

# APPENDIX A.22B: Spill Contingency Management Plan

## VOLUME A.V: ADDITIONAL YESAA REQUIREMENTS

**A.20** Effects of the Environment on the Project

**A.21** Accidents and Malfunctions

**A.22** Environmental Management

**A.22A** Waste and Hazardous Materials Management Plan

**A.22B** Spill Contingency Management Plan

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# CASINO

## CASINO PROJECT SPILL CONTINGENCY MANAGEMENT PLAN

**PRELIMINARY DRAFT**

Prepared by:  
Casino Mining Corporation  
March 2015

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## Executive Summary

The Casino Mine Project is an approximately 22 year mine project that will produce copper and molybdenum concentrates, and gold dore bars via flotation milling and heap leach processing, respectively. The proposed project includes a four year construction period and a 26 year post-closure period. A key component of the Casino Project is the upgrade and extension to the existing Freegold road, jointly called the Casino Mine Access Road. The Freegold Road is an existing 80 km long gravel resource road owned and operated by the Yukon Government. Casino Mining Corporation (CMC) proposes to upgrade the existing Freegold Road, including the addition of a bypass road around the town of Carmacks, and extend the road a further 120 km to the Casino Mine Site. Both the upgrade and the extension would be two-lane, gravel resource roads designed for all weather use by haul trucks with highway legal loads. The roads will be designed to BC Ministry of Forest guidelines, with a 70 km/hr design speed, with some short 50 km/hr sections where road geometry is limited by the terrain. The road will be 8.2 m wide with maximum grades of 8%.

The Casino Project will require the transportation of various materials for operation and construction of the mine, including up to eleven tanker trucks per day for LNG transportation from Fort Nelson. Additionally, the milling processes will require shipment of reagents, including cyanide based reagents for the leaching of gold in the heap leach facility.

This Spill Contingency Management Plan (SCMP) is a preliminary plan to outline the precautions and spill response procedures for the proposed Casino Project. The SCMP will be updated as the project is refined, and has been derived from guidance in the Plan Requirements Guidance for Quartz Mining Projects (Government of Yukon, 2013), *Guidelines for Preparing Contingency Plans for Carriers of Hazardous Waste* (Ministry of Environment, 2011), and from the *Land Transportation Emergency Response Guideline for Petroleum Spills* (Canadian Petroleum Products Institute, 2008).

The SCMP contains information on the identification of the potential spills that may occur at the Casino Mine, and outlines spill response procedures for specific types of spills.

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## 1 - INTRODUCTION

The Casino Mine Project is an approximately 22 year mine project owned and operated by Casino Mining Corporation (CMC), that will produce copper and molybdenum concentrates, and gold dore bars via flotation milling and heap leach processing, respectively. The proposed project includes a four year construction period and a 26 year post-closure period. The location of the Casino Project is shown on Figure 1-1. Key project components include the open pit, tailings management facility and waste rock storage area, heap leach facility, mill and associated infrastructure, ore stockpiles, liquefied natural gas power generating infrastructure, and office and accommodation buildings. The project also requires a 120 km access road from the town of Carmacks, YT, and concentrate will be trucked to the port at Skagway, Alaska.

The objective of the Spill Contingency Management Plan (the SCMP) is to minimize the potential effects of any spills associated with the Casino Project. While CMC will take all reasonable measures to prevent spills while undertaking the construction, operation and closure of the Casino Project, it is unlikely that all physical operations can attain zero risk. Unforeseen events, accidents and malfunctions can occur from time to time that may result in a spill. To minimize the effect of a spill and to prevent such spills from leaving the site, design features, background planning and diligent operational procedures are required.

The SCMP has been derived from guidance in the *Plan Requirement Guidance for Quartz Mining Project* (Government of Yukon, 2013), the *Guidelines for Preparing Contingency Plans for Carriers of Hazardous Waste* (Ministry of Environment, 2011), and from the *Land Transportation Emergency Response Guideline for Petroleum Spills* (Canadian Petroleum Products Institute, 2008). The SCMP has been written to provide clarity on spill response activities at the Casino Project, specifically with regards to spill prevention measures, and spill response activities. This preliminary SCMP should not be taken as a final spill response plan, but as one that will provide the framework for future plans, once project details are confirmed. The SCMP will be amended or updated as required, to accommodate change in construction, operational procedures, regulations and guidelines. A plan for spill response is required for both a Quartz Mining License and a Water Use License.

A spill is defined under Section 132 of the *Yukon Environment Act* (Government of Yukon, 2002) as “a release of a substance into the natural environment; from or out of a structure, vehicle or other container; and that is abnormal in quantity or quality in light of all the circumstances of the release; or in excess of an amount specified in the regulations”. Where a substance is defined as “a hazardous substance, pesticide, contaminant or special waste”.

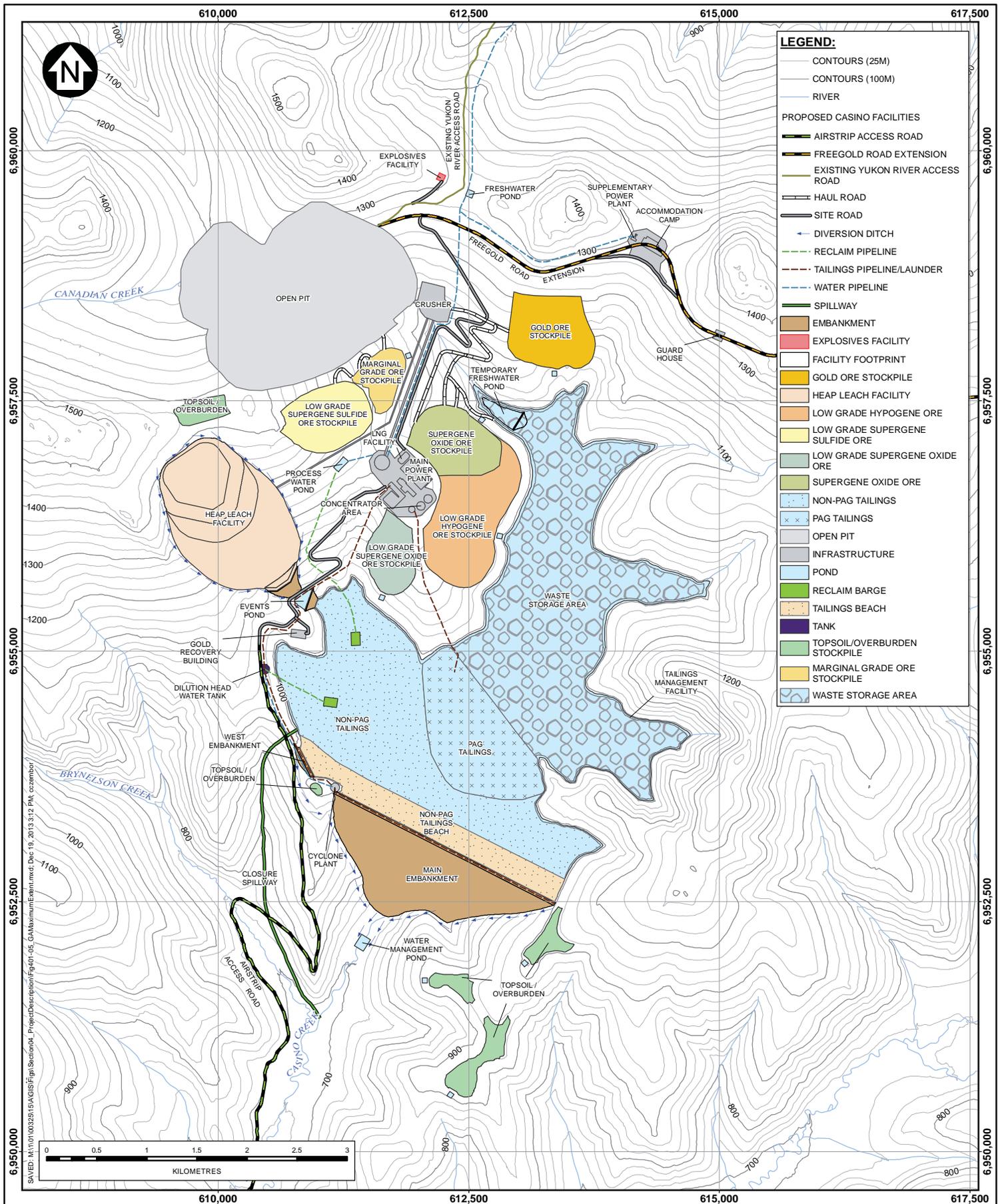
The purpose of the SCMP is to provide background planning and operational procedures for spills response to minimize:

- Danger to persons;
- Pollution of land and water;
- Size of the affected area;
- Degree of disturbance to plants, fish and animals; and

- Degree of disturbance during cleanup.

The SCMP identifies the types of spills that may occur at the Casino mine site, and provides procedures to respond to such emergencies. The purpose of the plan is to initiate an immediate response with trained personnel and equipment to clean any accidental spill and ensure minimal impact to the land or aquatic environment in the immediate and surrounding area. The SCMP includes procedures for cleanup, containment, disposal, and monitoring, including details regarding equipment and personnel allocations. The SCMP should be read in conjunction with the *Casino Project Emergency Response Plan*, and details of waste management and hazardous waste management are provided in the *Casino Project Waste Management Plan* and the *Casino Project Hazardous Materials Management Plan*, respectively.

The final SCMP will outline applicable commitments made during environmental assessment, the decision documents terms and conditions and conditions in the Quartz Mining and Water Use Licenses, and where these terms are addressed in the plan.



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**NOTES:**

1. BASE MAP: EAGLE MAPPING
2. PROJECTION: NAD 1983 UTM ZONE 7N
3. COORDINATE GRID: METRES

**CASINO**  
COPPER AND GOLD

**GENERAL ARRANGEMENT -  
MAXIMUM EXTENT**

CASINO PROJECT

FIGURE 1-1

REF 1  
P/A VA101-325/15

## 2 - HAZARDOUS MATERIAL IDENTIFICATION

The Casino Mine will use large volumes of diesel fuel, gasoline, oils, LNG, and hazardous chemical substances, that all have the potential to spill as they are transported to and around the mine site. Locations of fuels, chemicals and other materials at the mine site will be determined during detailed design prior to construction; however, general storage locations are likely to include the following, as described in Table 2-1 and shown on Figure 1-1:

**Table 2-1 Hazardous Material Locations**

Hazardous Material	Storage Area
Diesel fuels, gasoline, liquified natural gas	main power plant adjacent to LNG facility
Reagents, other process chemicals	Warehouse <sup>1</sup> , smaller volumes in mill building
Hazardous waste (e.g., used oils, contaminated materials)	Warehouse <sup>1</sup>
Oils, glycol, fuels for machinery maintenance	Truck shop <sup>2</sup>
Concentrate	Concentrate loadout building <sup>2</sup>
Explosives	Explosives facility
Propane, natural gas	Adjacent to accommodation camp
Tailings facility effluent	Tailings management facility
Sediment laden water	Not stored on-site, but may result from construction activities

1. Location to be determined, but likely within mill complex near concentrator area

2. Location to be determined

Mitigation measures, as implemented through design and planning for the Project, will minimize the risk of a spill occurring and limit the extent of the environmental impact. However, these measures cannot completely prevent all risks from spills. The Access Road will be used for year-round hauling of materials into and out of the Casino mine site during operations. There will be 18 major bridge crossings located along the route, which include crossings of Bow Creek, Big Creek, Hayes Creek, and Selwyn River, and 71 major culvert crossings. Spills of any substance to water at any of the watercourse crossings along the transport route are of particular concern.

Accidental release of hazardous materials could result in contamination of soil, air or water; cause vegetation damage; and be toxic to wildlife or humans. Consequences of any spill depend on the magnitude and extent of the spill; the material, quantity, location, and duration of the spill; and environmental conditions at the time. The following components of the Casino Project have the potential to generate a spill:

- The transfer, storage, and shipment of fuels (primarily diesel and LNG), waste, and other hazardous liquids;
- The storage, mixing, and distribution of chemical reagents associated with the heap leach facility;

- 
- Release of water from the TMF; and
  - Offsite release of sediment laden water from a construction zone.

Hazardous materials associated with the Project can be grouped into three categories, and are described further below:

- Petroleum products and lubricants (e.g., LNG, diesel, oils and degreasers);
- Sulfide and oxide ore processing reagents (listed in Appendix A); and
- Contaminated effluent (e.g., tailings pond effluent or sediment laden water).

## 2.1 LNG

LNG spills completely evaporate, leaving no residue that could harm soil or groundwater (Drube, Haukoos, Thompson, & Williams, 2012). Liquefied natural gas evaporates at -162°C (it's normal boiling point) at atmospheric pressure and forms a visible cloud which is initially heavier than air until the methane vapour warms to -108°C; at this point the natural gas becomes lighter than air and therefore dissipates (Drube et al, 2012). If spilled to water, LNG is lighter than water and boils on top until it evaporates (Drube et al, 2012). Natural gas is also non-toxic; therefore, no impacts to water or sediment quality or fish and fish habitat are expected.

## 2.2 DIESEL

Diesel spills to water could result in direct mortality of fish and invertebrates, since diesel is considered to be one of the most acutely toxic oil types (National Oceanic and Atmospheric Administration, 2014). Because of its low viscosity it is readily dispersed in the water column; this oil could then adhere to fine-grained suspended sediments which would settle out and result in sediment contamination (National Oceanic and Atmospheric Administration, 2014). Lytle and Peckarsky (2001) assessed the effects of a diesel fuel spill on stream macroinvertebrates over a 15 month period and found that the spill significantly reduced invertebrate density and taxonomic richness in the area immediately below the spill. Schein et al (2009) concluded that diesel toxicity could impair the health of fish populations, depending on the extent of chemical or mechanical dispersion (naturally caused by fast-flowing, turbulent rivers) and life stage of the fish. Dispersion of diesel increases the bioavailability and apparent toxicity to fish embryos - dispersion was reported to cause acute lethality to juvenile trout between 40 mg/L and 200 mg/L (Schein et al 2009). Best practices will be followed when siting and using the mobile refuelers and two portable fueling stations (e.g., ensuring that they are more than 30 m from any watercourse).

## 2.3 REAGENTS

Potential process reagents are listed in Appendix A. The volume, form, transportation logistics and storage locations of the reagents listed will be determined during detail design engineering of the Casino Project. In the event that a transport truck carrying reagents or concentrate is involved in a collision or accident, the effects of a reagent or concentrate spill will depend on the volume released, which will be primarily determined by the containment methods used. Environmental effects could range from

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negligible to moderate, depending on the location of the spill (to land or water) and the characteristics of the product. The following materials released to water could result in impacts to fish and fish habitat:

- Sodium-diisobutyl dithiophosphate: at high concentrations acutely toxic to aquatic life
- Pebble Lime (CaO), because of the high pH, would be expected to be toxic to aquatic organisms and aquatic systems;
- Sodium Hydrosulfide (NaHS): strongly alkaline
- Potassium amyl xanthate: may persist for several days in water; highly toxic to aquatic life and may increase metal uptake in fish
- Sodium Cyanide (NaCN): highly toxic to fish, amphibians, aquatic insects and aquatic vegetation; cyanide is acutely toxic to most species of fish at concentrations greater than 200 µg/L (see Section 2.4).

## 2.4 CYANIDE

Oxide gold ore from the Casino Project will be processed by stacking crushed ore in lifts onto a heap leach pile and irrigating the pile with a sodium cyanide solution (barren process solution). The heap leach pad will consist of liners and a low-permeability soil overliner. Ore will be layered in eight lifts onto the pad and the barren process solution will be applied to ore lots with drip emitters to minimize evaporation losses. Pregnant solution from the ore heap will be collected in a network of pipes placed in the overliner material and directed to an in-heap collection area. The pregnant solution will then be pumped to the carbon-in-column (CIC) / Sulphidization, Acidification, Recycling and Thickening (SART) circuit for recovery of gold and copper. When the last process leach cycle is completed on the last ore lift, the ore heap will be rinsed with fresh water to recover the remaining gold and rinse the residue. Following operations, the heap leachate solution will be detoxified using a SO<sub>2</sub> / Air cyanide destruction process.

Prior to the start of operation, a comprehensive Cyanide Management Plan for the Casino Project will be developed to ensure worker safety and to prevent release of cyanide to the environment. The Cyanide Management Plan will be developed in consideration of the principles and standards of practice of the International Cyanide Management Code (Cyanide Code). Guidelines for transport, handling, storage and use of sodium cyanide at the Casino Project are summarized below.

To ensure the protection of communities and the environment during transport of cyanide to the Casino Project, the following Cyanide Code standards of practice will be followed:

- Responsibility for safety, security, release prevention, training, and emergency response will be established in written agreements with producers, distributors and transporters; and
- Emergency response plans and management measures will be implemented by cyanide transporters.

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Casino Mining Corporation will require that contractors retained for delivery of cyanide to the Project will develop and implement a Cyanide Transportation Plan that is consistent with the Cyanide Code, as well as the Casino Cyanide Management Plan and component plans of the Environmental Management Plan.

The following industry best management practices will be described and implemented:

- Vehicles used for transportation of the cyanide and all containers and packaging comply with all applicable prescribed safety standards and display all applicable prescribed safety marks in accordance with the Dangerous Goods Transportation Act.
- Chain of custody documentation (including Material Safety Data Sheets) to track inventory and movement of cyanide.
- Methods to minimize the potential for contact of solid cyanide with water (e.g., covered trucks, sealed containers).
- Use of escort vehicles or convoys for cyanide shipments as necessary (e.g., inclement weather, change in road conditions).
- Regular maintenance of transportation equipment including containers, vehicles, loading and unloading machinery and storage systems.
- Training of all personnel operating cyanide handling and transport equipment.
- Emergency response plans for potential cyanide releases during transportation including:
  - Designate appropriate response personnel and commit necessary resources for emergency response.
  - Emergency response training of appropriate personnel.
  - Descriptions of the specific emergency response duties and personnel responsibilities.
  - A detailed list of all emergency response equipment available during transport or along the transportation route.
  - A detailed list of all emergency response and personal protective equipment during transport including self-contained breathing apparatus and oxygen gas.
  - Initial and periodic refresher training in emergency response procedures including implementation of the Emergency Response Plan and Spill Contingency Plan.
  - Develop procedures for internal and external emergency notification and reporting.
  - Periodically evaluate response procedures and capabilities and revise them as needed.

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The final Cyanide Transportation Plan developed by the contractor responsible for transportation of cyanide the mine site will include a risk assessment of the transportation route that will consider water crossings, population centres, road characteristics, weather characteristics, and public infrastructure.

Measures implemented during cyanide handling, storage, and use at the Casino Project will be in accordance with the following principles of the Cyanide Code:

- Protect workers and the environment during cyanide handling and storage; and
- Manage cyanide process solutions and waste streams to protect human health and the environment.

The following Cyanide Code standards of practice will be implemented for cyanide handling, storage and use:

- Design and construct unloading, storage and mixing facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures
- Operate unloading, storage and mixing facilities using inspections, preventive maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures.
- Implement measures to protect birds and other wildlife from adverse effects of cyanide process solutions.
- Implement measures to protect fish and wildlife from direct and indirect discharges of cyanide process solutions to surface water.
- Implement measures designed to manage seepage from cyanide facilities to protect the beneficial uses of ground water.
- Provide spill prevention or containment measures for process tanks and pipelines.

Delivery and unloading of cyanide on site will take place in a covered, concrete-bounded area located away from general work areas and incompatible reagents. Portable pumps will be provided within the processing area for the pumping of spills within the bounded areas back to the storage tanks or emergency holding tanks. Ventilation will be provided to prevent build-up of hydrogen cyanide gas in storage and mixing areas.

The unloading and storage area will be designed to allow safe manoeuvring of forklifts, trucks, and trailers. Sodium cyanide containers will be offloaded to concrete pads with concrete curbing that provide a minimum of 110% containment of the largest sized container.

Unloading and storage area design drawings will be prepared for construction of the facilities as required by the Yukon Water Use License and Yukon Quartz Mining License applications. These designs will include:

- 
- Details on use of level indicators and alarms.
  - Foundation characteristics (e.g., seepage prevention).
  - Details on methods to separate the cyanide from incompatible materials such as acids, strong oxidizers, etc.
  - Employee safe-handling training and PPE.
  - Fire suppression equipment.
  - Waste disposal methods (empty cyanide containers).

## 2.5 CONTAMINATED EFFLUENT

Under the Yukon *Waters Act* and the *Waters Regulation* and the *Metal Mine Effluent Regulations* (MMER), mine operators are permitted to discharge effluent so long as the conditions outlined in the Water Use Licences are met, and the effluent concentrations are less than those outlined in the MMER Schedule 4 at prescribed locations. Should effluent be discharged outside of the normal course of events, or in exceedance of the prescribed limits, it is considered an “unauthorized discharge” and must be reported similar to a spill. Events that may result in an unauthorized discharge include earth moving activities during construction or operation of the Casino Project resulting in sedimentation of watercourses (exceedances of total suspended solids concentrations) or accidental release of mill tailings or tailings pond water.

Earth moving activities during construction or operations of the Casino Project that may result in erosion or sedimentation include:

- Land clearing and topsoil stripping;
- Stockpiling of topsoil and ice-rich materials;
- Pit excavation, site grading, and land filling;
- Construction of roads, bridges, and culverts; and
- Construction of the TMF, waste rock dumps, and heap leach facility.

Potential adverse effects from erosion and sedimentation can be minimized through project planning, following BMPs, and providing site specific controls that are commensurate with the potential risks to the natural environment. The *Casino Project Erosion and Sediment Control Management Plan* will provide a detailed description of the methods of sedimentation and erosion prevention and control that will be used, the specific situations that they will be used in, and the implementation procedures that will be followed to minimize spills of sediment laden water to the receiving environment.

Tailings pond effluent spills may result from problems with pipelines or valves, in particular, winter operations may result in ice formation which could impact reclaim barge stability and operation or result in

blockage of pipelines. Therefore, monitoring of civil and mechanical operational components of the tailings management facility will be a daily/shift requirement to ensure that systems are functioning correctly. Tailings pond effluent contains a number of contaminants, including metals, cyanide, and ammonia, due to the influence of mine waste and chemical reagents used in ore processing. Contaminant concentrations are generally close to drinking water standards, but exceed the guidelines for protection of aquatic life, therefore, it is desirable to contain the tailings effluent and pond water at all times.

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## 3 - SPILL PREVENTION AND TRAINING

Comprehensive spill response training will be provided for all employees responsible for chemical handling, and all personnel visiting the site will be given basic spill prevention training. Specific details for the access road and mine site are provided in Sections 3.1 and 3.2, below.

### 3.1 ACCESS ROAD

Transportation of goods and materials will be in accordance with all applicable regulations and legislation, as well as the Explosives and Hazardous Materials Transport Permit required for the Project. All carriers and suppliers to the Casino Project will be certified under Transport Canada, and, as required, under the Transportation of Dangerous Goods Act. It is expected that external carriers and suppliers will have their own emergency response plans and training for their personnel, as they will be transporting supplies in their own vehicles with their own drivers.

Transportation of cyanide (as sodium cyanide) will be conducted in a manner to protect communities and the environment in accordance with the International Cyanide Management Code (International Cyanide Management Institute, 2012). Additionally, preventative maintenance along the access route will include regular maintenance and inspections for safe operation of vehicles, snow clearing, and the application of dust suppressants as required.

Shipping documents travel with hazardous materials, and are kept in the cab of the motor vehicle. Shipping documents provide vital information regarding the hazardous materials/dangerous goods to initiate protective actions, as per the Emergency Response Guidebook (Transport Canada, 2012). An example of information provided in the Emergency Response Guidebook is provided in Appendix B for sodium cyanide and LNG.

### 3.2 MINE SITE

Hazardous materials will be handled, stored and used in a manner that minimizes spills. Regular monitoring and inspections will ensure that small spills are avoided, and if they occur identified and cleaned up as soon as possible. CMC will ensure that its staff and contractors have basic emergency training as appropriate, such as standard first aid and Workplace Hazardous Material Information System (WHMIS), and are aware of CMC health and safety policies. Members of the Emergency Response Team require more vigorous and continual training. This training will focus on specific elements of the Casino mine site and will cover but not be limited to:

- Advanced First Aid and CPR;
- Surface Mine Rescue;
- Fire Response;
- Spill Response;
- Hazardous Materials Handling; and

- WHMIS.

Routine practice drills will occur to maintain Emergency Response Team member skills and test the ERP system and process.

## 4 - SPILL REPORTING

In addition to the definition in Section 1, spills are further defined by whether they are *reportable* (to an Environmental Protection Officer), or *non-reportable*. A reportable spill is one defined by the Yukon Spills Regulation (Government of Yukon, 1996) to be equal to, or to exceed the thresholds outlined in Table 4-1. Additionally, ANY spill onto a watercourse is considered a reportable spill under the Yukon Spills Regulation. Spills of any size will be reported to the environmental department, and a spill report will be completed and filed or submitted (Appendix C), as required.

**Table 4-1 Reportable Spill Thresholds**

Product	TDG <sup>1</sup> Code	Threshold Quantity
All petroleum products		> 200 liters
Explosives	1	Any amount
Flammable gases	2.1	> 100 liters
Non-flammable gases	2.2	> 100 liters
Non-poisonous gases	2.2	> 100 liters
Corrosive gases	2.4	Any amount
Non-corrosive gases	2.2	> 100 liters
Flammable liquids	3	> 200 liters
Flammable solids	4	> 25 kg
Spontaneously combustibles	4	> 25 kg
Dangerous when wet	4	> 25 kg
Oxidizers	5.1	> 50 kg or 50 liters
Organic peroxides	5.2	> 1 kg or 1 liter
Poisonous substances	6.1	> 5 kg or 5 liters
Corrosive materials	8	> 5 kg or 5 liters
Miscellaneous Dangerous Goods	9.1	> 50 kg
"Hazardous to Environment" material		> 1 kg
Dangerous wastes	9.3	> 5 kg or 5 liters

1. TDG = Transportation of Dangerous Good Regulations (Government of Canada, 1985)

Senior Project Managers are responsible for reporting spills. Under federal and territorial regulations, Managers are required to *immediately* notify the 24-hour Yukon Spill Report line should a reportable spill occur (see Table 4-2). Notification via email should also be sent to Yukon Government and Selkirk First Nations' Lands Director at the emails provided in Table 4-2. The following information should be provided to the 24-Hour Spill Report line:

- Name
- Phone number
- Product spilled
- Quantity spilled
- Quality of product (thin, viscous etc.)
- Location of spill
- Distance to water
- Distance to drinking water wells
- What happened
- Responsible party
- Actions to contain the spill
- Obtain the Environment Yukon Spill Reporting Number and first/last name of the person whom the report has been made to (in the event of a reporting discrepancy it's always good to know this information).

Spill reports (provided in Appendix C) are to be filled out for all spills, regardless of quantity. Spill reports for reportable spills (i.e., in quantities in exceedance of Table 4-1) should be provided in the email notifications to the parties listed below. All spills entering a watercourse must be immediately reported to the Yukon Authorization Officer (Director, Environmental Protection Operations Division).

**Table 4-2 Contact Information for Spill Reporting**

Resource	Email	Contact Number
<b>External Reporting Contacts</b>		
Yukon 24- Hour Spill Line		(867) 667-7244
Yukon Authorization Officer (Director, Environmental Protection Operations Division): Steven Wright, Director		(604) 666-0064
Yukon Government Environment, Water Resources, Inspections Division: Carola Scheu, Manager		(867) 456-3980
YG Department of Environment, Water Resources Branch		(867) 667-3227
YG Environmental Protection Branch		(867) 667-3436
Selkirk First Nation, Lands Director		(867) 537-3331
YG EMR, Carmacks Natural Resource Officer		(867) 863-5271
YG EMR, Client Services and Inspections		(867) 667-3199
<b>Contacts for Submission of Spill Reports</b>		
YG EMR, Matthew Jenner, Natural Resources Officer - Mining	Matthew.Jenner@gov.yk.ca	(867) 863-5271
Yukon Government Environmental Health Services, Dianna Hayden, Environmental Health Officer	Dianna.Hayden@gov.yk.ca	(867) 667-8321
Selkirk First Nations, William Sydney, SFN Lands Director	sydneyw@selkirkfn.com	(867) 537-3331
Little Salmon Carmacks First Nation, Robert Moar, Lands Director	Robert.moar@lscfn.ca	(867) 863-5576 ext 256
Tr'ondëk Hwëch'in First Nation	Darren.taylor@trondek.ca	(867) 993-7145

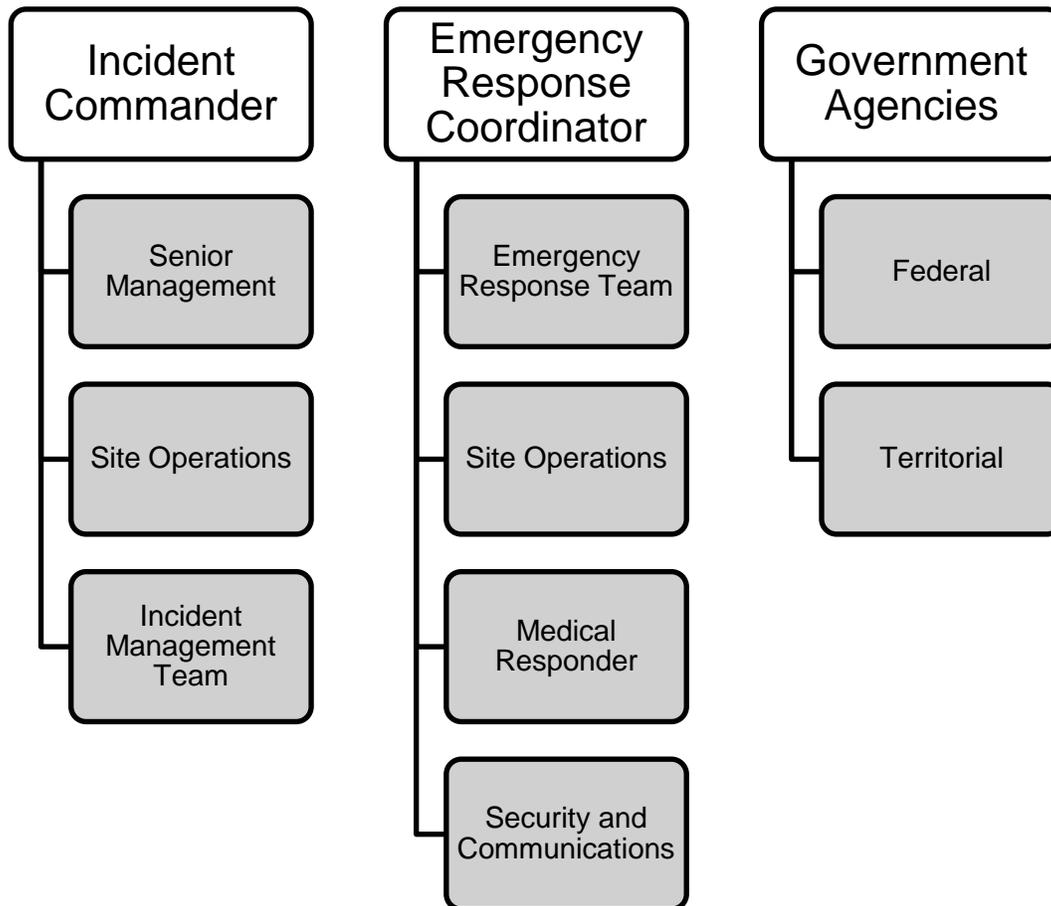
## 5 - EMERGENCY RESPONSE COMMUNICATION

Preliminary emergency organization and reporting chain of command is presented in section 5.1 and the external reporting procedures are provided in sections 5.2.

### 5.1 EMERGENCY ORGANIZATION AND RESPONSIBILITIES

The Emergency Response Team will be made up of CMC personnel who will be responsible for managing emergency situations. CMC will ensure that sufficient trained emergency response personnel are on site at all times.

The Incident Commander or designate will assume responsibility for each incident in consultation with senior management, the Emergency Response Coordinator, and relevant Governmental Agencies. The Incident Commander is the primary decision-maker for assessing and responding to incidents at the Project site. The incident response organizational structure is depicted in Figure 5-1.



**Figure 5-1 Emergency Response Organizational Chart**

## 5.2 EXTERNAL NOTIFICATION

Key external emergency contacts are provided in Table 5-1. This list is not intended to be all inclusive at this stage and will be updated prior to beginning the construction phase of the Project. An emergency response responsibility matrix will also be created for definition and quick reference.

**Table 5-1 External Emergency Contact List**

<b>Contact Name</b>	<b>Contact Number</b>
<b>Health Care Providers</b>	
Whitehorse Regional Hospital	(867) 393-8700
Carmacks Health Centre	(867) 863-4444
Pelly Crossing Health Centre	(867) 537-4444
<b>Emergency Responders</b>	
Fire Department – Pelly (Emergency)	(867) 537-3000
Fire Department – Whitehorse	(867) 668-8699 or (867) 668-2462
Police – Pelly	(867) 537-5555
Police – Whitehorse	(867) 667-5555
Yukon EMS, Dispatch	(867) 667-3333
Poisonous Substance Ingestion	(867) 633-8477
<b>Yukon Territory Government Contacts</b>	
Yukon Dept. of Conservation	(867) 667-5317
Yukon Dept. of Fish & Game	(867) 393-6722
Yukon Spill Report Center	(867) 667-7244
Yukon Energy (afterhours)	(800) 676-2843
Yukon Workers' Compensation Health and Safety Board	(867) 667-5450
Yukon Occupational Health and Safety Mine Inspector	(800) 661-0443
Yukon Coroner's Office	(867) 667-5317
<b>Helicopter Service Providers</b>	
Capitol Helicopters	(867) 668-6200
<b>Fixed Wing Service Providers</b>	
Alkan Air	(867) 668-7725

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## 6 - EMERGENCY RESPONSE TO SPILLS

The three levels of emergencies are identified as follows:

- LEVEL I: includes minor spills requiring an on-site worker to respond and take necessary corrective actions.
- LEVEL II: includes intermediate level spills requiring response by on-site or off-site trained staff but posing no danger to the public.
- LEVEL III: includes a major incident beyond the resources of a single facility, where there are subsidiary problems to complicate the situation such as fire, explosion, toxic compounds, and threat to life, property and the environment. Assistance will be required from local, regional, and/or territorial organizations.

Incident detection, information gathering and action decisions are the first steps in responding to an emergency incident. All these steps may occur over a short or extended time period depending on the circumstances and magnitude of the incident.

### 6.1 GENERAL EMERGENCY RESPONSE

Every emergency situation will be different depending upon the nature, location and cause of the incident. The following general course of action should be taken in all situations in combination with the incident-specific emergency response procedures described below:

1. Ensure your own safety as you approach the scene by making sure there is no hazard to you.
2. Where it is safe to do so, remove all personnel from the dangers posed by the emergency.
3. Contact the Emergency Response Coordinator. Describe the incident and take steps as instructed by the Emergency Response Coordinator to stop, slow or reduce the severity of the incident.
4. Report the details of the incident to the appropriate CMC staff and government agencies as per section 4.
5. Follow the response procedures in the Emergency Response Guidebook (Transport Canada, 2012):

#### **RESIST RUSHING IN!**

Approach cautiously from upwind, uphill or upstream:

- Stay clear of vapor, fumes, smoke and spills
- Keep vehicle at a safe distance from the scene

Secure the scene:

- Isolate the area and protect yourself and others

Identify the hazards using any of the following:

- Placards
- Container labels
- Shipping documents
- Rail car and road trailer identification chart
- Material safety data sheets (MSDS - Appendix A)
- Knowledge of persons on scene
- Consult applicable guide page (Transport Canada, 2012)

Assess the situation:

- Is there a fire, a spill or a leak?
- What are the weather conditions?
- What is the terrain like?
- Who/what is at risk: people, property or the environment?
- What actions should be taken – evacuation, shelter in-place or dike?
- What resources (human and equipment) are required?
- What can be done immediately?

Obtain help:

- Advise your headquarters to notify responsible agencies and call for assistance from qualified personnel

Respond:

- Enter only when wearing appropriate protective gear
- Rescue attempts and protecting property must be weighed against you becoming part of the problem

- Establish a command post and lines of communication
- Continually reassess the situation and modify response accordingly
- Consider safety of people in the immediate area first, including your own safety

**Above all:** do not assume that gases or vapors are harmless because of lack of a smell. Odorless gases or vapors may be harmful. Use caution when handling empty containers because they may still present hazards until they are cleaned and purged of all residues.

## 6.2 RESPONSE ACTION AND CONTAINMENT

In the event of a spill, the following priority sequence of spills response will be followed:

1. **Ensure Safety** – The implementation of spill containment measures and site cleanup and remediation will only be undertaken when it is safe to do so. If the nature of the spill hazard cannot be determined, it is to be assumed dangerous. Use appropriate Personal Protective Equipment (PPE). If the substance is flammable, remove all ignition sources.
2. **Administer First Aid** – If the spill has resulted in injured persons, and it is safe to do so, first aid should be administered through following the steps of the Medical Emergency ERP.
3. **Stop the Source** – Turn off valves, pumps or plug holes to stop to reduce flow from the source.
4. **Notify the Emergency Response Coordinator** – The Emergency Response Coordinator will be responsible for mobilizing the Emergency Response Team and notifying the appropriate CMC personnel and external agencies.
5. **Secure the Area** – Take steps to limit access to the spill area.
6. **Contain the Release** – Limit the extent of the spill through the use of spill response equipment (e.g., sorbent pads, socks or pillows) and by blocking drains and accesses to waterways through the use of dams, dykes, or drain covers.
7. **Clean-Up the Spill** – Clean-up and restore the affected area under direction of the Environmental Manager.
8. **Report the Spill** – The Emergency Response Coordinator will be responsible for reporting the details of the spill and the response actions to CMC and regulatory agencies.
9. **Conduct an Incident Investigation** – Understand the events that caused the spill and make modifications to site procedures, training, or emergency response planning to minimize the chance of a reoccurrence.

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## 6.2.1 Spill Response Equipment

Spill response equipment will be stationed along the access road and around the mine site at appropriate intervals and in areas where hazardous materials are stored (e.g., warehouse, truck shop, processing buildings, accommodation buildings, power plant). Spill kits typically contain oil sorbents (pads, socks, and granular), shovels, and protective equipment including gloves, goggles and protective suits. Heavy equipment, such as front-end loaders and haul trucks will be available for larger spills, and pumps, suction hoses and portable storage tanks or drums will also be located at the mine site to assist with spill recovery and cleanup.

## 6.2.2 Containment and Cleanup

Many materials will be used at the Casino Mine, including petroleum products, liquefied natural gas (LNG), reagents used in the milling process, and copper and molybdenum concentrates. A spill will typically be in the form of a liquid or powder and can be contained. An exception is propane, which is a gas and therefore, containment should not be attempted. Also, LNG is a highly volatalizable liquid, and containment is unnecessary, as the liquid will evaporate with time whether the spill is to land or water. Sodium cyanide (a reagent used in the heap leaching process) has specific precautions that must be taken should a spill occur. Generally, spill responders should be familiar with the requirements in the *Emergency Response Guidebook* (Transport Canada, 2012).

Below are summarized specific actions for the different types of spills that can occur along the Casino Access Road, including:

- Spills to land;
- Spills to water;
- Spills to ice or snow;
- Chemical spills; and
- Gaseous releases.

## 6.2.3 Spills to Land

The following techniques should be followed to contain a spill to land, and a guide to selecting containment techniques for spills on land is provided in Table 6-1:

- Block entry into waterways by building a berm or trench (see Table 6-1).
- Do not flush into ditches or drainage systems that lead to water.
- Contain with earth dam or other barrier.
- Capture minor spills with appropriate sorbent pads.

- Recover large spills with pumps or vacuum equipment.

**Table 6-1 Guide to Selecting Containment Techniques for Spills on Land**

Technique	Primary Use	Controlling Variables	Resources Required
Earth Dike	Best suited for spills on relatively flat areas	<ul style="list-style-type: none"> <li>• Sufficient earth may not be available, depending on location and season</li> <li>• Crew of four can create dike at 5 m/hr</li> </ul>	<ul style="list-style-type: none"> <li>• Earth moving machine or excavating equipment</li> <li>• Sandbags, liner material, sand or gravel</li> <li>• Work crew and foreman</li> </ul>
Sorbent Dike	Can provide temporary containment and cleanup  Applicable in all seasons	<ul style="list-style-type: none"> <li>• Requires sufficient sorbent material</li> <li>• May become impractical for large spill volume</li> </ul>	<ul style="list-style-type: none"> <li>• Sorbent materials</li> <li>• Temporary storage or incinerator to burn used sorbents</li> <li>• Work crew</li> </ul>
Snow/Ice Dike	Best suited on relatively flat areas in winter	<ul style="list-style-type: none"> <li>• Requires sufficient snow or ice</li> <li>• Only applicable when ice is &gt;1m thick</li> <li>• A crew of four with a bulldozer can create dike at 10 m/hr</li> </ul>	<ul style="list-style-type: none"> <li>• Earth moving machine</li> <li>• Ice chain saws</li> <li>• Equipment to spray water onto snow</li> <li>• Work crew and foreman</li> </ul>
Land Trench	Best on relatively flat areas	<ul style="list-style-type: none"> <li>• During the winter, frozen earth may be too difficult to excavate</li> <li>• In some areas, soil may be too thin to create trench</li> <li>• Can excavate 30 m/hr of trench per machine in summer, half that in winter</li> </ul>	<ul style="list-style-type: none"> <li>• Excavating equipment (backhoe or shovels)</li> <li>• Work crew and foreman</li> <li>• An oil recovery unit (pump)</li> </ul>
Excavation by Bulldozer, Front-end Loader, or Backhoe	Heavy equipment has site access	<ul style="list-style-type: none"> <li>• Disturbs surface of soil</li> <li>• Removes organics</li> <li>• Can lead to erosion or surface instability</li> <li>• Vegetation is slow to recover</li> <li>• Difficult in frozen soil</li> </ul>	<ul style="list-style-type: none"> <li>• Machine, fuel and operator</li> <li>• Work crew and foreman</li> <li>• Method to handle or dispose of excavated material</li> </ul>
Manual Removal	Best suited for areas lightly contaminated or where equipment	<ul style="list-style-type: none"> <li>• Some surface disturbance and removal of shallow organisms and vegetation</li> </ul>	<ul style="list-style-type: none"> <li>• Hand tools (rakes, shovels, wheelbarrows)</li> <li>• Work crew</li> </ul>

Technique	Primary Use	Controlling Variables	Resources Required
	access is unavailable Labour intensive and time consuming	<ul style="list-style-type: none"> <li>• More rapid repopulation of organisms than other excavation techniques</li> </ul>	<ul style="list-style-type: none"> <li>• Disposal facilities</li> </ul>
Sorbent Application	Best suited for areas lightly contaminated or where equipment access is unavailable	<ul style="list-style-type: none"> <li>• Require adequate supply of sorbents</li> <li>• Relatively little damage except surface disturbance of foot traffic</li> </ul>	<ul style="list-style-type: none"> <li>• Sorbents</li> <li>• Work crew</li> <li>• Disposal facility for used sorbents</li> </ul>

## 6.2.4 Spills to Water

A spill on or into open water is very difficult to contain and every effort should be made to prevent the contaminant from entering the water. Some products (hydrocarbons such as gasoline and diesel) float, and therefore immediate deployment of surface booms can be used to effectively mitigate further spread of the spill. The following techniques should be followed to contain a spill to water, and a guide to selecting containment techniques for spills on water is provided in Table 6-2:

- Contain spill as close to release point as possible.
- Use spill containment boom to concentrate slicks for recovery.
- Protection (diversionary) booming using sorbent booms could be deployed to deflect slicks from nearby intakes or other sensitive areas.
- On small spills, recover using appropriate sorbent pads.
- Do not use sorbent booms/pads in fast currents and turbulent water.
- Intercept moving slicks in quiet areas using sorbent booms.

**Table 6-2 Guide to Selecting Containment Techniques for Spills on Water**

Technique	Primary Use	Resources Required
Containment Boom	Best at location where spill enters water	<ul style="list-style-type: none"> <li>Booms totalling 1.5 to 2 times the diameter of the slick</li> <li>Labourer</li> </ul>
Sorbent Boom	Best across small ditches	<ul style="list-style-type: none"> <li>Disposal containers or incinerator for used sorbents</li> <li>Chicken wire and supports to make "fence"</li> <li>Earth moving or excavation equipment</li> <li>Labourer</li> </ul>
Earth Berm	Best across shallow ditches	<ul style="list-style-type: none"> <li>Boom and an oil recovery unit (pump)</li> <li>May also require sandbags, liner material, sheets of metal or wood</li> <li>Labourer</li> </ul>

### 6.2.5 Spills to Ice or Snow

Spills to snow and ice are generally easily contained and cleaned up, as snow is extremely absorbent and liquid spills are easily trapped within the snow, which can then be recovered for disposal. Snow can also be used to construct berms. For spills on ice, if the ice is safe to work on, then the methods of containment are similar to those on land. Where the spill has penetrated the ice, the methods of containment are similar to those on open water. The following techniques should be followed to contain a spill to land, and a guide to selecting containment techniques for spills on ice or snow:

- Block entry into waterways and contain with snow berm or other barrier.
- Trench or ditch to intercept or contain fuel on snow, where feasible.
- Compact the snow around the outside perimeter of the spill area.
- Construct a berm with snow, either manually or with shovels or heavy equipment such as graders and dozers where available.
- Contain or collect contaminated snow.
- Use synthetic liners to contain on site if feasible.
- Recover minor spills with appropriate sorbent pads or snow.

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## 6.2.6 Chemical Spills

The Casino Project will use many chemicals required for mineral processing. Chemical spill response is dependent on the type of chemical, and the whether the spill is to land, water or ice and snow. Therefore, the *Emergency Response Guidebook* (Transport Canada, 2012) should be used to determine the appropriate response to each chemical based on the information provided in the shipping documents that will accompany each shipment along the Casino Project Access Road.

Cyanide (as sodium cyanide) is a primary reagent in the leaching process for extraction of metals in the heap leaching facility. A Cyanide Management Plan for the Casino Project will be developed prior to the start of operations and will be developed in consideration of the principles and standards of practice of the International Cyanide Management Code (International Cyanide Management Institute, 2012).

The response to a cyanide spill should follow the guidelines as provided in the Emergency Response Guidebook (Appendix B). Cyanide is a toxic and corrosive substance, and is non-combustible and water sensitive. Reaction with water or moist air may release toxic, corrosive or flammable gases. When spilled in water potassium cyanide and sodium cyanide produce hydrogen cyanide toxic-by-inhalation gas. The following techniques should be followed to contain a cyanide spill:

- Wear positive pressure self-contained breathing apparatus.
- Wear chemical protective clothing that is specifically recommended by the manufacturer.
- Eliminate ALL ignition sources.
- All equipment used when handling the produce must be grounded.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- A vapor suppressing foam may be used to reduce vapors.
- DO NOT GET WATER INSIDE CONTAINERS.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers or confined areas.
- **Small spills to land:**
  - Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.

- Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.
- **Small spills to water (from a small package or small leak from a large package):**
  - First ISOLAGE 30 m in all directions.
  - Then PROTECT persons downwind 1. During the day 0.1 km; 2. During night 0.2 km.
- **Large spills to water (from a large package or many small packages):**
  - First ISOLAGE 100 m in all directions.
  - Then PROTECT persons downwind 1. During the day 0.4 km; 2. During night 1.4 km.

### 6.2.7 Gaseous Releases

Gases that may be used at the Casino Mine site include propane, acetylene and oxygen, which are typically transported in cylinders. Should an incident occur that results in the spillage of these products, the following procedures should be followed:

- Wear insulated gloves, safety glasses, and, if in a confined space, a respirator.
- If safe to do so, shut off flow and remove ignition sources.
- Evacuate area.
- Gases will disperse with time.
- Consult supplier if container needs disposal.

Liquefied natural gas (LNG) will be shipped to the Casino Project for vaporization into natural gas for use at the on-site power plants. The LNG will be shipped via double wall vacuum tanker trucks at -162 °C and 1+ atmospheric pressure. LNG spills completely evaporate, leaving no residue that could harm soil or groundwater. If spilled to water, LNG is lighter than water and boils on top until it evaporates (Drube et al 2012). Natural gas is also non-toxic; therefore, no impacts to water or sediment quality or fish and fish habitat are expected. The Emergency Response Guidelines for LNG are provided in Appendix B.

### 6.3 DISPOSAL OF CONTAMINATED MATERIAL

Contaminated materials collected from the clean-up of petroleum hydrocarbon spills along the Access Road could be disposed of by the following methods:

- Incineration in the on-site incinerator;
- In an on-site Land Treatment Facility, if required, constructed as per the Yukon Contaminated Sites Regulation (2002); or

- Removal from site to a licensed disposal facility.

Chemical spills will be disposed of as per the Emergency Response Guidelines for each specific material.

#### 6.4 SITE RESTORATION/REMEDIATION

Characterization of contaminated material will be done in accordance with the *Protocol No.3: Soil Sampling Procedures at Contaminated Sites*, under the Contaminated Sites Regulation (Yukon Environment, 2012). Sampling frequency for stockpiles created in emergency response situations include one sample for every 50 m<sup>3</sup> of contaminated material. Once excavation of contaminated material has been conducted a minimum of 5 samples should be taken from the faces of the excavation: one from each wall and one from the excavation floor. For shallow excavations not exceeding 0.2 m in depth, step out samples should be taken adjacent to each excavation boundary, at a frequency of one sample per 10 m running length to determine the extent of contamination. Should laboratory results indicate that contamination extends beyond the previously excavated material, more material should be excavated and the area re-sampled. Soil samples are required to comply with the generic numerical soil standards in Schedule 1 of the Contaminated Sites Regulation (Government of Yukon, 2002).

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## 7 - PLAN UPDATES

This SCMP is controlled by Casino Mining Corporation. Casino Mining Corporation is responsible for training staff on methods and procedures, and implementing the SCMP in accordance with relevant legislation and permits, and will be responsible for regular review and updating of the SCMP to ensure that it is up-to-date with current practices and legislation.

A copy of the SCMP plan will be provided to all emergency responders, and the contents of the plan communicated to employees and visitors upon arrival at the site, during orientation. Copies of the SCMP will also be kept at the following mine locations:

- Project Office;
- Safety Office;
- Emergency Response Coordinator's Office;
- Environmental Manager's Office;
- First Aid room(s);
- Common areas and near telephones; and
- CMC corporate office.

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## 8 - REFERENCES

- Canadian Petroleum Products Institute. (2008, December). *Land Transportation Emergency Response Guideline for Petroleum Spills*. Retrieved July 2, 2014, from [http://canadianfuels.ca/userfiles/file/LTER\\_Guidelines\\_2008.pdf](http://canadianfuels.ca/userfiles/file/LTER_Guidelines_2008.pdf)
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Schein, A., Scott, J., Mos, L., & Hodson, P. (2009). Oil dispersion increases the apparent bioavailability and toxicity of diesel to rainbow trout (*Oncorhynchus mykiss*). *Environmental Toxicology and Chemistry*, 28(3), 595-602.

Transport Canada. (2012). *Emergency Response Guidebook: A Guidebook for First Responders During the Initial Phase of a Dangerous Goods/Hazardous Materials Transportation Incident*. Ottawa: Transport Canada.

Yukon Environment. (2012, August). *Protocol No.3: Soil Sampling Procedures at Contaminated Sites*. Retrieved July 9, 2014, from Protocol for the Contaminated Sites Regulation Under the Environment Act: [http://www.env.gov.yk.ca/air-water-waste/documents/protocol\\_3\\_soil\\_sampling\\_procedures\\_aug-12.pdf](http://www.env.gov.yk.ca/air-water-waste/documents/protocol_3_soil_sampling_procedures_aug-12.pdf)

## APPENDIX A

### PROPOSED CHEMICALS FOR USE AT THE CASINO MINE PROJECT AND MSDS

Chemical	Description/Typical Material Safety Data Sheet Information
<b>Sulphide Ore Process Reagents</b>	
Sodium-diisobutyl dithiophosphinate (Aerophine 3418A Promoter)	Colorless to light yellow, odorless, mobile liquid; slightly alkaline; auto-ignition temperature 437°C; completely soluble in water;  LC50: Bluegill, 96-hour: 375 mg/l Daphnia, 48-hour: 149 mg/L
Sodium diethyl dithiophosphate/sodium disecundary butyl dithiophosphate (Aerofloat 208 Promoter)	Slight fire hazard when exposed to heat or flame; acid may react with metals to produce hydrogen, a highly flammable and explosive gas; heating may cause expansion or decomposition leading to violent rupture of rigid containers; may emit acrid smoke and corrosive fumes.
Methyl Isobutyl Carbinol (MIBC, frother)	Clear liquid with a "sweet" odour; Flammable liquid and vapour. Vapours are heavier than air and may travel across the ground and reach remote ignition sources causing a flashback fire danger.  Low toxicity: LD50 >2000 mg/kg for rat and rabbit.
Pebble Lime (CaO, pH modifier)	White or gray, odorless lumps, granules, or powder. Not combustible or flammable but reacts with water to form calcium hydroxide while generating heat, which could ignite combustible materials.  Not explosive but reaction with water or other incompatible materials causes material to swell and may rupture containers.  High pH therefore toxic to aquatic organisms and aquatic systems.
Fuel Oil (#2 Diesel fuel, moly collector)	Colourless to straw or red oily liquid with kerosene like odour.  Combustion may produce CO, CO2 and reactive hydrocarbons.
Sodium Hydrosulfide (NaHS, copper mineral depressant)	High pH therefore toxic to aquatic organisms and aquatic systems (pH 11).  Auto-ignition temperature 120°C; releases highly toxic and highly flammable hydrogen sulfide gas if mixed with an acid or if exposed to excessive heat.  Toxic to terrestrial vertebrates.
Flomin D-910 (Sodium dithiophosphate)	Prepared by the reaction of phosphorus pentasulfide with sodium hydroxide; commonly called "Nokes reagent"
Flocculant	Typical flocculant like Anionic Polyacrylamide is a colourless of white granular powder with a pH of 6.0.  Flammable, dust explosions may occur if material is dispersed in

Chemical	Description/Typical Material Safety Data Sheet Information
	air. Flammability may be enhanced by presence of strong oxidizers.
Potassium amyl xanthate (PAX – pyrite flotation)	<p>May spontaneously ignite on exposure to moist air; flammable gas (carbon disulfide) when wet; highly toxic gases (carbon disulfide, hydrogen sulfide) if heated to decomposition.</p> <p>If discharged to waterways, xanthates may persist for several days; highly toxic to aquatic life - may form complexes with heavy metals.</p>
<b>Oxide Ore Process</b>	
Sodium Cyanide (NaCN)	<p>Solid white substance with a faint “bitter almond” odour; soluble in water.</p> <p>Decomposes on heating, emitting toxic fumes, including those of hydrogen cyanide, and ammonia; toxic to animals in comparatively low concentrations.</p> <p>Known to cause bird kills in tailings dams.</p>
Caustic Soda (sodium hydroxide, NaOH)	Odourless white solid; highly reactive with metals; reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.
Pebble Lime (CaO)	<p>White or gray, odorless lumps, granules, or powder.</p> <p>Not combustible or flammable but reacts with water to form calcium hydroxide while generating heat, which could ignite combustible materials.</p> <p>Not explosive but reaction with water or other incompatible materials causes material to swell and may rupture containers.</p> <p>High pH - toxic to aquatic organisms and aquatic systems.</p>
Hydrochloric Acid (HCl)	<p>Liquid with a pungent odour; colourless to light yellow.</p> <p>Reacts violently with water, especially when water is added to the product; absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent at 125°C; sodium reacts very violently with</p> <p>gaseous hydrogen chloride; reacts with oxidizers releasing chlorine gas.</p> <p>Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates; reacts with most metals to produce flammable hydrogen gas.</p>

Chemical	Description/Typical Material Safety Data Sheet Information
Sodium Hydrosulphide (NaHS)	<p>High pH therefore toxic to aquatic organisms and aquatic systems (pH 11).</p> <p>Auto-ignition temperature 120°C; releases highly toxic and highly flammable hydrogen sulfide gas if mixed with an acid or if exposed to excessive heat.</p> <p>Toxic to terrestrial vertebrates.</p>
Sulphuric acid (H <sub>2</sub> SO <sub>4</sub> )	<p>Clear, colourless to dark brown, odourless; dense, oily liquid; hygroscopic.</p> <p>Will not burn but can decompose at high temperatures, forming toxic gases such as sulphur oxides.</p> <p>Contact with combustible materials may cause fire; highly reactive.</p> <p>Contact with many organic and inorganic chemicals may cause fire or explosion; contact with metals liberates flammable hydrogen gas; reacts violently with water; reacts with most metals, especially when diluted with water; this reaction produces highly flammable hydrogen gas that may explode if ignited.</p>
Activated Carbon	Black, odourless, pelletized powder; insoluble in water;
Antiscalant	Typical antiscalants such as -1,1 Diphosphonic Acid 1-hydroxyethane may produce Cox, POx and phosphine on combustion.
Flocculant	<p>Typical flocculant like Anionic Polyacrylamide is a colourless white granular powder with a pH of 6.0.</p> <p>Flammable, dust explosions may occur if material is dispersed in air. Flammability may be enhanced by presence of strong oxidizers.</p>

# CYTEC MATERIAL SAFETY DATA

Page 1 of 5  
MSDS No: 1787  
CAS No: 013360-78-6

Date: 10/14/97  
Supersedes: 07/01/97

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **AEROPHINE® 3418A Promoter**

SYNONYMS: Sodium diisobutyldithiophosphinate, 50% aqueous solution

CHEMICAL FAMILY: Dithiophosphinate

MOLECULAR FORMULA: C<sub>8</sub>H<sub>18</sub>PS<sub>2</sub>.Na

MOLECULAR WGT: 232

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WEST PATERSON, NEW JERSEY 07424, USA

For Product Information call 1-800/652-6013. Outside the USA and Canada call 973/357-3193.

EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800/424-9300. Outside the USA and Canada call 703/527-3887.

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA REGULATED COMPONENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
Sodium diisobutyldi-Thiophosphinate	013360-78-6	50-52	not established	

## 3. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

APPEARANCE AND ODOR: Colorless to light yellow mobile liquid; odorless

STATEMENTS OF HAZARD:

WARNING! CAUSES EYE IRRITATION  
MAY CAUSE SKIN IRRITATION

### POTENTIAL HEALTH EFFECTS

EFFECTS OF OVEREXPOSURE:

The acute oral (rat) and acute dermal (rabbit) LD<sub>50</sub> values for this material are 3.35 g/kg and greater than 5.0 g/kg, respectively. Mild skin and moderate eye irritation were produced during primary irritation studies in rabbits. Skin irritation was increased after repeated exposures in rabbit studies.

## 4. FIRST AID MEASURES

In case of skin contact, immediately wash affected areas with soap and plenty of water. Remove contaminated clothing and shoes. Obtain medical attention. Destroy or thoroughly clean shoes before reuse. Do not reuse contaminated clothing without laundering.

In case of eye contact, immediately irrigate with plenty of water for 15 minutes. Obtain medical attention if irritation persists.

Material is not expected to be harmful if inhaled. If inhaled, remove to fresh air.

## 5. FIRE FIGHTING MEASURES

### FLAMMABLE PROPERTIES

FLASH POINT: >200 F; 93 C

METHOD: Pensky-Martens Closed Cup

FLAMMABLE LIMITS (% BY VOL): Not applicable  
AUTOIGNITION TEMP: 819 F; 437 C  
DECOMPOSITION TEMP: >662 F; 350C

### **EXTINGUISHING MEDIA AND FIRE FIGHTING INSTRUCTIONS**

Use water spray, carbon dioxide or dry chemical to extinguish fires. Use water to keep containers cool. Wear self-contained, positive pressure breathing apparatus and full fire-fighting protective clothing. See Section 8 (Exposure Controls/Personal Protection) for special protective clothing.

## **6. ACCIDENTAL RELEASE MEASURES**

### **STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED**

Where exposure level is not known, wear NIOSH approved, positive pressure, self-contained respirator. Where exposure level is known, wear NIOSH approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8 (Exposure Controls/Personal Protection), wear impervious boots.

Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush area with water.

## **7. HANDLING AND STORAGE**

Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling.

## **8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

### **ENGINEERING CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure. Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands with soap and water. Avoid skin contact. Protective clothing such as impervious gloves, apron, workpants, long sleeve work shirt, or disposable coveralls are recommended to prevent skin contact. For operations where eye or face contact can occur, wear eye protection such as chemical splash proof goggles or face shield. Eyewash equipment and safety shower should be provided in areas of potential exposure. For operations where inhalation exposure can occur, a NIOSH approved respirator recommended by an industrial hygienist may be necessary. A full facepiece respirator also provides eye and face protection.

## **9. PHYSICAL AND CHEMICAL PROPERTIES**

APPEARANCE AND ODOR: Colorless to light yellow mobile liquid; odorless

BOILING POINT: 223 F; 106 C

MELTING POINT: 23-32 F; -5-0 C; (crystallization point)

VAPOR PRESSURE: 17.5 mm Hg @ 20 C; (value for water)

SPECIFIC GRAVITY: 1.14 @ 24 C

VAPOR DENSITY: Not applicable

% VOLATILE (BY WT): ~50; (water)

pH: Slightly alkaline

SATURATION IN AIR (% BY VOL): Not applicable

EVAPORATION RATE: Not applicable

SOLUBILITY IN WATER: Complete

## 10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: None known

POLYMERIZATION: Will Not Occur

CONDITIONS TO AVOID: None known

INCOMPATIBLE MATERIALS: Strong mineral acids and strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS: oxides of carbon; oxides of phosphorus; oxides of sulfur (includes sulfur di and tri oxides)

## 11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 3. HAZARDS IDENTIFICATION.

Toxicological information on the OSHA regulated components of this product is as follows:

Sodium diisobutylidithiophosphinate causes moderate eye and skin irritation.

## 12. ECOLOGICAL INFORMATION

Algae (*Selenastrum capricornutum*), 96 hr EbC50 = 35.1 mg/L; 96 hr ErC50 = 115 mg/L

### LC50

BLUEGILL, 96 HOUR: 375 mg/L

DAPHNIA, 48 HOUR: 149 mg/L

### BOD

28 Day: 78.8 %

OCTANOL/H<sub>2</sub>O PARTITION COEF.: Not applicable

## 13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the Cytec product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA "listed hazardous waste" or has any of the four RCRA "hazardous waste characteristics." Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA "listed hazardous waste"; information contained in Section 15 of this MSDS is not intended to indicate if the product is a "listed hazardous waste." RCRA Hazardous Waste Characteristic. There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 5 of this MSDS (flash point). For Corrosivity, see Sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 2 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent than the federal regulations, may also apply to the classification of the material if it is to be disposed. Cytec encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. Cytec recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. Cytec has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

## 14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

<b>D.O.T. SHIPPING INFORMATION</b>	<b>IMO SHIPPING INFORMATION</b>
SHIPPING NAME: NOT APPLICABLE/NOT REGULATED	NOT APPLICABLE/NOT REGULATED
HAZARD CLASS/ PACKING GROUP: Not Applicable	Not Applicable
UN NUMBER: Not Applicable	Not Applicable
IMDG PAGE: Not Applicable	Not Applicable
D.O.T. HAZARDOUS SUBSTANCES: (PRODUCT REPORTABLE QUANTITY) Not Applicable	Not Applicable
TRANSPORT LABEL REQUIRED: None Required	None Required
<b>ICAO/IATA</b>	<b>TRANSPORT CANADA</b>
SHIPPING NAME: NOT APPLICABLE/NOT REGULATED	NOT APPLICABLE/NOT REGULATED
HAZARD CLASS: Not Applicable	Not Applicable
SUBSIDIARY CLASS: Not Applicable	Not Applicable
UN / ID NUMBER: Not Applicable	Not Applicable
PACKING GROUP: Not Applicable	Not Applicable
TRANSPORT LABEL REQUIRED: None Required	None Required
PACKING INSTR: PASSENGER Not Applicable CARGO Not Applicable	Not Applicable
MAX NET QTY: PASSENGER Not Applicable CARGO Not Applicable	Not Applicable
<b>ADDITIONAL TRANSPORT INFORMATION</b>	
TECHNICAL NAME (N.O.S.): Not Applicable	

## 15. REGULATORY INFORMATION

### INVENTORY INFORMATION

US TSCA: This product is manufactured in compliance with all provisions of the Toxic Substances Control Act, 15 U.S.C. 2601 et. seq.

CANADA DSL: Components of this product have been reported to Environment Canada in accordance with subsection 25 of the Canadian Environmental Protection Act and are included on the Domestic Substances List.

EEC EINECS: All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments.

### OTHER ENVIRONMENTAL INFORMATION

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

COMPONENT	CAS. NO.	%	TPQ(lbs)	RQ(lbs)	S313	TSCA 12B
This product does not contain any components regulated under these sections of the EPA						

PRODUCT CLASSIFICATION UNDER SECTION 311 OF SARA					
ACUTE (Y)	CHRONIC (N)	FIRE (N)	REACTIVE (N)	PRESSURE (N)	

## 16. OTHER INFORMATION

### NFPA HAZARD RATING (National Fire Protection Association)

Fire 1  
Health 2  
Reactivity 0  
Special —

FIRE: Materials that must be preheated before ignition can occur.

HEALTH: Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given

REACTIVITY: Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.

### REASON FOR ISSUE:

Revised Sections 2, 3, 9 & 10

Randy Deskin, Ph.D., DABT

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CF Industries Sales, LLC  
 4 Parkway North, Suite 400  
 Deerfield, Illinois 6005-2590  
 847-405-2400

Material Safety Data Sheet

**Ammonium Nitrate**

MSDS Number 004 (Revised April 23, 2013)

9 Pages

**1. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT**

Product Name:..... Ammonium Nitrate  
 Trade Name..... Amtrate  
 Chemical Family:..... Inorganic Salt  
 Synonyms:..... AN, Ammonium Saltpeter, Nitric Acid,  
 Ammonium Salt  
 Formula:..... NH<sub>4</sub>NO<sub>3</sub>  
 Product Uses:..... Fertilizers

**EMERGENCY TELEPHONE NUMBERS**

CHEMTREC (U.S.):..... 800-424-9300  
 CANUTEC (Canada):..... 613-996-6666

**2. COMPOSITION/INFORMATION ON INGREDIENTS**

Component Name	Percentage by Weight	CAS Number
Ammonium Nitrate	98 - 100 %	6484-52-2
Conditioning Agent	0 - 0.2%	

Exposure Limits for Components				
Component	TWA	STEL	PEL	IDLH
Ammonia	25 ppm	35 ppm	50 ppm	300 ppm

**3. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**

**Strong oxidizer.** Contact with combustible material will increase fire hazard. May undergo detonation if heated under confinement causing pressure buildup or if subjected to strong shocks. Solid AN when sensitized or during decomposition may become unstable and/or explosive. When AN is heated to decomposition it may produce vapors which contain nitrogen oxides (NO<sub>x</sub>). **AN is an oxidizer** and as such may increase the flammability and/or explosiveness of other substances. Use water to control fires involving AN, if water is compatible with burning material. AN itself is non-flammable. AN can cause irritation to eyes and skin and may be an inhalation discomfort in confined locations.

<b>NFPA Hazard Classification</b>	<b>Health Hazard (Blue).....</b>	<b>1</b>
	<b>Flammability (Red).....</b>	<b>0</b>
	<b>Reactivity (Yellow).....</b>	<b>3</b>
	<b>Other .....</b>	<b>OX</b>

## **POTENTIAL HEALTH EFFECTS**

**Primary Routes of Entry:** Skin contact/absorption and eye contact.

**General Acute Exposure:** AN is a mild skin, eye, and respiratory irritant, possible allergen, and methemoglobin inducer. Because it can form methemoglobin, it may have irreversible effects which can be life threatening.

**General Chronic Exposure:** By analogy with nitrobenzene, AN is in Class A+ as a reproductive hazard. It is important to remember that this hazard is due to its association and there is no direct evidence for adverse reproductive effects. Nevertheless, it would be prudent for pregnant women not to be exposed to AN.

### **Carcinogenicity:**

NTP:.....Not Listed

IARC:.....Not Listed

OSHA: .....Not Regulated

**Medical Conditions Aggravated by Exposure:** No test data available.

## **4. FIRST AID MEASURES**

**First Aid for Eyes:** Immediately flush eyes with copious amounts of tepid water for at least 15 minutes. If irritation, pain, swelling, excessive tearing, or light sensitivity persists, the patient should be seen in a health care facility.

**First Aid for Skin:** Immediately flush exposed area with copious amounts of tepid water for at least 15 minutes followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists.

**First Aid for Inhalation:** Generally not considered an inhalation hazard. If irritation develops move patient to fresh air and monitor. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation. If trained to do so, administer supplemental oxygen if needed. If irritation, coughing, or difficulty in breathing persists the patient should be seen in a health care facility.

**First Aid for Ingestion:** If conscious, give the patient large quantities of milk or water to drink immediately. Do not induce vomiting. Seek medical attention.

### **Symptoms of Overexposure**

**Acute:** Cyanosis, nausea, vertigo, collapse, vomiting/abdominal pain, and tachycardia (rapid heartbeat), tachypnea (rapid breathing), coma, convulsions, and death can occur.

**Chronic:** Small repeated doses may lead to weakness, general depression, headache and mental impairment.

## 5. FIRE FIGHTING MEASURES

### **Firefighting Procedures**

Flood burning ammonium nitrate fertilizer with large volumes of low pressure water. Do not use salt water, carbon dioxide, dry chemicals or foam extinguishers. Never attempt to smother fire, such as by sealing off, closing a compartment or building doors when fire occurs. Do not add steam. Ammonium nitrate fertilizer does not have the property of spontaneous combustion. Fire fighters should wear approved self-contained breathing apparatus to protect themselves from the toxic fumes of decomposing ammonium nitrate, and protective clothing to guard against molten nitrate splashes should also be worn.

### **Unusual Fire and Explosive Hazards**

Nitrogen oxide gases emitted on decomposition are extremely toxic. Contamination of ammonium nitrate with oil, diesel fuel, charcoal, sulfur, metal fines or other combustible substances could possibly cause an explosion. If an explosion is expected, surrounding area should be evacuated.

**Extinguishing Media:** Use water only to extinguish a fire involving AN if water is compatible with the burning material. Do not use dry chemicals, CO<sub>2</sub>, Halogens or foam.

### **Special Fire Fighting Procedures:**

- a. Flood fire area with water from a distance.
- b. Move containers from the fire area if you can do it without risk. Do not move cargo or vehicle if cargo has been exposed to heat.
- c. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- d. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks due to exploding potential when tanks are involved in a fire.
- e. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
- f. Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
- g. Structural firefighters' protective clothing will only provide limited protection.

**Evacuation:** If tank, rail car or truck is involved in a fire, isolate for 1/2 mile in all directions; also, consider initial evacuation for 1/2 mile in all directions.

### **Caution:**

- a. Runoff from fire control or dilution water may cause pollution.
- b. AN solution pumps operated with blocked discharge have been known to detonate.
- c. Avoid welding or burning on pipes, valves, or tanks, which have contained AN solution until they have been thoroughly washed out. Residual solidified AN may explode under conditions of confinement and high temperature.

## 6. ACCIDENTAL RELEASE MEASURES

**Spill or Leak Measures:** Keep combustibles (wood, paper, oil, etc.) away from spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do so without risk. Do not get water inside containers.

### **Small Spill:**

- a. Stop leak if you can do so without risk.
- b. With a clean shovel, place material into a clean, dry container and cover loosely; move containers from spill area.
- c. Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- d. Wash contaminated areas with large volumes of water, if approved by local, state, and federal environmental agencies.
- e. Runoff may cause pollution.

### **Large Spill:**

- a. Dike ahead of liquid spill for later recovery of usable product and proper disposal of any residue.
- b. Stop leak if you can do so without risk.
- c. Wash contaminated areas with large volumes of water, if approved by local, state, and federal environmental agencies.
- d. Runoff may cause pollution.

**Environmental Impact:** Ammonium nitrate fertilizer is a plant nutrient, however, large spills can kill vegetation. If water courses are contaminated it may promote eutrophication and cause fish kills. If drinking water is contaminated beyond 10 mg of nitrate nitrogen per liter by ammonium nitrate fertilizer, it should be reported to the proper authorities.

**Precautions if Spilled or Released:** Spilled ammonium nitrate fertilizer can be reused if kept dry and uncontaminated. After cleanup, contaminated area should be washed down with water. Do not allow wash water to enter drinking water supplies. In the event of spill or wash water entering sewer or waterway, notify sewer authorities or other appropriate agencies.

Spills that have become contaminated with organic matter or other combustible material may present a fire and explosion hazard. Such material should be shoveled into drums and dissolved in water to obtain at least 50 percent water solution. Depending upon the amount of toxicity of the contaminated material, the solution can be reused as a fertilizer or disposed of.

## 7. HANDLING AND STORAGE

See NFPA 400 Hazardous Materials Code (2013 Edition)

Store in well-ventilated area away from acute fire hazards and easily oxidizable materials. Do not store near dynamite, blasting caps or other explosives. Avoid contamination. Floor drains and recesses should be plugged or eliminated to prevent entrapment of flowing, molten nitrate during fire.

Storage construction should be of non-combustible materials and preferably equipped with an automatic sprinkler system. Storage should be designed for safe release of pressure in emergency. Bagged ammonium nitrate fertilizer is subject to storage, stacking and quantity regulations. Follow federal, state and local regulations. See CFR 1910.109 regulations.

**Handling Precautions:** Keep away from open flames, hot surfaces and sources of ignition. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before re-use. Use only in area provided with appropriate exhaust ventilation. Avoid dust formation. Product is mildly corrosive to concrete and steel structures. Avoid materials made of copper and bronze in storage and handling equipment.

## **8. EXPOSURE CONTROLS, PERSONAL PROTECTION**

### **Respiratory Protection Requirements:**

- a. AN itself does not pose an inhalation hazard.
- b. Decomposition of AN may produce nitrogen oxides (NO<sub>x</sub> vapors) and ammonia. Use fresh air supply systems to protect against NO<sub>x</sub> vapors.
- c. If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
- d. For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn.

If necessary to enter a confined area which contains AN, monitor for ammonia vapors. If ammonia vapors are present protect as follows:

<25 ppm:	No protection required.
25 to 35 ppm:	Protection required if the daily TWA is exceeded.
35 to 50 ppm:	Protection required if exposed for more than 15 minutes.
50 to 250 ppm:	Minimum of an air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
250 to 300 ppm:	Minimum of a full-face air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
>300 ppm:	A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus).

### **Skin Protection Requirements:**

Skin contact should be avoided. Wear gloves and clean body protective covering. Gloves and protective clothing made from rubber should be impervious under conditions of use. Other products such as viton or neoprene may be impervious to AN. All protective equipment should be tested for compatibility before use.

### **Eye Protection Requirements:**

It is recommended that if there is a potential for AN to contact eyes that safety glasses/face shield and/or chemical goggles be used.

### **Other Protective Equipment:**

Safety shower and eyewash fountain or at least 5 gallons of accessible clean water should be provided in an AN handling area

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form:	Solid prills or granules (deliquescent solid)
Color:	White
Odor:	Odorless
Boiling Point:	Decomposition temperature 410°F
Melting point:	311° F - 337° F
pH: .....	(10% solution) 6-7
Solubility:.....	By Wt. 66.4% @ 70°F. Highly Soluble.
Specific Gravity: .....	1.72 @ 70°F
Vapor Density: .....	No test results
Vapor Pressure: .....	No test results
% Volatile by Volume: .....	No test results
Molecular Weight:.....	80.05
Critical Temperature:.....	No test results
Critical Pressure: .....	No test results

## 10. REACTIVITY

Stability: ..... This is a stable material.

Hazardous Polymerization: ..... Will not occur.

**Decomposition:** AN starts to dissociate and decompose at temperatures above 410° F. Upon decomposition it emits nitrogen oxide (NO<sub>x</sub>) and water vapors and may explode if confined. Hazardous decomposition products can include ammonia, oxides of nitrogen and nitric acid. If the product has been contaminated with another substance the decomposition temperature and effects of the decomposition may be varied. See Incompatibilities.

**Incompatibilities:** AN is incompatible with the following substances: Acetic Acid, Acetic Anhydride, Alkali Metals, Aluminum + Calcium Nitrate, Aluminum, Ammonium Chloride, Ammonium Dichromate, Ammonium Phosphate + Potassium, Antimony, Barium Chloride, Bismuth, Brass, Cadmium, Charcoal + Metal Oxides, Chloride Salts, Chromium, Cobalt, Copper Iron II Sulfide, Copper, Cyanoguanidine, Hydrocarbon Oils, Iron, Lead, Magnesium, Manganese, Nickel, Organic Fuels, Potassium Chromate, Potassium Dichromate, Potassium Nitrate, Potassium Nitrite, Potassium Permanganate, Sawdust, Sodium Chloride, Sodium Perchlorate, Sugar, Sulfide Ores, Sulfur, Tin, Titanium, Trinitroanisole, and Zinc.

**NOTE:** The incompatibilities above is a partial list taken from books by SAX & Lewis: "Dangerous Properties of Industrial Materials", 7th. ed., 1989 and "Hawley's Condensed Chemical Dictionary", 11th. ed. 1987, both published by Van Nostrand Reinhold Company, New York and other sources. It is recommended that if additional information is needed, refer to these and other published information. Incompatibility varies with AN concentration and not all forms of the above listed substances are incompatible.

## 11. TOXICOLOGICAL INFORMATION

### Toxicity

#### Acute Oral Toxicity

LD<sub>50</sub> Rat ..... 2,800 mg/kg bw (OECD 401)

#### Acute Inhalation Toxicity

LC<sub>50</sub> Rat ..... > 88.8 mg/L (4 hrs)

#### Acute Dermal Toxicity

LD<sub>50</sub> Rat ..... > 5,000 mg/kg (OECD 402)

#### Acute Toxicity, Other Routes

Minimum lethal dose Rat ..... 0.065 mg NH<sub>4</sub>NO<sub>3</sub>-N

#### Corrosiveness / Irritation

Skin irritation Rabbit ..... Moderately irritating

Eye irritation Rabbit ..... No data available

#### Repeated Dose

NOAEL Inhalation Rat ..... 185 mg/m<sup>3</sup> (2 weeks)

NOAEL Inhalation Rat ..... 1 mg/m<sup>3</sup> (4 weeks)

#### Genetic Toxicity *in vitro*

*Salmonella typhimurium* ..... Negative (Bacterial reverse mutation assay)

#### Development Toxicity / Teratogenicity

NOEL Rat ..... > 57 mg/kg/day

### Ecotoxicity

#### Acute Toxicity to Fish

LC<sub>50</sub> *Cyprinus carpio* L ..... 1.15 – 1.72 mg unionized NH<sub>3</sub>/L (48 hrs)

LC<sub>50</sub> Many species ..... 420 – 1,360 mg NO<sub>3</sub>/L (96 hrs)

#### Acute Toxicity to Aquatic Invertebrates

EC<sub>50</sub> *Daphnia magna* ..... 555 mg/L

#### Toxicity to Aquatic Plants (Algae)

EC<sub>50</sub> *Scenedesmus quadricauda* ..... 83 mg/L

#### Chronic Toxicity to Aquatic Invertebrates

NOEC *Bullia digitalis* ..... 300 mg/L (Up to 7 days)

Source: TFI Product Testing Program April 2003.

## 12. ECOLOGICAL INFORMATION

Notify local health and wildlife officials and operators of any nearby water intakes of contamination or discharge into or leading to waterways. Fertilizers containing AN can cause poisoning in livestock and poultry. AN can be toxic to aquatic life and spills may cause algae blooms in static waters. Nitrate ions are assimilated by growing plants. AN will also be taken up by bacteria. In anaerobic soils, nitrate ions may be converted to nitrite, molecular nitrogen, nitrous oxide, or ammonium ions.

**Note:** See Ecotoxicity information in section 11.

**13. DISPOSAL CONSIDERATIONS**

Consult state/provincial and local environmental agencies for acceptable disposal methods.  
Recover product for use as a fertilizer if possible

**14. TRANSPORTATION INFORMATION**

U.S. DOT and Canadian TDG Act  
Shipping Name:.....Ammonium nitrate  
Hazard Class: .....Class 5.1  
Product Identification Number (PIN):.....UN1942  
DOT Placard: .....Oxidizer 5.1, color: yellow  
RQ (Reportable Quantity):.....No RQ established  
STCC Number:.....4918311

**15. REGULATORY INFORMATION**

**OSHA:** This product is considered a hazardous material under criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

**SARA TITLE III:**

- a. EHS (Extremely Hazardous Substances) List: Not Listed (EPA, 1992a)
- b. EHS RQ (Reportable Quantity): No RQ established.
- c. TPQ (Threshold Planning Quantity): None
- d. As distributed by CF Industries Sales, LLC, this product contains no compounds subject to reporting under Section 313 of SARA III and 40 CFR 372; however, these federal regulations do contain reporting requirements regarding water solutions of ammonia and nitrates. Additionally, the following federal environmental statutes apply to this product: SARA Title III, Sections 311 & 312 (40 CFR 370).

**CERCLA Hazardous Substances List:** Not listed

**TSCA Inventory:**

- a. Listed (RTECS, 1993)

**Security:**

This product is listed as a Chemical of Interest (COI) by the Department of Homeland Security (DHS) for theft. DHS 6 CFR part 27 Appendix A, Chemical Facility Anti-Terrorism Standards.

## 16. OTHER INFORMATION

Aug. 21, 2008	The MSDS was reformatted and additional sections populated to comply with ANSI Standard Z400.1-1993. Toxicity information from the TFI Product Testing Program April 2003 was added. Reviewed and updated as necessary.
Jan. 25, 2011	Reviewed and revised for logo change.
Dec. 11, 2012	Revised for company name change. Reviewed product specifications.
April 23, 2013	Revised to update NFPA reference.

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# Material Safety Data Sheet

DIESEL FUEL



## 1. Product and company identification

- Product name** : DIESEL FUEL
- Synonym** : Seasonal Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, D50, D60, P40, P50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC), Marine Gas Oil.
- Code** : W104, W293
- Material uses** : Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining diesels, marine diesels, MDO and naval distillates may have a higher flash point requirement.
- Manufacturer** : PETRO-CANADA  
P.O. Box 2844  
150 – 6th Avenue South-West  
Calgary, Alberta  
T2P 3E3
- In case of emergency** : Petro-Canada: 403-296-3000  
Canotec Transportation: 613-996-6666  
Poison Control Centre: Consult local telephone directory for emergency number(s).

## 2. Hazards identification

- Physical state** : Bright oily liquid.
- Odour** : Mild petroleum oil like.
- WHMIS (Canada)** :    
Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class D-2B: Material causing other toxic effects (Toxic).
- OSHA/HCS status** : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
- Emergency overview** : WARNING!  
COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.  
Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapour or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.
- Routes of entry** : Dermal contact. Eye contact. Inhalation. Ingestion.
- Potential acute health effects**
- Inhalation** : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
- Ingestion** : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.
- Skin** : Severely irritating to the skin.
- Eyes** : Irritating to eyes.
- Potential chronic health effects**
- Chronic effects** : No known significant effects or critical hazards.
- Carcinogenicity** : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).
- Mutagenicity** : No known significant effects or critical hazards.
- Teratogenicity** : No known significant effects or critical hazards.

## 2. Hazards identification

- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.
- Medical conditions aggravated by over-exposure** : Avoid prolonged or repeated skin contact to diesel fuels which can lead to dermal irritation and may be associated with an increased risk of skin cancer.

See toxicological information (Section 11)

## 3. Composition/information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>%</u>
Hydrotreated Renewable Diesel/ Fuels, diesel/ Fuel Oil No. 1/ Fuel Oil No. 2	64742-81-0/ 68334-30-5/ 8008-20-6/ 68476-30-2	95 - 100
Alkanes, C10 – 20 Branched and Linear (R100)	928771-01-1	10 - 20
Fatty acids methyl esters	61788-61-2 / 67784-80-9 / 73891-99-3	0 - 5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

## 4. First-aid measures

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

## 5. Fire-fighting measures

- Flammability of the product** : Combustible liquid
- Extinguishing media**
- Suitable** : Use dry chemical, CO<sub>2</sub>, water spray (fog) or foam.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Products of combustion** : Carbon oxides (CO, CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>), sulphur compounds (H<sub>2</sub>S), smoke and irritating vapours as products of incomplete combustion.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

## 5 . Fire-fighting measures

- Special remarks on fire hazards** : Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.
- Special remarks on explosion hazards** : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Runoff to sewer may create fire or explosion hazard.

## 6 . Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
- Environmental precautions** : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

## 7 . Handling and storage

- Handling** : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination. Ensure the storage containers are grounded/bonded.

## 8 . Exposure controls/personal protection

Ingredient	Exposure limits
Fuels, diesel	<b>ACGIH TLV (United States). Absorbed through skin.</b> TWA: 100 mg/m <sup>3</sup> , (Inhalable fraction and vapour) 8 hour(s).
Fuel oil No. 2	<b>ACGIH TLV (United States). Absorbed through skin.</b> TWA: 100 mg/m <sup>3</sup> , (Inhalable fraction and vapour) 8 hour(s).
Hydrotreated Renewable Diesel	<b>ACGIH TLV (United States). Absorbed through skin.</b> TWA: 200 mg/m <sup>3</sup> 8 hour(s).
Fuel oil No. 1	<b>ACGIH TLV (United States). Absorbed through skin.</b> TWA: 200 mg/m <sup>3</sup> 8 hour(s).

### Consult local authorities for acceptable exposure limits.

**Recommended monitoring procedures** : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

**Engineering measures** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

**Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

### Personal protection

#### Respiratory

: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

#### Hands

: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.  
Recommended: nitrile, neoprene, polyvinyl alcohol (PVA), Viton®. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

#### Eyes

: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

#### Skin

: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

#### Environmental exposure controls

: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

## 9 . Physical and chemical properties

<b>Physical state</b>	: Bright oily liquid.
<b>Flash point</b>	: Diesel fuel and other distillate fuels: Closed cup: $\geq 40^{\circ}\text{C}$ ( $\geq 104^{\circ}\text{F}$ ) Marine Diesel/MDO/Naval Distillate: Closed Cup: $\geq 60^{\circ}\text{C}$ ( $\geq 140^{\circ}\text{F}$ ) Mining Diesel: Closed Cup: $\geq 52^{\circ}\text{C}$ ( $\geq 126^{\circ}\text{F}$ )
<b>Auto-ignition temperature</b>	: $225^{\circ}\text{C}$ ( $437^{\circ}\text{F}$ )
<b>Flammable limits</b>	: Lower: 0.7% Upper: 6%
<b>Colour</b>	: Clear to yellow (This product may be dyed red for taxation purposes).
<b>Odour</b>	: Mild petroleum oil like.
<b>Odour threshold</b>	: Not available.
<b>pH</b>	: Not available.
<b>Boiling/condensation point</b>	: $150$ to $371^{\circ}\text{C}$ ( $302$ to $699.8^{\circ}\text{F}$ )
<b>Melting/freezing point</b>	: Not available.
<b>Relative density</b>	: $0.80$ to $0.88$ kg/L @ $15^{\circ}\text{C}$ ( $59^{\circ}\text{F}$ )
<b>Vapour pressure</b>	: $1$ kPa ( $7.5$ mm Hg) @ $20^{\circ}\text{C}$ ( $68^{\circ}\text{F}$ ).
<b>Vapour density</b>	: $4.5$ [Air = 1]
<b>Volatility</b>	: Not available.
<b>Evaporation rate</b>	: Not available.
<b>Viscosity</b>	: Diesel fuel: $1.3$ - $4.1$ cSt @ $40^{\circ}\text{C}$ ( $104^{\circ}\text{F}$ ) Marine Diesel Fuel: $1.3$ - $4.4$ cSt @ $40^{\circ}\text{C}$ ( $104^{\circ}\text{F}$ )
<b>Pour point</b>	: Not available.
<b>Solubility</b>	: Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

## 10 . Stability and reactivity

<b>Chemical stability</b>	: The product is stable.
<b>Hazardous polymerisation</b>	: Under normal conditions of storage and use, hazardous polymerisation will not occur.
<b>Materials to avoid</b>	: Reactive with oxidising agents and acids.
<b>Hazardous decomposition products</b>	: May release COx, NOx, SOx, H <sub>2</sub> S, smoke and irritating vapours when heated to decomposition.

## 11 . Toxicological information

### Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Fuels, diesel	LD50 Dermal	Mouse	24500 mg/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Fuel oil No. 2	LD50 Oral	Rat	12000 mg/kg	-
Fuel oil No. 1	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5000 mg/m <sup>3</sup>	4 hours
Hydrotreated Renewable Diesel	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5000 mg/kg	-
	LC50 Inhalation Vapour	Rat	>5200 mg/m <sup>3</sup>	4 hours

**Conclusion/Summary** : Not available.

### Chronic toxicity

**Conclusion/Summary** : Not available.

### Irritation/Corrosion

**Conclusion/Summary** : Not available.

### Sensitiser

## 11 . Toxicological information

**Conclusion/Summary** : Not available.

### Carcinogenicity

**Conclusion/Summary** : Diesel engine exhaust particulate is probably carcinogenic to humans (IARC Group 2A).

### Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Fuels, diesel	A3	3	-	-	-	-
Fuel oil No. 1	A3	3	-	-	-	-
Fuel oil No. 2	A3	3	-	-	-	-
Hydrotreated Renewable Diesel	A3	3	-	-	-	-

### Mutagenicity

**Conclusion/Summary** : Not available.

### Teratogenicity

**Conclusion/Summary** : Not available.

### Reproductive toxicity

**Conclusion/Summary** : Not available.

## 12 . Ecological information

**Environmental effects** : No known significant effects or critical hazards.

### Aquatic ecotoxicity

**Conclusion/Summary** : Not available.

### Biodegradability

**Conclusion/Summary** : Not available.

## 13 . Disposal considerations

**Waste disposal** : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

## 14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
<b>TDG Classification</b>	UN1202	DIESEL FUEL	3	III		-
<b>DOT Classification</b>	Not available.	Not available.	Not available.	-		-

## 14 . Transport information

PG\* : Packing group

## 15 . Regulatory information

### United States

**HCS Classification** : Combustible liquid  
Irritating material

### Canada

**WHMIS (Canada)** : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).  
Class D-2A: Material causing other toxic effects (Very toxic).  
Class D-2B: Material causing other toxic effects (Toxic).

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

### International regulations

**Canada inventory** : All components are listed or exempted.

**United States inventory (TSCA 8b)** : All components are listed or exempted.

**Europe inventory** : All components are listed or exempted.

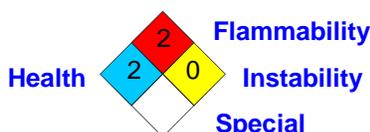
## 16 . Other information

**Label requirements** : COMBUSTIBLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION.

**Hazardous Material Information System (U.S.A.)** :

Health	2
Flammability	2
Physical hazards	0
Personal protection	H

**National Fire Protection Association (U.S.A.)** :



**References** : Available upon request.  
™ Trademark of Suncor Energy Inc. Used under licence.

**Date of printing** : 4/14/2014.

**Date of issue** : 28 June 2013

**Date of previous issue** : No previous validation.

**Responsible name** : **Product Safety - DSR**

▣ Indicates information that has changed from previously issued version.

**For Copy of (M)SDS** : Internet: [www.petro-canada.ca/msds](http://www.petro-canada.ca/msds)

Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228

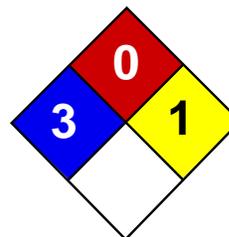
For Product Safety Information: (905) 804-4752

### Notice to reader

## 16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Health	3
Fire	0
Reactivity	1
Personal Protection	

## Material Safety Data Sheet

### Hydrochloric acid MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Hydrochloric acid

**Catalog Codes:** SLH1462, SLH3154

**CAS#:** Mixture.

**RTECS:** MW4025000

**TSCA:** TSCA 8(b) inventory: Hydrochloric acid

**CI#:** Not applicable.

**Synonym:** Hydrochloric Acid; Muriatic Acid

**Chemical Name:** Not applicable.

**Chemical Formula:** Not applicable.

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Hydrogen chloride	7647-01-0	20-38
Water	7732-18-5	62-80

**Toxicological Data on Ingredients:** Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

Slightly hazardous in case of skin contact (sensitizer). **CARCINOGENIC EFFECTS:** Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target

organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Serious Ingestion:** Not available.

#### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** of metals

**Explosion Hazards in Presence of Various Substances:** Non-explosive in presence of open flames and sparks, of shocks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrogen gas.

**Special Remarks on Explosion Hazards:**

Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4 , Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

## Section 6: Accidental Release Measures

### Small Spill:

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

### Large Spill:

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

### Personal Protection:

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Pungent. Irritating (Strong.)

**Taste:** Not available.

**Molecular Weight:** Not applicable.

**Color:** Colorless to light yellow.

**pH (1% soln/water):** Acidic.

**Boiling Point:**

108.58 C @ 760 mm Hg (for 20.22% HCl in water) 83 C @ 760 mm Hg (for 31% HCl in water) 50.5 C (for 37% HCl in water)

**Melting Point:**

-62.25°C (-80°F) (20.69% HCl in water) -46.2 C (31.24% HCl in water) -25.4 C (39.17% HCl in water)

**Critical Temperature:** Not available.

**Specific Gravity:**

1.1- 1.19 (Water = 1) 1.10 (20%and 22% HCl solutions) 1.12 (24% HCl solution) 1.15 (29.57% HCl solution) 1.16 (32% HCl solution) 1.19 (37% and 38%HCl solutions)

**Vapor Pressure:** 16 kPa (@ 20°C) average

**Vapor Density:** 1.267 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** 0.25 to 10 ppm

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, diethyl ether.

**Solubility:** Soluble in cold water, hot water, diethyl ether.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, water

**Incompatibility with various substances:**

Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.

**Corrosivity:**

Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphide and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalis (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid(increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothermic reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or

**Special Remarks on Corrosivity:**

Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinum, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**

Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

**Other Toxic Effects on Humans:**

Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Doses (LDL/LCL) LDL [Man] -Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LCL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

**Special Remarks on Chronic Effects on Humans:**

May cause adverse reproductive effects (fetotoxicity). May affect genetic material.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjunctivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and laryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well as headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomiting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophageal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Hydrochloric acid, solution UNNA: 1789 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

### Federal and State Regulations:

Connecticut hazardous material survey.: Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid Illinois chemical safety act: Hydrochloric acid New York release reporting list: Hydrochloric acid Rhode Island RTK hazardous substances: Hydrochloric acid Pennsylvania RTK: Hydrochloric acid Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid New Jersey: Hydrochloric acid New Jersey spill list: Hydrochloric acid Louisiana RTK reporting list: Hydrochloric acid Louisiana spill reporting: Hydrochloric acid California Director's List of Hazardous Substances: Hydrochloric acid TSCA 8(b) inventory: Hydrochloric acid TSCA 4(a) proposed test rules: Hydrochloric acid SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid SARA 313 toxic chemical notification and release reporting: Hydrochloric acid CERCLA: Hazardous substances.: Hydrochloric acid: 5000 lbs. (2268 kg)

### Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

### Other Classifications:

#### WHMIS (Canada):

CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

#### DSCL (EEC):

R34- Causes burns. R37- Irritating to respiratory system. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

#### HMIS (U.S.A.):

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 1

**Personal Protection:**

#### National Fire Protection Association (U.S.A.):

**Health:** 3

**Flammability:** 0

**Reactivity:** 1

**Specific hazard:**

#### Protective Equipment:

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

## Section 16: Other Information

**References:**

-Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987. -SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 05:45 PM

**Last Updated:** 05/21/2013 12:00 PM

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## Material Safety Data Sheet (Canada) Liquefied Natural Gas

### Section 1 – Material Identification and Use

**Material Name:** LIQUEFIED NATURAL GAS (CRYOGENIC LIQUID)  
**Use:** Vehicle Fuel Gas  
**WHMIS Classification:** Class A; Class B, Div. 1  
**TDG:** UN: 1972 **Class:** 2.1 **Packing Group:** N.Av.  
**Shipping Name:** LIQUEFIED NATURAL GAS (CRYOGENIC LIQUID)  
**Manufacturer/Supplier:** ENCANA SERVICES COMPANY LTD.  
500 Centre Street SE  
CALGARY, ALBERTA, T2P 2S5  
**Emergency Telephone:** CANUTEC: 1-613-996-6666  
**Chemical Family:** Liquefied aliphatic paraffinic hydrocarbon

### Section 2 – Hazardous Ingredients of Materials

Hazardous Ingredients	Approximate Concentrations %	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Methane	>97%	74-82-8	N.Av.	1000 ppm (BC)
Ethane	2-3%	74-84-0	N.Av.	1000 ppm (AB & BC)

All exposure levels are 8-hour time-weighted exposure limits unless otherwise indicated.

### Section 3 – Physical Data for Material

**Physical State:** Liquefied Gas  
**Specific Gravity:** 0.422 to 0.546  
**Vapour Density (air=1):** 0.55 to 1.1  
**Percent Volatiles, by volume:** 100  
**pH:** N.App.  
**Coefficient of Water/Oil Distribution:** <0.1  
(N.AV. = not available N.App. = not applicable)

**Vapour Pressure (mmHg):** N.App.  
**Odour Threshold (ppm):** N.Av.  
**Evaporation Rate:** N.Av.  
**Boiling Pt. (deg.C):** -88.15  
**Freezing Pt. (deg.C):** -172.15  
**Odour & Appearance:** colourless, odourless or mercaptan odour

### Section 4 – Fire and Explosion

**Flammability:** Yes **Conditions:** Material may ignite at normal temperatures.  
**Means of Extinction:** Foam, CO<sub>2</sub>, dry chemical. Explosive accumulations can build up in areas of poor ventilation.  
**Special Procedures:** Use water spray to cool fire-exposed containers, and to disperse gas if leak has not ignited. Do not direct water at spill or source of leak. If safe to do so, cut off fuel and allow flame to burn out. If flames are accidentally extinguished, explosive re-ignition may occur.

**Flash Point (deg.C):** -187.78 to -135.15  
**Upper Explosive Limit (% by vol.):** 15.0  
**Lower Explosive Limit (% by vol.):** 3.0  
**Auto-Ignition Temp. (deg.C):** 530  
**Hazardous Combustion Products:** Carbon monoxide and carbon dioxide.

**Sensitivity to Impact:** No  
**Sensitivity to Static Discharge:** Yes, may ignite  
**TDG Flammability Classification:** 2.1

### Section 5 – Reactivity Data

**Chemical Stability:** Yes **Conditions:** N.App.  
**Incompatibility:** Yes **Substances:** Chlorine and other strong oxidizing agents.  
**Reactivity:** Yes **Conditions:** Heat, strong sunlight  
**Hazardous Decomposition Products:** Carbon dioxide and carbon monoxide



## Material Safety Data Sheet (Canada) Liquefied Natural Gas

### Section 6 – Toxicological Properties of Product

**Routes of Entry:**

**Skin Absorption:** Yes

**Skin Contact:** Yes (liquid)

**Eye Contact:** Yes

**Inhalation: Acute:** Yes

**Chronic:** No

**Ingestion:** No

**Effects of Acute Exposure:** Inhalation can cause headache, disorientation, dizziness, drowsiness and possibly unconsciousness at concentrations that cause oxygen deficiency and asphyxiation. Rapidly expanding gas or vaporized liquid may cause frostbite to skin and eyes.

**Effects of Chronic Exposure:** N.Av.

**Sensitization to Product:** No

**Irritancy:** N.Av.

**Synergistic Materials:** None reported

**Carcinogenicity:** N.Av.

**Reproductive Effects:** N.Av.

**Teratogenicity:** N.Av.

**Mutagenicity:** N.Av.

### Section 7 – Preventative Measures

**Personal Protective Equipment:** Use a NIOSH approved positive pressure self-contained breathing apparatus or supplied air breathing apparatus when concentrations may exceed exposure limits. Use approved gas detectors.

**Gloves:** Insulated gloves (e.g.: cryogenic)

**Eye:** Splash goggles and face shield or equivalent.

**Footwear:** Covered footwear such as steel-toed boots.

**Clothing:** Fire retardant garments that meet NFPA 2112. For situations or activities involving elevated risk of fluid contact, wear an insulated apron or smock.

**Respiratory Protection:** SCBA or SABA

**Engineering Controls:** Use only in well ventilated areas. Mechanical ventilation recommended in confined areas. Equipment must be explosion proof.

**Leaks & Spills:** If safe to do so, stop liquid flow. Remove all ignition sources. Provide explosion-proof clearing ventilation if possible. Prevent from entering confined spaces. Use personal protective equipment.

**Waste Disposal:** Controlled burning or venting in accordance with regulatory requirements.

**Handling Procedures & Equipment:** Avoid contact with liquid or liquid cooled equipment. Avoid inhalation.

Bond and ground all transfers. Avoid sparking conditions.

**Storage Requirements:** Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.

**Special Shipping Information:** N.Av.

### Section 8 – First aid Measures

**Skin:** If freeze burn occurs, gently bathe affected area in warm water (38 – 43 deg. C). Do not rub. Get medical attention. Seek immediate medical attention if blistering, tissue freezing or frost bite has occurred.

**Eye:** Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

**Inhalation:** Remove to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention.

**Ingestion:** Ingestion of liquid causes freeze burns to mouth, throat, esophagus and lungs. Get immediate medical attention.

### Section 9 – Preparation Date of MSDS

Prepared By: Encana Environment, Health and Safety (EH&S)

Phone Number: (403) 645-2000 Preparation Date: July 1, 2014

Expiry Date: July 1, 2017

**Material Safety Data Sheet**

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**1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING**

**Material Name** : **Methyl Isobutyl Carbinol**  
**Uses** : Use as a solvent only in industrial manufacturing processes.  
**Product Code** : S1216

**Manufacturer/Supplier** : **Shell Chemicals Europe B.V.**  
PO Box 8610  
3009 AP Rotterdam  
Netherlands

**Telephone** : +31 (0)10 231 7000  
**Fax** : +31 (0)10 231 7180

**Emergency Telephone Number** : +31 (0)10 431 3233

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**2. COMPOSITION/INFORMATION ON INGREDIENTS**

**Material Formal Name** : 4-methylpentan-2-ol  
**Synonyms** : 1,3-dimethyl 1-butanol  
MIBC  
Methyl Amyl Alcohol

**CAS No.** : 108-11-2  
**INDEX No.** : 603-008-00-8  
**EINECS No.** : 203-551-7

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**3. HAZARDS IDENTIFICATION**

**Health Hazards** : Irritating to respiratory system. Vapours may cause drowsiness and dizziness. May cause moderate irritation to skin. Repeated exposure may cause skin dryness or cracking. Moderately irritating to eyes.

**Signs and Symptoms** : Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing. Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. Other signs and symptoms of central nervous system (CNS) depression may include headache, nausea, and lack of coordination.

**Aggravated Medical Condition** : Pre-existing medical conditions of the following organ(s) or organ system(s) may be aggravated by exposure to this material: Respiratory system. Central nervous system (CNS). Skin. Eyes.

**Safety Hazards** : Flammable liquid and vapour. Vapours are heavier than air.

**Material Safety Data Sheet**

Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger.

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**4. FIRST AID MEASURES**

- Inhalation** : Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
- Skin Contact** : Remove contaminated clothing. Flush exposed area with water and follow by washing with soap if available.
- Eye Contact** : Immediately flush eyes with large amounts of water for at least 15 minutes while holding eyelids open. Transport to the nearest medical facility for additional treatment.
- Ingestion** : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration.
- Advice to Physician** : Causes central nervous system depression. Call a doctor or poison control center for guidance.

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**5. FIRE FIGHTING MEASURES**

Clear fire area of all non-emergency personnel.

- Specific Hazards** : Carbon monoxide may be evolved if incomplete combustion occurs. Will float and can be reignited on surface water. The vapour is heavier than air, spreads along the ground and distant ignition is possible.
- Extinguishing Media** : Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only. Do not discharge extinguishing waters into the aquatic environment.
- Unsuitable Extinguishing Media** : Do not use water in a jet.
- Protective Equipment for Firefighters** : Wear full protective clothing and self-contained breathing apparatus.
- Additional Advice** : Keep adjacent containers cool by spraying with water.

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**6. ACCIDENTAL RELEASE MEASURES**

Observe all relevant local and international regulations.

- Protective measures** : Avoid contact with spilled or released material. Immediately remove all contaminated clothing. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all

**Material Safety Data Sheet**

- Clean Up Methods** : equipment. Monitor area with combustible gas indicator.  
: For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.  
: For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
- Additional Advice** : See Chapter 13 for information on disposal. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Vapour may form an explosive mixture with air.

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**7. HANDLING AND STORAGE**

- General Precautions** : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
- Handling** : Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge ( $\leq 10$  m/sec). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Handling Temperature: Ambient.
- Storage** : Keep away from aerosols, flammables, oxidizing agents, corrosives and from products harmful or toxic to man or to the environment. Must be stored in a well-ventilated area, away from sunlight, ignition sources and other sources of heat. Storage Temperature: Ambient.
- Product Transfer** : Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.
- Recommended Materials** : For container paints, use epoxy paint, zinc silicate paint. For containers, or container linings use mild steel.
- Unsuitable Materials** : Aluminium if  $> 50$  °C. Most plastics.
- Container Advice** : Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers.
- Additional Information** : Ensure that all local regulations regarding handling and storage facilities are followed.

**Material Safety Data Sheet**
**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**
**Occupational Exposure Limits**

Material	Source	Type	ppm	mg/m3	Notation
Methyl Isobutyl Carbinol	ACGIH	TWA	25 ppm		
	ACGIH	STEL	40 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.

- Additional Information** : Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes. Wash hands before eating, drinking, smoking and using the toilet.
- Exposure Controls** : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Eye washes and showers for emergency use.
- Personal Protective Equipment** : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
- Respiratory Protection** : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN141. Where air-filtering respirators are unsuitable (e.g., airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus.
- Hand Protection** : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739, AS/NZS:2161) made from the following materials may provide suitable chemical protection:  
 Longer term protection: Butyl rubber. Incidental contact/Splash protection: Neoprene rubber. Nitrile rubber. Viton. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended.
- Eye Protection** : Chemical splash goggles (chemical monogoggles).

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<b>Protective Clothing</b>	: Monogoggles (EN166) : Use protective clothing which is chemical resistant to this material. Safety shoes and boots should also be chemical resistant.
<b>Monitoring Methods</b>	: Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods, <a href="http://www.cdc.gov/niosh/nmam/nmammenu.html">http://www.cdc.gov/niosh/nmam/nmammenu.html</a> . Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods, <a href="http://www.osha-slc.gov/dts/sltc/methods/toc.html">http://www.osha-slc.gov/dts/sltc/methods/toc.html</a> . Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances, <a href="http://www.hsl.gov.uk/search.htm">http://www.hsl.gov.uk/search.htm</a> .
<b>Environmental Exposure Controls</b>	: Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

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**9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	: Clear. Liquid.
Odour	: Sweet.
Boiling point	: 130 - 133 °C / 266 - 271 °F
Flash point	: 41 °C / 106 °F (IP 170)
Explosion / Flammability limits in air	: 1 - 5.5 %(V)
Auto-ignition temperature	: 305 °C / 581 °F (ASTM E-659)
Vapour pressure	: 420 Pa at 20 °C / 68 °F
Specific gravity	: 0.81 at 20 °C / 68 °F
Density	: 806 - 808 kg/m <sup>3</sup> at 20 °C / 68 °F (ASTM D-4052)
Water solubility	: 16 g/l at 20 °C / 68 °F
Vapour density (air=1)	: 3.5
Volatile organic carbon content	: 70.6 % (EC/1999/13)
Evaporation rate (nBuAc=1)	: 0.3 (ASTM D 3539, nBuAc=1)

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**10. STABILITY AND REACTIVITY**

<b>Stability</b>	: Stable under normal conditions of use. Reacts with strong oxidising agents. Reacts with strong acids.
<b>Conditions to Avoid</b>	: Avoid heat, sparks, open flames and other ignition sources.
<b>Materials to Avoid</b>	: Strong oxidising agents. Strong acids.
<b>Hazardous</b>	: Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
<b>Decomposition Products</b>	

**Material Safety Data Sheet**

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**11. TOXICOLOGICAL INFORMATION**

<b>Basis for Assessment</b>	: Information given is based on product testing.
<b>Acute Oral Toxicity</b>	: Low toxicity: LD50 >2000 mg/kg , Rat
<b>Acute Dermal Toxicity</b>	: Low toxicity: LD50 >2000 mg/kg , Rabbit
<b>Acute Inhalation Toxicity</b>	: Low toxicity: LC50 greater than near-saturated vapour concentration. / 4 hours, Rat High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.
<b>Skin Irritation</b>	: May cause moderate skin irritation (but insufficient to classify). Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
<b>Eye Irritation</b>	: Moderately irritating to eyes (but insufficient to classify).
<b>Respiratory Irritation</b>	: Inhalation of vapours or mists may cause irritation to the respiratory system.
<b>Sensitisation</b>	: Not expected to be a skin sensitiser.
<b>Repeated Dose Toxicity</b>	: Kidney: caused kidney effects in male rats which are not considered relevant to humans
<b>Mutagenicity</b>	: No evidence of mutagenic activity.
<b>Carcinogenicity</b>	: Not expected to be carcinogenic.
<b>Reproductive and Developmental Toxicity</b>	: Data not available.

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**12. ECOLOGICAL INFORMATION**

<b>Acute Toxicity</b>	
<b>Fish</b>	: Low toxicity: LC/EC/IC50 > 100 mg/l
<b>Aquatic Invertebrates</b>	: Expected to have low toxicity: LC/EC/IC50 > 100 mg/l
<b>Microorganisms</b>	: Expected to have low toxicity: LC/EC/IC50 > 100 mg/l
<b>Mobility</b>	: Floats on water. If product enters soil, it will be highly mobile and may contaminate groundwater.
<b>Persistence/degradability</b>	: Readily biodegradable meeting the 10 day window criterion. Oxidises rapidly by photo-chemical reactions in air.
<b>Bioaccumulation</b>	: Not expected to bioaccumulate significantly.

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**13. DISPOSAL CONSIDERATIONS**

<b>Material Disposal</b>	: Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Waste product should not be allowed to contaminate soil or water.
<b>Container Disposal</b>	: Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard. Do not puncture, cut or weld uncleaned drums. Send to drum recoverer or metal reclaimer.

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**Local Legislation** : Disposal should be in accordance with applicable regional, national, and local laws and regulations. Local regulations may be more stringent than regional or national requirements and must be complied with.

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**14. TRANSPORT INFORMATION****ADR**

Class : 3  
Packing group : III  
Classification code : F1  
Hazard identification no. : 30  
UN No. : 2053  
Danger label (primary risk) : 3  
Proper shipping name : Methyl isobutyl carbinol

**RID**

Class : 3  
Packing group : III  
Classification code : F1  
Hazard identification no. : 30  
UN No. : 2053  
Danger label (primary risk) : 3  
Proper shipping name : Methyl isobutyl carbinol

**IMDG**

Identification number : UN 2053  
Proper shipping name : METHYL ISOBUTYL CARBINOL  
Class / Division : 3  
Packing group : III  
Marine pollutant: No

**IATA (Country variations may apply)**

UN No. : 2053  
Proper shipping name : Methyl isobutyl carbinol  
Class / Division : 3  
Packing group : III

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**15. REGULATORY INFORMATION**

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

EC Label Name : METHYL ISOBUTYL CARBINOL  
EC label/EC Number : 203-551-7  
EC Classification : Irritant.  
EC Annex I Number : 603-008-00-8  
EC Symbols : Xi Irritant.  
EC Risk Phrases : R10 Flammable.

**Material Safety Data Sheet**

		R37 Irritating to respiratory system.
EC Safety Phrases	:	S24/25 Avoid contact with skin and eyes.
AICS	:	Listed.
DSL	:	Listed.
INV (CN)	:	Listed.
ENCS (JP)	:	Listed. (2)-217
TSCA	:	Listed.
EINECS	:	Listed. 203-551-7
KECI (KR)	:	Listed. KE-24720
PICCS (PH)	:	Listed.
National Legislation	:	
OE_HP	:	Listed.

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**16. OTHER INFORMATION**

R-phrases)

R10 Flammable.  
R37 Irritating to respiratory system.

<b>MSDS Version Number</b>	:	1.3
<b>MSDS Effective Date</b>	:	22.04.2009
<b>MSDS Revisions</b>	:	A vertical bar ( ) in the left margin indicates an amendment from the previous version.
<b>Uses and Restrictions</b>	:	Use as a solvent only in industrial manufacturing processes.
<b>MSDS Distribution</b>	:	The information in this document should be made available to all who may handle the product
<b>Disclaimer</b>	:	This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

## SODIUM HYDROSULFIDE - FLAKES 70-72 %

### 1. PRODUCT AND COMPANY IDENTIFICATION

#### 1.1. Identification of the substance or mixture

Product name : SODIUM HYDROSULFIDE - FLAKES 70-72 %  
Product grade(s) : SODIUM HYDROSULFIDE - (Solid 70-72 % - Crystallization water >= 25%)

Chemical Name : Sodium hydrosulfide  
Molecular formula : NaHS xH<sub>2</sub>O; x >= 0,93  
Molecular weight : 72.81 g/mol

#### 1.2. Use of the Substance/Mixture

Recommended use : - Chemical industry  
- Waste treatment  
- Water treatment  
- De-hairing agent  
- Textile industry  
- Pulp and paper

#### 1.3. Company/Undertaking Identification

Address : SOLVAY FLUORIDES, LLC  
3333 RICHMOND AVENUE  
HOUSTON TX 77098-3099  
United States

#### 1.4. Emergency and contact telephone numbers

Emergency telephone number : 1 (800) 424-9300 CHEMTREC® (USA & Canada)  
01-800-00-214-00 (MEX. REPUBLIC)

Contact telephone number (product information) : US: +1-800-765-8292 (Product information)  
US: +1-713-525-6500 (Product information)

### 2. HAZARDS IDENTIFICATION

#### 2.1. Emergency Overview:

NFPA : H= 2 F= 1 I= 2 S= None  
HMIS : H= 2 F= 1 R= 2 PPE = Supplied by User; dependent on local conditions

#### General Information

Appearance : flakes  
Colour : yellow

**SODIUM HYDROSULFIDE - FLAKES 70-72 %**

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Odour : odourless, slight, rotten-egg like

**2.2. Potential Health Effects:**

**Inhalation**

- No hazards to be specially mentioned.
- (in case of higher concentration): slight irritation.

**Eye contact**

- May cause irreversible eye damage.
- May cause blindness.
- Symptoms: Redness, Lachrymation, Swelling of tissue, Burn.

**Skin contact**

- Corrosive
- Symptoms: Redness, Swelling of tissue, Burn.

**Ingestion**

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the oesophagus and the stomach.
- Symptoms: Nausea, Abdominal pain, Bloody vomiting, Diarrhoea, Suffocation, Cough, Severe shortness of breath.

**Other toxicity effects**

- See section 11: Toxicological Information

**2.3. Environmental Effects:**

- See section 12: Ecological Information

**3. COMPOSITION/INFORMATION ON INGREDIENTS**

**Sodium hydrogensulfide (hydrate)**

CAS-No. : 207683-19-0  
Concentration :  $\geq 84.0 - \leq 95.5 \%$

**Disodium sulfide (hydrate)**

CAS-No. : 27610-45-3  
Concentration :  $\leq 13.5 \%$

**Sodium carbonate**

CAS-No. : 497-19-8  
Concentration :  $\leq 1.0 \%$

**4. FIRST AID MEASURES**

**4.1. Inhalation**

- Move to fresh air.
- Oxygen or artificial respiration if needed.
- Victim to lie down in the recovery position, cover and keep him warm.
- Call a physician immediately.

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**4.2. Eye contact**

- Call a physician or poison control centre immediately.
- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).
- Take victim immediately to hospital.

**4.3. Skin contact**

- Take off contaminated clothing and shoes immediately.
- Wash off immediately with plenty of water.
- Keep warm and in a quiet place.
- Call a physician or poison control centre immediately.
- Wash contaminated clothing before re-use.

**4.4. Ingestion**

- Call a physician or poison control centre immediately.
- Take victim immediately to hospital.
- If swallowed, rinse mouth with water (only if the person is conscious).
- Do NOT induce vomiting.
- Artificial respiration and/or oxygen may be necessary.

**4.5. Notes to physician**

***Exposure to decomposition products :***

- Take victim immediately to hospital.
- Immediate medical attention is required.

***Exposure to decomposition products :***

- Medical supervision for minimum 48 hours.

**5. FIREFIGHTING MEASURES**

**5.1. Suitable extinguishing media**

- Foam
- powder

**5.2. Extinguishing media which shall not be used for safety reasons**

- Water
- Carbon dioxide (CO<sub>2</sub>)

**5.3. Special exposure hazards in a fire**

- Not combustible.
- Hazardous decomposition products

**5.4. Hazardous decomposition products**

- Sulphur oxides

**5.5. Special protective equipment for firefighters**

- Exposure to decomposition products may be a hazard to health.
- In the event of fire, wear self-contained breathing apparatus.
- Use personal protective equipment.
- Wear chemical resistant oversuit

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

#### 6.1.1. Advice for non-emergency personnel

- Sweep up to prevent slipping hazard.
- Avoid dust formation.
- Prevent further leakage or spillage if safe to do so.

#### 6.1.2. Advice for emergency responders

- Isolate the area.
- Wear self-contained breathing apparatus and protective suit.

### 6.2. Environmental precautions

- Discharge into the environment must be avoided.
- Do not flush into surface water or sanitary sewer system.
- In case of accidental release or spill, immediately notify the appropriate authorities if required by Federal, State/Provincial and local laws and regulations.

### 6.3. Methods and materials for containment and cleaning up

- Pick up and arrange disposal without creating dust.
- Keep in suitable, closed containers for disposal.

### 6.4. Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

## 7. HANDLING AND STORAGE

### 7.1. Handling

- Use product only in closed system.
- Ensure adequate ventilation.
- Keep away from heat.
- Keep away from Incompatible products.

### 7.2. Storage

- Store in original container.
- Keep in a well-ventilated place.
- Keep in a dry place.
- Keep in properly labelled containers.
- Keep container closed.
- Keep away from heat.
- Avoid dust formation.
- Keep away from Incompatible products.

### 7.3. Packaging material

- Steel drum
- Polyethylene

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1. Exposure Limit Values

#### **Sodium hydrogensulfide (hydrate)**

- US. ACGIH Threshold Limit Values  
Remarks: none established

#### **Disodium sulfide (hydrate)**

- US. ACGIH Threshold Limit Values  
Remarks: none established

#### **Sodium carbonate**

- SAEL (Solvay Acceptable Exposure Limit) 2007  
TWA = 10 mg/m<sup>3</sup>

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists. SAEL = Solvay Acceptable Exposure Limit, Time Weighted Average for 8 hour workdays. No Specific TLV STEL (Short Term Exposure Level) has been set. Excursions in exposure level may exceed 3 times the TLV TWA for no more than a total of 30 minutes during a workday and under no circumstances should they exceed 5 times the TLV TWA.

### 8.2. Engineering controls

- Provide appropriate exhaust ventilation at places where dust is formed.
- Apply technical measures to comply with the occupational exposure limits.

### 8.3. Personal protective equipment

#### **8.3.1. Respiratory protection**

- In case of insufficient ventilation, wear suitable respiratory equipment.
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- In case of decomposition (see section 10), face mask with combined type B-P3 cartridge.
- Recommended Filter type:: P3

#### **8.3.2. Hand protection**

- chemical resistant gloves
- Suitable material: PVC, Neoprene, Natural Rubber

#### **8.3.3. Eye protection**

- Goggles

#### **8.3.4. Skin and body protection**

- Dust impervious protective suit
- Apron
- Boots
- PVC
- Neoprene

#### **8.3.5. Hygiene measures**

- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using, do not eat, drink or smoke.
- Handle in accordance with good industrial hygiene and safety practice.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1. General Information

Appearance	:	flakes
Colour	:	yellow
Odour	:	odourless, slight, rotten-egg like

### 9.2. Important health safety and environmental information

pH	:	11.2 (1 % solution) 12.1 (saturated aqueous solution)
Boiling point/boiling range	:	Remarks: not applicable
Flash point	:	( ) (inorganic ) Remarks: not applicable
Flammability	:	Remarks: not applicable
Explosive properties	:	<u>Explosion danger.</u> Remarks: Not explosive
Oxidizing properties	:	Remarks: Non oxidizer
Vapour pressure	:	(inorganic) Remarks: not applicable
Relative density / Density	:	1.55
Solubility(ies)	:	548 g/l Temperature: 20 °C ( 68 °F )
Partition coefficient: n-octanol/water	:	<u>log Pow:</u> (inorganic) Remarks: not applicable
Viscosity	:	Remarks: not applicable
Vapour density	:	(inorganic) Remarks: not applicable
Evaporation rate	:	(inorganic) Remarks: not applicable

### 9.3. Other data

Melting point/range	:	44 - 48 °C ( 111 - 118 °F )
Auto-flammability	:	> 150 °C ( 302 °F )
Granulometry	:	7000 µm Remarks: d 50

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**Decomposition temperature** : *Remarks: not applicable*

## 10. STABILITY AND REACTIVITY

### 10.1. Stability

- Stable under recommended storage conditions.

### 10.2. Conditions to avoid

- Keep away from flames and hot surfaces.
- Exposure to moisture.

### 10.3. Materials to avoid

- Carbon dioxide (CO<sub>2</sub>), Acids, Oxidizing agents, Metals

### 10.4. Hazardous decomposition products

- Sulphur oxides: Hydrogen sulphide

## 11. TOXICOLOGICAL INFORMATION

### Toxicological data

#### **Acute oral toxicity**

- LD<sub>50</sub>, rat, 72 - 105 mg/kg

#### **Acute inhalation toxicity**

- , *Remarks: no data available*

#### **Acute dermal irritation/corrosion**

- *Remarks: study scientifically unjustified*

#### **Skin irritation**

- Corrosive

#### **Eye irritation**

- Corrosive

#### **Chronic toxicity**

- Inhalation, 90-day, rat, (Hydrogen sulphide), *Remarks: NOAEC*

#### **Carcinogenicity**

- *Remarks: no data available*

#### **Reproductive toxicity**

- no data available

#### **Remarks**

- no data available
- In vitro tests did not show mutagenic effects
- In vivo tests did not show mutagenic effects

## 12. ECOLOGICAL INFORMATION

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### 12.1. Ecotoxicity effects

#### **Acute toxicity**

- Fishes, LC50, 96 h, 0.0027 mg/l (Hydrogen sulphide)
- Fishes, *Lepomis macrochirus*, NOEC, 826 Days, 0.0046 mg/l (Hydrogen sulphide)
- Crustaceans, EC50, 96 h, 0.02 mg/l (Fresh water) (Hydrogen sulphide)
- Crustaceans, EC50, 96 h, 0.032 mg/l (Marine water) (Hydrogen sulphide)

#### **Chronic toxicity**

- Amphipod (*Eohaustorius estuarius*), LOEC, 48 h, 1.92 mg/l (Hydrogen sulphide)
- Amphipod (*Eohaustorius estuarius*), LC50, 3.32 mg/l (Hydrogen sulphide)
- Algae, *Nitzschia linearis*, EC50, 120 h, 1,900 mg/l (Sodium sulfate)  
Remarks: fresh water
- Algae, *Skeletonema costatum*, EC50, 4 h, 0.104 mg/l (Sodium sulfide)  
Remarks: salt water

### 12.2. Mobility

- Air  
Remarks: mobility as solid aerosols
- Water/soil  
Remarks: considerable solubility and mobility

### 12.3. Persistence and degradability

#### **Abiotic degradation**

- Air, indirect photo-oxidation, Chemical degradation 0.6 - 2 %, from 1 h (hydrogen sulphide)  
Conditions: sensitizer: OH/O<sub>3</sub> radicals  
Degradation products: Sulphur dioxide / sulfates / Sulphides
- Water/soil  
Result: complexation/precipitation of inorganic and organic materials
- Water/soil  
Result: oxidation  
Degradation products: sulfates

#### **Biodegradation**

- aerobic, Tested according to: oxidation (Sulphides)  
Degradation products: sulfites / sulfates
- anaerobic, Tested according to: biodegradation by sulforeduction (sulfates)  
Degradation products: hydrogen sulphide
- anaerobic, Tested according to: methanogenesis (sulfates)  
Remarks: inhibitory action

### 12.4. Bioaccumulative potential

- Result: Does not bioaccumulate.

### 12.5. Other adverse effects

- no data available

### 12.6. Remarks

## 13. DISPOSAL CONSIDERATIONS

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**13.1. Waste from residues / unused products**

- In accordance with local and national regulations.
- Where possible recycling is preferred to disposal or incineration.
- Use an FeCl<sub>3</sub> solution to precipitate FeS.
- Filtrate the product and send the cake to a landfill for industrial waste.

**13.2. Packaging treatment**

- The empty and clean containers are to be reused in conformity with regulations.
- Uncleaned empty packaging
- Dispose of as unused product.

**13.3. RCRA Hazardous Waste**

- Listed RCRA Hazardous Waste (40 CFR 302) - No
- Unlisted RCRA Hazardous Waste (40 CFR 302) - Yes
- D002 (corrosive waste)
- D003 (reactive waste)

**14. TRANSPORT INFORMATION**

**IATA-DGR**

UN number	UN 2949
Class	8
Packing group	II
ICAO-Labels	8 - Corrosive
Remarks	Environmentally hazardous
Proper shipping name:	SODIUM HYDROSULPHIDE, HYDRATED

**IMDG**

UN number	UN 2949
Class	8
Packing group	II
IMDG-Labels	8 - Corrosive
EmS	F-A S-B
Remarks	Marine pollutant
Proper shipping name:	SODIUM HYDROSULPHIDE, HYDRATED

**U.S. Dept of Transportation**

UN number	UN 2949
Class	8
Packing group	II
Label	8 - Corrosive
EmS	154

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Proper shipping name: SODIUM HYDROSULPHIDE, HYDRATED

**Canada (TDG)**

UN number UN 2949  
Class 8  
Packing group II  
Label 8 - Corrosive  
EmS 154

Proper shipping name: SODIUM HYDROSULPHIDE, HYDRATED

**15. REGULATORY INFORMATION**

**15.1. Inventory Information**

<b>USA. Toxic Substances Control Act (TSCA)</b>	: - yes (Anhydrous form).
<b>Australia. Inventory of Chemical Substances (AICS)</b>	: - yes (Anhydrous form).
<b>Canada. Domestic Substances List (DSL)</b>	: - yes (Anhydrous form).
<b>Korea. Existing Chemicals Inventory (KECI (KR))</b>	: - yes (Anhydrous form).
<b>EU list of existing chemical substances (EINECS)</b>	: - yes (Anhydrous form).
<b>Japan. Inventory of Existing &amp; New Chemical Substances (ENCS)</b>	: - yes (Anhydrous form).
<b>Inventory of Existing Chemical Substances (China) (IECS)</b>	: - yes (Anhydrous form).
<b>Philippine. Inventory of Chemicals and Chemical Substances (PICCS)</b>	: - yes (Anhydrous form).
<b>New Zealand. Inventory of Chemicals (NZIOC)</b>	: - yes (Anhydrous form).

**15.2. Other regulations**

**US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)**

- not regulated.

**SARA Hazard Designation (SARA 311/312)**

- Acute Health Hazard: Yes.
- Reactivity Hazard: Yes.

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**US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required**

- not regulated.

**US. EPA CERCLA Hazardous Substances (40 CFR 302)**

- not regulated.

**US. New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)**

- yes.

**US. Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)**

- yes.

**US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)**

- not regulated.

## 16. OTHER INFORMATION

### Ratings :

#### NFPA (National Fire Protection Association)

Health = 2 Flammability = 1 Instability = 2 Special =None

#### HMIS (Hazardous Material Information System)

Health = 2 Fire = 1 Reactivity = 2 PPE : Supplied by User; dependent on local conditions

### Further information

- Update  
This data sheet contains changes from the previous version in section(s): 2.2.5,3.1.2,4.1.2,8.1.2,14
- Distribute new edition to clients

Material Safety Data Sheets contain country specific regulatory information; therefore, the MSDS's provided are for use only by customers of the company mentioned in section 1 in North America. If you are located in a country other than Canada, Mexico or the United States, please contact the Solvay Group company in your country for MSDS information applicable to your location.

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations or mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

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# MATERIAL SAFETY DATA SHEET

POTASSIUM AMYL XANTHATE, SOLID

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Brenntag Canada Inc.  
43 Jutland Rd.  
Toronto, ON  
M8Z 2G6  
(416) 259-8231

WHMIS#: 00060600  
Index: HCl0065/09B  
Effective Date: 2009 June 17  
Date of Revision: 2009 June 17

Website: <http://www.brenntag.ca>

### EMERGENCY TELEPHONE NUMBERS (FOR EMERGENCIES INVOLVING CHEMICAL SPILLS OR RELEASE)

Toronto, ON (416) 226-6117  
Edmonton, AB (780) 424-1754

Montreal, QC (514) 861-1211  
Calgary, AB (403) 263-8660

Winnipeg, MB (204) 943-8827  
Vancouver, BC (604) 685-5036

### PRODUCT IDENTIFICATION

Product Name: Potassium Amyl Xanthate, Solid.  
Chemical Name: Dithiocarbonic Acid, Amyl Ester, Potassium Salt.  
Synonyms: Potassium Amyl Xanthate; KAX 51; Potassium Pentyl Xanthate; Potassium Pentyl Xanthogenate.  
Chemical Family: Salts of carbonic acid dithio esters.  
Molecular Formula: C<sub>6</sub>H<sub>11</sub>OS<sub>2</sub>. K.  
Product Use: Flotation agent.

### WHMIS Classification / Symbol:

B-6: Reactive Flammable Material  
D-1B: Toxic (acute effects)  
D-2B: Toxic (skin and eye irritant)



READ THE ENTIRE MSDS FOR THE COMPLETE HAZARD EVALUATION OF THIS PRODUCT.

## 2. COMPOSITION, INFORMATION ON INGREDIENTS (Not Intended As Specifications)

<i>Ingredient</i>	<i>CAS#</i>	<i>ACGIH TLV</i>	<i>% Concentration</i>
Potassium Amyl Xanthate	2720-73-2	---	60 - 100
Potassium Hydroxide	1310-58-3	—	1 - 5
Isoamyl alcohol	123-51-3	100 ppm	1 - 5

Decomposition Product: Carbon disulfide 75-15-0 10 ppm (Skin)

Skin Notation: Contact with skin, eyes and mucous membranes can contribute to the overall exposure and may invalidate the TLV. Consider measures to prevent absorption by these routes.

## 3. HAZARDS IDENTIFICATION

**EMERGENCY OVERVIEW:** May be fatal if swallowed. Harmful if inhaled. Causes skin and eye irritation. Dust is irritating to respiratory tract. See "Other Health Effects" Section. Heating of solid xanthate or aging or heating of solutions will cause formation of Carbon Bisulfide. Upon exposure of solid xanthates to moisture and/or heat, decomposition results and spontaneous combustion can occur. Contact of solid xanthate with moist air has resulted in ignition. (4) Emits a flammable gas upon contact with water or water vapour. Can decompose at high temperatures forming toxic gases. Powdered material may form explosive dust-air mixtures. Contents may develop pressure on prolonged exposure to heat.

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## POTENTIAL HEALTH EFFECTS

Inhalation:	Excessive contact with powder may cause drying of mucous membranes of nose and throat due to absorption of moisture and oils. 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 oedema (fluid build-up in lungs), and reduction of pulmonary function. Irritation of mucous membranes and respiratory tract is possible following exposure to the decomposition product. (3) See "Other Health Effects" Section.
Skin Contact:	Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Potassium Amyl Xanthate may cause symptoms of skin irritation such as reddening, swelling, rash, scaling, or blistering. May cause defatting, drying and cracking of the skin.
Skin Absorption:	May be absorbed through intact skin. See Section 11, "Other Studies Relevant to Material".
Eye Contact:	This product may cause irritation, redness and possible damage due to abrasiveness. Brief contact with the dust causes irritation. Greater exposure causes severe burns. In the presence of moisture (perspiration, humidity, tears), the dust dissolves to form a corrosive solution which may cause burns. (3) Irritation of the eyes is possible following exposure to the decomposition product. (3)
Ingestion:	Ingestion is not a likely route of exposure. This product causes irritation, a burning sensation of the mouth and throat and abdominal pain.
Other Health Effects:	<p>Effects (irritancy) 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.</p> <p>May cause cardiovascular effects, liver damage, peripheral nervous system (PNS) effects or central nervous system (CNS) depression. 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. Peripheral Neuropathy is a progressive disorder of the nervous system characterized by sensory and motor abnormalities, muscle spasms, weakness and pain in the arms and legs, numbness and tingling of the fingers and toes and paralysis. Liver damage is characterized by the loss of appetite, jaundice (yellowish skin colour), and occasional pain in the upper left-hand side of the abdomen.</p> <p>Potassium Amyl Xanthate: Symptoms of potassium poisoning may occur. These include slow heartbeat, accelerated breathing, muscle weakness and, in severe cases, paralysis.</p> <p>Vapours of the decomposition products of Xanthates (Carbon Bisulphide) can cause severe disturbances of mood and behaviour, including excitation, anger and violent dreams. High concentrations of vapours can cause death. (4)</p> <p>Carbon Bisulphide: Contact with moisture in the body by inhalation may yield sodium hydroxide (corrosive) and 2-mercaptobenzothiazole, an irritant. (4) Contact with acids will liberate carbon disulphide. (3) Exposure to carbon disulphide (500 to 1000 ppm) may cause severe mood and personality disturbances, including excitability, confusion, irritability, uncontrollable anger, bizarre dreams, insomnia, psychosis and suicide. Exposure to carbon disulphide at 4800 ppm for thirty minutes results in coma and may be fatal. Carbon disulphide is readily absorbed through intact skin. Chronic exposure to carbon disulphide produces central and peripheral nervous system, cardiovascular, gastrointestinal, kidney, endocrine and eye disorders. (4)</p> <p>Potassium Hydroxide: Exposure to very low doses, even for a short period of time, has produced extensive damage to the esophagus, stomach and intestine extending into surrounding tissues, as well as hyperexcitability followed by apathy and weakness. In some cases, death has resulted from hemorrhage, adhesions or perforation. Following esophageal damage, strictures have frequently developed in surviving animals. (4)</p>

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## 4. FIRST AID MEASURES

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### FIRST AID PROCEDURES

Inhalation:	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.
Skin Contact:	Prompt removal of the material from the skin is essential. Remove all contaminated clothing and immediately wash the exposed areas with copious amounts of soap and water for a minimum of 30 minutes or up to 60 minutes for critical body areas. Immerse the exposed part immediately in ice water to relieve pain and to prevent swelling and blistering. Place cold packs, ice or wet cloths on the burned area if immersion is not possible. Cover the exposed part with a clean, preferably sterile, lint-free dressing. Obtain medical attention IMMEDIATELY and monitor breathing and treat for shock for severe exposure.
Eye Contact:	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.

Ingestion: Do not attempt to give anything by mouth to an unconscious person. 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.

Note to Physicians: Treat symptomatically.

Medical conditions that may be aggravated by exposure to this product include neurological and cardiovascular disorders, diseases of the skin, eyes or respiratory tract, preexisting liver and kidney disorders.

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## 5. FIRE-FIGHTING MEASURES

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<i>Flashpoint (°C)</i>	<i>Autolgnition Temperature (°C)</i>	<i>Flammability Limits in Air (%):</i>	
		<i>LEL</i>	<i>UEL</i>
-30. (Carbon Disulphide)	90.1 (Carbon Disulphide)	1.25. (Carbon Disulphide)	50. (Carbon Disulphide)
Flammability Class (WHMIS):	B-6: Reactive Flammable Material		
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include Carbon Disulphide, Potassium sulphide, carbonyl sulphide, Amyl Alcohols, oxides of carbon, sulphur, potassium and irritating gases.		
Unusual Fire or Explosion Hazards:	This product may be capable of forming flammable dust clouds in air. Avoid accumulation and dispersion of dust to reduce explosion potential. Spilled material may cause floors and contact surfaces to become slippery. Heating of solid xanthate or aging or heating of solutions will cause formation of Carbon Bisulfide. Upon exposure of solid xanthates to moisture and/or heat, decomposition results and spontaneous combustion can occur. Contact of solid xanthate with moist air has resulted in ignition. (4) 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. Enforce NO SMOKING rules.		
Sensitivity to Mechanical Impact:	Not expected to be sensitive to mechanical impact.		
Rate of Burning:	Not available.		
Explosive Power:	Not available.		
Sensitivity to Static Discharge:	If product has come into contact with moisture and Carbon Bisulphide gas has evolved, then Carbon Bisulphide is expected to be sensitive to static discharge if vapours are present between the lower and upper explosive limits. (3) High voltage static electricity build-up is possible when significant quantities of dust are present.		
<b>EXTINGUISHING MEDIA</b>			
Fire Extinguishing Media:	Use carbon dioxide or dry chemical media for small fires. If only water is available, use it in the form of a fog. Cool containers with flooding quantities of water until well after the fire is out. Exposure to heat and moisture may cause the decomposition of xanthates to release flammable, explosive and poisonous Carbon Bisulphide vapours. (3)		
<b>FIRE FIGHTING INSTRUCTIONS</b>			
Instructions to the Fire Fighters:	Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours; re-ignition is possible. Clean up immediately to eliminate slipping hazard. Do not allow to enter sewers or watercourses. Avoid accumulation and dispersion of dust to reduce explosion potential.		
Fire Fighting Protective Equipment:	Use self-contained breathing apparatus and protective clothing.		

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## 6. ACCIDENTAL RELEASE MEASURES

---

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

**Containment and Clean-Up Procedures:** In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. Avoid accumulation and dispersion of dust to reduce explosion potential. Wear respirator, protective clothing and gloves. Spilled material may cause floors and contact surfaces to become slippery. Any recovered product can be used for the usual purpose, depending on the extent and kind of contamination. Where a package (drum or bag) is damaged and / or leaking, repair it, or place it into an over-pack drum immediately so as to avoid or minimize material loss and contamination of surrounding environment. Replace damaged containers immediately to avoid loss of material and contamination of surrounding atmosphere. Avoid dry sweeping. Do not use compressed air to clean surfaces. Vacuuming or wet sweeping is preferred. Return all material possible to container for proper disposal. Do not flush with water as aqueous solutions or powders that become wet render surfaces extremely slippery. 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.

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## 7. HANDLING AND STORAGE

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### HANDLING

**Handling Practices:** Avoid accumulation and dispersion of dust to reduce explosion potential. Ground and bond equipment and containers to prevent a static charge buildup. Use spark-resistant tools. Use normal "good" industrial hygiene and housekeeping practices. Clean up immediately to eliminate slipping hazard. Enforce NO SMOKING rules in area of use.

**Ventilation Requirements:** See Section 8, "Engineering Controls".

**Other Precautions:** Use only with adequate ventilation and avoid breathing dusts ( aerosols, 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. Do not use cutting or welding torches on empty drums that contained this material/product. Absorption via contact with skin, eyes and mucous membranes can contribute to the overall exposure. Consider measures to prevent absorption by these routes.

### STORAGE

**Storage Temperature (°C):** See below.

**Ventilation Requirements:** Ventilation should be explosion proof.

**Storage Requirements:** Store solid Xanthates under cool, dark, dry conditions. Liquid products must be kept cool and used as quickly as possible. (3) 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° C. Avoid moisture contamination. Prolonged storage may result in lumping or caking.

**Special Materials to be Used for Packaging or Containers:** Materials of construction for storing the product include: carbon steel. Copper and its alloys should not be used in equipment for storage, handling or transportation. Attacks some types of rubber, plastics and coatings. Confirm suitability of any material before using.

---

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

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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

**Engineering Controls:** Local exhaust ventilation required. Ventilation should be explosion proof. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Avoid accumulation and dispersion of dust to reduce explosion potential. Ventilate low lying areas such as sumps or pits where dense dust may collect. Enforce NO SMOKING rules.

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

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

**Skin Protection:** Gloves and protective clothing made from neoprene, PVC, polyethylene, rubber or plastic should be impervious under conditions of use. Attacks some types of rubber, plastics and coatings. Prior to use, user should confirm impermeability. Discard contaminated gloves.

**Respiratory Protection:** No specific guidelines available. A NIOSH/MSHA-approved air-purifying respirator equipped with dust, mist, fume cartridges for concentrations up to 2 mg/m<sup>3</sup> Potassium Hydroxide. An air-supplied respirator if concentrations are higher or unknown.

Other Personal Protective Equipment: Avoid accumulation and dispersion of dust to reduce explosion potential. Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact. Clothing and footwear that is fire retardant and dissipates static electrical charges should be worn when handling flammable materials. Natural fibers (cotton, wool, leather and linen) should be selected in favour of synthetic materials (rayon, nylon and polyester).

Skin Notation: Contact with skin, eyes and mucous membranes can contribute to the overall exposure and may invalidate the TLV. Consider measures to prevent absorption by these routes.

EXPOSURE GUIDELINES

SUBSTANCE	ACGIH TLV (STEL)	OSHA PEL		NIOSH REL	
		(TWA)	(STEL)	(TWA)	(STEL)
Potassium Hydroxide	2 mg/m <sup>3</sup> (Ceiling)	---	---	---	2 mg/m <sup>3</sup> (Ceiling)
Isoamyl alcohol	125 ppm	100 ppm	---	100 ppm	125 ppm
Decomposition Product: Carbon disulfide	—	20 ppm (Skin)	30 ppm (Skin)	1 ppm (Skin)	3 ppm (Skin)

**9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)**

Physical State:	Solid.
Appearance:	Yellow to yellow-green pellets.
Odour:	Strong, disagreeable sulphur odour.
Odour Threshold (ppm):	0.02 - 0.21(Carbon Disulphide)
Boiling Range (°C):	Not available.
Melting/Freezing Point (°C):	255 - 280 (decomposes). (3)
Vapour Pressure (mm Hg at 20° C):	Not applicable.
Vapour Density (Air = 1.0):	Not applicable.
Relative Density (g/cc):	0.7. (4)
Bulk Density:	Not applicable.
Viscosity:	Not applicable.
Evaporation Rate (Butyl Acetate = 1.0):	Not applicable.
Solubility:	Soluble in water. Hygroscopic (readily absorbs water).
% Volatile by Volume:	< 20. (3)
pH:	10.5 (10 % solution). (3)
Coefficient of Water/Oil Distribution:	Not available.
Volatile Organic Compounds (VOC):	Not applicable.
Flashpoint (°C):	-30. (Carbon Disulphide)

**10. STABILITY AND REACTIVITY**

CHEMICAL STABILITY

Under Normal Conditions:	Unstable. Solid Xanthates are stable when kept cool and dry. Exposure to heat causes decomposition. Acids and oxidizing agents accelerate aging. In solution, Xanthates will decompose slowly even at room temperature. (3)
Under Fire Conditions:	Flammable. This product may be capable of forming flammable dust clouds in air.
Hazardous Polymerization:	Will not occur.
Conditions to Avoid:	High temperatures, sparks, open flames and all other sources of ignition. Avoid accumulation and dispersion of dust to reduce explosion potential. Exposure to heat and moisture may cause the decomposition of xanthates to release flammable, explosive and poisonous Carbon Bisulphide vapours. (3)
Materials to Avoid:	Strong oxidizers. Lewis or mineral acids. Metal Salts. Copper and its alloys.. Contact with acids will liberate Carbon Bisulphide. Avoid moisture contamination. Contact with water or moisture will liberate Carbon Bisulphide. Mixtures or reactions of alcohols with the following materials may cause explosions: barium perchlorate, chlorine, hypochlorous acid, ethylene oxide, hexamethylene diisocyanate and other isocyanates, nitrogen tetroxide, permonosulfuric acid and tri-isobutyl aluminum. (4) Attacks some types of rubber, plastics and coatings.

Decomposition or Combustion Products: Thermal decomposition products are toxic and may include Carbon Bisulphide, Potassium sulphide, carbonyl sulphide, Amyl Alcohols, oxides of carbon, sulphur, potassium and irritating gases.

## 11. TOXICOLOGICAL INFORMATION

### TOXICOLOGICAL DATA:

<b>SUBSTANCE</b>	<b>LD50 (Oral, Rat)</b>	<b>LD50 (Dermal, Rabbit)</b>	<b>LC50 (Inhalation, Rat, 4h)</b>
Potassium Amyl Xanthate	1 000 mg/kg (3)	---	---
Potassium Hydroxide	214 - 365 mg/kg (1,3)	1 260 mg/kg (3)	---
Isoamyl alcohol	1 300 mg/kg (1)	3 216 mg/kg (1)	---
Decomposition Product: Carbon disulfide	1 200 mg/kg (1)	---	12 500 mg/m3 (1)
Carcinogenicity Data:	The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP.		
Reproductive Data:	This product: No adverse reproductive effects are anticipated.		
Mutagenicity Data:	No adverse mutagenic effects are anticipated.		
Teratogenicity Data:	No adverse teratogenic effects are anticipated.		
Respiratory / Skin Sensitization Data:	None known.		
Synergistic Materials:	Alcohols may interact synergistically with chlorinated solvents (example - carbon tetrachloride, chloroform, bromotrichloromethane), dithiocarbamates (example - disulfiram), dimethylnitrosamine and thioacetamide. (4)  Carbon Bisulphide: The toxic effects of Carbon Bisulphide, particularly on the nervous system, can be intensified by consumption of alcohol, alcoholism, treatment with disulfiram (Antibuse), and exposure to Hydrogen Sulphide. (4) In animal studies the toxicity of Carbon Bisulphide was intensified by chemicals such as reserpine and amphetamine which act on the nervous system. (4)		
Other Studies Relevant to Material:	None known.		

## 12. ECOLOGICAL INFORMATION

Ecotoxicity: Not available. May be harmful to aquatic life.

Environmental Fate: Not available. Product has an unaesthetic appearance and can be a nuisance. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

## 13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals: Not available.

Waste Disposal Methods: This information applies to the material as manufactured. 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.

Safe Handling of Residues: See "Waste Disposal Methods".

Disposal of Packaging: Empty containers retain product residue and can be dangerous. Treat package in the same manner as the product.

## 14. TRANSPORTATION INFORMATION

### CANADIAN TDG ACT SHIPPING DESCRIPTION:

XANTHATES, Class 4.2, UN3342, PG III.

Label(s): Substances Liable To Spontaneous Combustion. Placard: Substances Liable To Spontaneous Combustion.

ERAP Index: ----- Exemptions: None known.

**US DOT CLASSIFICATION (49CFR 172.101, 172.102):**

XANTHATES, Class 4.2, UN3342, PG III.

Label(s): Spontaneously Combustible. Placard: Spontaneously Combustible.

CERCLA-RQ: Not available. Exemptions: None known.

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## 15. REGULATORY INFORMATION

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### CANADA

CEPA - NSNR: All constituents of this product are included on the DSL.

CEPA - NPRI: Not included.

Controlled Products Regulations Classification (WHMIS):

B-6: Reactive Flammable Material

D-1B: Toxic (acute effects)

D-2B: Toxic (skin and eye irritant)

### USA

Environmental Protection Act: All constituents of this product are included on the TSCA inventory.

OSHA HCS (29CFR 1910.1200): Flammable Solid. Toxic. Skin and Eye Irritant.

NFPA: 3 Health, 4 Fire, 0 Reactivity (6)

HMIS: Health, Fire, Reactivity (Not available.)

### INTERNATIONAL

Not available.

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## 16. OTHER INFORMATION

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### REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
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, 2007, American Conference of Governmental Industrial Hygienists, Cincinnati, 2007.
6. Regulatory Affairs Group, Brenntag Canada Inc.
7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.

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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 Brenntag Canada 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.

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

British Columbia: 20333-102B Avenue, Langley, BC, V1M 3H1  
Phone: (604) 513-9009 Facsimile: (604) 513-9010

Alberta: 6628 - 45 th. Street, Leduc, AB, T9E 7C9  
Phone: (780) 986-4544 Facsimile: (780) 986-1070

Manitoba: 681 Plinquet Street, Winnipeg, MB, R2J 2X2  
Phone: (204) 233-3416 Facsimile: (204) 233-7005

Potassium Amyl Xanthate, Solid

WHMIS Number : 00060600

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Brenntag Canada Inc.

Date of Revision: 2009 June 17

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Phone: (514) 636-9230 Facsimile: (514) 636-0877

Atlantic: A-105 Akerley Boulevard, Dartmouth, NS, B3B 1R7

Phone: (902) 468-9690 Facsimile: (902) 468-3085

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

MSDS# 04030

Section 1 - Chemical Product and Company Identification

MSDS Name: Calcium oxide

Catalog Numbers: AC196910000, AC196910010, AC196910025, AC403895000, AC422830000, AC422830010

Numbers: AC422830010, C114-3, C114-50, C117-500

Synonyms: Lime; Quicklime; Burnt lime; Calx; Unslaked lime; Fluxing lime; Calcia; Pebble lime.

Company Identification: Fisher Scientific  
One Reagent Lane  
Fair Lawn, NJ 07410

For information in the US, call: 201-796-7100

Emergency Number US: 201-796-7100

CHEMTREC Phone Number, US: 800-424-9300

Section 2 - Composition, Information on Ingredients

-----  
CAS#: 1305-78-8  
Chemical Name: Calcium oxide  
%: 96+  
EINECS#: 215-138-9  
-----

Hazard Symbols: C



Risk Phrases: 14 22 35

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Danger! Harmful if swallowed. Causes burns by all exposure routes. Reacts violently with water. Target Organs: Respiratory system, gastrointestinal system, eyes, skin.

Potential Health Effects

Eye: Causes eye burns.

Skin: Causes skin burns. May be harmful if absorbed through the skin.

Ingestion: Harmful if swallowed. Causes gastrointestinal tract burns.

Inhalation: Causes chemical burns to the respiratory tract. May be harmful if inhaled.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause nasal septum ulceration and perforation.

Section 4 - First Aid Measures

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

Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Do not induce vomiting. Get medical aid immediately. Call a poison control center.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper

respiratory medical device.

Notes to Physician: Treat symptomatically and supportively.

### Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water reactive. Material will react with water and may release a flammable and/or toxic gas.

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. DO NOT USE WATER!

Autoignition Temperature: Not available.

Flash Point: Not applicable.

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: ; Special Hazard: -W-

### Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Avoid generating dusty conditions. Provide ventilation. Do not expose spill to water. Do not get water inside containers. Do not let this chemical enter the environment.

### Section 7 - Handling and Storage

Handling: Do not allow water to get into the container because of violent reaction. Minimize dust generation and accumulation. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Do not allow contact with water. Use only in a chemical fume hood.

Storage: Store in a cool, dry place. Store in a tightly closed container. Corrosives area. Store protected from moisture. Store under an inert atmosphere.

### Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Calcium oxide	2 mg/m3	2 mg/m3 TWA 25 mg/m3 IDLH	5 mg/m3 TWA

OSHA Vacated PELs: Calcium oxide: 5 mg/m3 TWA (not in effect as a result of reconsideration)

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

### Section 9 - Physical and Chemical Properties

Physical State: Powder

Color: white to light yellow - very slightly beige

Odor: Odorless.

pH: 12.5 (1.65 g/L aq sol)

Vapor Pressure: Negligible.

Vapor Density: Not available

Evaporation Rate: Negligible.

Viscosity: Not available

Boiling Point: 2850 deg C @ 760 mmHg ( 5,162.00°F)

Freezing/Melting Point: 2570 deg C ( 4,658.00°F)

Decomposition Temperature: Not available

Solubility in water: Reacts

Specific Gravity/Density: Not available.

Molecular Formula: CaO

Molecular Weight: 56.08

#### Section 10 - Stability and Reactivity

Chemical Stability: Air sensitive. Reacts violently with water. Moisture sensitive.

Conditions to Avoid: Incompatible materials, dust generation, exposure to air, exposure to moist air or water.

Incompatibilities with Other Materials: Strong oxidizing agents, acids, carbon dioxide, chlorine trifluoride, fluorine, halogens, phosphorus pentoxide, calcium chloride, metal halides, hydrofluoric acid, hydrogen fluoride, ethanol, boron trifluoride.

Hazardous Decomposition Products: Calcium hydroxide.

Hazardous Polymerization: Has not been reported.

#### Section 11 - Toxicological Information

RTECS#: CAS# 1305-78-8: EW3100000

LD50/LC50: RTECS: Not available.

Carcinogenicity: Calcium oxide - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Other: See actual entry in RTECS for complete information.

#### Section 12 - Ecological Information

Other: Do not empty into drains.

#### Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

#### Section 14 - Transport Information

US DOT

Shipping Name: CALCIUM OXIDE

Hazard Class: 8

UN Number: UN1910

Packing Group: III

Canada TDG

Shipping Name: CALCIUM OXIDE

Hazard Class: 8

UN Number: UN1910

Packing Group: III

#### Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: C

Risk Phrases:

R 14 Reacts violently with water.

R 22 Harmful if swallowed.

R 35 Causes severe burns.

Safety Phrases:

S 25 Avoid contact with eyes.

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1305-78-8: 1

Canada

CAS# 1305-78-8 is listed on Canada's DSL List

Canadian WHMIS Classifications: E, F, D1B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 1305-78-8 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 1305-78-8 is listed on the TSCA Inventory.

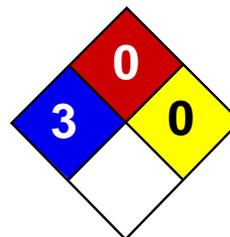
Section 16 - Other Information

MSDS Creation Date: 12/12/1997

Revision #13 Date 7/20/2009

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.

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Health	3
Fire	1
Reactivity	0
Personal Protection	J

## Material Safety Data Sheet

### Sodium Cyanide MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Sodium Cyanide

**Catalog Codes:** SLS2314, SLS3736

**CAS#:** 143-33-9

**RTECS:** VZ7525000

**TSCA:** TSCA 8(b) inventory: Sodium Cyanide

**CI#:** Not available.

**Synonym:**

**Chemical Name:** Sodium Cyanide

**Chemical Formula:** NaCN

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sodium Cyanide	143-33-9	100

**Toxicological Data on Ingredients:** Sodium Cyanide: ORAL (LD50): Acute: 6.44 mg/kg [Rat]. DERMAL (LD50): Acute: 10.4 mg/kg [Rabbit].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator). Corrosive to eyes and skin. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to skin, eyes, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

## Section 4: First Aid Measures

### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

### Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

### Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** May be combustible at high temperature.

**Auto-Ignition Temperature:** Not available.

**Flash Points:** Not available.

**Flammable Limits:** Not available.

**Products of Combustion:** Some metallic oxides.

**Fire Hazards in Presence of Various Substances:** Slightly flammable to flammable in presence of acids, of moisture.

### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

### Fire Fighting Media and Instructions:

**SMALL FIRE:** Use DRY chemical powder. **LARGE FIRE:** Use water spray, fog or foam. Do not use water jet.

### Special Remarks on Fire Hazards:

Dangerous on contact with acids, acid fumes, water or steam. It will produce toxic and flammable vapors of CN-H and sodium oxide. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas. When heated to decomposition it emits toxic fumes hydrogen cyanide and oxides of nitrogen

**Special Remarks on Explosion Hazards:** Fusion mixtures of metal cyanides with metal chlorates, perchlorated or nitrates causes a violent explosion

## Section 6: Accidental Release Measures

**Small Spill:** Use appropriate tools to put the spilled solid in a convenient waste disposal container.

**Large Spill:**

Corrosive solid. Poisonous solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

**Precautions:**

Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids, moisture.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 24°C (75.2°F).

## Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

**Personal Protection:**

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

STEL: 5 (mg/m3) from ACGIH (TLV) [United States] SKIN CEIL: 4.7 from NIOSH CEIL: 5 (mg/m3) from NIOSH Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Granular solid. Flakes solid.)

**Odor:**

Faint almond-like odor. Odorless when perfectly dry. Emits odor of hydrogen cyanide when damp.

**Taste:** Not available.

**Molecular Weight:** 49.01 g/mole

**Color:** White.

**pH (1% soln/water):** Not available.

**Boiling Point:** 1496°C (2724.8°F)

**Melting Point:** 563°C (1045.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.595 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Vapor Density of Hydrogen Cyanide gas: 0.941

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:**

Soluble in cold water. Slightly soluble in Ethanol

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, moisture, incompatibles.

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, moisture.

**Corrosivity:**

Corrosive in presence of aluminum. Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Violent reaction with fluorine gas, magnesium, nitrates, nitric acid. Dangerous on contact with acids, acid fumes, water or steam. It will produce toxic and flammable vapors of CN-H and sodium oxide. Cyanide may react with CO<sub>2</sub> in ordinary air to form toxic hydrogen cyanide gas. Strong oxidizers such as acids, acid salts, chlorates, and nitrates. Contact with acids and acid salts causes immediate formation of toxic and flammable hydrogen cyanide gas.

**Special Remarks on Corrosivity:** Corrosive to aluminum

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

Acute oral toxicity (LD<sub>50</sub>): 6.44 mg/kg [Rat]. Acute dermal toxicity (LD<sub>50</sub>): 10.4 mg/kg [Rabbit].

**Chronic Effects on Humans:** May cause damage to the following organs: skin, eyes, central nervous system (CNS).

**Other Toxic Effects on Humans:**

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation. Hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:** May cause adverse reproductive effects (maternal and paternal fertility) based on animal data.

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health effects: Skin: May cause itching and irritation. May be fatal if absorbed through injured skin with symptoms similar to those noted for inhalation and ingestion. Eyes: May cause eye irritation and eye damage. Inhalation: May cause respiratory tract irritation. May be fatal if inhaled. The substance inhibits cellular respiration causing metabolic asphyxiation. May cause headache, weakness, dizziness, labored breathing, nausea, vomiting. May be followed by cardiovascular effects, unconsciousness, convulsions, coma, and death Ingestion: May be fatal if swallowed. May cause

gastrointestinal tract irritation with nausea, vomiting. May affect behavior and nervous systems (seizures, convulsions, change in motor activity, headache, dizziness, confusion, weakness stupor, anxiety, agitation, tremors), cardiovascular system, respiration (hyperventilation, pulmonary edema, breathing difficulty, respiratory failure), cardiovascular system (palpitations, rapid heart beat, hypertension, hypotension). Massive doses by produce sudden loss of consciousness and prompt death from respiratory arrest. Smaller but still lethal doses on the breath or vomitus. Chronic Potential Health Effects: Central Nervous system effects (headaches, vertigo, insomnia, memory loss, tremors, fatigue), fatigue, metabolic effects (poor appetite), cardiovascular effects (chest discomfort, palpitations), nerve damage to the eyes, or dermatitis, respiratory tract irritation, eye irritation, or death can occur. may prolong the illness for 1 or more hours. A bitter almond odor may be noted

## Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** CLASS 6.1: Poisonous material.

**Identification:** : Sodium cyanide UNNA: 1689 PG: I

**Special Provisions for Transport:** Marine Pollutant

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Connecticut carcinogen reporting list.: Sodium Cyanide Illinois chemical safety act: Sodium Cyanide New York release reporting list: Sodium Cyanide Rhode Island RTK hazardous substances: Sodium Cyanide Pennsylvania RTK: Sodium Cyanide Minnesota: Sodium Cyanide Massachusetts RTK: Sodium Cyanide Massachusetts spill list: Sodium Cyanide New Jersey: Sodium Cyanide New Jersey spill list: Sodium Cyanide Louisiana RTK reporting list: Sodium Cyanide Louisiana spill reporting: Sodium Cyanide California Director's List of Hazardous Substances: Sodium Cyanide TSCA 8(b) inventory: Sodium Cyanide TSCA 4(a) final test rules: Sodium Cyanide TSCA 8(a) PAIR: Sodium Cyanide TSCA 8(d) H and S data reporting: Sodium Cyanide TSCA 12(b) one time export: Sodium Cyanide SARA 302/304/311/312 extremely hazardous substances: Sodium Cyanide CERCLA: Hazardous substances.: Sodium Cyanide: 10 lbs. (4.536 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS B-6: Reactive and very flammable material. CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive solid.

**DSCL (EEC):**

R27/28- Very toxic in contact with skin and if swallowed. R41- Risk of serious damage to eyes. S1/2- Keep locked up and out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S28- After contact with skin, wash immediately with plenty of water S36/37- Wear suitable protective clothing and gloves. S39- Wear eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S46- If swallowed, seek medical advice immediately and show this container or label.

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 1

**Reactivity:** 0

**Personal Protection:** j

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 0

**Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/11/2005 01:58 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	3
Fire	0
Reactivity	2
Personal Protection	J

## Material Safety Data Sheet

### Sodium hydroxide MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Sodium hydroxide

**Catalog Codes:** SLS3298, SLS1081, SLS2503, SLS3925, SLS1705

**CAS#:** 1310-73-2

**RTECS:** WB4900000

**TSCA:** TSCA 8(b) inventory: Sodium hydroxide

**CI#:** Not available.

**Synonym:** Caustic Soda

**Chemical Name:** Sodium Hydroxide

**Chemical Formula:** NaOH

**Contact Information:**

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: [ScienceLab.com](http://ScienceLab.com)

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**International CHEMTREC, call:** 1-703-527-3887

**For non-emergency assistance, call:** 1-281-441-4400

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sodium hydroxide	1310-73-2	100

**Toxicological Data on Ingredients:** Sodium hydroxide LD50: Not available. LC50: Not available.

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. The amount of tissue damage depends on length of contact. Eye contact can result in corneal damage or blindness. Skin contact can produce inflammation and blistering. Inhalation of dust will produce irritation to gastro-intestinal or respiratory tract, characterized by burning, sneezing and coughing. Severe over-exposure can produce lung damage, choking, unconsciousness or death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Not available. **MUTAGENIC EFFECTS:** Mutagenic for mammalian somatic cells.

**TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to mucous membranes, upper respiratory tract, skin, eyes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure of the eyes to a low level of dust can produce eye irritation. Repeated skin exposure can produce local skin destruction, or dermatitis. Repeated inhalation of dust can produce varying degree of respiratory irritation or lung damage.

## Section 4: First Aid Measures

### Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

### Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

### Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

### Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

### Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

### Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:** Not available.

## Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** metals

### Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

**Fire Fighting Media and Instructions:** Not available

### Special Remarks on Fire Hazards:

sodium hydroxide + zinc metal dust causes ignition of the latter. Under proper conditions of temperature, pressure and state of division, it can ignite or react violently with acetaldehyde, allyl alcohol, allyl chloride, benzene-1,4-diol, chlorine trifluoride, 1,2 dichlorethylene, nitroethane, nitromethane, nitroparaffins, nitropropane, cinnamaldehyde, 2,2-dichloro-3,3-dimethylbutane. Sodium hydroxide in contact with water may generate enough heat to ignite adjacent combustible materials. Phosphorous boiled with NaOH yields mixed phosphines which may ignite spontaneously in air. sodium hydroxide and cinnamaldehyde + heat may cause ignition. Reaction with certain metals releases flammable and explosive hydrogen gas.

### Special Remarks on Explosion Hazards:

Sodium hydroxide reacts to form explosive products with ammonia + silver nitrate. Benzene extract of allyl benzenesulfonate prepared from allyl alcohol, and benzene sulfonyl chloride in presence of aqueous sodium hydroxide, under vacuum distillation, residue darkened and exploded. Sodium Hydroxide + impure tetrahydrofuran, which can contain peroxides, can

cause serious explosions. Dry mixtures of sodium hydroxide and sodium tetrahydroborate liberate hydrogen explosively at 230-270 deg. C. Sodium Hydroxide reacts with sodium salt of trichlorophenol + methyl alcohol + trichlorobenzene + heat to cause an explosion.

## Section 6: Accidental Release Measures

### Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. If necessary: Neutralize the residue with a dilute solution of acetic acid.

### Large Spill:

Corrosive solid. Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of acetic acid. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

## Section 7: Handling and Storage

### Precautions:

Keep container dry. Do not breathe dust. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If you feel unwell, seek medical attention and show the label when possible. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, metals, acids, alkalis, moisture.

**Storage:** Keep container tightly closed. Keep container in a cool, well-ventilated area. Hygroscopic. Deliquescent.

## Section 8: Exposure Controls/Personal Protection

### Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

### Personal Protection:

Splash goggles. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

### Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor and dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

### Exposure Limits:

STEL: 2 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] TWA: 2 CEIL: 2 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] CEIL: 2 (mg/m<sup>3</sup>) from NIOSH Consult local authorities for acceptable exposure limits.

## Section 9: Physical and Chemical Properties

**Physical state and appearance:** Solid. (Deliquescent solid.)

**Odor:** Odorless.

**Taste:** Not available.

**Molecular Weight:** 40 g/mole

**Color:** White.

**pH (1% soln/water):** 13.5 [Basic.]

**Boiling Point:** 1388°C (2530.4°F)

**Melting Point:** 323°C (613.4°F)

**Critical Temperature:** Not available.

**Specific Gravity:** 2.13 (Water = 1)

**Vapor Pressure:** Not applicable.

**Vapor Density:** Not available.

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:** Easily soluble in cold water.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials, moisture, moist air

**Incompatibility with various substances:**

Highly reactive with metals. Reactive with oxidizing agents, reducing agents, acids, alkalis, moisture.

**Corrosivity:** Not available.

**Special Remarks on Reactivity:**

Hygroscopic. Much heat is evolved when solid material is dissolved in water. Therefore cold water and caution must be used for this process. Sodium hydroxide solution and octanol + diborane during a work-up of a reaction mixture of oxime and diborane in tetrahydrofuran is very exothermic, a mild explosion being noted on one occasion. Reactive with water, acids (mineral, non-oxidizing, e.g. hydrochloric, hydrofluoric acid, muriatic acid, phosphoric), acids (mineral, oxidizing e.g. chromic acid, hypochlorous acid, nitric acid, sulfuric acid), acids (organic e.g. acetic acid, benzoic acid, formic acid, methanoic acid, oxalic acid), aldehydes (e.g. acetaldehyde, acrolein, chloral hydrate, formaldehyde), carbamates (e.g. carbanolate, carbofuran), esters (e.g. butyl acetate, ethyl acetate, propyl formate), halogenated organics (dibromoethane, hexachlorobenzene, methyl chloride, trichloroethylene), isocyanates (e.g. methyl isocyanate), ketones (acetone, acetophenone, MEK, MIBK), acid chlorides, strong bases, strong oxidizing agents, strong reducing agents, flammable liquids, powdered metals and metals (i.e. aluminum, tin, zinc, hafnium, raney nickel), metals (alkali and alkaline e.g. cesium, potassium, sodium), metal compounds (toxic e.g. beryllium, lead acetate, nickel carbonyl, tetraethyl lead), nitrides (e.g. potassium nitride, sodium nitride), nitriles (e.g. acetonitrile, methyl cyanide), nitro compounds (organic e.g. nitrobenzene, nitromethane), acetic anhydride, chlorohydrin, chlorosulfonic acid, ethylene cyanohydrin, glyoxal, hydrosulfuric acid, oleum, propiolactone, acylonitrile, phorous pentoxide, chloroethanol, chloroform-methanol, tetrahydroborate, cyanogen azide, 1,2,4,5 tetrachlorobenzene, cinnamaldehyde. Reacts with formaldehyde hydroxide to yield formic acid, and hydrogen.

**Special Remarks on Corrosivity:** Very caustic to aluminum and other metals in presence of moisture.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. May cause damage to the following organs: mucous membranes, upper respiratory tract, skin, eyes.

**Other Toxic Effects on Humans:**

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

**Special Remarks on Toxicity to Animals:**

Lowest Published Lethal Dose: LDL [Rabbit] - Route: Oral; Dose: 500 mg/kg

**Special Remarks on Chronic Effects on Humans:** May affect genetic material. Investigation as a mutagen (cytogenetic analysis)

**Special Remarks on other Toxic Effects on Humans:****Section 12: Ecological Information**

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

**Section 13: Disposal Considerations****Waste Disposal:**

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

**Section 14: Transport Information**

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Sodium hydroxide, solid UNNA: 1823 PG: II

**Special Provisions for Transport:** Not available.

**Section 15: Other Regulatory Information****Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Sodium hydroxide Illinois chemical safety act: Sodium hydroxide New York release reporting list: Sodium hydroxide Rhode Island RTK hazardous substances: Sodium hydroxide Pennsylvania RTK: Sodium hydroxide Minnesota: Sodium hydroxide Massachusetts RTK: Sodium hydroxide New Jersey: Sodium hydroxide Louisiana spill reporting: Sodium hydroxide California Director's List of Hazardous Substances: Sodium hydroxide TSCA 8(b) inventory: Sodium hydroxide CERCLA: Hazardous substances.: Sodium hydroxide: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):** CLASS E: Corrosive solid.

**DSCL (EEC):**

R35- Causes severe burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S37/39- Wear suitable gloves and eye/face protection. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 2

**Personal Protection:** j

**National Fire Protection Association (U.S.A.):**

**Health:** 3

**Flammability:** 0

**Reactivity:** 1

**Specific hazard:**

**Protective Equipment:**

Gloves. Synthetic apron. Vapor and dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

**Section 16: Other Information**

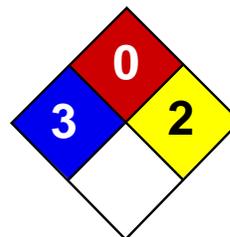
**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 06:32 PM

**Last Updated:** 05/21/2013 12:00 PM

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Health	3
Fire	0
Reactivity	2
Personal Protection	

## Material Safety Data Sheet

### Sulfuric acid MSDS

#### Section 1: Chemical Product and Company Identification

**Product Name:** Sulfuric acid

**Contact Information:**

**Catalog Codes:** SLS2539, SLS1741, SLS3166, SLS2371, SLS3793

**Sciencelab.com, Inc.**

14025 Smith Rd.

Houston, Texas 77396

**CAS#:** 7664-93-9

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

**RTECS:** WS5600000

Order Online: [ScienceLab.com](http://ScienceLab.com)

**TSCA:** TSCA 8(b) inventory: Sulfuric acid

**CHEMTREC (24HR Emergency Telephone), call:**

1-800-424-9300

**CI#:** Not applicable.

**International CHEMTREC, call:** 1-703-527-3887

**Synonym:** Oil of Vitriol; Sulfuric Acid

**Chemical Name:** Hydrogen sulfate

**For non-emergency assistance, call:** 1-281-441-4400

**Chemical Formula:** H<sub>2</sub>-SO<sub>4</sub>

#### Section 2: Composition and Information on Ingredients

**Composition:**

Name	CAS #	% by Weight
Sulfuric acid	7664-93-9	95 - 98

**Toxicological Data on Ingredients:** Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

#### Section 3: Hazards Identification

**Potential Acute Health Effects:**

Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

**Potential Chronic Health Effects:**

**CARCINOGENIC EFFECTS:** Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. **MUTAGENIC EFFECTS:** Not available. **TERATOGENIC EFFECTS:** Not available. **DEVELOPMENTAL TOXICITY:** Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged

contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

#### Section 4: First Aid Measures

**Eye Contact:**

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

#### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:**

Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

**Fire Hazards in Presence of Various Substances:** Combustible materials

**Explosion Hazards in Presence of Various Substances:**

Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of oxidizing materials.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**

Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.

**Special Remarks on Explosion Hazards:**

Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, alcohols with strong hydrogen peroxide, ammonium tetraperoxychromate, mercuric nitrite, potassium chlorate, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picrates, fulminates, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decomposition.

**Section 6: Accidental Release Measures****Small Spill:**

Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

**Large Spill:**

Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

**Section 7: Handling and Storage****Precautions:**

Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

**Storage:**

Hygroscopic. Reacts violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

**Section 8: Exposure Controls/Personal Protection****Engineering Controls:**

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

Face shield. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves. Boots.

**Personal Protection in Case of a Large Spill:**

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**

TWA: 1 STEL: 3 (mg/m<sup>3</sup>) [Australia] Inhalation TWA: 1 (mg/m<sup>3</sup>) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m<sup>3</sup>) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m<sup>3</sup>) from NIOSH [United States] Inhalation TWA: 1 (mg/m<sup>3</sup>) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

**Section 9: Physical and Chemical Properties**

**Physical state and appearance:** Liquid. (Thick oily liquid.)

**Odor:** Odorless, but has a choking odor when hot.

**Taste:** Marked acid taste. (Strong.)

**Molecular Weight:** 98.08 g/mole

**Color:** Colorless.

**pH (1% soln/water):** Acidic.

**Boiling Point:**

270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

**Melting Point:** -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

**Critical Temperature:** Not available.

**Specific Gravity:** 1.84 (Water = 1)

**Vapor Pressure:** Not available.

**Vapor Density:** 3.4 (Air = 1)

**Volatility:** Not available.

**Odor Threshold:** Not available.

**Water/Oil Dist. Coeff.:** Not available.

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:**

Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

## Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:**

Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

**Incompatibility with various substances:**

Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

**Corrosivity:**

Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**

Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchromate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +

sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, 1,3-Diazidobenzene, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, , Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, p-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium acetylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thallium (I) azidodithiocarbonate, Zinc chlorate, Zinc Iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

**Special Remarks on Corrosivity:**

Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

**Polymerization:** Will not occur.

## Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m<sup>3</sup> 2 hours [Mouse].

**Chronic Effects on Humans:**

CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

**Other Toxic Effects on Humans:**

Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**

Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m<sup>3</sup> for 7 hrs.(RTECS) Teratogenicity: neither embryotoxic, fetotoxic, nor teratogenic in mice or rabbits at inhaled doses producing some maternal toxicity

**Special Remarks on other Toxic Effects on Humans:**

Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart lesions), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.

## Section 12: Ecological Information

**Ecotoxicity:** Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

## Section 13: Disposal Considerations

**Waste Disposal:**

Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

## Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** : Sulfuric acid UNNA: 1830 PG: II

**Special Provisions for Transport:** Not available.

## Section 15: Other Regulatory Information

**Federal and State Regulations:**

Illinois toxic substances disclosure to employee act: Sulfuric acid New York release reporting list: Sulfuric acid Rhode Island RTK hazardous substances: Sulfuric acid Pennsylvania RTK: Sulfuric acid Minnesota: Sulfuric acid Massachusetts RTK: Sulfuric acid New Jersey: Sulfuric acid California Director's List of Hazardous Substances (8 CCR 339): Sulfuric acid Tennessee RTK: Sulfuric acid TSCA 8(b) inventory: Sulfuric acid SARA 302/304/311/312 extremely hazardous substances: Sulfuric acid SARA 313 toxic chemical notification and release reporting: Sulfuric acid CERCLA: Hazardous substances.: Sulfuric acid: 1000 lbs. (453.6 kg)

**Other Regulations:**

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

**Other Classifications:**

**WHMIS (Canada):**

CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

**DSCL (EEC):**

R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**HMIS (U.S.A.):**

**Health Hazard:** 3

**Fire Hazard:** 0

**Reactivity:** 2

**Personal Protection:****National Fire Protection Association (U.S.A.):****Health:** 3**Flammability:** 0**Reactivity:** 2**Specific hazard:****Protective Equipment:**

Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

**Section 16: Other Information****References:**

-Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Hawley, G.G.. The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.

**Other Special Considerations:** Not available.**Created:** 10/09/2005 11:58 PM**Last Updated:** 05/21/2013 12:00 PM

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## **APPENDIX B**

### **SODIUM CYANIDE AND LNG EMERGENCY RESPONSE GUIDELINES (TRANSPORT CANADA, 2012)**

**POTENTIAL HAZARDS****FIRE OR EXPLOSION****• EXTREMELY FLAMMABLE.**

- Will be easily ignited by heat, sparks or flames.
- Will form explosive mixtures with air.
- Vapors from liquefied gas are initially heavier than air and spread along ground.

**CAUTION: Hydrogen (UN1049), Deuterium (UN1957), Hydrogen, refrigerated liquid (UN1966) and Methane (UN1971) are lighter than air and will rise. Hydrogen and Deuterium fires are difficult to detect since they burn with an invisible flame. Use an alternate method of detection (thermal camera, broom handle, etc.)**

- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

**HEALTH**

- Vapors may cause dizziness or asphyxiation without warning.
- Some may be irritating if inhaled at high concentrations.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Fire may produce irritating and/or toxic gases.

**PUBLIC SAFETY**

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.
- Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

**EVACUATION****Large Spill**

- Consider initial downwind evacuation for at least 800 meters (1/2 mile).

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

**EMERGENCY RESPONSE****FIRE**

- **DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.**

**CAUTION:** Hydrogen (UN1049), Deuterium (UN1957) and Hydrogen, refrigerated liquid (UN1966) burn with an invisible flame. Hydrogen and Methane mixture, compressed (UN2034) may burn with an invisible flame.

**Small Fire**

- Dry chemical or CO<sub>2</sub>.

**Large Fire**

- Water spray or fog.
- Move containers from fire area if you can do it without risk.

**Fire involving Tanks**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

**SPILL OR LEAK**

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.
- Isolate area until gas has dispersed.

**CAUTION:** When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

**FIRST AID**

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- Clothing frozen to the skin should be thawed before being removed.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

**POTENTIAL HAZARDS****HEALTH**

- **TOXIC**; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death.
- Reaction with water or moist air may release toxic, corrosive or flammable gases.
- Reaction with water may generate much heat that will increase the concentration of fumes in the air.
- Fire will produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

**FIRE OR EXPLOSION**

- Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- For UN1796, UN1826, UN2031 at high concentrations and for UN2032, these may act as oxidizers, also consult GUIDE 140.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Substance may react with water (some violently), releasing corrosive and/or toxic gases and runoff.
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated or if contaminated with water.

**PUBLIC SAFETY**

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate enclosed areas.

**PROTECTIVE CLOTHING**

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

**EVACUATION****Spill**

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

**Fire**

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

## EMERGENCY RESPONSE

## FIRE

- Note: Some foams will react with the material and release corrosive/toxic gases.

**Small Fire**

- CO<sub>2</sub> (except for Cyanides), dry chemical, dry sand, alcohol-resistant foam.

**Large Fire**

- Water spray, fog or alcohol-resistant foam.
- Move containers from fire area if you can do it without risk.
- Use water spray or fog; do not use straight streams.
- Dike fire-control water for later disposal; do not scatter the material.

**Fire involving Tanks or Car/Trailer Loads**

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

## SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- A vapor suppressing foam may be used to reduce vapors.
- DO NOT GET WATER INSIDE CONTAINERS.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Prevent entry into waterways, sewers, basements or confined areas.

**Small Spill**

- Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal.

## FIRST AID

- Move victim to fresh air. • Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- **In case of contact with Hydrofluoric acid (UN1790)**, flush skin and eyes with water for 5 minutes; then, for skin exposures rub on a calcium/gel combination; for eyes flush with a water/calcium solution if available, otherwise continue with water for 15 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim warm and quiet.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.



## TABLE2 - WATER-REACTIVE MATERIALS WHICH PRODUCE TOXIC GASES

### Materials Which Produce Large Amounts of Toxic-by-Inhalation (TIH) Gas(es) When Spilled in Water

ID No.	Guide No.	Name of Material	TIH Gas(es) Produced
1162	155	Dimethyldichlorosilane	HCl
1183	139	Ethylchlorosilane	HCl
1196	155	Ethyltrichlorosilane	HCl
1242	139	Methylchlorosilane	HCl
1250	155	Methyltrichlorosilane	HCl
1295	139	Trichlorosilane	HCl
1298	155	Trimethylchlorosilane	HCl
1305	155P	Vinyltrichlorosilane	HCl
1305	155P	Vinyltrichlorosilane, stabilized	HCl
1340	139	Phosphorus pentasulfide, free from yellow and white Phosphorus	H <sub>2</sub> S
1340	139	Phosphorus pentasulphide, free from yellow and white Phosphorus	H <sub>2</sub> S
1360	139	Calcium phosphide	PH <sub>3</sub>
1384	135	Sodium dithionite	H <sub>2</sub> S SO <sub>2</sub>
1384	135	Sodium hydrosulfite	H <sub>2</sub> S SO <sub>2</sub>
1384	135	Sodium hydrosulphite	H <sub>2</sub> S SO <sub>2</sub>
1397	139	Aluminum phosphide	PH <sub>3</sub>
1419	139	Magnesium aluminum phosphide	PH <sub>3</sub>
1432	139	Sodium phosphide	PH <sub>3</sub>
1541	155	Acetone cyanohydrin, stabilized	HCN
1680	157	Potassium cyanide	HCN
1680	157	Potassium cyanide, solid	HCN
1689	157	Sodium cyanide	HCN
1689	157	Sodium cyanide, solid	HCN

#### Chemical Symbols for TIH Gases:

Br <sub>2</sub>	Bromine	HF	Hydrogen fluoride	NO <sub>2</sub>	Nitrogen dioxide
Cl <sub>2</sub>	Chlorine	HI	Hydrogen iodide	PH <sub>3</sub>	Phosphine
HBr	Hydrogen bromide	H <sub>2</sub> S	Hydrogen sulfide	SO <sub>2</sub>	Sulfur dioxide
HCl	Hydrogen chloride	H <sub>2</sub> S	Hydrogen sulphide	SO <sub>2</sub>	Sulphur dioxide
HCN	Hydrogen cyanide	NH <sub>3</sub>	Ammonia		

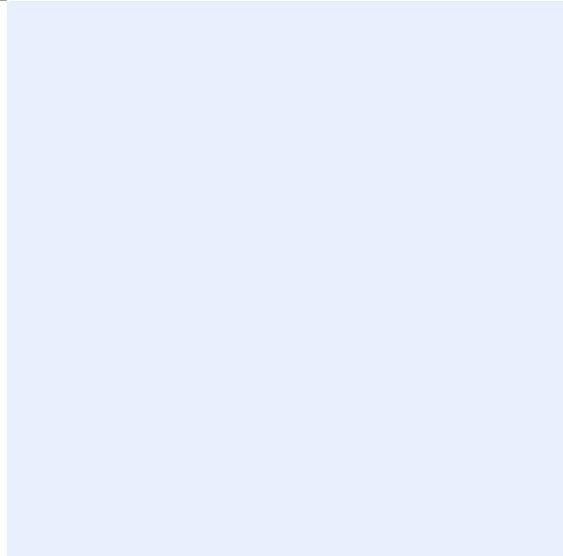
## APPENDIX C

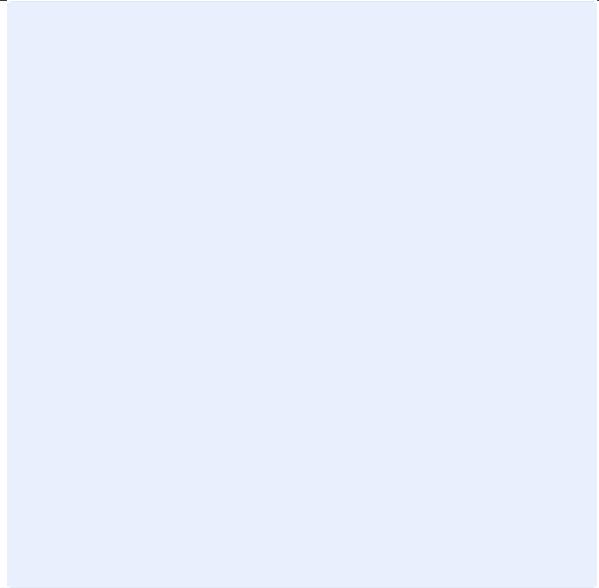
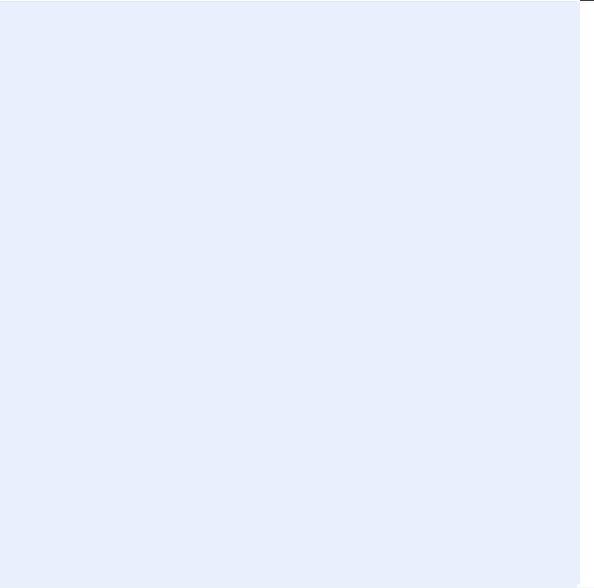
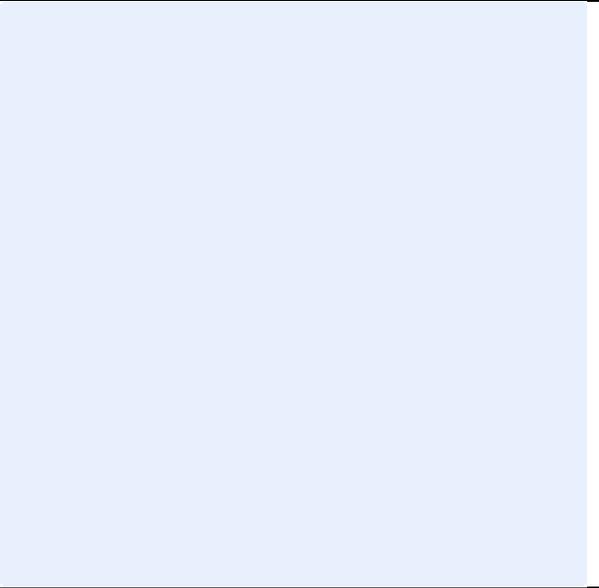
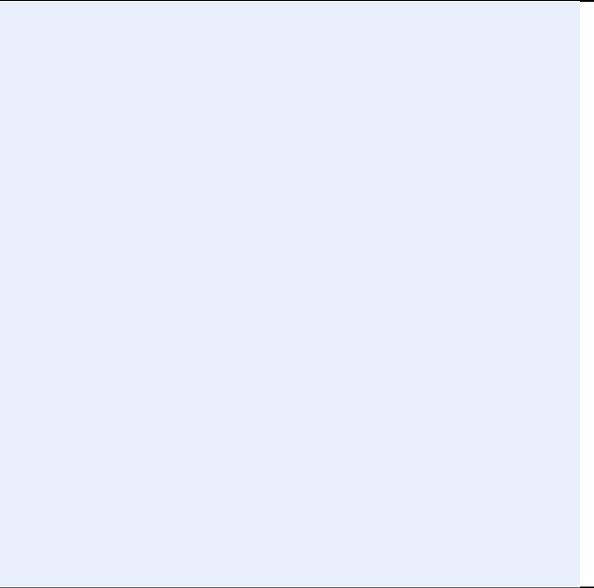
### SPILL REPORT FORM

1	DATE OF SPILL: Click here to enter a date.	TIME OF SPILL:	
2	LOCATION OF SPILL:	SITE CONDITIONS (TEMPERATURE, WIND, GROUND PERMEABILITY, ETC.):	
3	SAFETY HAZARDS (FIRE, FUMES, EXPLOSIVE SUBSTANCES, ETC.):		
4	TYPE OF PRODUCT SPILLED: OIL <input type="checkbox"/> GASOLINE <input type="checkbox"/> DIESEL <input type="checkbox"/> OTHER <input type="checkbox"/> _____ QUANTITY RELEASED (IN LITERS):		
5	CAUSE OF THE SPILL (E.G., BROKEN HOSE, VEHICLE ACCIDENT):		
6	ACTIONS TAKEN TO DATE TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS:		
7	ENVIRONMENTAL RISK (DESCRIBE DISTANCE TO NEAREST WATER BODY, SENSITIVE HABITAT, ETC.): LOW <input type="checkbox"/> MEDIUM <input type="checkbox"/> HIGH <input type="checkbox"/>		
8	SAMPLES TAKEN:		
9	SUBSEQUENT ACTIONS REQUIRED TO CONTAIN, RECOVER OR DISPOSE OF THE SPILLED PRODUCT AND CONTAMINATED MATERIALS:		
10	RECOMMENDATIONS FOR IMPROVEMENTS/PREVENTATIVE MEASURES:		
11	COMPANY/CONTRACTOR INVOLVED:	FRONT LINE SUPERVISOR:	
12	NAME OF ONSITE SUPERVISOR(S) AT THE TIME OF SPILL:	13	IS THE SPILL REPORTABLE AS PER REPORTABLE SPILL THRESHOLDS? YES <input type="checkbox"/> NO <input type="checkbox"/> IF YES, FILL OUT BOX 16. IF NO, STOP AFTER BOX 14.

<b>14</b>	<p><b>INTERNAL REPORTING SEQUENCE:</b></p> <p>FIRST OBSERVER:</p> <p>_____</p> <p style="text-align: center;">NAME <span style="margin-left: 200px;">COMPANY</span></p> <p>REPORTED TO:</p> <p>_____</p> <p style="text-align: center;">NAME <span style="margin-left: 100px;">COMPANY</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO ENVIRONMENTAL DEPARTMENT:</p> <p>_____</p> <p style="text-align: center;">NAME <span style="margin-left: 100px;">BY WHOM</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO MANAGEMENT (MINE MANAGER OR ALTERNATE):</p> <p>_____</p> <p style="text-align: center;">NAME <span style="margin-left: 100px;">BY WHOM</span> <span style="margin-left: 100px;">DATE/TIME</span></p>
<b>15</b>	<p><b>EXTERNAL REPORTING SEQUENCE:</b></p> <p>REPORTED TO 24-HOUR YUKON SPILL HOTLINE (867) 667-7244:</p> <p>_____</p> <p style="text-align: center;">BY WHOM <span style="margin-left: 100px;">TO WHO</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO SELKIRK FIRST NATION (867) 537-3331:</p> <p>_____</p> <p style="text-align: center;">BY WHOM <span style="margin-left: 100px;">TO WHO</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO LITTLE SALMON CARMACKS FIRST NATION (867) 863-5576:</p> <p>_____</p> <p style="text-align: center;">BY WHOM <span style="margin-left: 100px;">TO WHO</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO TR'ONDĚK HWĚCH'IN FIRST NATION (867) 993-7145:</p> <p>_____</p> <p style="text-align: center;">BY WHOM <span style="margin-left: 100px;">TO WHO</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>REPORTED TO YUKON GOVERNMENT – CLIENT SERVICES (867) 456-3852:</p> <p>_____</p> <p style="text-align: center;">BY WHOM <span style="margin-left: 100px;">TO WHO</span> <span style="margin-left: 100px;">DATE/TIME</span></p> <p>DETAILED WRITTEN REPORT TO YWB, EMR, ENVIRONMENT CANADA AND FIRST NATIONS (REQUIRED WITHIN 10 DAYS OF SPILL):</p> <p>_____</p> <p style="text-align: center;">DATE SUBMITTED <span style="margin-left: 200px;">BY WHOM</span></p>

PHOTOS

	
PHOTO 1: DESCRIPTION <a href="#">Click here to enter a date.</a>	PHOTO 2: DESCRIPTION <a href="#">Click here to enter a date.</a>
	
PHOTO 3: DESCRIPTION <a href="#">Click here to enter a date.</a>	PHOTO 4: DESCRIPTION <a href="#">Click here to enter a date.</a>

	
<p>PHOTO 5: DESCRIPTION <a href="#">Click here to enter a date.</a></p>	<p>PHOTO 6: DESCRIPTION <a href="#">Click here to enter a date.</a></p>
	
<p>PHOTO 6: DESCRIPTION <a href="#">Click here to enter a date.</a></p>	<p>PHOTO 7: DESCRIPTION <a href="#">Click here to enter a date.</a></p>