept. 29, 1990

Results:

Sample No.	Gasoline (mg/Kg)	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl Benzene (ug/Kg)	Total Xylenes (ug/Kg)
a*	24	N.D.	N.D.	6.0	4.7
BLANK	N.D.	N.D.	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.1%	89.3%	88.7%	90.0%	107.6%
DETECTION LIMIT	2.5	5.0	5.0	5.0	5.0
METHOD OF ANALYSIS	5030/8015	8020	8020	8020	8020

*Sample may consist of aged gasoline and/or diesel fuel

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

E; X ≤

8.6

CHROMALAB, INC. 2239 Omeg[illegible] 415[illegible]

CHROMALAB FILE # 990161

Chain of Cus[tody]

PROJ. MGR. Lew Schmit?

COMPANY Tech-[illegible]

ADDRESS

SAMPLERS (SIGNATURE) (PHONE NO.)

DATE ______ PAGE ______ OF

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	TPH - Gasoline (EPA 5030)	TPH - Gasoline (5030) w/BTEX (EPA 602, 8020)	TPH - Diesel (EPA 3510, 3550)	PURGEABLE AROMATICS BTEX (EPA 602, 8020)	PURGEABLE HALOCARBONS (EPA 601, 8010)	VOLATILE ORGANICS (EPA 624, 8240)	BASE/NEUTRALS, ACIDS (EPA 625/627, 8270)	TOTAL OIL & GREASE (EPA 5520 B,E)	PESTICIDES/PCB (EPA 608, 8080)	PHENOLS (EPA 604, 8040)	ASBESTOS		METALS: Cd, Cr, Pb, Zn	CAM METALS (18) TLC/STLC	PRIORITY POLLUTANT METALS (13)	Notes
LB #1/ Contract oil [illegible]	9-28	8.05A	oily					X												
LB #2 soil [illegible] R.H. Tank	↓	8.10	soil			X														
#3 L.H. Tank Content		9.00	oily																	FROM LH DOUBLE TANK [illegible]
LB #4 [illegible] Ceiling Pipe [illegible]			ASB							X										FROM WASH TANK [illegible]
#5 [illegible]		8.45	soil												X					Composite
LB #6 [illegible], UST		9.00				X						X								TN SUMP
MGF #7 [illegible] Car Wash Sump										X										HAND GROUND?

PROJECT INFORMATION

PROJECT:

PO NO.

SHIPPING ID. NO.

VIA:

SPECIAL INSTRUCTIONS/COMMENTS:

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS

CHAIN OF CUSTODY SEALS

REC'D GOOD CONDITION/COLD

CONFORMS TO RECORD

LAB NO.

RELINQUISHED BY 1.

(Signature) (Time)

(Printed Name) (Date)

(Company)

RELINQUISHED BY 2.

(Signature) (Time)

(Printed Name) (Date)

(Company)

RELINQUISHED BY

(Signature)

(Printed Name)

(Company)

RECEIVED BY 1.

(Signature) (Time)

(Printed Name) (Date)

(Company)

RECEIVED BY 2.

(Signature) (Time)

(Printed Name) (Date)

RECEIVED BY (LABORATORY)

(Signature)

(Printed Name)

OCT 17 '90 [illegible] TO 4154511527 FROM TECH/AR

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE TRACKING NUMBER 814258126

8142581263

RECIPIENT'S COPY

Date

1 From (Your Name) Please Print: Jonathan W. Redding
Your Phone Number (Very Important): (415) 451-3300
Company: FITZGERALD ABBOTT & BEARDSLEY
Department/Floor No.
Street Address: 1221 BROADWAY 21ST FLR
City: OAKLAND
State: CA
ZIP Required: 94612

2 To (Recipient's Name) Please Print: Selinda Bendix, Ph.D.
Recipient's Phone Number: ( )
Company: Bendix Enviornmental Research, I
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 1390 Market Street, Suite 418
City: San Francisco
State: CA
ZIP Required: 94102

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.)

IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address
City
State
ZIP Required

3 PAYMENT 1 [x] Bill Sender 2 [ ] Bill Recipient's FedEx Acct No 3 [ ] Bill 3rd Party FedEx Acct No 4 [ ] Bill Credit Card 5 [ ] Cash

4 SERVICES (Check only one box)

Priority Overnight Service (Delivery by next business morning†)
- 11 [ ] YOUR PACKAGING
- 16 [x] FEDEX LETTER *
- 12 [ ] FEDEX PAK *
- 13 [ ] FEDEX BOX
- 14 [ ] FEDEX TUBE

Standard Overnight Service (Delivery by next business afternoon†)
- 51 [ ]
- 56 [ ] FEDEX LETTER *
- 52 [ ] FEDEX PAK *
- 53 [ ] FEDEX BOX
- 54 [ ] FEDEX TUBE

Economy Service (formerly Standard Air) (Delivery by second business day†)
- 30 [ ] ECONOMY SERVICE

Heavyweight Service (for Extra Large or any package over 150 lbs.)
- 70 [ ] HEAVYWEIGHT **
- 80 [ ] DEFERRED HEAVYWEIGHT **

† Delivery commitment may be later in some areas.
* Declared Value Limit $100
** Call for delivery schedule

DELIVERY AND SPECIAL HANDLING
- 1 [ ] HOLD FOR PICK-UP
- 2 [x] DELIVER WEEKDAY
- 3 [ ] DELIVER SATURDAY (Extra charge)
- 4 [ ] DANGEROUS GOODS (Extra charge)
- 5 [ ] CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge)
- 6 [ ] DRY ICE ____ Lbs.
- 7 [ ] OTHER SPECIAL SERVICE
- 8 [ ]
- 9 [ ] SATURDAY PICK-UP (Extra charge)
- 10 [ ]
- 11 [ ]
- 12 [ ] HOLIDAY DELIVERY (Extra charge)

Packages | Weight | Declared Value | Total | Total | Total

DIM SHIPMENT

Received At: 1 Regular Stop 2 Drop Box 4 B.S.C. 3 On-Call Stop 5 Station
FedEx Emp. No.

Emp. No. | Date
- [ ] Cash Received
- [ ] Return Shipment
- [ ] Third Party [ ] Chg. To Del. [ ] Chg. To Hold

Street Address
City State Zip
Received By X
Date/Time Received FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/89
FORMAT 014
014
© 1989 F.E.C. PRINTED IN U.S.A.

8

OCT-12-90 FRI 17:28 415-831-8798 P.

CHROMALAB, INC.

dup

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File No.: 0990161

TECH-ART

Attn: Lew Schalit

Samples not checked for PCBs, O&G

RE: Four soil samples for Gasoline/BTEX, and Oil & Grease analyses

Date Sampled: Sept. 28,1990
Date Extracted: Oct. 4-11, 1990
Date Submitted: Sept. 28, 1990
Date Analyzed: Oct. 4-11, 1990

RESULTS:

Sample No.	Gasoline (mg/Kg)	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl Benzene (ug/Kg)	Total Xylenes (ug/Kg)	Oil & Grease (mg/Kg)
[illegible] floor drain channel LB #1	----	N.D.	7.3	6.9	21	----
soil over tank LB #2	N.D.	N.D.	N.D.	N.D.	N.D.	----
CHUNK #5	----	----	----	----	----	N.,D.
Soil over [illegible] same tank LB #6	N.D.	N.D.	N.D.	N.D.	N.D.	----
BLANK	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
SPIKED RECOVERY	91.7%	98.6%	99.1%	103.5%	105.6%	----
DUP SPIKED RECOVERY	91.1%	89.3%	89.7%	90.05	107.6%	----
DETECTION LIMIT	2.5	5	5	5	5	10
METHOD OF ANALYSIS	5030/ 8015	8020	8020	8020	8020	503 D&E

CHROMALAB, INC.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

EXHIBIT 5
BENDIX 10/24/90

LB = LOWER BASEMENT

LB #1 : "OIL" SAMPLE FROM CENTRAL FLOOR DRAIN

LB #2 : "OILY DIRT" OVER R.H. TANK FACING ALICE ST. (2 TANKS TOGETHER)

LB #3 : CONTENT SAMPLE FROM L.H. TANK FACING ALICE ST. (" " ")

LB #4 : CEILING PIPE INSULATION

CHUNK #5 = LB #5 : SOIL INSIDE SUMP INSIDE LOWER BASEMENT OF ADJACENT TV SHOP

LB #6 : SOIL FROM TANK AT BLDG. CORNER (ALICE ST AND PARK. LOT CORNER)

MGF #7 : [illegible] "WASH [illegible], ETC." AREA OF MAIN GROUND FLOOR CORNER 2 STORY BLDG AWAY FROM HARRISON, OF OFFICE SIDE

CHROMALAB, INC.

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Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File # 0990161 C

Client: Tech-Art
Attn: Lew Schalit
Date Sampled: Sept. 28, 1990
Date Submitted: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990

Project Name:
Project No.:
Sample I.D.: LB #3
Method of Analysis: EPA 8240
Detection Limit: 200 mg/Kg*

COMPOUND NAME	mg/Kg	Spike Recovery
CHLOROMETHANE	N.D	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	N.D.	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	96.5% 98.2%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	950 ←	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	6300 ←	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	110.5% 102.5%
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	N.D.	---
ETHYLBENZENE	1000 ←	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.3% 110.8%
TOTAL XYLENES	5900 ←	---

*High detection limit due to presence of high concentration of compounds in sample.

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

- Environmental Analysis
- Hazardous Waste (#E694)
- Drinking Water (#955)
- Waste Water
- Consultation

dup

October 12, 1990

ChromaLab File # 0990161 Q

Client: Tech-Art
Date Sampled: Sept. 28, 1990
Date of Analysis: Oct. 12, 1990

Attn: Lew Schalit
Date Submitted: Sept. 28, 1990

Project Name:
Sample I.D.: MGF # 7
Method of Analysis: EPA 8240

Project No.:
Detection Limit: 10 ug/Kg

COMPOUND NAME	ug/Kg	Spike Recovery
CHLOROMETHANE	N.D.	---
VINYL CHLORIDE	N.D.	---
BROMOMETHANE	N.D.	---
CHLOROETHANE	N.D.	---
TRICHLOROFLUOROMETHANE	N.D.	98.5% 97.2%
1,1-DICHLOROETHENE	N.D.	---
METHYLENE CHLORIDE	18	---
1,2-DICHLOROETHENE (TOTAL)	N.D.	---
1,1-DICHLOROETHANE	N.D.	---
CHLOROFORM	N.D.	96.5% 98.2%
1,1,1-TRICHLOROETHANE	N.D.	---
CARBON TETRACHLORIDE	N.D.	---
BENZENE	10	---
1,2-DICHLOROETHANE	N.D.	---
TRICHLOROETHENE	N.D.	---
1,2-DICHLOROPROPANE	N.D.	---
BROMODICHLOROMETHANE	N.D.	---
2-CHLOROETHYLVINYLETHER	N.D.	---
TRANS-1,3-DICHLOROPROPENE	N.D.	---
TOLUENE	30	---
CIS-1,3-DICHLOROPROPENE	N.D.	---
1,1,2-TRICHLOROETHANE	N.D.	110.5% 102.5%
TETRACHLOROETHENE	N.D.	---
DIBROMOCHLOROMETHANE	N.D.	---
CHLOROBENZENE	16	---
ETHYLBENZENE	10	---
BROMOFORM	N.D.	---
1,1,2,2-TETRACHLOROETHANE	N.D.	---
1,3-DICHLOROBENZENE	N.D.	---
1,4-DICHLOROBENZENE	N.D.	---
1,2-DICHLOROBENZENE	N.D.	92.3% 110.8%
TOTAL XYLENES	68	---

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Lab Director

2239 Omega Road, #1 • San Ramon, California 94583
415/831-1788 • Facsimile 415/831-8798

CHROMALAB, INC. 2239 Omeg 415/

CHROMALAB FILE # 990161

33

Chain of Cust

PROJ. MGR. Lew Schalit
COMPANY Tech-Art
ADDRESS

SAMPLERS (SIGNATURE) (PHONE NO.)

DATE ____ PAGE ____ OF ____

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	TPH - Gasoline (EPA 5030)	TPH - Gasoline (5030) w/BTEX (EPA 602, 8020)	TPH - Diesel (EPA 3510, 3550)	PURGEABLE AROMATICS BTEX (EPA 602, 8020)	PURGEABLE HALOCARBONS (EPA 601, 8010)	VOLATILE ORGANICS (EPA 624, 8260)	BASE/NEUTRALS, ACIDS (EPA 625/627, 8270)	TOTAL OIL & GREASE (EPA 5520B&E)	PESTICIDES/PCB (EPA 608, 8080)	PHENOLS (EPA 604, 8040)	ASBESTOS		METALS: Cd, Cr, Pb, Zn	CAM METALS (18) w/Cr VI	PRIORITY POLLUTANT METALS (13)					
LB #1 Conveyor Oil Ch	9.28	8.05A	oily					X																
LB #2 Soil under R.H. Tank	↓	8.10	soil			X																		
#3 L.H. Tank Content		9.00	oily								Fr. R.H Double Tank set													
LB #4 ~~[illegible]~~ Ceiling pipe ins			ASB							X	Fr. wash Tank, double set									any Hint of [illegible]				
LB #5 Back Sump		8.45	soil											X						Composite				
LB #6 Conveyor, Sump, UST		9.00										X	TV Sump											
MGF #7 ~~[illegible]~~ Car Wash Sump					X																			
									X						155									
																				MAIN GROUND [illegible]				
					300		115		140		45			75										

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT:	TOTAL NO. OF CONTAINERS	
PO NO.	CHAIN OF CUSTODY SEALS	
SHIPPING ID. NO.	REC'D GOOD CONDITION/COLD	
VIA:	CONFORMS TO RECORD	
	LAB NO.	

RELINQUISHED BY 1.	RELINQUISHED BY 2.	RELINQUISHED BY
(Signature) (Time)	(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)	(Company)

RECEIVED BY 1.	RECEIVED BY 2.	RECEIVED BY (LABORATORY)
(Signature) (Time)	(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name) (Date)
(Company)		

SPECIAL INSTRUCTIONS/COMMENTS:

10 Days T-A-T

CHROMALAB, INC.

Analytical Laboratory
Specializing in GC-GC/MS

dup

- Environmental Analysis
- Hazardous Waste (#E694
- Drinking Water (#955)
- Waste Water
- Consultation

October 12, 1990

ChromaLab File # 0990165

Tech-Art

Attn: Lew Schalit

Re: One soil sample for Gasoline/BTEX analysis

Date Sampled: Sept. 29, 1990
Date Analyzed: Oct. 12, 1990
Date Submitted: Sept. 29, 199

Results:

Sample No.	Gasoline (mg/Kg)	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl Benzene (ug/Kg)	Total Xylenes (ug/Kg)
a*	24	N.D.	N.D.	6.0	4.7
BLANK	N.D.	N.D.	N.D.	N.D.	N.D.
SPIKE RECOVERY	91.1%	89.3%	89.7%	90.0%	107.6%
DETECTION LIMIT	2.5	5.0	5.0	5.0	5.0
METHOD OF ANALYSIS	5030/8015	8020	8020	8020	8020

*Sample may consist of aged gasoline and/or diesel fuel

ChromaLab, Inc.

David Duong
Senior Chemist

Eric Tam
Laboratory Director

IROMALAB, INC.

2239 Omega Road, #1 • San ...mon, California 94583
415/831-1788 • Facsimile 415/831-8798

Chain of Custody

DATE 9/29/90 PAGE 1 OF 1

OR. L. SCHALIT
ANY TECH/ART
ESS 462 DOUGLASS ST
SAN FRANCISCO CA 94114

RS (SIGNATURE) Lew Schalit (PHONE NO.) 415-550-2435

ANALYSIS REQUEST

MPLE ID.	DATE	TIME	MATRIX	LAB ID.	TPH - Gasoline (EPA 5030)	TPH - Gasoline (5030) w/BTEX (EPA 602, 8020)	TPH - Diesel (EPA 3510, 3550)	PURGEABLE AROMATICS BTEX (EPA 602, 8020)	PURGEABLE HALOCARBONS (EPA 601, 8010)	VOLATILE ORGANICS (EPA 624, 8240)	BASE/NEUTRALS, ACIDS (EPA 625/627, 8270)	TOTAL OIL & GREASE (EPA 5030&E)	PESTICIDES/PCB (EPA 608, 8080)	PHENOLS (EPA 604, 8040)			METALS: Cd, Cr, Pb, Zn	CAM METALS (18) W/CP VI	PRIORITY POLLUTANT METALS (13)						NUMBER OF CONTAINERS
	9/29	10[12]	SOIL			x		look for diesel traces + information																	1
...L BASEMENT ...VEL UNDER ...K								take sample from jar top																	

CHROMALAB FILE # 990165

OJECT INFORMATION	SAMPLE RECEIPT	
HARRISON ST	TOTAL NO. OF CONTAINERS	1
	CHAIN OF CUSTODY SEALS	
	REC'D GOOD CONDITION/COLD	
I.D. NO.	CONFORMS TO RECORD	
	LAB NO.	

RELINQUISHED BY 1.	RELINQUISHED BY 2.	RELINQUISHED BY 3.
(Signature) Lew Schalit (Time) 11[15]	(Signature) (Time)	(Signature) (Time)
(Printed Name) LEW SCHALIT (Date) 9/29/90	(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)	(Company)

RECEIVED BY 1.	RECEIVED BY 2.	RECEIVED BY (LABORATORY) 3.
(Signature) (Time)	(Signature) (Time)	(Signature) [signature] (Time) 1115
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name) ERIC TOM (Date) 9/29/90
(Company)	(Company)	(Lab) CHROMALAB.

. INSTRUCTIONS/COMMENTS:

10 DAY TURNAROUND
LESS 10%

SECTION 2
SITE DESCRIPTION AND HISTORY

The subject site is located in downtown Oakland and is bordered by Harrison Street on the west and Alice Street on the east, between 14th and 15th Streets (Figure 1). Lake Merritt is located approximately one-quarter mile east of the subject site. Figure 2 presents a site plan that outlines the building perimeter, adjacent streets, and suspected locations of both on-site and off-site USTs.

A garage facility utilized for parking automobiles and light trucks currently exists on the site, and essentially consists of two directly adjoining buildings. The first is the principal entrance to the parking garage at 1432 Harrison Street. This single-story building contains a partial mezzanine and is constructed of timber and masonry. The second is a multi-story garage that is on the Alice Street portion of the property and is constructed of reinforced concrete. Historical aerial photographs date construction of the buildings back some forty to fifty years.

Results of Previous Investigations

Previous investigations by others indicate that the soil is contaminated beneath the site and that such contamination includes measurable quantities of gasoline and diesel fuels, benzene, toluene, ethylbenzene, and xylenes (BTEX) aromatic constituents, and PCBs. The reported analytical results (Table 1) are based on analyses of selected soil samples collected during the drilling of 6 exploratory borings by Subsurface Consultants in October 1990. The Subsurface Consultants' report also indicates that subsurface materials consist primarily of dense, fine-grained sands containing varying amounts of clay and silt. Published geologic maps indicate that these sediments are part of the Merritt Sand Formation. Groundwater was encountered by Subsurface Consultants during the drilling at depths ranging from 23 to 25 feet below the Harrison Street grade. Information regarding groundwater flow direction is not available; however, it is presumed to flow eastward toward Lake Merritt.

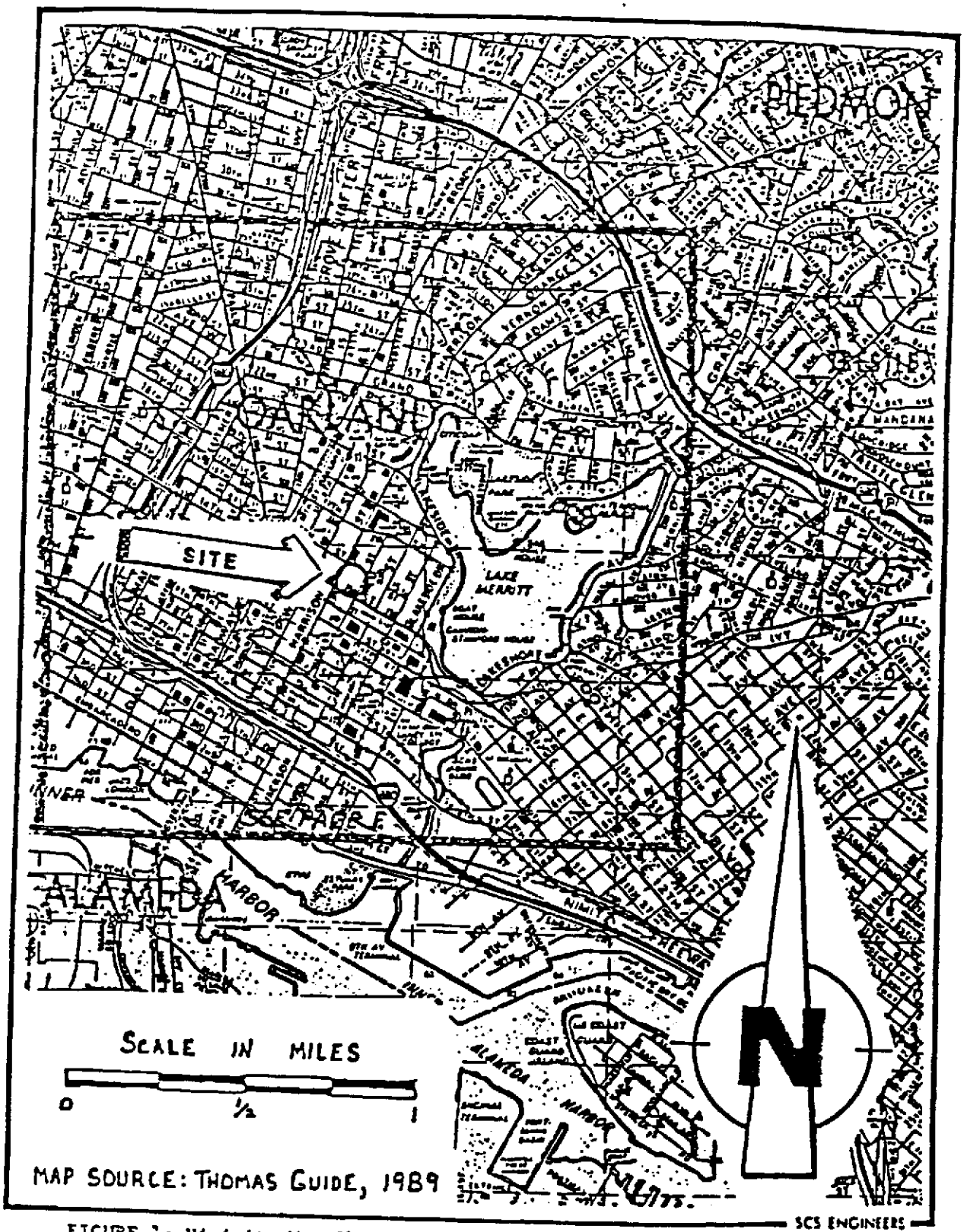


FIGURE 1: Vicinity Map Showing the Location of Subject Site

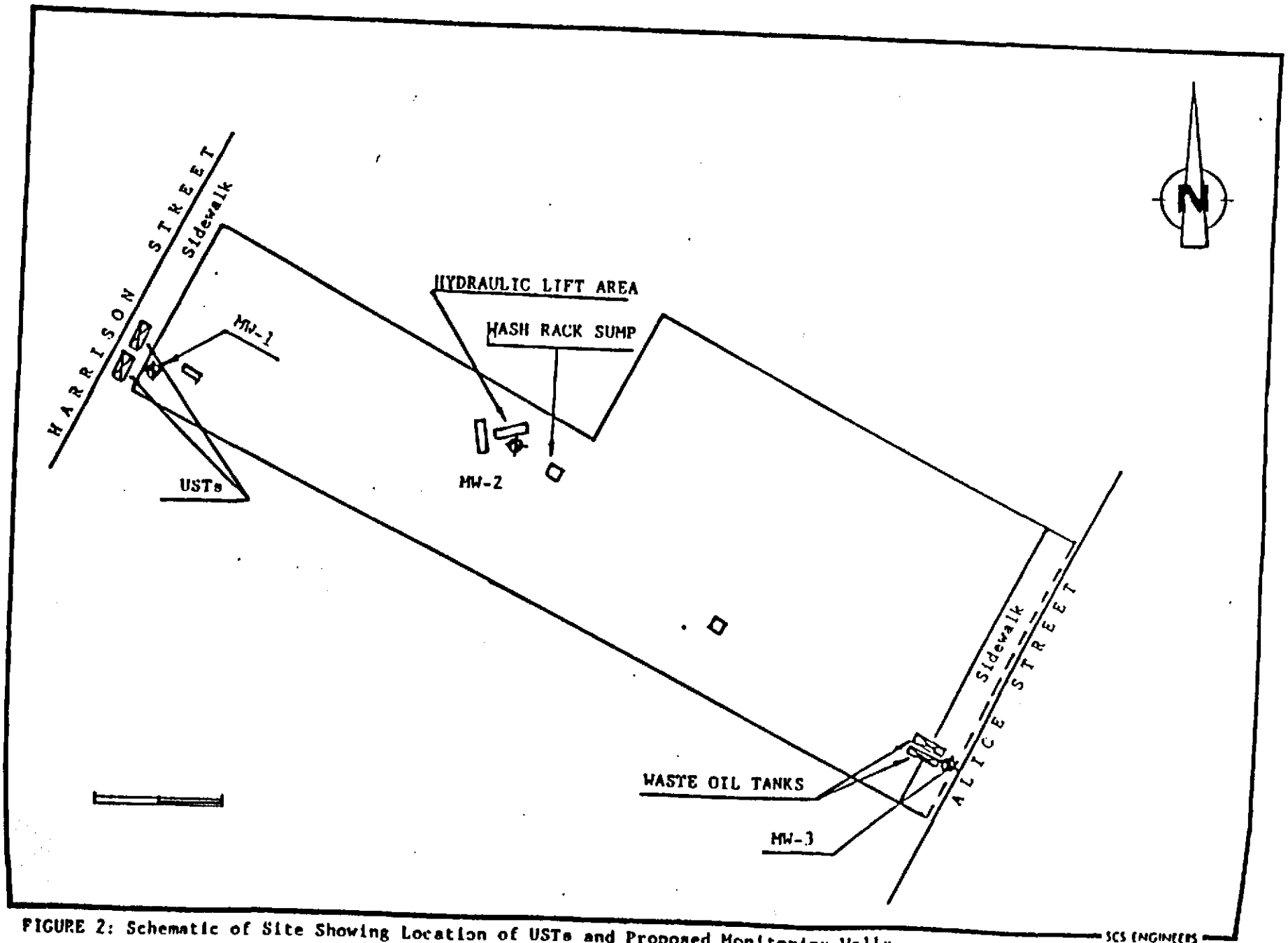


FIGURE 2: Schematic of Site Showing Location of USTs and Proposed Monitoring Wells

TABLE 1. CONTAMINANT CONCENTRATIONS IN SOIL
(Results of Subsurface Consultants October 1990 Investigation)

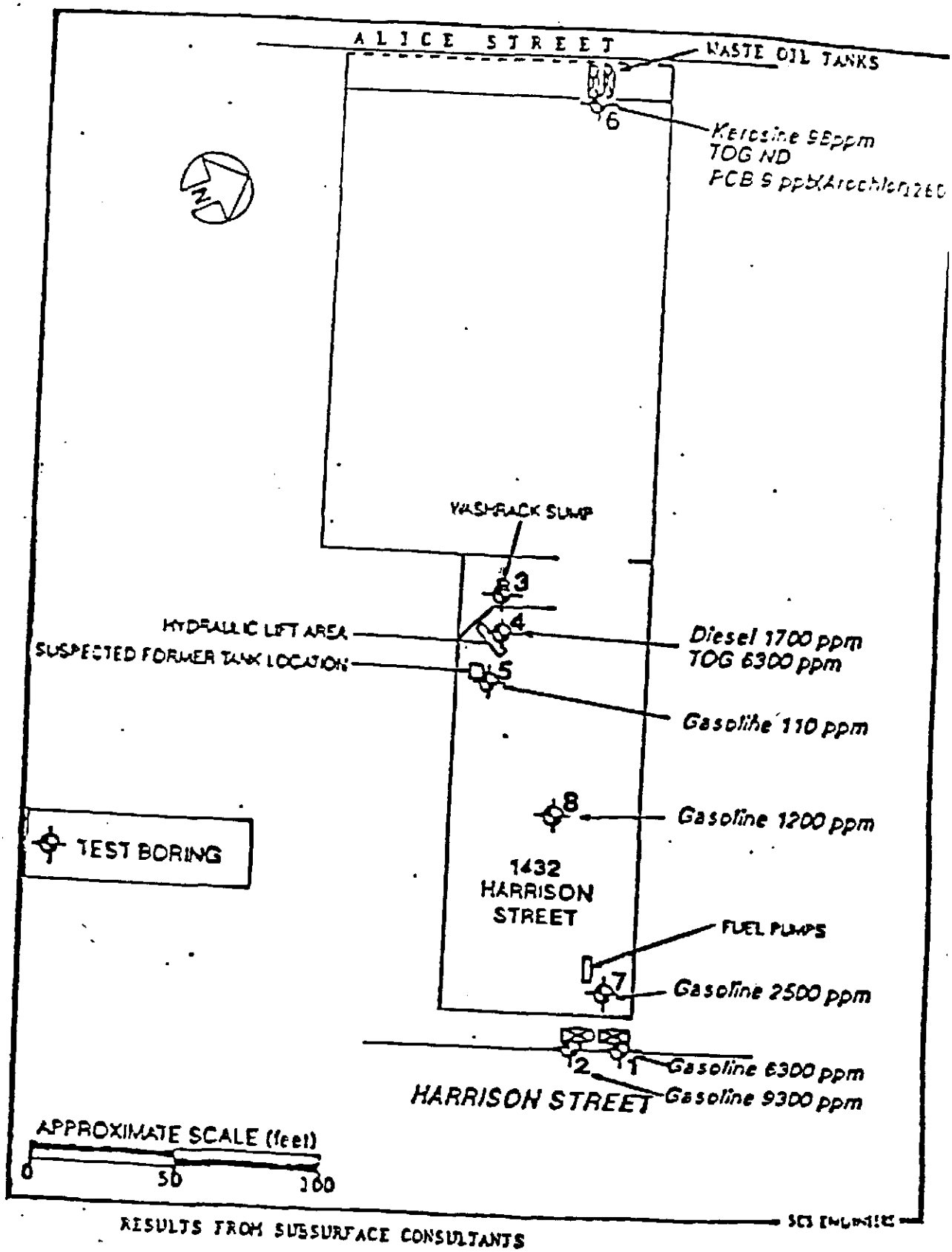
Boring No. & Depth (ft)	TVH[1] (ppm)	B[2] (ppb)	T[3] (ppb)	X[4] (ppb)	X[5] (ppb)	TOG[6] (ppm)	TKH[7] (ppm) Keros./Diesel	OTHER 8010/Sol Pb/PCBs ---/(ppm)/(ppb)
B1 @ 20	6,300	99,000	490,000	610,000	110,000	---[8]	---/---	---/---/---
B2 @ 18.5	9,300	98,000	900,000	1,100,000	190,000	---	---/---	---/0.21/---
B3 (in sump)	---	---	---	---	---	---	---/---	---/---/---
B4 @ 10	---	---	---	---	---	6,300	ND[9]/1,700	---/---/---
B5 @ 22.5	110	24	210	1,300	69	---	---/---	---/---/---
B6 @ 9	---	ND	ND	ND	ND	ND	98/ND	ND/0.06/9 (Arochlor 1260)
B6 @ 9.5	---	---	---	---	---	ND	140/ND	---/---/---

1 Total Volatile Hydrocarbons, mg/kg = ppm
2 Benzene, ug/kg = ppb
3 Toluene
4 Xylene
5 Ethylbenzene
6 Total Oil & Grease
7 Total Extractable Hydrocarbons (as kerosene and diesel)
8 --- = Not tested for
9 ND = Not detected

TABLE 1. CONTAMINANT CONCENTRATIONS IN SOIL (CONT'D)
(Results of Subsurface Consultants October 1990 Investigation)

Boring No. & Depth (ft)	TVH[1] (ppm)	B[2] (ppb)	T[3] (ppb)	X[4] (ppb)	X[5] (ppb)	TOG[6] (ppm)	TKH[7] (ppm) Keros./Diesel	OTHER 8010/Sol Pb/PCBs ---/(ppm)/(ppb)
B7 @ 13	ND	ND	ND	ND	ND			
B7 @ 20	2,500	3,500	34,000	130,000	33,000	---	---/---	---/0.07/---
B8 @ 22.5	1,200	2,300	38,000	89,000	18,000	---	---/---	---/---/---

1 Total Volatile Hydrocarbons, mg/kg = ppm
2 Benzene, ug/kg = ppb
3 Toluene
4 Xylene
5 Ethylbenzene
6 Total Oil & Grease
7 Total Extractable Hydrocarbons (as kerosene and diesel)
8 --- = Not tested for
9 ND = Not detected



RESULTS FROM SUBSURFACE CONSULTANTS

Suspected sources of contamination may include either on-site and/or off-site USTs. The lateral and vertical extent of contamination has not yet been defined. A previous geophysical investigation by J. R. Associates completed in August 1990 disclosed the presence of several USTs and associated facilities within the boundaries of the subject site. A description of these tanks and a summary of investigative and remedial actions which have been performed to date are presented below.

Waste Oil Tanks

Two waste oil tanks are located beneath the basement floor of the multi-story parking structure along Alice Street. Figure 3 shows the tanks and associated piping and vent lines in the area. The date of installation of these tanks is unknown. No records have been located which have documented the capacity or composition of these tanks. However, it is believed that each tank has an approximately 1000-gallon capacity and is of steel construction. On October 27, 1990, Falcon Energy drained the contents of both tanks by removing a combined total of 1300-gallons of waste oil from them.

Gasoline Tanks

Two gasoline tanks are located near the western property boundary beneath the Harrison Street sidewalk in front of the entrance to the garage. Permits issued to a former long-term tenant of the garage, Douglas Motor Services, show that these tanks each have 1000-gallon capacities, are of steel construction, and were installed in 1975 and 1982, respectively. On October 27, 1990, Falcon Energy removed most gasoline (total less than 200 gallons) from the tanks. The condition of these two tanks is unknown, although a sample collected from one was discolored by rust. The recovered gasoline and waste oil was accepted and utilized by a recycling contractor.

It should be noted that there is evidence of two other abandoned-in-place USTs a few feet west of the above-described gasoline tanks, beneath the Harrison Street sidewalk of the adjacent property. These tanks and property are owned and operated by other parties.

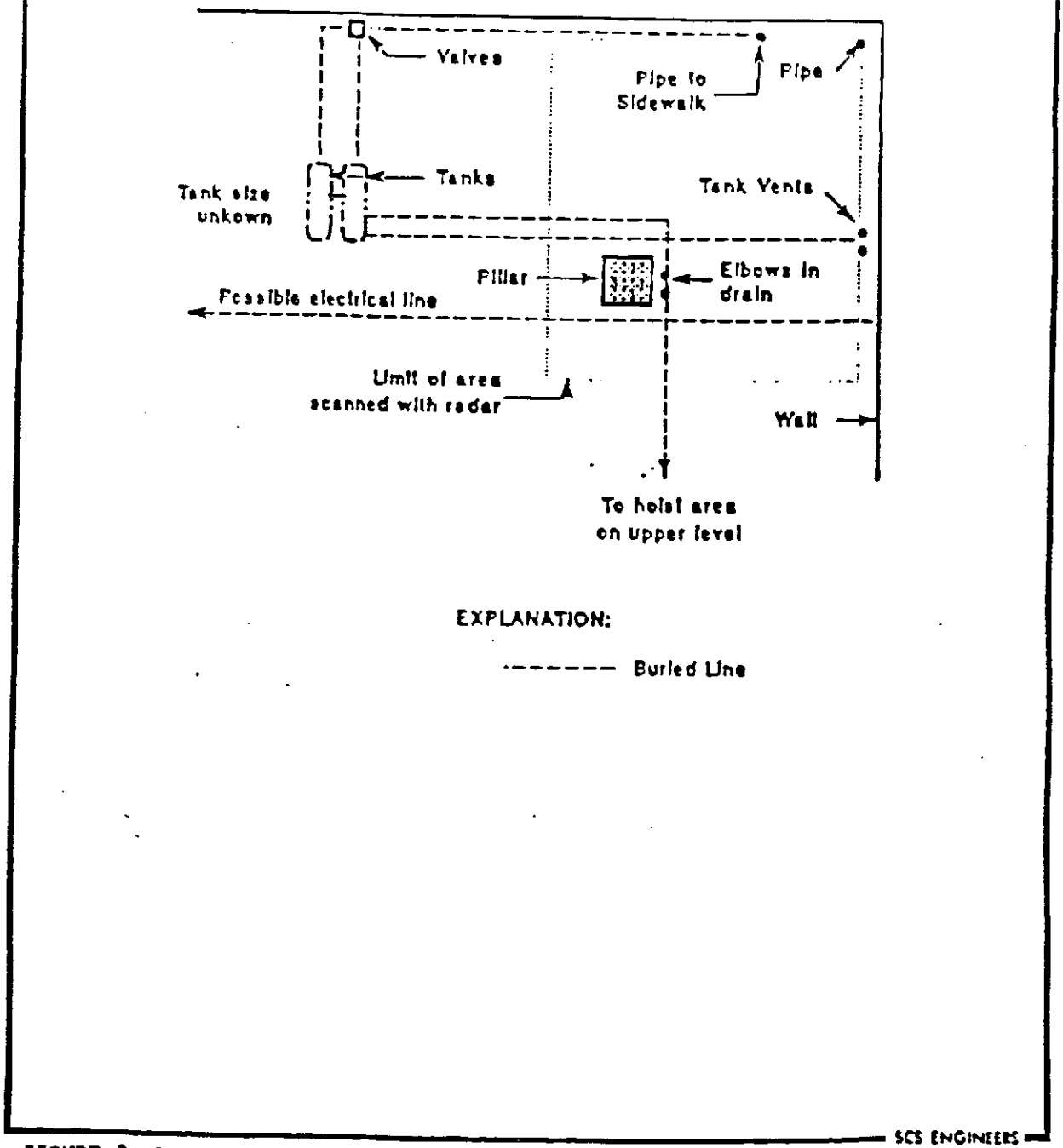


FIGURE 3: Detailed Site Plan of Alice Street Basement Garage, Showing Tank and Associated Piping Locations based on Geophysical Survey

Hydraulic Lift Area

The recent J. R. Associates geophysical investigation also identified a probable underground fluid reservoir located near the hydraulic lift area as well as three hydraulic lift rams inside the Harrison Street parking garage. Figure 4 shows the hydraulic lifts and associated piping in the area; the area of the Ground Penetrating Radar (GPR) anomaly marks the suspected location of the underground fluid reservoir.

There is no available record to indicate that integrity testing has ever been performed on any of the above-described tanks. The tanks are suspected to be the principal source(s) of the site's contamination. However, the time(s) of occurrence and total quantity of product(s) lost cannot be estimated at this time.

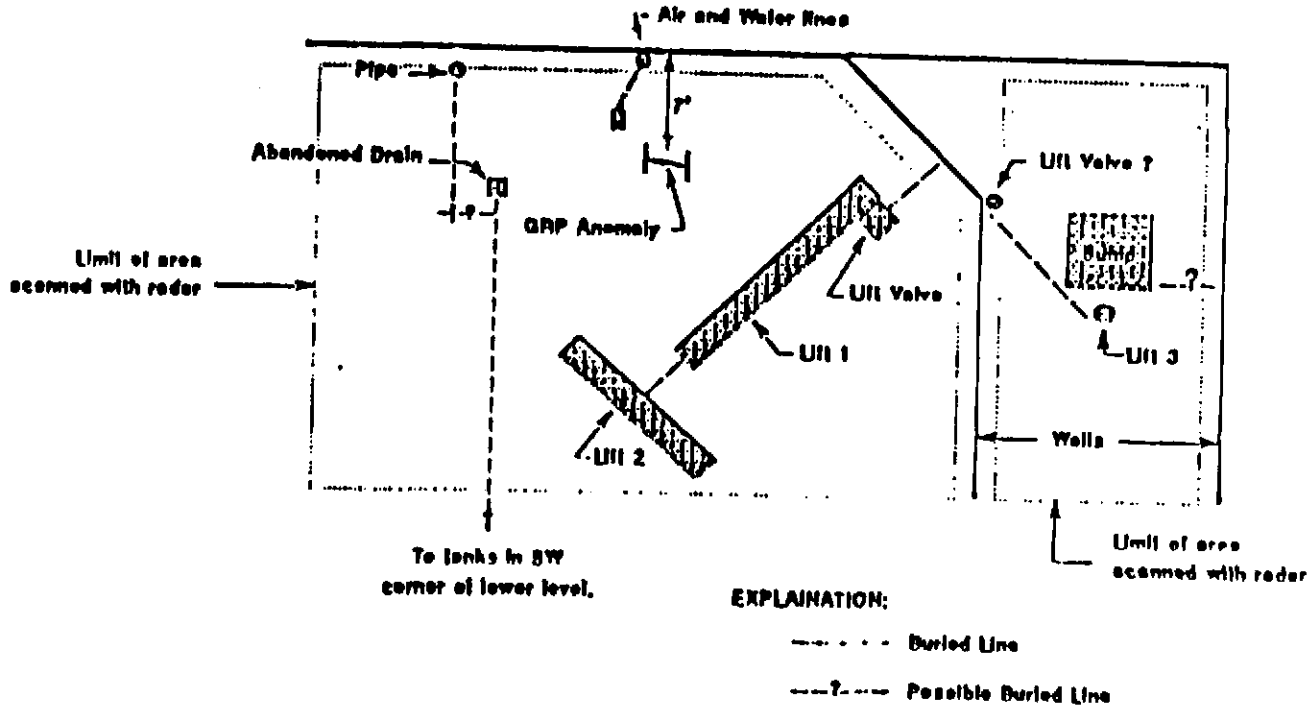


FIGURE 4: Detailed Site Plan of Hydraulic Lift Area in upper Harrison Street Garage, Showing Lift and associated Piping and Suspected Underground Fluid Reservoir (GPR anomaly) areas

SCS ENGINEERS

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November 12, 1991

VIA MESSENGER

Mr. Robert E. Gils
President
RGA, Inc.
1260 45th Street
Emeryville, CA 94608

Re: 1432-1434 Harrison Street and 1435 Alice Street Garages

Dear Bob:

I have enclosed for your review a chronological binder of reports and correspondence from SCS Engineers and Alameda County. Please review them this week as your time permits, and we will plan on meeting with you on Monday, November 18, at our office. John Cummings of SCS will join us. You will be formally retained by our clients, Alvin Bacharach and Barbara Jean Borsuk.

Please call me in the meanwhile if you have any questions.

Very truly yours,

Randall D. Morrison

RDM:ma

Enclosure: Binder

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December 6, 1991

Mr. Thomas A. Joseph
Director, Business Development
ROBERT GILS ASSOCIATES, INC.
6400 Hollis Street, #4
Emeryville, CA 94608-1028

Re: 1432 Harrison Street, Oakland, California

Dear Tom:

I have enclosed our compilation of Chromalab reports, which were produced at various times during the litigation. We recently subpoenaed Chromalab's files and will advise you if there are any additional reports you should consider.

Very truly yours,

Randall D. Morrison

RDM:ma

Enclosures: Chromalab reports

cc w/out Enclosure:

Mark Borsuk
John Cummings

CHROMOLAB REPORT

Date of Report	ID # of Sample	Date Sampled
A. Fax from John Cummings		
October 19, 1990	1090048	October 6, 1990
October 19, 1990	1090048	October 6, 1990
October 12, 1990	0990161 C	September 23, 1990
October 22, 1990	1090137 D	October 19, 1990
October 12, 1990	0990161 G	September 28, 1990
October 18, 1990	1090048 C	October 6, 1990
October 31, 1990	1090171 A	October 25, 1990
October 31, 1990	1090171 B	October 25, 1990
October 31, 1990	1090171 D	October 25, 1990
November 1, 1990	0990161	September 28, 1990
November 1, 1990	1090171	October 25, 1990
November 1, 1990	1090171 C	October 25, 1990
October 22, 1990	1090137 D	October 22, 1990

Date of Report	ID # of Sample	Date Sampled
B. Deposition of James Bowers		
October 22, 1990	1090137 D	October 18, 1990
October 22, 1990	1090137 D	October 22, 1990
October 22, 1990	1090137 C	October 19, 1990
October 22, 1990	1090137 B	October 19, 1990

Date of Report	ID # of Sample	Date Sampled
C. Deposition of Selina Bendix, Ph.D.		
1. Exhibit 2		
October 22, 1990	1090137 D	October 18, 1990
October 22, 1990	1090137 D	October 22, 1990
October 22, 1990	1090137 C	October 19, 1990
October 22, 1990	1090137 B	October 19, 1990

2. Exhibit 4

October 12, 1990	0990161	September 28, 1990
October 12, 1990	0990161 C	September 28, 1990
October 12, 1990	0990161 G	September 28, 1990
October 12, 1990	0990165	September 29, 1990
Chart with no dates	990161	

3. Exhibit 5

October 12, 1990	0990161	September 28, 1990
October 12, 1990	0990161 C	September 28, 1990
October 12, 1990	0990161 G	September 28, 1990
Chart with no dates	990161	
October 12, 1990	0990165	September 29, 1991
Chart dated September 29, 1990		