



**Western Copper
Corporation**

Project Proposal
Carmacks Copper Project
Yukon Territory

Appendix L

Spill Contingencies and Emergency Response Plan



WESTERN SILVER CORPORATION

**CARMACKS COPPER PROJECT
YUKON TERRITORY**

SPILL CONTINGENCY AND EMERGENCY RESPONSE PLAN

May 2005

Table of Contents

| | | |
|-------------|--|-----------|
| 1.0 | INTRODUCTION..... | 1 |
| 2.0 | SECURITY | 2 |
| 3.0 | TRANSPORTERS | 3 |
| 4.0 | RELEASE/SPILL PREVENTION AND CONTAINMENT | 4 |
| 4.1 | LEACH PAD AND EVENTS POND..... | 4 |
| 4.1.1 | <i>Liner System</i> | <i>4</i> |
| 4.1.2 | <i>Leakage Rates</i> | <i>5</i> |
| 4.1.3 | <i>Events Pond Capacity</i> | <i>5</i> |
| 4.1.4 | <i>Emergency Response</i> | <i>6</i> |
| 4.2 | PIPELINES/SOLUTION COLLECTION DITCHES..... | 6 |
| 4.3 | FUEL STORAGE AND HANDLING..... | 7 |
| 4.4 | ACID PROCESSING REAGENT STORAGE..... | 8 |
| 4.5 | LUBRICANTS, OILS, SOLVENTS AND DEGREASERS | 8 |
| 5.0 | INSPECTION AND MAINTENANCE | 9 |
| 6.0 | OPERATING PROCEDURES | 10 |
| 7.0 | ORGANIZATION AND RESPONSIBILITIES | 10 |
| 8.0 | PETROLEUM PRODUCT SPILLS | 13 |
| 9.0 | REPORTING PROCEDURES | 13 |
| 10.0 | EMERGENCY SPILL RESPONSE PROCEDURE | 16 |
| 10.1 | RESPONSE FOR GASOLINE SPILLS..... | 17 |
| 10.2 | RESPONSE FOR DIESEL SPILLS..... | 18 |
| 11.0 | DANGEROUS SUBSTANCES | 20 |
| 12.0 | PLAN IMPLEMENTATION AND AMENDMENT | 21 |

List of Appendices

| | |
|------------|--|
| Appendix A | General Arrangement – Material Storage Locations |
| Appendix B | Reportable Spills |
| Appendix C | Spill Reporting Form |
| Appendix D | List of Typical Spill Response Equipment |
| Appendix E | Material Safety Data Sheets |

1.0 INTRODUCTION

The Carmacks Copper operations consist of an open pit copper mine, heap leach pad, copper recovery process plant and related ancillary facilities, and waste rock storage area. Due to the nature and layout of the operations, all storage areas have been designed for spill containment and control with runoff control facilities, liners, containment diking or concrete flooring of the plant itself.

The purpose of the Spill Contingency and Emergency Response Plan is to minimize spill potential through design features (such as secondary containment impoundments), the establishment of procedures for storage and handling of material, and to enable a quick and efficient response in the event of a spill. This plan, which has been patterned after that of the Brewery Creek Emergency Response Plan, has been developed using industry and regulatory approved handling, storage, containment, response and notification procedures.

The procedures outlined in this plan are designed to protect the health and safety of mine personnel and the public, to minimize adverse effects to wildlife, and to help ensure that waters of the Territory will not be degraded. The Carmacks Copper Spill Contingency and Emergency Response Plan is designed to cover the operations area and the access road into the site. However, the company will also respond, if requested, to any incidents between Whitehorse and the Freegold Road turnoff, but will assume no responsibility for the incident outside this defined response area.

This Spill Contingency and Emergency Response Plan accounts for facility design, construction, operation and maintenance. This document is designed to highlight the elements of the Carmacks Copper Spill Contingency and Emergency Response Plan and associated procedures.

The Spill Contingency and Emergency Response Plan will be maintained in the following locations:

- Mine Manager Office;
- Administration Offices (i.e. Safety offices);
- Departmental Superintendents Offices;
- Environmental Coordinators Offices;
- First Aid Room; and
- Ambulance.

In addition, copies will be issued to:

- Little Salmon Carmacks First Nation (LSCFN);
- Village of Carmacks;
- Carmacks RCMP;
- Whitehorse General Hospital;
- Environment Canada Spill Centre;
- YG Department of Environment, Water Resources Branch;
- YG Department of Environment, Environmental Affairs;
- YG Energy, Mines and Resources, Minerals Development Branch; and

- YG Energy, Mines and Resources, Client Services & Inspection Branch, Village of Carmacks Natural Resource Officer.

A variety of heavy equipment, suitable for contingency use during a hazardous spill, will be on site at different phases of the operation. An Equipment Inventory will be kept updated for efficient relocation of heavy equipment required for spill response. The On-Scene Coordinator (OSC) and Spill Contingency and Emergency Response Team (ERT) will have a current list of available heavy equipment.

Typically, bulldozers, backhoes, excavators, and other equipment will be located at various locales throughout the mine site and the access road and will be available for spill contingencies on a site-specific basis.

Maps of the Contingency Plan Area covered by the final Spill Contingency Plan will be prepared. Potentially affected watercourses will be highlighted on the topographic maps. Important strategic items for a spill response (heavy machinery, sorbents, safety items, etc.) will be localized at fuel or chemical storage areas during construction and will be relocated as construction progresses. During operations, permanent storage locations will be situated for minimum response times. Refer to Appendix A for a map that shows the general arrangement of the site with material storage locations.

The only solid materials requiring special containment are lime and cobalt powder; liquid materials include SX/EW reagents (including sulphuric acid), kerosene, gasoline, diesel fuel, propane, varsol, and ethylene glycol. Storage facilities will be designed with adequate containment and response facilities to rapidly clean up any spills. Loading and transport protocols will reduce the possibility of spills occurring during shipment. Full design details of quantities of hazardous materials to be handled and stored are presented in the Feasibility Study completed by Kilborn (1994).

Transportation to the site from Alaska or British Columbia (B.C.) will follow all transportation regulations for Alaska, B.C. and the Yukon Territory. Any spills on site or during transport will follow the general procedures presented in the spill plan. Transport of sulphuric acid from Skagway to the mine site will require the storage of neutralizing agents such as bicarbonate or a slaked lime/soda ash mixture and sorbents at various department of highways stations along the route (i.e. Carcross, Whitehorse, and Carmacks). In addition, liquid bicarbonate will be stored at the stations to treat acid spills in adjacent waterways. Contractors will be identified for emergency response and an emergency response team will be trained.

2.0 SECURITY

The Carmacks Copper Mine will have an active security/safety system. All in-coming traffic will enter the plant site area first and will be required to sign in. Visitors will be directed to the administration offices and equipment and supplies will be directed to the warehousing or cold storage receiving areas. All trucks and vehicles delivering chemicals, fuels, etc. will be inspected for leakage and integrity when entering the Carmacks Copper property. The inspection will be performed by warehouse personnel with the assistance of maintenance personnel when requested. The inspection will include:

- Cargo inspection, quantity and quality against way bills and bills of lading;
- Checks for any visible leakage; and

- General condition of the vehicle and equipment.

Routine patrols of the property, including the waste rock storage area and explosives magazines will be carried out on a daily basis either by foot or by vehicle. All pump stations and process control points will be equipped with adequate lighting or area and yard lighting to prevent vandalism and to allow detection of spills or leaks. Primary facilities will be secured or equipped with locks (i.e. valves or pump starters).

The Carmacks Copper Mine security system will prevent accidental or intentional entry to the plant that might result in vandalism, theft, sabotage or other improper or illegal use of facilities that could possibly result in an incident.

3.0 TRANSPORTERS

Transporter Qualifications

Transporters will be carefully selected, and are required to have Department of Transport certification, acceptable spill response programs, hazardous materials safety and handling procedures (including material safety data sheets [MSDS]), and driver training programs. Each approved transporter will be periodically reviewed to assure that they continue to carry valid Department of Transport certification.

Delivery Scheduling

The potential for spills will be minimized to the extent possible by scheduling deliveries to avoid any regular or temporary congestion that may occur along routes leading to Carmacks Copper project. Transporters will be required to advise the operations of any delays or schedule changes that occur. Deliveries will be timed during daylight hours to coincide with warehousing hours and to minimize offloading problems.

Regulatory Compliance

Transporters making deliveries to Carmacks Copper operations will be required to follow all federal and territorial Department of Transportation regulations for the transportation of dangerous goods, as defined in the Transportation of Dangerous Goods Act (TDGA). This will include all placarding, packaging, manifests, etc.

Response Outside Territory

The transporters or contact carriers will implement their response plan. The Carmacks Copper OSC will be notified as a courtesy and kept informed of the success of the cleanup.

Response Inside Territory

Carmacks Copper's Spill Contingency and Emergency Response Plan is designed to cover the operations area and the access road into the site. However, the company will also respond, if requested, to any incidents between Whitehorse and the Freegold Road turnoff. The transporter or other agency (i.e. RCMP) who is first made aware of the emergency will be required to notify the territory emergency response office. If the Carmacks Copper operations

are informed of the incident, the OSC may then direct the ERT to the scene if requested, although Carmacks Copper will assume no responsibility for the incident beyond their defined Response Area.

Response Access Road and Operations Area

The Carmacks Copper's Spill Contingency and Emergency Response Plan is designed to respond to spills or an emergencies which arise at the site or along the access road from the Mt. Freegold Road turnoff to the site. The transporter or mine personnel who is first made aware of the emergency will be required to notify the OSC. He/she will then immediately coordinate the clean-up operations and direct the ERT to the scene.

4.0 RELEASE/SPILL PREVENTION AND CONTAINMENT

Release prevention measures centre around proper design, inspection, and maintenance procedures. The leach pad and events pond at Carmacks Copper are designed as zero discharge facilities under all normal and extreme operating conditions; all process solutions are either contained within the events pond or process fluid management system for re-circulation.

A perimeter diversion system consisting of a lined ditch and raised access road has been included in the design to direct all clean runoff away from the heap leach pad and to direct all extraneous runoff from the heap into the heap events pond. The general arrangement includes a 5.0 m wide lined barren solution ditch between the heap perimeter toe, with the heap synthetic and soil liner ramped up onto a 1m high outer dike. Outside of the dike is a 5.0 m wide running course and a runoff collection ditch.

Runoff from the plant site area will be directed to a plant site sedimentation pond, located downslope of the plant site, heap leach pad and events pond.

Runoff from the waste rock storage area will be intercepted by a perimeter ditch and directed to a stilling pond located at the eastern end of the stockpile. This pond also serves as a source of plant make-up water.

Any release from the plant site sedimentation pond and waste rock storage area stilling pond will enter Williams Creek once it is determined that effluent criteria are met.

4.1 LEACH PAD AND EVENTS POND

The leach pad has been designed such that any catastrophic release of process fluids would be contained within the events pond.

4.1.1 Liner System

The entire heap leach area will be lined. The heap leach pad will be equipped with a double synthetic geomembrane liner system overlying by a low permeability soil liner, and incorporates a leak detection and recovery system (LDRS).

The primary and secondary liners will be separated by a HDPE geonet LDRS. A high level of QA/QC will be employed during liner placement ensuring liner integrity.

Any seepage collected by this system will be pumped back to the heap storage. In addition to the geonet leak detection system, the entire heap leach pad below the secondary soil liner will be equipped with foundation drains, which are located in natural draws within the heap leach pad area. This secondary drainage system, which is designed to provide drainage and pore pressure relief for groundwater generated by thawing permafrost, terminates in the events pond and acts as a secondary LDRS. Consequently, minimal contamination to the groundwater is expected since any seepage through the primary leak detection system and any seepage picked-up by the foundation drains will be directed to heap or events pond storage.

The events pond is also equipped with a double synthetic geomembrane liner separated by its own geonet LDRS, independently equipped with a pump-back recovery system. Any seepage that escapes the LDRS and the foundation drainage system, if any, is expected to be extremely minor. Any water below the heap will migrate down gradient toward the events pond, the mine site sediment control pond, and then to Williams Creek.

4.1.2 Leakage Rates

Seepage rates through the outer liner from the heap leach pad have been estimated to be in the order of 0.1 m³/day when applying a contact coefficient of 0.21 for the liner moulding and 0.5 m³/day when using an extremely conservative coefficient of 1.15. Even if these seepage rates could not be intercepted by the fountain drains, they would have little or no impact on regional groundwater quality and were found to be too small to project impacts on Williams Creek water quality. Seepage through the liner and seepage collection systems would be minor, given that the active layer is relatively restricted and shallow. If localized groundwater was adversely affected, measures could be implemented to intercept this water within the draw down-gradient of the heap leach pad for pump-back or treatment, as required.

4.1.3 Events Pond Capacity

Normally, solution will flow directly from the heap to the plant. When there is a high-rainfall or high-precipitation event, or when the plant cannot accept solution, the flow can be directed from the heap to the events pond. The events pond will have a capacity of approximately 160,000 m³ to store the following combinations of events:

- The operating solution volume, plus
- Excess runoff inflows from the critical duration 100-yr return period event occurring at the most critical point in time, plus,
- An allowance for heap draindown as follows:
 - During the first year of operation, 100% of the total potential heap draindown volume, or
 - During subsequent years of operation, 48 hours of draindown at the full rate of solution application. For a solution application rate of 540 m³/hr this volume is 26 000 m³; and
- Redundant systems (i.e. pumps, power, spare parts).

The total available solution storage volume of 160 000 m³ will provide storage for 100% of the total potential draindown volumes in the winter months. This volume is calculated to be 22,000 m³ more than the maximum required solution storage volume (Clearwater Consultants Ltd., 1998). At the start of the winter season and until the start of the snowmelt every year, the

events pond will be empty thereby ensuring that the full solution storage capacity of the system is available during the winter and in advance of the annual snowmelt. Therefore, 100% of the total potential draindown volume may be stored in the winter at all times throughout the mine life for all precipitation conditions.

4.1.4 Emergency Response

If monitoring reveals that the volume of water in the LDRS has increased but the quality is uncontaminated, the sources of water would be from below the heap leach pad and no immediate action would be required. If the quantity increases and the quality deteriorates by more than 50% of normal (e.g. copper concentrations or sulphate concentrations double), the source of seepage would be from the heap leach pad and would be a confirmed leak and action would be required immediately to intercept this water at source. Action would be to immediately increase the amount of pumping and seepage withdrawal to the heap storage to ensure that there is minimal hydraulic head on the outer liner and to increase the amount of monitoring of the foundation drains. The location of the leak would be determined from specific LDRS monitoring locations and heap application in that area would be restricted.

The specific "action level trigger" would be changes in total copper concentrations since this analyses would be done routinely by AAS at the site laboratory where quick turn around times can be expected.

If monitoring reveals that the volume of water in the foundation drains has increased but the water is uncontaminated, the source of water would likely be from groundwater and no immediate action would be required. If the quantity of water in the foundation drains increases and the quality deteriorates by more than 25% of normal, the source of seepage would be from the heap leach pad. This would again be considered a confirmed leak and immediate action would be required to intercept this water at source. Since the foundation drainage network reports to the events pond, depending on the volume of seepage, action would be to pump this water to the mill raffinate treatment system for neutralization or depending on quality, back to the mill pregnant solution system.

In the event that there was a major rupture of both primary and secondary liners, the volume of leakage could outpace the ability of the seepage recovery systems. Under such circumstances, all operations would have to be immediately suspended and Spill Contingency and Emergency Response Plans implemented immediately. Action would require the excavation of cut-off trenches below the heap leach pad and the installation of pumping equipment to intercept groundwater flow below the events pond and the pumping of ground water to the events pond and raffinate treatment system.

4.2 PIPELINES/SOLUTION COLLECTION DITCHES

Pipelines between the leach pad, events pond and process plant are either buried or located in ditches lined with synthetic geomembrane. Solution collection ditches are graded, so that in the event of a pipeline leak, solution will flow to either the in-heap solution pond or the events ponds.

In the event of a major pipeline rupture, temporary berms or dikes will be constructed using earthmoving equipment to contain releases until emergency pumps can be mobilized to return

the process fluids to the processing circuits. Damaged portions of the fluid management system will be shut down until they can be satisfactorily repaired and tested.

4.3 FUEL STORAGE AND HANDLING

Fuel storage areas will be lined with an impermeable geomembrane and bermed or set on concrete foundations with berms. Design of these areas will follow both the Gasoline Handling Act under the Yukon Government and the Canadian Council of Ministers of the Environment (CCME) guidelines. The bermed area will be sized to accommodate 110% of the largest tank volume. All tanks are located above ground and are visually inspected on a regular basis for leaks, damage or unusual conditions. The berms and liners will also be inspected on a regular basis. Any leaks or other damage will be reported to the Plant Superintendent, who will ensure that necessary repairs are completed in a timely manner.

Diesel Tanks – Service Complex

The mine will use diesel-powered trucks and various diesel-powered items of surface equipment. The diesel fuel tank will be a steel, above ground vertical tank with a 190 m³ capacity. There will be room within the lined, bermed storage area for an additional tank in addition to 110% capacity and 300 mm of freeboard. Diesel will be transported into the site from Whitehorse via a 42,000 L capacity B-train haul truck. The following controls will be incorporated.

- The tanks will be located in bermed areas with a concrete base and concrete curbs. The preferred strategy will be to operate each tank independently, and consequently the containment volume would be 110% of the volume of the largest tank. However, if the final design incorporates the more flexible operation of tanks in parallel, a worst-case scenario will be assumed and the containment volume will be designed to accommodate the total volume of all tanks.
- The containment foundations will be designed by geotechnical engineers.
- The bottom of the containment area will be sloped slightly so that spilled material will drain toward a corner sump where the material can be reclaimed.
- A drain valve will be installed through the berm wall adjacent to the sump to allow for periodic drainage of precipitation. A locking system incorporated in the valve will ensure that the valve is not left open inadvertently.

Gasoline Storage Tank

A gasoline tank will be provided in the service complex fuel storage area along with the diesel tanks and the waste oil tank. The gasoline fuel tank will have 38 m³ capacity. The spill control measures outlined for the diesel storage area will also apply to the gasoline tank.

Flammable Materials Storage

A lockable, fireproof cabinet will be installed in the laboratory to isolate the small quantities of flammable materials that are normally used in analytical laboratories. This is a standard safety practice at other operating mines, which in addition to deducing fire hazard is designed also to

prevent spillage of these materials and to confine any cleanup operation within the laboratory building.

Small quantities of flammable materials for use in general operations will be stored in the warehouse. A fireproof cabinet will be installed in a designated area of the warehouse, to minimize spillage of these materials and to facilitate cleanup.

4.4 ACID PROCESSING REAGENT STORAGE

Sulphuric acid will be stored on site in two insulated, carbon steel, 10 000 mm x 8,500 mm tanks, providing 2,500 tonnes of storage. The tanks will be placed in a lined containment dike with a 110% capacity. Kerosene will be stored in a 4,100 mm x 5,000 mm tank outside of the warehouse in a lined containment with a 110% capacity. The organic solvent will be stored in 45 gallon (200 litre) kegs in the warehouse in the area designated for solvents and degreasers. Quartec and cobalt sulphate powder will be stored in 25 kg bags on pallets in the warehouse. Lime powder will be stored in a 75 tonne silo within a lined containment dike adjacent to the Solvent Extraction building. All chemicals will be kept separate to avoid reactivity in the event of a spill.

4.5 LUBRICANTS, OILS, SOLVENTS AND DEGREASERS

Lubricants, oils, solvents and flammable materials will be stored in the warehouse or maintenance shop. Storage and dispensing of bulk delivered lubricants and solvents in the shops will be done through a well engineered, integrated system that has been developed and used at other major mine sites. This system, which is designed to minimize and control spillage, will consist of the following components:

- Bulk storage tanks for lubricants and solvents will be located outside the pit shop in a concrete bermed storage area. Smaller day tanks will be located inside the pit shop and will incorporate standard spill control measures.
- All liquids will be piped directly to the area in the shop where they will be used. As a result of the direct piping of liquids to the point of use, the manual transfer of liquids in small containers will be minimized. This will reduce the spillage and fire hazards associated with the use of open vessels of petroleum products.
- Sight glasses will be located on each tank to indicate the liquid level in the tank. Appropriate filling techniques and schedules can then be used, which will eliminate spillages from overfilling the tanks.
- The simplicity of this overall system will encourage a clean and safe working environment, which in turn will reduce the risk of spills within the mine site area.

All solvents and degreasers delivered in small containers will be stored inside the cold storage area. Incoming container trucks will report to the warehouse personnel, where new containers will be offloaded and empty containers loaded on returning trucks.

The following will be incorporated in the design to minimize the impact of minor spills and to allow an orderly cleanup.

- The storage of these materials inside a building will prevent accidental spillage or puncture of the containers from vehicle traffic or other mine activities.

- The cold storage and warehouse will have a concrete floor to confine any spilled liquids. In the area of the stored liquids, the floor will be slightly sloped toward a small sump designed to contain spills and allow them to be cleaned up.
- A separate area will be defined for the storage of solvents and degreaser materials, away from the general materials in the warehouse. Areas designated for storage of solvent and degreaser materials will be surrounded by a concrete curb. Concrete roll curbs will be installed to allow access by forklifts. The compatibility of materials for storage in a common area will be determined and, where necessary, additional intermediate berms will be installed to isolate and separate incompatible materials.
- Clear labels for each area will declare the type of material stored. WHMIS labels will be posted as appropriate, to ensure that materials are handled safely and that correct methods are used to clean up any spilled materials.

This overall berming strategy will ensure that any spillage is confined inside the building, and will eliminate the potential problems of minor spills seeping into adjacent ground with attendant cleanup difficulties.

5.0 INSPECTION AND MAINTENANCE

A regular inspection and maintenance program for all elements of the barren and pregnant solution management system will be followed to ensure systems are operating properly and are maintained in good condition. In the event of a release of process solution from any portion of the fluid management system, the plant operators will, as soon as possible, shut down the portion of the process circuit where the release is occurring to stop the release of process solutions. The fluid management system will be thoroughly inspected, and measures to abate the release and prevent spread of solution will be initiated as soon as possible.

Process plant and mill facilities such as pipelines, tanks, and pumps will be inspected regularly for leaks, deterioration or other damage.

Inspection of storage facilities will be completed on a regular basis. Materials in the warehouse or cold storage area will be routinely checked by personnel. The inspection included checking for visible signs of leakage, checking containers for any sign of weakness, tearing or rupturing and checking for cracks or breaks in containment berms. Any observed problem will immediately be reported and repaired.

Good housekeeping practices will be employed at all times during the handling of chemicals and reagents. Dry chemicals are stored in sealed containers or pallets or above ground in bins or silots to prevent water infiltration. Incompatible materials, such as acids and bases, are stored in separate areas. All empty chemical containers are disposed of appropriately.

Solution fluid levels in tanks and the events pond throughout the leach system will be monitored daily.

Routine monitoring of leak detection and recovery systems for the leach pads, solution collection ditches, solution ponds, and solution tanks and the regular schedule of inspection and maintenance of other process components provide early detection of releases occurring from these units.

6.0 OPERATING PROCEDURES

Operating procedures relate to on-site movement and use of chemicals, and monitoring of fluid containment areas. Employees involved in chemical handling will receive WHMIS and TDGA training and instruction on safe work practices. This will include:

- Driving vehicles (trucks and forklifts) carefully to avoid collisions or ruptures to storage containers and pipelines.
- Making sure there is adequate clearance when positioning a truck or equipment adjacent to storage or distribution points.
- Checking to ensure all pallets or containers are securely placed when transporting and storing, to prevent tipping and spilling.
- Proper dispensing of fuels and other motor vehicle fluids (including dipping tanks before filling).
- Locations of storage and use areas for chemicals and solutions.
- Employees assigned to areas in which chemicals are utilized, receive personal instruction and task training to promote and ensure safe chemical work practices.

7.0 ORGANIZATION AND RESPONSIBILITIES

A structured organization will be created for contingency planning and spill response. Preparations will include clear definitions of responsibilities in the event of a spill. The OSC and back-ups will be designated in the final Spill Contingency and Emergency Response Plan.

During construction and operational phases of the Carmacks Copper Project, a designated OSC who is a member of the Spill Response Team will be on site at all times. The OSC will have the prime responsibility of coordination and directing control efforts at the scene of a spill incident. The duties of the OSC are outlined below and will be assumed by the Project Manager or other senior management personnel.

The OSC will contact the Construction Supervisor, the Environmental Supervisor, and the First Aid Supervisor to relay details of the spill incident. The OSC will notify the appropriate authorities and submit the required reports, including all relevant details of the spill.

The Construction Supervisor will indicate the deployment of available equipment to facilitate containment and clean-up functions. He or she will be responsible for procuring off-site contractors or additional equipment as required.

The Environmental Supervisor will assess the impact of the spill on the environment and direct the actions needed to reduce further impact. The Environmental Supervisor will determine and supervise the institution of appropriate disposal techniques and restoration measures in cooperation with government representatives.

The First Aid Supervisor will ensure that personnel involved with spill containment and clean up are outfitted with proper safety equipment. In addition, clean-up personnel will be advised of the possible hazards and proper clean-up procedures for the spill.

All on-site personnel will receive training in spill response procedures, materials hazards, and local biophysical constraints. Special training will be provided to truck driving personnel, road

maintenance personnel, freight handlers and load-out operators, and others most likely to be present at a possible spill.

The detailed contingency plan will be kept in a loose-leaf binder with tabbed sections so that information is easily accessible and can be updated as operations progress. This manual will contain the response organization, action procedures, environmental mapping, resource inventory, training, hazardous materials information and supporting documentation. In addition, training and exercises in the form of mock spills will be undertaken to ensure that individuals know their responsibilities, spill response, action plan, where and what type of clean up equipment can be obtained.

Responsibilities of the On-Scene Coordinator

Specific responsibilities of the OSC include:

- Becoming familiar with all aspect of the contingency plan for which he/she is responsible;
- Becoming familiar with potential spill situations within the project area and applicable techniques for confinement, recovery, and restoration;
- Establishing liaison with various government authorities and industry in the area;
- Ensuring the training of personnel in spill clean-up procedures;
- During a spill, directing the acquisition and employment of resources for containment, clean-up, disposal, and restoration;
- Collecting any required samples for analysis;
- Preparing a report on all aspects of the spill; and
- Providing a focal point for incorporating the concerns of the public and government agencies into the counter-measures taken to deal with a spill.

At the Carmacks Copper Mine, any person witnessing a serious injury, fire, chemical spill or serious incident will be charged with the responsibility for immediately advising the OSC. This requirement and responsibility will be conveyed to all new employees through the orientation and environmental awareness training. All communications for mine-site emergencies will be coordinated through the OSC. Depending on the emergency (serious injury, fire, chemical spills, serious incidents) the following people will be notified:

- On-Scene Coordinator;
- Mine Manager;
- Safety Officer;
- Mine Superintendent;
- Plant Superintendent; and
- Environmental Supervisor.

An Emergency Phone Numbers list will be compiled and include the numbers of:

- the On-Scene Coordinator and alternates;
- the Construction Supervisor;
- the Environmental Supervisor;
- the First Aid Supervisor;
- the construction camp and/or Mine Operations;
- Yukon Spill Line;
- helicopter company;

- regional and central Territorial Emergency Program;
- regional RCMP;
- regional General Hospital/Nursing Station;
- regional Fire Department;
- poison Control Centre;
- CANUTEC (Canada Transport Emergency Centre);
- Village of Carmacks;
- LSCFN office;
- YG Department of Environment, Monitoring and Inspections Section;
- YG Environmental Protection Branch;
- YG Department of Environment, Water Resources Branch;
- YG Energy, Mines and Resources, Minerals Development Branch; and
- YG Energy, Mines and Resources, Client Services & Inspection Branch, Village of Carmacks Natural Resource Officer.

Once these positions have been filled, the emergency response plan will be amended to include the person's name and home phone number. Some of the contact phone numbers are provided in Table 1.

Table 1 Spill Related Resources and Contact Numbers

| Resource | Contact Number |
|---|---|
| Yukon Spill Line | (867) 667-7244 |
| Village of Carmacks | (867) 863-6271 |
| Fire Department – Carmacks | (867) 863-6709 |
| Police – Carmacks | (867) 863-5555 |
| Hospital – Whitehorse | (867) 667-8700 |
| Fire Department – Whitehorse | (867) 668-8699 or (867) 668-2462 |
| Police – Whitehorse | (867) 667-5555 |
| Access Consulting Group (Environmental Consultant) | (867) 668-6463 |
| YG Department of Environment, Water Resources Branch | (867) 667-3227 |
| YG Environmental Protection Branch | (867) 667-3436 |
| Little Salmon Carmacks First Nation | (867) 863-5576 |
| YG EMR, Village of Carmacks Natural Resource Officer | (867) 863-5271 |

The ERT will include members that have received St. John Advanced First Aid training, WHMIS and TDGA training, specialized hazardous materials response training, fire fighting training, and production or facility operators that have specialized knowledge. Members of the ERT, Safety Officer, Plant Superintendent, and Mine Superintendent, will stand by to assist the emergency response agency(s) and offer the benefit of their special knowledge of the facility and its

contents. A well-stocked first aid treatment room and ambulance will be also be available on-site.

Any employee affected by exposure to a hazardous materials release or spill, that may require medical attention, will be transported to Whitehorse. This is the nearest medical facility that can provide appropriate treatment and/or evaluation of chemical related injuries. A copy of the appropriate WHMIS and MSDS, which includes emergency medical and/or first-aid treatment, will accompany the affected person(s) to the hospital. The first aid room and ambulance will be provided with a complete copy of the Carmacks Copper Spill Contingency and Emergency Response Plan prior to production beginning at the mine.

8.0 PETROLEUM PRODUCT SPILLS

Spills and leaks are addressed herein.

A, “**spill**” is defined as:

“Petroleum product or lubricant which is poured, spilled, or pumped onto the ground or into water, by faulty conveyance or transfer, overturned vehicles or equipment, or through human error or negligence.”

Severity rating: Non-Reportable – Less than 100 litres*
 Minor – More than 100 litres and Less than 400 litres
 Major – More than 400 and Less than 1,000 litres
 Emergency - More than 1,000 litres

*If a spill is less than 100 litres and has not entered a watercourse, the Owner and/or operator do not have to report the spill.

A “**leak**” is defined as:

“Passing of a petroleum product through a breach, tear or puncture in a container, or receptacle at a rate of less than 10 litres per minute.”

Please find a table of reportable spills for various substances in Appendix B.

9.0 REPORTING PROCEDURES

The following two levels of reporting is required by any individual who locates a spill or leak:

Report to a Supervisor: Refers to the direct supervisor in charge of the individual who located the spill or leak.

and,

Report to the Owner: The Owner shall immediately be given details of any leak or spill. It is the Owner's responsibility to ensure protection of human health and safety, provide directions to stop or contain spills, and report the spill (if necessary, see severity rating and notes above) to affected agencies prior to investigating the spill themselves.

Affected Agencies: Affected Agencies shall all be contacted through the 24-hour emergency spill response line at **(867) 667-7244**. Affected parties may include organizations associated with fuel supply and transport companies. All of the major suppliers in the Yukon are members of TEAP, or the Transportation Emergency Assistance Plan. One of the responsibilities of this organization is the sharing of resources, consumables, equipment, and personnel in the event of a spill.

The following information shall be conveyed to the affected agencies through the 24-hour Emergency Spill Response Line. This information should be documented on the “Spill Reporting Form” provided in Appendix C.

- Location of the Spill or Leak
 - Nearest community, town, highway, major water body, kilometre location on highway if known etc.
- Time of Spill
- Severity of Spill or Leak
 - Minor – more than 100 litres and less than 400 litres
 - Major – more than 400 litres and less than 1,000 litres
 - Emergency - more than 1,000 litres
- Type of Spill
 - Total loss/leakage
 - Overturned vehicle or tanker (plus name of transport company)
 - Ruptured tank
 - Lost drum
- Product Spilled
 - Diesel Fuel (Identify Grade)
 - Gasoline
 - Lubricant (Identify Grade)
 - Other (Identify)
- Nearest Watercourse
 - Identify by name and description the nearest watercourse, pond or lake, with an approximate distance to the spill.
 - Describe the soils conditions and direction of probable flow for the spilled product.
- Potential to enter surface water
- Fire Hazard
- Hazard to life and limb, injuries
- Environmental effect expected, if any
- Equipment and clean-up consumables on hand

Response by Affected Agencies depends upon the location of the possible spill and will vary. However, they will be coordinated by phoning the Emergency Response Spill Line **(867) 667-7244**. For the purpose of this Plan, it is recommended that only one call be made to government or other agencies using the 24 hr spill line.

Other affected parties may include organizations associated with fuel supply and transport companies or local First Nations. Most major suppliers in the Yukon are members of the Transportation Emergency Assistance Plan (TEAP). One of the responsibilities of this organization is the sharing of resources, consumables, equipment and personnel in the event of a spill. The transporter is responsible for contacting TEAP in the event of a spill.

The Canadian Transport Emergency Centre (CANUTEC), a branch of Transport Canada, can also be contacted for 24 hr technical advice on Dangerous Goods, as needed. The CANUTEC – help line for dangerous goods is **0 (613) 996-6666 (collect)**.

10.0 EMERGENCY SPILL RESPONSE PROCEDURE

As outlined in the previous section, any person witnessing a spill will be charged with the responsibility for notifying the OSC. The ERT members and the appropriate people within the mine operation will be alerted and mobilized, as appropriate. These people will ensure the following activities are conducted in a timely manner in the event of a discharge:

Ensure personal and worker safety, if you cannot identify the spilled substance consider it dangerous.

If Personnel Are Injured

- Call for medical help, attend to injured person, and administer first aid if safe to do so.
- Warn / remove bystanders

If Safe (do not enter confined spaces or expose self to fire hazard)

- Stop all sources of ignition and stop or reduce the source flow of the spill
- Shut off all valves
- Shut off all electrical power
- Initiate containment: put down sorbent pads and berm spill area, if possible
- Recover product and contaminated soil / other materials
- Remain at the site and assist with response as needed when help arrives.

If Unsafe

- Initiate evacuation (upgrade or upwind), move to safe area
- Notify Owner
- Report the following: location, initial spill site, possible cause, description of present condition, affecting or about to enter water.
- Isolate area and deny entry until qualified response personnel arrive
- Deny access to all unauthorized personnel
- Update Owner on spill status

At Carmacks Copper, the following procedures are part of the release response policy:

- If it is determined that there is a release outside secondary containment, then the ERT will be called into action and will immediately commence containment and clean up of the spill or release.
- Personal protection equipment is required to be used when responding to a release or spill. The personal protection equipment will be determined by the product specific

Material Safety Data Sheet (MSDS). All precautions that are stated in the MSDS will be followed. Special personal protection equipment will be available for the ERT.

- If the spill is all liquid and outside secondary containment, a pump will be used to place the liquid back into contained area.
- If a spill occurs within a stream or creek, previously approved (by emergency response agencies) booms, absorbents, etc. will be put to use immediately.
- Soil contaminated with regulated material will be removed and disposed of according to the product specific MSDS. Disposal will follow applicable local, territorial and federal regulations and guidelines.

10.1 RESPONSE FOR GASOLINE SPILLS

If in water and if safe to do so:

1. Stop or reduce discharge, if safe to do so, by plugging, uprighting, adjusting valves, or other suitable method.
2. If possible, contain discharge by booming using commercial boom material, logs, or other material at hand.
3. If in rapidly flowing water, direct to quieter backwater using booms to deflect material.
4. Ensure that you have reported the spill.
5. Remove from water by skimming, using absorbents, and collect in suitable container (tanks, drums, plastic lined depression in ground or snow). **See Appendix D for a listing typical spill response tools/equipment.**

NOTE: IN THE EVENT MATERIAL IS SPILLED DURING VERY WARM WEATHER AND THERE IS DANGER OF FIRE DUE TO FUMES, DO NOT ATTEMPT TO CONTAIN PRODUCT ON WATER. ALLOW PRODUCT TO DISPERSE AND EVAPORATE.

6. Dispose absorbents by recycling or incineration if conditions are suitable and after consultation with environmental authorities and/or forestry officials contacted through the Emergency Spill Response Line.

Response for Gasoline Spills (Cont'd)

If on land and it is safe to do so:

1. Stop, or reduce discharge if safe to do so by plugging, uprighting, adjusting valves or other suitable method.
2. Contain spill by diking with earth, snow and ice or other barrier, possible trenching or creating a lined sump down gradient from the spill source.
3. Ensure that you have reported the spill.
4. Remove fuel from containment area with pumps, vacuum equipment and place in appropriate containers. Ensure equipment intrinsically safe (does not have a source of ignition/spark).
5. Absorb residual liquid on natural or synthetic absorbents (e.g. 3M products).
6. Remove contaminated soils in the spill site to an appropriate disposal site if spill located near water supply or stream/river course or for aesthetic reasons.

7. Dispose of contaminated fuel by recycling or incineration. In situ, incineration may be possible if permission granted from environmental and forestry officials contacted through the Emergency Spill Response Line.

10.2 RESPONSE FOR DIESEL SPILLS

If in water and if safe to do so:

1. Stop, or reduce discharge if safe to do so by plugging, uprighting, adjusting valves, or other suitable method.
2. If possible, contain discharge by booming using commercial boom material, logs or other material at hand.
3. If in rapidly flowing water, direct to quieter backwater using booms to deflect material.
4. Ensure that you have reported the spill.
5. Remove from water by skimming, using absorbents, and collect in suitable container (tanks, drums, plastic lined depression in ground or snow).
6. Dispose by recycling or incineration, if conditions are suitable and regulatory authorities grant permission.

Response for Diesel Spills (Cont'd)

If on land and it is safe to do so:

1. Stop or reduce discharge if safe to do so by plugging, uprighting, adjusting valves or other suitable method.
2. Contain spill by diking with earth, snow or ice or other barrier, possible trenching or creating a lined sump down gradient from the spill source.
3. Ensure that you have reported the spill.
4. Remove fuel from containment area with pumps, vacuum equipment and place in appropriate containers.
5. Absorb residual liquid on natural or synthetic absorbents (e.g. 3M products).
6. Remove contaminated soils in the spill to an appropriate disposal site if spill site is located near water supply or stream/river course or for aesthetic reasons.
7. Dispose of contaminated fuel by recycling or incineration. In site, incineration may be possible if permission granted from environmental and forestry officials.

Specific Information for Gasoline and Diesel

Gasoline

Characteristics

- Flammable
- Solubility in water 1 to 100 ppm
- Floats
- Flash point - 38 to -43 C

Human Health

- Moderately toxic by inhalation. Avoid prolonged exposure to fumes

Environment

- Harmful to aquatic life. Fish toxicity: 5 - 40 ppm rainbow trout

Protective Clothing

- No specific recommendations. Protective clothing is required.

Diesel

Characteristics

- Combustible/Flammable liquid
- Insoluble in water (30 ppm)
- Floats
- Flash point 52 to 96 C

Human Health

- Low toxicity by all routes

Environment

- Fish toxicity: 10 ppm rainbow trout; 2 ppm for grass shrimp

Protective Clothing

- Gloves and boots made from neoprene or butyl rubber

11.0 DANGEROUS SUBSTANCES

The substances used or generated at the mine site or to be transported via the Freegold Road and highways are listed below. Each of these products is to be classified according to Federal 1993 *Transportation of Dangerous Goods Regulations* Classification codes:

| | |
|------------------------------|---------------------------|
| copper cathode | Exempt |
| gasoline | Flammable Liquid 3.1 |
| diesel | Flammable Liquid 3.2 |
| ethylene glycol (antifreeze) | N/A – very toxic material |
| ammonium nitrate (for ANFO) | Oxidizer 5.1 |
| varsol | N/A – Combustible Liquid |
| propane | Ignitable Gases 2.1 |
| mill reagents: | |
| - petroleum derived organic | flammable liquid |
| - Hydrated lime | not regulated |
| - sulphuric acid | corrosive 8 |
| - cobalt SO ₄ | unclassified |
| - guar gum | unclassified |
| - kerosene | unclassified |

Action plans for each of these dangerous goods will be based on published Materials Safety Data Sheets (MSDS) issued by the manufacturer. The action plan for each substance lists potential dangers, the recommended initial spill response, the recommended fire response, recovery protocol, and disposal protocol. Employees who have any potential to come in direct contact with these materials (in particular, sulphuric acid and lime) will be educated in the properties of each chemical, proper handling techniques and personal protection measures.

Sulphuric acid spills may potentially occur: from tankers along the access road to the mine; during transfer from the trucks to the on-site storage facility; from pipelines to the heap leach pad; and from pregnant solution pipelines from the leach pad to the process plant.

Sulphuric acid is a colourless liquid that must be handled carefully with proper protective equipment and adequate ventilation. Ventilation systems must be non-corrosive. When in contact with some metals, sulphuric acid liberates hydrogen gas, which is explosive. Therefore, flames and sparks should not be used in these areas. In the event of a spill, all sources of ignition should be eliminated and the product should be collected for recovery or disposal. Personal safety must come first before attempting clean up. For release to land, or storm water runoff, discharge should be contained by constructing dykes or applying inert absorbent; for release to water, damming and/or water diversion should be utilized to minimize the spread of contamination. Applicable government authorities should be notified if the environment may be adversely affected.

Hydrated lime will be used for neutralizing raffinate (effluent) from the process plant prior to disposal. Lime is a basic (high pH, corrosive) powder that should be only handled with proper protective equipment. In the event of a spill, lime powder should be swept up, not allowed to enter sewers or watercourses, airborne dust should be minimized, and enclosed areas vented.

Cobalt sulphate is a toxic, odourless pink crystalline powder that may cause irritation to skin, eyes or respiratory tract if contact is made. Ingestion can cause nausea, gastrointestinal upset and abdominal pain. Proper protective handling measures should be taken and spills cleared up. Cobalt sulphate should not be allowed to enter the streams and should not be disposed of with normal garbage; special disposal is required.

Organic reagents will be used as industrial solvents in the process plant. Potential spills may occur during transportation to site, transfer to storage facilities and during use. If a spill occurs, the product should be collected for recovery or disposal, the area should be ventilated, and release to watercourses should be avoided.

Kerosene is an organic solvent that will be used to aid the organic reagents. As with the organic reagents, spills will be recovered and/or disposed of and the handling areas will be kept well ventilated. Initial spill response to a kerosene spill is to stop the flow if possible, eliminate open flame ignition processes, contain flow of oil by dyking, barricading or blocking flow by any means available (use earth moving equipment as available), and preventing the spill from reaching open water. If fire is involved, CO₂ should be used in dry chemical, foam, or water spray (fog) to fight the fire. Fog streams are a means used to protect rescue team and trapped people and to cool surface tanks. Alternatively, fuel is diverted to an open area where it is left to burn off under controlled conditions. If the fire is extinguished before it is fully consumed, there is a chance of re-ignition. Contact with strong oxidizing agents (e.g. ammonium nitrate) may ignite the product, or cause it to explode. Unburned kerosene can be recovered by soaking up with sand, straw, peat moss, or by commercial sorbents (e.g. Graboil). Contaminated soil should be excavated and seepage entering the ground should be recovered by digging sumps or trenches and pumping from below the water table. Spills to surface waters should be collected and recovered by booms, sorbents such as Graboil, or collected by a liquid/solid vacuum cleaner. Recovery materials should be incinerated under controlled conditions with the approval of the Territory Emergency Response Officer or burned at an approved site

Copper cathode is not regarded as being a hazardous material and will be secured down by strapping and covered for truck transportation.

12.0 PLAN IMPLEMENTATION AND AMENDMENT

Warning signs are part of the chemical spill prevention program and will be posted at all material storage and use areas. These signs are posted to remind people of the nature of the material, potential hazards and to promote safe work practices. Copies of the Spill Contingency and Emergency Response Plan will be maintained by the Safety Officer. Response tables will be posted in appropriate areas of the processing facilities in highly visible locations. Material Safety Data Sheets (MSDS) and WHMIS sheets will be kept accessible to personnel at appropriate locations, including the Mine Managers office, line Superintendent offices, Safety and Environmental Supervisors offices, first aid room and ambulance. Material safety data sheets for some of the substances likely to be found at the Carmacks Copper project mine site are located in Appendix E.

All workers will be trained in the following area to ensure that implementation of the Spill Contingency and Emergency Response Plan is possible:

- Handling and clean-up of hazardous materials and combinations of hazardous materials on site;
- Fire fighting and fire suppression;
- First Aid (St John Advanced First Aid); and
- Supply and maintenance of equipment needed to control and clean-up any incidents.

Copies of the plan will also be sent to the following people:

- Village of Carmacks;
- RCMP in Carmacks;
- Whitehorse General Hospital;
- Environment Canada Spill Centre;
- YG Water Resources, Inspection Section;
- YG Energy, Mines and Resources, Minerals Development Branch;
- LSCFN Office; and
- YG Energy, Mines and Resources, Client Services & Inspection Branch, Village of Carmacks Natural Resource Officer.

The Spill Contingency and Emergency Response Plan will be updated internally on a quarterly basis or as necessary. An updated Spill Contingency and Emergency Response Plan will be provided to the appropriate regulatory authorities on an annual basis.

SPILL CONTINGENCY AND EMERGENCY RESPONSE PLAN

APPENDIX A

GENERAL ARRANGEMENT – MATERIALS STORAGE LOCATIONS

**Project Description
& Environmental
Assessment Report**

**Carmacks Copper
Project
Yukon Territory**

**Appendix L -
Spill Contingency &
Emergency Response
Plan**



Legend



Original drawing from Kilborn.
The engineering data on this drawing is solely for the purpose and project for which this drawing is issued.
"Overall Site Plan Year 2",
Drawing #100-13-45 Rev B

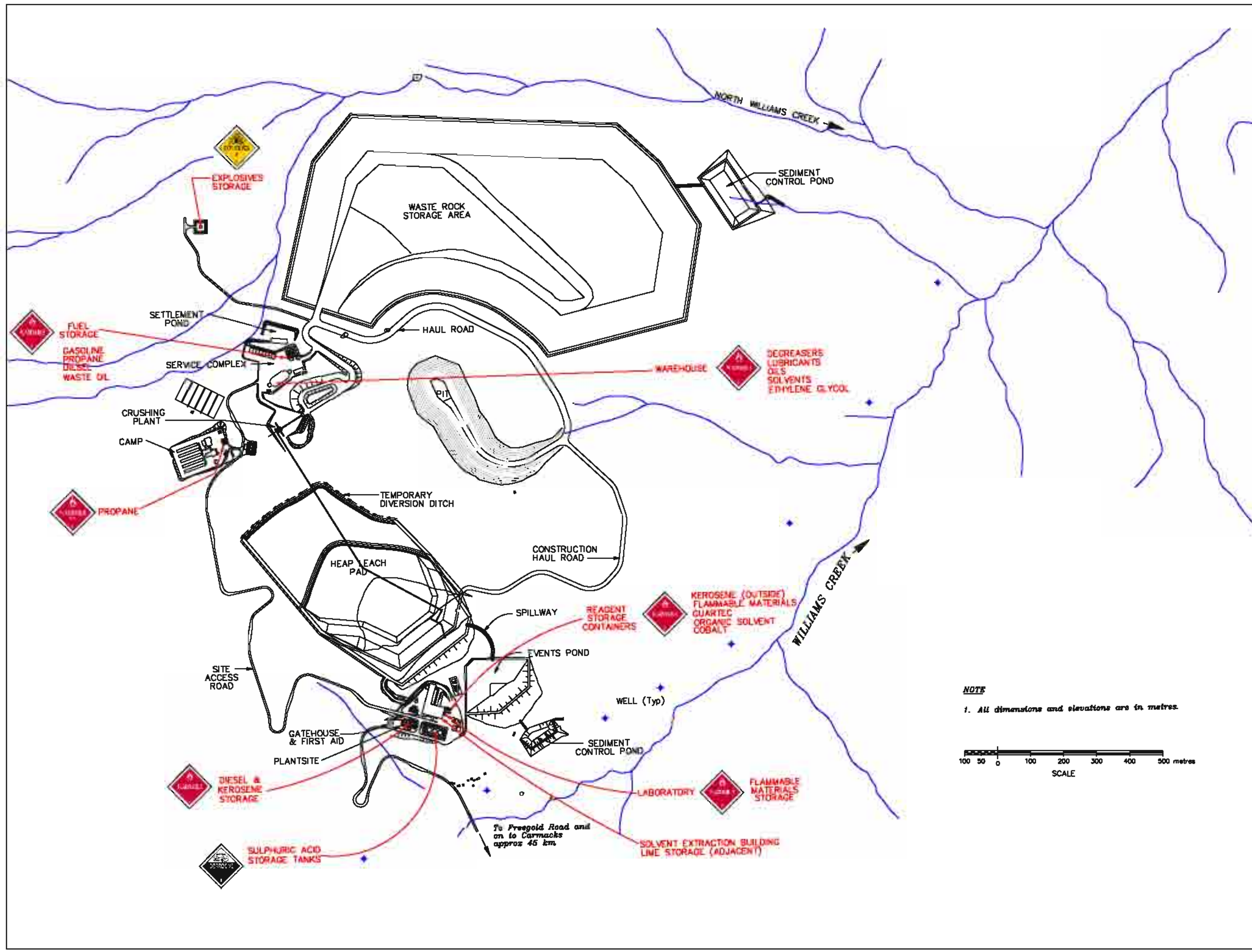
**General Arrangement -
Material Storage Locations**

Spill Plan - Appendix A



Revised by: HD Checked by: DDC

Date: April, 2005



NOTE
1. All dimensions and elevations are in metres.

SCALE: 0 100 200 300 400 500 metres

SPILL CONTINGENCY AND EMERGENCY RESPONSE PLAN

APPENDIX B

REPORTABLE SPILLS

A spill in excess of the following thresholds is considered a spill under the Yukon *Spill Regulations* (O.I.C. 1996/193), pursuant to the Environment Act. In this table, the listed regulations “Federal Regulations” means the *Transportation of Dangerous Goods Regulations* (Canada) Sor/85/77 of January 18, 1985.

| Substance Spilled | TDG Code | Reportable Quantity |
|---|----------|---|
| Explosives of Class 1 as defined in section 3.9 of the Federal Regulations. | 1 | Any amount |
| Flammable gases, of Division 1 of Class 2 as defined in section 3.11 (a) of the Federal Regulations. | 2.1 | Any amount of gas from a container larger than 100L, or where the spill results from equipment failure, error or deliberate action or inaction. |
| Non-flammable gases of Division 2 of Class 2 as defined in section 3.11 (d) of the Federal Regulations. | 2.2 | Any amount of gas from a container larger than 100L, or where the spill results from equipment failure, error or deliberate action or inaction. |
| Poisonous gases of Division 3 of Class 2 as defined in section 3.11(b) of the Federal Regulations. | 2.3 | Any amount |
| Corrosive gases of Division 4 of Class 2 as defined in section 3.11 (c) of the Federal Regulations. | 2.4 | Any amount |
| Flammable liquids of Class 3 as defined in section 3.12 of the Federal Regulations. | 3 | 200L (Any amount if spilled into a watercourse) |
| Flammable solids of Class 4 as defined in section 3.15 of the Federal Regulations. | 4 | 25 kg |
| Products or substances that are oxidizing substances of Division 1 of Class 5 as defined in sections 3.17(a) and 3.18(a) of the Federal Regulations. | 5.1 | 50 kg or 50 L |
| Products or substances that are organic compounds that contain the bivalent “-O-O-“ structure of Division 2 of Class 5 as defined in sections 3.17 (b) and 3.18 (b) of the Federal Regulations. | 5.2 | 1 kg or 1L |
| Products or substances that are poisons of Division 1 of Class 6 as defined in sections 3.19 (a) to (e) and 3.20 (a) of the Federal Regulations. | 6.1 | 5 kg or 5 L |
| Organisms that are infectious or that are reasonable believed to be infectious and the toxins of these organisms as defined in sections 3.19(f) and 3.20(b) of the Federal Regulations. | 6.2 | Any amount |
| Radioactive materials of Class 7 as defined by section 3.24 of the Federal Regulations. | 7 | Any discharge or a radiation level exceeding 10 mSv/h at the package surface and 200 mSv/h at 1 m from the package surface. |
| Products or substances of Class 8 as defined by section 3.24 of the Federal Regulations. | 8 | 5 kg or 5 L |
| Miscellaneous products or substances of Division 1 of Class 9 as defined by sections 3.27 (1) and 2 (a) of the Federal Regulations. | 9 | 50 kg or 50 L |

SPILL RESPONSE FOR PETROLEUM PRODUCTS (FUELS)

APPENDIX C

SPILL REPORTING FORM

Spill Reporting Form

- 1) Type: (check) Oil Gasoline Diesel Sewage
Other (name) _____
 - 2) Source (Company): _____
 - 3) Severity: (check) Minor 100 – 400 litres Major 400 - 1,000 litres
Emergency more than 1,000 litres
 - 4) Date of Incident: _____ Time: _____
 - 5) General Roadway Kilometre Mine Site Location: _____
 - 6) Specifics of Location (nearest community, watercourse etc.): _____

 - 7) Cause of Incident (e.g.: building failure): _____
 - 8) Reason: (e.g.: earthquake): _____
 - 9) Weather Conditions: Temperature Wind Direction/Speed Precipitation
 - 10) Hazards to human life or health: _____
 - 11) Expected Environmental Effects: _____
 - 12) Nearest Surface Water with Approximate Distance to Spill: _____

 - 13) Potential to Enter Surface Water: _____
 - 14) Fish Kill: Yes No Bird Kill: Yes No
 - 15) Fire Hazard: _____
 - 16) Threat to drinking water: _____
 - 17) Who to contact at the scene: _____
Company: _____ Phone: _____
 - 18) General Comments: _____
 - 19) How to prevent recurrence: _____
 - 20) Action taken to date: Containment: _____
Clean up: _____
- Reported by:
Name: _____ Dept.: _____ Phone: _____
- Reported to:
Name: _____ Dept.: _____ Phone: _____

SPILL RESPONSE FOR PETROLEUM PRODUCTS (FUELS)

APPENDIX D

LIST OF TYPICAL SPILL RESPONSE EQUIPMENT

List of Typical Spill Response Equipment

- **Absorbents** (For Petroleum Hydrocarbon {Fuels, Lubricants, and Solvents} and Wastewater)
 - Booms
 - Sheets
 - Towels
 - Absorbent granules

- **Contaminated Soils Recovery Tools**
 - Shovels
 - Picks
 - Excavators
 - Loaders
 - Trucks

- **Liquid Recovery Tools**
 - Pumps
 - Containers
 - Vacuum / Eductor Truck

- **Fire Suppression Equipment**
 - Various, for different material types

- **Personal Safety Equipment**
 - Protective Clothing
 - Eye Protection
 - Breathing Apparatus

Note:

This is by no means an exhaustive list of materials and tools that can be assembled and used for spill response.

More information on spill response equipment and equipment suppliers can be found on the Internet. Yukon Explosives in Whitehorse is an example of a local supplier.

SPILL RESPONSE FOR PETROLEUM PRODUCTS (FUELS)

APPENDIX E

MATERIAL SAFETY DATA SHEETS



CITGO Gasolines, All Grades Unleaded Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No. UNLEAD
Revision Date 05/23/2005

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

| Hazard Rankings | | |
|-----------------|------|------|
| | HMIS | NFPA |
| Health Hazard | * 2 | 1 |
| Fire Hazard | 3 | 3 |
| Reactivity | 0 | 0 |

* = Chronic Health Hazard

| Emergency Overview | | | |
|---|-------------------------------------|-------------|-----------------------------------|
| Physical State | Liquid. | | |
| Color | Transparent, clear to amber or red. | Odor | Pungent, characteristic gasoline. |
| DANGER: | | | |
| Extremely flammable liquid; vapor may cause flash fire or explosion. | | | |
| Vapor may travel considerable distance to source of ignition and flash back. | | | |
| Use Only as a Motor Fuel. Do Not Siphon by Mouth. | | | |
| Harmful or fatal if swallowed - Can enter lungs and cause damage. | | | |
| High concentrations of vapor reduce oxygen available for breathing and may cause suffocation. | | | |
| May be harmful if inhaled or absorbed through the skin. | | | |
| Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract. | | | |
| Liquid contact may cause eye and skin irritation. | | | |
| Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3). | | | |
| Harmful or fatal if swallowed - Can enter lung and cause damage. | | | |
| Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats). | | | |
| Contains Benzene - Cancer Hazard. | | | |
| Long term exposure to gasoline vapor has caused cancer in laboratory animals. | | | |
| Avoid Spills. Spills may present both a physical and an environmental hazard. | | | |

| Protective Equipment |
|---|
| Minimum Recommended See Section 8 for Details |
|    |

SECTION 1. PRODUCT IDENTIFICATION

| | | | |
|-----------------------|--------------------------------------|--|----------------|
| Trade Name | CITGO Gasolines, All Grades Unleaded | Technical Contact | (800) 248-4684 |
| Product Number | Various | Medical Emergency | (832) 486-4700 |
| CAS Number | Mixture. | CHEMTREC Emergency (United States Only) | (800) 424-9300 |

CITGO Gasolines, All Grades Unleaded

| | |
|-----------------------|--|
| Product Family | Motor fuels. |
| Synonyms | Unleaded Gasolines; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated. |

SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

| Component Name(s) | CAS Registry No. | Concentration (%) |
|------------------------------------|-------------------------|--------------------------|
| Methyl tertiary-Butyl Ether (MTBE) | 1634-04-4 | 0 - 15 |
| Tertiary-Amyl Methyl Ether (TAME) | 994-05-8 | 0 - 15 |
| Ethyl tertiary Butyl Ether (ETBE) | 637-92-3 | 0 - 15 |
| Tertiary-Amyl Ethyl Ether (TAEE) | 919-94-8 | 0 - 15 |
| Diisopropyl Ether (DIPE) | 108-20-3 | 0 - 15 |
| Ethanol | 64-17-5 | 0 - 10 |
| Toluene | 108-88-3 | <20 |
| Xylene, all isomers | 1330-20-7 | <18 |
| n-Hexane | 110-54-3 | <8 |
| Trimethylbenzenes, all isomers | 25551-13-7 | <5 |
| Benzene | 71-43-2 | <5 |
| Cumene | 98-82-8 | <4 |
| Ethylbenzene | 100-41-4 | <4 |
| Cyclohexane | 110-82-7 | <3 |
| Naphthalene | 91-20-3 | <2 |
| Styrene | 100-42-5 | <1 |

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation. Ingestion.

Signs and Symptoms of Acute Exposure

| | |
|---------------------|---|
| Inhalation | Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death. |
| Eye Contact | This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result. |
| Skin Contact | This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases. |
| Ingestion | |

CITGO Gasolines, All Grades Unleaded

If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

Chronic Health Effects Summary

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

Target Organs

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

Carcinogenic Potential

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

CITGO Gasolines, All Grades Unleaded

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

| OSHA Health Hazard Classification | | OSHA Physical Hazard Classification | | | | | | | |
|-----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|----------------|-------------------------------------|------------------|--------------------------|----------------|--------------------------|
| Irritant | <input checked="" type="checkbox"/> | Sensitizer | <input type="checkbox"/> | Combustible | <input type="checkbox"/> | Explosive | <input type="checkbox"/> | Pyrophoric | <input type="checkbox"/> |
| Toxic | <input type="checkbox"/> | Highly Toxic | <input type="checkbox"/> | Flammable | <input checked="" type="checkbox"/> | Oxidizer | <input type="checkbox"/> | Water-reactive | <input type="checkbox"/> |
| Corrosive | <input type="checkbox"/> | Carcinogenic | <input checked="" type="checkbox"/> | Compressed Gas | <input type="checkbox"/> | Organic Peroxide | <input type="checkbox"/> | Unstable | <input type="checkbox"/> |

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.

Eye Contact Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.

Skin Contact Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

CITGO Gasolines, All Grades Unleaded

SECTION 5. FIRE FIGHTING MEASURES

| | | | |
|---|--|------------------------------|----------|
| NFPA Flammability Classification | NFPA Class-IB flammable liquid. | | |
| Flash Point | Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56]) | | |
| Lower Flammable Limit | AP 1.4 % | Upper Flammable Limit | AP 7.6 % |
| Autoignition Temperature | 280°C (536°F) | | |
| Hazardous Combustion Products | Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion. | | |
| Special Properties | Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire. | | |
| Extinguishing Media | SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces. LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area. | | |
| Protection of Fire Fighters | Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways. | | |

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can be done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a

CITGO Gasolines, All Grades Unleaded

liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxillary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

CITGO Gasolines, All Grades Unleaded

Storage

Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respiratory Protection

For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

General Comments

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance

Applicable Workplace Exposure Levels

CITGO Gasolines, All Grades Unleaded

| | |
|------------------------------------|---|
| Gasoline | ACGIH (United States). TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s). |
| Toluene | ACGIH (United States). Skin TWA: 50 ppm 8 hour(s). OSHA (United States). TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm |
| Xylene, all isomers | ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). |
| Tertiary-Amyl Methyl Ether (TAME) | ACGIH TLV (United States). TWA: 20 ppm 8 hour(s). |
| Methyl tertiary-Butyl Ether (MTBE) | ACGIH (United States). TWA: 50 ppm 8 hour(s). |
| Ethyl tertiary Butyl Ether (ETBE) | ACGIH TLV (United States). TWA: 5 ppm 8 hour(s). |
| n-Hexane | ACGIH (United States). Skin TWA: 50 ppm 8 hour(s). OSHA (United States). TWA: 500 ppm 8 hour(s). |
| Cumene | ACGIH (United States). TWA: 50 ppm 8 hour(s). OSHA (United States). Skin TWA: 50 ppm 8 hour(s). |
| Trimethylbenzenes, all isomers | ACGIH (United States). TWA: 25 ppm 8 hour(s). |
| Benzene | ACGIH (United States). Skin TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL. TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s). |
| Ethylbenzene | ACGIH (United States). TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). |
| Cyclohexane | ACGIH (United States). TWA: 100 ppm 8 hour(s). OSHA (United States). TWA: 300 ppm 8 hour(s). |
| Naphthalene | ACGIH (United States). Skin TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). OSHA (United States). TWA: 10 ppm 8 hour(s). |
| Styrene | ACGIH (United States). TWA: 20 ppm 8 hour(s). STEL: 40 ppm 15 minute(s). OSHA (United States). TWA: 100 ppm 8 hour(s). STEL: 200 ppm 15 minute(s). PEAK: 600 ppm |

CITGO Gasolines, All Grades Unleaded

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

| | | | | | |
|------------------------------|--|--------------|-------------------------------------|-------------------------------|-----------------------------------|
| Physical State | Liquid. | Color | Transparent, clear to amber or red. | Odor | Pungent, characteristic gasoline. |
| Specific Gravity | 0.72 - 0.77 (Water = 1) | pH | Not applicable | Vapor Density | 3 to 4 (Air = 1) |
| Boiling Range | 38 to 204°C (100 to 400°F) | | | Melting/Freezing Point | Not available. |
| Vapor Pressure | 220 to 450 mm Hg at 20°C (68°F) or 6 to 15 Reid-psia at 37.8°C (100°F). | | | Volatility | 720 to 770 g/l VOC (w/v) |
| Solubility in Water | Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components. | | | Viscosity (cSt @ 40°C) | <1 |
| Flash Point | Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56]) | | | | |
| Additional Properties | Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161) | | | | |

SECTION 10. STABILITY AND REACTIVITY

| | | | |
|---|---|---------------------------------|------------------------|
| Chemical Stability | Stable. | Hazardous Polymerization | Not expected to occur. |
| Conditions to Avoid | Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents. | | |
| Materials Incompatibility | Strong acids, alkalis and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen. | | |
| Hazardous Decomposition Products | No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS. | | |

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Gasoline:

VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant.
VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant.
INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects.
DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects.
INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).

Gasoline Containing 15% MTBE:

ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level).
DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level).
INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours).
DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

CITGO Gasolines, All Grades Unleaded

DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

Pentanes, all isomers:

Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

Toluene:

Effects from Acute Exposure:

Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:

Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

Heptane, all isomers:

n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

CITGO Gasolines, All Grades Unleaded

Xylene, all isomers:

Effects from Acute Exposure:

ORAL (LD₅₀), Acute: 4,300 mg/kg [Rat].

INHALATION (LC₅₀), Acute: 4,550 ppm for four hours [Rat].

DERMAL (LD₅₀), Acute: 14,100 uL/kg [Rabbit].

Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:

Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

Ethyl tertiary Butyl Ether (ETBE):

ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2μ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant (p<0.05) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

Tertiary-Amyl Methyl Ether (TAME):

TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

Methyl tertiary-Butyl Ether (MTBE):

Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

CITGO Gasolines, All Grades Unleaded

exposures to MTBE.

Diisopropyl Ether (DIPE):

Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

Ethanol:

Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

Butane, all isomers:

Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

n-Hexane:

This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Cumene:

Effects from Acute Exposure:

Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:

Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

Trimethylbenzenes, all isomers:

Studies of Workers:

Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:

In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

CITGO Gasolines, All Grades Unleaded

for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Benzene:

ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse].

INHALATION (LC50):

(VAPOR): Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse].

Studies of Workers Over-Exposed to Benzene:

Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:

Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

Ethylbenzene:

Effects from Acute Exposure:

ORAL (LD50), Acute: 3,500 mg/kg [Rat].

DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].

INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:

Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Cyclohexane:

Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane

CITGO Gasolines, All Grades Unleaded

was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Naphthalene:

Studies in Humans Overexposed to Naphthalene:

Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:

Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro*.

Styrene:

Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity (LC₁₀₀) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TLm (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden (*Brevoortia patronus*), gasoline exhibited a 96-hour LC₅₀ of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitrocras spinipes*), MTBE exhibited an LC₅₀ (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish (*Alburnus alburnus*), MTBE exhibited an LC₅₀ (24-hour) of 1,700 PPM and an LC₅₀ (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an LC₅₀ (48-hour) of 1,000 PPM and an LC₁₀₀ of 2,000 PPM.

Environmental Fate

CITGO Gasolines, All Grades Unleaded

Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.


SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specific disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

| | | | |
|-----------------------------|---|-------------------------------------|--|
| US DOT Status | A U.S. Department of Transportation regulated material. | | |
| Proper Shipping Name | Gasoline, 3, UN 1203, PG II Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol) | | |
| Hazard Class | 3 DOT Class: Flammable liquid. | Packing Group(s) | II |
| | | UN/NA Number | UN1203 or NA1203 |
| Reportable Quantity | A Reportable Quantity (RQ) has not been established for this material. | | |
| Placard(s) |  | Emergency Response Guide No. | 128 |
| | | MARPOL III Status | Not a DOT "Marine Pollutant" per 49 CFR 171.8. |

CITGO Gasolines, All Grades Unleaded

SECTION 15. REGULATORY INFORMATION

| | |
|---|---|
| TSCA Inventory | This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory. |
| SARA 302/304 Emergency Planning and Notification | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified. |
| SARA 311/312 Hazard Identification | The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard |
| SARA 313 Toxic Chemical Notification and Release Reporting | This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Toluene [CAS No.: 108-88-3] Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15% n-Hexane [CAS No.: 110-54-3] Concentration: <8% Cumene [CAS No.: 98-82-8] Concentration: <4% Benzene [CAS No.: 71-43-2] Concentration: <5% Ethylbenzene [CAS No.: 100-41-4] Concentration: <4% 1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4% Cyclohexane [CAS No.: 110-82-7] Concentration: <3% Naphthalene [CAS No.: 91-20-3] Concentration: <2% Styrene [CAS No.: 100-42-5] Concentration: <1% |
| CERCLA | The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20% Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18% Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15% n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8% 2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5% Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4% Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4% Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3% Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2% Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1% |
| Clean Water Act (CWA) | This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802. |

California Proposition 65

CITGO Gasolines, All Grades Unleaded

This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]

New Jersey Right-to-Know Label

Gasoline [NJDEP CAS No. 8006-61-9]

Additional Regulatory Remarks

As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth."

WHMIS Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

WHMIS Class D-2B: Material causing other toxic effects (TOXIC).

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number 7.0
Revision Date 05/23/2005
Print Date Printed on 05/23/2005.

ABBREVIATIONS

| | | | | | | |
|--|-----------|-----------------|--------------|---|-------------|---------------------|
| AP: Approximately | EQ: Equal | >: Greater Than | <: Less Than | NA: Not Applicable | ND: No Data | NE: Not Established |
| ACGIH: American Conference of Governmental Industrial Hygienists | | | | AIHA: American Industrial Hygiene Association | | |
| IARC: International Agency for Research on Cancer | | | | NTP: National Toxicology Program | | |
| NIOSH: National Institute of Occupational Safety and Health | | | | OSHA: Occupational Safety and Health Administration | | |
| NPCA: National Paint and Coating Manufacturers Association | | | | HMIS: Hazardous Materials Information System | | |
| NFPA: National Fire Protection Association | | | | EPA: US Environmental Protection Agency | | |

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

1. Chemical Product

Product Name: Diesel

2. Composition, Information On Ingredients

Product Use: This product is intended for use as a fuel in engines and heaters designed for diesel fuels, and for use in engineered processes. Use in other applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

Description: Diesel is a complex mixture of hydrocarbons from a variety of chemical processes blended to meet standardized product specifications.

3. Hazards Identification

Health Hazard Data:

1. The major effect of exposure to this product is giddiness, headache, central nervous system depression; possible irritation of eyes, nose, and lungs; and dermal irritation. Signs of kidney and liver damage may be delayed. Pulmonary irritation secondary to exhalation of solvent.
2. NIOSH recommends that whole diesel engine exhaust be regarded as a potential occupational carcinogen. Follow OSHA and NSHA rules where diesel engine exhaust fumes may be generated.
3. A lifetime skin painting study by the American Petroleum Institute has shown that similar naphtha products with a boiling range of 350-700 degrees F usually produce skin tumors and/ or skin cancers in laboratory mice. Only a weak to moderate response occurred. The effect to humans has not been determined.
4. Positive results at 2.0 ml/kg and 6.0 ml/kg noted in mutagenesis studies via in-vivo bone marrow cytogenetics assay in rats.

5. Kerosene is classified as a severe skin irritant. Mutation data has been reported for kerosene products. Hydrotreated kerosene is listed as being probably carcinogenic to humans with limited evidence in humans and sufficient evidence in experimental animals.

Hazards of Combustion Products: Carbon monoxide and carbon dioxide can be found in the combustion products of this product and other forms of hydrocarbon combustion. Carbon monoxide in moderate concentrations can cause symptoms of headache, nausea, vomiting, increased cardiac output, and confusion. Exposure to higher concentrations of carbon monoxide can cause loss of consciousness, heart damage, brain damage, and/or death. Exposure to high concentrations of carbon dioxide can cause simple asphyxiation by displacing available oxygen. Combustion of this and other similar materials should only be carried out in well-ventilated areas.

Medical Condition Generally Aggravated By Exposure: Medical conditions which have the same symptoms and effects as those outlined under the health hazard information section can be aggravated by exposure to this product.

Medical Limitation: N/A

Routes Of Exposure

Inhalation: Irritation of the upper respiratory tract and eyes, with possible euphoria, dizziness, headache, discoordination, ringing in the ears, convulsions, coma, and respiratory arrest.

Skin Contact: Defatting of the skin may occur with continued and prolonged contact. Irritation and burning sensation may occur on exposure to the liquid or mists.

Skin Absorption: Not significant.

Eye Contact: Severe burning sensation with temporary irritation and swelling of lids.

Ingestion: Irritation of the mucous membranes of throat, esophagus and stomach which may result in nausea and vomiting; central nervous system depression may occur, if absorbed (see inhalation symptoms above). If aspirated, chemical pneumonitis may occur with potentially fatal results. Possible kidney and liver damage may be delayed.

Carcinogenicity Statement: Diesel is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene and light catalytic cracked distillates as a probable

human carcinogen. Light paraffinic hydrotreated petroleum distillates are listed as confirmed human carcinogens by IARC.

4. First Aid Measures

Eyes: Immediately flush eyes with large amount of water for at least 15 minutes holding lids apart to ensure flushing of the entire eye surface. **SEEK IMMEDIATE MEDICAL ATTENTION.**

Skin: Wash contaminated areas with plenty of soap and water. A soothing ointment may be applied to irritated skin after thoroughly cleansing. Remove contaminated clothing and footwear. **SEEK IMMEDIATE MEDICAL ATTENTION.**

Inhalation: Get person out of contaminated area to fresh air. If breathing has stopped resuscitate and administer oxygen if readily available. **SEEK MEDICAL ATTENTION IMMEDIATELY.**

INGESTION: Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. If vomiting occurs spontaneously, keep airway clear. **SEEK MEDICAL ATTENTION IMMEDIATELY.**

Note to Physician: Do not induce vomiting, use gastric lavage only. Aspiration of liquid into the lungs could result in Chemical pneumonitis. Use of adrenaline is not advised. Treat symptomatically.

5. Fire and Explosion Data

Flash Point: 100 degrees F PM (minimum)

Autoignition Temperature: 494 degrees F

Flammable Limits In Air: UEL: 5% - LEL: 0.7%

Extinguishing Media: Use dry chemical, carbon dioxide, foam or water spray. Water may be ineffective in fighting fires of liquids with low flash points, but water should be used to keep fire exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect persons attempting to stop a leak.

Special Fire Fighting Procedures: Pressure-demand, self contained, breathing apparatus should be provided for fire fighters in buildings or confined areas where product is stored.

Unusual Fire And Explosion Hazard: Vapor accumulation is possible, and flashback can occur with explosive force if vapors are ignited.

6. Accidental Release Measures

If material is spilled, steps should be taken to contain liquid and prevent discharges to streams or sewer systems and control or stop the loss of volatile materials to the atmosphere. Spills or releases should be reported, if required to the appropriate local, state and federal regulatory agencies.

Small Spills: Remove ignition sources. Absorb spilled material with non-combustible materials such as cat litter, dirt, sand, or petroleum sorbent pads/pillows. Do not use combustible materials like rags, wood chips, or saw dust. Remove contaminated materials to an appropriate disposal container.

Large Spills: Remove ignition sources. Dike spill area with sand or dirt to contain material and cover sewers/drains. Remain upwind and keep unnecessary people away. Contact trained emergency response team for cleanup. Remove liquid using grounded suction pumps, isolate hazard area and deny entry.

7. Handling and Storage Information

Store only in approved containers. Protect containers against physical damage. Outside or detached storage is preferred. Separate from oxidizing materials. Store in cool, well ventilated area of non-combustible construction away from possible sources of ignition. Keep away from incompatible materials and follow OSHA 29 CFR 1910.106 and NFPA 30 for storage requirements.

Product Use: This product is intended for use as a fuel in engines and heaters designed for kerosene or diesel fuels, and for use in engineered processes. Use in other

applications may result in higher exposures and require additional controls, such as local exhaust ventilation and personal protective equipment.

8. Exposure Controls/Personal Protection

Ventilation Requirements: Work in well-ventilated areas using good engineering practices to process, transfer and store. Special ventilation is not required unless product is sprayed or heated. High volume use may require engineering controls.

Specific Personal Protective Equipment

Respiratory: Respiratory protection is not required unless product is sprayed or heated. Use NIOSH approved respiratory protection following manufacturer's recommendations where spray, mists, or vapors may be generated. Supplied air respiratory protection is required for IDLH areas. See 29 CFR 1910.134 for OSHA Respirator Protection regulations.

Eye: Face shield and goggles or chemical goggles should be worn where mist or spray may be generated, and where splashing occurs. Shower and eyewash facilities should be accessible.

Gloves: Impermeable protective gloves such as nitrile gloves should be worn during routine handling of this product. Barrier creams may also be appropriate where tactile sensitivity is required.

Other Clothing and Equipment: Clothing contaminated with this product should be removed and laundered before reuse. Items which cannot be laundered should be discarded. Allow contaminated items to air-dry or hang in a well-ventilated area. Spontaneous combustion or fire may result from contaminated materials being placed together before drying.

Exposure Monitoring

Biological: No applicable procedure, breath analysis for hydrocarbons has been suggested.

Personal/Area: Based on similarity to kerosene, both active and passive monitors employing charcoal adsorption follow by gas chromatography. An average molecular weight of 170 has been suggested as the average value to convert the determined

weight of hydrocarbons to ppm. Direct reading colorimetric tubes are available to evaluate short-term exposure.

9. Physical and Chemical Properties

Appearance and Odor: Colorless to straw, or red oily liquid with characteristic kerosene-like odor.

Viscosity: Specification dependent, 1.7 - 3.4 cSt @ 140 degrees F

Boiling Range @ 760 mm Hg: 302-644 degrees F

Vapor Density (Air=1): 4.5 (kerosene)

Evaporation Rate (BuAc=1): N/A

Specific Gravity (H2O=1): 0.865

Bulk Density At 60 degrees F: 6.8-7.2 lbs./gal.

Solubility in H2O % by WT.: Insoluble

Freezing Point: -51 degrees F

Vapor Pressure: 0.5 mmHg @ 20 degrees C

% Volatiles By Vol.: N/A

API Gravity: Specification dependent

pH: NA

10. Stability and Reactivity Information

Conditions Contributing to Instability: Under normal conditions, the material is stable. Avoid sources of ignition such as flames, hot surfaces, sparks, and electrical equipment.

Incompatibility: Avoid contact with strong oxidizers such as chlorine, concentrated oxygen, and sodium hypochlorite or other hypochlorites.

Hazardous Decomposition Products: Thermal decomposition products may include carbon monoxide, carbon dioxide, oxides of sulfur and nitrogen, and other toxic gases

Hazardous Polymerization: Material is not known to polymerize.

11. Disposal Considerations

Shipment, storage, disposal, and cleanup actions of waste materials are regulated under local, provincial and federal rules. Contact the appropriate agencies if uncertain of

applicability. Waste product and contaminated material having a flash point below 140 degrees F is considered a hazardous waste. Consult appropriate agencies for disposal requirements.

12. Other

This material safety data sheet was originally prepared by T. W. Brown Oil Co., Inc. and modified by Access Consulting Group. All information, recommendations and suggestions appearing herein concerning this product are based upon tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantee expressed or implied is made by T. W. Brown Oil Co., Inc. or Access Consulting Group as to the effects of such use, the results to be obtained or the safety and toxicity of the product nor does T. W. Brown Oil Co., Inc. or Access Consulting Group assume any liability arising out of use by others of the product referred to herein. Nor is the information herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MG INDUSTRIES
3 GREAT VALLEY PARKWAY
MALVERN, PENNSYLVANIA 19355
PHONE: 610-695-7400
FAX: 610-695-7596
SUBSTANCE: PROPANE
TRADE NAMES/SYNONYMS:
N-PROPANE; DIMETHYLMETHANE; PROPYL HYDRIDE; R-290; PROPYLHYDRIDE; LIQUEFIED
PETROLEUM GAS; LPG; STCC 4905781; UN 1978; C3H8; MGI19690; RTECS TX2275000
CHEMICAL FAMILY: hydrocarbons, aliphatic
CREATION DATE: May 07 1990
REVISION DATE: Mar 19 2003

EMERGENCY CONTACT:
CHEMTREC:
1-800-424-9300

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: PROPANE
CAS NUMBER: 74-98-6
EC NUMBER (EINECS): 200-827-9
EC INDEX NUMBER: 601-003-00-5
PERCENTAGE: 100

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=4 REACTIVITY=0

EMERGENCY OVERVIEW:

PHYSICAL DESCRIPTION: Colorless gas with a characteristic natural gas odor.

MAJOR HEALTH HAZARDS: central nervous system depression, difficulty breathing

PHYSICAL HAZARDS: Flammable gas. May cause flash fire.

POTENTIAL HEALTH EFFECTS:

INHALATION:

SHORT TERM EXPOSURE: nausea, vomiting, irregular heartbeat, headache,
symptoms of drunkenness, disorientation, suffocation, convulsions, coma

LONG TERM EXPOSURE: same as effects reported in short term exposure

SKIN CONTACT:

SHORT TERM EXPOSURE: blisters, frostbite

LONG TERM EXPOSURE: no information on significant adverse effects

EYE CONTACT:

SHORT TERM EXPOSURE: frostbite, blurred vision

LONG TERM EXPOSURE: no information is available

INGESTION:

SHORT TERM EXPOSURE: frostbite

LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:

OSHA: No

NTP: No

IARC: No

MGI19690 Page 002 of 008

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give
artificial respiration if not breathing. If breathing is difficult, oxygen
should be administered by qualified personnel. Get immediate medical
attention.

SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of

lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

EYE CONTACT: Flush eyes with plenty of water.

INGESTION: If a large amount is swallowed, get medical attention.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Severe explosion hazard.

Vapor/air mixtures are explosive. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk.

Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Stop flow of gas.

FLASH POINT: -157 F (-105 C)

LOWER FLAMMABLE LIMIT: 2.1%

MGI19690 Page 003 of 008

UPPER FLAMMABLE LIMIT: 9.5%

AUTOIGNITION: 842 F (450 C)

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:

Avoid heat, flames, sparks and other sources of ignition. Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.110.

Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

PROPANE:

1000 ppm (1800 mg/m³) OSHA TWA

2500 ppm ACGIH TWA

1000 ppm (1800 mg/m³) NIOSH recommended TWA 10 hour(s)

1800 mg/m³ (1000 ml/m³) DFG MAK (peak limitation category - II, with excursion factor of 2)

UK OES (simple asphyxiant)

MEASUREMENT METHOD: Combustible gas meter; NIOSH II(2) # S87

LIQUIFIED PETROLEUM GAS (LPG):

1000 ppm (1800 mg/m3) OSHA TWA

1000 ppm ACGIH TWA

1000 ppm (1800 mg/m3) NIOSH recommended TWA 10 hour(s)

1000 ppm (1750 mg/m3) UK OES TWA

1250 ppm (2180 mg/m3) UK OES STEL

MEASUREMENT METHOD: Combustible gas meter; NIOSH II(2) # S93

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield.

Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: For the gas: Protective clothing is not required. For the liquid: Wear appropriate protective, cold insulating clothing.

MGI19690 Page 004 of 008

GLOVES: Wear insulated gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

2100 ppm

Any supplied-air respirator.

Any self-contained breathing apparatus with a full facepiece.

Escape -

Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Any self-contained breathing apparatus with a full facepiece.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL DESCRIPTION: Colorless gas with a characteristic natural gas odor.

MOLECULAR WEIGHT: 44.11

MOLECULAR FORMULA: C-H3-C-H2-C-H3

BOILING POINT: -44 F (-42 C)

FREEZING POINT: -310 F (-190 C)

VAPOR PRESSURE: 6536 mmHg @ 20 C

VAPOR DENSITY (air=1): 1.55

SPECIFIC GRAVITY (water=1): 0.5853 @ -45 C

WATER SOLUBILITY: very slightly soluble

PH: Not applicable

VOLATILITY: Not applicable

ODOR THRESHOLD: 5000-20000 ppm

EVAPORATION RATE: Not applicable

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable

SOLVENT SOLUBILITY:

Soluble: absolute alcohol, ether, chloroform, benzene, turpentine

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition.

Minimize contact with material. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: oxidizing materials, combustible materials
PROPANE:

BARIUM PEROXIDE: Violent exothermic reaction.
CHLORINE DIOXIDE: Spontaneous explosion.
PLASTICS, RUBBER, COATINGS: Attacked by liquid propane.
OXIDIZERS (STRONG): Fire and explosion hazard.

MGI19690 Page 005 of 008

HAZARDOUS DECOMPOSITION:

Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

PROPANE:

TARGET ORGANS: central nervous system

ADDITIONAL DATA: Stimulants such as epinephrine may induce ventricular fibrillation.

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

PROPANE: Brief exposure to 10,000 ppm caused no symptoms in human subjects; 100,000 ppm produced slight dizziness in a few minutes but was not noticeably irritating to the nose or respiratory tract. High levels may produce disorientation, excitation, excessive salivation, headache and vomiting. In primates, 100,000 ppm produced some myocardial effects and at 200,000 ppm aggravation of these parameters and respiratory depression. Concentrations of 100,000 ppm in mice and 150,000 ppm in dogs appear to produce no arrhythmia but weak cardiac sensitization. Concentrations of 75% may produce nausea, vomiting, prostration, unconsciousness, convulsions, deep coma and death.

CHRONIC EXPOSURE:

PROPANE: Repeated contact may result in symptoms as described in acute exposure.

SKIN CONTACT:

ACUTE EXPOSURE:

PROPANE: No adverse effects have been reported from the gas. Due to rapid evaporation, the liquid may cause frostbite with redness, tingling and pain or numbness. In more severe cases, the skin may become hard and white and develop blisters.

CHRONIC EXPOSURE:

PROPANE: No adverse effects reported.

EYE CONTACT:

ACUTE EXPOSURE:

PROPANE: Vapor concentrations of 100,000 ppm were not noticeably irritating to the eyes. Due to rapid evaporation, the liquid may cause frostbite with redness, pain and blurred vision.

CHRONIC EXPOSURE:

PROPANE: No data available.

INGESTION:

ACUTE EXPOSURE:

PROPANE: Ingestion of a gas is unlikely. If the liquid is swallowed, frostbite damage of the lips, mouth and mucous membranes may occur.

MGI19690 Page 006 of 008

CHRONIC EXPOSURE:

PROPANE: No data available.

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **KEROSENE**

CAS Number: 8008-20-6

DOT Number: UN 1223

RTK Substance number: 1091

Date: September 1986 Revision: January 1997

HAZARD SUMMARY

- * **Kerosene** can affect you when breathed in and by passing through your skin.
- * Contact can irritate and burn the skin and eyes.
- * Breathing **Kerosene** can irritate the nose, throat and lungs.
- * High exposure can affect the nervous system causing headache, nausea, weakness, drowsiness and even coma.
- * **Kerosene** may damage the kidneys.

IDENTIFICATION

- * **Kerosene** is a clear to pale yellowish liquid with a fuel oil odor. It is used as a rocket fuel, a home heating fuel, and a solvent.

REASON FOR CITATION

- * **Kerosene** is on the Hazardous Substance List because it is cited by DOT, NIOSH and NFPA.
- * Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

- * Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
- * If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

NIOSH: The recommended airborne exposure limit is **100 mg/m³** averaged over a 10-hour workshift.

It should be recognized that **Kerosene** can be absorbed through your skin, thereby increasing your exposure.

WAYS OF REDUCING EXPOSURE

- * Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
- * Wear protective work clothing.
- * Wash thoroughly immediately after exposure to **Kerosene**.
- * Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Kerosene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Kerosene**:

- * Contact can irritate and burn the skin and eyes.
- * Breathing **Kerosene** can irritate the nose and throat causing cough and wheezing.
- * High exposure can affect the nervous system causing headache, nausea, weakness, disorientation, drowsiness and even coma.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Kerosene** and can last for months or years:

Cancer Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Kerosene** has not been tested for its ability to cause cancer in animals.

Reproductive Hazard

- * According to the information presently available to the New Jersey Department of Health and Senior Services, **Kerosene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

- * Repeated skin contact can cause itching and a skin rash.
- * **Kerosene** can irritate the lungs. Repeated exposures may cause bronchitis to develop with cough, phlegm, and/or shortness of breath.
- * **Kerosene** may damage the kidneys.

MEDICAL

Medical Testing

If symptoms develop or overexposure is suspected, the following may be useful:

- * Lung function tests.
- * Kidney function tests.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

Mixed Exposures

Because smoking can cause heart disease, as well as lung cancer, emphysema, and other respiratory problems, it may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

- * Where possible, automatically pump liquid **Kerosene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

- * Workers whose clothing has been contaminated by **Kerosene** should change into clean clothing promptly.
- * Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Kerosene**.
- * On skin contact with **Kerosene**, immediately wash or shower to remove the chemical.
- * Do not eat, smoke, or drink where **Kerosene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Kerosene**. The ACGIH recommends wearing *Neoprene, Nitrile Rubber or Polyvinyl Alcohol* gloves when handling **Kerosene**.

Eye Protection

- * Wear splash-proof chemical goggles and faceshield when working with liquid, unless full facepiece respiratory protection is worn.
- * All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

- * Where the potential exists for exposures over **100 mg/m³**, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

- Q: If I have acute health effects, will I later get chronic health effects?
- A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.
- Q: Can I get long-term effects without ever having short-term effects?
- A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

- Q: What are my chances of getting sick when I have been exposed to chemicals?
- A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.
- Q: When are higher exposures more likely?
- A: Conditions which increase risk of exposure include physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).
- Q: Is the risk of getting sick higher for workers than for community residents?
- A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

The following information is available from:

New Jersey Department of Health and
Senior Services
Occupational Disease and Injury Services
Trenton, NJ 08625-0360
(609) 984-1863

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call a Department of Health and Senior Services physician who can help you find the services you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m³ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

ETHYLENE GLYCOL

1. Product Identification

Synonyms: 1,2-Ethanediol; glycol; 1,2-Dihydroxyethane; Ethylene Alcohol; Ethulene Dihydrate

CAS No.: 107-21-1

Molecular Weight: 62.07

Chemical Formula: CH₂OHCH₂OH

Product Codes:

J.T. Baker: 5387, 5845, 9140, 9298, 9300, 9346, 9356, L715

Mallinckrodt: 5001, 5037

2. Composition/Information on Ingredients

| Ingredient | CAS No | Percent | Hazardous |
|-----------------|----------|-----------|-----------|
| Ethylene Glycol | 107-21-1 | 99 - 100% | Yes |

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

SAF-T-DATA^(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate (Life)

Flammability Rating: 1 - Slight

Reactivity Rating: 1 - Slight

Contact Rating: 3 - Severe (Life)

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

Vapor inhalation is generally not a problem unless heated or misted. Exposure to vapors over an extended time period has caused throat irritation and headache. May cause nausea, vomiting, dizziness and drowsiness. Pulmonary edema and central nervous system depression may also develop. When heated or misted, has produced rapid, involuntary eye movement and coma.

Ingestion:

Initial symptoms in massive dosage parallel alcohol intoxication, progressing to CNS depression, vomiting, headache, rapid respiratory and heart rate, lowered blood pressure, stupor, collapse, and unconsciousness with convulsions. Death from respiratory arrest or cardiovascular collapse may follow. Lethal dose in humans: 100 ml (3-4 ounces).

Skin Contact:

Minor skin irritation and penetration may occur.

Eye Contact:

Splashes may cause irritation, pain, eye damage.

Chronic Exposure:

Repeated small exposures by any route can cause severe kidney problems. Brain damage may also occur. Skin allergy can develop. May damage the developing fetus.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders, eye problems, or impaired liver, kidney, or respiratory function may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:

Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:

Give sodium bicarbonate intravenously to treat acidosis. Urinalysis may show low

specific gravity, proteinuria, pyuria, cylindruria, hematuria, calcium oxide, and hippuric acid crystals. Ethanol can be used in antidotal treatment but monitor blood glucose when administering ethanol because it can cause hypoglycemia. Consider infusion of a diuretic such as mannitol to help prevent or control brain edema and hemodialysis to remove ethylene glycol from circulation.

5. Fire Fighting Measures

Fire:

Flash point: 111C (232F) CC

Autoignition temperature: 398C (748F)

Flammable limits in air % by volume:

lel: 3.2; uel: 15.3

Slight to moderate fire hazard when exposed to heat or flame.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Containers may explode when involved in a fire.

Fire Extinguishing Media:

Dry chemical, foam or carbon dioxide. Water or foam may cause frothing. Water spray may be used to extinguish surrounding fire and cool exposed containers. Water spray will also reduce fume and irritant gases.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Toxic gases and vapors may be released if involved in a fire.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Separate from acids and oxidizing materials. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

-OSHA Permissible Exposure Limit (PEL):
50 ppm Ceiling

-ACGIH Threshold Limit Value (TLV):
50 ppm Ceiling (vapor)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. Please note that N series filters are not recommended for this material. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear protective gloves and clean body-covering clothing.

Eye Protection:

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear oily liquid.

Odor:

Odorless.

Solubility:

Miscible in water.

Specific Gravity:

1.1 @20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

197.6C (388F)

Melting Point:

-13C (9F)

Vapor Density (Air=1):

2.14

Vapor Pressure (mm Hg):

0.06 @ 20C (68F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Carbon dioxide and carbon monoxide may form when heated to decomposition. May produce acrid smoke and irritating fumes when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong oxidizing agents. Reacts violently with chlorosulfonic acid, oleum, sulfuric acid, perchloric acid. Causes ignition at room temperature with chromium trioxide, potassium permanganate and sodium peroxide; causes ignition at 212F(100C) with ammonium dichromate, silver chlorate, sodium chloride and uranyl nitrate.

Conditions to Avoid:

Heat, flames, ignition sources, water (absorbs readily) and incompatibles.

11. Toxicological Information

Toxicological Data:

Oral rat LD50: 4700 mg/kg; skin rabbit LD50: 9530 mg/kg.

Irritation - skin rabbit: 555mg(open), mild; eye rabbit: 500mg/24H, mild.

Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:

Has shown teratogenic effects in laboratory animals.

| Ingredient | ---NTP Carcinogen--- | | IARC Category |
|----------------------------|----------------------|-------------|---------------|
| | Known | Anticipated | |
| Ethylene Glycol (107-21-1) | No | No | None |

12. Ecological Information

Environmental Fate:

When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is not expected to evaporate significantly. When released into water, this material is expected to readily biodegrade. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material is not expected to significantly bioaccumulate. This material has a log octanol-water partition coefficient of less than 3.0. When released into water, this material is not expected to evaporate significantly. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity:

The LC50/96-hour values for fish are over 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

```
-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
-----
Ethylene Glycol (107-21-1)                   Yes  Yes  Yes    Yes
```

```
-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea  --Canada--
                                     DSL   NDSL   Phil.
-----
Ethylene Glycol (107-21-1)                   Yes   Yes   No     Yes
```

```
-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-
                                     RQ   TPQ   List  Chemical Catg.
-----
Ethylene Glycol (107-21-1)                   No    No    Yes   No
```

```
-----\Federal, State & International Regulations - Part 2\-----
Ingredient                                     CERCLA  -RCRA-  -TSCA-
                                     5000   261.33  8(d)
-----
Ethylene Glycol (107-21-1)                   5000   No     No
```

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: None allocated.

Poison Schedule: None allocated.

WHMIS:

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 1 Flammability: 1 Reactivity: 0

Label Hazard Warning:

WARNING! HARMFUL OR FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE IRRITATION TO SKIN, EYES, AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:

Do not breathe vapor or mist.

Use only with adequate ventilation.

Keep container closed.

Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Label First Aid:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. Call a physician if irritation develops or persists. If swallowed, give water or milk to drink and induce vomiting. Never give anything by mouth to an unconscious person. In all cases call a physician.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3.

RECEIVED MAR 7 - 1994

Date: Tuesday, 5 November 1991 3:17pm ET
To: MSDS-ENGLISH
From: Greg.Brown
Subject: COBALT SULPHATE HEPTAHYDRATE, 91OCT31

STANCHEM Inc.
195 The West Mall,
Suite 500,
Etobicoke, Ontario
M9C 5K1
(416) 620-1711

COBALT SULPHATE HEPTAHYDRATE

MATERIAL SAFETY DATA SHEET

Date Revised: 1991 October 31
WHMIS Number: 00060162
Index: HCl0120/91D

EMERGENCY TELEPHONE NUMBERS

| | | | |
|-----------------|----------------|-----------------|----------------|
| Toronto, Ont. | (416) 226-6117 | Montreal, Que | (514) 861-1211 |
| Winnipeg, Man. | (204) 943-8827 | Edmonton, Alta. | (403) 424-1754 |
| Vancouver, B.C. | (604) 685-5036 | | |

PRODUCT IDENTIFICATION

Product Name: Cobalt (II) Sulphate Heptahydrate.
Chemical Name: Sulphuric Acid, Cobalt (II) salt.
Synonyms: Not applicable.
Chemical Family: Inorganic metallic salt.
Molecular Formula: $CoSO_4 \cdot 7H_2O$.
Product Use: Ceramic glazes. Glass colouring.

REGULATORY SECTION

Controlled Products Regulations Classification: D-1B: Toxic (acute effects).

OSHA Hazard Communication (29CFR 1910.1200) Classification: Highly Toxic.

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Not regulated.
Shipping Class/Division: Not regulated.
Product Identification No (PIN): Not regulated.
Packing Group: Not regulated.

J.S. DOT Classification: Not regulated.

Other Regulations: None known.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF MATERIAL

| Hazardous Ingredients | % | ACGIH | |
|---------------------------------|------------|-------------------------|--------------|
| | | TLV | CAS No. |
| Cobalt Sulphate Heptahydrate | 95 - 100 % | 0.05 mg/M3 as Cobalt | 0010124-43-3 |

PHYSICAL PROPERTIES

Physical State: Solid.
Appearance and Odour: Odourless pink crystalline powder.
Odour Threshold: Not available.
Boiling Range (Deg C): 420 Deg. Celsius (loses water).
Melting/Freezing Point (Deg C): Decomposes at 735 Deg. Celsius.
Vapour Pressure: Not applicable.
Specific Gravity: 1.1 - 3.7 gm/cc (water = 1.00).
Vapour Density: Not applicable.
Bulk Density: Not available.
Evaporation Rate: Not applicable.
Solubility: 320 gm/Liter H2O at 20 Deg. Celsius;
830 gm/Liter H2O at 100 Deg. Celsius.
% Volatile by Volume: 0 %.
pH: Not available.
Coefficient of Water/Oil Distribution: Not available.
Sensitivity to Mechanical Impact: Not available. Not expected to be sensitive to mechanical impact.
Rate of Burning: Not available.
Explosive Power: Not available.
Sensitivity to Static Discharge: Not available. Not expected to be sensitive to static discharge.

REACTIVITY DATA

Stability:
Under Normal Conditions: Stable.
Under Fire Conditions: Not flammable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition.

StancheM Inc.

Cobalt Sulphate Heptahydrate
WHMIS Number: 00060162
Page 3.

Materials to Avoid: Avoid moisture contamination. Strong oxidizers, ammonium nitrates.

Hazardous Decomposition or Combustion Products: Thermal decomposition products are toxic and may include oxides of sulphur and cobalt.

FIRE AND EXPLOSION DATA

Flash Point (Method): Does not form vapour.

Autoignition Temperature: Not applicable.

Flammability Limits in Air (%): LEL: Not applicable.
UEL: Not applicable.

Fire Extinguishing Media: Use media appropriate for surrounding fire and/or materials.

Fire Fighting Procedures: Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Use self-contained breathing apparatus and special protective clothing.

Other Fire or Explosion Hazards: None known.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: None established for this product. See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data:

Cobalt Sulphate LD50 (oral rat) = 424 mg/Kg (1).

Carcinogenicity Data: The ingredient(s) of this product is (are) not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by NTP (National Toxicology Program).

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

- . Inhaled: Product is irritating to the nose, throat and respiratory tract.
- . In contact with the skin: This product may cause irritation due to abrasive action.
- . In contact with the eyes: This product may cause irritation, redness and possible damage due to abrasiveness.
- . Ingested: Ingestion of large amounts may cause nausea, gastrointestinal upset and abdominal pain. May cause nausea and vomiting

Other Health Effects: None known.

FIRST AID PROCEDURES WHEN:

- . Inhaled: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.
- . In contact with the skin: Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, obtain medical advice.
- . In contact with the eyes: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.
- . Ingested: If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local poison control centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Emergency Medical Care: None known.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required.

Respiratory Protection: A NIOSH/MSHA-approved air-purifying respirator equipped with dust, mist, fume cartridges for concentrations up to 0.25 mg/M3. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: Gloves and protective clothing made from butyl rubber should be impervious under conditions of use. Prior to use, user should confirm impermeability.

Eye Protection: Safety glasses with side shields are recommended to prevent eye contact.

Other Personal Protective Equipment: Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

Handling Procedures and Equipment: Use normal "good" industrial hygiene and housekeeping practices.

Storage Temperature (Deg C): See below.

Storage Requirements: Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40 Deg. Celsius. Keep containers closed. Avoid moisture contamination.

Other Precautions: Use only with adequate ventilation and avoid breathing vapours. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use. Do not store or transport with food or feed.

Stanchem Inc.

Cobalt Sulphate Heptahydrate
WHMIS Number: 00060162
Page 6.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Eliminate all sources of ignition. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: May be harmful to aquatic life. Can be dangerous if allowed to enter drinking water intakes.

Deactivating Chemicals: None known.

Waste Disposal Methods: Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-Line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
2. Supplier's Material Safety Data Sheets, 1985 September 25.

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Stanchem Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

Date Issued: 1991 October 31
Date Revised: 1991 October 31
MSDS Index No: HCl0120/91D

Prepared By: Regulatory Affairs Officer, Stanchem Inc., (416) 259-8231.

Date: Tuesday, 20 April 1993 9:43am ET
To: MSDS-ENGLISH
From: Carol.Palichuk
Subject: SULPHURIC ACID 60 - 100 %, ENG, 93APR19

STANCHEM Inc.
43 Jutland Road,
Etobicoke, Ontario,
M8Z 2G6
(416) 259-8231

SULPHURIC ACID 60 - 100 %
(48 - 66 Baume; 1.48 - 1.84 Density)

MATERIAL SAFETY DATA SHEET

Issue Date: 1993 April 19
WHMIS Number: 00060799
Index: GCD0052/93B

EMERGENCY TELEPHONE NUMBERS

| | | | |
|-----------------|----------------|-----------------|----------------|
| Toronto, Ont. | (416) 226-6117 | Montreal, Que | (514) 861-1211 |
| Winnipeg, Man. | (204) 943-8827 | Edmonton, Alta. | (403) 424-1754 |
| Vancouver, B.C. | (604) 685-5036 | | |

PRODUCT IDENTIFICATION

Product Name: Sulphuric Acid, 60 - 100 %.
Chemical Name: Sulphuric Acid.
Synonyms: Oil of Vitriol, Nordhausen Acid.
Chemical Family: Inorganic Acid.
Molecular Formula: H₂SO₄.
Product Use: Fertilizer. Dyes and pigments. Industrial explosives.
Electrical storage batteries.
CAS #: 7664-93-9.

REGULATORY SECTION

Controlled Products Regulations Classification: D-1A: Very Toxic (Acute Effects), E: Corrosive.

OSHA Hazard Communication (29CFR 1910.1200) Classification: Highly Toxic, Corrosive.

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Sulphuric Acid.
Shipping Class/Division: 8 (9.2).
Product Identification No (PIN): UN1830.
Packing Group: II.
Regulated Limit: Not applicable.

Stanchem Inc.

Sulphuric Acid 60 - 100 %

WHMIS Number: 00060799

Page 2

1.5. DOT Classification:

Identification: Sulphuric Acid.
Hazard Class: 8.
UN Identification: UN1830.
Packing Group: II.
Label(s)/Placard: Corrosive.
Reportable Quantity: 1000 lb.

ENVIRONMENTAL PROTECTION ACTS: CANADA AND USA

The (ALL) constituent(s) of this product is (are) included on the DSL/NDL of the CEPA and the TSCA Inventory of the US-EPA.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF MATERIAL

| Hazardous Ingredients | CAS No. | ACGIH TLV | % |
|-----------------------|-------------|-----------|----------|
| Sulphuric Acid | 007664-93-9 | 1 mg/M3 | 60 - 100 |

PHYSICAL PROPERTIES

Physical State: Liquid.
Appearance and Odour: Clear, colourless liquid with characteristic odour.
Odour Threshold (ppm): Not available.
Boiling Range (Deg Celsius): 330 (98% Sulphuric Acid).
Melting/Freezing Point (Deg Celsius): -1.1 (98% Sulphuric Acid).
Vapour Pressure (mm Hg at 20 Deg. Celsius): 0.002 (98% Sulphuric Acid).
Specific Gravity (gm/cc, Water = 1.0): 1.48 (60% Sulphuric Acid) - 1.84 (98% Sulphuric Acid).
Vapour Density (Air = 1.0): 3.4 (Sulphuric Acid Component).
Bulk Density: Not applicable.
Evaporation Rate (Butyl Acetate = 1.0): Not applicable.
Solubility: Soluble in water.
Volatile by Volume: Not available.
H: 0.3 (1N Solution).
Coefficient of Water/Oil Distribution: Not available.

Sensitivity to Mechanical Impact: Not available. Not expected to be sensitive to mechanical impact.
Rate of Burning: Not available.
Explosive Power: Not available.
Sensitivity to Static Discharge: Not available. Not expected to be sensitive to static discharge.

REACTIVITY DATA

Stability:

Under Normal Conditions: Stable.
Under Fire Conditions: Not flammable.
Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition.

Materials to Avoid: Organic materials. Alcohols. Chlorinated compounds. Hydrogen gas may be produced on prolonged contact with metals such as aluminium, tin, lead and zinc.

Hazardous Decomposition or Combustion Products: Thermal decomposition products are toxic and may include oxides of sulphur.

FIRE AND EXPLOSION DATA

Flash Point (TCC, Deg. Celsius): Not applicable.
Autoignition Temperature (Deg. Celsius): Not applicable.
Flammability Limits in Air (%): LEL: Not applicable.
UEL: Not applicable.

Fire Extinguishing Media: Use media appropriate for surrounding fire and/or materials.

Fire Fighting Procedures: Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Use self-contained breathing apparatus and special protective clothing.

Other Fire or Explosion Hazards: Avoid direct contact of this product with water as this can cause a violent exothermic reaction.

Stanchem Inc.

Sulphuric Acid 60 - 100 %

WHMIS Number: 00060799

Page 4

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data:

Sulphuric Acid LD50 (Oral, Rat) = 472 mg/kg (3)
 LC50 (Inhal'n, Rat) = 90 ppm for 4 hours (1)

Carcinogenicity Data: The ingredient(s) of this product is (are) not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by NTP (National Toxicology Program). See "Other Health Effects" Section.

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Respiratory / Skin Sensitization: None known.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

- Inhaled: Product may cause severe irritation of the nose, throat and respiratory tract. Repeated and/or prolonged exposures may cause productive cough, running nose, bronchopneumonia, pulmonary edema (fluid build-up in lungs), and reduction of pulmonary function. Prolonged or repeated exposure may cause discolouration and erosion of teeth.
- In contact with the skin: Concentrated solutions may cause pain and deep and severe burns to the skin. Prolonged and repeated exposure to dilute solutions often causes irritation, redness, pain and drying and cracking of the skin.

-
- . In contact with the eyes: Extremely corrosive! This product causes corneal scarring and clouding. Glaucoma, cataracts and permanent blindness may occur.
 - . Ingested: This product causes severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhea and perforation of the esophagus and stomach lining may occur.

Other Health Effects: Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following ANY exposure is ESSENTIAL.

Although no direct link has been established between exposure to sulphuric acid, itself, and cancer in man, the World Health Organization (WHO) and International Agency for Research on Cancer (IARC) have concluded that occupational exposure to strong inorganic acid mists containing sulphuric acid is carcinogenic to man, causing cancer of the larynx (the voice box) and, to a lesser extent, the lung. Exposure to any mist or aerosol during the use of this product should be avoided and, in any case, keep exposures below the occupational exposure limit for sulphuric acid. (3)

Acid mist is most likely to be generated at the vents of process or storage tanks, especially during filling operations. The use of compressed air to force acids from delivery trucks is of special concern. Scrubbing the exhaust of these vents is highly recommended. Jurisdictional regulations should be consulted to determine required practices.

FIRST AID PROCEDURES WHEN:

Inhaled: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY.

In contact with the skin: Flush skin with running water for a minimum of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.

. In contact with the eyes: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport.

. Ingested: If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local poison control centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Emergency Medical Care: While the patient is being transported to a medical facility, apply compresses of iced water. If medical treatment must be delayed, immerse the affected area in iced water. If immersion is not practical, compresses of iced water can be applied. Avoid freezing tissues.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required. Ventilation should be corrosion proof.

Respiratory Protection: A NIOSH/MSHA-approved air-purifying respirator equipped with acid gas cartridges for concentrations up to 10 mg/M3 Sulphuric Acid. An air-supplied respirator if concentrations are higher or unknown.

Skin Protection: Gloves and protective clothing made from neoprene or PVC should be impervious under conditions of use. Prior to use, user should confirm impermeability.

Eye Protection: Use full face-shield and chemical safety goggles when there is potential for contact.

Stanchem Inc.

Sulphuric Acid 60 - 100 %

WHMIS Number: 00060799

Page 7

Other Personal Protective Equipment: Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

Handling Procedures and Equipment: Use normal "good" industrial hygiene and housekeeping practices.

When diluting, add this product to water in small amounts to avoid spattering. Never add water to this product. The water should be lukewarm. Never start with hot or cold water.

Storage Temperature (Deg Celsius): See below.

Storage Requirements: Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40 Deg. Celsius.

Other Precautions: Use only with adequate ventilation and avoid breathing mists and vapours. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Eliminate all sources of ignition. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Product has an unaesthetic appearance and can be a nuisance. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Deactivating Chemicals: Neutralize carefully with soda ash or sodium bicarbonate to a pH of 6 to 9.

Waste Disposal Methods: Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-Line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).
4. "CHEMINFO", through "CCINFODisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
5. Guide to Occupational Exposure Values, 1992, American Conference of Governmental Industrial Hygienists, Cincinnati, 1992.

The information contained herein is offered only as a guide to the handling of this specific material and has been prepared in good faith by technically knowledgeable personnel. It is not intended to be all-inclusive and the manner and conditions of use and handling may involve other and additional considerations. No warranty of any kind is given or implied and Stanchem Inc. will not be liable for any damages, losses, injuries or consequential damages which may result from the use of or reliance on any information contained herein. This Material Safety Data Sheet is valid for three years.

Stanchem Inc.

Sulphuric Acid 60 - 100 %
WHMIS Number: 00060799
Page 9

To obtain revised copies of this or other Material Safety Data Sheets,
contact your nearest Stanchem Regional office.

Stanchem Regional Offices

Stanchem Inc., 800 Terminal Avenue, Vancouver, British Columbia, V6A 2M8
Phone: (604) 685-1411 Facsimile: (604) 681-5218

Stanchem Inc., 9637 - 45 th. Avenue, Edmonton, Alberta, T5J 2L4
Phone: (403) 434-1818 Facsimile: (403) 434-9009

Stanchem Inc., 681 Plinquet Street, Winnipeg, Manitoba, R2J 2X2
Phone: (204) 233-5361 Facsimile: (204) 233-7005

Stanchem Inc., 43 Jutland Road, Etobicoke, Ontario, M8Z 2G6
Phone: (416) 259-8231 Facsimile: (416) 259-6175

Stanchem Inc., 2900 Jean Baptiste Des., Lachine, PQ, H8T 1C8
Phone: (514) 636-9230 Facsimile: (514) 636-0877

Stanchem Inc., A-105 Akerley Boulevard, Dartmouth, Nova Scotia, B3B 1R7
Phone: (902) 468-9690 Facsimile: (902) 468-3085

Issue Date: 1993 April 19
Date Revised: 1993 April 19
Index: GCD0052/93B

Prepared By: Regulatory Affairs Group, Stanchem Inc., (416) 259-8231.

Date: Monday, 26 October 1992 1:21pm ET
To: MSDS-ENGLISH
From: Carol.Palichuk
Subject: HYDRATED LIME, ENG, 92OCT20

STANCHEM Inc.
43 Jutland Road,
Etobicoke, Ontario,
M8Z 2G6
(416) 259-8231

HYDRATED LIME

MATERIAL SAFETY DATA SHEET

Issue Date: 1992 October 20
WHMIS Number: 00060399
Index: GCD1281/92D

EMERGENCY TELEPHONE NUMBERS

| | | | |
|-----------------|----------------|-----------------|----------------|
| Toronto, Ont. | (416) 226-6117 | Montreal, Que | (514) 861-1211 |
| Winnipeg, Man. | (204) 943-8827 | Edmonton, Alta. | (403) 424-1754 |
| Vancouver, B.C. | (604) 685-5036 | | |

PRODUCT IDENTIFICATION

Product Name: Hydrated Lime.
Chemical Name: Calcium Hydroxide.
Synonyms: Calcium hydrate, caustic lime, slaked lime.
Chemical Family: Hydroxide.
Molecular Formula: Ca(OH)₂.
Product Use: Mortars, plasters, cements.
CAS #: 1305 - 62-0.

REGULATORY SECTION

Controlled Products Regulations Classification: E: Corrosive.

OSHA Hazard Communication (29CFR 1910.1200) Classification: Corrosive.

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Not regulated.
Shipping Class/Division: Not regulated.
Product Identification No (PIN): Not regulated.
Packing Group: Not regulated.
Regulated Limit: Not regulated.

U.S. DOT Classification:

Identification: Not regulated.
 Hazard Class: Not regulated.
 UN Identification: Not regulated.
 Label(s)/Placard: Not regulated.

Other Regulations: None known.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF MATERIAL

| Hazardous Ingredients | CAS No. | ACGIH TLV | % |
|-----------------------|-------------|-----------|----------|
| Calcium Hydroxide | 001305-62-0 | 5 mg/M3 | 90 - 100 |

PHYSICAL PROPERTIES

Physical State: Solid.
 Appearance and Odour: Odourless, greyish-white powder or lumps.
 Odour Threshold (ppm): Odourless.
 Boiling Range (Deg Celsius): 2850.
 Melting/Freezing Point (Deg Celsius): Not available.
 Vapour Pressure (mm Hg at 20 Deg. Celsius): Not applicable.
 Specific Gravity (gm/cc, Water = 1.0): 2.2 - 2.4.
 Vapour Density (Air = 1.0): Not applicable.
 Bulk Density: Not available.
 Evaporation Rate (Butyl Acetate = 1.0): Not applicable.
 Solubility: Partially soluble in water.
 Volatile by Volume: Not applicable.
 pH: 12 - 12.4.
 Coefficient of Water/Oil Distribution: Not available.
 Sensitivity to Mechanical Impact: Not available. Not expected to be sensitive to mechanical impact.
 Rate of Burning: Not available.
 Explosive Power: Not available.
 Sensitivity to Static Discharge: Not available. Not expected to be sensitive to static discharge.

REACTIVITY DATA

Stability:

- Under Normal Conditions: Stable.
- Under Fire Conditions: Not flammable.
- Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition.

Materials to Avoid: Lewis or mineral acids. Maleic anhydride. Nitro-organic compounds. Phosphorous.

Hazardous Decomposition or Combustion Products: Calcium oxide.

FIRE AND EXPLOSION DATA

Flash Point (TCC, Deg. Celsius): Not applicable.

Auto Ignition Temperature (Deg. Celsius): Not applicable.

Flammability Limits in Air (%): LEL: Not applicable.
UEL: Not applicable.

Fire Extinguishing Media: Use media appropriate for surrounding fire and/or materials.

Fire Fighting Procedures: Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Use self-contained breathing apparatus and special protective clothing.

Other Fire or Explosion Hazards: None known.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: See "HAZARDOUS INGREDIENTS OF PRODUCT" Section.

Toxicological Data:

Calcium Hydroxide LD50 (Oral, Rat) = 7340 mg/kg (1)

Carcinogenicity Data: The ingredient(s) of this product is (are) not classified as carcinogenic by ACGIH (American Conference of Governmental Industrial Hygienists) or IARC (International Agency for Research on Cancer), not regulated as carcinogens by OSHA (Occupational Safety and Health Administration), and not listed as carcinogens by NTP (National Toxicology Program).

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Respiratory / Skin Sensitization: None known.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

Inhaled: Product may cause severe irritation of the nose, throat and respiratory tract.

In contact with the skin: Concentrated solutions may cause pain and deep and severe burns to the skin. Prolonged and repeated exposure to dilute solutions often causes irritation, redness, pain and drying and cracking of the skin.

In contact with the eyes: This product causes immediate pain, severe burns and permanent corneal damage which may result in blindness.

Ingested: This product causes severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhea and perforation of the esophagus and stomach lining may occur.

Other Health Effects: Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following ANY exposure is ESSENTIAL.

FIRST AID PROCEDURES WHEN:

- . Inhaled: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical attention IMMEDIATELY.
- . In contact with the skin: Flush skin with running water for a minimum of 30 minutes or up to 60 minutes for critical body areas. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.
- . In contact with the eyes: Immediately flush eyes with running water for a minimum of 30 minutes, preferably up to 60 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport.
- . Ingested: If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local poison control centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Emergency Medical Care: Treat symptomatically.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required. Ventilation should be corrosion proof.

Respiratory Protection: A NIOSH/MSHA-approved air-purifying respirator equipped with dust, mist, fume cartridges for concentrations up to 50 mg/M3. An air-supplied respirator if concentrations are higher or unknown.

Stanchem Inc.

Hydrated Lime

WHMIS Number: 00060399

Page 6

Skin Protection: Gloves and protective clothing made from neoprene or PVC should be impervious under conditions of use. Prior to use, user should confirm impermeability.

Eye Protection: Safety glasses with side shields are recommended to prevent eye contact. Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

Handling Procedures and Equipment: Use normal "good" industrial hygiene and housekeeping practices.

Storage Temperature (Deg Celsius): See below.

Storage Requirements: Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40 Deg. Celsius.

Other Precautions: Use only with adequate ventilation and avoid breathing dusts and mists. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Sweep up immediately to eliminate slipping hazard. Do not allow to enter sewers or watercourses. Minimize air borne spreading of dust. Eliminate all sources of ignition. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Product has an unaesthetic appearance and can be a nuisance. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Deactivating Chemicals: Neutralize carefully with weak acid to a pH of 6 to 9.

Waste Disposal Methods: Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

ADDITIONAL INFORMATION AND SOURCES USED

1. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
 2. Guide to Occupational Exposure Values, 1991, American Conference of Governmental Industrial Hygienists, Cincinnati, 1991.
 3. Supplier's Material Safety Data Sheet(s).
 4. "CHEMINFO", through "CCINFOdisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
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Stanchem Inc.

Hydrated Lime

WHMIS Number: 00060399

Page 8

To obtain revised copies of this or other Material Safety Data Sheets,
contact your nearest Stanchem Regional office.

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Issue Date: 1992 October 20
Date Revised: 1992 October 20
Index: GCD1281/92D

Prepared By: Regulatory Affairs Group, Stanchem Inc., (416) 259-8231.

Date: Thursday, 18 June 1992 1:46pm ET
To: MSDS-ENGLISH
From: Carol.Palichuk
Subject: SOLVENT 160, ENG, 92JUN19

STANCHEM Inc.
43 Jutland Road,
Etobicoke, Ontario,
M8Z 2G6
(416) 259-8231

SOLVENT 160

MATERIAL SAFETY DATA SHEET

Date Revised: 1992 June 19
WHMIS Number: 00060729
Index: GCD3186/92B

EMERGENCY TELEPHONE NUMBERS

| | | | |
|-----------------|----------------|-----------------|----------------|
| Toronto, Ont. | (416) 226-6117 | Montreal, Que | (514) 861-1211 |
| Winnipeg, Man. | (204) 943-8827 | Edmonton, Alta. | (403) 424-1754 |
| Vancouver, B.C. | (604) 685-5036 | | |

PRODUCT IDENTIFICATION

Product Name: Solvent 160.
Chemical Name: Not applicable.
Synonyms: Petroleum solvent.
Chemical Family: Hydrocarbons.
Molecular Formula: Not applicable.
Product Use: Industrial solvent, cleaner, degreaser.
CAS #: 64742-47-8.

REGULATORY SECTION

Controlled Products Regulations Classification: B-3: Combustible Liquid,
D-2B: Toxic (Skin Irritant).

OSHA Hazard Communication (29CFR 1910.1200) Classification: Combustible
Liquid, Skin Irritant.

CANADIAN TDG ACT SHIPPING DESCRIPTION

Shipping Name: Not regulated.
Shipping Class/Division: Not regulated.
Product Identification No (PIN): Not regulated.
Packing Group: Not regulated.
Regulated Limit: Not regulated.

U.S. DOT Classification:

Identification: Not regulated.
Hazard Class: Not regulated.
UN Identification: Not regulated.
Label(s)/Placard: Not regulated.

Other Regulations: None known.

Read the entire MSDS for the complete hazard evaluation of this product.

HAZARDOUS INGREDIENTS OF MATERIAL

| Hazardous Ingredients | CAS No. | ACGIH TLV | % |
|-----------------------|-------------|--------------|----------|
| Solvent 160 | 064742-47-8 | Not listed. | 95 - 100 |
| Benzene | 000071-43-2 | 10 ppm *A1 | Trace |

*A1 = Confirmed Human Carcinogen (ACGIH).

PHYSICAL PROPERTIES

Physical State: Liquid.
Appearance and Odour: Clear, colourless liquid with characteristic odour.
Odour Threshold (ppm): Not available.
Boiling Range (Deg Celsius): 199 - 264.
Melting/Freezing Point (Deg Celsius): Not available.
Vapour Pressure (mm Hg at 20 Deg. Celsius): Not available.
Specific Gravity (gm/cc, Water = 1.0): 0.8.
Vapour Density (Air = 1.0): Not available.
Bulk Density: Not applicable.
Evaporation Rate (Butyl Acetate = 1.0): Not available.
Solubility: Not soluble in water. -
% Volatile by Volume: 100.
pH: Not applicable.
Coefficient of Water/Oil Distribution: Not available.

Sensitivity to Mechanical Impact: Not available. Not expected to be sensitive to mechanical impact.
Rate of Burning: Not available.
Explosive Power: Not available.
Sensitivity to Static Discharge: Not available. Expected to be sensitive to static discharge when vapours are present below the lower and upper explosive limits.

REACTIVITY DATA

Stability:

Under Normal Conditions: Stable.
Under Fire Conditions: Flammable.
Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition.

Materials to Avoid: Strong oxidizers.

Hazardous Decomposition or Combustion Products: Thermal decomposition products are toxic and may include carbon dioxide, carbon monoxide and, possibly, irritating gases.

FIRE AND EXPLOSION DATA

Flash Point (TCC, Deg. Celsius): Above 71.
Autoignition Temperature (Deg. Celsius): Not available.
Flammability Limits in Air (%): LEL: Not available.
UEL: Not available.

Fire Extinguishing Media: For large fires use an all purpose type AFFF foam according to foam manufacturer's recommended techniques. The foam supplier should be consulted for recommendations regarding foam types and delivery rates for specific applications. Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog.

Do not use water. This material may produce a floating fire hazard in extreme fire conditions.

Fire Fighting Procedures: Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours; re-ignition is possible. Use self-contained breathing apparatus and protective clothing.

Stanchem Inc.

Solvent 160

WHMIS Number: 00060729

Page 4

Other Fire or Explosion Hazards: Vapours from this product are heavier than air, and may "travel" to a source of ignition (eg. pilot lights, heaters, electric motors) some distance away, and then "flash back" to the point of product discharge causing an explosion and fire.

TOXICOLOGICAL AND HEALTH DATA

Recommended Exposure Limit: None established for this product.

Manufacturer's Recommended Exposure Level = 1000 ppm mg/M3 (max) for 8 hours, or 500 mg/M3 (max) for 12 hours exposure.

Toxicological Data:

Solvent 160 LD50 (oral, rat) = Above 5600 mg/kg (3)
LC50 (inhal'n, rat) = 13700 ppm 4 hours (3)

Carcinogenicity Data: This product may contain a trace amount (less than 0.1%, w/w) of a carcinogen (Benzene). It is our belief that, under conditions of normal occupational exposure, this product should not pose such a hazard to the worker.

Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.

Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.

Teratogenicity Data: No information is available and no adverse teratogenic/embryotoxic effects are anticipated.

Respiratory / Skin Sensitization: None known.

Synergistic Materials: None known.

EFFECTS OF EXPOSURE WHEN:

. Inhaled: Product is irritating to the nose, throat and respiratory tract. May cause central nervous system (CNS) depression. See "Other Health Effects" Section.

-
- . In contact with the skin: May cause defatting, drying and cracking of the skin. Prolonged and repeated contact may lead to dermatitis.
 - . In contact with the eyes: Vapours from this product are irritating to the eyes. This product causes irritation, redness and pain.
 - . Ingested: This product causes irritation, a burning sensation of the mouth and throat and abdominal pain.

Other Health Effects: CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure.

Intentional misuse of organic solvents (eg. "glue sniffing") over prolonged periods of time may be habit forming and lead to behavioural changes.

This product may sensitize heart muscle causing cardiac arrhythmia, in rare cases.

FIRST AID PROCEDURES WHEN:

- . Inhaled: Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical attention IMMEDIATELY.
- . In contact with the skin: Flush skin with running water and wash affected areas thoroughly with soap and water. Start flushing while removing contaminated clothing. Obtain medical attention IMMEDIATELY.
- . In contact with the eyes: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.
- . Ingested: If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local poison control centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Emergency Medical Care: This product contains materials that may cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage; use endotracheal cuff if available, to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis. Give artificial resuscitation and appropriate chemotherapy if respiration is depressed.

Medical conditions that may be aggravated by exposure to this product include diseases of the skin, eyes or respiratory tract.

PREVENTATIVE MEASURES

Recommendations listed in this section indicate the type of equipment which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

Engineering Controls: Local exhaust ventilation required. Ventilation should be explosion proof. Ventilate low lying areas such as sumps or pits where dense vapours may collect.

Respiratory Protection: An air-supplied respirator if concentrations are high or unknown.

Skin Protection: Gloves and protective clothing made from nitrile rubber or Viton should be impervious under conditions of use. Prior to use, user should confirm impermeability.

Eye Protection: Safety glasses with side shields are recommended to prevent eye contact. Use chemical safety goggles when there is potential for eye contact.

Other Personal Protective Equipment: Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

Handling Procedures and Equipment: Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools and avoid "splash-filling" of containers. Do not use in poorly ventilated or confined areas without proper respiratory protection.

Storage Temperature (Deg Celsius): See below.

Storage Requirements: Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40 Deg. Celsius.

Other Precautions: Use only with adequate ventilation and avoid breathing vapours or mists. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

ENVIRONMENTAL PROTECTION DATA

Steps to be Taken in the Event of a Spill or Leak: Eliminate all sources of ignition. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

Environmental Effects: Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Product has an unaesthetic appearance and can be a nuisance. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Deactivating Chemicals: Not applicable.

Waste Disposal Methods: Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

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1. RTECS-Registry of Toxic Effects of Chemical Substances, On-line search, Canadian Centre for Occupational Health and Safety RTECS database, Vol I-V, 1985-1986 edition, Doris V. Sweet, Ed., National Institute for Occupational Safety and Health, U.S. Dept. of Health and Human Services, Cincinnati, 1987.
 2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
 3. Supplier's Material Safety Data Sheet(s).
 4. "CHEMINFO", through "CCINFODisc", Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
 5. Guide to Occupational Exposure Values, 1991, American Conference of Governmental Industrial Hygienists, Cincinnati, 1991.
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Stanchem Inc.

Solvent 160

WHMIS Number: 00060729

Page 8

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