KUDZ ZE KAYAH PROJECT

HAZARDOUS MATERIALS MANAGEMENT PLAN

REV 04

June 2026

BMC MINERALS LTD.

This Management Plan has been developed to meet the appropriate subject objectives based on existing regulatory requirements, current or planned site activities, existing and expected site conditions, and designed outcomes at the time of writing. Operational processes/practices for achievement of licence terms and conditions may be updated from time to time as appropriate due to changes to relevant legislation and regulations, changes to site activities or conditions, differences from expected objective outcomes, or improvement of management practices. All rates, capacities, dimensions, weights, volumes and durations in text or figures are based on current feasibility level designs and are subject to change based on final design, licence conditions or site conditions encountered. Updates will be resubmitted to government authorities and/or stakeholders as required.

LIST OF REVISIONS

Issue Date	Revision Number	Description of Revision
September 1, 2020	Rev 00	For Issue to Agencies
November 19, 2020	Rev 01	Updated with commitments and Final Screening Report Recommendations
July 18, 2022	Rev 02	Updated with final edits from BMC
December 18, 2023	Rev 03	Updated in response to Phase 2/3 IR from EMR dated May 5, 2023
June 1, 2026	Rev 04	Administrative updates in response to EMR completeness check

SUMMARY OF REVISIONS

Information Request/Intervention	Document	Section	Revision
Revision 03			
EMR Phase 2/3 IR A concordance table is missing from the plan BMC is to provide a concordance table that demonstrates how all applicable decision document terms and conditions and proponent commitments have been addressed. This concordance table should also indicate where revisions have been made based upon the information requests outlined in this table.	Hazardous Materials Management Plan	n/a	Added Table of Revisions and Table of Concordance
EMR Phase 2/3 IR Throughout document Yukon OHSA is referred throughout the plan. Since the new legislation has come into effect, the name has changed. Please review report and change name accordingly. BMC to replace all instances of references to OHSA and Worker's Safety and Compensation Act with Workplace Health and Safety or WHS and ensure accuracy with new legislation.	Hazardous Materials Management Plan	n/a	OHSA references changed to Workers Safety and Compensation Act throughout document
EMR Phase 2/3 IR Section 2: Hazardous Materials Identification and Classification This section in the plan references WHMIS but does not specify latest revision. Even though 2015 is mentioned in Section 3. 2015 Workplace Hazardous Materials Information System Regulations must be followed and referenced appropriately throughout.	Hazardous Materials Management Plan	n/a	2015 revision noted throughout document
EMR Phase 2/3 IR Section 2: Hazardous Materials Identification and Classification The plan states that All waste from the analytical laboratory will be either buried on site (in the Class A Storage Facility or the Waste Management Facility). BMC to clarify where exactly they want to bury the laboratory hazardous waste and what criteria will be met for each buried site.	Hazardous Materials Management Plan	2	Analytical residues will be collected and stored at laboratory and periodically sent off site for disposal in an approved facility.
EMR Phase 2/3 IR Section 2: Table 2-1 Table 2-1 does not clearly provide required permits, registrations, or legislative requirements for each container type.	Hazardous Materials Management Plan	2.1	Added to table

Information Request/Intervention	Document	Section	Revision
Revision 03			
BMC to add column outlining required permits, registration, or legislative requirements for each container type.			
EMR Phase 2/3 IR Section 3: Employee Training Effective July 1, 2022, records of all worker H&S Training must be maintained. (1.06.01 WHS Regulations) BMC to revise wording to include record of training as required by WHS regulations.	Hazardous Materials Management Plan	3	Added "Records of all worker health and safety training will be maintained in accordance with applicable legislation".
EMR Phase 2/3 IR Appendix C: Section 7 Explosives Storage When storing explosives, employers must follow 14.24 – 14.29 of the Workplace Health and Safety Regulations (Yukon). BMC to acknowledge the comment with revised wording.	Hazardous Materials Management Plan	7	Added text specifically noting these regulations
EMR Phase 2/3 IR Appendix C: Section 9.1 Safety Requirements Each blast must be overseen by the holder of a Yukon Blaster's Certificate. Post blast inspection should be documented and signed off by the blaster in charge. BMC to acknowledge the comment with revised wording.	Hazardous Materials Management Plan	9.1	Added text
EMR Phase 2/3 IR Appendix C: Section 9.3 Explosives Transport Equipment When transporting explosives, employers must follow 14.13 – 14.20 of the Workplace Health and Safety Regulations (Yukon). BMC to acknowledge the comment with revised wording.	Hazardous Materials Management Plan	9.3	Added text specifically noting these regulations
EMR Phase 2/3 IR Appendix C: Section 9.6 Blasting Fumes, Dust, and Fly Rock The plan states: "The blaster will not give the "all-clear" until completely satisfied that the gases have dispersed, and that the area is safe approach." It is unclear how BMC plans to achieve this or how gas levels will be sampled. Elaborate on the blasting process to make it clear how "all-clear" will be achieved and determined by appropriate personnel.	Hazardous Materials Management Plan	9.6	Added text on general procedure.
EMR Phase 2/3 IR Appendix C: Section 9.7 Misfires	Hazardous Materials	9.7	Added text specifically noting these regulations

Information Request/Intervention	Document	Section	Revision
Revision 03			
14.69 – 14.72 of the WHS Regulations must be followed when addressing any misfires. BMC to acknowledge the comment with revised wording.	Management Plan		
EMR Phase 2/3 IR Appendix D: Section 3 – Cyanide Handling, Storage and Use Engineering controls must be implemented to prevent workers from coming in direct contact with cyanide briquettes while mixing. BMC to acknowledge the comment with revised wording.	Hazardous Materials Management Plan	3	BMC confirms that the design does include engineering controls. For avoidance of doubt, have added text: "which includes application of engineering controls to prevent workers from coming into direct contact with cyanide briquettes while mixing".
EMR Phase 2/3 IR Appendix D: Section 3 – Cyanide Handling, Storage and Use The statement "During mixing the hood and ventilation equipment will operate under negative pressure so that any airborne NaCN dust cannot be released." is not consistent with the requirements outlined in section 8 of the Workplace Health Regulations, specifically items 1 through 4. BMC to Update the plan to reflect the requirements outlined in section 8 of the WHS.	Hazardous Materials Management Plan	3	BMC confirms that a local exhaust system for cyanide mixing is part of the design, and that all facilities will be designed in accordance with Territorial and Federal legislative requirements. For avoidance of doubt have added text: "Ventilation for the mixing area will be through a local exhaust ventilation system, in accordance with Section 8 of the Workplace Health Regulations".
EMR Phase 2/3 IR Appendix D: Section 4 The plan does not elaborate on the conditions set for health and safety within the process plant control room. It must be adequately ventilated and under positive pressure. HCN levels will need to be monitored and the plan does not outline clear methods of monitoring such as personal badges or stationary devices, nor how the monitoring requirements are determined or justified. Provide a discussion and additional details on the conditions of the process plant control room and HCN monitoring in the plant to ensure the health and safety of workers.	Hazardous Materials Management Plan	4	BMC confirms that the control room will be adequately ventilated under positive pressure and have added text saying the same. Have added text to clarify monitoring of HCN gas: "The reagent storage and cyanide mixing areas, as well as the NaCN dosing point into the lead flotation circuit will have fixed local audible and visual HCN alarm systems that will also relay an alarm signal to the process plant control room".
EMR Phase 2/3 IR Appendix D: Section 6.1 – Emergency Response Workers should never be exposed to HCN permissible levels outlined in Table 8 of the WHS Regulations. - "Process Plant or reagent mixing area HCN gas levels are above 10 ppm" Why has BMC chosen 10 ppm when ACGIH recommends 4.7 ppm. BMC to clarify HCN levels for response according to appropriate guidance.	Hazardous Materials Management Plan	6	Revised to 4.7ppm

LIST OF ACRONYMS AND ABBREVIATIONS

BMC	BMC Minerals Ltd.
HMMP	Hazardous Materials Management Plan
Kaska	Kaska First Nations
l	litres
SDS	Safety Data Sheet
NaHS	sodium hydrosulphide
PPE	personal protective equipment
WHMIS	Workplace Hazardous Materials Information System
YG	Yukon Government

GLOSSARY

ANFO: A widely used bulk industrial explosive mixture, comprising Ammonium Nitrate and No. 2 Fuel Oil.

Concentrate: A product containing metal from which most of the waste material has been removed.

Cryogenic Container: Double-walled vacuum vessel with multilayer insulation in the annular space, designed for the reliable and economic transportation and storage of liquefied gases at cryogenic temperatures, typically colder than -90 degrees Celsius.

Hazardous Material: A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a potential hazard to human health or the environment when it is improperly handled, used, stored, disposed of, spilled or otherwise managed.

Line Supervisor: A person responsible for the safety and operational control of a team of people working in a given function, section or department.

Safety Data Sheet (SDS): Is a document that contains information on the potential health effects of exposure to chemicals, or other potentially dangerous materials, and on safe working procedures when handling chemical products.

Personnel: Any person working at the Project site in any capacity whether as a direct employee of BMC or a contractor/subcontractor.

Workplace Hazardous Materials Information System (WHMIS): A comprehensive plan for providing information on the safe use of hazardous materials used in Canadian workplaces. Information is provided by means of product labels, SDS and worker education programs, in accordance with the Workplace Hazardous Materials Information System Regulations (2015).

TABLE OF CONTENTS

TABLES

FIGURES

LIST OF APPENDICES

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

BMC Minerals Ltd. (BMC) is the owner of the Kudz Ze Kayah Project (the Project). Since acquiring the project in 2015, BMC has actively engaged in assessing historical work, optimizing design, resource drilling, economic assessment, baseline environmental studies, and First Nations and community engagement as well as the successful completion of the Executive Committee Screening by the Yukon Environmental and Social-Economic Assessment Board.

1.2 OVERVIEW

The purpose of this Hazardous Materials Management Plan (HMMP) is to provide a consolidated source of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous materials that will be used during the Construction, Operations, and Closure phases of the Project. In combination with BMC's Emergency Response and Health and Safety Plan (BMC, 2026a) this HMMP also provides instruction on the prevention, detection, containment, response, and mitigations of accidents that could result during handling of hazardous materials at the Project. It should be noted that many of the hazardous materials discussed in this HMMP will be used in the extraction of metals in the Process Plant and consequently will not be shipped to or utilized on site until commencement of the Operations phase.

This HMMP is based on the following principles for management of hazardous materials:

- Purchasing controls – control of transport methods, appropriate packaging, transport schedules;
- Transport tracking procedures;
- Inventory controls on site – periodic inventory of materials in storage on site to determine usage and to identify and manage any unexpected loss;
- Maintenance of safe handling and storage procedures –Safety Data Sheet (SDS), Workplace Hazardous Material Information System (WHMIS), Transport of Dangerous Goods data and labelling;
- Clear allocation of responsibility for the management of transport, storage, handling and use of potentially hazardous materials;
- Defined methods for transport, storage, handling, and use;
- Identification of disposal methods for potentially hazardous waste generated from use of these products;
- Preparation of contingency and emergency response plans;
- Training for management, staff, and contractors whose responsibilities include handling potentially hazardous materials;

- Maintenance and review of records of hazardous material consumption and incidents to anticipate and avoid effects on human health and the environment; and
- Procedures to track and manage waste generated through use of these products, including regular transportation of potentially hazardous waste to appropriate licensed disposal facilities following all relevant regulatory requirements (packaging, labelling, inventory tracking and waste manifests).

BMC will require that the transportation, storage, handling and use of all chemicals to be used at the Project be conducted in a safe and efficient manner. Prevention, detection, containment, response, and mitigation are the key elements in the management of hazardous materials. BMC is committed to minimizing the potential for adverse environmental effects on terrestrial and aquatic biota and ecosystems that may result from accidental release. The first step in accomplishing this is to apply consistent practices towards the management of hazardous materials site-wide. BMC will incorporate hazardous material management procedures into its environmental management plans and systems for the Project to reduce risk of accidental release.

All hazardous materials will be sourced from reputable suppliers and will be delivered, stored, and handled in compliance with all applicable federal and territorial regulations. BMC is committed to preventing, to the extent possible, both inadvertent release of these materials to the environment and accidents resulting from mishandling. BMC will institute programs for employee training, Project site inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

All employees will be required to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees will also be expected to report any concerns to their supervisors, the Health and Safety Committee, or senior site management. All staff will be encouraged to bring forward suggestions for improvements that can be incorporated into procedure revisions as appropriate.

The management of hazardous materials is governed by the *Dangerous Goods Transportation Act* (YG, 2013) and the *Workers' Safety and Compensation Act* (YG, 2021) as well as the *Special Wastes Regulations* (YG, 2014) and *Storage Tank Regulations* of the *Environment Act* (YG, 2002).

Guidance documents used to develop this HMMP include (but are not limited to) the following:

- *Transportation of Dangerous Goods Regulations* (Government of Canada, 2019a);
- *Environmental Emergency Regulations* (Government of Canada, 2019b);
- A Field Guide to Fuel Handling, Transportation and Storage (BC Ministry of Water, Land and Air Protection, 2002);
- Standards and Best Practices for Instream Works (BC Ministry of Water, Land and Air Protection, 2004);
- Hazardous Waste Legislation Guide (BC Ministry of Environment, 2016);
- *Special Waste Regulations* (YG, 2014);

- *Hazardous Waste Regulation* (BC ENV, 2017);
- National Fire Code of Canada (National Research Council Canada, 2015);
- *Workers' Safety and Compensation Act* (YG, 2021);
- *Spills Regulations* (YG, 1996); and
- Workplace Hazardous Materials Information System (Health Canada, 2015).

1.3 PLAN REVIEW AND EXECUTION

BMC has had extensive engagement with Ross River Dena Council (RRDC) including community meetings in Ross River, Elders Oversight Committee Meetings, meetings with Chief and Council and engagement with RRDC's wholly owned environmental consultancy, Dena Cho Environmental and Remediation Inc. (Dena Cho). As part of this ongoing engagement, prior to this Plan being finalized Dean Cho conducted a detailed independent review of the draft plan. Issues raised during the Dena Cho review were addressed collaboratively through a number of workshops and where appropriate this plan was amended and additional commitments added.

BMC and Ross River Dena Council (in its role as lead community for the Kaska Nations, including Liard First Nation) are parties to an existing Socio-Economic Participation Agreement (SEPA) for the KZK Project. In 2019, BMC and RRDC signed a Letter of Intent committing the parties to a modernization process for the existing SEPA. In March 2021, BMC tabled a proposed modernized SEPA with all Kaska leadership. The proposed SEPA includes provision for establishment of a Kaska/BMC Environmental Management Advisory Committee (EMAC). Under the current proposal before Kaska, this committee will be tasked with, among other things, reviewing and providing input into environmental management plans, reporting on implementation of those plans, reviewing monitoring plans/results, and reviewing incident reports and reporting back to Kaska members.

2 HAZARDOUS MATERIALS IDENTIFICATION AND CLASSIFICATION

A number of hazardous materials will be used for various purposes and at various locations throughout the life of the Project.

The Project will typically use the following types of hazardous materials in the day to day operation of the Project:

- Fuel and Lubricants: fuel, oils, greases, anti-freeze, and solvents for power generation, building heating, equipment operation and maintenance;
- Explosives: ammonium nitrate-based blasting agents and explosives used for blasting in the mine;
- Process Plant and Water Treatment Plant reagents: Lime, flotation depressants, activators and collectors, frother, and flocculant;
- Laboratory chemicals: small volumes of various chemicals in the on site analytical laboratory to analyze rock and water samples for grade control, to monitor metallurgical performance and to monitor environmental performance. Laboratory chemicals are generally very limited in quantity and will be handled only by specialist lab technicians. Residues from laboratory analytical processes will be collected and stored at the laboratory and periodically sent off site for disposal in an approved facility; and
- Biomedical Wastes: sharps, swabs, human blood/fluid/tissue, used medical supplies.

A full catalogue of dangerous goods and hazardous materials will be maintained at the Project site in addition to SDS and WHMIS (YG, 2015) information on the products, so as to ensure that Project personnel have all the necessary information for safe transportation, use, handling, and disposal of dangerous goods and hazardous materials. Appendix A presents an example of the SDS inventory which will be maintained and updated by the Company. Before any product is brought to the site, the supplier or contractor will be required to supply SDS for the product that will then be added to the on site inventory. Appendix B provides an example of the type of list of the Personal Protective Equipment (PPE) requirements for handling each product and quick reference spill response, in the event of a spill for each product.

Hazardous materials will be stored on site in purpose-built designated facilities including fuel storage tanks, explosives magazines and the Process Plant reagent storage area. Where practicable, rotational inventories will be used so that older stock is used ahead of newer stock. The materials will be stored in an organized manner to ensure shelf lives are not exceeded and that minimal waste is incurred. A strict inventory control system will be implemented that documents items such as:

- Quantities remaining in stock, where practicable; and
- Minimum inventory levels.

All hazardous materials purchased will, where practicable, meet the following waste minimization and pollution prevention principles:

Could the material in question be substituted with something less toxic or non-toxic?

- If a hazardous material is requested for usage that could be substituted with a non-hazardous material that adequately and cost effectively meets the same purpose, the non-hazardous material will be purchased.

Are the correct quantities of hazardous materials being purchased?

- Quantities of materials will be managed to ensure that adequate amounts of materials are available for effective operation of the Mine, but that excess materials are not present that may impose a risk of wastage due to out of date inventory or an increased safety or environmental risk.

Will the purchasing vendor accept the return of used containers and/or the return of excess or obsolete materials?

- Where practicable, preference will be given to suppliers of hazardous materials which have policies for return of used containers, and/or the return of excess or obsolete materials. Minimization of waste materials will be a priority and will be taken into account during the purchasing stage of any potentially hazardous material.

Hazardous materials released during transportation, handling, storage, usage, distribution, and disposal have the potential to negatively affect the environment as well as the health of personnel handling those materials. The Spill Contingency Plan (BMC, 2026b) addresses the emergency protocols pertaining to accidental hazardous material release in the transportation, storage, handling, usage, distribution, and disposal of such hazardous materials will be trained in appropriate emergency response procedures.

2.1 FUELS AND LUBRICANTS

The Project will consume relatively large amounts of petroleum fuels, natural gas, oils, and lubricants (Table 2-1). These products will be transported, stored, handled, and consumed in compliance with applicable federal and territorial legislation, regulations, licences, and permits.

The transport, storage, and handling of fuel and lubricant products are strictly regulated by both federal and territorial legislation. BMC will ensure that all such requirements are met during the detailed design phase including risk assessments. BMC will implement a regular inspection programme of all storage and distribution facilities on site so as to assure the suitability and mechanical soundness of the facilities as an aid to preventing the release of fuels and lubricants into the environment.

Table 2-1: Estimated Fuels and Lubricants Usage and Storage Summary, Noting Applicable Legislation

Product	Usage	Usage/Year	Storage on Site	Storage Location	Container	Applicable Legislation
Diesel	Mine Vehicle Fuel	15 Million litres (l)	400,000 l	Mine Workshop, Camp	4 by 100,000 l bulk double lined tanks, 30,000 l tank at camp	Storage Tank Regulations
	Power Generation	1.4 Million l	227,000 l	Power Plant, Camp	2 by 113,500 l bulk double lined tanks, 30,000 l tank at camp	Storage Tank Regulations
Liquified Natural Gas	Power Generation	800,000 Gigajoule	300 m^3	Power Plant	3 by 100 m^3 cryogenic containers located in power plant compound	Oil and Gas Licence Administration Regulations
Aviation Fuel	Helicopter Fuel	40,000 l	30,000 l	Helicopter Pad	30,000 l in bulk tank, bermed and lined	Storage Tank Regulations
Gasoline	Small Engines and Vehicles	50,000 l	30,000 l	Mine Workshop, Camp	30,000 l bulk tank bermed and lined	Storage Tank Regulations
Propane	Heating, cooking and hot water	900,000 l	189,000 l	Camp, Mine Workshop, Process Plant Workshop	Approved propane tanks, ranging from 7,570 l (2000 US gallons) to 113,400 l (30,000 US gallons), with some smaller tanks as needed.	Gas Regulations
Motor Oil	Vehicles	110,000 l	8,000 l	Mine Workshop	1,000 l bulk containers or barrels stored in shipping containers on workshop pad	N/A
	Power Plant	60,000 l	8,000 l	Process Plant Workshop	1,000 l bulk containers or barrels stored at Process Plant Workshop	Storage Tank Regulations
Hydraulic Fluid	Vehicles	30,000 l	5,000 l	Mine Workshop	1,000 l bulk containers or barrels stored in sea containers on workshop pad	Storage Tank Regulations
Grease	Mine Vehicles	10,000 l	2,000 l	Mine and Process Plant Workshop	Pails and/or cartridges stored in workshops	N/A
Ethylene Glycol	Vehicle Coolant	2,000 l	1,000 l	Mine Workshop	Barrels stored in shipping container	N/A
Propylene Glycol	Heat Reclaim from Power Plant; Aircraft De-icing	2,000 l	80,000 l	Power Plant and Process Plant Workshop	2 by 40,000 l tanks in Power Plant as part of the heat reclaim circuit, 21,000 l bulk containers or barrels	Storage Tank Regulations

Note: Fuel/lubricant consumption, storage and containers are current estimates, and may change based on actual consumption, design revisions to ensure safety and efficiency of storage and usage, and tank availability, in accordance with applicable legislation.

The majority of vehicles on site will run on diesel fuel, however a minimal amount of gasoline will be stored and used on site for the purpose of powering small portable generators and pumps as well as the provision of emergency fuel for visiting vehicles. There will be aircraft de-icing equipment on site, and this will utilize propylene glycol stored in the Process Plant workshop area.

2.2 EXPLOSIVES

Explosives management is detailed in the Explosives Management Plan for the Project (Appendix C). The Explosives Management Plan details the specific requirements for transport, storage, use and disposal of the various explosive classes being used at the Project and associated record keeping and inventory control.

2.2.1 Types of Explosives to be Used on Site

BMC plans to use the following types of explosive materials and supplies in blasting operations:

- Bulk ammonium nitrate;
- Emulsion (bulk and packaged);
- Nitroglycerin based explosives;
- Cast pentaerythritol tetranitrate boosters;
- Non-electric, surface delay and in-hole detonator assembly;
- Non-electric, short delay, trunk-line assembly;
- Electronic detonators;
- Lead-in line (shock tube); and
- Detonating cord.

Descriptions of each type of explosive are provided in Appendix C.

2.3 PROCESS PLANT REAGENTS & CONSUMABLES

Reagents requiring handling, mixing, and distribution systems in the Process Plant are shown in Table 2-2. All reagents will be stored in the reagent mixing and storage area of the Process Plant (Figure 2-1), except for quicklime and paste fill binder which will be stored in a silo adjacent to the Process Plant. Dry reagents will be stored in a covered area, mixed in reagent tanks, and transferred to distribution tanks for process use. The reagent storage tanks will be equipped with volume level indicators and instrumentation for early leak detection and management. The reagent mixing and storage area has been designed as a wet area, with sloped concrete floors draining to sumps for containment. In addition, appropriate ventilation, fire, and safety protection will be implemented. If spills occur, the reagents will be collected in the sumps and pumped back to the relevant reagent storage tank. Reagent containers will be washed and recycled, if safe to do so. Containers that cannot be recycled will be stored in the Special Waste Storage area and returned to the manufacturer or disposed of at an approved facility in accordance with the Waste Management Plan (BMC, 2026c).

Small amounts of sodium cyanide will be used for ore processing. Transportation, handling, and disposal of cyanide will follow the systems and procedures outlined in the Cyanide Management Plan (Appendix D).

Table 2-2: Process Plant Reagents, Storage and Estimated Consumption

Reagent	Delivered Product Size	Storage Location	Use in Process Plant	Annual Consumption (tonnes)
Process Plant				
Quicklime	40 tonne bulk delivery	Lime silo	pH modifier	3,000
Sodium Metabisulphite	1,000 kg bulk bags	Reagent storage area	Copper circuit depressant	1,400
Zinc Sulphate	1,000 kg bulk bags	Reagent storage area	High Precious Metal circuit depressant	800
Aerophine 3418A	1,000 l bulk liquid box	Reagent storage area	High Precious Metal circuit collector	20
Copper Sulphate	1,000 kg bulk bags	Reagent storage area	Zinc circuit activator	1,300
Danafloat 262	1,000 l bulk liquid box	Reagent storage area	Zinc circuit collector	170
Flocculant	750 kg bulk bags	Reagent storage area	Flocculant	60
Sodium Cyanide	1,000 kg bulk bags	Reagent storage area	High Precious Metal circuit depressant	275
Danafloat 468	1,000 l bulk liquid box	Reagent storage shed	Copper circuit collector	65
Methyl Isobutyl Carbinol	1,000 l bulk liquid box	Reagent storage shed	Frother	140
Water Treatment Plant				
Hydrated lime	40 tonne bulk delivery	Water Treatment Plant Lime Silo	pH modifier	1,770
Ferric Sulphate	1,000 kg bulk bags	Water Treatment Plant reagent storage area	Water Treatment	70
Trimercapto-triazine	1,000 l bulk liquid box	Water Treatment Plant reagent storage area	Water Treatment	2
Sodium hydrosulphide	1,000 l bulk liquid box	Water Treatment Plant reagent storage area	Water Treatment	4
Sodium Hydroxide	1,000 kg bulk bags	Water Treatment Plant reagent storage area	Water Treatment	160
Sodium Sulphate	1,000 kg bulk bags	Water Treatment Plant reagent storage area	Water Treatment	540
Sulphuric Acid	1,000 l bulk liquid box	Water Treatment Plant reagent storage area	Water Treatment	120
Flocculant	1,000 kg bulk bags	Water Treatment Plant reagent storage area	Water Treatment	5

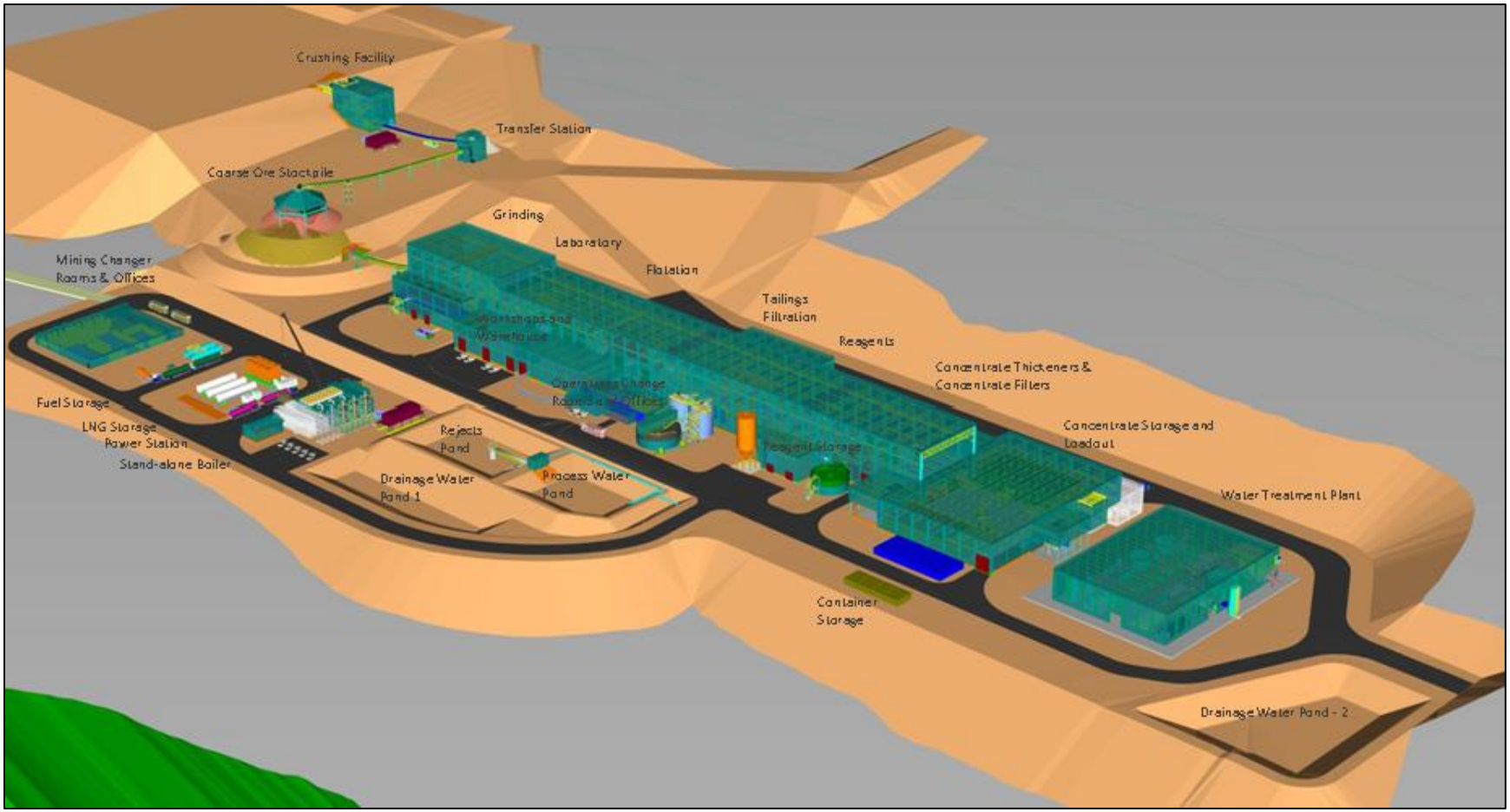

Figure 2-1: Process Plant Layout

2.4 BIOMEDICAL WASTE

A small amount of biomedical waste will be generated at the first aid room. Biomedical wastes will be collected and stored in designated purpose-built containers and disposed of primarily via incineration or at an approved off-site facility (e.g., for waste sharps). Biomedical waste containers will be leak resistant, tightly sealed, puncture resistant, color coded and will be stored in a locked facility within the first aid room only accessible by trained medical personnel. Biomedical waste containers will be color coded as follows:

- Human Anatomical — Red;
- Animal — Orange;
- Human blood and bodily fluid — Yellow; and
- Waste sharps — Yellow.

2.5 LOCATION OF HAZARDOUS MATERIALS MANAGEMENT PLAN AND ASSOCIATED DOCUMENTATION

Signage with standard WHMIS (YG, 2015) symbols will be placed at all hazardous material storage areas to identify the type of material present. Safety Data Sheets (SDS) for each product will be available at all locations where hazardous materials are stored.

This HMMP (or later revisions) and all site SDS's will be available at the following locations (at a minimum):

- Medical center at accommodation camp;
- Process Plant reagent storage area;
- Mine workshop;
- Mine first aid/medical center;
- Water Treatment Plant office;
- Mine office; and
- Mine rescue center.

3 EMPLOYEE TRAINING

Training relating to management of safety, health and the environment will be standardized, maintained, and updated on a regular basis to ensure staff are adequately educated and informed about potential hazards (including those from hazardous materials). Records of all worker health and safety training will be maintained in accordance with applicable legislation.

3.1 GENERAL

All personnel and site visitors will undergo an appropriate Project orientation during which they will, if required, receive training on the proper handling, use, storage, transportation, spill identification, reporting requirements, and clean-up of hazardous materials.

Task specific training will address specific materials a worker will encounter during their normal duties and the requirements for safe material handling, storage, disposal, PPE, and clean-up in the event of a spill. Each worker will be required to show competence in managing each hazardous material prior to being allowed to commence duties in their specific work area. Experienced personnel will train and mentor newly hired personnel on proper hazardous materials management.

BMC will ensure that the SDS for all products are present and available for workers in areas where hazardous materials are stored.

All employees (and contractors) involved with handling hazardous materials will receive training on safe and appropriate use as per WHMIS from the Workplace Hazardous Materials Information System Regulation (2015). All employees will follow these requirements including use of appropriate PPE as well as proper handling procedures when handling hazardous materials.

All employees (and contractors) will be supplied with the proper PPE when required to handle hazardous materials. Employees will be trained in proper use of PPE, as required. Employees will be trained in the proper use of specialized PPE when handling, storing, or disposing of certain types of hazardous material. In the event of accidental exposure to the hazardous material, first aid will be administered as directed in the SDS and dependent on the severity of the exposure. Emergency response procedures are detailed further in the Emergency Response and Health and Safety Plan (BMC, 2026a).

Regular safety meetings with supervisors, safety officers, and employees will be mandated. Any changes in procedures, equipment, or potential hazards will require notification to employees.

3.1.1 Fuel & Lubricants Handlers

Personnel who handle fuel and lubricants will be expected to be conversant with relevant SDS information. As well, these personnel will be given training in the following:

- Transportation of dangerous goods;
- Fuel handling procedures;

- Spill response and cleanup procedures for petroleum products; and
- Emergency response, especially firefighting procedures.

3.1.2 Explosives Handlers

Only trained and certified personnel will work with explosives. BMC will arrange for formal training and on-the-job training to ensure compliance with appropriate legislation. Training requirements will include (but will not necessarily be limited to):

- Specific fire procedures as per the *Explosives Act* (Government of Canada, 2015);
- First aid; and
- Transportation of dangerous goods.

All blasting personnel will be required to have a valid Blaster's Permit or Temporary Blaster's Permit that is issued in accordance with Part 14 of the *Workers' Safety and Compensation Act* (YG, 2021). Detailed handling procedures are contained in Appendix C.

3.1.3 Process Plant Employees

In addition to the site wide general training, all Process Plant employees, including Water Treatment Plant operators, will be trained in specific hazards of the chemicals that will be handled in the Process Plant and required safety measures to be undertaken including minimum PPE to be worn. All process personnel will be trained in spill and emergency response procedures.

3.2 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

All personnel will receive WHMIS basic training as part of Project orientation, regardless of their role or requirement to handle hazardous materials. This training will be renewed no longer than every three years. The training will include, but is not limited to:

- How to identify hazardous materials;
- How to identify the risks and hazards associated with hazardous materials;
- How to safely use, handle, store, and dispose of hazardous materials;
- What the different WHMIS hazard classes, categories, and symbols are;
- Proper segregation of different classes and categories of hazardous wastes;
- Labeling requirements for hazardous materials;
- Review of Safety Data Sheets;
- Inspection requirements;
- Spill response procedures;
- PPE requirements;

- Emergency response including the location of fire extinguishers and first aid equipment; and
- Implementation of monitoring systems in hazardous material storage areas.

3.3 TRANSPORTATION OF DANGEROUS GOODS

The transportation of hazardous materials in Yukon is regulated by the *Dangerous Goods Transportation Act* (YG, 2013) and the federal *Transport of Dangerous Goods Regulations* (Government of Canada, 2019) and the *Special Waste Regulations* (YG, 2014). All Project personnel responsible for transporting any good considered hazardous under the *Transportation of Dangerous Goods Act* (YG, 2013) will be required to have a valid Transportation of Dangerous Goods certificate and provide a spill response plan prior to the start of work. The transporter will be required to ensure:

- Appropriate SDS's accompany all goods and materials;
- Non-compatible materials will be transported in separate shipments;
- Fire extinguisher and fire prevention materials will be adequate and appropriate for the material being transported;
- Containers will be appropriate for the material being shipped;
- Containers will be properly secured;
- Containers and trucks will be properly marked, labelled, and placarded;
- Manifests will be maintained in accordance with federal and provincial/territorial regulations;
- Spill response materials will be adequate and appropriate for the materials being transported; and
- Drivers will be adequately trained and equipped for spill first response, containment, and communication.

3.4 PERSONAL PROTECTIVE EQUIPMENT

BMC will provide PPE to its employees, and contractors will be required to supply PPE to their employees. At a minimum, all employees and contractors will be required to wear Canadian Standards Association approved PPE as specifically required for various locations and tasks based on site PPE standards. Additionally, specific PPE requirements for hazardous materials will be required and will be selected based on information presented on the SDS for the material.

4 HAZARDOUS MATERIALS SEGREGATION AND STORAGE

Hazardous materials will be stored in appropriate containers in appropriate contained areas that comply with WHMIS. A figure outlining all hazardous material storage locations at the site will be developed as part of the in the final design of the Project and will be added to this Plan.

General handling and storage measures that will be implemented to avoid, control, and mitigate risk include:

- Manufacturers will provide safe packaging and labelling for packaged materials, as a condition of purchase agreements;
- Storage areas will be appropriately climate-controlled, dry, and well-ventilated;
- Containers holding the materials will remain sealed to prevent accidental leakage and/or spillage;
- Incompatible chemicals will be stored separately to prevent deleterious chemical reactions and cross contamination;
- Chemical storage areas will be designated as non-smoking areas and will be located away from food storage areas;
- All personnel handling dangerous goods will be trained and provided with appropriate PPE;
- All bulk chemical storage sites will be constructed with concrete or lined floors and walls capable of containing 110% of the volume of the largest vessel in the area or as stipulated by appropriate legislation or permits; and
- Storage of bulk fuel will be in double walled tanks of steel construction.

Monitoring and inspections of hazardous materials and hazardous materials storage facilities will be conducted on a scheduled basis by properly trained personnel with support provided by the on site Safety and/or Environmental Departments. During each inspection, a Hazardous Materials Inspection Form will be completed which will note the general observations, deficiencies (e.g. improper storage of hazardous materials, spills of materials, potential hazards in storage areas) and required remedial action. Prior to conducting a new inspection, the relevant departmental supervisor will review the form from the most recent inspection to see if remedial actions were required, with support provided as required by the site Safety and/or Environmental Departments. An example reagent mixing, and storage area inspection form is included in Appendix E.

5 HAZARDOUS MATERIALS DISPOSAL

The following provides a brief overview of the procedures that will be followed for the disposal of hazardous materials. Hazardous materials will be disposed of in accordance with all applicable legislation.

Temporary storage of hazardous materials and wastes, other than waste oil will take place within the Waste Management Facility as detailed in the Waste Management Plan (BMC, 2026c). Waste oil will be stored in the waste oil tank adjacent to the mine workshop. Both locations are at least 15 m from the ordinary high water mark of any non-fish bearing water body and 30 m for fish bearing water bodies.

Appropriate records will be maintained for the handling and disposal of hazardous materials, including:

- Inventories of types and volumes of wastes generated, stored and removed;
- Manifests identifying licensed waste haulers and disposal destinations; and
- Disposal certification documentation.

5.1 FUELS, LUBRICANTS FILTERS

The majority of the waste generated in this class will be waste engine oil and hydraulic oil, generated by periodic oil changes in the power generating plant and mobile equipment. Waste oil will be handled in two ways: by collection and disposal via incineration in the Waste Oil Burner for the purpose of space heating in the Mine Workshop or stored in a waste oil tank in the Mine Workshop and periodically removed from site. The waste oil will not be burned unless it conforms with the acceptable contaminant levels in waste oil as defined in the *Special Waste Regulations* (YG, 2014), Table 5-1.

Table 5-1: Waste Oil Maximum Concentrations

Contaminant	Maximum Concentration (mg/kg)
Arsenic	5.0
Cadmium	2.0
Chromium	10
Lead	50
Total organic halogens	1,000
PCB's	2

Used oil filters and fuel filters will be drained prior to transport off site to a licensed recycling or disposal facility. Steps required for proper disposal will include puncturing the top of the filter, setting the filter in a tray, and allowing the oil or fuel to drain for approximately 24 hours. Used filters

will be stored and drained in the Temporary Special Waste Storage area until ready for transportation off site for disposal, per the Waste Management Plan (BMC, 2026c).

Small amounts of waste diesel, if any, may be mixed with the oil and consumed by the Waste Oil Burner. Larger amounts of waste diesel will be stored in barrels and transported off site in bulk, in the unlikely event that large amounts are generated.

Waste antifreeze, brake fluid and contaminated waste oil (per the *Special Waste Regulations*) from heavy equipment maintenance and the power generation plant will be stored in labelled appropriate containers in the Special Waste Storage Pad prior to off site disposal.

5.2 EXPLOSIVES

With appropriate inventory control and storage of explosive materials there will be limited requirements for disposal of waste explosive material. In all cases consultation with the explosives manufacturer and Explosives Regulatory Division of Natural Resources Canada will be conducted prior to disposal. The two likely methods of explosives disposal are destruction by detonation or combustion. The primary method of disposal will be to detonate small amounts of damaged explosives in a blast hole as part of a production blast. This will be undertaken providing the explosives are still in good condition and can be transported to a production blast. Combustion is another method of disposal and will be undertaken in a remote location, as there remains the chance of explosion during the burning process. During combustion, only one type of explosive is to be disposed of at a time. Special attention will be given to make sure no detonation devices are burned along with the explosives. Initiation devices are best disposed of by detonation at a location separate from the disposal site of the other explosives. Additional details can be found in Appendix C.

5.3 PROCESS PLANT REAGENTS

With appropriate inventory management and handling procedures, reagent waste will be minimal. Small amounts of deteriorated reagents will be added into the appropriate circuit of the Process Plant to be consumed and ultimately included in the tailings stream. In the unlikely event that large amounts of reagents that are not suitable for use in the Process Plant, then these will be stored in the reagent storage facility in appropriately labelled containers and then shipped off site for disposal, preferably to the original supplier for recycling.

Empty reagent containers will be cleaned and repurposed, if feasible, or they will be stored at the Waste Management Facility Prior to shipment off site, to the original supplier.

6 SPILL PREVENTION AND RESPONSE

Most spills of hazardous materials are likely to be small and site personnel will have sufficient training and materials to safely and properly clean the spill up. However, the Project will have an Emergency Response Team available if there is a large spill of hazardous materials that could pose a danger to personnel, the environment, or Project infrastructure. Additional information on spill and emergency response is outlined in the Spill Contingency Plan (BMC, 2026b) and Emergency Response and Health and Safety Plan (BMC, 2026a).

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APPENDIX A: SDS SHEETS

Acetone

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 11/12/1998 Revision date: 04/24/2018 Supersedes: 04/24/2018 Version: 1.3

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Acetone
Chemical name	:	2-Propanone
CAS-No.	:	67-64-1
Product code	:	LC10420, LC10425
Formula	:	C3H6O
Synonyms	:	2-propanone / beta-ketopropane / dimethyl formaldehyde / dimethyl ketone / dimethylketal / DMK (=dimethyl ketone) / keto propane / methyl ketone / pyroacetic acid / pyroacetic ether / pyroacetic spirit

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Solvent Cleaning product Chemical raw material
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem, Inc.

Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court

Zelienople, PA 16063 - USA

T 412-826-5230 - F 724-473-0647

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flammable liquids Category 2	H225	Highly flammable liquid and vapour
Serious eye damage/eye irritation Category 2A	H319	Causes serious eye irritation
Specific target organ toxicity (single exposure) Category 3	H336	May cause drowsiness or dizziness

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS US labeling

Hazard pictograms (GHS US) :

GHS02 GHS07

Signal word (GHS US) : Danger

Hazard statements (GHS US) :
H225 - Highly flammable liquid and vapour
H319 - Causes serious eye irritation
H336 - May cause drowsiness or dizziness

Precautionary statements (GHS US) :
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking.
P233 - Keep container tightly closed.
P240 - Ground/bond container and receiving equipment.
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P242 - Use only non-sparking tools.
P243 - Take precautionary measures against static discharge.
P261 - Avoid breathing mist, spray, vapors.

P264 - Wash exposed skin thoroughly after handling.
P271 - Use only outdoors or in a well-ventilated area.
P280 - Wear eye protection, face protection, protective clothing, protective gloves.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use dry chemical powder, alcohol-resistant foam, carbon dioxide (CO2) to extinguish
P403+P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations
P235 - Keep cool.

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Acetone (Main constituent)	(CAS-No.) 67-64-1	100	Flam. Liq. 2, H225 Eye Irrit. 2A, H319 STOT SE 3, H336

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water. Soap may be used. Do not apply (chemical) neutralizing agents. Remove clothing before washing. Take victim to a doctor if irritation persists.

First-aid measures after eye contact : Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Do not apply neutralizing agents. Take victim to an ophthalmologist if irritation persists.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not give milk/oil to drink. Do not induce vomiting. Give activated charcoal. Call Poison Information Centre (www.big.be/antigif.htm). Consult a doctor/medical service if you feel unwell. Ingestion of large quantities: immediately to hospital. Doctor: gastric lavage.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : Not expected to present a significant hazard under anticipated conditions of normal use.

Symptoms/effects after inhalation : EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Irritation of the respiratory tract. Nausea. Vomiting. Headache. Central nervous system depression. Dizziness. Narcosis. Excited/restless. Drunkenness. Disturbed motor response. Respiratory difficulties. Disturbances of consciousness.

Symptoms/effects after skin contact : ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.

Symptoms/effects after eye contact : Irritation of the eye tissue.

Symptoms/effects after ingestion	:	Dry/sore throat. Risk of aspiration pneumonia. Symptoms similar to those listed under inhalation. AFTER ABSORPTION OF LARGE QUANTITIES: Irritation of the gastric/intestinal mucosa. Change in the blood composition. Change in urine output. Renal disease. Enlargement/disease of the liver.
Symptoms/effects upon intravenous administration	:	Not available.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Skin rash/inflammation. Dry/sore throat. Headache. Nausea. Feeling of weakness. Loss of weight. Possible inflammation of the respiratory tract.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media	:	Quick-acting ABC powder extinguisher. Quick-acting BC powder extinguisher. Quick-acting class B foam extinguisher. Quick-acting CO2 extinguisher. Class B foam (alcohol-resistant). Water spray if puddle cannot expand.
Unsuitable extinguishing media	:	Water (quick-acting extinguisher, reel); risk of puddle expansion. Water; risk of puddle expansion.

5.2. Specific hazards arising from the chemical

Fire hazard	:	DIRECT FIRE HAZARD. Highly flammable liquid and vapour. Gas/vapor flammable with air within explosion limits. INDIRECT FIRE HAZARD. May be ignited by sparks. Gas/vapor spreads at floor level: ignition hazard. Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard	:	DIRECT EXPLOSION HAZARD. Gas/vapour explosive with air within explosion limits. INDIRECT EXPLOSION HAZARD. Heat may cause pressure rise in tanks/drums: explosion risk. may be ignited by sparks. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistant risk of physical explosion.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Protective goggles. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus.
Emergency procedures	:	Keep upwind. Mark the danger area. Consider evacuation. Seal off low-lying areas. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosion-proof appliances and lighting equipment. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Ventilate area.

6.2. Environmental precautions

Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Measure the concentration of the explosive gas-air mixture. Dilute/disperse combustible gas/vapour with water curtain. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills.
Methods for cleaning up	:	Take up liquid spill into inert absorbent material, e.g.: sand, earth, vermiculite. Scoop absorbed substance into closing containers. Spill must not return in its original container. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Measure the concentration in the air regularly. Work under local exhaust/ventilation. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Handle uncleaned empty containers as full ones. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Do not use compressed air for pumping over. Keep container tightly closed.

Hygiene measures : Do not eat, drink or smoke when using this product. Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep only in the original container in a cool, well ventilated place away from : Heat sources, Direct sunlight, incompatible materials. Keep container closed when not in use.

Incompatible products : Strong bases. Strong acids.

Incompatible materials : Sources of ignition. Direct sunlight.

Storage temperature : 15 - 20 °C

Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.

Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. reducing agents. strong acids. (strong) bases. halogens. amines.

Storage area : Store in a cool area. Keep out of direct sunlight. Store in a dry area. Store in a dark area. Ventilation at floor level. Fireproof storeroom. Provide for an automatic sprinkler system. Provide for a tub to collect spills. Provide the tank with earthing. Meet the legal requirements.

Special rules on packaging : SPECIAL REQUIREMENTS: closing. with pressure relief valve. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: steel. stainless steel. carbon steel. aluminium. iron. copper. nickel. bronze. glass. MATERIAL TO AVOID: synthetic material.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Acetone (67-64-1)		
ACGIH	ACGIH TWA (ppm)	250 ppm
ACGIH	ACGIH STEL (ppm)	500 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	590 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	250 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses. Gloves. Protective clothing. Face shield. High gas/vapor concentration: gas mask with filter type A.

Materials for protective clothing:

GIVE GOOD RESISTANCE: butyl rubber. tetrafluoroethylene. GIVE LESS RESISTANCE: chlorosulfonated polyethylene. natural rubber. neoprene. polyurethane. PVA. styrene-butadiene rubber. GIVE POOR RESISTANCE: nitrile rubber. polyethylene. PVC. viton. nitrile rubber/PVC

Hand protection:

Gloves

Eye protection:

Safety glasses

Skin and body protection:

Head/neck protection. Protective clothing

Respiratory protection:

Full face mask with filter type AX at conc. in air > exposure limit

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquid.
	:	Colourless
	:	Aromatic odour Sweet odour Fruity odour
Odor threshold	:	No data available
pH	:	7 (10 g/L)
Melting point	:	-95 °C
Freezing point	:	No data available
Boiling point	:	56 °C
Critical temperature	:	235 °C
Critical pressure	:	47010 hPa
Flash point	:	-17 °C (Closed cup)
Relative evaporation rate (butyl acetate=1)	:	6
Relative evaporation rate (ether=1)	:	2
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	247 hPa (20 °C)
Vapor pressure at 50 °C	:	828 hPa
Relative vapor density at 20 °C	:	2
Relative density	:	0.79
Relative density of saturated gas/air mixture	:	1.2
Specific gravity / density	:	786 kg/m³
Molecular mass	:	58.08 g/mol
Solubility	:	Soluble in water. Soluble in ethanol. Soluble in ether. Soluble in dimethyl ether. Soluble in petroleum spirit. Soluble in chloroform. Soluble in dimethylformamide. Soluble in oils/fats. Water: complete Ethanol: complete Ether: complete
Log Pow	:	-0.24 (Test data)
Auto-ignition temperature	:	465 °C
Decomposition temperature	:	No data available
Viscosity, kinematic	:	0.417 mm²/s
Viscosity, dynamic	:	0.32 mPa·s (20 °C)
Explosion limits	:	2 - 12.8 vol % 60 - 310 g/m³ Lower explosive limit (LEL): 2 vol % UEL: 12.8 vol %
Explosive properties	:	No data available.
Oxidizing properties	:	None.

9.2. Other information

Minimum ignition energy	:	1.15 mJ
Specific conductivity	:	6000000 pS/m (25 °C)
Saturation concentration	:	589 g/m³
VOC content	:	100 %
Other properties	:	Gas/vapour heavier than air at 20°C. Clear. Highly volatile. Neutral reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Violent to explosive reaction with many compounds. Prolonged storage: on exposure to light: release of harmful gases/vapours.

10.2. Chemical stability

Unstable on exposure to light.

10.3. Possibility of hazardous reactions

Reacts with (strong) oxidizers.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong acids. Strong bases. Strong oxidizers.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Inhalation; Skin and eye contact
Acute toxicity	:	Not classified

Acetone (67-64-1)	
LD50 oral rat	5800 mg/kg (Equivalent or similar to OECD 401, Rat, Female, Experimental value, Oral)
LD50 dermal rabbit	20000 mg/kg (Equivalent or similar to OECD 402, Rabbit, Male, Experimental value, Dermal)
LC50 inhalation rat (mg/L)	76 mg/L (Other, 4 h, Rat, Female, Experimental value, Inhalation (vapours))
ATE US (oral)	5800 mg/kg body weight
ATE US (dermal)	20000 mg/kg body weight
ATE US (gases)	30000 ppmV/4h
ATE US (vapors)	71 mg/L/4h
ATE US (dust, mist)	71 mg/L/4h

Skin corrosion/irritation	:	Not classified pH: 7 (10 g/L)
Serious eye damage/irritation	:	Causes serious eye irritation. pH: 7 (10 g/L)
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified Based on available data, the classification criteria are not met
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified Based on available data, the classification criteria are not met
Specific target organ toxicity – single exposure	:	May cause drowsiness or dizziness.
Specific target organ toxicity – repeated exposure	:	Not classified
Aspiration hazard	:	Not classified
Potential Adverse human health effects and symptoms	:	Based on available data, the classification criteria are not met.

Symptoms/effects after inhalation	:	EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Irritation of the respiratory tract. Nausea. Vomiting. Headache. Central nervous system depression. Dizziness. Narcosis. Excited/restless. Drunkenness. Disturbed motor response. Respiratory difficulties. Disturbances of consciousness.
Symptoms/effects after skin contact	:	ON CONTINUOUS EXPOSURE/CONTACT: Dry skin. Cracking of the skin.
Symptoms/effects after eye contact	:	Irritation of the eye tissue.
Symptoms/effects after ingestion	:	Dry/sore throat. Risk of aspiration pneumonia. Symptoms similar to those listed under inhalation. AFTER ABSORPTION OF LARGE QUANTITIES: Irritation of the gastric/intestinal mucosa. Change in the blood composition. Change in urine output. Renal disease. Enlargement/disease of the liver.
Symptoms/effects upon intravenous administration	:	Not available.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Skin rash/inflammation. Dry/sore throat. Headache. Nausea. Feeling of weakness. Loss of weight. Possible inflammation of the respiratory tract.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.
Ecology - air	:	Not included in the list of substances which may contribute to the greenhouse effect (IPCC). Not included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014). Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).
Ecology - water	:	Not harmful to crustacea. Not harmful to fishes. Inhibition of activated sludge. Not harmful to algae. Not harmful to plankton.

Acetone (67-64-1)	
LC50 fish 1	5540 mg/L (EU Method C.1, 96 h, Salmo gairdneri, Static system, Fresh water, Experimental value, Nominal concentration)

12.2. Persistence and degradability

Acetone (67-64-1)	
Persistence and degradability	Biodegradable in the soil. Biodegradable in the soil under anaerobic conditions. Readily biodegradable in water.
Biochemical oxygen demand (BOD)	1.43 g O_2/g substance
Chemical oxygen demand (COD)	1.92 g O_2/g substance
ThOD	2.2 g O_2/g substance
BOD (% of ThOD)	0.872 (20 day(s), Literature study)

12.3. Bioaccumulative potential

Acetone (67-64-1)	
BCF fish 1	0.69 (Pisces)
BCF other aquatic organisms 1	3 (BCFWIN, Calculated value)
Log Pow	-0.24 (Test data)
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

Acetone (67-64-1)	
Surface tension	0.0237 N/m
Ecology - soil	No (test)data on mobility of the substance available.

12.5. Other adverse effects

Other information	:	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Do not discharge into drains or the environment. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle by distillation. Incinerate under surveillance with energy recovery.

Additional information : Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1090 Acetone, 3, II

UN-No.(DOT) : UN1090

Proper Shipping Name (DOT) : Acetone

Transport hazard class(es) (DOT) : 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 3 - Flammable liquid

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102) : IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized.
T4 - 2.65 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 150

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

DOT Vessel Stowage Location : B - (i) The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) ‘‘On deck only’’ on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded.

Other information : No supplementary information available.

Transportation of Dangerous Goods

Transport document description : UN1090 ACETONE, 3, II

UN-No. (TDG) : UN1090

Proper Shipping Name (Transportation of Dangerous Goods) : ACETONE

TDG Primary Hazard Classes : 3 - Class 3 - Flammable Liquids

Packing group : II - Medium Danger

Explosive Limit and Limited Quantity Index : 1 L

Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index : 5 L

Passenger Carrying Ship Index : Forbidden

Transport by sea

Transport document description (IMDG)	:	UN 1090 acetone, 3, II
UN-No. (IMDG)	:	1090
Proper Shipping Name (IMDG)	:	acetone
Class (IMDG)	:	3 - Flammable liquids
Packing group (IMDG)	:	II - substances presenting medium danger
EmS-No. (1)	:	F-E
EmS-No. (2)	:	S-D

Air transport

Transport document description (IATA)	:	UN 1090 Acetone, 3, II
UN-No. (IATA)	:	1090
Proper Shipping Name (IATA)	:	Acetone
Class (IATA)	:	3 - Flammable Liquids
Packing group (IATA)	:	II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Acetone (67-64-1)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	5000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Fire hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

Acetone (67-64-1)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Acetone (67-64-1)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

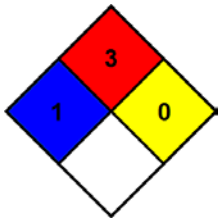
SECTION 16: Other information

Revision date	:	04/24/2018
Other information	:	None.

Full text of H-phrases: see section 16:

H225	Highly flammable liquid and vapour
H319	Causes serious eye irritation
H336	May cause drowsiness or dizziness

NFPA health hazard	:	1 - Materials that, under emergency conditions, can cause significant irritation.
NFPA fire hazard	:	3 - Liquids and solids (including finely divided suspended solids) that can be ignited under almost all ambient temperature conditions.
NFPA reactivity	:	0 - Material that in themselves are normally stable, even under fire conditions.



Hazard Rating

Health	:	1 Slight Hazard - Irritation or minor reversible injury possible
Flammability	:	3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)
Physical	:	0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.
Personal protection	:	C C - Safety glasses, Gloves, Synthetic apron

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Material Safety Data Sheet

LA0018
Aero ® 5100 Promoter

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Id: LA0018
Product Name: Aero ® 5100 Promoter
Synonyms: None
Chemical Family: None Known
Application: Mining chemicals.

Distributed By:
Univar Canada Ltd.
9800 Van Horne Way
Richmond, BC
V6X 1W5

Prepared By: The Safety, Health and Environment Department of Univar Canada Ltd.
Preparation date of MSDS: 10/29/2004
Telephone number of preparer: 1-866-686-4827

24-Hour Emergency Telephone Number (CHEMTREC): (800) 424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS

Ingredients	Percentage (W/W)	LD50s and LC50s Route & Species:
Modified thionocarbamate (#1) Proprietary	60-100	Oral LD50 : >700 mg/kg (rat) Dermal LD50 :>2000 mg/kg
Isobutanol 78-83-1	3-7	Oral LD50 (Rat) 2460 mg/kg Dermal LD50 (Rabbit) 3400 mg/kg
Butanol, sec 78-92-2	3-7	Oral LD50 (rat) 2193 mg/kg

Notes: Under the Hazardous Materials Information Review Act, a claim for exemption was filed for this product on January 26, 2004 and was assigned registry number 5875.

3. HAZARDS IDENTIFICATION

Potential Acute Health Effects:
Eye Contact: Causes mild eye irritation.
Skin Contact: Causes moderate skin irritation. Repeated or prolonged dermal contact with this material may cause allergic skin reactions.
Inhalation: Overexposure to vapours may cause irritation of the respiratory tract and may cause central nervous system effects.

Ingestion: Not available.

4. FIRST AID MEASURES

Eye Contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Contact: In case of contact, immediately flush skin with plenty of water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.
Inhalation: Remove person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, get immediate medical attention.
Ingestion: Do NOT induce vomiting. Never give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs.
Notes to Physician: Treatment based on sound judgment of physician and individual reactions of patient.

5. FIRE FIGHTING MEASURES

Flash Point: 47 °C / 116 °F
Flash Point Method: Tag Closed Cup
Autoignition Temperature: 344 °C / 651 °F
Flammable Limits in Air (%): Not Available.
Extinguishing Media: Use DRY chemicals, CO2, alcohol foam or water spray.
Special Exposure Hazards: Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure build-up which could result in container rupture.
Hazardous Decomposition Materials (under fire conditions): Oxides of carbon. Oxides of sulfur. Oxides of nitrogen.
Special Protective Equipment: Fire fighters should wear full protective clothing, including self-contained breathing equipment.
NFPA RATINGS FOR THIS PRODUCT ARE: HEALTH 2, FLAMMABILITY 2, REACTIVITY 0
HMIS RATINGS FOR THIS PRODUCT ARE: Not Available.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures: Wear appropriate protective equipment.
Environmental Precautionary Measures: Prevent entry into sewers or streams, dike if needed. Consult local authorities.
Procedure for Clean Up: Isolate hazard area and restrict access. Stop leak only if safe to do so. Remove ignition sources and work with non-sparking tools. Small spills: soak up with absorbent material and scoop into containers. Large spills : prevent contamination of waterways. Dike and pump into suitable containers. Clean up residual with absorbent material, place in appropriate container and flush with water.

7. HANDLING AND STORAGE

Handling: Flammable. For industrial use only. Handle and open containers with care. Avoid contact with eyes, skin and clothing. Do not ingest. Avoid inhalation of chemical. DO NOT handle or store near an open flame, heat, or other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. DO NOT pressurize, cut, heat, or weld containers. Empty containers may contain hazardous product residues. Keep the containers closed when not in use. Launder contaminated clothing prior to reuse. Protect against physical damage. Use appropriate personnel protective equipment. Wash thoroughly after handling.
Storage: Store in a cool, dry, well ventilated area, away from heat and ignition sources. Store in accordance with good industrial practices. Place away from incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Utilize a closed system process where feasible. Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.
Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH approved respirator. In case of spill or leak resulting in unknown concentration, use NIOSH approved supplied air respirator.
Gloves: Appropriate chemical resistant gloves should be worn.
Skin Protection: Skin contact should be prevented through the use of suitable protective clothing, gloves and footwear, selected for conditions of use and exposure potential. Consideration must be given both to durability as well as permeation resistance.
Eyes: Chemical goggles; also wear a face shield if splashing hazard exists.
Other Personal Protection Data: Ensure that eyewash stations and safety showers are proximal to the work-station location.

Ingredients	Exposure Limit - ACGIH	Exposure Limit - OSHA	Immediately Dangerous to Life or Health - IDLH
Modified thionocarbamate (#1)	Not available.	Not available.	Not Available.
Isobutanol	50 ppm TLV-TWA	150 mg/m³ TWA 50 ppm TWA	1600 ppm
Butanol, sec	100 ppm TLV-TWA	100 ppm TWA 305 mg/m³ TWA	2000 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Color: Orange - Brown
Odor: Garlic
pH Not Available.
Specific Gravity: 0.994 @ 25 °C
Boiling Point: Not Available.
Freezing/Melting Point: 226 °C / 439 °F
Vapor Pressure: 7.9 Pa @ 25 °C
Vapor Density: Not Available.
% Volatile by Volume: 13%
Evaporation Rate: Not Available.
Solubility: Water:- 497 mg/L
VOCs: Not Available.
Viscosity: Not Available.
Molecular Weight: Not Available.

10. STABILITY AND REACTIVITY

Chemical Stability: Stable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid excessive heat, open flames and all ignition sources.
Materials to Avoid: Strong oxidizing agents. Strong acids. Strong alkalis.
Hazardous Decomposition Products: Oxides of nitrogen. Oxides of sulfur. Oxides of carbon.
Additional Information: No additional remark.

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion: Not available.
Skin Contact: Causes moderate skin irritation. Repeated or prolonged dermal contact with this material may cause allergic skin reactions.
Inhalation: Overexposure to vapours may cause irritation of the respiratory tract and may cause central nervous system effects.
Eye Contact: Causes mild eye irritation.

Additional Information: Acute overexposure to 2-butanol vapor may cause eye irritation and central nervous system depression. Direct eye contact will cause severe irritation. Prolonged or repeated contact with skin can cause defatting and drying of skin which can cause irritation. Modified thionocarbamate (#1) produced mild eye and moderate skin irritation in animal studies. Skin sensitization was produced in tests with guinea pigs. In a 28 day oral (rat) toxicity study, systemic toxicity was observed at 150 mg/kg/day, with some treatment related effects at 50 mg/kg/day and 15 mg/kg/day. No suitable NOEL could be established due to the occurrence of treatment related changes at 15 mg/kg/day. Acute overexposure to isobutanol vapor can cause irritation to the eyes (severe), skin (moderate), and mucous membranes, as well as, central nervous system depression. Direct contact with isobutanol may cause severe eye and mild to moderate skin irritation.

Acute Test of Product:
Acute Oral LD50: Not Available.
Acute Dermal LD50: Not Available.
Acute Inhalation LC50: Not Available.

Carcinogenicity:

Ingredients	IARC - Carcinogens	ACGIH - Carcinogens
Modified thionocarbamate (#1)	Not listed.	Not listed.
Isobutanol	Not listed.	Not listed.
Butanol, sec	Not listed.	Not listed.

Carcinogenicity Comment: No additional information available.

Reproductive Toxicity/ Teratogenicity/ Embryotoxicity/ Mutagenicity: The Modified thionocarbamate (#1) was positive in the Ames Salmonella assay, but not mutagenic in the in-vitro CHO/HGPRT forward gene mutation assay and mouse lymphoma assay. When tested in an in-vivo mouse micronucleus test, this material did not show any evidence of causing chromosome damage or bone marrow cell toxicity and therefore is considered not mutagenic. Based on both the weight and strength of evidence, this material is not considered to be mutagenic

12. ECOLOGICAL INFORMATION

Ecotoxicological Information:

Ingredients	Ecotoxicity - Fish Species Data	Acute Crustaceans Toxicity:	Ecotoxicity - Freshwater Algae Data
Modified thionocarbamate (#1)	LC50: 2.8 mg/L Rainbow Trout (Oncorhyncus mykiss) / 96 hr.	EC50 : 0.006 mg/L Water Flea (Daphnia magna) / 48 hr	ErC50 : 3.9 mg/L ; EbC50 : 9.3 mg/L Green Algae (Selenastrum capricornutum) / 72 hrs
Isobutanol	LC50 (fathead minnow) 1430 mg/L	Not Available.	Not Available.
Butanol, sec	LC50 (fathead minnow) 3670 mg/L	Not Available.	Not Available.

Other Information:
Toxic to aquatic life. May cause long-term adverse effects in the aquatic environment. Not readily biodegradable. Potential for significant bioconcentration and bioaccumulation.
BACTERIA TEST RESULTS
Test: Respiration Inhibition (OECD 209)
Duration: 3 hr
Species: Activated Sludge - Bacterial EC50 137.5 mg/LDEGRADATION
Test: Closed Bottle (OECD 301D)
Test: Abiotic Degradation
Duration: 28 day
Procedure: Ready biodegradability 0 %
Procedure: Other

Hydrolytically stable under acidic, neutral and basic conditions

13. DISPOSAL CONSIDERATIONS

Disposal of Waste Method: Disposal of all wastes must be done in accordance with municipal, provincial and federal regulations.
Contaminated Packaging: Empty containers should be recycled or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (U.S.):
DOT Shipping Name: Alcohols, n.o.s. (Butanol, sec)
DOT Hazardous Class 3
DOT UN Number: UN1987
DOT Packing Group: III
DOT Reportable Quantity (lbs): Not Applicable.
Notes: No additional remark.
Marine Pollutant: Yes.

ICAO/IATA:
IATA Proper Shipping Name: Alcohols, n.o.s. (Butanol, sec)
IATA Hazard Class: 3
UN Number: UN1987
Packing Group: III
IATA Label: Flammable liquid.
IATA Remarks: No additional remark.

IMDG:
IMDG Proper Shipping Name: Alcohols, n.o.s. (Butanol, sec)
Hazard Class: 3
UN Number: UN1987
Packing Group: III
Marine Pollutant: Yes.
IMDG Label: Flammable.
Remarks: No additional remark.

TDG (Canada):
TDG Proper Shipping Name: Alcohols, n.o.s. (Butanol, sec)
Hazard Class: 3
UN Number: UN1987
Packing Group: III
Note: Not regulated under the Transportation of Dangerous Goods Act when transported by road or rail in packagings or containers of 450 L or less (waste excluded).
Marine Pollutant: Yes.

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on theToxic Substances Control Act (TSCA) Inventory List or exempt.

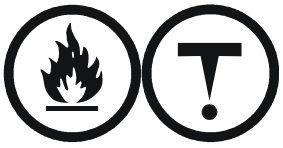
Canadian DSL Inventory Status: All components of this product are either on the Domestic Substances List (DSL), the Non-Domestic Substances List (NDSL) or exempt.

U.S. Regulatory Rules

Ingredients	CERCLA/SARA - Section 302:	SARA (311, 312) Hazard Class:	CERCLA/SARA - Section 313:
Modified thionocarbamate (#1)	Not Listed.	Not Listed.	Not Listed.
Isobutanol	Not Listed.	LISTED	Not Listed.
Butanol, sec	Not Listed.	Not Listed.	LISTED

California Proposition 65: Not Listed.
MA Right to Know List: Not Listed.
New Jersey Right-to-Know List: Not Listed.
Pennsylvania Right to Know List: Not Listed.

WHMIS Hazardous Class:
B3 COMBUSTIBLE LIQUIDS
D2B TOXIC MATERIALS



16. OTHER INFORMATION

Additional Information: This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Disclaimer: NOTICE TO READER:
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All information appearing herein is based upon data obtained from the manufacturer and/or recognized technical sources. While the information is believed to be accurate, Univar makes no representations as to its accuracy or sufficiency. Conditions of use are beyond Univar's control and therefore users are responsible to verify this data under their own operating conditions to determine whether the product is suitable for their particular purposes and they assume all risks of their use, handling, and disposal of the product, or from the publication or use of, or reliance upon, information contained herein. This information relates only to the product designated herein, and does not relate to its use in combination with any other material or in any other process.

*****END OF MSDS*****

Ammonium Hydroxide, ACS

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/06/1998 Revision date: 11/21/2016 Supersedes: 12/29/2015 Version: 2.0

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Ammonium Hydroxide, ACS
CAS-No.	:	1336-21-6
Product code	:	LC11050
Formula	:	NH4OH
Synonyms	:	ammonia hydrate, 28%-30% / ammonia,liquor,25%<=conc<35% / ammonia, solutions, 28%-30% / ammoniawater, 28%-30% / aqua ammonia, solution, 28%-30% / spirit of hartshorn, 28%-30%

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Chemical raw material Food industry: additive Solvent

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Acute toxicity (oral) Category 4	H302	Harmful if swallowed
Acute toxicity (inhalation:vapour) Category 4	H332	Harmful if inhaled
Skin corrosion/irritation Category 1C	H314	Causes severe skin burns and eye damage
Serious eye damage/eye irritation Category 1	H318	Causes serious eye damage
Hazardous to the aquatic environment - Acute Hazard Category 1	H400	Very toxic to aquatic life

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS05 GHS07 GHS09

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H302+H332 - Harmful if swallowed or if inhaled
H314 - Causes severe skin burns and eye damage
H400 - Very toxic to aquatic life

Precautionary statements (GHS-US) :
P260 - Do not breathe mist, spray, vapors.
P264 - Wash exposed skin thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area.
P273 - Avoid release to the environment.
P280 - Wear eye protection, face protection, protective clothing, protective gloves.

P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center or doctor/physician.
P363 - Wash contaminated clothing before reuse.
P391 - Collect spillage.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations
If inhaled: Remove person to fresh air and keep comfortable for breathing

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Multi-constituent

Name : Ammonium Hydroxide, ACS

CAS-No. : 1336-21-6

Name	Product identifier	%	GHS-US classification
Water	(CAS-No.) 7732-18-5	72	Not classified
Ammonia	(CAS-No.) 7664-41-7	28	Flam. Gas 2, H221 Press. Gas (Comp.), H280 Acute Tox. 3 (Inhalation), H331 Skin Corr. 1B, H314 Aquatic Acute 1, H400

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with labored breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Cover eyes aseptically. Do not apply neutralizing agents. Take victim to an ophthalmologist.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : Not expected to present a significant hazard under anticipated conditions of normal use.

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. Nausea. Headache. EXPOSURE TO HIGH CONCENTRATIONS: Possible oedema of the upper respiratory tract. Possible inflammation of the respiratory tract. Possible laryngeal spasm/oedema. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of lung edema. Risk of pneumonia. Respiratory difficulties. Possible esophageal perforation.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Irritation of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion	:	Risk of aspiration pneumonia. Nausea. Vomiting. AFTER ABSORPTION OF LARGE QUANTITIES: Blue/grey discoloration of the skin. Blood in stool. Blood in vomit. Possible esophageal perforation. FOLLOWING SYMPTOMS MAY APPEAR LATER: Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Coughing. Irritation of the respiratory tract. Irritation of the eye tissue. Redness of the eye tissue. Possible inflammation of the respiratory tract. Respiratory difficulties. Affection of the nasal septum.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media	:	Adapt extinguishing media to the environment.
Unsuitable extinguishing media	:	No unsuitable extinguishing media known.

5.2. Specific hazards arising from the chemical

Fire hazard	:	DIRECT FIRE HAZARD. Non combustible.
Explosion hazard	:	INDIRECT EXPLOSION HAZARD. Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	On heating: release of toxic/corrosive/combustible gases/vapours (ammonia). On burning: release of toxic and corrosive gases/vapours (nitrous vapours). Concentrated solution violent to explosive reaction with many compounds e.g.: with (some) halogens compounds, with (strong) oxidizers and with (some) acids.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. Do not move the load if exposed to heat. Dilute toxic gases with water spray. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gas-tight suit. Corrosion-proof suit. See "Material-Handling" to select protective clothing.
Emergency procedures	:	Keep upwind. Mark the danger area. Consider evacuation. Close doors and windows of adjacent premises. No naked flames. Keep containers closed. Wash contaminated clothes.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released substance, pump into suitable containers. Consult "Material-handling" to select material of containers. Plug the leak, cut off the supply. Dam up the liquid spill. Try to reduce evaporation. Dilute toxic gases/vapours with water spray. Take account of toxic/corrosive precipitation water.
Methods for cleaning up	:	Damaged/cooled tanks must be emptied. Take up liquid spill into absorbent material, e.g.: sand/earth or powdered limestone. Scoop absorbed substance into closing containers. See "Material-handling" for suitable container materials. Carefully collect the spill/leftovers. Take collected spill to manufacturer/competent authority. Clean contaminated surfaces with an excess of water. Wash clothing and equipment after handling.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Use corrosionproof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Keep away from naked flames/heat. Observe strict hygiene. Keep container tightly closed. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Exhaust gas must be neutralised.

Hygiene measures : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use. Keep only in the original container in a cool, well ventilated place away from :

Incompatible products : Strong acids. silver nitrate. Strong bases.

Incompatible materials : Sources of ignition. Direct sunlight.

Maximum storage period : 365 days

Storage temperature : < 38 °C

Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources.

Prohibitions on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. strong acids. halogens.

Storage area : Store at ambient temperature. Keep out of direct sunlight. Store in a dark area. Keep container in a well-ventilated place. Keep locked up. Provide for a tub to collect spills. Meet the legal requirements.

Special rules on packaging : SPECIAL REQUIREMENTS: closing. clean. opaque. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: synthetic material. glass. MATERIAL TO AVOID: aluminium. copper. tin. zinc. nickel. bronze.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ammonium Hydroxide, ACS (1336-21-6)		
ACGIH	ACGIH TWA (mg/m³)	17 mg/m³
ACGIH	ACGIH STEL (mg/m³)	24 mg/m³
OSHA	OSHA PEL (TWA) (mg/m³)	35 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	50 ppm
IDLH	US IDLH (ppm)	300 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	18 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm
NIOSH	NIOSH REL (STEL) (mg/m³)	27 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	35 ppm

Water (7732-18-5)
Not applicable

Ammonia (7664-41-7)		
ACGIH	ACGIH TWA (mg/m³)	17 mg/m³
ACGIH	ACGIH TWA (ppm)	25 ppm
ACGIH	ACGIH STEL (mg/m³)	24 mg/m³
ACGIH	ACGIH STEL (ppm)	25 ppm
OSHA	OSHA PEL (TWA) (mg/m³)	35 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	50 ppm
IDLH	US IDLH (ppm)	300 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	18 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm
NIOSH	NIOSH REL (STEL) (mg/m³)	27 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	35 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Provide adequate general and local exhaust ventilation. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Avoid all unnecessary exposure. Corrosionproof clothing. Face shield. High gas/vapor concentration: gas mask. Gloves. Safety glasses.

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. GIVE GOOD RESISTANCE: neoprene. nitrile rubber. viton. tetrafluoroethylene. GIVE LESS RESISTANCE: PVC. GIVE POOR RESISTANCE: natural rubber. polyethylene. PVA

Hand protection:

Gloves

Eye protection:

Safety glasses

Skin and body protection:

Head/neck protection. Corrosion-proof clothing

Respiratory protection:

Gas mask with filter type K. High vapour/gas concentration: self-contained respirator

Thermal hazard protection:

None necessary.

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquid.
Color	:	Colourless
Odor	:	Irritating/pungent odour
Odor threshold	:	5 - 50 ppm
pH	:	11.7 (3.5 %)
pH solution	:	3.5 %
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	27 °C
Flash point	:	Not applicable
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	0.88 - 0.91
Specific gravity / density	:	0.89
Molecular mass	:	35.05 g/mol
Solubility	:	Water: Complete
Log Pow	:	-1.3
Auto-ignition temperature	:	Not applicable
Decomposition temperature	:	No data available

Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available

9.2. Other information

Minimum ignition energy	:	Not applicable
VOC content	:	Not applicable
Other properties	:	Clear. Physical properties depending on the concentration. Volatile. Substance has basic reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

On heating: release of toxic/corrosive/combustible gases/vapours (ammonia). On burning: release of toxic and corrosive gases/vapours (nitrous vapours). Concentrated solution violent to explosive reaction with many compounds e.g.: with (some) halogens compounds, with (strong) oxidizers and with (some) acids.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Reacts vigorously with strong oxidizers and acids.

10.4. Conditions to avoid

High temperature. Incompatible materials. Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

May react violently with acids. Strong acids. Strong bases.

10.6. Hazardous decomposition products

Gaseous ammonia. fume. Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Inhalation; Skin and eye contact
Acute toxicity	:	Oral: Harmful if swallowed. Inhalation:vapour: Harmful if inhaled.

Ammonium Hydroxide, ACS (1336-21-6)	
LD50 oral rat	350 mg/kg
ATE US (oral)	350 mg/kg body weight
ATE US (vapors)	10.714 mg/L/4h

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Ammonia (7664-41-7)	
ATE US (gases)	700 ppmV/4h
ATE US (vapors)	3 mg/L/4h
ATE US (dust, mist)	0.5 mg/L/4h

Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: 11.7 (3.5 %)
Serious eye damage/irritation	:	Causes serious eye damage. pH: 11.7 (3.5 %)
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity – single exposure	:	Not classified

Specific target organ toxicity – repeated exposure	:	Not classified
Aspiration hazard	:	Not classified
Potential Adverse human health effects and symptoms	:	Based on available data, the classification criteria are not met.
Symptoms/effects after inhalation	:	Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. Nausea. Headache. EXPOSURE TO HIGH CONCENTRATIONS: Possible oedema of the upper respiratory tract. Possible inflammation of the respiratory tract. Possible laryngeal spasm/oedema. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of lung edema. Risk of pneumonia. Respiratory difficulties. Possible esophageal perforation.
Symptoms/effects after skin contact	:	Caustic burns/corrosion of the skin.
Symptoms/effects after eye contact	:	Irritation of the eye tissue. Permanent eye damage.
Symptoms/effects after ingestion	:	Risk of aspiration pneumonia. Nausea. Vomiting. AFTER ABSORPTION OF LARGE QUANTITIES: Blue/grey discoloration of the skin. Blood in stool. Blood in vomit. Possible esophageal perforation. FOLLOWING SYMPTOMS MAY APPEAR LATER: Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Coughing. Irritation of the respiratory tract. Irritation of the eye tissue. Redness of the eye tissue. Possible inflammation of the respiratory tract. Respiratory difficulties. Affection of the nasal septum.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Dangerous for the environment.
Ecology - air	:	Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).
Ecology - water	:	Water pollutant (surface water). Affects the self-cleaning capacity of surface water. Ground water pollutant. Maximum concentration in drinking water: 0.50 mg/L (ammonium) (Directive 98/83/EC). Highly toxic to fishes. Toxic to invertebrates (Daphnia). May cause eutrophication. Highly toxic to plankton. pH shift. Inhibition of activated sludge.

Ammonium Hydroxide, ACS (1336-21-6)	
LC50 fish 1	0.16 - 1.1 mg/L (LC50; 96 h)
EC50 Daphnia 1	2.08 mg/L (LC50; 48 h)

12.2. Persistence and degradability

Ammonium Hydroxide, ACS (1336-21-6)	
Persistence and degradability	Readily biodegradable in water. Ozonation in water. Biodegradable in the soil. No test data on mobility of the components available. Ozonation in the air.

Water (7732-18-5)	
Persistence and degradability	Not established.

Ammonia (7664-41-7)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Ammonium Hydroxide, ACS (1336-21-6)	
Log Pow	-1.3
Bioaccumulative potential	Bioaccumulation: not applicable.

Water (7732-18-5)	
Bioaccumulative potential	Not established.

Ammonia (7664-41-7)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information	:	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove for physico-chemical/biological treatment. Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery. Use appropriate containment to avoid environmental contamination.

Additional information : LWCA (the Netherlands): KGA category 02. Hazardous waste according to Directive 2008/98/EC.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, III

UN-No.(DOT) : UN2672

Proper Shipping Name (DOT) : Ammonia solutions

relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : III - Minor Danger

Hazard labels (DOT) : 8 - Corrosive

Dangerous for the environment : Yes

Marine pollutant : Yes

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203

DOT Packaging Bulk (49 CFR 173.xxx) : 241

DOT Special Provisions (49 CFR 172.102) : IB3 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1 and 31HA2, 31HB2, 31HN2, 31HD2 and 31HH2). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized, except for UN2672 (also see Special Provision IP8 in Table 2 for UN2672).
IP8 - Ammonia solutions may be transported in rigid or composite plastic IBCs (31H1, 31H2 and 31HZ1) that have successfully passed, without leakage or permanent deformation, the hydrostatic test specified in 178.814 of this subchapter at a test pressure that is not less than 1.5 times the vapor pressure of the contents at 55 C (131 F).
T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3)
TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 5 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 60 L

DOT Vessel Stowage Location	:	A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.
DOT Vessel Stowage Other	:	40 - Stow ‘‘clear of living quarters’’,52 - Stow ‘‘separated from’’ acids,85 - Under deck stowage must be in mechanically ventilated space
Other information	:	No supplementary information available.

Transport by sea

Transport document description (IMDG)	:	UN 2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS
UN-No. (IMDG)	:	2672
Proper Shipping Name (IMDG)	:	Ammonia solutions
Class (IMDG)	:	8 - Corrosive substances
EmS-No. (1)	:	F-A
EmS-No. (2)	:	S-B
Marine pollutant	:	Yes

Air transport

Transport document description (IATA)	:	UN 2672 Ammonia solutions (relative density between 0.880 and 0.957 at 15 degrees C in water, with more than 10 percent but not more than 35 percent ammonia), 8, III, ENVIRONMENTALLY HAZARDOUS
UN-No. (IATA)	:	2672
Proper Shipping Name (IATA)	:	Ammonia solutions
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Ammonium Hydroxide, ACS (1336-21-6)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Acute toxicity (any route of exposure) Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Ammonia	CAS-No. 7664-41-7	28%

Ammonia (7664-41-7)	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb

15.2. International regulations

CANADA

No additional information available

Ammonia (7664-41-7)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations

Ammonia (7664-41-7)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 11/21/2016

Training advice : Users of breathing apparatus must be trained.

Other information : None.

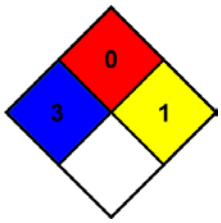
Full text of H-phrases: see section 16:

H221	Flammable gas
H280	Contains gas under pressure; may explode if heated
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H331	Toxic if inhaled
H332	Harmful if inhaled
H400	Very toxic to aquatic life

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection : H

H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

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SAFETY DATA SHEET

DANAFLOAT™ 262

Revision: Sections containing a revision or new information are marked with a ♣.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. **Product identifier** ..... **Danafloat™ 262**
Contains O-isopropyl ethylthiocarbamate

1.2. **Relevant identified uses of the substance or mixture and uses advised against** ..... Can be used as flotation reagent (flotation collector) only.

1.3. **Details of the supplier of the safety data sheet**

CHEMINOVA A/S
P.O. Box 9
DK-7620 Lemvig
Denmark
sds@cheminova.dk

1.4. **Emergency telephone number** ... (+45) 97 83 53 53 (24 h; for emergencies only)

♣ SECTION 2: HAZARDS IDENTIFICATION

2.1. **Classification of the substance or mixture**

Acute oral toxicity: Category 4 (H302)
Skin irritation: Category 2 (H315)
Hazards to the aquatic environment, chronic: Category 3 (H412)

Health hazards ..... The product may have adverse effects on fertility. See section 11. It can cause irritation to skin. It is harmful by ingestion.

Environmental hazards ..... The product may be hazardous in the aquatic environment.

2.2. **Label elements**

According to EU Reg. 1272/2008 as amended

Product identifier ..... Danafloat™ 262
Contains O-isopropyl ethylthiocarbamate

Hazard pictogram (GHS07) .....

Signal word ..... Warning

Hazard statements
H302 ..... Harmful if swallowed.
H315 ..... Causes skin irritation.
H412 ..... Harmful to aquatic life with long lasting effects.

Precautionary statements
P264 ..... Wash hands thoroughly after handling.
P270 ..... Do not eat, drink or smoke when using this product.
P280 ..... Wear protective gloves.
P301+P312+P330 ..... IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth.
P362+P364 ..... Take off contaminated clothing and wash it before reuse.
P501 ..... Dispose of contents/container as hazardous waste.

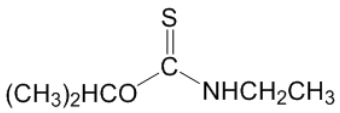
2.3. **Other hazards** ..... None of the ingredients in the product meets the criteria for being PBT or vPvB.

♣ SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. **Substances** ..... The product is a mixture, not a substance.

3.2. **Mixtures** ..... See section 16 for full text of hazard statements.

Active ingredient
Thionocarbamate ..... Content: 93 - 98% by weight
CAS name ..... Carbamothioic acid, ethyl-, O-(1-methylethyl) ester
CAS no. 141-98-0
EU name ..... O-Isopropyl ethylthiocarbamate
Other name(s) ..... Isopropyl ethyl thionocarbamate
O-Isopropyl N-ethyl thiocarbamate
O-Isopropyl ethylcarbamothioate
Thionocarbamate
IPETC
EC no. (EINECS no.) 205-517-7
EU index no. ..... None
Reg. no. 01-2119980723-30-0000
Classification of the ingredient ..... Acute oral toxicity: Category 4 (H302)
Skin irritation: Category 2 (H315)
Hazards to the aquatic environment, chronic: Category 3 (H412)
Structural formula .....



Reportable ingredient	Content (% w/w)	CAS no.	EC no. (EINECS no.)	Classification
Propan-2-ol Reg. no. 01-2119457558-25	max. 2	67-63-0	200-661-7	Flam. Liq. 2 (H225) Eye Irrit. 2 (H319) STOT SE 3 (H336)

SECTION 4: FIRST AID MEASURES

4.1. **Description of first aid measures**
Inhalation ..... If experiencing any discomfort, immediately remove from

exposure. Light cases: Keep person under surveillance. Get medical attention immediately if symptoms develop. Serious cases: Get medical attention immediately or call for an ambulance.

Skin contact ..... Immediately remove contaminated clothing and footwear. Flush skin with much water. Wash with water and soap. See physician immediately if irritation develops.

Eye contact ..... Immediately rinse eyes with much water or eyewash solution, occasionally opening eyelids, until no evidence of chemical remains. Remove contact lenses after a few minutes and rinse again. See physician immediately.

Ingestion ..... Let the exposed person rinse mouth and drink several glasses of water or milk. Inducing vomiting is not recommended. If vomiting does occur, let him/her rinse mouth and drink fluids again. Never give anything by mouth to an unconscious person. Get medical attention immediately.

4.2. **Most important symptoms and effects, both acute and delayed** Possibly irritation. The symptoms of ingestion are not known. In an animal test, non-specific symptoms were observed, such as reduced activity.

4.3. **Indication of any immediate medical attention and special treatment needed** Immediate medical attention is required in case of eye contact or ingestion.

It may be helpful to show this safety data sheet to physician.

Note to physician ..... A specific antidote against this substance is not known. Gastric lavage and administration of activated charcoal can be considered. After decontamination, treatment is supportive and symptomatic.

SECTION 5: FIREFIGHTING MEASURES

5.1. **Extinguishing media** ..... Dry chemical or carbon dioxide for small fires, water spray or foam for large fires. Avoid heavy hose streams.

5.2. **Special hazards arising from the substance or mixture** The essential breakdown products are volatile, toxic, malodorous, irritant and inflammable compounds such as hydrogen sulphide, sulphur dioxide, nitrogen oxides, carbon monoxide and carbon dioxide.

5.3. **Advice for firefighters** ..... Use water spray to keep fire-exposed containers cool. Approach fire from upwind to avoid hazardous vapours and toxic decomposition products. Fight fire from protected location or maximum possible distance. Dike area to prevent water runoff. Firemen should wear self-contained breathing apparatus and protective clothing.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. **Personal precautions, protective equipment and emergency procedures** It is recommended to have a predetermined plan for the handling of spills. Empty, sealable vessels for the collection of spills should be available.

In case of large spill (involving 10 tons of the product or more):

1. Use personal protection equipment; see section 8
2. Call emergency telephone no.; see section 1
3. Alert authorities.

Observe all safety precautions when cleaning up spills. Use personal protection equipment. Depending on the magnitude of the spill this may mean wearing respirator, face mask or eye protection, chemical resistant clothing, gloves and boots.

Stop the source of the spill immediately if safe to do so. Keep unprotected persons away from the spill area. Avoid and reduce mist formation as much as possible.

6.2. **Environmental precautions** ..... Contain the spill to prevent any further contamination of surface, soil or water. Wash waters must be prevented from entering surface water drains. Uncontrolled discharge into water courses must be alerted to the appropriate regulatory body.

6.3. **Methods and materials for containment and cleaning up** It is recommended to consider possibilities to prevent damaging effects of spills, such as bunding or capping. See GHS (Annex 4, Section 6).

If appropriate, surface water drains should be covered. Minor spills on the floor or other impervious surface should be absorbed onto an absorptive material such as universal binder, bentonite, Fuller's earth or other absorbent clays. Collect the contaminated absorbent in suitable containers. Clean area with detergent and water. Absorb wash liquid with absorbent and transfer to suitable containers. The used containers should be properly closed and labelled.

Large spills which soak into the ground should be dug up and transferred to suitable containers.

Spills in water should be contained as much as possible by isolation of the contaminated water. The contaminated water must be collected and removed for treatment or disposal.

6.4. **Reference to other sections** ..... See subsection 8.2. for personal protection.
See section 13 for disposal.

SECTION 7: HANDLING AND STORAGE

7.1. **Precautions for safe handling** ..... In an industrial environment it is recommended to avoid all personal contact with the product, if possible by using closed systems with remote system control. Otherwise, the material should be handled by mechanical means as much as possible. Adequate ventilation or local exhaust ventilation is required. The exhaust gases should be filtered or treated otherwise. Splashing and the formation of aerosol or mist must be avoided.

Remove contaminated clothing immediately. Wash thoroughly after handling. Before removing gloves, wash them with water and soap. After work, take off all work clothes and footwear. Take a shower, using water and soap. Wear only clean clothes when leaving job. Wash protective clothing and protective equipment with water and soap after each use.

Do not discharge to the environment. Collect all waste material and remains from cleaning equipment, etc., and dispose of as hazardous waste. See section 13 for disposal.

7.2. **Conditions for safe storage, including any incompatibilities** — The product is stable under normal conditions of warehouse storage.

Store in labelled, tightly closed plastic drums or coated steel drums. The storage room should be constructed of incombustible material, closed, dry, ventilated and with impermeable floor, without access of unauthorised persons or children. The room should exclusively be used for storage of chemicals. Food, drinks, feed or seed should not be present. A warning sign reading "POISON" is recommended. A hand wash station should be available.

7.3. **Specific end use(s)** ..... Can be used as flotation reagent (flotation collector) only.

♣ SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. **Control parameters**

Personal exposure limits ..... To our knowledge not established for thionocarbamate.

		Year	
Propan-2-ol	ACGIH (USA) TLV	2015	TWA 200 ppm (492 mg/m^3) STEL 400 ppm (984 mg/m^3) BEI
	OSHA (USA) PEL	2015	TWA 400 ppm (980 mg/m^3)
	EU, 2000/39/EC as amended	2009	Not established
	Germany, MAK	2014	TWA 200 ppm (500 mg/m^3) Peak level 400 ppm (1000 mg/m^3) BAT
	HSE (UK) WEL	2011	8-hr TWA 400 ppm (999 mg/m^3) STEL 500 ppm (1250 mg/m^3), 15 min. reference period

However, other personal exposure limits defined by local regulations may exist and must be observed.

O-Isopropyl ethylthiocarbamate

DNEL, dermal ..... 33.33 µg/kg bw/day
DNEL, inhalation ..... 118 µg/m^3
PNEC, freshwater 0.02 mg/L0.002
PNEC, marine water ..... mg/L

8.2. **Exposure controls** ..... When used in a closed system, personal protection equipment will not be required. The following is meant for other situations, when the use of a closed system is not possible, or when it is necessary to open the system. Consider the need to render equipment or piping systems non-hazardous before opening.

Respiratory protection — Avoid inhalation of vapours. In the event of an accidental discharge of the material which produces a heavy vapour or mist, workers must put on officially approved respiratory protection equipment with a universal filter type including particle filter.

Protective gloves ..... Wear chemical resistant gloves, such as barrier laminate, butyl rubber or nitrile rubber. The breakthrough times of these materials for the product are unknown. Generally, however, the use of protective gloves will give only partial protection against dermal exposure. Small tears in the gloves and cross-contamination can easily occur. It is recommended to shift the gloves frequently and to limit the work to be done manually. Used gloves should be thrown out and not be reused.

Eye protection ..... Wear safety glasses or face shield. It is recommended to have an eye wash fountain immediately available in the workplace when there is a potential for eye contact.

Other skin protection Wear appropriate chemical resistant clothing to prevent skin contact depending on the extent of exposure. During most normal work situations where exposure to the material cannot be avoided for a limited time span, waterproof pants and apron of chemical resistant material or coveralls of polyethylene (PE) will be sufficient. Coveralls of PE must be discarded after use if contaminated. In cases of appreciable or prolonged exposure, coveralls of barrier laminate may be required.

♣ SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. **Information on physical and chemical properties**

Appearance	Yellow to reddish liquid
Odour	Characteristic odour of sulphur compounds
Odour threshold	Not determined
pH	1% Dilution in water: 2 - 4
Melting point/freezing point	-4°C
Initial boiling point and boiling range	> 100°C
Flash point	95°C
Evaporation rate	Not determined
Flammability (solid/gas)	Not applicable (liquid)
Upper/lower flammability or explosive limits	**Propan-2-ol** : 2.0 - 12.7 vol% (≈ 2.0 - 12.7 kPa)
Vapour pressure	Not determined
Vapour density	Not determined
Relative density	Not determined
	Density: 0.98 - 1.02 g/ml at 20°C
Solubility(ies)	Soluble in alcohols, ethyl ether, benzene
Partition coefficient n-octanol/water	**Thionocarbamate** : not determined; log K_{ow} = 1.7 by model calculation
Autoignition temperature	Not determined
	Propan-2-ol : 399°C
Decomposition temperature	Not determined
Viscosity	5.6 mPa·s
Explosive properties.....	Not explosive
Oxidising properties	Not oxidising

9.2. **Other information**

Miscibility	The product is not miscible with water.

SECTION 10: STABILITY AND REACTIVITY

10.1.	**Reactivity**	To our knowledge, the product has no special reactivities.
10.2.	**Chemical stability**	Stable at ambient temperatures
10.3.	**Possibility of hazardous reactions**	None known.
10.4.	**Conditions to avoid**	Heating of the product will produce harmful and irritant vapours.
10.5.	**Incompatible materials**	Oxidising materials. The product is corrosive to copper and brass.
10.6.	**Hazardous decomposition products**	See subsection 5.2.

♣ SECTION 11: TOXICOLOGICAL INFORMATION

11.1. **Information on toxicological effects**

* = Based on available data, the classification criteria are not met.

Product

Acute toxicity		The product is expected to be harmful by ingestion.
Route(s) of entry	- ingestion	LD_{50}, oral, rat: 500 - 1000 mg/kg (estimated)
	- skin	LD_{50}, dermal, rat: not available
	- inhalation	LC_{50}, inhalation, rat: not available
Skin corrosion/irritation		Not expected to be irritating to skin. *
Serious eye damage/irritation		Not expected to be irritating to eyes. *
Respiratory or skin sensitisation ...		Not expected to cause hypersensitivity. *
Germ cell mutagenicity		The product contains no ingredients known to be mutagenic. *
Carcinogenicity		The product contains no ingredients known to be carcinogenic. *
Reproductive toxicity		In a screening study on O-isopropyl ethylthiocarbamate (method OECD 422), decreased fertility was observed at dose level 30 mg/kg bw/day.
STOT – single exposure		To our knowledge, no specific effects have been observed after single exposure. *
STOT – repeated exposure		The following has been measured on O-isopropyl ethylthio-carbamate: NOAEL: 30 mg/kg bw/day measured in a rat study. *
Aspiration hazard		The product contains no ingredients known to present an aspiration pneumonia hazard. *
Symptoms and effects, acute and delayed		Possibly irritation. The symptoms of ingestion are not known. In an animal test on thionocarbamate non-specific symptoms were observed, such as reduced activity.

O-Isopropyl ethylthiocarbamate

Acute toxicity	The substance is harmful by ingestion. The acute toxicity is

measured as:

Route(s) of entry - ingestion: LD_{50}, oral, rat: 568 mg/kg (method OECD 425)

- skin: LD_{50}, dermal, rat: not available

- inhalation: LC_{50}, inhalation, rat: not available

Skin corrosion/irritation ..... Irritating to skin (OECD 431).

Serious eye damage/irritation ..... Not irritating to eyes (method OECD 405). *

Respiratory or skin sensitisation ... Not a skin sensitizer (method OECD 429). *

Propan-2-ol

Toxicokinetics, metabolism and distribution: The substance is rapidly absorbed in the body by inhalation. The concentration in blood decreases rapidly after cessation of exposure. The substance is extensively and completely metabolised. The substance is widely distributed in the body with a preference for adipose tissue.

Acute toxicity ..... Propan-2-ol is not considered as harmful. *
The acute toxicity is measured as:

Route(s) of entry - ingestion: LD_{50}, oral, rat: 4110 mg/kg (method OECD 401)

- skin: LD_{50}, dermal, rabbit: 12800 mg/kg (method OECD 402)

- inhalation: LC_{50}, inhalation, rat: 72.6 mg/L/4 h (method OECD 403)

Skin corrosion/irritation ..... Not irritating to rabbit skin. *

Serious eye damage/irritation ..... Causes serious eye irritation (method OECD 405).

Respiratory or skin sensitisation ... Not sensitising to guinea pigs (method OECD 406). To our knowledge, no indications of allergenic properties have been recorded. *

♣ SECTION 12: ECOLOGICAL INFORMATION

12.1. **Toxicity** ..... The product is toxic to aquatic organisms.

The following is measured on thionocarbamate:

- Fish: Rainbow trout (*Oncorhynchus mykiss*) ..... 96-h LC_{50}: 1.5 mg/L
- Invertebrates: Daphnids (*Daphnia magna*) ..... 48-h EC_{50}: 60 mg/L
- Algae: Green algae (*Pseudokirchneriella subcapitata*) ..... 72-h E_rC_{50}: 20.7 mg/L
  72-h NOEC: 1.0 mg/L

12.2. **Persistence and degradability** .... The product is biodegradable, but does not meet the criteria for being readily biodegradable. It undergoes degradation in the environment and in waste water treatment plants.

12.3. **Bioaccumulative potential** ..... See section 9 for octanol-water partition coefficient.

Bioaccumulation is not expected.

12.4. **Mobility in soil** ..... In the environment the product is expected to be moderately mobile.

12.5. **Results of PBT and vPvB assessment** ..... None of the ingredients meets the criteria for being PBT or vPvB.

12.6. **Other adverse effects** ..... Other relevant hazardous effects in the environment are not known.

♣ SECTION 13: DISPOSAL CONSIDERATIONS

13.1. **Waste treatment methods** .....

Remaining quantities of the material and empty but unclean packaging should be regarded as hazardous waste.

Disposal of waste and packagings must always be in accordance with all applicable local regulations.

Disposal of product .....

According to the Waste Framework Directive (2008/98/EC), possibilities for reuse or reprocessing should first be considered. If this is not feasible, the material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing.

Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Disposal of packaging .....

It is recommended to consider possible ways of dispoSal in the following order:
1. Reuse or recycling should first be considered. If offered for recycling, containers must be emptied and triply rinsed (or equivalent). Do not discharge rinsing water to sewer systems.
2. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.
3. Delivery of the packaging to a licensed service for disposal of hazardous waste.
4. Disposal in a landfill or burning in open air should only occur as a last resort. For disposal in a landfill containers should be emptied completely, rinsed and punctured to make them unusable for other purposes. If burned, stay out of smoke.

SECTION 14: TRANSPORT INFORMATION

ADR/RID/IMDG/IATA/ICAO classification

14.1. **UN number** 3082

14.2. **UN proper shipping name** ..... Environmentally hazardous substance, liquid, n.o.s. (O-isopropyl ethylthiocarbamate)

14.3. **Transport hazard class(es)** 9

14.4. **Packing group** III

14.5. **Environmental hazards** ..... Marine pollutant

14.6. **Special precautions for user** ..... Do not discharge to the environment.

14.7. **Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code** ..... The product is not transported in bulk by ship.

♣ SECTION 15: REGULATORY INFORMATION

15.1. **Safety, health and environmental regulations/legislation specific for the substance or mixture**

Seveso category (Dir. 2012/18/EU): dangerous for the environment

All ingredients are covered by EU chemical legislation.

15.2. **Chemical safety assessment** ..... The conclusions of a chemical safety assessment have been attached.

♣ SECTION 16: OTHER INFORMATION

Relevant changes in the safety data sheet: The safety data sheet is extended with the conclusions of a chemical safety assessment.

List of abbreviations .....

ACGIH	American Conference of Governmental Industrial Hygienists
BAT	Biologischer Arbeitsstoff-Toleranzwert
BEI	Biological Exposure Index
CAS	Chemical Abstracts Service
Dir.	Directive
DNEL	Derived No Effect Level
EC_{50}	50% Effect Concentration
E_rC_{50}	50% Effect Concentration based on growth
EINECS	European INventory of Existing Commercial Chemical Substances
GHS	Globally Harmonized classification and labelling System of chemicals, Fifth revised edition 2013
HSE	Health & Safety Executive, UK
IBC	International Bulk Chemical code
IC_{50}	50% Inhibition Concentration
IUPAC	International Union of Pure and Applied Chemistry
LC_{50}	50% Lethal Concentration
LD_{50}	50% Lethal Dose
MAK	Maximale Arbeitspaltz-Konzentration
MARPOL	Set of rules from the International Maritime Organisation (IMO) for prevention of sea pollution
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
n.o.s.	Not otherwise specified
OECD	Organisation for Economic Cooperation and Development
OSHA	Occupational Safety and Health Administration
PBT	Persistent, Bioaccumulative, Toxic
PEL	Personal Exposure Limit
PNEC	Predicted No Effect Concentration
Reg.	Regulation
STEL	Short-Term Exposure Limit
STOT	Specific Target Organ Toxicity
TLV	Threshold Limit Value
TWA	Time Weighed Average
vPvB	very Persistent, very Bioaccumulative
WEL	Workplace Exposure Limit

References	Data on thionocarbamate are unpublished company data. Data on other ingredients are available from published literature and can be found several places.	
Method for classification	Calculation rules	
Used hazard statements	H225	Highly flammable liquid and vapour.
	H302	Harmful if swallowed.
	H315	Causes skin irritation.
	H319	Causes serious eye irritation.
	H336	May cause drowsiness or dizziness.
	H412	Harmful to aquatic life with long lasting effects.
Advice on training	This material should only be used by persons who are made aware of its hazardous properties and have been instructed in the required safety precautions.	

The information provided in this safety data sheet is believed to be accurate and reliable, but uses of the product vary and situations unforeseen by Cheminova A/S may exist. The user has to check the validity of the information under local circumstances.

Prepared by: Cheminova A/S / GHB

ANNEX: Exposure assessment and related risk characterisation

1. Introduction

1.1. Overview of uses and Exposure Scenarios

The following table lists all the exposure scenarios (ES).

Table 1. Overview of exposure scenarios and contributing scenarios

Identifiers	Titles of exposure scenarios and the related contributing scenarios	Tonnage (tonnes per year)
ES - IW	Use at industrial site - Use at industrial site - Use at industrial site (ERC 6b) - Worker. Flotation batch process with exposure possible (PROC 5) - Worker. Transfer of substance to flotation process, outdoors, with respiratoric protection (PROC 8b) - Worker. Transfer of substance to flotation process, outdoors, with no respiratoric protection, but measured exposure values (PROC 8b) - Worker. Laboratory analytical work on floatation process (PROC 15)	999.0
IW: Industrial end use at site		

1.2. Introduction to the assessment

1.2.1. Environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for the environment are described in the following table based on the hazard conclusions presented in the CSR.

Table 2. Type of risk characterisation required for the environment

Protection target	Type of risk characterisation	Hazard conclusion
Freshwater	Quantitative	PNEC aqua (freshwater) = 0.02 mg/L
Sediment (freshwater)	Qualitative	No exposure of sediment expected
Marine water	Quantitative	PNEC aqua (marine water) = 0.002 mg/L
Sediment (marine water)	Qualitative	No exposure of sediment expected
Sewage treatment plant	Qualitative	No emission to STP expected
Air	Not needed	No hazard identified
Agricultural soil	Qualitative	No exposure of soil expected
Predator	Not needed	No potential for bioaccumulation

Comments on assessment approach:

The regional concentrations are reported in the CSR in section 10.2.1.2 (see Table 54, “Predicted regional exposure concentrations (Regional PEC)”). The local Predicted Exposure Concentrations (PECs) reported for each contributing scenario correspond to the sum of the local concentrations (Clocal) and the regional concentrations (PEC regional).

1.2.2. Man via environment

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for man via the environment are described in the following table based on the hazard conclusions reported and justified in the CSR.

Table 1. Type of risk characterisation required for man via the environment

Route of exposure and type of effects	Type of risk characterisation	Hazard conclusion
Inhalation: systemic long-term	Quantitative	DNEL = 29.99 µg/m³
Oral: systemic long-term	Quantitative	DNEL = 17 µg/kg bw/day

1.2.3. Workers

Scope and type of assessment

The scope of exposure assessment and type of risk characterisation required for workers are described in the following table based on the hazard conclusions presented in the CSR.

Table 4. Type of risk characterisation required for workers

Route	Type of effect	Type of risk characterisation	Hazard conclusion
Inhalation	Systemic long-term	Quantitative	DNEL = 118 µg/m³
	Systemic acute	Quantitative	DNEL = 7.05 mg/m³
	Local long-term	Qualitative	Low hazard (no threshold derived)
	Local acute	Qualitative	Low hazard (no threshold derived)
Dermal	Systemic long-term	Quantitative	DNEL = 33.33 µg/kg bw/day
	Systemic acute	Quantitative	DNEL = 2 mg/kg bw/day
	Local long-term	Qualitative	Low hazard (no threshold derived)
	Local acute	Qualitative	Low hazard (no threshold derived)

2. Exposure scenario: Use at industrial site

Sector of use:
SU 2a, Mining, (without offshore industries)

Environment contributing scenario(s):	
Use at industrial site	ERC 6b
Worker contributing scenario(s):	
Worker. Flotation batch process with exposure possible	PROC 5
Worker. Transfer of substance to flotation process, outdoors, with respiratoric protection	PROC 8b
Worker. Transfer of substance to flotation process, outdoors, with no respiratoric protection, but measured exposure values	PROC 8b
Worker. Laboratory analytical work on floatation process	PROC 15

2.1. Environmental contributing scenario 1: Use at industrial site

2.1.1. Conditions of use

Amount used, frequency and duration of use (or from service life)
• Daily use at site: ≤ 10 tonnes/day
• Annual use at a site: ≤ 999 tonnes/year
• Percentage of tonnage used at regional scale: 100 %
Conditions and measures related to sewage treatment plant
• Municipal STP: no [effectiveness water: 0%] *No discharge to sewage treatment plant, all waste are either incinerated or led to holding ponds.*
Conditions and measures related to treatment of waste (including article waste)
• Particular considerations on the waste treatment operations: no (low risk) (ERC based assessment demonstrating control of risk with default conditions. Low risk assumed for waste life stage. Waste disposal according to national/local legislation is sufficient.)
Other conditions affecting environmental exposure
• Discharge rate of effluent: ≥ 0 m^3/d
• Receiving surface water flow rate: ≥ 0 m^3/d

2.1.2. Releases

The local releases to the environment are reported in the following table.

Table 5. Local releases to the environment

Release	**Release factor estimation method**	**Explanation / Justification**
Water	ERC based	**Initial release factor:** 5% **Final release factor:** 5% **Local release rate:** 500 kg/day
Air	ERC based	**Initial release factor:** 0.1% **Final release factor:** 0.1% **Local release rate:** 10 kg/day
Soil	ERC based	**Final release factor:** 0.025%

2.1.3. Exposure and risks for the environment and man via the environment

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 6. Exposure concentrations and risks for the environment

Protection target	Exposure concentration	Risk characterisation
Freshwater	**Local PEC:** 2.321E-4 mg/L	RCR = 0.012
Sediment (freshwater)		Qualitative risk characterisation (see below)
Marine water	**Local PEC:** 1.987E-5 mg/L	RCR < 0.01
Sediment (marine water)		Qualitative risk characterisation (see below)
Sewage treatment plant		Qualitative risk characterisation (see below)
Agricultural soil		Qualitative risk characterisation (see below)
Man via environment - inhalation	**Local PEC:** 7.759E-4 mg/m³	RCR = 0.026
Man via environment - oral	**Exposure via food consumption:**	
Man via environment - combined routes		RCR = 0.026

Table 7. Contribution to oral intake for man via the environment from local contribution

Type of food	Estimated daily dose	Concentration in food
Drinking water	3.13E-5 mg/kg bw/day	0.001 mg/L
Fish		
Leaf crops	2.765E-6 mg/kg bw/day	1.613E-4 mg/kg ww
Root crops	1.873E-5 mg/kg bw/day	0.003 mg/kg ww
Meat	3.608E-9 mg/kg bw/day	8.39E-7 mg/kg ww
Milk	1.066E-8 mg/kg bw/day	1.33E-6 mg/kg ww

Conclusion on risk characterisation

There is no exposure to sediment (fresh- and marine water), sewage treatment plant or agricultural soil. Use, transfer and laboratory work does not produce any waste intended to be released into the environment.

2.2. Worker contributing scenario 1: Worker. Flotation batch process with exposure possible (PROC 5)

2.2.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: < 8 hours (avoid carrying out activities involving exposure for more than 8 hours.)	External tool (easyTRA)
• Concentration of substance in a mixture: < 0.01 % w/w *Covers substance in the mixture below 0.01 %.*	External tool (easyTRA)

	Method
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA)
Other conditions affecting workers exposure	
• Place of use: outdoor	External tool (easyTRA)

2.2.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 8. Exposure concentrations and risks for workers

Route of exposure and type of effects	Exposure concentration	Risk characterisation
Inhalation, systemic, long-term	**0.064 mg/m³** (external tool (easyTRA))	RCR = 0.546
Inhalation, systemic, acute	**0.086 mg/m³** (external tool (easyTRA))	RCR = 0.012
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	**2.06E-4 mg/kg bw/day** (external tool (easyTRA))	RCR < 0.01
Dermal, systemic, acute	**2.06E-4 mg/kg bw/day** (external tool (easyTRA))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.552
Combined routes, systemic, acute		RCR = 0.012

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be irritation. Dermal irritation is prevented by workers wearing gloves at all times when working with the substance. Inhalative irritation is prevented by either working under effective local area ventilation systems or, when this is not available, by wearing air supplied respiratory protection or when not available, a universal filtering respiratory protective system, when significant chance for exposure arises. The relative low vapor pressure of the substance further lowers any inhalative exposure below a level, which could give local inhalative irritation. The risk management measures mentioned above (gloves and LEV/respiratory protection) are primarily implemented to eliminate the more severe systemic effect of exposure, but also effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure the substance are controlled.

2.3. Worker contributing scenario 2: Worker. Transfer of substance to flotation process, outdoors, with respiratoric protection (PROC 8b)

2.3.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: < 10 minutes	External tool (easyTRA v.3.5.0)

	Method
• Concentration of substance in a mixture: < 95 % w/w	External tool (easyTRA v.3.5.0)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Respiratory protection: yes [effectiveness inhalation: 99%]	External tool (easyTRA v.3.5.0)
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA v.3.5.0)
Other conditions affecting workers exposure	
• Place of use: outdoor	External tool (easyTRA v.3.5.0)

2.3.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 9. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk characterisation**
Inhalation, systemic, long-term	**0.042 mg/m³** (external tool (easyTRA v.3.5.0))	RCR = 0.36
Inhalation, systemic, acute	**4.08 mg/m³** (external tool (easyTRA v.3.5.0))	RCR = 0.579
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	**0.014 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR = 0.407
Dermal, systemic, acute	**0.027 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR = 0.014
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.767
Combined routes, systemic, acute		RCR = 0.592

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be irritation. Dermal irritation is prevented by workers wearing gloves at all times when working with the substance. Inhalative irritation is prevented by either working under effective local area ventilation systems or, when this is not available, by wearing air supplied respiratory protection or when not available, a universal filtering respiratory protective system, when significant chance for exposure arises. The relative low vapor pressure of the substance further lowers any inhalative exposure below a level, which could give local inhalative irritation. The risk management measures mentioned above (gloves and LEV/respiratory protection) are primarily implemented to eliminate the more severe systemic effect of exposure, but also effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure the substance are controlled.

2.4. Worker contributing scenario 3: Worker. Transfer of substance to flotation process, outdoors, with no respiratoric protection, but measured exposure values (PROC 8b)

2.4.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: < 10 minutes *This work process must not exceed 10 minutes per workday.*	External tool (easyTRA v.3.5.0)
• Concentration of substance in a mixture: < 95 % w/w	External tool (easyTRA v.3.5.0)
Technical and organisational conditions and measures	
• Measured inhalation data: 0.05 mg/m^3 *This exposure scenario is based on measured worker inhalation data. If such data is not available for a similar work situation, then respiratory protection must be used, see exposure scenario number 11*	External tool (easyTRA v.3.5.0)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA v.3.5.0)
Other conditions affecting workers exposure	
• Place of use: outdoor	External tool (easyTRA v.3.5.0)

2.4.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 10. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk characterisation**
Inhalation, systemic, long-term	**0.05 mg/m³** (external tool (easyTRA v.3.5.0))	RCR = 0.424
Inhalation, systemic, acute	**0.05 mg/m³** (external tool (easyTRA v.3.5.0))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	**0.014 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR = 0.407
Dermal, systemic, acute	**0.027 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR = 0.014
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Combined routes, systemic, long-term		RCR = 0.831
Combined routes, systemic, acute		RCR = 0.021

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be irritation. Dermal irritation is prevented by workers wearing gloves at all times when working with the substance. Inhalative irritation is prevented by either working under effective local area ventilation systems or, when this is not available, by wearing air supplied respiratory protection or when not available, a universal filtering respiratory protective system, when significant chance for exposure arises. The relative low vapor pressure

of the substance further lowers any inhalative exposure below a level, which could give local inhalative irritation. The risk management measures mentioned above (gloves and LEV/respiratory protection) are primarily implemented to eliminate the more severe systemic effect of exposure, but also effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure the substance are controlled.

2.5. Worker contributing scenario 4: Worker. Laboratory analytical work on floatation process (PROC 15)

2.5.1. Conditions of use

	Method
Amount used (or contained in articles), frequency and duration of use/exposure	
• Duration of activity: < 24 hours *This work process must not exceed 24 hours per workday.*	External tool (easyTRA v.3.5.0)
• Concentration of substance in a mixture: < 0.01 % w/w	External tool (easyTRA v.3.5.0)
Conditions and measures related to personal protection, hygiene and health evaluation	
• Dermal protection: yes (chemically resistant gloves conforming to EN374 with specific activity training) [effectiveness dermal: 95%]	External tool (easyTRA v.3.5.0)
Other conditions affecting workers exposure	
• Place of use: indoor	External tool (easyTRA v.3.5.0)

2.5.2. Exposure and risks for workers

The exposure concentrations and risk characterisation ratios (RCR) are reported in the following table.

Table 11. Exposure concentrations and risks for workers

Route of exposure and type of effects	**Exposure concentration**	**Risk characterisation**
Inhalation, systemic, long-term	**5.52E-4 mg/m³** (external tool (easyTRA v.3.5.0))	RCR < 0.01
Inhalation, systemic, acute	**7.36E-4 mg/m³** (external tool (easyTRA v.3.5.0))	RCR < 0.01
Inhalation, local, long-term		Qualitative (see below)
Inhalation, local, acute		Qualitative (see below)
Dermal, systemic, long-term	**5.14E-6 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR < 0.01
Dermal, systemic, acute	**5.14E-6 mg/kg bw/day** (external tool (easyTRA v.3.5.0))	RCR < 0.01
Dermal, local, long-term		Qualitative (see below)
Dermal, local, acute		Qualitative (see below)
Combined routes, systemic, long-term		RCR < 0.01
Combined routes, systemic, acute		RCR < 0.01

Conclusion on risk characterisation

The available data material suggests that the dominating local effect upon exposure to the substance, both long- and short term, will be irritation. Dermal irritation is prevented by workers wearing gloves at all times when working

with the substance. Inhalative irritation is prevented by either working under effective local area ventilation systems or, when this is not available, by wearing air supplied respiratory protection or when not available, a universal filtering respiratory protective system, when significant chance for exposure arises. The relative low vapor pressure of the substance further lowers any inhalative exposure below a level, which could give local inhalative irritation. The risk management measures mentioned above (gloves and LEV/respiratory protection) are primarily implemented to eliminate the more severe systemic effect of exposure, but also effectively eliminates local effects. Therefore any long- or short-term risks for local effects upon exposure the substance are controlled.

ZINC CONCENTRATE
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Red Dog Zinc Concentrate.

Trade Names and Synonyms: None.

Manufacturer:
Teck Alaska Incorporated
Red Dog Mine
P.O. Box 1230
Kotzebue, Alaska
99752
Emergency Telephone: (250) 364-4214

Supplier:
Teck Alaska Incorporated
Red Dog Mine
P.O. Box 1230
Kotzebue, Alaska
99752

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 12, 2015.

Date of Last Edit: June 12, 2015.

Product Use: Zinc concentrate is used in the production of zinc metal and zinc alloys.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Long Term – Category 3**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	– Does not meet criteria		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	**– Category 1A**		
Reproductive Toxicity	**– Category 1A**		
Specific Target Organ Toxicity:			
Acute Exposure	– Does not meet criteria		
Chronic Exposure	**– Category 1**		

LABEL:

Symbols: 

Signal Word: **DANGER**

Hazard Statements	Precautionary Statements:
DANGER! May cause cancer through inhalation of dust. May damage fertility or the unborn child. Causes damage to the respiratory system through prolonged or repeated exposure. Harmful to aquatic life with long lasting effects.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Wear protective gloves, protective clothing, and eye protection. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. If exposed or concerned or you feel unwell: Get medical advice/attention. Collect all spillage.

Emergency Overview: A dark brown, heavy, soil-like material that is not flammable or combustible under normal conditions of transport and storage. However, when heated strongly in air it will burn, releasing toxic and irritating sulphur dioxide gas as well as possible lead and zinc oxide fumes. Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas (H_2S). Inhalation or ingestion of concentrate dust may produce chronic health effects. Possible cancer hazard due to lead, cadmium and silica content. Possible reproductive hazard due to the lead content. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: *Caution: The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent compounds*.

Concentrate dust is irritating to the nose, throat and respiratory tract. Inhalation or ingestion of very high concentrations of concentrate dust may result in lead and cadmium absorption and possible lead intoxication. Symptoms include headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage (e.g., fatigue, headaches, tremors, hypertension), gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and lead compounds are listed as an A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans) by the ACGIH. IARC has listed lead compounds as Group 2A Carcinogens (Probably Carcinogenic to Humans). Cadmium is classified as an A2 Carcinogen by the ACGIH and as a Group 1 Carcinogen by IARC. Silica is classified as an A2 Carcinogen by the ACGIH and as a Group 1 Carcinogen by IARC (see Toxicological Information, Section 11).

Potential Environmental Effects: Zinc concentrate will likely have minimal direct environmental effects, since its constituent metals have low solubility, and are therefore not highly bioavailable. However, when the product is processed or resides in the environment for extended periods, compound forms of zinc and lead may form which are potentially toxic to aquatic and terrestrial organisms (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Zinc Sulphide	1314-98-3	80 to 85%
Iron Sulphide	1317-37-9	7.0 to 12%
Lead Sulphide	1314-87-0	3.0 to 5.0%
Silica	14808-60-7	2.5 to 5.0%
Cadmium Sulphide	1306-23-6	0.35 to 0.41%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Product is not considered a fire or explosion hazard. However, concentrate will burn if strongly heated in a fire situation, releasing toxic and irritating sulphur dioxide gas (SO_2). Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas (H_2S). The ignition temperature of zinc concentrate is approximately 700 – 800ºC.

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Toxic fumes of sulphur dioxide will result from combustion. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of cleanup. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods that will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear coveralls or other protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination with lead-containing dust.

Environmental Precautions: The handling, shipment, storage and processing of this material requires appropriate controls and care to prevent spillage or gradual accumulation in the terrestrial and aquatic environment. Spilled material should be promptly cleaned up.

SECTION 7. HANDLING AND STORAGE

Health Precautions: Some sulphide concentrates may slowly oxidize in storage and generate sulphur dioxide as well as deplete the oxygen content of a confined space. The atmosphere within confined spaces containing concentrate must be tested before entry and the area thoroughly ventilated or self-contained breathing apparatus used, if conditions warrant.

Handling (Physical Aspects): Avoid excessive heat. Avoid contact with acids, oxidizers and combustible materials. Minimize dust generation and accumulation.

Storage Precautions: Store in a cool, dry area.

Autoignition: Some sulphide concentrates may oxidize and generate heat which accumulates in storage piles. If material is to be stored for an extended period, the temperature of piles should be monitored.

Means of Control: If heating of the concentrate is detected, the material should be sealed from air or oxygen in one of the following ways:

1. Leave the piles totally intact, do not open them up or try to spread them around.
2. Tamp or compact the surface of the piles.
3. Spray the pile with water. Resort to an organic binder only if needed because it can cause formation of hard lumps and subsequent problems for processing. Suggestions for organic binders include Aerospray 70A Binder, Coherex, Igepal CA-720 and lignin sulphonate, a pulp mill by-product.
4. For smaller piles, cover them with a tarp that will prevent exposure of the material to air.
5. If inside a building or ship's hold, keep all doors closed as much as possible and minimize ventilation.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Zinc Sulphide	None established*	None established*	None established*
Iron Sulphide	None established*	None established*	None established*
Lead Sulphide	0.05 mg Pb/m^3	0.05 mg Pb/m^3	0.05 mg Pb/m^3
Quartz (Respirable Crystalline Free Silica)	0.025 mg/m^3 Respirable SiO_2	1.4 mg/m^3 Respirable Dust** 4.3 mg/m^3 Total Dust**	0.05 mg/m^3 Respirable SiO_2
Cadmium Sulphide	0.01 mg/m^3 (Total Cd) 0.002 mg/m^3 (Respirable	0.005 mg Cd/m^3 {SECAL 0.015 / 0.05 mg Cd/m^3}	Lowest feasible level

Cd)

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

* - NOTE: While there are no established OELs for zinc sulphide and iron sulphide as such, there are OELs for their respective oxides, which may be formed during burning, welding or other fuming processes. The OSHA PEL for zinc oxide dust is 15 mg/m^3 (total) and 5 mg/m^3 (respirable); the OSHA PEL for zinc oxide fume is 5 mg/m^3. The ACGIH TLV for zinc oxide is 2 mg/ m^3 (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m^3 (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m^3 10 hr TWA with a 15 mg/m^3 ceiling for zinc oxide dust and a 10 mg/m^3 STEL for zinc oxide fume (15 min. sample).
The OSHA PEL for iron oxide fume is 10 mg/m^3. The NIOSH REL for iron oxide dust and fume is 5 mg/m^3 (as Fe) and the ACGIH TLV is 5 mg/m^3 of iron oxide dust/fume (respirable fraction).
** - NOTE: The OSHA PEL for silica applies to the total airborne zinc concentrate dust concentration and has been calculated based on the maximum percent SiO_2 in the sample using the formulas: Respirable Dust PEL = 10 $mg/m^3/(\%SiO_2 + 2)$: Total Dust PEL. = 30 $mg/m^3/(\%SiO_2 + 2)$ (see Table Z-3 of 29 CFR 1910.1000).
SECAL: To be achieved in specified processes and work places where it is not possible to achieve the PEL through engineering and work practices alone. The OSHA SECAL for cadmium is 0.015 or 0.05 mg/m^3, depending on the processes involved. See Table 1 of 29 CFR 1910.1027.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of zinc concentrate dust in the working environment well below the appropriate occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Protective Clothing: Coveralls or other work clothing, glasses or goggles, and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles should be worn to prevent eye contact if excessive dust is generated. Workers should wash immediately when skin becomes contaminated and at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily and laundered before reuse if there is a reasonable probability that the clothing may be contaminated.

Respirators: Where zinc concentrate dust is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge).

General Hygiene Considerations: Avoid breathing dust. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate designated areas only.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Dark grey-brown, fine-grained powder	**Odour:** Weak organic odour from entrained flotation reagents	**Odour Threshold:** No data	**pH:** Not applicable
Vapour Pressure: Negligible at 20°C	**Vapour Density:** Not Applicable	**Melting Point/Range:** Will burn first unless in an inert atmosphere	**Boiling Point/Range:** Not Applicable
Relative Density (Water = 1)**:** 2.0 (Bulk Sp. Gr.)	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Solubility:** Essentially Insoluble
Flash Point: Not Applicable	**Flammable Limits (LEL/UEL):** Non Flammable	**Auto-ignition Temperature:** None	**Decomposition Temperature:** >1000°C
Particle Size: <40 μm, with 80% <20 μm	**Percent Volatiles:** 8.4% @ 100°C (moisture)		

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Material is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Reacts violently with iodine pentachloride. Incompatible with iodine monochloride, hydrogen peroxide, strong oxidizers, and strong acids.

Hazardous Decomposition Products: May release highly toxic and flammable hydrogen sulfide gas on contact with strong acids. This material can decompose at high temperatures forming toxic and irritating sulphur dioxide gas as well as zinc, lead and cadmium oxides.

SECTION 11. TOXICOLOGICAL INFORMATION

General: In the powder form in which this product is sold, the metals are present as sulphides that are relatively insoluble and poorly absorbed within the body. However, high temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging on dust–contaminated surfaces will generate zinc oxide fume that also contains lead and cadmium oxides. These oxides are soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body. The primary route of exposure would be through inhalation of metal oxide fumes, composed principally of zinc oxide and including some lead and cadmium oxides.

NOTE: The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.

Acute: Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to dust or fume is irritating to the nose, throat and respiratory tract with dryness and irritation of the nose and throat, possible tightness of the chest, coughing and metallic taste. It may cause headache, as well as gastrointestinal disturbances. An intense, short-term exposure to welding/burning fumes could cause congestion and pulmonary edema. However, short-term exposures of this magnitude are unlikely in industry today. Less intense short-term exposure could result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours, and include immediate dryness and irritation of the throat, tightness of the chest, and coughing which may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after affects, or chronic affects that result from zinc metal fume fever. An acute, short-term exposure to high levels of oxide fumes could also result in the absorption of lead and cadmium in the body. Kidney damage, as well as anemia, could then result from acute exposure.

Ingestion: Symptoms due to ingestion of dust or fume would be similar to those from inhalation. Other health effects such as constipation or bloody diarrhea might also occur.

Chronic: The chronic health effects of zinc concentrate have not been fully investigated. Prolonged exposure to zinc concentrate dust may be expected to produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, kidney dysfunction, anemia, and possible skin rashes or dermatitis. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead and cadmium poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)*. The NTP has listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen. IARC has classified cadmium and certain cadmium compounds as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies cadmium as a *Suspected Human Carcinogen (A2)*. The NTP classifies cadmium as a *Known Human Carcinogen* and OSHA lists cadmium as a *Carcinogen.* The European Union (EU) classifies cadmium sulphide as a *Category 3 (Possible) Carcinogen*. IARC has classified crystalline silica of respirable particle size as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies it as a *Suspected Human Carcinogen (A2)*. The NTP classifies silica as a *Known Human Carcinogen.* OSHA and the EU do not list silica as a carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Zinc Sulphide	>2,000 mg/kg†	>2000 mg/kg*	>5.04 mg/L/4hr‡
Iron Sulphide	no data	no data	no data
Lead Sulphide	no data	no data	no data
Silica	no data	no data	no data
Cadmium Sulphide	7,080 mg/kg†	no data	no data

† LD_{50}, Rat,Oral, * LD_{50}, Rat, Dermal ‡ LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

Zinc concentrate will likely have minimal direct environmental effects, since its constituent metals have low solubility, and are therefore not highly bioavailable. However, when the product is processed or resides in the environment for extended periods, compound forms of zinc and lead may form which are potentially toxic to aquatic and terrestrial organisms. The mobilities of zinc and lead are media-dependent. These elements can bind with inorganic and organic ligands, reducing their mobility and bioavailability in soil and water. Bioavailability is also regulated by other physico-chemical factors, such as pH and hardness.

Zinc: Zinc is potentially toxic to aquatic organisms. In aquatic systems, zinc bioaccumulates in both plants and animals. Zinc also bioaccumulates in terrestrial plants, vertebrates, and mammals; plant uptake from soil depends upon the plant species, soil pH, and soil composition. In general, zinc does not biomagnify through food chains.

Lead: Lead compounds are potentially persistent in the aquatic environment. Dissolved lead compounds have the potential to bioaccumulate in plants and animals, both aquatic and terrestrial. Lead may occur as sorbed ions or surface coatings on sediment mineral particles, or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in relatively low mobility. Lead may be immobilized by ion exchange with hydrous oxides or clays or by chelation with humic or fulvic acids in the soil.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of only in accordance with applicable regulations. Spilled concentrate may meet the requirements of a hazardous waste in most jurisdictions. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated in order to determine the proper waste classification and disposal methods.

SECTION 14. TRANSPORT INFORMATION

TRANSPORT CANADA CLASSIFICATION ..... Not regulated
U.S. DOT HAZARD CLASSIFICATION ..... Class 9, Packing Group III
U.S. PROPER SHIPPING NAME ..... Environmentally Hazardous Substance, Solid, n.o.s. (contains lead sulphide)
U.S. DOT RQ ..... Lead sulphide 10 lbs.
U.S. DOT PRODUCT IDENTIFICATION NUMBER UN3077
MARINE POLLUTANT ..... No
IMO CLASSIFICATION ..... MHB - Materials Hazardous Only in Bulk, Group A and B

Note that this material has been tested under the United Nations Transport of Dangerous Goods, Manual of Tests and Criteria, Fifth Revised Edition (2009). Test results indicate that the concentrate qualifies neither as a flammable solid under Class 4.1 nor a self-heating substance under Class 4.2.

Risks: This material may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). It may also present chemical hazards. Recommendations set out in Appendix 1 of the International Marine Solid Bulk Cargo Code should be observed.

IMO MARPOL V Classification: Not Harmful to the Marine Environment.

SECTION 15. REGULATORY INFORMATION

U.S.
INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... Lead Sulphide .....Yes
Cadmium Sulphide .....Yes

	Silica .....Yes
CERCLA SECTION 103 HAZARDOUS SUBSTANCES	Lead Sulphide.....RQ: 10 lbs. (4.54 kg.) Zinc Compounds .....RQ: None assigned Cadmium Compounds.....RQ: None assigned
EPCRA SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCE.....	None of the ingredients qualify.
EPCRA SECTION 311/312 HAZARD CATEGORIES	Delayed (chronic) Health Hazard - Carcinogen Delayed (chronic) Health Hazard – Reproductive Toxin
EPCRA SECTION 313 TOXIC RELEASE INVENTORY.....	Lead Compounds (Lead Sulphide) CAS No 1314-87-0 Percent by Weight: .....3.0% to 5.0% Zinc Compounds (Zinc Sulphide) CAS No 1314-98-3 Percent by Weight: .....80% to 85% Cadmium Compounds (Cadmium Sulphide) CAS No 1306-23-6 Percent by Weight .....0.35% to 0.41%

SECTION 16. OTHER INFORMATION

Date of Original Issue: September 24, 1997 **Version:** 01 *(First edition)*

Date of Latest Revision: June 12, 2015 **Version:** 15

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P.G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 608 Lead.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 548 Zinc.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 3454 Cadmium.
- European Economic Community, Commission Directives 91/155/EEC and 67/548/EEC.
- Industry Canada, SOR/2015-17, January 30, 2015 - Hazardous Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 – Lead, ICSC 1627 – Zinc Sulphide, ICSC 0404 – Cadmium Sulphide, ICSC 0808 – Quartz.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13th Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (on-line edition).
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition September 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS).
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Zinc.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Cadmium.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Alaska Incorporated extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

HIGHLAND VALLEY COPPER CONCENTRATE
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Highland Valley Copper Concentrate

Trade Names and Synonyms: HVC Copper Concentrate

Manufacturer:
Teck Highland Valley Copper Partnership
P.O. Box 1500
Logan Lake, British Columbia
V0K 1W0
Emergency Telephone: CANUTEC
(613) 996-6666

Supplier:
Teck Highland Valley Copper Partnership
P.O. Box 1500
Logan Lake, British Columbia
V0K 1W0

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: October 17, 2018.

Date of Last Edit: October 17, 2018.

Product Use: Primary production of copper metal.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Short Term (Acute) Category 2**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	– Does not meet criteria		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	**– Category 1**		
Reproductive Toxicity	– Does not meet criteria		
Specific Target Organ Toxicity:			
Acute Exposure	– Does not meet criteria		
Chronic Exposure	**– Category 1**		

LABEL:

Symbols:

Signal Word:

DANGER

Hazard Statements	**Precautionary Statements:**
DANGER! Causes damage to the respiratory system through prolonged or repeated inhalation of fine respirable dust. May cause cancer through inhalation of dust. Toxic to aquatic life.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing. Wash thoroughly after handling. Avoid release to the environment. If exposed or concerned or you feel unwell: get medical advice/attention.

Emergency Overview: A green to red-brown, finely-ground material that is not flammable or combustible under normal conditions of transport and storage. However, when heated strongly in air for a sufficient time it will burn, releasing toxic and irritating sulphur dioxide gas as well as possible copper and iron oxide fumes. Contact with strong acids will generate flammable

and highly toxic hydrogen sulphide gas. Inhalation or ingestion of copper concentrate dust or copper oxide fume may produce irritation of the upper airways. Possible cancer hazard due to the silica content. Full face piece SCBA and protective clothing are required for fire emergency response personnel due to the potential for release of high concentrations of sulphur dioxide from burning concentrate. The metals content in this product have low direct bioavailability and pose little immediate ecological risk.

Potential Health Effects: Concentrate dust may be irritating to the nose, throat and respiratory tract. Inhalation or ingestion of copper may cause nausea, vomiting, headaches, dizziness, and gastrointestinal irritation. Inhalation of high concentrations of copper oxide fume may cause irritation of the upper respiratory tract and may result in a form of metal fume fever, characterized by flu-like symptoms such as chills, fever, nausea, and vomiting. Crystalline silica is classified as a Group 1 Carcinogen by IARC and as an A2 Carcinogen by the ACGIH (see Toxicological Information, Section 11).

Potential Environmental Effects: Copper concentrate is relatively insoluble in water, and therefore its constituent metals have low direct bioavailability. However, extended exposure of the concentrate in the aquatic and terrestrial environments can lead to the release of constituent metals in more bioavailable forms; these forms have the potential to cause adverse effects on biota (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENTS	CAS Registry No.	CONCENTRATION (% wt/wt)
Copper (present as Sulphides/Oxides)	1317-40-4 / 1344-70-3	30 – 60%
Sulphur (present as Mineral Sulphides)	7704-34-9	25 – 35%
Iron (present as Sulphides/Oxides)	1317-37-9 / 1332-37-2	10 – 30%
Silica (Amorphous and/or Crystalline)	60676-86-0 / 14808-60-7	3 – 7%
Alumina (Aluminum Oxide)	1344-28-1	0.5 – 1.5%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Dust in the eyes, mild irritation. Do not allow victim to rub eye(s). Let the eye(s) water naturally for a few minutes. If particle/dust does not dislodge, flush with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, immediately obtain medical attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Soiling and possible irritation. Remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts). Quickly and gently blot or brush away excess concentrate. Wash gently and thoroughly with lukewarm flowing water and non-abrasive soap for 5 minutes. If irritation persists, repeat flushing and obtain medical advice. Completely decontaminate clothing, shoes and leather goods before reuse or else discard.

Inhalation: *Symptoms:* Coughing, tingling sensation, sneezing. Remove source of contamination or move victim from exposure area to fresh air immediately.

Ingestion: *Symptoms:* Nausea, diarrhea, metallic taste. Rinse mouth. Get medical advice/attention if you are concerned or feel unwell.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Copper concentrate is not considered a fire or explosion hazard. However, it may burn if heated strongly enough and for sufficient time in a fire situation. When burning, it releases toxic and highly irritating sulphur dioxide gas (SO_2). Contact with strong acids may also generate flammable and highly toxic hydrogen sulphide gas (H_2S). Long term storage may result in oxidation and under certain conditions, spontaneous combustion may occur.

Extinguishing Media: Use any means of extinction appropriate for the surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Highly irritating and toxic fumes of sulphur dioxide (SO_2) will be released by burning copper concentrate. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods which will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear coveralls or other protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination.

Environmental Precautions: The handling, shipment, storage and processing of this material requires appropriate controls and care to prevent spillage or gradual accumulation in aquatic and terrestrial environments. Any spilled material should be promptly cleaned up.

SECTION 7. HANDLING AND STORAGE

Precautions for Safe Handling: Some sulphide concentrates may slowly oxidize in storage and generate sulphur dioxide as well as deplete the oxygen content of a confined space, such as a ship's hold. The atmosphere within confined spaces containing concentrate must be tested before entry and the area thoroughly ventilated or self-contained breathing apparatus used, if conditions warrant.

Conditions for Safe Storage: Store in a dry, well-ventilated area away from sources of combustion, acids and strong oxidizers. Some sulphide concentrates may also oxidize and generate heat which accumulates in storage piles. If material is to be stored for an extended period, the temperature of storage piles should be monitored.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines: *(Time-Weighted Average (TWA) concentration over 8 hr. unless otherwise indicated.)*

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Copper (present as Sulphides/Oxides)	1 mg Cu/m^3	1 mg Cu/m^3	1 mg Cu/m^3
Iron (present as Sulphides/Oxides)	None established†	None established†	None established†
Silica (assumed to be Crystalline alpha-Quartz)	0.025 mg SiO_2/m^3 (Respirable Dust)	3.3 mg/m^3 (Total Concentrate Dust)‡ 1.1 mg/m^3 (Respirable Concentrate)‡	0.05 mg SiO_2/m^3 (Respirable Dust)
Alumina (Aluminum Oxide)	1 mg/m^3 (Respirable Dust)	15 mg/m^3 (Total Dust) 5 mg/m^3 (Respirable Dust)	10 mg/m^3 (Total Dust) 5 mg/m^3 (Respirable Dust)
Sulphur (potentially present as SO_2)	None established*	None established*	None established*

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

* While there are no established OELs for sulphur as such, there are OELs for sulphur dioxide which will be formed during any combustion processes. The OSHA PEL for SO_2 is a time-weighted average concentration (TWA) of 5 ppm and the NIOSH REL is 2 ppm TWA and 5 ppm STEL. In 2008 the ACGIH significantly reduced their TLV® to a short term exposure limit (STEL) of 0.25 ppm over any 15 minute exposure.

† While there is no established Occupational Exposure Limit for iron as such, there are OELs for iron oxides which may be formed during burning, welding or other fuming processes. The OSHA PEL for iron oxide fume is 10 mg/m^3. The NIOSH REL for iron oxide dust and fume is 5 mg/m^3 (as Fe) and the ACGIH TLV is 5 mg/m^3 of iron oxide dust/fume (respirable fraction).

‡ The OSHA PEL for quartz (crystalline silica) applies to the total airborne concentrate dust concentration and has been calculated based on the maximum percent SiO_2 in the sample using the formula: Total Dust PEL = 30 mg/m3 / (%SiO_2 + 2) and Respirable Dust = 10 mg/m3 / (%SiO_2 + 2). The NIOSH and ACGIH limits apply to the actual amount of respirable quartz or silica in the workplace air.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of copper concentrate dust in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Protective Clothing: Coveralls or other work clothing, safety glasses, and gloves are recommended to prevent prolonged or repeated direct skin and eye contact. Close-fitting safety goggles may be required to prevent eye contact if excessive dust is generated. Workers should wash immediately when skin becomes heavily contaminated as well as at the end of each work shift.

Respirators: Where copper concentrate dust and/or sulphur dioxide gas is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a minimum of a combination N-100 or P-100 particulate filter / acid gas cartridge) in an air purifying respirator (APR) or powered air purifying respirator (PAPR). A full face piece chemical cartridge respirator or even a self-contained breathing apparatus may be required for higher concentrations of sulphur dioxide gas that could also result in significant eye irritation.

General Hygiene Considerations: Minimize dust generation and accumulation. Avoid breathing dust. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate designated areas only. Remove contaminated clothing and wash before reuse.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Greenish, coppery, reddish or brassy with blue tones.	**Odour:** Odourless	**Odour Threshold:** Not Applicable	**pH:** Not Applicable
Vapour Pressure: <1 mm Hg @ 25°C	**Vapour Density:** Not Applicable	**Melting Point/Range:** Not Available	**Boiling Point/Range:** >2200°C
Relative Density (Water = 1)**:** 2.2	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** Not Applicable	**Solubility:** Insoluble in water
Flammability: Non-combustible solid	**Flammable Limits (LEL/UEL):** Not Applicable	**Auto-ignition Temperature:** Not Applicable	**Decomposition Temperature:** Not Available

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: This concentrate is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Incompatible with strong oxidizing agents such as ammonium nitrate, ammonium peroxodisulfate, chlorates, chlorine trifluoride, chloroformadinium nitrate, sodium acetylide, chlorine, dinitrogen tetraoxide, liquid fluorine, nitryl fluoride and heat, peroxyl formic and potassium dichromate, oxygen difluoride, hot chlorinated rubber, strong acids such as hydrochloric and sulphuric acid. Also incompatible with sodium azide, acetylene, calcium hypochlorite and sodium peroxide. Vigorous reactions with iodine monochloride and hydrogen peroxide. May be ignited by open flames or other high temperature sources.

Hazardous Decomposition Products: Many sulphides react violently and explosively with powerful oxidizers, at the same time releasing large volumes of highly irritating and toxic SO_2. May release highly toxic and flammable hydrogen sulphide (H_2S) gas on contact with strong acids. High temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging may generate irritating copper and iron oxide fumes as well as large volumes of toxic and irritating sulphur dioxide gas. Long term storage may result in oxidation and under certain conditions, spontaneous combustion may occur.

SECTION 11. TOXICOLOGICAL INFORMATION

General: NOTE: The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent components.

Acute:
Skin/Eye: Contact with the eyes may cause local irritation due to direct abrasive action of the particles but would not cause tissue damage. Direct contact with the skin may also cause local mechanical irritation but is not known to be irritating or corrosive.

Inhalation: Acute inhalation of dusts will result in irritation of the nose, throat and upper respiratory passages. Symptoms may include discomfort, coughing, tingling sensation, sneezing and/or shortness of breath and wheezing as well as metallic taste. However, the metals are present predominantly as sulphides that are relatively insoluble and poorly absorbed within the body. An intense, short-term exposure to fumes from cutting or welding, etc. could result in the condition called metal fume fever. The symptoms of metal fume fever generally occur within 3 to 10 hours. They may include immediate dryness and irritation of the throat, tightness of the chest, and coughing that may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. Those experiencing a single acute episode of metal fume fever generally recover without apparent residual effects.

Ingestion: Individuals reported to have ingested large quantities of copper salts (primarily copper sulphate in attempting suicide) have reported gastrointestinal effects including vomiting, diarrhea, nausea, abdominal pain and a metallic taste in the mouth. Effects on the kidneys and liver, and even death, have also been reported in severe cases of copper poisoning. However, copper sulphide is poorly absorbed from the gastrointestinal tract, limiting exposure by ingestion and copper is a strong emetic so spontaneous vomiting following ingestion usually limits uptake of copper.

Chronic:
Prolonged exposure to copper dust or fume can cause irritation to the upper respiratory tract and, occasionally, ulceration and perforation of the nasal septum. A green discoloration of the skin and hair has been reported in some copper workers similar to that caused by wearing jewellery made of copper. A few instances of allergic skin rashes have also been reported in workers exposed to metallic copper. Copper is an essential element, but can become toxic when inhaled or ingested in large doses. Individuals with a rare disorder called "Wilson's Disease" (estimated prevalence 0.003% of the population) are predisposed to accumulate copper and should not be occupationally exposed. Prolonged inhalation of iron oxide fume causes a benign pneumoconiosis called siderosis. Alumina is considered to be a relatively benign compound with no significant effects on the respiratory system or other body organs. Chronic inhalation of crystalline free silica causes silicosis, a form of disabling, progressive, and sometimes fatal pulmonary fibrosis. Silicotics are also at increased risk of developing tuberculosis and/or lung cancer. IARC has classified crystalline silica of respirable particle size as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies it as a *Suspected Human Carcinogen (A2)*. The NTP recently reclassified silica as a *Known Human Carcinogen.* OSHA and the EU do not list silica as a carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Copper Sulphide	>2,500 mg/kg†	>2,000 mg/kg*	No data
Iron Sulphide	>2,000 mg/kg†	>2,000 mg/kg*	No data
Silica	No data	No data	No data
Alumina	>15,900 mg/kg†	No data	>2.3 mg/L‡

† LD_{50}, Rat, Oral * LD_{50}, Rat, Dermal ‡ LC_{50}, Rat, Inhal

SECTION 12. ECOLOGICAL INFORMATION

Copper concentrate is relatively insoluble in water, and therefore its constituent metals have low direct bioavailability. However, extended exposure of the concentrate in aquatic and terrestrial environments can lead to the release of the constituent metals in more bioavailable forms; these forms have the potential to cause adverse effects on biota. The mobility of the constituent metals in more soluble forms is media-dependent; they can bind with inorganic and organic ligands, reducing their mobility and bioavailability in both soil and water. Bioavailability is also mediated by other factors (e.g., pH, hardness, total organic carbon) in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations. Empty and thoroughly clean all residues from containers before reuse or disposal.

SECTION 14. TRANSPORT INFORMATION

Transport Canada Classification ..... Not regulated
U.S. DOT Hazard Classification ..... Not regulated
Marine Pollutant ..... No
IMO Classification ..... MHB (Material Hazardous in Bulk)

Note that this material has been tested under the United Nations Transport of Dangerous Goods, Manual of Tests and Criteria, Fifth Revised Edition (2009). Test results indicate that the concentrate qualifies neither as a flammable solid under Class 4.1 nor a self-heating substance under Class 4.2.

IMO MARPOL V Classification: Not Harmful to the Marine Environment.

SECTION 15. REGULATORY INFORMATION

U.S.
Ingredients Listed on TSCA Inventory..... Yes

Hazardous Under Hazard Communication Standard ..... Yes

CERCLA Section 103 Hazardous Substances ..... Yes.....Copper Compounds RQ: 5,000 lbs. (2270 kg)*
* reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance ..... None of the ingredients qualify.

EPCRA Section 311/312 Hazard Categories ..... Delayed (Chronic) Health Hazard - Carcinogen (due to presence of silica)

EPCRA Section 313 Toxic Release Inventory (Supplier Notification): ..... Copper ..... CAS No. 7440-50-8
Percent by Weight: 30-60%
Aluminum Oxide CAS No. 1344-28-1
Percent by Weight 0.5-1.5%

SECTION 16. OTHER INFORMATION

Date of Original Issue: June 15, 2010 **Version:** 01 *(First edition)*

Date of Latest Revision: October 17, 2018 **Version:** 04

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2018, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2018, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety CHEMINFO Record No: 2073, Copper.
- Commission de la santé et la sécurité du travail, Service du répertoire toxicologique, Cuivre, 2010-07.
- European Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 11 February 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Labour Office (WHO/ILO) Encyclopaedia of Occupational Health & Safety 4th Ed.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank.
- Patty's Toxicology, Fifth Edition, 2001: E Bingham, B Cohrssen & C H Powell, Ed.
- Sax, N. Irving & Lewis, Richard J. Sr., 1987, Hawley's Condensed Chemical Dictionary, Eleventh Edition.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, National Toxicology Program (NTP), 14th Report on Carcinogens, November 2016.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) CCOHS Web Access subscription.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.1000 and 1900.1200.

Acronyms not spelled out elsewhere in the SDS:

CAS: Chemical Abstract Service
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
DOT: Department of Transportation
EPCRA: Emergency Planning and Community Right-to-Know Act
IMO: International Maritime Organization
LD50, LC50: Lethal Dose 50%, Lethal Concentration 50%
MSHA: Mine Safety and Health Administration, U.S. Department of Labour
TSCA: Toxic Substances Control Act
Wt.: Weight

Notice to Reader
Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Highland Valley Copper Partnership extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

LEAD CONCENTRATE
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Red Dog Lead Concentrate

Trade Names and Synonyms: None

Manufacturer:
Teck Alaska Incorporated
Red Dog Mine
P.O. Box 1230
Kotzebue, Alaska
99752
Emergency Telephone: (250) 364-4214

Supplier:
Teck Alaska Incorporated
Red Dog Mine
P.O. Box 1230
Kotzebue, Alaska
99752

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Revision: June 12, 2015.

Date of Last Edit: June 12, 2015.

Product Use: Lead concentrate is used in the production of lead metal and lead alloys.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Long Term – Category 2**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	– Does not meet criteria		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	– **Category 1A**		
Reproductive Toxicity	– **Category 1A**		
Specific Target Organ Toxicity:			
Acute Exposure	– Does not meet criteria		
Chronic Exposure	– **Category 1**		

LABEL:

Symbols: 

Signal Word: **DANGER**

Hazard Statements	Precautionary Statements:
DANGER! May cause cancer through inhalation of dust. May damage fertility or the unborn child. Causes damage to the respiratory system through prolonged or repeated exposure. Toxic to aquatic life with long lasting effects.	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not breathe dust. Wear protective gloves, protective clothing, and eye protection. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. Avoid release to the environment. If exposed or concerned or you feel unwell: Get medical advice/attention. Collect all spillage.

Emergency Overview: A dark grey, heavy, soil-like material that is not flammable or combustible under normal conditions of transport and storage. However, when heated strongly in air it will burn, releasing toxic and irritating sulphur dioxide gas as well as possible lead and zinc oxide fumes. Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas

(H_2S). Inhalation or ingestion of concentrate dust may produce chronic health effects. Possible cancer hazard due to lead, cadmium and silica content. Possible reproductive hazard due to the lead content. SCBA and full protective clothing required for fire emergency response personnel.

Potential Health Effects: *Caution: The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.*

Concentrate dust is irritating to the nose, throat and respiratory tract. Inhalation or ingestion of concentrate dust may result in lead and cadmium absorption and possible lead intoxication. Symptoms include headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage (e.g., fatigue, headaches, tremors, hypertension), gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)*. The NTP has listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. Cadmium and silica are classified as *A2 Carcinogens* by the ACGIH and as *Group 1 Carcinogens* by IARC (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead concentrate will likely have minimal direct environmental effects, since its constituent metals have low solubility, and are therefore not highly bioavailable. However, when the product is processed or resides in the environment for extended periods, compound forms of lead and zinc may form which are potentially toxic to aquatic and terrestrial organisms (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead Sulphide	1314-87-0	58 to 66%
Zinc Sulphide	1314-98-3	16 to 23%
Iron Sulphide	1317-37-9	10 to 15%
Silica	14808-60-7	2.0 to 4.5%
Cadmium Sulphide	1306-23-6	0.10 to 0.25%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Product is not considered a fire or explosion hazard. However, concentrate will burn if heated strongly in a fire situation, releasing toxic and irritating sulphur dioxide gas (SO_2). Contact with strong acids will generate flammable and highly toxic hydrogen sulphide gas (H_2S). The ignition temperature of lead concentrate is approximately 500 – 600ºC.

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Toxic fumes of sulphur dioxide will result from combustion. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection and using methods that will minimize dust generation (e.g., vacuum solids, dampen material and shovel or wet sweep). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labeled containers for recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear coveralls or other protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust. Workers should wash and change clothing following cleanup of a spill to prevent personal contamination with lead-containing dust.

Environmental Precautions: The handling, shipment, storage and processing of this material requires appropriate controls and care to prevent spillage or gradual accumulation in the terrestrial and aquatic environments. Spilled material should be promptly cleaned up.

SECTION 7. HANDLING AND STORAGE

Health Precautions: Some sulphide concentrates may slowly oxidize in storage and generate sulphur dioxide as well as deplete the oxygen content of a confined space. The atmosphere within confined spaces containing concentrate must be tested before entry and the area thoroughly ventilated or self-contained breathing apparatus used, if conditions warrant.

Handling (Physical Aspects): Avoid excessive heat. Avoid contact with acids, oxidizers and combustible materials. Minimize dust generation and accumulation.

Storage Precautions: Store in a cool, dry area.

Autoignition: Some sulphide concentrates may oxidize and generate heat which accumulates in storage piles. If material is to be stored for an extended period, the temperature of piles should be monitored.

Means of Control: If heating of the concentrate is detected, the material should be sealed from air or oxygen in one of the following ways:

1. Leave the piles totally intact, do not open them up or try to spread them around.
2. Tamp or compact the surface of the piles.
3. Spray the pile with water. Resort to an organic binder only if needed because it can cause formation of hard lumps and subsequent problems for processing. Suggestions for organic binders include Aerospray 70A Binder, Coherex, Igepal CA-720 and lignin sulphonate, a pulp mill by-product.
4. For smaller piles, cover them with a tarp that will prevent exposure of the material to air.
5. If inside a building or ship's hold, keep all doors closed as much as possible and minimize ventilation.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Lead Sulphide	0.05 mg Pb/m^3	0.05 mg Pb/m^3	0.05 mg Pb/m^3
Zinc Sulphide	None established*	None established*	None established*
Iron Sulphide	None established*	None established*	None established*
Quartz (Respirable Crystalline Free Silica)	0.025 mg/m^3 Respirable SiO_2	1.5 mg/m^3 Respirable Dust** 4.6 mg/m^3 Total Dust**	0.05 mg/m^3 Respirable SiO_2
Cadmium Sulphide	0.01 mg/m^3 (Total Cd) 0.002 mg/m^3 (Respirable	0.005 mg Cd/m^3 {SECAL 0.015 / 0.05 mg Cd/m^3}	Lowest feasible level

Cd)

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

* - NOTE: While there are no established OELs for zinc sulphide and iron sulphide as such, there are OELs for their respective oxides, which may be formed during burning, welding or other fuming processes. The OSHA PEL for zinc oxide dust is 15 mg/m^3 (total) and 5 mg/m^3 (respirable); the OSHA PEL for zinc oxide fume is 5 mg/m^3. The ACGIH TLV for zinc oxide is 2 mg/ m^3 (respirable fraction) with a Short Term Exposure Limit (STEL) of 10 mg/m^3 (respirable fraction). The NIOSH REL for zinc oxide (dust or fume) is 5 mg/m^3 10 hr TWA with a 15 mg/m^3 ceiling for zinc oxide dust and a 10 mg/m^3 STEL for zinc oxide fume (15 min. sample).
The OSHA PEL for iron oxide fume is 10 mg/m^3. The NIOSH REL for iron oxide dust and fume is 5 mg/m^3 (as Fe) and the ACGIH TLV is 5 mg/m^3 of iron oxide dust/fume (respirable fraction).
** - NOTE: The OSHA PEL for silica applies to the total airborne lead concentrate dust concentration and has been calculated based on the maximum percent SiO_2 in the sample using the formulas: Respirable Dust PEL = 10 $mg/m^3/(\%SiO_2 + 2)$: Total Dust PEL. = 30 $mg/m^3/(\%SiO_2 + 2)$ (see Table Z-3 of 29 CFR 1910.1000)
SECAL: To be achieved in specified processes and work places where it is not possible to achieve the PEL through engineering and work practices alone. The OSHA SECAL for cadmium is 0.015 or 0.05 mg/m^3, depending on the processes involved. See Table 1 of 29 CFR 1910.1027.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead concentrate dust in the working environment well below the appropriate occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system.

Protective Clothing: Coveralls or other work clothing, glasses or goggles, and gloves are recommended to prevent prolonged or repeated direct skin contact. Close-fitting safety goggles should be worn to prevent eye contact if excessive dust is generated or where any possibility exists that eye contact may occur. Workers should wash immediately when skin becomes contaminated and at the end of each work shift. Work clothing should be removed immediately if it becomes heavily contaminated and should be changed daily and laundered before reuse if there is reasonable probability that the clothing may be contaminated.

Respirators: Where lead concentrate dust is generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge).

General Hygiene Considerations: Avoid breathing dust. Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate designated areas only.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Dark grey, fine powder	**Odour:** Weak organic odour from entrained flotation reagents	**Odour Threshold:** No data	**pH:** Not applicable
Vapour Pressure: Negligible at 20°C	**Vapour Density:** Not applicable	**Melting Point/Range:** Will burn first unless in an inert atmosphere	**Boiling Point/Range:** Not applicable
Relative Density (Water = 1)**:** 3.5 (Bulk Sp. Gr.)	**Evaporation Rate:** Not applicable	**Coefficient of Water/Oil Distribution:** Not applicable	**Solubility:** Essentially insoluble
Flash Point: Not applicable	**Flammable Limits (LEL/UEL):** Not Flammable	**Auto-ignition Temperature:** None	**Decomposition Temperature:** No data
Particle Size: <40 μm, with 80% <20 μm	**Percent Volatiles:** 8.1% @ 100°C (moisture)		

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Material is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: Reacts violently with iodine pentachloride. Incompatible with iodine monochloride, hydrogen peroxide, strong oxidizers, and strong acids.

Hazardous Decomposition Products: May release highly toxic and flammable hydrogen sulphide gas on contact with strong acids. This material can decompose at high temperatures forming toxic and irritating sulphur dioxide gas as well as lead, zinc and cadmium oxides.

SECTION 11. TOXICOLOGICAL INFORMATION

General: In the powder form in which this product is sold, the metals are present as sulphides that are relatively insoluble and poorly absorbed within the body. However, high temperature operations such as oxy-acetylene cutting, electric arc welding or arc-air gouging on dust–contaminated surfaces will generate highly toxic lead oxide fume that also contains some cadmium and zinc oxides. These oxides are highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body. The primary route of exposure would be through inhalation of metal oxide fumes, composed principally of lead oxide and including some zinc and cadmium oxides.
NOTE: The toxicological properties of this material have not been fully investigated. The information contained in this SDS is therefore based on information in the technical and scientific literature about the material's constituent compounds.

Acute:
Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to dust or fume is irritating to the nose, throat and respiratory tract with dryness and irritation of the nose and throat, tightness of the chest, coughing and metallic taste. It may cause headache, as well as gastrointestinal disturbances. An intense, short-term exposure to welding/burning fumes could cause congestion and pulmonary edema. However, short-term exposures of this magnitude are unlikely in industry today. Less intense, short term exposure to such fumes could produce metal fume fever with flu-like symptoms of fever, malaise, perspiration, frontal headache and muscle cramps from the zinc oxide fume. An acute, short-term exposure to high levels of oxide fumes could also result in the absorption of lead and cadmium in the body. Kidney damage, as well as anemia, could then result from acute exposure.

Ingestion: Symptoms due to ingestion of dust or fume would be similar to those from inhalation. Other health effects such as constipation or bloody diarrhea might also occur.

Chronic: Prolonged exposure to lead concentrate dust may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, kidney dysfunction, anemia, and possible skin rashes or dermatitis. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate exposure include fatigue, headaches, tremors and hypertension. Very high exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead and cadmium poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)*. The NTP has listed lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen. IARC has classified cadmium and certain cadmium compounds as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies cadmium as a *Suspected Human Carcinogen (A2)*. The NTP classifies cadmium as a *Known Human Carcinogen* and OSHA lists cadmium as a *Carcinogen*. The European Union (EU) classifies cadmium sulphide as a *Category 3 (Possible) Carcinogen.* IARC has classified crystalline silica of respirable particle size as a *Group 1 Carcinogen (Carcinogenic to Humans)* while ACGIH classifies it as a *Suspected Human Carcinogen (A2)*. The NTP classifies silica as a *Known Human Carcinogen.* OSHA and the EU do not list silica as a carcinogen.

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity:	Acute Dermal Toxicity:	Acute Inhalation Toxicity:
Lead Sulphide	no data	no data	no data
Zinc Sulphide	>2,000 mg/kg†	>2000 mg/kg*	>5.04 mg/L/4hr‡

Iron Sulphide	no data	no data	no data
Silica	no data	no data	no data
Cadmium Sulphide	7,080 mg/kg†	no data	no data

† LD_{50}, Rat, Oral, * LD_{50}, Rat, Dermal ‡ LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

Lead concentrate will likely have minimal direct environmental effects, since its constituent metals have low solubility, and are therefore not highly bioavailable. However, when the product is processed or resides in the environment for extended periods, compound forms of lead and zinc may form which are potentially toxic to aquatic and terrestrial organisms. The mobilities of lead and zinc are media-dependent. These elements can bind with inorganic and organic ligands, reducing their mobility and bioavailability in soil and water. Bioavailability is also regulated by other physico-chemical factors, such as pH and hardness.

Lead: Lead compounds are potentially persistent in the aquatic environment. Dissolved lead compounds have the potential to bioaccumulate in both aquatic and terrestrial plants and animals. Lead may occur as sorbed ions or surface coatings on sediment mineral particles, or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in relatively low mobility. Lead may be immobilized by ion exchange with hydrous oxides or clays or by chelation with humic or fulvic acids in the soil.

Zinc: Zinc is also potentially toxic to aquatic organisms. In aquatic systems, zinc bioaccumulates in both plants and animals. Zinc also bioaccumulates in terrestrial plants, vertebrates, and mammals; plant uptake from soil depends upon the plant species, soil pH, and soil composition. In general, zinc does not biomagnify through food chains.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of only in accordance with applicable regulations. Spilled concentrate would meet the requirements of a hazardous waste in most jurisdictions. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated in order to determine the proper waste classification and disposal methods.

SECTION 14. TRANSPORT INFORMATION

TRANSPORT CANADA CLASSIFICATION ..... Not regulated
U.S. DOT HAZARD CLASSIFICATION ..... Class 9, Packing Group III
U.S. PROPER SHIPPING NAME ..... Environmentally Hazardous Substance, Solid, n.o.s. (contains lead sulphide)
U.S. DOT RQ ..... Lead Sulphide (10 lbs.)
U.S. DOT PRODUCT IDENTIFICATION NUMBER UN3077
MARINE POLLUTANT ..... No
IMO CLASSIFICATION ..... MHB - Materials Hazardous Only in Bulk, Group A and B

Note that this material has been tested under the United Nations Transport of Dangerous Goods, Manual of Tests and Criteria, Fifth Revised Edition (2009). Test results indicate that the concentrate qualifies neither as a flammable solid under Class 4.1 nor a self-heating substance under Class 4.2.

Risks: This material may liquefy if shipped at moisture content in excess of its transportable moisture limit (TML). It may also present chemical hazards. Recommendations set out in Appendix 1 of the International Marine Solid Bulk Cargo Code should be observed.

IMO MARPOL V Classification: Harmful to the Marine Environment.

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY ..... Yes

HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD ..... Lead Sulphide ..... Yes
Cadmium Sulphide ..... Yes
Silica ..... Yes

CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Lead Sulphide ..... RQ: 10 lbs. (4.54 kg.)
Zinc Compounds ..... RQ: None assigned
Cadmium Compounds ... RQ: None Assigned

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE ..... None of the ingredients qualify.

EPCRA SECTION 311/312 HAZARD CATEGORIES	Delayed (Chronic) Health Hazard - Carcinogen Delayed (Chronic) Health Hazard – Reproductive Toxin
EPCRA SECTION 313 TOXIC RELEASE INVENTORY:	Lead Compounds (Lead Sulphide) CAS No 1314-87-0 Percent by Weight: .....58% to 66% Zinc Compounds (Zinc Sulphide) CAS No 1314-98-3 Percent by Weight: .....16% to 23% Cadmium Compounds (Cadmium Sulphide) CAS No 1306-23-6 Percent by Weight .....0.10% to 0.25%

SECTION 16. OTHER INFORMATION

Date of Original Issue: Sept. 24, 1997 **Version:** 01 *(First edition)*

Date of Latest Revision: June 12, 2015 **Version:** 15

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices - 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P.G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 608 Lead.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 548 Zinc.
- Canadian Centre for Occupational Health and Safety (CCOHS), Hamilton, ON, CHEMINFO Record No. 3454 Cadmium.
- European Economic Community, Commission Directives 91/155/EEC, 93/21/EEC and 67/548/EEC.
- Industry Canada, SOR/2015-7, January 30, 2015, Hazardous Products Regulations.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 – Lead, ICSC 1627 – Zinc Sulphide, ICSC 0404 – Cadmium Sulphide, ICSC 0808 – Quartz.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, 13th Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank. On-line version.
- Patty's Toxicology, 5th Edition, (E Bingham, B Cohrssen & C H Powell, Ed.) 2001:
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, CD-ROM Edition September 2005.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS).
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Update Toxicological Profile for Zinc.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Cadmium.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Alaska Incorporated extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

SAFETY DATA SHEET

Creation Date 09-Apr-2010 **Revision Date** 23-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Copper(II) sulfate**

Cat No. : **AC422870000; AC422870025; AC422870050; AC422870100; AC422871000; AC422875000**

CAS-No 7758-98-7
Synonyms Cupric sulfate anhydrous; Cupric sulfate; Copper monosulfate

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number
For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Acute oral toxicity	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Wear protective gloves/protective clothing/eye protection/face protection
Skin
IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Cupric sulfate	7758-98-7	98

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention if symptoms occur.

Inhalation Move to fresh air. 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. Obtain medical attention. If not breathing, give artificial respiration.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point	No information available
Method -	No information available

Autoignition Temperature

Explosion Limits

Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products

Highly toxic fumes Sulfur oxides Copper oxides

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	0	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained. Should not be released into the environment.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Store under an inert atmosphere.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cupric sulfate	TWA: 1 mg/m^3		IDLH: 100 mg/m^3 TWA: 1 mg/m^3	

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection	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 and body protection	Wear appropriate protective gloves and clothing to prevent skin exposure.
Respiratory Protection	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.
Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Grey
Odor	Odorless
Odor Threshold	No information available
pH	3.5-4.5
Melting Point/Range	200 °C / 392 °F
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	3.6
Solubility	203 g/L (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	Cu O4 S
Molecular Weight	159.6

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions. Hygroscopic.
Conditions to Avoid	Avoid dust formation. Incompatible products. Excess heat. Exposure to moisture.
Incompatible Materials	Strong bases, Metals, Alkali metals, Powdered metals
Hazardous Decomposition Products	Highly toxic fumes, Sulfur oxides, Copper oxides
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Cupric sulfate	LD50 = 481 mg/kg (Rat)	LD50 > 1000 mg/kg (Rabbit)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Cupric sulfate	7758-98-7	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not allow material to contaminate ground water system. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cupric sulfate	Not listed	LC50: = 0.1 mg/L, 96h (Oncorhynchus mykiss)	Not listed	EC50 = 0.024 mg/L/48h

Persistence and Degradability May persist based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.

Proper technical name Cupric sulfate
Hazard Class 9
Packing Group III

TDG
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IMDG/IMO
UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cupric sulfate	X	X	-	231-847-6	-		X	X	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.
F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Cupric sulfate	7758-98-7	98	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Cupric sulfate	X	10 lb	X	-

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Cupric sulfate	10 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Cupric sulfate	X	X	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 09-Apr-2010
Revision Date 23-Jan-2018
Print Date 23-Jan-2018
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-3, D-2B		

Section 1. Chemical Product and Company Identification

Product Name	**DIESEL FUEL**	**Code**	W104 SAP: 120, 121, 122, 287
Synonym	Diesel 50, Diesel 50 LS, #1 Diesel , #1 Diesel LS, Diesel LC, Seasonal Diesel, Seasonal Diesel LS, Diesel AA, Domestic Marine Diesel, International marine Diesel, Seasonal Diesel Locomotive, Domestic Marine diesel LS, diesel -20°C (LS), LSD, Low Sulphur Diesel, dyed diesel, marked diesel, coloured diesel, Naval Distillate.	**Validated on**	**3/2/2001.**
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Diesel oil. 2) Proprietary additives. 3) Aromatic content is 50% maximum (benzene: nil). 4) * Notice of Intended Change (2000): 100 mg/m³, skin, A3.	68334-30-5 Not available	>99.9 <0.1	Not established* Not established	Not established Not established	Not established Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Eye contact may cause mild eye irritation. Skin contact can cause moderate to severe irritation and produce drying, cracking, or defatting dermatitis. Inhalation of vapours can cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Inhalation can also cause irritation of nose and throat. Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. For more information, refer to Section 11.

Section 4. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section 5. Fire-fighting Measures

Flammability	Class II - combustible liquid (NFPA).	**Flammable Limits**	LOWER: 0.7%, UPPER: 6%
Flash Points	Diesel Fuel: Closed Cup: >40ºC (>104ºF) Marine Diesel Fuel: Closed Cup: >60ºC (>140ºF)	**Auto-Ignition Temperature**	225ºC (437ºF)
Fire Hazards in Presence of Various Substances	Flammable in presence of open flames, sparks, or 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. May accumulate in confined spaces.	**Explosion Hazards in Presence of Various Substances**	Containers may explode in heat of fire. Do not cut, weld, heat, drill or pressurize empty container. Vapour explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard.
Products of Combustion	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), water vapour (H2O), smoke and irritating vapours as products of incomplete combustion.		

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Fire Fighting Media and Instructions	NAERG96, GUIDE 128, Flammable liquids (Non-polar/Water-immiscible). CAUTION: This product has a moderate flash point above 40ºC: Use of water spray when fighting fire may be inefficient. 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. SMALL FIRES: Dry chemical, CO2, water spray or regular foam. LARGE FIRES: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if you can do it without risk. Fires Involving Tanks or Car/Trailer Loads: 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. Withdraw immediately in case of rising sound from venting devices or any discolouration of tank. ALWAYS stay away from the ends of tanks. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 128, Flammable Liquids (Non-polar/ Water-immiscible). ELIMINATE ALL IGNITION SOURCES. Avoid contact. Stop leak if without risk. Contain spill. Absorb with inert absorbents, dry clay, or diatomaceous earth. Avoid inhaling dust of diatomaceous earth for it may contain silica in very fine particle size, making this a potential respiratory hazard. Place used absorbent in closed metal containers for later disposal or burn absorbent in a suitable combustion chamber. DO NOT FLUSH TO SEWERS, STREAMS OR OTHER BODIES OF WATER. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.

Section 7. Handling and Storage

Handling	Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. DO NOT ingest. Do not breathe gas/vapour/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods.
Storage	Store in tightly closed containers in cool, dry, isolated, well-ventilated area, and away from incompatibles. Ground all equipment containing material.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection -	***The selection of personal protective equipment varies, depending upon conditions of use.***
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section 9. Physical and Chemical Properties

Physical State and Appearance	Bright oily liquid.	**Viscosity**	1.3-4.1 cSt @ 40ºC (104ºF)
Colour	Clear to yellow / brown. Low sulphur diesel fuels (<0.05 wt % sulphur) are colourless to light yellow (and may be dyed red for taxation purposes). Regular sulphur diesel fuels (0.05-0.50 % sulphur) may be colourless to yellow / brown and are usually dyed red for taxation purposes.	**Pour Point**	Variable, 0ºC to -50ºC (32ºF to -58ºF)
Odour	Petroleum oil like.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	150-371ºC (302-700ºF)	**Penetration**	Not applicable.
Density	0.85 kg/L @ 15ºC (Water = 1).	**Oil / Water Dist. Coefficient**	Not available
Vapour Density	4.5 (Air = 1)	**Ionicity (in water)**	Not applicable.

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Vapour Pressure	1.0 kPa @ 20ºC (7.5 mmHg @ 68ºF).	**Dispersion Properties**	Not available
Volatility	<0.1 (Butyl acetate = 1), less than gasoline.	**Solubility**	Insoluble in cold water, soluble in non-polar hydrocarbon solvents.

Section 10. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable under normal handling and storage conditions.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents and acids.	**Decomposition Products**	May release COx, NOx, SOx, H2S, H2O, smoke and irritating vapours when heated to decomposition.

Section 11. Toxicological Information

Routes of Entry	Skin contact, eye contact, inhalation, and ingestion.
Acute Lethality	Acute oral toxicity (LD50): 7500 mg/kg (rat).
Chronic or Other Toxic Effects	
Dermal Route:	Skin contact may cause moderate to severe irritation. Repeated exposure would produce drying and cracking or defatting dermatitis.
Inhalation Route:	Inhalation of vapours can cause CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Inhalation can also cause irritation of nose and throat.
Oral Route:	Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure.
Eye Irritation/Inflammation:	Eye contact may cause mild irritation, but no permanent damage.
Immunotoxicity:	Not available
Skin Sensitization:	This product is not expected to be a skin sensitizer, based on the available data and the known hazards of the components.
Respiratory Tract Sensitization:	This product is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.
Mutagenic:	This product is not expected to be a mutagen, based on the available data and the known hazards of the components.
Reproductive Toxicity:	This product is not expected to be a reproductive hazard, based on the available data and the known hazards of the components.
Teratogenicity/Embryotoxicity:	This product is not expected to be a teratogen or an embryotoxin, based on the available data and the known hazards of the components.
Carcinogenicity (ACGIH):	ACGIH Notice of Intended Changed (2000): proposed A3: animal carcinogen. [Diesel oil]
Carcinogenicity (IARC):	This product is not known to contain any chemicals at reportable quantities that are listed as group 1, 2A or 2B carcinogens by IARC.
Carcinogenicity (NTP):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by NTP.
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	This product is not known to contain any chemicals at reportable quantities that are listed as carcinogens by OSHA.
Other Considerations	No additional remark.

Section 12. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

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Section 13. Disposal Considerations

Waste Disposal Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section 14. Transport Information

TDG Classification
Diesel Fuel
UN1202
3
III

Special Provisions for Transport Not applicable.

Section 15. Regulatory Information

Other Regulations

This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List).

All components of this formulation are listed on the US EPA-TSCA Inventory.

All components of this product are on the European Inventory of Existing Commercial Chemical Substances (EINECS).

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

Please contact Product Safety for more information.

DSD/DPD (Europe) Not evaluated.

HCS (U.S.A.)
CLASS: Irritating substance.
CLASS: Target organ effects.
CLASS: Combustible liquid having a flash point between 37.8°C (100°F) and 93.3°C (200°F).

ADR (Europe) (Pictograms)
NOT EVALUATED FOR EUROPEAN TRANSPORT

NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.

DOT (U.S.A) (Pictograms)

HMIS (U.S.A.)

Health Hazard	2*
Fire Hazard	2
Reactivity	0
Personal Protection	H

NFPA (U.S.A.)

Rating	
0	Insignificant
1	Slight
2	Moderate
3	High
4	Extreme

Section 16. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Fuels & Solvents:
Western Canada, telephone: 403-296-4158; fax: 403-296-6551
Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TAR on 3/2/2001.

Data entry by Product Safety - JDW.

Continued on Next Page *Available in French*

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.

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: MOBIL DELVAC MX 15W-40
Product Description: Base Oil and Additives
Product Code: 201520402010, 201520402010, 441048-00, 97E501
Intended Use: Engine oil

COMPANY IDENTIFICATION

Supplier: **EXXON MOBIL CORPORATION**
3225 GALLOWS RD.
FAIRFAX, VA. 22037 USA

24 Hour Health Emergency	609-737-4411
Transportation Emergency Phone	800-424-9300
ExxonMobil Transportation No.	281-834-3296
Product Technical Information	800-662-4525, 800-947-9147
MSDS Internet Address	http://www.exxon.com, http://www.mobil.com

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
ZINC DITHIOPHOSPHATE	68649-42-3	1 - 2.5%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Hazardous Combustion Products: Smoke, Fume, Aldehydes, Sulfur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: 215°C (419°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable

regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: respiratory protection will be necessary only in special cases, e.g., formation of mists. Half-face or full-face respirator with filter(s) for dust/organic vapor or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Work gloves that are resistant to hydrocarbons are recommended. Gloves made of polyvinyl acetate (PVA) are not water-resistant and are not suitable for emergency use. Chemical goggles are recommended if splashes or contact with eyes is possible. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic material is recommended.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

STORAGE

The container choice, for example storage vessel, may effect static accumulation and dissipation. Do not store in open or unlabelled containers.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following are recommended: 5 mg/m³ - ACGIH TLV (inhalable fraction), 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Color: Brown
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.879
Flash Point [Method]: 215°C (419°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: N/D
Boiling Point / Range: > 316°C (600°F) [Estimated]
Vapor Density (Air = 1): N/D
Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 °C [Estimated]
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5 [Estimated]
Solubility in Water: Negligible
Viscosity: 123 cSt (123 mm2/sec) at 40 °C | 15.6 cSt (15.6 mm2/sec) at 100°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -27°C (-17°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt
Decomposition Temperature: N/D

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/m3	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: No end point data for material.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on test data for structurally similar materials.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Diesel engine oils: Not carcinogenic in animals tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies.
Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC
2 = NTP SUS
3 = IARC 1
4 = IARC 2A
5 = IARC 2B
6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION.

THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT): Not Regulated for Land Transport

LAND (TDG): Not Regulated for Land Transport

SEA (IMDG): Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA): Not Regulated for Air Transport

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

Complies with the following national/regional chemical inventory requirements: DSL, KECI, TSCA
Special Cases:

Inventory	Status
AICS	Restrictions Apply

EPCRA SECTION 302: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: None.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
ZINC DITHIOPHOSPHATE	68649-42-3	1 - 2.5%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
DIPHENYLAMINE	122-39-4	18
ZINC DITHIOPHOSPHATE	68649-42-3	13, 15, 17, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK

5 = TSCA 4 10 = CA P65 CARC 15 = MI 293

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
Revision Changes:
Section 04: First Aid Inhalation - Header was modified.
Section 04: First Aid Ingestion - Header was modified.
Section 13: Disposal Considerations - Disposal Recommendations was modified.
Section 01: Product Code was modified.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Color was modified.
Section 09: Boiling Point C(F) was modified.
Section 09: Pour Point C(F) was modified.
Section 09: Evaporation Rate - Header was modified.
Section 09: n-Octanol/Water Partition Coefficient was modified.
Section 08: Comply with applicable regulations phrase was modified.
Section 09: Vapor Pressure was modified.
Section 07: Handling and Storage - Handling was modified.
Section 07: Handling and Storage - Storage Phrases was modified.
Hazard Identification: Health Hazards was modified.
Section 11: Inhalation Lethality Test Data was modified.
Section 11: Inhalation Irritation Test Data was modified.
Section 05: Hazardous Combustion Products was modified.
Section 06: Accidental Release - Spill Management - Water was modified.
Section 09: Relative Density - Header was modified.
Section 09: Flash Point C(F) was modified.
Section 09: Viscosity was modified.
Section 09: Viscosity was modified.
Section 14: Sea (IMDG) - Header was modified.
Section 14: Air (IATA) - Header was modified.
Section 14: LAND (TDG) - Header was modified.
Section 14: LAND (DOT) - Header was modified.
Composition: Component table was modified.
Section 15: List Citations Table was modified.
Section 14: LAND (DOT) - Default was modified.
Section 14: LAND (TDG) Default was modified.
Section 14: Sea (IMDG) - Default was modified.
Section 14: Air (IATA) - Default was modified.
Section 15: National Chemical Inventory Listing - Header was modified.
Section 15: SARA (313) TOXIC RELEASE INVENTORY - Table was modified.
Section 15: Community RTK - Header was modified.
Section 11: Additional Health Information was modified.
Section 08: Exposure limits/standards was modified.
Section 15: Special Cases Table was modified.
Section 09: Oxidizing Properties was modified.
Section 01: Company Contact Methods Sorted by Priority was modified.
Section 06: Protective Measures was added.

Section 06: Accidental Release - Protective Measures - Header was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 09: Decomposition Temperature was added.
Section 09: Decomposition Temp - Header was added.
Section 09: Vapor Pressure was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.
Section 12: Ecological Information - Acute Aquatic Toxicity was deleted.

Internal Use Only

MHC: 0B, 0B, 0, 0, 0, 0 PPEC: A

DGN: 2003490XUS (1012126)

Safety Data Sheet

Section 01 - Product And Company Identification

Product Identifier	Inhibited Ethylene Glycol
Other Means of Identification	Not Available
Product Use and Restrictions on Use	Antifreeze, heat transfer liquid.
Initial Supplier Identifier	ClearTech Industries Inc. 1500 Quebec Avenue Saskatoon, SK. Canada S7K 1V7
Prepared By	ClearTech Industries Inc. Technical Department Phone: 1 (800) 387-7503
24-Hour Emergency Phone	Phone: 1 (306) 664 – 2522 Alternative Phone: 1 (800) 387-7503

Section 02 - Hazard Identification

GHS-Classification

Acute Toxicity-Oral	Category 5
Serious Eye Damage/Eye Irritation	Category 2B
Reproductive Toxicity	Category 1A
STOT-Single Exposure	Category 2

Signal Word
Danger

Hazard Statements
May be harmful if swallowed.
Causes eye irritation.
May damage fertility or the unborn child.
May cause damage to kidneys, liver and central nervous system.

Physical Hazards

No physical hazards known.

Pictograms

Precautionary Statements

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Use personal protective equipment as required.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Do not breathe dust/fume/gas/mist/vapours/spray.
Call a POISON CENTER/doctor/physician if you feel unwell.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists, get medical advice/attention.
Wash hands after handling
IF exposed or concerned: Get medical attention/advice.
Call a POISON CENTER or doctor/physician if exposed or you feel unwell.
Store locked up.

Section 03 - Composition / Information on Ingredients

Chemical Name	CAS Number	Weight %	Unique Identifiers
Ethylene Glycol	107-21-1	93-100%	
Dipotassium Phosphate	7758-11-4	1-5%	

Common Name and Synonyms Ucartherrm

Section 04 - First Aid Measures

Inhalation

Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption

Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact

Contact lenses should never be worn when working with this product. Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion

If swallowed, do not induce vomiting. Never give anything by mouth to an unconscious person. If vomitting occurs, keep head below hips. Obtain medical help immediately.

Additional Information

Notes to physician:
It is estimated that the oral dose to adults is of the order of 1.0 ml/kg. Ethylene glycol is metabolized by alcohol dehydrogenate to various metabolites including glyceraldehydes, glycolic acid and oxalic acid which cause an elevated anion-gap metabolic acidosis and renal tubular injury. The signs and symptoms in ethylene glycol poisoning are those of metabolic acidosis, CNS depression and kidney injury. Urinalysis may show albuminuria, hematuria and oxaluria. Clinical chemistry may reveal anion-gap metabolic acidosis and uremia. The currently recommended medical management of ethylene glycol poisoning includes elimination of ethylene glycol and metabolites, correction of metabolic acidosis and prevention of kidney injury. It is essential to have immediate and follow up urinalysis and clinical chemistry. There should be particular emphasis on acid-base balance and renal function tests. A continuous infusion of 5% sodium bicarbonate with frequent monitoring of electrolytes and fluid balance is used to achieve correction of metabolic acidosis and forced diuresis. As a competitive substrate for alcohol dehydogenase, ethanol is antidotal. Given in the early stages of intoxication, it blocks the formulation of nephrotoxic metabolites. A therapeutically effective blood concentration of ethanol is in the range 100 - 150 mg/dl and should be achieved by a rapid loading dose and maintained by intravenous infusion. For severe and /or deteriorating cases, hemodialysis may be required. Dialysis should be considered for patients who are symptomatic, have severe metabolic acidosis, a blood ethylene glycol concentration greater than 25 mg/dl, or compromise of renal functions.
A more effective intravenous antidote for physician use in 4 methylpyrazole, a potent inhibitor of alcohol dehydrogenases which effectively blocks the formation of toxic metabolites of ethylene glycol. It has been used to decrease the metabolic consequences of ethylene glycol poisoning before metabolic acidosis coma, seizures and renal failure have occurred. A generally recommended protocol is a loading dose of 15 mg/kg followed by 10 mg/kg every 12 hours for 4 doses and the 15 mg/kg every 12 hours until the ethylene glycol concentrations are below 20 mg/100ml. Slow intravenous infusion is required. Since 4-methylpyrazole is dialyzable, increased dosage may be necessary during hemodialysis. Additional therapeutic measures may include the administration of cofactors involved in the metabolism of ethylene glycol. Thiamine (100 mg) and pyridoxine (50 mg) should be given every six hours.
Pulmonary edema with hypoxemia has been described in a number of patients following poisoning with ethylene glycol. The mechanism of production has not been elucidated, but it appears to be non-cardiogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end expiratory pressure may be required. There may be cranial nerve involvement in the late stages of toxicity from swallowed ethylene glycol. In particular, effects have been reported involving the seventh, eighth and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing, and dysphagia.

Section 05 - Fire Fighting Measures

Suitable Extinguishing Media	For small fires use dry chemicals, carbon dioxide, water spray or alcohol resistant foams. For large fires use water spray, CO_2 or foam but do not use water jet.
Unsuitable Extinguishing Media	Not Available
Specific Hazards Arising From the Chemical	Carbon monoxide and carbon dioxide.
Special Protective Equipment for Fire-Fighters	Wear NIOSH-approved self-contained breathing apparatus and protective clothing.
Further Information	Not Available

Section 06 - Accidental Release Measures

Personal Precautions / Protective Equipment / Emergency Procedures	Wear appropriate personal protective equipment. Ventilate area. Only enter area with PPE. Stop or reduce leak if safe to do so. Prevent material from entering sewers. Flush with water to remove any residue.
Environmental Precautions	Prevent materials from entering sewers or streams.
Methods and Materials for Containment and Cleaning Up	For small spills, collect with non-combustible absorbent. For large spills, remove by mechanical means and place in appropriate containers for disposal.

Section 07 - Handling and Storage

Precautions for Safe Handling	Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure. Maximum recommended temperature on heat transfer side of a heat exchanger is 160°C.
Conditions for Safe Storage	Keep containers tightly closed. Keep in a cool, well-ventilated place away from heat and ignition sources. Avoid storage with incompatible materials such as galvanized steel. Carbon or stainless steel are compatible materials for storage. Thermal degradation can occur if product is subject to prolonged exposure to high temperatures.
Incompatibilities	Acids, bases, hydroxyl compounds, oxidizers.

Section 08 - Exposure Controls and Personal Protection

Exposure Limit(s)

Component	Regulation	Type of Listing	Value
Ethylene glycol	ACGIH	TLV-C	100mg/m^3
	OSHA	PEL-C	50ppm

Engineering Control(s)

Ventilation Requirements

Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other

Emergency shower and eyewash should be in close proximity.

Protective Equipment

Eyes/Face

Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Hand Protection

Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Skin and Body Protection

Body suite, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Impervious boots of chemically resistant material should be worn at all times. No special footwear is required other than what is mandated at place of work.

Respiratory Protection

Atmospheric levels should be maintained below the exposure guideline. For most conditions, no respiratory protection is needed; however, if handling at elevated temperatures without sufficient ventilation, use an approved NIOSH approved respirator with organic vapour cartridge.

Thermal Hazards

Not Available

Section 09 - Physical and Chemical Properties

Appearance

Physical State

Liquid

Colour

Colourless to yellow

Odour	Slightly sweet smelling.
Odour Threshold	Not Available

Property

pH	9.5 at 50%
Melting Point/Freezing Point	-19.4°C
Initial Boiling Point and Boiling Range	158°C
Flash Point	126.7°C
Evaporation Rate	0.1
Flammability	Flammable liquid. Solutions of this product with water can form flammable vapours with air if heated sufficiently.
Upper Flammable Limit	15.0%
Lower Flammable Limit	3.2%
Vapour Pressure (mm Hg, 20^{o}C)	2.2
Vapour Density (Air=1)	> 1.0
Relative Density	Not Available
Solubility(ies)	100%
Partition Coefficient: n-octanol/water	Not Available
Auto-ignition Temperature	398°C
Decomposition Temperature	Not Available
Viscosity	Not Available
Explosive Properties	Sudden release of hot organic chemical vapours or mists from process equipment may result in ignitions without the presence of obvious ignition sources.

Specific Gravity (Water=1)	1.133
% Volatiles by Volume	96% by weight
Formula	$C_2H_6O_2$
Molecular Weight	62.07

Section 10 - Stability and Reactivity

Reactivity	No dangerous reaction known under conditions of normal use.
Stability	Stable under normal conditions.
Possibility of Hazardous Reactions	Polymerization will not occur.
Conditions to Avoid	Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems.
Incompatible Materials	Acids, bases, hydroxyl compounds, oxidizers.
Hazardous Decomposition Products	Explosive decompostion may occur if combined with strong acids or strong bases and subjected to elevated temperatures. Burning may produce carbon monoxide and/or carbon dioxide and other organic compounds such as formaldehyde, acetaldehyde, and glycol ethers.

Section 11 - Toxicological Information

Acute Toxicity

Component	Oral LD_{50}	Dermal LD_{50}	LC_{50}
Ethylene Glycol	4700mg/kg (rat) 7500mg/kg (mouse) 1650mg/kg (cat)	9530mg/kg (rabbit) 3500mg/kg (mouse)	2725mg/m^3 (rat, 4hr exposure)

Chronic Toxicity – Carcinogenicity

Component	IARC
Ethylene glycol	Not considered to be carcinogenic (IARC and ACGIH).
Dipotassium phosphate	Not considered to be carcinogenic (IARC and ACGIH).

Skin Corrosion/Irritation	Brief contact is essentially nonirritating to skin. Prolonged contact may cause slight skin irritation with local redness. Repeated contact may cause skin irritation with local redness. Repeated skin exposure to large quantities may result in absorption of harmful amounts. Massive contact with damaged skin or of material sufficiently hot to burn skin may result in absorption of potential lethal amounts.
Serious Eye Damage/Irritation	Vapours or mists may cause eye irritation. Corneal injury is unlikely.
Ingestion	May cause abdominal discomfort or pain, nausea, vomiting, dizziness, drowsiness, malaise, blurring of vision, irritability, lumbar pain, oliguria, uremia, and central nervous system effects, including irregular eye movements, convulsions and coma. Cardiac failure, pulmonary edema, and severe kidney damage may develop. May be fatal if swallowed, lethal dose in adult humans for ethylene glycol is approximately 100 mL.
Inhalation	At room temperature, exposure to vapor is minimal due to low volatility. With good ventilation, single exposure is not expected to cause adverse effects. If material is heated or areas are poorly ventilated, vapor/mist may accumulate and cause respiratory irritation and symptoms such as headache and nausea.
Respiratory or Skin Sensitization	Repeated skin contact may cause sensitization with the development of allergic contact dermatitis.
Germ Cell Mutagenicity	The available information does not indicate that ethylene glycol is mutagenic.
Reproductive Toxicity	Ethylene glycol induces developmental effects in rats and mice by all routes of exposure, although at doses greater than those associated with renal effects in male rats. Ethylene glycol is teratogenic, inducing primarily skeletal and external malformations, sometimes at doses less than those that are maternally toxic, with mice being more sensitive than rats. Reproductive studies with ethylene glycol show that in repeated dose toxicity studies, no evidence of an adverse impact on reproductive organs was observed. In special studies, including a three generation study in rats and continuous breeding protocols in mice, evidence of reproductive effects have been restricted to mice (but not rabbits or rats) exposed to doses considerably higher than those associated with developmental effects in this species or renal effects in rats. Passes through the placental barrier in animals and is embryotoxic. Proven teratogen in humans.
STOT-Single Exposure	The substance may cause effects on the kidneys and central nervous system. This may result in renal failure and brain injury. Exposure could cause lowering of consciousness.
STOT-Repeated Exposure	Repeated inhalation of ethylene glycol mist may produce signs of central nervous system involvement, particularly dizziness and nystagmus. May aggravate existing kidney disease. Repeated or prolonged exposure may produce target organ damage. It may cause general deterioration in health by accumulating in one or more human organs.

Aspiration Hazard	Not likely to be an aspiration hazard based on physical properties.
Synergistic Materials	Not Available

Section 12 - Ecological Information

Ecotoxicity

Component	Toxicity to Algae	Toxicity to Fish	Toxicity to Daphnia and Other Aquatic Invertebrates
Ethylene Glycol	Not Available	LC_{50}(96 hrs, Bluegill sunfish): 27,500mg/L LC_{50}(96 hrs, Fathead minnow): 49,000mg/L LC_{50}(96 hrs, rainbow trout): 18500mg/L	Not Available

Biodegradability	Ultimately biodegradable.
Bioaccumulation	Not Available
Mobility	Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process. Potential for mobility in soil is very high.
Other Adverse Effects	Not Available

Section 13 - Disposal Considerations

Waste From Residues/Unused Products	Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.
Contaminated Packaging	Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transport Information

UN Number	Not Regulated
UN Proper Shipping Name	Not Regulated
Transport Hazard Class(es)	Not Regulated

Packaging Group	Not Regulated
Environmental Hazards	
Special Precautions	
Transport in Bulk	

TDG

Other	Secure containers (full and/or empty) with suitable hold down devises during shipment and ensure all caps, valves, or closures are secured in the closed position.

PRODUCT CLASSIFICATION: This product has been classified on the preparation date specified at section 16 of this MSDS / SDS, for transportation in accordance with the requirements of part 2 of the Transportation of Dangerous Goods Regulations. If applicable, testing and/or published test data regarding the classification of this product are listed in the references at section 16 of this MSDS / SDS.

Section 15 - Regulatory Information

NOTE: THE PRODUCT LISTED ON THIS SDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS SDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

Section 16 - Other Information

Preparation Date	July 21, 2014

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / SDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service center or technical service department.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
AIHA	American Industrial Hygiene Association
CAS	Chemical Abstract Service

CACD
RESPONSIBILITY MATTERS

DSL	Domestic Substance List
EC	Effective Concentration
IARC	International Agency for Research on Cancer
IDHL	International Digest of Health Legislation
LC	Lethal Concentration
LD	Lethal Dosage
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health
NFPA	National Fire Protection Association
NTP	National Toxicology Program (U.S.A.)
OSHA	Occupational Safety and Health Administration (U.S.A.)
PEL	Permissible Exposure Limit
PPE	Personal Protection Equipment
STEL	Short-term Exposure Limit
STOT	Specific Target Organ Systemic Toxicity
TLV	Threshold Limit Value
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
UN	United Nations
WEEL	Workplace Environmental Exposure Level
WHMIS	Workplace Hazardous Materials Information System

References

1) *CHEMINFO: Dipotassium phosphate.* (2014). Retrieved from Canadian Centre for Occupational Health and Safety: http://ccinfoweb2.ccohs.ca/cheminfo/records/126E.html
2) *CHEMINFO: Ethylene glycol.* (2014). Retrieved from Canadian Centre for Occupational Health and Safety: http://ccinfoweb2.ccohs.ca/cheminfo/records/41E.html
3) *Ethylene Glycol*. (2012). Retrieved from INCHEM: http://www.inchem.org/documents/icsc/icsc/eics0270.htm
4) U.S. National Library of Medicine. (2012). *Ethylene glycol*. Retrieved from TOXNET: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~h55Gwt:1

ClearTech Industries Inc. - Locations

Corporate Head Office: 1500 Quebec Avenue, Saskatoon, SK, S7K 1V7
Phone: 1(306) 664 – 2522
Alternative Phone: 1(800) 387-7503
Fax: 1(888) 281-8109

www.ClearTech.ca

Location	Address	Postal Code	Phone Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	1(800)387-7503
Port Coquitlam, B.C.	223 Kingsway Avenue	V3C 1S9	1(800)387-7503
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	1(800)387-7503
Edmonton, AB.	12020 - 142nd Street	T5L 2G8	1(800)387-7503
Saskatoon, SK.	North Corman Industrial Park	S7K 1V7	1(800)387-7503
Regina, SK.	555 Henderson Drive	S42 5X2	1(800)387-7503
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	1(800)387-7503

CACD
RESPONSIBILITY MATTERS

Mississauga, ON. 355 Admiral Blvd Unit #1 L5T 2N1 1(800)387-7503

24 Hour Emergency Number - All Locations – 1(306) 664-2522
Alternative - 1(800) 387-7503

End of Safety Data Sheet

MATERIAL SAFETY DATA SHEET

Ferric Sulphate

Section 01 - Chemical And Product And Company Information

Product Identifier ..... Ferric Sulphate, granular

Product Use ..... Pigmentation, reagent, iron alum manufacturing, etching aluminum, disinfectant, textiles, flocculant in water and waste treatment, soil conditioner

Supplier Name..... ClearTech Industries Inc.
2302 Hanselman Avenue
Saskatoon, SK. Canada
S7L 5Z3

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... 2012-01-13

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....Ferric Sulphate ≤ 100%

CAS Number..... Ferric Sulphate 10028-22-5

Synonym (s)..... Iron(III) sulphate, granular ferric sulphate

Section 03 - Hazard Identification

Inhalation..... Dust of soluble salts may cause mucous membrane irritation with coughing, sneezing or difficulty breathing.

Skin Contact / Absorption..... May cause skin irritation.

Eye Contact..... Causes slight irritation.

Ingestion..... Ingestion will cause nausea and vomiting after swallowing. The absorption of large quantities is followed by cardiovascular disorders. Toxic effects expected on liver and kidneys.

Exposure Limits..... Not available

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion..... Do not induce induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention immediately.

Additional Information..... Not available

Section 05 - Fire Fighting

Conditions of Flammability..... Non-flammable

Means of Extinction..... Foam, dry powder, carbon dioxide and sand for extinguishing surrounding fire.

Flash Point..... Not applicable

Auto-ignition Temperature..... Not applicable

Upper Flammable Limit ..... Not applicable

Lower Flammable Limit..... Not applicable

Hazardous Combustible Products... Material itself does not burn or burns with difficulty. When heated to decomposition > 520°C, it may emit sulphur oxides and toxic fumes of iron.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards…….. Not considered to be an explosion hazard.

Section 06 - Accidental Release Measures

Leak / Spill.....…….. Wear appropriate personal protective equipment. Ventilate area. Stop or reduce leak if safe to do so. Prevent material from entering sewers. Resisues can be washed away with clean water.

Deactivating Materials...…….. Not available

Section 07 - Handling and Storage

Handling Procedures.....…….. Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements.....……..…... Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes…….…….. Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory……... Use a NIOSH-approved respirator for dusts that may be created during product use.

Gloves……..... Impervious gloves of chemically resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing……..…….... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear……..... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Solid

Odor and Appearance..... Odorless, brown to yellow powder

Odor Threshold..... Not available

Specific Gravity (Water=1)..... Not available

Vapor Pressure (mm Hg, 20C)..... Not available

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Boiling Point..... Not available

Freeze/Melting Point..... Not available

pH...... 2-3 (1% solution)

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... Approximately 200 kg/m^3

% Volatiles by Volume..... Not available

Solubility in Water..... Soluble

Molecular Formula..... $Fe_2(SO_4)_3$

Molecular Weight..... 399.88

Section 10 - Stability and Reactivity

Stability..... Stable under normal conditions of use and storage.

Incompatibility..... Alkalis, soluble carbonates, copper, copper alloys, mild steel, galvanized steel and oxidizing materials.

Hazardous Products of Decomposition.. Burning may produce sulfur and iron oxides.

Polymerization..... Will not occur.

Section 11 - Toxicological Information

Irritancy..... Moderate

Sensitization..... Not available

Chronic/Acute Effects..... No other effects are expected other than what is listed in Section 3.

Synergistic Materials..... Not available

Animal Toxicity Data..... Not available

Carcinogenicity..... Not available

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... Not available

Environmental Effects..... Not available

Section 13 - Disposal Consideration

Waste Disposal..... Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transportation Information

TDG Classification

Class…….…….…….... Not regulated

Group.....…….....……... Not regulated

PIN Number.....…….…….... Not regulated

Other……..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....……....Not a controlled product

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

ClearTech Industries Inc. - Locations

Corporate Head Office: 2302 Hanselman Avenue, Saskatoon, SK, S7L 5Z3
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	2302 Hanselman Avenue	S7L 5Z3	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

MATERIAL SAFETY DATA SHEET

Gasoline, All Grades

MSDS No. 9950

EMERGENCY OVERVIEW
DANGER!
EXTREMELY FLAMMABLE - EYE AND MUCOUS MEMBRANE IRRITANT - EFFECTS CENTRAL NERVOUS SYSTEM - HARMFUL OR FATAL IF SWALLOWED - ASPIRATION HAZARD

NFPA 704 (Section 16)

High fire hazard. Keep away from heat, spark, open flame, and other ignition sources.

If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs). Contact may cause eye, skin and mucous membrane irritation. Harmful if absorbed through the skin. Avoid prolonged breathing of vapors or mists. Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects.

Long-term exposure may cause effects to specific organs, such as to the liver, kidneys, blood, nervous system, and skin. Contains benzene, which can cause blood disease, including anemia and leukemia.

1. CHEMICAL PRODUCT and COMPANY INFORMATION

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

EMERGENCY TELEPHONE NUMBER (24 hrs): **CHEMTREC (800)424-9300**
COMPANY CONTACT (business hours): Corporate Safety (732)750-6000
MSDS (Environment, Health, Safety) Internet Website www.hess.com

SYNONYMS: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

See Section 16 for abbreviations and acronyms.

2. COMPOSITION and INFORMATION ON INGREDIENTS *

INGREDIENT NAME (CAS No.)	CONCENTRATION PERCENT BY WEIGHT
Gasoline (86290-81-5)	100
Benzene (71-43-2)	0.1 - 4.9 (0.1 - 1.3 reformulated gasoline)
n-Butane (106-97-8)	< 10
Ethyl Alcohol (Ethanol) (64-17-5)	0 - 10
Ethyl benzene (100-41-4)	< 3
n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Tertiary-amyl methyl ether (TAME) (994-05-8)	0 to 17.2
Toluene (108-88-3)	1 - 25
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 - 15

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol or MTBE and/or TAME).

Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

3. HAZARDS IDENTIFICATION

EYES
Moderate irritant. Contact with liquid or vapor may cause irritation.

SKIN
Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

INGESTION
The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

INHALATION
Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

CHRONIC EFFECTS and CARCINOGENICITY
Contains benzene, a regulated human carcinogen. Benzene has the potential to cause anemia and other blood diseases, including leukemia, after repeated and prolonged exposure. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with systemic toxicity. See also Section 11 - Toxicological Information.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
Irritation from skin exposure may aggravate existing open wounds, skin disorders, and dermatitis (rash). Chronic respiratory disease, liver or kidney dysfunction, or pre-existing central nervous system disorders may be aggravated by exposure.

4. FIRST AID MEASURES

EYES
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

SKIN
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

INGESTION

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

INHALATION
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES:

FLASH POINT:	-45 ^{o}F (-43^{o}C)
AUTOIGNITION TEMPERATURE:	highly variable; > 530 ^{o}F (>280 ^{o}C)
OSHA/NFPA FLAMMABILITY CLASS:	1A (flammable liquid)
LOWER EXPLOSIVE LIMIT (%):	1.4%
UPPER EXPLOSIVE LIMIT (%):	7.6%

FIRE AND EXPLOSION HAZARDS
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

EXTINGUISHING MEDIA
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, fire fighting foam, or Halon.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

During certain times of the year and/or in certain geographical locations, gasoline may contain MTBE and/or TAME. Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration - refer to NFPA 11 “Low Expansion Foam - 1994 Edition.”

FIRE FIGHTING INSTRUCTIONS
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

See Section 16 for the NFPA 704 Hazard Rating.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPILL CONTINGENCY or EMERGENCY PLAN.

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

7. HANDLING and STORAGE

HANDLING PRECAUTIONS

******USE ONLY AS A MOTOR FUEL******
******DO NOT SIPHON BY MOUTH******

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents.

STORAGE PRECAUTIONS

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

WORK/HYGIENIC PRACTICES

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

8. EXPOSURE CONTROLS and PERSONAL PROTECTION

EXPOSURE LIMITS

Component (CAS No.)	Source	TWA (ppm)	STEL (ppm)	Exposure Limits Note
Gasoline (86290-81-5)	ACGIH	300	500	A3
Benzene (71-43-2)	OSHA	1	5	Carcinogen
	ACGIH	0.5	2.5	A1, skin
	USCG	1	5	
n-Butane (106-97-8)	ACGIH	1000	--	Aliphatic Hydrocarbon Gases Alkane (C1-C4)
Ethyl Alcohol (ethanol) (64-17-5)	OSHA	1000	--	
	ACGIH	1000	--	A4
Ethyl benzene (100-41-4)	OSHA	100	--	
	ACGIH	100	125	A3
n-Hexane (110-54-3)	OSHA	500	--	
	ACGIH	50	--	Skin
Methyl-tertiary butyl ether [MTBE] (1634-04-4)	ACGIH	50		A3
Tertiary-amyl methyl ether [TAME] (994-05-8)				None established
Toluene (108-88-3)	OSHA	200		Ceiling: 300 ppm; Peak: 500 ppm (10 min.)
	ACGIH	20	--	A4
1,2,4- Trimethylbenzene (95-63-6)	ACGIH	25	--	
Xylene, mixed isomers (1330-20-7)	OSHA	100	--	
	ACGIH	100	150	A4

ENGINEERING CONTROLS

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

EYE/FACE PROTECTION

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

SKIN PROTECTION

Gloves constructed of nitrile or neoprene are recommended. Chemical protective clothing such as that made of of E.I. DuPont Tychem ®, products or equivalent is recommended based on degree of exposure.

Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

RESPIRATORY PROTECTION

A NIOSH-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE

A translucent, straw-colored or light yellow liquid

ODOR
A strong, characteristic aromatic hydrocarbon odor. Oxygenated gasoline with MTBE and/or TAME may have a sweet, ether-like odor and is detectable at a lower concentration than non-oxygenated gasoline.

ODOR THRESHOLD

	Odor Detection	Odor Recognition
Non-oxygenated gasoline:	0.5 - 0.6 ppm	0.8 - 1.1 ppm
Gasoline with 15% MTBE:	0.2 - 0.3 ppm	0.4 - 0.7 ppm
Gasoline with 15% TAME:	0.1 ppm	0.2 ppm

BASIC PHYSICAL PROPERTIES

BOILING RANGE:	85 to 437 ^{o}F (39 to 200 ^{o}C)
VAPOR PRESSURE:	6.4 - 15 RVP @ 100 ^{o}F (38 ^{o}C) (275-475 mm Hg @ 68 ^{o}F (20 ^{o}C)
VAPOR DENSITY (air = 1):	AP 3 to 4
SPECIFIC GRAVITY (H_2O = 1):	0.70 – 0.78
EVAPORATION RATE:	10-11 (n-butyl acetate = 1)
PERCENT VOLATILES:	100 %
SOLUBILITY (H_2O):	Non-oxygenated gasoline - negligible (< 0.1% @ 77 ^{o}F). Gasoline with 15% MTBE - slight (0.1 - 3% @ 77 ^{o}F); ethanol is readily soluble in water

10. STABILITY and REACTIVITY)

STABILITY: Stable. Hazardous polymerization will not occur.

CONDITIONS TO AVOID
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources

INCOMPATIBLE MATERIALS
Keep away from strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

11. TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY
Acute Dermal LD50 (rabbits): > 5 ml/kg
Acute Oral LD50 (rat): 18.75 ml/kg
Primary dermal irritation (rabbits): slightly irritating
Draize eye irritation (rabbits): non-irritating
Guinea pig sensitization: negative

CHRONIC EFFECTS AND CARCINOGENICITY
Carcinogenicity: OSHA: NO IARC: YES - 2B NTP: NO ACGIH: YES (A3)

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

This product may contain methyl tertiary butyl ether (MTBE): animal and human health effects studies indicate that MTBE may cause eye, skin, and respiratory tract irritation, central nervous system depression and neurotoxicity. MTBE is classified as an animal carcinogen (A3) by the ACGIH.

12. ECOLOGICAL INFORMATION

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations. If released, oxygenates such as ethers and alcohols will be expected to exhibit fairly high mobility in soil, and therefore may leach into groundwater. The API (www.api.org) provides a number of useful references addressing petroleum and oxygenate contamination of groundwater.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options.

14. TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME:	Gasoline
DOT HAZARD CLASS and PACKING GROUP:	3, PG II
DOT IDENTIFICATION NUMBER:	UN 1203
DOT SHIPPING LABEL:	FLAMMABLE LIQUID

PLACARD:

15. REGULATORY INFORMATION

U.S. FEDERAL, STATE, and LOCAL REGULATORY INFORMATION

This product and its constituents listed herein are on the EPA TSCA Inventory. Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

CLEAN WATER ACT (OIL SPILLS)

Any spill or release of this product to "navigable waters" (essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIRONMENT)

The CERCLA definition of hazardous substances contains a “petroleum exclusion” clause which exempts crude oil, refined, and unrefined petroleum products and any indigenous components of such. However, other federal reporting requirements (e.g., SARA Section 304 as well as the Clean Water Act if the spill occurs on navigable waters) may still apply.

SARA SECTION 311/312 - HAZARD CLASSES

ACUTE HEALTH	CHRONIC HEALTH	FIRE	SUDDEN RELEASE OF PRESSURE	REACTIVE
X	X	X	--	--

SARA SECTION 313 - SUPPLIER NOTIFICATION

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION WT. PERCENT
Benzene (71-43-2)	0.1 to 4.9 (0.1 to 1.3 for reformulated gasoline)
Ethyl benzene (100-41-4)	< 3

n-Hexane (110-54-3)	0.5 to 4
Methyl-tertiary butyl ether (MTBE) (1634-04-4)	0 to 15.0
Toluene (108-88-3)	1 to 15
1,2,4- Trimethylbenzene (95-63-6)	< 6
Xylene, mixed isomers (1330-20-7)	1 to 15

US EPA guidance documents (www.epa.gov/tri) for reporting Persistent Bioaccumulating Toxics (PBTs) indicate this product may contain the following deminimis levels of toxic chemicals subject to Section 313 reporting:

INGREDIENT NAME (CAS NUMBER)	CONCENTRATION - Parts per million (ppm) by weight
Polycyclic aromatic compounds (PACs)	17
Benzo (g,h,i) perylene (191-24-2)	2.55
Lead (7439-92-1)	0.079

CALIFORNIA PROPOSITION 65 LIST OF CHEMICALS

This product contains the following chemicals that are included on the Proposition 65 "List of Chemicals" required by the California Safe Drinking Water and Toxic Enforcement Act of 1986:

INGREDIENT NAME (CAS NUMBER)	Date Listed
Benzene	2/27/1987
Ethyl benzene	6/11/2004
Toluene	1/1/1991

CANADIAN REGULATORY INFORMATION (WHMIS)

Class B, Division 2 (Flammable Liquid)
Class D, Division 2A (Very toxic by other means) and Class D, Division 2B (Toxic by other means)

16. OTHER INFORMATION

NFPA® HAZARD RATING	HEALTH:	1	Slight
	FIRE:	3	Serious
	REACTIVITY:	0	Minimal
HMIS® HAZARD RATING	HEALTH:	1 *	Slight
	FIRE:	3	Serious
	PHYSICAL:	0	Minimal
			* CHRONIC

SUPERSEDES MSDS DATED: 07/01/06

ABBREVIATIONS:

AP = Approximately	< = Less than	> = Greater than
N/A = Not Applicable	N/D = Not Determined	ppm = parts per million

ACRONYMS:

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation [General Info: (800)467-4922]
ANSI	American National Standards Institute (212)642-4900	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute (202)682-8000	HMIS	Hazardous Materials Information System

IARC	International Agency For Research On Cancer	REL	Recommended Exposure Limit (NIOSH)
MSHA	Mine Safety and Health Administration	SARA	Superfund Amendments and Reauthorization Act of 1986 Title III
NFPA	National Fire Protection Association (617)770-3000	SCBA	Self-Contained Breathing Apparatus
NIOSH	National Institute of Occupational Safety and Health	SPCC	Spill Prevention, Control, and Countermeasures
NOIC	Notice of Intended Change (proposed change to ACGIH TLV)	STEL	Short-Term Exposure Limit (generally 15 minutes)
NTP	National Toxicology Program	TLV	Threshold Limit Value (ACGIH)
OPA	Oil Pollution Act of 1990	TSCA	Toxic Substances Control Act
OSHA	U.S. Occupational Safety & Health Administration	TWA	Time Weighted Average (8 hr.)
PEL	Permissible Exposure Limit (OSHA)	WEEL	Workplace Environmental Exposure Level (AIHA)
RCRA	Resource Conservation and Recovery Act	WHMIS	Workplace Hazardous Materials Information System (Canada)

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Material Safety Data Sheet

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Chevron Hydraulic Oil AW

Product Number(s): CPS255673, CPS255674, CPS255675
Synonyms: Chevron Hydraulic Oil AW ISO 32, Chevron Hydraulic Oil AW ISO 46, Chevron Hydraulic Oil AW ISO 68
Company Identification
ChevronTexaco Global Lubricants
6001 Bollinger Canyon Rd.
San Ramon, CA 94583
United States of America
www.chevron-lubricants.com

Transportation Emergency Response
CHEMTREC: (800) 424-9300 or (703) 527-3887
Health Emergency
ChevronTexaco Emergency Information Center: Located in the USA. International collect calls accepted. (800) 231-0623 or (510) 231-0623
Product Information
email : lubemsds@chevrontexaco.com
Product Information: (800) LUBE TEK
MSDS Requests: (800) 414-6737

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Non-hazardous additive blend in refined oil	Mixture	100 %weight

SECTION 3 HAZARDS IDENTIFICATION

IMMEDIATE HEALTH EFFECTS
Eye: Not expected to cause prolonged or significant eye irritation.
Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin. High-Pressure Equipment Information: Accidental high-velocity injection under the skin of materials of this type may result in serious injury. Seek medical attention at once should an accident like this occur. The initial wound at the injection site may not appear to be serious at first; but, if left untreated, could result in disfigurement or amputation of the affected part.

Ingestion: Not expected to be harmful if swallowed.
Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.
Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.
Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.
Note to Physicians: In an accident involving high-pressure equipment, this product may be injected under the skin. Such an accident may result in a small, sometimes bloodless, puncture wound. However, because of its driving force, material injected into a fingertip can be deposited into the palm of the hand. Within 24 hours, there is usually a great deal of swelling, discoloration, and intense throbbing pain. Immediate treatment at a surgical emergency center is recommended.

SECTION 5 FIRE FIGHTING MEASURES

Leaks/ruptures in high pressure system using materials of this type can create a fire hazard when in the vicinity of ignition sources (eg. open flame, pilot lights, sparks, or electric arcs).

FIRE CLASSIFICATION:
OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

FLAMMABLE PROPERTIES:
Flashpoint: (Cleveland Open Cup) 170 °C (338 °F) (Min)
Autoignition: No Data Available
Flammability (Explosive) Limits (% by volume in air): Lower: Not Applicable Upper: Not Applicable

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:
Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.
Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as

possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: DO NOT USE IN HIGH PRESSURE SYSTEMS in the vicinity of flames, sparks and hot surfaces. Use only in well ventilated areas. Keep container closed.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.
Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating and accumulating an electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.
Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:
Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

ENGINEERING CONTROLS:
Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT
Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.
Skin Protection: No special protective clothing is normally required. Where splashing is possible, select protective clothing depending on operations conducted, physical requirements and other substances in the workplace. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.
Respiratory Protection: No respiratory protection is normally required.
If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.
Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators

may not provide adequate protection.

Occupational Exposure Limits:

Component	Agency	TWA	STEL	Ceiling	Notation
Non-hazardous additive blend in refined oil	ACGIH	5 mg/m3	10 mg/m3	--	--
Non-hazardous additive blend in refined oil	OSHA Z-1	5 mg/m3	--	--	--

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Yellow
Physical State: Liquid
Odor: Petroleum odor
pH: Not Applicable
Vapor Pressure: <0.01 mmHg @ 37.8 °C (100 °F)
Vapor Density (Air = 1): >1
Boiling Point: >315.6°C (600°F)
Solubility: Soluble in hydrocarbon solvents; insoluble in water.
Freezing Point: Not Applicable
Melting Point: Not Applicable
Specific Gravity: 0.86 - 0.9 @ 15.6°C (60.1°F) / 15.6°C (60.1°F)
Density: 0.86 kg/L - 0.9 kg/L @ 15°C (59°F)
Viscosity: 28.8 cSt - 61.2 cSt @ 40°C (104°F) (Min)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Incompatibility With Other Materials: May react with strong acids or strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.
Hazardous Decomposition Products: None known (None expected)
Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS
Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.
Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.
Skin Sensitization: No product toxicology data available.
Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.
Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.
Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:
This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils

requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B). These oils have not been classified by the American Conference of Governmental Industrial Hygienists (ACGIH) as: confirmed human carcinogen (A1), suspected human carcinogen (A2), or confirmed animal carcinogen with unknown relevance to humans (A3).

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY
96 hour(s) LC50: >1000 mg/L (Oncorhynchus mykiss)
48 hour(s) EC50: >1000 mg/L (Daphnia magna)
This material is not expected to be harmful to aquatic organisms.

ENVIRONMENTAL FATE
This material is not expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods.

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Description: PETROLEUM LUBRICATING OIL

IMO/IMDG Shipping Description: PETROLEUM LUBRICATING OIL

SECTION 15 REGULATORY INFORMATION

EPCRA 311/312 CATEGORIES: 1. Immediate (Acute) Health Effects: NO
2. Delayed (Chronic) Health Effects: NO
3. Fire Hazard: NO
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

REGULATORY LISTS SEARCHED:

01-1=IARC Group 1	03=EPCRA 313
01-2A=IARC Group 2A	04=CA Proposition 65
01-2B=IARC Group 2B	05=MA RTK

02=NTP Carcinogen 06=NJ RTK
07=PA RTK

No components of this material were found on the regulatory lists above.

CHEMICAL INVENTORIES:
All components comply with the following chemical inventory requirements: AICS (Australia), EINECS (European Union), ENCS (Japan), KECI (Korea), PICCS (Philippines), TSCA (United States).

One or more components does not comply with the following chemical inventory requirements: DSL (Canada).

NEW JERSEY RTK CLASSIFICATION:
Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows: PETROLEUM OIL (Hydraulic oil)

WHMIS CLASSIFICATION:
This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0
(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT: This revision updates the following sections of this Material Safety Data Sheet: 1, 8, 11, 14, 15
Revision Date: 02/19/2004

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV - Threshold Limit Value	TWA - Time Weighted Average
STEL - Short-term Exposure Limit	PEL - Permissible Exposure Limit
	CAS - Chemical Abstract Service Number
ACGIH - American Conference of Government Industrial Hygienists	IMO/IMDG - International Maritime Dangerous Goods Code
API - American Petroleum Institute	MSDS - Material Safety Data Sheet
CVX - ChevronTexaco	NFPA - National Fire Protection Association (USA)
DOT - Department of Transportation (USA)	NTP - National Toxicology Program (USA)
IARC - International Agency for Research on Cancer	OSHA - Occupational Safety and Health Administration

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the

ANSI MSDS Standard (Z400.1) by the ChevronTexaco Energy Research & Technology Company, 100 Chevron Way, Richmond, California 94802.

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

Hydrochloric Acid, 2.0N (2.0M)

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/03/2013 Revision date: 11/20/2019 Supersedes: 10/24/2017 Version: 1.3

SECTION 1: Identification

1.1. Identification

Product form : Mixtures

Product name : Hydrochloric Acid, 2.0N (2.0M)

Product code : LC15320

1.2. Recommended use and restrictions on use

Use of the substance/mixture : For laboratory and manufacturing use only.

Recommended use : Laboratory chemicals

Restrictions on use : Not for food, drug or household use

1.3. Supplier

LabChem, Inc.
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS US classification

Skin corrosion/irritation Category 1B H314 Causes severe skin burns and eye damage
Serious eye damage/eye irritation Category 1 H318 Causes serious eye damage

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS US labeling

Hazard pictograms (GHS US) :

Signal word (GHS US) : Danger

Hazard statements (GHS US) : H314 - Causes severe skin burns and eye damage

Precautionary statements (GHS US) : P260 - Do not breathe mist, vapors, spray.
P264 - Wash exposed skin thoroughly after handling.
P280 - Wear protective gloves, eye protection, protective clothing, face protection.
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a poison center or doctor/physician.
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	GHS US classification
Water	(CAS-No.) 7732-18-5	92.94	Not classified
Hydrochloric Acid, 37% w/w	(CAS-No.) 7647-01-0	7.06	Acute Tox. 4 (Oral), H302 Skin Corr. 1B, H314 Eye Dam. 1, H318 STOT SE 3, H335

Full text of hazard classes and H-statements : see section 16

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

First-aid measures after skin contact : Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a poison center or doctor/physician.

First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Immediately call a poison center or doctor/physician.

4.2. Most important symptoms and effects (acute and delayed)

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

Symptoms/effects : Causes severe skin burns and eye damage.

Symptoms/effects after inhalation : Possible inflammation of the respiratory tract.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Causes serious eye damage.

Symptoms/effects after ingestion : Nausea. Vomiting.

Chronic symptoms : Affection/discolouration of the teeth.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Fire hazard : Not flammable.

Explosion hazard : Not applicable.

Reactivity in case of fire : Thermal decomposition generates : Corrosive vapors.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

Other information : Not applicable.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Try to stop release. Dike and contain spill.

6.1.1. For non-emergency personnel

Protective equipment : Gloves. Safety glasses. Protective clothing. Face-shield.

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. Do not breathe mist, vapors, spray.

Hygiene measures : Wash exposed skin thoroughly after handling. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Comply with applicable regulations.

Storage conditions : Keep only in the original container in a cool, well ventilated place away from : incompatible materials. Keep container closed when not in use.

Incompatible products : metals. cyanides. Strong bases.

Incompatible materials : Direct sunlight.

Packaging materials : Do not store in corrodable metal.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hydrochloric Acid, 37% w/w (7647-01-0)		
ACGIH	ACGIH Ceiling (mg/m³)	2.98 mg/m³
ACGIH	ACGIH Ceiling (ppm)	2 ppm
OSHA	OSHA PEL (Ceiling) (mg/m³)	7 mg/m³
OSHA	OSHA PEL (Ceiling) (ppm)	5 ppm
IDLH	US IDLH (ppm)	50 ppm
NIOSH	NIOSH REL (ceiling) (mg/m³)	7 mg/m³
NIOSH	NIOSH REL (ceiling) (ppm)	5 ppm

Water (7732-18-5)
Not applicable

8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Chemical resistant apron. Face shield. Gloves. Safety glasses.

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or face shield

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Respiratory protection not required in normal conditions

Personal protective equipment symbol(s):

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Color	:	Colorless
Odor	:	Odorless
Odor threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	No data available
Specific gravity / density	:	1 - 1.1
Molecular mass	:	36.46 g/mol
Solubility	:	Soluble in water. Soluble in ethanol. Soluble in methanol.
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	Not applicable.
Oxidizing properties	:	None.

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Thermal decomposition generates : Corrosive vapors.

10.2. Chemical stability

Stable under normal conditions. Not established.

10.3. Possibility of hazardous reactions

Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

metals. cyanides. Strong bases.

10.6. Hazardous decomposition products

Hydrogen chloride. Thermal decomposition generates : Corrosive vapors.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

Hydrochloric Acid, 37% w/w (7647-01-0)	
LD50 oral rat	700 mg/kg
LD50 dermal rabbit	5010 mg/kg
ATE US (oral)	700 mg/kg body weight
ATE US (dermal)	5010 mg/kg body weight

Water (7732-18-5)	
LD50 oral rat	≥ 90000 mg/kg
ATE US (oral)	90000 mg/kg body weight

Skin corrosion/irritation : Causes severe skin burns and eye damage.
Serious eye damage/irritation : Causes serious eye damage.
Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified

Reproductive toxicity : Not classified
STOT-single exposure : Not classified

Hydrochloric Acid, 37% w/w (7647-01-0)	
STOT-single exposure	May cause respiratory irritation.

STOT-repeated exposure : Not classified

Aspiration hazard : Not classified
Viscosity, kinematic : No data available

Likely routes of exposure : Skin and eye contact.
Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.
Symptoms/effects : Causes severe skin burns and eye damage.
Symptoms/effects after inhalation : Possible inflammation of the respiratory tract.
Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.
Symptoms/effects after eye contact : Causes serious eye damage.
Symptoms/effects after ingestion : Nausea. Vomiting.
Chronic symptoms : Affection/discolouration of the teeth.

SECTION 12: Ecological information

12.1. Toxicity

Hydrochloric Acid, 37% w/w (7647-01-0)	
LC50 fish 1	282 mg/L (96 h, Gambusia affinis, Pure substance)
EC50 Daphnia 1	< 56 mg/L (72 h, Daphnia magna, Pure substance)

12.2. Persistence and degradability

Hydrochloric Acid, 2.0N (2.0M)	
Persistence and degradability	Not established.

Hydrochloric Acid, 37% w/w (7647-01-0)	
Persistence and degradability	Biodegradability: not applicable.
Chemical oxygen demand (COD)	Not applicable

Hydrochloric Acid, 37% w/w (7647-01-0)	
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

Water (7732-18-5)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Hydrochloric Acid, 2.0N (2.0M)	
Bioaccumulative potential	Not established.

Hydrochloric Acid, 37% w/w (7647-01-0)	
Log Pow	0.25 (QSAR)
Bioaccumulative potential	Low potential for bioaccumulation (Log Kow < 4).

Water (7732-18-5)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

Hydrochloric Acid, 37% w/w (7647-01-0)	
Ecology - soil	No (test)data on mobility of the components available. May be harmful to plant growth, blooming and fruit formation.

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1789 Hydrochloric acid, 8, II

UN-No.(DOT) : UN1789

Proper Shipping Name (DOT) : Hydrochloric acid

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 8 - Corrosive

DOT Packaging Non Bulk (49 CFR 173.xxx) : 202

DOT Packaging Bulk (49 CFR 173.xxx) : 242

DOT Special Provisions (49 CFR 172.102)	:	A3 - For combination packaging, if glass inner packaging (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packaging. A6 - For combination packaging, if plastic inner packaging are used, they must be packed in tightly closed metal receptacles before packing in outer packaging. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B15 - Packaging must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N41 - Metal construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal..... Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	30 L
DOT Vessel Stowage Location	:	C - The material must be stowed ‘‘on deck only’’ on a cargo vessel and on a passenger vessel.
Other information	:	No supplementary information available.

Transport by sea

Transport document description (IMDG)	:	UN 1789 HYDROCHLORIC ACID, 8, II
UN-No. (IMDG)	:	1789
Proper Shipping Name (IMDG)	:	HYDROCHLORIC ACID
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	II - substances presenting medium danger

Air transport

Transport document description (IATA)	:	UN 1789 Hydrochloric acid, 8, II
UN-No. (IATA)	:	1789
Proper Shipping Name (IATA)	:	Hydrochloric acid
Class (IATA)	:	8 - Corrosives
Packing group (IATA)	:	II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Hydrochloric Acid, 2.0N (2.0M)	
SARA Section 311/312 Hazard Classes	Health hazard - Serious eye damage or eye irritation Health hazard - Skin corrosion or Irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Hydrochloric Acid, 37% w/w	CAS-No. 7647-01-0	7.06%

Hydrochloric Acid, 37% w/w (7647-01-0)	
EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a final TSCA section 4 test rule.
RQ (Reportable quantity, section 304 of EPA's List of Lists)	5000 lb
RQ (Reportable quantity, section 304 of EPA's List of Lists)	5000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	500 lb
SARA Section 311/312 Hazard Classes	Health hazard - Acute toxicity (any route of exposure) Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation Health hazard - Specific target organ toxicity (single or repeated exposure)

15.2. International regulations

CANADA
No additional information available

Water (7732-18-5)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Revision date : 11/20/2019

Other information : None.

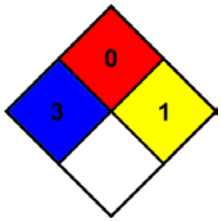
Full text of H-phrases: see section 16:

H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H318	Causes serious eye damage
H335	May cause respiratory irritation

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating		
Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.
Personal protection	:	C C - Safety glasses, Gloves, Synthetic apron

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SDS: 0016077
Date Prepared: 10/07/2014

SAFETY DATA SHEET

1. IDENTIFICATION

Product Name:	**AERO® 3477 HS Promoter, Aqueous**
Synonyms:	None
Chemical Family:	Sodium dialkyl dithiophosphate
Molecular Formula:	C8H18O2PS2.Na
Molecular Weight:	265
Intended/Recommended Use:	Mining chemical

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WOODLAND PARK, NEW JERSEY 07424, USA
For Product and all Non-Emergency Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.

EMERGENCY PHONE (24 hours/day) - For emergency only involving spill, leak, fire, exposure or accident call:
Asia Pacific:
Australia - +61-3-9663-2130 or 1800-033-111
China (PRC) - +86 0532 83889090 (NRCC)
New Guinea - +61-3-9663-2130
New Zealand - +61-3-9663-2130 or 0800-734-607
All Others - +65 3158 1074 (Carechem24 Singapore)
Canada: +1-905-356-8310 (Cytec Welland, Canada plant)
Europe/Africa/Middle East (Carechem24 UK):
Europe, Middle East, Africa, Israel - +44 (0) 1235 239 670
Middle East, Africa (Arabic speaking countries) - +44 (0) 1235 239 671
Latin America:
Brazil - 0800 7077 022 (SUATRANS)
Chile - +56-2-247-3600 (CITUC QUIMICO)
All Others - +52-376-73 74122 (Cytec Atequiza, Mexico plant)
USA: +1-703-527-3887 or 1-800-424-9300 (CHEMTREC #CCN6083)

2. HAZARDS IDENTIFICATION

GHS Classification
Corrosive To Metal Hazard Category 1
Skin Corrosion / Irritation Hazard Category 1B
Serious Eye Damage / Eye Irritation Hazard Category 1

LABEL ELEMENTS

Signal Word
Danger

Hazard Statements

May be corrosive to metals
Causes severe skin burns and eye damage

Precautionary Statements
Keep only in original container.
Do not breathe dust/fume/gas/mist/vapours/spray.
Wash face, hands and any exposed skin thoroughly after handling.
Wear protective gloves/protective clothing/eye protection/face protection.
Absorb spillage to prevent material-damage.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
Wash contaminated clothing before reuse.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Immediately call a POISON CENTER or doctor/physician.
Specific treatment (see supplemental first aid instructions on this label).
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Store in corrosive resistant container with a resistant inner liner.
Store locked up.
Dispose of contents/container in accordance with local and national regulations.

Hazards Not Otherwise Classified (HNOC), Other Hazards
Contact with acids can produce Hydrogen Sulfide gas.

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3. COMPOSITION/INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS

Component / CAS No.	%	GHS Classification	Carcinogen
Sodium diisobutyl dithiophosphate 53378-51-1	46.0 - 55.0	Skin Corr. 1B (H314) Eye Dam. 1 (H318)	-
Sodium hydroxide 1310-73-2	0.5 - 1.0	Met. Corr. 1 (H290) Skin Corr. 1A (H314) Eye Dam. 1 (H318)	-

Additional GHS classification or other information may be included in this section but has not been adopted by OSHA.
See Section 16 for full text of H phrases.

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4. FIRST AID MEASURES

DESCRIPTION OF FIRST AID MEASURES

Eye Contact:
Rinse immediately with plenty of water for at least 15 minutes. Obtain medical attention immediately.

Skin Contact:
Take off immediately all contaminated clothing. Wear impermeable gloves. Wash immediately with plenty of water and soap. Pay particular attention to skin crevices, nail folds, etc. Do not reuse contaminated clothing without laundering. Do not reuse contaminated leatherware.

Ingestion:
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Inhalation:
Remove to fresh air. If breathing is difficult, give oxygen. Obtain medical advice if there are persistent symptoms.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

None known

INDICATION OF ANY IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDS

Not applicable

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5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media:
Use water spray, alcohol foam, carbon dioxide or dry chemical to extinguish fires.

Extinguishing Media to Avoid:
full water jet

Protective Equipment:
Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. Use approved air-supplied full face respirator. See MSDS Section 8 (Exposure Controls/Personal Protection).

Special Hazards:
Sulfur dioxide or hydrogen sulfide may be formed under fire conditions. Do not flush to sewer which may contain acid. This could result in generation of toxic and flammable hydrogen sulfide.

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6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Where exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8, wear a two piece PVC suit with hood or PVC overalls with hood.

Methods For Cleaning Up:
Cover spills with some inert absorbent. Sweep up into containers for disposal. Flush spill area with water.

References to other sections:
See Sections 8 and 13 for additional information.

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7. HANDLING AND STORAGE

HANDLING

Precautions: Keep only in the original container. Wash hands thoroughly after handling. Wear protective gloves/clothing and eye/face protection. Do not breathe vapors or spray mist.

Special Handling Statements: Large quantities of undiluted product should not be mixed with acids, since evolution of toxic and flammable hydrogen sulphide could result. In particular, precautions must be taken to avoid the accidental discharge of large volumes of the product in acid storage tanks or any tank or containment containing acidic materials. This precaution does not, of course, apply to addition of this reagent to flotation pulps in amounts customarily used in flotation, were the reagent amounts are small and instantly diluted to concentrations well below the solubility limits.

STORAGE
None

Storage Temperature: Room temperature
Reason: Quality.

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Measures:
Utilize a closed system process where feasible. Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.

Respiratory Protection:
For operations where inhalation exposure can occur, use an approved respirator recommended by an industrial hygienist after an evaluation of the operation. Where inhalation exposure cannot occur, no respiratory protection is required. A full facepiece respirator also provides eye and face protection.

Eye Protection:
Prevent eye and skin contact. Provide eye wash fountain and safety shower in close proximity to points of potential exposure. Wear eye/face protection such as chemical splash proof goggles or face shield.

Skin Protection:
Prevent contamination of skin or clothing when removing protective equipment. Wear impermeable gloves and suitable protective clothing.

Hand Protection:
Wear impermeable gloves. Replace gloves immediately when torn or any change in appearance (dimension, colour, flexibility etc) is noticed. Barrier creams may help to protect the exposed areas of the skin, they should however not be applied once exposure has occurred.

Additional Advice:
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 thoroughly with soap and water.

Exposure Limit(s)

1310-73-2 Sodium hydroxide

OSHA (PEL):	2 mg/m^3 (TWA)
ACGIH (TLV):	2 mg/m^3 (Ceiling)
Other Value:	Not established

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9. PHYSICAL AND CHEMICAL PROPERTIES

Color:	amber-brown		
Appearance:	liquid		
Odor:	sulfur		
Boiling Point:	Not available		
Melting Point:	Not applicable		
Vapor Pressure:	Similar to water		
Specific Gravity/Density:	1.105		
Vapor Density:	Similar to water		
Percent Volatile (% by wt.):	~50(water)		
pH:	>12		
Saturation In Air (% By Vol.):	Similar to water		
Evaporation Rate:	Similar to water		
Solubility In Water:	Complete		
Volatile Organic Content:	Not available		
Flash Point:	>93 °C	200 °F	Setaflash Closed Cup
Flammable Limits (% By Vol):	Not applicable		
Autoignition (Self) Temperature:	Not available		
Decomposition Temperature:	Not available		
Partition coefficient (n-octanol/water):	Not available		
Odor Threshold:	Not available		

9. PHYSICAL AND CHEMICAL PROPERTIES

Viscosity (Kinematic): Not available

10. STABILITY AND REACTIVITY

Stability: Stable

Conditions To Avoid: None known

Polymerization: Will not occur

Conditions To Avoid: None known

Materials To Avoid: This product contains a neutralized dithio acid.
Avoid contact with strong oxidizing agents and mineral acids.

Hazardous Decomposition Products: Oxides of sulfur (includes sulfur di and tri oxides)
oxides of phosphorus
Carbon monoxide (CO)
Carbon dioxide
Hydrogen sulfide (H2S)

11. TOXICOLOGICAL INFORMATION

PRODUCT TOXICITY INFORMATION

Likely Routes of Exposure: Eyes, Skin, Oral.

ACUTE TOXICITY DATA

oral	rat	Acute LD50	>2000 mg/kg
dermal	rabbit	Acute LD50	>2000 mg/kg
inhalation	rat	Acute LC50 4 hr	>5 mg/l (Dust/Mist)

LOCAL EFFECTS ON SKIN AND EYE

Acute Irritation	skin	Corrosive
Acute Irritation	eye	Causes serious damage

ALLERGIC SENSITIZATION

Sensitization	skin	Not sensitizing
Sensitization	respiratory	Not sensitizing

GENOTOXICITY

Assays for Gene Mutations

Ames Salmonella Assay	No data

OTHER INFORMATION

The product toxicity information above has been estimated.

HAZARDOUS INGREDIENT TOXICITY DATA

Sodium diisobutyldithiophosphate has estimated acute oral (rat) and dermal (rabbit) LD50 values of greater than 5000 mg/kg and 2000 mg/kg, respectively. Direct contact with sodium diisobutyldithiophosphate can cause eye burns and skin corrosion.

Sodium hydroxide (NaOH) is corrosive to eyes, skin, and soft tissues of the digestive and respiratory tracts. Even dilute solutions of NaOH can produce irreversible damage to eyes and skin. Acute overexposure to NaOH mists or dusts causes severe respiratory irritation. NaOH is not a known skin or respiratory sensitizer. Reported acute oral (rat) and dermal (rabbit) LD50 values are 104-340 mg/kg and 1250 mg/kg, respectively. Fatal ingestion and fatal dermal exposure has been reported for humans. According to the OECD (2002), no valid animal data are available on repeated dose toxicity by the oral, dermal or inhalation routes. However, under normal, non-irritating handling and use conditions, exposure to NaOH is not expected to result in systemic availability and, therefore, harmful effects are not anticipated. NaOH is not known to cause reproductive or developmental toxicity. Both in vitro and in vivo genetic toxicity tests with NaOH indicated no evidence for mutagenic activity.

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12. ECOLOGICAL INFORMATION

TOXICITY, PERSISTENCE AND DEGRADABILITY, BIOACCUMULATIVE POTENTIAL, MOBILITY IN SOIL, OTHER ADVERSE EFFECTS

This material is not classified as dangerous for the environment.
This material is not readily biodegradable.
All ecological information provided was conducted on a structurally similar product.

FISH TEST RESULTS

Test: Acute toxicity, freshwater (OECD 203)
Duration: 96 hr.
Species: Rainbow Trout (Oncorhyncus mykiss)

>100 mg/l	LC50

INVERTEBRATE TEST RESULTS

Test: Acute Immobilization (OECD 202)
Duration: 48 hr
Species: Water Flea (Daphnia magna)

>100 mg/l	EC50

DEGRADATION

Test: Biodegradability

Duration: 28 day	**Procedure:** Ready biodegradability
<70 %	Material does not significantly bioaccumlate This material is not readily biodegradable.

RESULTS OF PBT AND vPvB ASSESSMENT
Not determined

HAZARDOUS INGREDIENT TOXICITY DATA

Component / CAS No.	Toxicity to Algae	Toxicity to Fish	Toxicity to Water Flea
Sodium diisobutyl dithiophosphate 53378-51-1	Not available	Not available	Not available
Sodium hydroxide 1310-73-2	Not available	LC50 = 45.4 mg/L - Oncorhynchus mykiss (96h) static	Not available

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13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the 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 Characteristics: There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 9 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 3 (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. The Company encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. The Company recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. The Company has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

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14. TRANSPORT INFORMATION

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

US DOT

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN/ID Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

TRANSPORT CANADA

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

ICAO / IATA

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

IMO

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
UN Number: UN1719
Packing Group: II
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

15. REGULATORY INFORMATION

Inventory Information

United States (USA): All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical Inventory.

Canada: All components of this product are included on the Domestic Substances List (DSL) or are not required to be listed on the DSL.

Australia: All components of this product are included in the Australian Inventory of Chemical Substances (AICS) or are not required to be listed on AICS.

China: All components of this product are included on the Chinese inventory or are not required to be listed on the Chinese inventory.

Japan: All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese inventory.

Korea: All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory.

Philippines: All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory.

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.

This product does not contain any components regulated under these sections of the EPA

PRODUCT HAZARD CLASSIFICATION UNDER SECTION 311 OF SARA
- Acute

16. OTHER INFORMATION

NFPA Hazard Rating (National Fire Protection Association)

Health: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

Fire: 1 - Materials that must be preheated before ignition can occur.

Instability: 0 - Materials that in themselves are normally stable, even under fire exposure conditions.

Reasons For Issue: New Format

Date Prepared: 10/07/2014
Date of last significant revision: 10/07/2014

Sodium diisobutyl dithiophosphate

H314 - Causes severe skin burns and eye damage.

Sodium hydroxide

H290 - May be corrosive to metals.
H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.

Prepared By: Legal & Compliance Services; E-mail: custinfo@cytec.com

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SAFETY DATA SHEET
Aviation Jet Fuel JET A-1 (JETA1)

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name Aviation Jet Fuel JET A-1 (JETA1)

Product number ID 10505

Internal identification 145163

1.2. Relevant identified uses of the substance or mixture and uses advised against

Identified uses Distribution of substance, (ES01a) Formulation & (re)packing of substances and mixtures, (ES02) Use as a fuel, (ES12a, ES12b)

1.3. Details of the supplier of the safety data sheet

Supplier Neste Oyj
Keilaranta 21, Espoo, P.O.B. 95, FIN-00095 NESTE, FINLAND
Tel. +358 10 45811
SDS@neste.com (chemical safety)

1.4. Emergency telephone number

National emergency telephone number +358-9-471 977, +358-9-4711, Poison Information Centre

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification (EC 1272/2008)

Physical hazards Flam. Liq. 3 - H226

Health hazards Skin Irrit. 2 - H315 STOT SE 3 - H336 Asp. Tox. 1 - H304

Environmental hazards Aquatic Chronic 2 - H411

2.2. Label elements

Hazard pictograms

Signal word Danger

Hazard statements H226 Flammable liquid and vapour.
H315 Causes skin irritation.
H336 May cause drowsiness or dizziness.
H411 Toxic to aquatic life with long lasting effects.
H304 May be fatal if swallowed and enters airways.

Aviation Jet Fuel JET A-1 (JETA1)

Precautionary statements P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P273 Avoid release to the environment.
P301+P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P331 Do NOT induce vomiting.
P261 Avoid breathing vapours.
P280 Wear protective gloves.

Contains Kerosine (petroleum), sweetened, Distillates (petroleum), hydrotreated light; Kerosine - unspecified, Kerosine (petroleum), hydrodesulfurized

2.3. Other hazards

Other hazards Evaporates slowly. May cause eye and respiratory system irritation. Risk of soil and ground water contamination.

SECTION 3: Composition/information on ingredients

3.2. Mixtures

Distillates (petroleum), hydrotreated light; Kerosine - unspecified **0-100 %**

CAS number: 64742-47-8 EC number: 265-149-8 REACH registration number: 01-2119484819-18-XXXX

Classification
Flam. Liq. 3 - H226
Skin Irrit. 2 - H315
STOT SE 3 - H336
Asp. Tox. 1 - H304
Aquatic Chronic 2 - H411

Kerosine (petroleum), sweetened **0-100%**

CAS number: 91770-15-9 EC number: 294-799-5 REACH registration number: 01-2119502385-46-XXXX

Classification
Flam. Liq. 3 - H226
Skin Irrit. 2 - H315
STOT SE 3 - H336
Asp. Tox. 1 - H304
Aquatic Chronic 2 - H411

Kerosine (petroleum), hydrodesulfurized **0-100%**

CAS number: 64742-81-0 EC number: 265-184-9 REACH registration number: 01-2119462828-25-XXXX

Classification
Flam. Liq. 3 - H226
Skin Irrit. 2 - H315
STOT SE 3 - H336
Asp. Tox. 1 - H304
Aquatic Chronic 2 - H411

Aviation Jet Fuel JET A-1 (JETA1)

The Full Text for all R-Phrases and Hazard Statements are Displayed in Section 16.

Composition comments Mixture of a petroleum product and additives. Total aromatics at maximum: 26,5 %. Naphthalene (CAS 91-20-3) < 1 %. Toluene (CAS 108-88-3) < 1%. Benzene (CAS 71-43-2) < 0,1 %.

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation Remove person to fresh air and keep comfortable for breathing. Get medical attention if symptoms are severe or persist.

Ingestion Do not induce vomiting. Get medical attention immediately.

Skin contact Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention if irritation persists after washing.

Eye contact Rinse immediately with plenty of water. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation persists after washing.

4.2. Most important symptoms and effects, both acute and delayed

General information Irritating to skin. May irritate eyes. Vapours in high concentrations are narcotic. May cause nausea, headache, dizziness and intoxication. Entry into the lungs following ingestion or vomiting may cause chemical pneumonitis.

4.3. Indication of any immediate medical attention and special treatment needed

Notes for the doctor Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media Water spray, foam, dry powder or carbon dioxide.

Unsuitable extinguishing media Do not use water jet as an extinguisher, as this will spread the fire.

5.2. Special hazards arising from the substance or mixture

Specific hazards Flammable liquid and vapour. Containers can burst violently or explode when heated, due to excessive pressure build-up.

Hazardous combustion products Carbon dioxide (CO2). Carbon monoxide (CO).

5.3. Advice for firefighters

Protective actions during firefighting Cool containers exposed to heat with water spray and remove them from the fire area if it can be done without risk. Prevent fire extinguishing water from contaminating surface water or the ground water system.

Special protective equipment for firefighters Wear positive-pressure self-contained breathing apparatus (SCBA) and appropriate protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions Avoid inhalation of vapours and contact with skin and eyes. Wear adequate protective equipment at all operations.

For emergency responders Prevent unauthorized access. Vapours are heavier than air and may spread near ground and travel a considerable distance to a source of ignition and flash back. Eliminate all ignition sources if safe to do so. Take precautionary measures against static discharge.

Aviation Jet Fuel JET A-1 (JETA1)

6.2. Environmental precautions

Environmental precautions Avoid release to the environment. Stop leak if safe to do so. Avoid the spillage or runoff entering drains, sewers or watercourses. Contain spillage with sand, earth or other suitable non-combustible material. Inform the relevant authorities if environmental pollution occurs (sewers, waterways, soil or air). Risk of soil and ground water contamination.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up Immediately start clean-up of the liquid and contaminated soil. Small Spillages: Absorb spillage with sand or other inert absorbent. Pay attention to the fire and health hazards caused by the product.

6.4. Reference to other sections

Reference to other sections For personal protection, see Section 8.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Usage precautions The product contains volatile substances which may spread in the atmosphere. Avoid heat, flames and other sources of ignition. Take precautionary measures against static discharges. All handling should only take place in well-ventilated areas. Avoid inhalation of vapours and contact with skin and eyes. Use personal protective equipment and/or local ventilation when needed. Do not eat, drink or smoke when using this product. Wash hands and any other contaminated areas of the body with soap and water before leaving the work site. During tank operations follow special instructions (risk of oxygen displacement and hydrocarbons).

7.2. Conditions for safe storage, including any incompatibilities

Storage precautions Flammable liquid storage. Store in accordance with local regulations. Store in a demarcated bunded area to prevent release to drains and/or watercourses. Take precautions against leakage by constructing collecting pools and sewerage systems as well as by surfacing the loading and unloading stations. Only store in correctly labelled containers. Use containers made of the following materials: Carbon steel. Stainless steel.

7.3. Specific end use(s)

Specific end use(s) Not known.

SECTION 8: Exposure controls/Personal protection

8.1. Control parameters

Occupational exposure limits

Solvent naphtha, group 3: 100mg/m3 (8h), HTP 2018/FIN.
The individual limit values can be applied for the hydrocarbons.

Kerosine (petroleum), hydrodesulfurized

Solvent naphtha, group 1: 500 mg/m3 (8h), HTP 2018/FIN.

toluene

Toluene: 25 ppm (8h), 81 mg/m3 (8h), 100ppm (15min), 380 mg/m3 (15min), HTP 2018/FIN.
Toluene: 50 ppm (8h), 192 mg/m3 (8h), 100ppm (15min), 384 mg/m3 (15min), EU OELV (EC/2006/15)
May be absorbed through the skin.

naphthalene

Naphthalene: 1 ppm (8h), 5 mg/m3 (8h), 2 ppm (15min), 10mg/m3 (15min), HTP 2018/FIN.
Naphthalene: 10 ppm (8h), 50 mg/m3 (8h), EU OELV (EC/1991/322).

Benzene

Aviation Jet Fuel JET A-1 (JETA1)

Benzene: 1 ppm (8h), 3,25 mg/m3, VNa 716/2000/FIN (binding limit value).
May be absorbed through the skin.

DNEL	Consumer - Oral; Long term systemic effects: 19 mg/kg/day
PNEC	Not available.

Kerosine (petroleum), sweetened (CAS: 91770-15-9)

DNEL	Consumer - Oral; Long term systemic effects: 19 mg/kg, (24h)

Kerosine (petroleum), hydrodesulfurized (CAS: 64742-81-0)

DNEL	Consumer - Oral; Long term systemic effects: 19 mg/kg, (24h)

8.2. Exposure controls

Appropriate engineering controls	All handling should only take place in well-ventilated areas. Use personal protective equipment and/or local ventilation when needed. Handle in accordance with good industrial hygiene and safety practice. During tank operations follow special instructions (risk of oxygen displacement and hydrocarbons).
Eye/face protection	Tight-fitting safety glasses.
Hand protection	Wear protective gloves. It is recommended that gloves are made of the following material: Nitrile rubber. Neoprene. Polyvinyl chloride (PVC). The selected gloves should have a breakthrough time of at least 8 hours. Protection class 6. Protective gloves according to standards EN 420 and EN 374. Change protective gloves regularly.
Other skin and body protection	Protective clothing when needed. Wear anti-static protective clothing if there is a risk of ignition from static electricity.
Respiratory protection	Filter device/half mask Gas filter, type A2. Filter device could be used maximum 2 hours at a time. Filter devices must not be used in conditions where the oxygen level is low (< 19 vol.-%). At high concentrations a breathing apparatus must be used (self-contained or fresh air hose breathing apparatus). Filter must be changed often enough. Respirator according to standard EN 140.
Environmental exposure controls	Take precautions against leakage by constructing collecting pools and sewerage systems as well as by surfacing the loading and unloading stations.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Liquid.
Colour	Clear.
Odour	Hydrocarbons.
Odour threshold	-
pH	-
Melting point	≤ -47°C (ASTM D2386, D5972, IP 529)
Initial boiling point and range	170 - 300°C (ASTM D 86)
Flash point	≥ 40°C (IP 170)
Upper/lower flammability or explosive limits	Upper flammable/explosive limit: 0,6 % Lower flammable/explosive limit: 6 %

Aviation Jet Fuel JET A-1 (JETA1)

Vapour pressure	~ 2 kPa @ 38°C
Vapour density	> 3 (Air = 1.0)
Relative density	0,775 - 0,840 @ 15°C (ASTM D4052)
Solubility(ies)	The product has poor water-solubility. < 50 mg/L @
Partition coefficient	20°C
Auto-ignition temperature	log Kow: > 3
Decomposition Temperature	~ 250°C
Viscosity	Kinematic viscosity < 7 mm2/s @ 40°C
Explosive properties	Not considered to be explosive.
Oxidising properties	Does not meet the criteria for classification as oxidising.

9.2. Other information

Other information	Not known.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity There are no known reactivity hazards associated with this product.

10.2. Chemical stability

Stability Stable at normal ambient temperatures and when used as recommended.

10.3. Possibility of hazardous reactions

Possibility of hazardous reactions No potentially hazardous reactions known.

10.4. Conditions to avoid

Conditions to avoid Keep away from heat, sparks and open flame.

10.5. Incompatible materials

Materials to avoid Oxidising agents.

10.6. Hazardous decomposition products

Hazardous decomposition products Does not decompose when used and stored as recommended.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Toxicological effects Based on available data the classification criteria are not met.

Skin corrosion/irritation

Skin corrosion/irritation Irritating to skin. (EPA Guidelines in FR Vol. 44, No. 145, p. 44054-44093) The product irritates mucous membranes and may cause abdominal discomfort if swallowed. May cause respiratory irritation.

Serious eye damage/irritation

Serious eye damage/irritation Based on available data the classification criteria are not met. (EPA OTS 798.4500)

Skin sensitisation

Aviation Jet Fuel JET A-1 (JETA1)

Skin sensitisation Based on available data the classification criteria are not met. (OECD 406, EPA OTS 798.4100)

Germ cell mutagenicity

Genotoxicity - in vitro Based on available data the classification criteria are not met. (OECD 471, 476, modified Ames test)

Genotoxicity - in vivo Based on available data the classification criteria are not met. (OECD 475, 478, 479)

Carcinogenicity

Carcinogenicity Based on available data the classification criteria are not met.

Reproductive toxicity

Reproductive toxicity - fertility Based on available data the classification criteria are not met. (OECD 421)

Reproductive toxicity - development Based on available data the classification criteria are not met. (OECD 414)

Specific target organ toxicity - single exposure

STOT - single exposure May cause nausea, headache, dizziness and intoxication. Anaesthetic in high concentrations.

Specific target organ toxicity - repeated exposure

STOT - repeated exposure Based on available data the classification criteria are not met. (OECD 410, 412, 413)

Aspiration hazard

Aspiration hazard May be fatal if swallowed and enters airways. Entry into the lungs following ingestion or vomiting may cause chemical pneumonitis.

Toxicological information on ingredients.

Distillates (petroleum), hydrotreated light; Kerosine - unspecified

Acute toxicity - oral

Notes (oral LD_{50}) LD_{50} > 5000 mg/kg, Oral, Rat (OECD 420, EPA OTS 798.1175)

Acute toxicity - dermal

Notes (dermal LD_{50}) LD_{50} > 2000 mg/kg, Dermal, Rabbit (OECD 402, EPA OTS 798.1100)

Acute toxicity - inhalation

Notes (inhalation LC_{50}) LC_{50} > 5,28 mg/L, Inhalation, Rat (4h) (OECD 403)

Kerosine (petroleum), sweetened

Acute toxicity - oral

Notes (oral LD_{50}) LD_{50} > 5000 mg/kg, Oral, Rat (OECD 420, EPA OTS 798.1175)

Acute toxicity - dermal

Notes (dermal LD_{50}) LD_{50} > 2000 mg/kg, Dermal, Rabbit (OECD 402, EPA OTS 798.1100)

Acute toxicity - inhalation

Notes (inhalation LC_{50}) LC_{50} > 5,28 mg/L, Inhalation, Rat (4h) (OECD 403)

Skin corrosion/irritation

Skin corrosion/irritation Irritating to skin. (EPA Guidelines in FR Vol. 44, No. 145, p. 44054-44093)

Serious eye damage/irritation

Serious eye damage/irritation Based on available data the classification criteria are not met. (EPA OTS 798.4500)

Aviation Jet Fuel JET A-1 (JETA1)

Skin sensitisation

Skin sensitisation	Not sensitising. (OECD 406, EPA OTS 798.4100)

Aspiration hazard

Aspiration hazard	Entry into the lungs following ingestion or vomiting may cause chemical pneumonitis.

SECTION 12: Ecological information

12.1. Toxicity

Toxicity Toxic to aquatic life with long lasting effects.

Ecological information on ingredients.

Distillates (petroleum), hydrotreated light; Kerosine - unspecified

Acute aquatic toxicity

Acute toxicity - fish	LL_{50}, 24 hours: 5-17 mg/L, LL_{50}, 48 hours: 2-5 mg/L, WAF (OECD 203)
Acute toxicity - aquatic invertebrates	EL50, 24 hours: 4,6 mg/L, EL50, 48 hours: 1,4 mg/L, NOEL, 48 hours: 0,3 mg/L, WAF (OECD 202)
Acute toxicity - aquatic plants	EL50, 24 hours: 1-3 mg/L, NOEL, 24 hours: 1 mg/L, WAF (OECD 201)

Chronic aquatic toxicity

Chronic toxicity - aquatic invertebrates	EL50, 21 days: 0.81 mg/L, NOEL, 21 days: 0,48 mg/L, WAF (OECD 211)

Kerosine (petroleum), sweetened

Acute aquatic toxicity

Acute toxicity - fish	LL_{50}, 24 hours: 5-17 mg/L, LL_{50}, 48 hours: 2-5 mg/L, WAF (OECD 203)
Acute toxicity - aquatic invertebrates	EL50, 24 hours: 4,6 mg/L, EL50, 48 hours: 1,4 mg/L, NOEL, 48 hours: 0,3 mg/L, WAF (OECD 202)
Acute toxicity - aquatic plants	EL50, 24 hours: 1-3 mg/L, NOEL, 24 hours: 1 mg/L, WAF (OECD 201)

Chronic aquatic toxicity

Chronic toxicity - fish early life stage	NOEL, 28 days: 0,1 mg/L, Fish (QSAR)

Aviation Jet Fuel JET A-1 (JETA1)

Chronic toxicity - aquatic invertebrates	EL50, 21 days: 0.81 mg/L, NOEL, 21 days: 0,48 mg/L, WAF (OECD 211)

12.2. Persistence and degradability

Persistence and degradability	The product contains volatile substances which may spread in the atmosphere. Can be photodegraded in the atmosphere.
Stability (hydrolysis)	No significant reaction in water.
Biodegradation	Inherently biodegradable. (OECD 301F)

12.3. Bioaccumulative potential

Bioaccumulative potential	Possibly bioaccumulative.
Partition coefficient	log Kow: > 3

12.4. Mobility in soil

Mobility	Evaporates slowly. The product has poor water-solubility. Product can penetrate soil until reaching the surface of ground water. The product contains substances which are bound to particulate matter and are retained in soil.

12.5. Results of PBT and vPvB assessment

Results of PBT and vPvB assessment	This product does not contain any substances classified as PBT or vPvB.

12.6. Other adverse effects

Other adverse effects	Product causes fouling, and direct contact produces harmful effects e.g. to birds and vegetation. Adsorbed hydrocarbon residues can be harmful to sediment organisms.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Disposal methods	Dispose of waste to licensed waste disposal site in accordance with the requirements of the local Waste Disposal Authority. When handling waste, the safety precautions applying to handling of the product should be considered. Care should be taken when handling emptied containers that have not been thoroughly cleaned or rinsed out.

SECTION 14: Transport information

14.1. UN number

UN No. (ADR/RID)	1863

14.2. UN proper shipping name

Proper shipping name (ADR/RID)	UN 1863 FUEL, AVIATION, TURBINE ENGINE

14.3. Transport hazard class(es)

ADR/RID class	3

14.4. Packing group

ADR/RID packing group	III

14.5. Environmental hazards

Aviation Jet Fuel JET A-1 (JETA1)

Environmentally hazardous substance/marine pollutant
MARINE POLLUTANT

14.6. Special precautions for user

Hazard Identification Number (ADR/RID)	30
Tunnel restriction code	(D/E)

14.7. Transport in bulk according to Annex II of MARPOL and the IBC Code

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU legislation	Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (as amended). Commission Regulation (EU) No 2015/830 of 28 May 2015. Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures (as amended).

15.2. Chemical safety assessment

A chemical safety assessment has been carried out.

SECTION 16: Other information

Abbreviations and acronyms used in the safety data sheet	EU OELV = European Occupational Exposure Limit Value
Key literature references and sources for data	Regulations, databases, literature, own research. Concawe Report No 11/10, 10/14. Chemical Safety Report Kerosines, 2010.
Training advice	DO NOT SIPHON PRODUCT BY MOUTH SUCTION.
Revision comments	Revised formulation. NOTE: Lines within the margin indicate significant changes from the previous revision.
Revision date	11/03/2019
Supersedes date	14/08/2018
SDS number	5306
Hazard statements in full	H226 Flammable liquid and vapour. H304 May be fatal if swallowed and enters airways. H315 Causes skin irritation. H336 May cause drowsiness or dizziness. H411 Toxic to aquatic life with long lasting effects.

Exposure scenario
Distribution of Substance - Industrial

Identification

Product name	Kerosines
Version number	2018
Es reference	ES01a

1. Title of exposure scenario

Main title	Distribution of Substance - Industrial
Process scope	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities.

Environment

Environmental release category	ERC4 Use of non-reactive processing aid at industrial site (no inclusion into or onto article) ERC5 Use at industrial site leading to inclusion into/onto article ERC6a Use of intermediate ERC6b Use of reactive processing aid at industrial site (no inclusion into or onto article) ERC6c Use of monomer in polymerisation processes at industrial site (inclusion or not into/onto article) ERC6d Use of reactive process regulators in polymerisation processes at industrial site (inclusion or not into/onto article) ERC7 Use of functional fluid at industrial site
SPERC	ESVOC SPERC 1.1b.v1

Worker

Process category	PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC4 Chemical production where opportunity for exposure arises PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing) PROC15 Use as laboratory reagent.

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 8,700,000 tonnes/year
Fraction of Regional tonnage used locally: 1
Annual site tonnage: 17,000 tonnes
Maximum daily site tonnage: 58 tonnes

Distribution of Substance - Industrial

Frequency and duration of use

Continuous release.
Emission days: 300 days/year

Other given operational conditions affecting environmental exposure

Emission factor - air	Release fraction to air from process (initial release prior to RMM): 1.0E-03
Emission factor - water	Release fraction to wastewater from process (initial release prior to RMM): 1.0E-05
Emission factor - soil	Release fraction to soil from process (initial release prior to RMM): 1.0E-05

Environmental factors not influenced by risk management measures

Dilution	Local freshwater dilution factor: 10 Local marine water dilution factor: 100

Risk management measures

Good practice	Common practices vary across sites, thus conservative process release estimates used. Risk from environmental exposure is driven by freshwater sediment.
STP details	Estimated substance removal from wastewater via domestic sewage treatment: 95% Removal efficiency (total): 95% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 2.1E+06 kg/day Assumed domestic sewage treatment plant flow (m³/day): 2000.

Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

Air	Treat air emission to provide a typical removal efficiency of 90%.
Water	Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): 0.0 If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.
Soil	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment	External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery method	External recovery and recycling of waste should comply with applicable local and/or national regulations.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics

Physical state	Liquid
Vapour pressure	Vapour pressure 0.5 - 10 kPa at STP.
Concentration details	Covers percentage substance in the product up to 100% (unless stated differently).

Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

Other given operational conditions affecting workers exposure

Distribution of Substance - Industrial

Setting Assumes a good basic standard of occupational hygiene is implemented.

Temperature Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Risk management measures

General exposures (closed systems)
No other specific measures identified.
.
General exposures (open systems)
No other specific measures identified.
.
Process sampling
No other specific measures identified.
.
Laboratory activities
No other specific measures identified.
.
Bulk transfers
No other specific measures identified.
.
Drum and small package filling
No other specific measures identified.
.
Equipment cleaning and maintenance
No other specific measures identified.
.
Bulk product storage
No other specific measures identified.

3. Exposure estimation (Environment 1)

Assessment method Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 2.3E-04 Maximum Risk Characterisation Ratios for wastewater emissions 1.3E-02

4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

3. Exposure estimation (Health 1)

Assessment method The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Distribution of Substance - Industrial

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Qualitative approach used to conclude safe use. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

4. Guidance to check compliance with the exposure scenario (Health 1)

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Exposure scenario
Formulation & (Re)packing of Substances and Mixtures - Industrial

Identification

Product name Kerosines

Version number 2018

Es reference ES02

1. Title of exposure scenario

Main title Formulation & (Re)packing of Substances and Mixtures - Industrial

Process scope Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.

Environment

Environmental release category ERC2 Formulation into mixture

SPERC ESVOC SPERC 2.2.v1

Worker

Process category

PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC4 Chemical production where opportunity for exposure arises
PROC5 Mixing or blending in batch processes
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC9 Transfer of substance or mixture into small containers (dedicated filling line, including weighing)
PROC14 Tabletting, compression, extrusion, pelletisation, granulation
PROC15 Use as laboratory reagent.

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 6,800,000 tonnes/year
Fraction of Regional tonnage used locally: 1
Annual site tonnage: 30,000 tonnes
Maximum daily site tonnage: 100 tonnes

Frequency and duration of use

Continuous release.
Emission days: 300 days/year

Formulation & (Re)packing of Substances and Mixtures - Industrial

Other given operational conditions affecting environmental exposure

Emission factor - air	Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements): 2.5E-02
Emission factor - water	Release fraction to wastewater from process (initial release prior to RMM): 2.0E-04
Emission factor - soil	Release fraction to soil from process (initial release prior to RMM): 1.0E-04

Environmental factors not influenced by risk management measures

Dilution	Local freshwater dilution factor: 10 Local marine water dilution factor: 100

Risk management measures

Good practice	Common practices vary across sites, thus conservative process release estimates used. Risk from environmental exposure is driven by freshwater sediment.
STP type	Municipal STP.
STP details	Estimated substance removal from wastewater via domestic sewage treatment: 95.0% Removal efficiency (total): 95.0% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 100 tonne/day Assumed domestic sewage treatment plant flow (m³/day): 2000.

Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

Air	Treat air emission to provide a typical removal efficiency of 0%.
Water	Prevent leaks and prevent soil/water pollution caused by leaks. Onsite wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): 94.8 If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%): 0.0
Soil	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment	External treatment and disposal of waste should comply with applicable local and/or national regulations.

Conditions and measures related to external recovery of waste

Recovery method	External recovery and recycling of waste should comply with applicable local and/or national regulations.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics

Physical state	Liquid
Vapour pressure	Vapour pressure 0.5 - 10 kPa at STP.
Concentration details	Covers percentage substance in the product up to 100% (unless stated differently).

Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

Other given operational conditions affecting workers exposure

Setting	Assumes a good basic standard of occupational hygiene is implemented.

Formulation & (Re)packing of Substances and Mixtures - Industrial

Temperature Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Risk management measures

General exposures (closed systems)
No other specific measures identified.
.
General exposures (open systems)
No other specific measures identified.
.
Process sampling
No other specific measures identified.
.
Laboratory activities
No other specific measures identified.
.
Bulk transfers
No other specific measures identified.
.
Mixing operations
No other specific measures identified.
.
Manual
Transfer from/pouring from containers
No other specific measures identified.
.
Drum/batch transfers
No other specific measures identified.
.
Tabletting, compression, extrusion or pelletisation
No other specific measures identified.
.
Drum and small package filling
No other specific measures identified.
.
Equipment cleaning and maintenance
No other specific measures identified.
.
Bulk product storage
No other specific measures identified.

3. Exposure estimation (Environment 1)

Assessment method Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 1.6E-02 Maximum Risk Characterisation Ratios for wastewater emissions 9.7E-01

4. Guidance to check compliance with the exposure scenario (Environment 1)

Formulation & (Re)packing of Substances and Mixtures - Industrial

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

3. Exposure estimation (Health 1)

Assessment method

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Qualitative approach used to conclude safe use. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

4. Guidance to check compliance with the exposure scenario (Health 1)

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Exposure scenario
Use as a Fuel - Industrial

Identification

Product name	Kerosines
Version number	2018
Es reference	ES12a

1. Title of exposure scenario

Main title	Use as a Fuel - Industrial
Process scope	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

Environment

Environmental release category	ERC7 Use of functional fluid at industrial site
SPERC	ESVOC SPERC 7.12a.v1

Worker

Process category	PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities PROC16 Use of fuels

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 1,600,000 tonnes/year
Fraction of Regional tonnage used locally: 1
Annual site tonnage: 1,500,000 tonnes
Maximum daily site tonnage: 5000 tonnes

Frequency and duration of use

Continuous release.
Emission days: 300 days/year

Other given operational conditions affecting environmental exposure

Emission factor - air	Release fraction to air from process (initial release prior to RMM): 5.0E-02
Emission factor - water	Release fraction to wastewater from process (initial release prior to RMM): 1.0E-05
Emission factor - soil	Release fraction to soil from process (initial release prior to RMM): 0

Environmental factors not influenced by risk management measures

Use as a Fuel - Industrial

Dilution	Local freshwater dilution factor: 10 Local marine water dilution factor: 100

Risk management measures

Good practice	Common practices vary across sites, thus conservative process release estimates used. Risk from environmental exposure is driven by freshwater sediment.
STP type	Municipal STP.
STP details	Estimated substance removal from wastewater via domestic sewage treatment: 95.0% Removal efficiency (total): 95% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 2.1E+06 tonne/day Assumed domestic sewage treatment plant flow (m³/day): 2000.

Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

Air	Treat air emission to provide a typical removal efficiency of 95%.
Water	Prevent leaks and prevent soil/water pollution caused by leaks. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): 94.4 If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%): 0.0
Soil	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment	Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment.

Conditions and measures related to external recovery of waste

Recovery method	This substance is consumed during use and no waste of the substance is generated.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics

Physical state	Liquid
Vapour pressure	Vapour pressure 0.5 - 10 kPa at STP.
Concentration details	Covers percentage substance in the product up to 100% (unless stated differently).

Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

Other given operational conditions affecting workers exposure

Setting	Assumes a good basic standard of occupational hygiene is implemented.
Temperature	Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures	General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Use as a Fuel - Industrial

Risk management measures

General exposures (closed systems)
No other specific measures identified.
.
Use as a fuel
(closed systems)
No other specific measures identified.
.
Bulk transfers
No other specific measures identified.
.
Drum/batch transfers
No other specific measures identified.
.
Equipment cleaning and maintenance
No other specific measures identified.
.
Bulk product storage
No other specific measures identified.

3. Exposure estimation (Environment 1)

Assessment method

Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 2.9E-02 Maximum Risk Characterisation Ratios for wastewater emissions 9.0E-01

4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

3. Exposure estimation (Health 1)

Assessment method

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Qualitative approach used to conclude safe use. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

4. Guidance to check compliance with the exposure scenario (Health 1)

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Exposure scenario
Use as a Fuel - Professional

Identification

Product name Kerosines

Version number 2018

Es reference ES12b

1. Title of exposure scenario

Main title Use as a Fuel - Professional

Process scope Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste.

Environment

Environmental release category ERC9a Widespread use of functional fluid (indoor)
ERC9b Widespread use of functional fluid (outdoor)

SPERC ESVOC SPERC 9.12b.v1

Worker

Process category PROC1 Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
PROC2 Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions
PROC3 Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition
PROC8a Transfer of substance or mixture (charging and discharging) at non-dedicated facilities
PROC8b Transfer of substance or mixture (charging and discharging) at dedicated facilities
PROC16 Use of fuels

2. Conditions of use affecting exposure (Industrial - Environment 1)

Product characteristics

Substance is complex UVCB. Predominantly hydrophobic.

Amounts used

Fraction of EU tonnage used in region: 0.1
Regional use tonnage: 4,600,000 tonnes/year
Fraction of Regional tonnage used locally: 1
Annual site tonnage: 2300 tonnes
Maximum daily site tonnage: 6.4 tonnes

Frequency and duration of use

Continuous release.
Emission days: 365 days/year

Other given operational conditions affecting environmental exposure

Emission factor - air Release fraction to air from wide dispersive use (regional only): 1.0E-03

Emission factor - water Release fraction to wastewater from wide dispersive use: 1.0E-05

Emission factor - soil Release fraction to soil from wide dispersive use (regional only): 1.0E-05

Environmental factors not influenced by risk management measures

Use as a Fuel - Professional

Dilution	Local freshwater dilution factor: 10 Local marine water dilution factor: 100

Risk management measures

Good practice	Common practices vary across sites, thus conservative process release estimates used. Risk from environmental exposure is driven by fresh water.
STP type	Municipal STP.
STP details	Estimated substance removal from wastewater via domestic sewage treatment: 95.0% Removal efficiency (total): 95.0% Maximum allowable site tonnage (Msafe), based on release following total wastewater treatment removal: 2.9E+05 kg/day Assumed domestic sewage treatment plant flow (m³/day): 2000.

Technical onsite conditions and measures to reduce or limit discharges to air, water and soil

Air	Treat air emission to provide a typical removal efficiency of N/A%.
Water	Prevent leaks and prevent soil/water pollution caused by leaks. Onsite wastewater treatment required. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): 0.0 If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of (%): 0.0
Soil	Do not apply industrial sludge to natural soils. Sludge should be incinerated, contained or reclaimed.

Conditions and measures related to external treatment of waste for disposal

Waste treatment	Combustion emissions limited by required exhaust emission controls. Combustion emissions considered in regional exposure assessment.

Conditions and measures related to external recovery of waste

Recovery method	This substance is consumed during use and no waste of the substance is generated.

2. Conditions of use affecting exposure (Workers - Health 1)

Product characteristics

Physical state	Liquid
Vapour pressure	Vapour pressure 0.5 - 10 kPa at STP.
Concentration details	Covers percentage substance in the product up to 100% (unless stated differently).

Frequency and duration of use

Covers daily exposures up to 8 hours (unless stated differently).

Other given operational conditions affecting workers exposure

Setting	Assumes a good basic standard of occupational hygiene is implemented.
Temperature	Assumes use at not more than 20°C above ambient temperature, unless stated differently.

Organisational measures to prevent/limit releases, dispersion and exposure

Organisational measures	General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent/minimise exposures and to report any skin problems that may develop.

Use as a Fuel - Professional

Risk management measures

General exposures (closed systems)
No other specific measures identified.
.
Use as a fuel
(closed systems)
No other specific measures identified.
.
Bulk transfers
No other specific measures identified.
.
Transfer from/pouring from containers
No other specific measures identified.
.
Equipment cleaning and maintenance
No other specific measures identified.
.
Bulk product storage
No other specific measures identified.

3. Exposure estimation (Environment 1)

Assessment method

Used Petrorisk model. (Hydrocarbon Block Method)

Maximum Risk Characterisation Ratios for air emissions 4.4E-04 Maximum Risk Characterisation Ratios for wastewater emissions 3.4E-03

4. Guidance to check compliance with the exposure scenario (Environment 1)

Guidance is based on assumed operating conditions which may not be applicable to all sites, thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).

3. Exposure estimation (Health 1)

Assessment method

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Qualitative approach used to conclude safe use. Available hazard data do not support the need for a DNEL to be established for other health effects. Users are advised to consider national Occupational Exposure Limits or other equivalent values.

4. Guidance to check compliance with the exposure scenario (Health 1)

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Material Safety Data Sheet
HYDRATED LIME

Rev. Date:10/30/2008

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	**Hi-Cal Hydrate**	
Synonym/s:	**Hydrate, High Calcium Hydrated Lime, HL**	
Manufacturer:	**US Operations:** **Chemical Lime Co.** **3700 Hulen St.** **Fort Worth, TX 76107** **817-732-8164**	**Canadian Operations:** **Chemical Lime Co. of Canada Inc.** **20302-102B Ave.** **Langley, BC V1M 3H1** **604-888-4333**
Emergency Phone:	**Chemtrec 1-800-424-9300**	
Chemical Name: **Chemical Family:** **Chemical Formula:**	**Calcium Hydroxide** **Alkaline Earth Hydroxide** **$Ca(OH)_2$**	**WHMIS Classification:** **D2A, E**
Product Use/s:	**Water treatment, pH adjustment, FGT, Construction, Pulp/Paper**	
Prepared By:	**Chemical Lime Co.** **R&D/Technical Services, KSA**	

SECTION 2: COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient	CAS	OSHA PEL, TWA 8/40h (mg/m3)	ACGIH TLV, TWA 8/40h (mg/m3)	NIOSH REL, TWA 8/40h (mg/m3)	NIOSH IDLH (mg/m3)	Conc. (%)
Calcium Hydroxide, $Ca(OH)_2$ (Hydrated Lime)	**1305-62-0**	**15** (total dust) **5** (respirable)	**5**	**5**	**N.A.**	**> 90**
Magnesium Hydroxide, $Mg(OH)_2$ (Brucite)	**1309-42-8**	**N.A.**	**N.A.**	**N.A.**	**N.A.**	**< 5**
Magnesium Oxide, MgO (Periclase)	**1309-48-4**	**10**	**10**	**N.A.**	**N.A.**	**< 5**
Calcium Carbonate, $CaCO_3$ (Limestone)	**1317-65-3 (471-34-1)**	**15** (total dust) **5** (respirable)	**10**	**10** (total dust) **5** (respirable)	**N.A.**	**< 3**
Crystalline Silica, SiO_2 (Quartz)	**14808-60-7**	**10/(SiO2% + 2)** (respirable)	**0.025** (respirable)	**0.05** (respirable)	**50**	**< 2**

OSHA Regulatory Status: This material is subject to 29 CFR 1910.1200 (Hazard Communication).

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview: Hydrate is an odorless white or grayish-white powder. Contact can cause irritation to eyes, skin, respiratory system, and gastrointestinal tract.

Potential Health Effects

Eyes: Contact can cause severe irritation or burning of eyes, including permanent damage.

Skin: Contact can cause irritation of skin.

Ingestion: This product can cause severe irritation of gastrointestinal tract if swallowed.

Inhalation: This product can cause severe irritation of the respiratory system. Long-term exposure may cause permanent damage. Hydrate is not listed by MSHA, OSHA, or IARC as a carcinogen However, this product may contain trace amounts of crystalline silica in the form of quartz or crystobalite, which has been classified by IARC as a Group I carcinogen to humans when inhaled. Inhalation of silica can also cause a chronic lung disorder, silicosis.

Medical Conditions Aggravated by Exposure: Contact may aggravate disorders of the eyes, skin, gastrointestinal tract, and respiratory system.

Potential Environmental Effects: This material is alkaline and if released into water or moist soil will cause an increase in pH.

SECTION 4: FIRST AID MEASURES

Eyes: Immediately flush eyes with generous amounts of water or eye wash solution if water is unavailable. Pull back eyelid while flushing to ensure that all lime dust has been washed out. Seek medical attention promptly if the initial flushing of the eyes does not remove the irritant. Do not rub eyes.

Skin: Brush off or remove as much dry lime as possible. Wash exposed area with large amounts of water. If irritation persists, seek medical attention promptly.

Inhalation: Move victim to fresh air. Seek medical attention. If breathing has stopped, give artificial respiration.

Ingestion: Do not induce vomiting. Seek medical attention immediately. Never give anything by mouth unless instructed to do so by medical personnel.

SECTION 5: FIRE FIGHTING MEASURES

Fire Hazards:	Hydrate is not combustible or flammable. However, hydrate reacts vigorously with acids, and may release heat sufficient to ignite combustible materials in specific instances. Hydrate is not considered to be an explosion hazard, although reaction with acids or other incompatible materials may rupture containers.
Hazardous Combustion Products:	None
Extinguishing Media:	Use dry chemical fire extinguisher. Do not use water or halogenated compounds, except that large amounts of water may be used to deluge small quantities of hydrate.
Fire Fighting Instructions:	Keep personnel away from and upwind of fire. Avoid skin contact or inhalation of dust. Wear full fire-fighting turn-out gear (full Bunker gear), and respiratory protection (SCBA).

SECTION 6: ACCIDENTAL RELEASE MEASURES

Spill / Leak Procedures:	**Do Not** use water on bulk material spills. Use proper protective equipment.
Small Spills:	Use dry methods to collect spilled materials. Avoid generating dust. Do not clean up with compressed air. Store collected materials in dry, sealed plastic or non-aluminum metal containers. Residue on surfaces may be water washed.
Large Spills:	Use dry methods to collect spilled materials. Evacuate area downwind of clean-up operations to minimize dust exposure. Store spilled materials in dry, sealed plastic or non-aluminum metal containers.
Containment:	Minimize dust generation and prevent bulk release to sewers or waterways.
Clean-up:	Residual amounts of material can be flushed with large amounts of water. Equipment can be washed with either a mild vinegar and water solution, or detergent and water.

SECTION 7: HANDLING AND STORAGE

Handling:	Keep in tightly closed plastic or non-aluminum metal containers. Protect containers from physical damage. Avoid direct skin contact with the material.
Storage:	Store in a cool, dry, and well-ventilated location. Do not store near acids or other incompatible materials. Keep away from moisture. Do not store or ship in aluminum containers.

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls:	Provide ventilation adequate to maintain PELs.
Respiratory Protection:	Use NIOSH/MSHA approved respirators if airborne concentration exceeds PELs.
Skin Protection:	Use appropriate gloves and footwear to prevent skin contact. Clothing should fully cover arms and legs. Should lime get inside clothing or gloves, remove the clothing and the lime promptly.
Eye Protection:	Use safety glasses with side shields or safety goggles. Contact lenses should not be worn when working with lime products.
Other:	Eye wash fountain/stations and emergency showers should be available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	**Odor:**	**Physical State:**
White or grayish-white powder	Odorless	Solid
Boiling Point (°C/°F):	**Melting Point (°C/°F):**	**Specific Gravity**
2850 / 5162	dec 580 / 1076	(Apparent) g/cc: 0.4 - 0.55 (True) g/cc: 2.2 - 2.4
Vapor Pressure (mm Hg):	**Vapor Density:**	**Evaporation Rate:**
N.A.	N.A.	N.A.
Solubility in Water	**pH (25°C/77°F):**	
Slightly soluble in water.	12.4	

SECTION 10: STABILITY AND REACTIVITY

Stability: Chemically stable, but slowly reacts with carbon dioxide to form calcium carbonate. See also Incompatibility below.

Incompatibility/ Conditions to Avoid: Hydrate should not be mixed or stored with the following materials, due to the potential for vigorous reaction and release of heat:

Acids (unless in a controlled process)	Organic Acid Anhydrides
Reactive Fluoridated Compounds	Nitro-Organic Compounds
Reactive Brominated Compounds	Reactive Phosphorous Compounds
Reactive Powdered Metals	Interhalogenated Compounds

Hazardous Decomposition Products: None

Hazardous Polymerization: None

SECTION 11: TOXICOLOGICAL INFORMATION

ORL-RAT LD50: 7,340 MG/KG
ORL-MUS LD50: 7,300 MG/KG

Hydrated Lime is not listed by MSHA, OSHA, or IARC as a carcinogen, but this product may contain trace amounts of crystalline silica, which has been classified by IARC as carcinogenic to humans when inhaled in the form of quartz or crystobalite.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: Because of the high pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems in high concentrations.

Environmental Fate: This material shows no bioaccumulation effect or food chain concentration toxicity.

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose of in accordance with all applicable federal, state, and local environmental regulations. If this product as supplied, and unmixed, becomes a waste, it will not meet the criteria of a hazardous waste as defined under the U.S. Resource Conservation and Recovery Act (RCRA).

SECTION 14: TRANSPORTATION INFORMATION

Hydrate is not classified as a hazardous material by US DOT and is not regulated by the Transportation of Dangerous Goods (TDG) when shipped by any mode of transport.

SECTION 15: REGULATORY INFORMATION

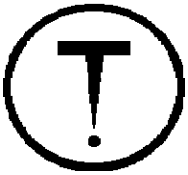
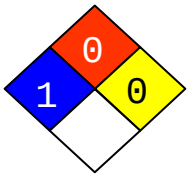
U.S. EPA Regulations:
RCRA Hazardous Waste Number (40 CFR 261.33): not listed
RCRA Hazardous Waste Classification (40 CFR 261): not classified
CERCLA Hazardous Substance (40 CFR 302.4) unlisted specific per RCRA, Sec. 3001; CWA, Sec. 311(b)(4); CWA, Sec. 307(a), CAA, Sec. 112
CERCLA Reportable Quantity (RQ), not listed
SARA 311/312 Codes: not listed
SARA Toxic Chemical (40 CFR 372.65): not listed
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): not listed, Threshold Planning Quantity (TPQ): not listed
All chemical ingredients are listed on the USEPA TSCA Inventory List.

OSHA/MSHA Regulations:
Air Contaminant (29 CRF 1910.1000, Table Z-1, Z-1-A): 5mg/M^3 TWA-8
MSHA: not listed
OSHA Specifically Regulated Substance (29 CFR 1910): not listed

State Regulations:
Consult state and local authorities for guidance. Components found in this product may contain trace amounts of inherent naturally occurring elements (such as, but not limited to arsenic and cadmium) that may be regulated.

Canada:
WHMIS Classification: "D2A" Materials Causing Other Toxic Effects
WHMIS Classification: "E" Corrosive Materials (listed due to corrosive effect on aluminum)
Canada DSL: Listed

NFPA Hazard Class: Health: 1 Flammability: 0 Reactivity: 0
HMIS Hazard Class: Health: 1 Flammability: 0 Reactivity: 0 Personal Protection: E

SECTION 16: OTHER INFORMATION

Prepared By: **Chemical Lime Company, R&D/Technical Services, KSA**

Chemical Lime Company provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person. Individuals receiving this information must consult their own technical and legal advisors and/ or exercise their own judgment in determining its appropriateness for a particular purpose. Chemical Lime Company makes no representations or warranties, either express or implied, including without limitation and warranties of merchantability or fitness for a particular purpose with respect to the information set forth herein or the product(s) to which the information refers. Accordingly, Chemical Lime Company will not be responsible or liable for any claims, losses or damages resulting from the use of or reliance upon or failure to use this information.

Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **METHYL ISOBUTYL CARBINOL**

Other name(s): Methyl amyl alcohol; 4-Methyl-2-pentanol; Isobutyl methyl carbinol; MIBC; Metilisobutilcarbinol

Recommended Use of the Chemical and Restrictions on Use Solvent; mineral floatation agent.

Supplier: Ixom Operations Pty Ltd
ABN: 51 600 546 512
Street Address: Level 8, 1 Nicholson Street
East Melbourne Victoria 3002
Australia

Telephone Number: +61 3 9906 3000
Emergency Telephone: **1 800 033 111 (ALL HOURS)**

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Flammable liquids - Category 3
Eye Irritation - Category 2A
Specific target organ toxicity (single exposure) - Category 3

SIGNAL WORD: WARNING

Hazard Statement(s):
H226 Flammable liquid and vapour.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Precautionary Statement(s):

Prevention:
P210 Keep away from heat, sparks, open flames, hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground or bond container and receiving equipment.
P241 Use explosion-proof electrical, ventilating, lighting equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing mist, vapours, spray.
P264 Wash hands thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves / protective clothing / eye protection / face protection.

Response:
P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312 Call a POISON CENTER or doctor/physician if you feel unwell.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 If eye irritation persists: Get medical advice/attention.
P370+P378 In case of fire: Use extinguishing media as outlined in Section 5 of this Safety Data Sheet to extinguish.

Storage:
P403+P233 Store in a well-ventilated place. Keep container tightly closed.
P403+P235 Store in a well-ventilated place. Keep cool.
P405 Store locked up.

Disposal:
P501 Dispose of contents and container in accordance with local, regional, national, international regulations.

Poisons Schedule (SUSMP): None allocated.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Methyl isobutyl carbinol	108-11-2	>98.0%	H226 H335
Diisobutyl ketone	108-83-8	<2.0%	H226 H335
Methyl isobutyl ketone	108-10-1	<1.0%	H225 H332 H319 H335

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:
Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. If patient finds breathing difficult and develops a bluish discolouration of the skin (which suggests a lack of oxygen in the blood - cyanosis), ensure airways are clear of any obstruction and have a qualified person give oxygen through a face mask. Apply artificial respiration if patient is not breathing. Seek immediate medical advice.

Skin Contact:
If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.

Eye Contact:
If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:
Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:
Treat symptomatically. No known specific antidote.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Alcohol resistant foam is the preferred firefighting medium but, if it is not available, normal protein foam can be used.

Unsuitable Extinguishing Media:
Water jet. Solid water jet/stream may scatter and spread the fire.

Hazchem or Emergency Action Code: · 3Y

Specific hazards arising from the chemical:
Flammable liquid. May form flammable vapour mixtures with air. Vapour may travel a considerable distance to source of ignition and flash back.

Special protective equipment and precautions for fire-fighters:
On burning will emit toxic fumes, including those of oxides of carbon . Heating can cause expansion or decomposition of the material, which can lead to the containers exploding. If safe to do so, remove containers from the path of fire. Keep containers cool with water spray. Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to vapour or products of combustion.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:
Shut off all possible sources of ignition. Clear area of all unprotected personnel. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:
Slippery when spilt. Avoid accidents, clean up immediately. Wear protective equipment to prevent skin and eye contact and breathing in vapours. Work up wind or increase ventilation. Contain - prevent run off into drains and waterways. Use absorbent (soil, sand or other inert material). Collect and seal in properly labelled containers or drums for disposal. Use non-sparking tools.

7. HANDLING AND STORAGE

Precautions for safe handling:
Avoid skin and eye contact and breathing in vapour. All potential sources of ignition (open flames, pilot lights, furnaces, spark producing switches and electrical equipment etc) must be eliminated both in and near the work area. Do NOT smoke. Take precautionary measures against static discharges. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities:
Store in a cool, dry, well ventilated place. Store away from sources of heat or ignition. Store away from incompatible materials described in Section 10. Keep containers closed when not in use - check regularly for leaks.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Methyl isobutyl carbinol: 8hr TWA = 104 mg/m^3 (25 ppm), 15 min STEL = 167 mg/m^3 (40 ppm), Sk
Diisobutyl ketone: 8hr TWA = 145 mg/m^3 (25 ppm)
Methyl isobutyl ketone: 8hr TWA = 205 mg/m^3 (50 ppm), 15 min STEL = 307 mg/m^3 (75 ppm)

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

STEL (Short Term Exposure Limit) - the airborne concentration of a particular substance calculated as a time-weighted average over 15 minutes, which should not be exceeded at any time during a normal eight hour work day. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.

`Sk' (skin) Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:
Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Vapour heavier than air - prevent concentration in hollows or sumps. DO NOT enter confined spaces where vapour may have collected. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):
The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES, RESPIRATOR.

Wear overalls, chemical goggles and impervious gloves. Use with adequate ventilation. If determined by a risk assessment an inhalation risk exists, wear an organic vapour respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

When handling this product in bulk quantities, and/or in Intermediate Bulk Containers (IBC's), wear overalls, safety shoes, impervious gloves, chemical goggles, and a face shield. If determined by a risk assessment an inhalation risk exists, wear appropriate respiratory protection as mentioned above.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid

Colour:	Colourless
Odour:	Mild
Molecular Formula:	(CH3)2CHCH2CH(OH)CH3
Specific Gravity:	0.807 @20°C
Relative Vapour Density (air=1):	3.5
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	40.56 (Open Cup)
Flammability Limits (%):	1.0 - 5.5 vol
Autoignition Temperature (°C):	355 @1013 hPa
Solubility in water (g/L):	17 @20°C
Boiling Point/Range (°C):	132
pH:	Not available
Viscosity:	5.2 mPa.s @20°C
Evaporation Rate:	0.43 (Butyl acetate = 1)
Partition Coefficient:	log Pow = 1.57 (estimated)
Freezing Point/Range (°C):	-90

10. STABILITY AND REACTIVITY

Reactivity: No information available.

Chemical stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Possibility of hazardous reactions: Hazardous polymerisation will not occur.

Conditions to avoid: Avoid exposure to heat, sources of ignition, and open flame.

Incompatible materials: Incompatible with acids , oxidising agents , acid chlorides .

Hazardous decomposition products: Oxides of carbon.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion: Swallowing can result in nausea, vomiting and central nervous system depression. If the victim is showing signs of central system depression (like those of drunkeness) there is greater likelihood of the patient breathing in vomit and causing damage to the lungs.

Eye contact: An eye irritant.

Skin contact: Contact with skin may result in irritation. Will have a degreasing action on the skin. Repeated or prolonged skin contact may lead to irritant contact dermatitis. Can be absorbed through the skin with resultant adverse effects.

Inhalation: Material is irritant to the mucous membranes of the respiratory tract (airways). Breathing in vapour can result in headaches, dizziness, drowsiness, and possible nausea. Breathing in high concentrations can produce central nervous system depression, which can lead to loss of co-ordination, impaired judgement and if exposure is prolonged, unconsciousness.

Acute toxicity:
Oral LD50 (rat): 2590 mg/kg
Dermal LD50 (rabbit): 2870 mg/kg
Inhalation LC50 (rat): >16000 mg/m^3/4hr

Respiratory or skin sensitisation: Not a skin sensitiser (guinea pig).

Chronic effects: In vitro genetic toxicity studies were negative. For the minor component: The product has been found to cause cancer in laboratory animals.

Specific Target Organ Toxicity (STOT) - single exposure: May cause respiratory irritation.
Specific Target Organ Toxicity (STOT) - repeated exposure: In animals, effects have been reported on the following organs: kidney.
Aspiration hazard: May be harmful if swallowed and enters airways.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: The material is readily biodegradable.

48hr EC50 (Daphnia magna): 337 mg/L (semi-static test)
96hr LC50 (rainbow trout): 359 mg/L (semi-static test)

13. DISPOSAL CONSIDERATIONS

Disposal methods:
Refer to Waste Management Authority. Dispose of material through a licensed waste contractor. Advise flammable nature. Normally suitable for incineration by an approved agent.

14. TRANSPORT INFORMATION

Road and Rail Transport
Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN No: 2053
Transport Hazard Class: 3 Flammable Liquid
Packing Group: III
Proper Shipping Name or Technical Name: METHYL ISOBUTYL CARBINOL
Hazchem or Emergency Action Code: · 3Y

Marine Transport
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN No:	2053
Transport Hazard Class:	3 Flammable Liquid
Packing Group:	III
Proper Shipping Name or Technical Name:	METHYL ISOBUTYL CARBINOL
IMDG EMS Fire:	F-E
IMDG EMS Spill:	S-D
Marine Pollutant	No

Air Transport

Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS.

UN No:	2053
Transport Hazard Class:	3 Flammable Liquid
Packing Group:	III
Proper Shipping Name or Technical Name:	METHYL ISOBUTYL CARBINOL

15. REGULATORY INFORMATION

Classification:
This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Flammable liquids - Category 3
Eye Irritation - Category 2A
Specific target organ toxicity (single exposure) - Category 3

Hazard Statement(s):
H226 Flammable liquid and vapour.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.

Poisons Schedule (SUSMP): None allocated.

This material is listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

Supplier Safety Data Sheet; 02/ 2017.

This safety data sheet has been prepared by Ixom Operations Pty Ltd Toxicology & SDS Services.

Reason(s) for Issue:
5 Yearly Revised Primary SDS
Change in Hazardous Chemical Classification
Change in Personal Protection Requirements
Change in Physical Properties

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

Creation Date 12-Mar-2009 **Revision Date** 25-Apr-2019 **Revision Number** 10

1. Identification

Product Name **Nitric acid (65 - 70%)**

Cat No. : **A198C-212, A200-212, A200-212LC, A200-500, A200-500LC, A200-612GAL, A200C-212, A200S-212, A200S-212LC, A200S-500, A200SI-212, A467-1, A467-2, A467-250, A467-500, A483-212; S719721**

CAS-No 7697-37-2
Synonyms Azotic acid; Engraver's acid; Aqua fortis

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 3
Corrosive to metals	Category 1
Acute Inhalation Toxicity - Dusts and Mists	Category 3
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
May intensify fire; oxidizer
May be corrosive to metals
Causes severe skin burns and eye damage

Toxic if inhaled

Precautionary Statements
Prevention
Do not breathe dust/fume/gas/mist/vapors/spray
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Keep only in original container
Wear respiratory protection
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Immediately call a POISON CENTER or doctor/physician
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Corrosive to the respiratory tract

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Nitric acid	7697-37-2	65 - 70
Water	7732-18-5	30 - 35

4. First-aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in

attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.

Inhalation If breathing is difficult, give oxygen. 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. Remove from exposure, lie down. Call a physician immediately.

Ingestion Do not induce vomiting. Never give anything by mouth to an unconscious person. Clean mouth with water. Call a physician immediately.

Most important symptoms and effects Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media CO_2, dry chemical, dry sand, alcohol-resistant foam.

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available

Oxidizing Properties Oxidizer

Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	OX

6. Accidental release measures

Personal Precautions Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Use personal protective equipment.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal. Wear self-contained breathing apparatus and protective suit.

7. Handling and storage

Handling Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a cool, well-ventilated place. Do not store near combustible materials.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Nitric acid	TWA: 2 ppm STEL: 4 ppm	(Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m³ (Vacated) STEL: 4 ppm (Vacated) STEL: 10 mg/m³ TWA: 2 ppm TWA: 5 mg/m³	IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m³ STEL: 4 ppm STEL: 10 mg/m³	TWA: 2 ppm STEL: 4 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection 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. Tightly fitting safety goggles. Face-shield.

Skin and body protection Long sleeved clothing.

Respiratory Protection 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.

Hygiene Measures Keep away from food, drink and animal feeding stuffs. When using, do not eat, drink or smoke. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Avoid contact with skin, eyes and clothing. For environmental protection remove and wash all contaminated protective equipment before re-use. Wear suitable gloves and eye/face protection.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Clear Colorless, Light yellow
Odor	Strong Acrid
Odor Threshold	No information available
pH	< 1.0 (0.1M)
Melting Point/Range	-41 °C / -41.8 °F

Boiling Point/Range	Not applicable
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.94 kPa (20°C)
Vapor Density	No information available
Specific Gravity	1.40
Solubility	miscible
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	HNO3
Molecular Weight	63.01

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Combustible material. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Combustible material, Strong bases, Reducing agents, Metals, Powdered metals, Organic materials, Aldehydes, Alcohols, Cyanides, Ammonia, Strong reducing agents

Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Oral LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Dermal LD50	Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Mist LC50	Category 3. ATE = 1 - 5 mg/L. Category 4.
Vapor LC50	Based on ATE data, the classification criteria are not met. ATE > 20 mg/L.

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitric acid	Not listed	Not listed	LC50 = 2500 ppm. (Rat) 1h
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico

Nitric acid	7697-37-2	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known
STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Large amounts will affect pH and harm aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Nitric acid	Not listed	LC50: = 72 mg/L, 96h (Gambusia affinis)	Not listed	Not listed

Persistence and Degradability Miscible with water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Nitric acid	-2.3

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

TDG

UN-No UN2031
Proper Shipping Name NITRIC ACID
Hazard Class 8
Subsidiary Hazard Class 5.1
Packing Group II

IATA

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

IMDG/IMO

UN-No	UN2031
Proper Shipping Name	NITRIC ACID
Hazard Class	8
Subsidiary Hazard Class	5.1
Packing Group	II

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Nitric acid	7697-37-2	X	ACTIVE	-
Water	7732-18-5	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Nitric acid	7697-37-2	X	-	231-714-2	X	X	X	X	KE-25911
Water	7732-18-5	X	-	231-791-2	X	-	X	X	KE-35400

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Nitric acid	7697-37-2	65 - 70	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Nitric acid	X	1000 lb	-	-

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Nitric acid	-	TQ: 500 lb

CERCLA This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Nitric acid	1000 lb	1000 lb

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Nitric acid	X	X	X	X	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product contains the following DHS chemicals:
Legend - STQs = Screening Threshold Quantities, APA = A placarded amount

Component	DHS Chemical Facility Anti-Terrorism Standard
Nitric acid	Release STQs - 15000lb Theft STQs - 400lb

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By
Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 12-Mar-2009
Revision Date 25-Apr-2019
Print Date 25-Apr-2019
Revision Summary SDS sections updated. 2. 11.

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 06-Oct-2009 **Revision Date** 18-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Perchloric Acid**

Cat No. : **A469-1, A469-250, A469-500**

CAS-No 7601-90-3
Synonyms Dioxonium perchlorate; Hydronium perchlorate; Perchloric acid solution

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Oxidizing liquids	Category 1
Corrosive to metals	Category 1
Acute oral toxicity	Category 4
Skin Corrosion/irritation	Category 1 A
Serious Eye Damage/Eye Irritation	Category 1
Specific target organ toxicity (single exposure) Target Organs - Respiratory system.	Category 3
Specific target organ toxicity - (repeated exposure) Target Organs - Thyroid.	Category 2

Label Elements

Signal Word
Danger

Hazard Statements
May cause fire or explosion; strong oxidizer
May be corrosive to metals
Harmful if swallowed
Causes severe skin burns and eye damage
May cause respiratory irritation
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep/Store away from clothing/ other combustible materials
Take any precaution to avoid mixing with combustibles
Wear fire/flame resistant/retardant clothing
Keep only in original container
Response
Immediately call a POISON CENTER or doctor/physician
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
Wash contaminated clothing before reuse
IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes
Rinse skin with water/shower
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Ingestion
Rinse mouth
Do NOT induce vomiting
Fire
In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion
In case of fire: Use CO2, dry chemical, or foam for extinction
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Risk of explosion if heated under confinement

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Perchloric acid	7601-90-3	60-70
Water	7732-18-5	30-40

4. First-aid measures

General Advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Remove and wash contaminated clothing before re-use. Call a physician immediately.
Inhalation	If not breathing, give artificial respiration. Remove from exposure, lie down. 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. Call a physician immediately.
Ingestion	Do not induce vomiting. Clean mouth with water. Never give anything by mouth to an unconscious person. Call a physician immediately.
Most important symptoms and effects	Causes burns by all exposure routes. Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO_2, dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media	No information available
Flash Point	113 °C / 235.4 °F
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Oxidizing Properties	Oxidizer
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous membranes. Oxidizer: Contact with combustible/organic material may cause fire. May ignite combustibles (wood paper, oil, clothing, etc.).

Hazardous Combustion Products
Hydrogen chloride gas
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	3	OX

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Sweep up and shovel into suitable containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest. Keep away from clothing and other combustible materials.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near combustible materials. Corrosives area.

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

OSHA - Occupational Safety and Health Administration

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection 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 and body protection Long sleeved clothing.

Respiratory Protection No protective equipment is needed under normal use conditions.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Strong
Odor Threshold	No information available
pH	0.1 @ 20°C
Melting Point/Range	-18 °C / -0.4 °F
Boiling Point/Range	203 °C / 397.4 °F @ 760 mmHg
Flash Point	113 °C / 235.4 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	6.8 mmHg @ 25 °C
Vapor Density	3.46
Specific Gravity	1.660
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	3.5 mPa.s @ 20 °C

Molecular Formula H Cl O4
Molecular Weight 100.46

10. Stability and reactivity

Reactive Hazard Yes

Stability Oxidizer: Contact with combustible/organic material may cause fire.

Conditions to Avoid Incompatible products. Excess heat. Combustible material.

Incompatible Materials Strong oxidizing agents, Powdered metals, Organic materials, Amines, Alcohols, Strong reducing agents, Combustible material

Hazardous Decomposition Products Hydrogen chloride gas

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information
Oral LD50 Category 4. ATE = 300 - 2000 mg/kg.
Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg.
Vapor LC50 Based on ATE data, the classification criteria are not met. ATE > 20 mg/L.
Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Perchloric acid	LD50 = 1100 mg/kg (Rat)	Not listed	Not listed
Water	-	Not listed	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Causes severe burns by all exposure routes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Perchloric acid	7601-90-3	Not listed	Not listed	Not listed	Not listed	Not listed
Water	7732-18-5	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure Thyroid

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation: Product is a corrosive material. Use of gastric lavage or emesis is

contraindicated. Possible perforation of stomach or esophagus should be investigated

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains. .

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT

UN-No	UN1873
Proper Shipping Name	PERCHLORIC ACID
Hazard Class	5.1
Subsidiary Hazard Class	8
Packing Group	I

TDG

UN-No	UN1873
Proper Shipping Name	PERCHLORIC ACID
Hazard Class	5.1
Subsidiary Hazard Class	8
Packing Group	I

IATA

UN-No	UN1873
Proper Shipping Name	PERCHLORIC ACID
Hazard Class	5.1
Subsidiary Hazard Class	8
Packing Group	I

IMDG/IMO

UN-No	UN1873
Proper Shipping Name	PERCHLORIC ACID
Hazard Class	5.1
Subsidiary Hazard Class	8
Packing Group	I

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Perchloric acid	X	X	-	231-512-4	-		X	X	X	X	X
Water	X	X	-	231-791-2	-		X	-	X	X	X

Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.
S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
OSHA - United States Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Perchloric acid	-	TQ: 5000 lb

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Perchloric acid	X	X	X	-	X
Water	-	-	X	-	-

U.S. Department of Transportation

Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Slight risk, Grade 1

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 06-Oct-2009
Revision Date 18-Jan-2018
Print Date 18-Jan-2018

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

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CHEMINOVA
HELPING YOU GROW

SAFETY DATA SHEET

DANAFLOAT™ 468

Revision: Sections containing a revision or new information are marked with a ♣.

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. **Product identifier** .....
DANAFLOAT™ 468
Contains sodium O,O-di-sec-butyl phosphorodithioate, sodium O,O-diethyl phosphorodithioate and sodium hydroxide

1.2. **Relevant identified uses of the substance or mixture and uses advised against** .....
Can be used as flotation reagent (flotation collector) only.

1.3. **Details of the supplier of the safety data sheet**
CHEMINOVA A/S
P.O. Box 9
DK-7620 Lemvig
Denmark
sds@cheminova.dk

1.4. **Emergency telephone number** ...
(+45) 97 83 53 53 (24 h; for emergencies only)

♣ SECTION 2: HAZARDS IDENTIFICATION

2.1. **Classification of the substance or mixture** .....
Skin corrosion: Category 1C (H314)

Health hazards .....
The product can have severe irritating effects on skin, eyes, upper digestive tract and respiratory tract.

Environmental hazards .....
The product is not considered as dangerous to the aquatic environment.

2.2. **Label elements**
According to EU Reg. 1272/2008 as amended

Product identifier .....
Danafloat™ 468
Contains sodium O,O-di-sec-butyl phosphorodithioate, sodium O,O-diethyl phosphorodithioate and sodium hydroxide

Hazard pictogram (GHS05) .....

Signal word ..... Danger

Hazard statement
H314 ..... Causes severe skin burns and eye damage.

Precautionary statements
P280 ..... Wear protective gloves, protective clothing and eye/face protection.
P301+P330+P331 ..... IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 ..... IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 ..... IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 ..... Immediately call a POISON CENTER or doctor/physician.
P501 ..... Dispose of contents/container as hazardous waste.

2.3. **Other hazards** ..... None of the ingredients in the product meets the criteria for being PBT or vPvB.

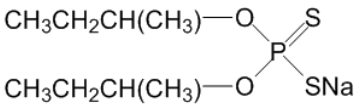
♣ SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. **Substances** ..... The product is a mixture, not a substance.

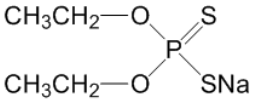
3.2. **Mixtures** ..... See section 16 for full text of hazard statements.

Active ingredients

s-Butyl-dtp-Na ..... Content: 21 - 24% by weight
CAS name ..... Phosphorodithioic acid, O,O-bis(1-methylpropyl) ester, sodium salt
CAS no. 33619-92-0
IUPAC name ..... Sodium O,O-di-sec-butyl phosphorodithioate
EU name ..... Sodium O,O-di-sec-butyl dithiophosphate
Other name(s) ..... s-Butyl-dtp-Na
EC no. (EINECS no.) 251-598-7
EU index no. ..... None
Classification of the ingredient ..... Skin corrosion: Category 1C (H314)
Structural formula .....



Ethyl-dtp-Na ..... Content: 21 - 24% by weight
CAS name ..... Phosphorodithioic acid, O,O-diethyl ester, sodium salt
CAS no. 3338-24-7
IUPAC name ..... Sodium O,O-diethyl phosphorodithioate
EU name ..... Sodium O,O-diethyl dithiophosphate
Other name(s) ..... Ethyl-dtp-Na
EC no. (EINECS no.) 222-079-2
EU index no. ..... None
Classification of the ingredient ..... Acute oral toxicity: Category 4 (H302)
Acute inhalation toxicity: Category 4 (H332)
Skin corrosion: Category 1C (H314)
Structural formula .....



Other reportable ingredient	Content (% w/w)	CAS no.	EC no. (EINECS no.)	Classification
Sodium hydroxide Reg. no. 01-2119457892-27	max. 2.5	1310-73-2	215-185-5	Skin Corr. 1A (H314)

♣ SECTION 4: FIRST AID MEASURES

4.1. **Description of first aid measures**

In case of exposure, do not wait for symptoms to develop. Immediately start the recommended procedures below.

Inhalation .....

If experiencing any discomfort, immediately remove from exposure. Light cases: Keep person under surveillance. Get medical attention immediately if symptoms develop. Serious cases: Get medical attention immediately or call for an ambulance.

Skin contact .....

Immediately remove contaminated clothing and footwear. Flush skin with water. Wash with water and soap. See physician immediately if irritation develops.

Eye contact .....

Immediately rinse eyes with much water or eyewash solution, occasionally opening eyelids. Remove contact lenses after a few minutes and rinse again. See physician immediately. Continue rinsing under way to physician, also if initial pain has subsided.

Ingestion .....

Let the exposed person rinse mouth and drink several glasses of water or milk, but not induce vomiting. If vomiting does occur, let him/her rinse mouth and drink fluids again. Never give anything by mouth to an unconscious person. Make the exposed person lie down and keep quiet. Get medical attention immediately.

4.2. **Most important symptoms and effects, both acute and delayed**

Causes severe irritation/burns to eyes and skin.

4.3. **Indication of any immediate medical attention and special treatment needed**

In case of eye contact or ingestion call a physician, poison centre or hospital immediately. Describe the type and extent of exposure and the victim's condition.

It may be helpful to show this safety data sheet to physician.

Note to physician .....

Irritated skin should be treated as usual against effects of bases (alkali lye) or basic mists. In case lungs are affected watch for pulmonary oedema. Probable mucosal damage may contraindicate the use of gastric lavage.

SECTION 5: FIREFIGHTING MEASURES

5.1. **Extinguishing media** .....

Dry chemical or carbon dioxide for small fires, water spray or foam for large fires. Avoid heavy hose streams.

5.2. **Special hazards arising from the substance or mixture**

The essential breakdown products are volatile, toxic, malodorous, irritant and inflammable compounds such as alkyl mercaptans, hydrogen sulphide, sulphur dioxide, dialkyl sulpides, carbon monoxide, carbon dioxide and phosphorous pentoxide.

5.3. **Advice for firefighters** .....

Use water spray to keep fire-exposed containers cool. Approach fire from upwind to avoid hazardous vapours and toxic

decomposition products. Fight fire from protected location or maximum possible distance. Dike area to prevent water runoff. Firemen should wear self-contained breathing apparatus and protective clothing.

SECTION 6: ACCIDENTAL RELEASE MEASURES

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

It is recommended to have a predetermined plan for the handling of spills. Empty, sealable vessels for the collection of spills should be available.

In case of large spill (involving 10 tonnes of the product or more):
1. Use personal protection equipment; see section 8
2. Call emergency telephone no.; see section 1
3. Alert authorities.

Observe all safety precautions when cleaning up spills. Use personal protection equipment. Depending on the magnitude of the spill this may mean wearing respirator, face mask or eye protection, chemical resistant clothing, gloves and boots.

Stop the source of the spill immediately if safe to do so. Keep unprotected persons away from the spill area. Avoid and reduce mist formation as much as possible. Personal exposure by splashing must be avoided.

6.2. **Environmental precautions** .....

Contain the spill to prevent any further contamination of surface, soil or water. Wash waters must be prevented from entering surface water drains. Uncontrolled discharge into water courses must be alerted to the appropriate regulatory body.

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

It is recommended to consider possibilities to prevent damaging effects of spills, such as bunding or capping. See GHS (Annex 4, Section 6).

If appropriate, surface water drains should be covered. Minor spills on the floor or other impervious surface should be absorbed onto an absorptive material such as universal binder, bentonite, Fuller's earth or other absorbent clays. Collect the contaminated absorbent in suitable containers. Clean area with detergent and water. Absorb wash liquid with absorbent and transfer to suitable containers. The used containers should be properly closed and labelled.

Large spills which soak into the ground should be dug up and transferred to suitable containers.

Spills in water should be contained as much as possible by isolation of the contaminated water. The contaminated water must be collected and removed for treatment or disposal.

6.4. **Reference to other sections** .....

See subsection 8.2. for personal protection.
See section 13 for disposal.

♣ SECTION 7: HANDLING AND STORAGE

7.1. **Precautions for safe handling** .....

In an industrial environment it is recommended to avoid all

personal contact with the product, if possible by using closed systems with remote system control. The material should always be handled by mechanical means as much as possible. Adequate ventilation or local exhaust ventilation is required. The exhaust gases should be filtered or treated otherwise.

Remove contaminated clothing immediately. Wash thoroughly after handling. Before removing gloves, wash them with water and soap. After work, take off all work clothes and footwear. Take a shower, using water and soap. Wear only clean clothes when leaving job. Wash protective clothing and protective equipment with water and soap after each use.

Do not discharge to the environment. Collect all waste material and remains from cleaning equipment, etc., and dispose of as hazardous waste. See section 13 for disposal.

7.2. **Conditions for safe storage, including any incompatibilities**

The product is stable under normal conditions of warehouse storage. To avoid freezing, store wherever possible above 0°C.

Store in labelled, tightly closed plastic drums or coated steel drums. The storage room should be constructed of incombustible material, closed, dry, ventilated and with impermeable floor, without access of unauthorised persons or children. The room should exclusively be used for storage of chemicals. Food, drinks, feed or seed should not be present. A hand wash station should be available.

7.3. **Specific end use(s)** ..... Can be used as flotation reagent (flotation collector) only.

♣ SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. **Control parameters**

Personal exposure limits

To our knowledge, no personal exposure limits have been established for the active ingredients s-butyl-dtp-Na and ethyl-dtp-Na.

		Year	
Sodium hydroxide	ACGIH (USA) TLV	2015	CEILING 2 mg/m^3
	OSHA (USA) PEL	2015	8-hr TWA 2 mg/m^3
	EU, 2000/39/EC as amended	2009	Not established
	Germany, MAK	2014	Cannot be established at present
	HSE (UK) WEL	2011	STEL 2 mg/m^3, 15 minutes reference period

However, other personal exposure limits defined by local regulations may exist and must be observed.

Ethyl-dtp-Na

DNEL, dermal	0.066 mg/kg bw/day
DNEL, inhalation	0.235 mg/m^3
PNEC, fresh water	65 µg/L6.5 µg/L
PNEC, marine water	

8.2. **Exposure controls** ..... When used in a closed system, personal protection equipment will not be required. The following is meant for other situations, when the use of a closed system is not possible, or when it is necessary to

open the system. Consider the need to render equipment or piping systems non-hazardous before opening.

Respiratory protection

In the event of an accidental discharge of the material which produces a vapour or mist, workers must put on officially approved respiratory protection equipment with a universal filter type including particle filter.

Protective gloves .....

Wear chemical resistant gloves, such as barrier laminate, butyl rubber or nitrile rubber. The breakthrough times of these materials for the product are unknown. Generally, however, the use of protective gloves will give only partial protection against dermal exposure. Small tears in the gloves and cross-contamination can easily occur. It is recommended to shift the gloves frequently and to limit the work to be done manually.

Eye protection .....

Preferably wear a face shield, rather than goggles or safety glasses. It is recommended to have an eye wash fountain immediately available in the workplace.

Other skin protection

Wear appropriate chemical resistant clothing to prevent skin contact depending on the extent of exposure. During most normal work situations where exposure to the material cannot be avoided for a limited time span, waterproof pants and apron of chemical resistant material or coveralls of polyethylene (PE) will be sufficient. Coveralls of PE must be discarded after use if contaminated. In cases of appreciable or prolonged exposure, coveralls of barrier laminate may be required.

♣ SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. **Information on physical and chemical properties**

Appearance	Light brown liquid (solution in water)
Odour	Characteristic odour of sulphur compounds
Odour threshold	Not determined
pH	11 to 14
Melting point/freezing point	-8 to -10°C
Initial boiling point and boiling range	102°C
Flash point	None. The flame is extinguished at 64°C in the Pensky-Martens closed cup test.
Evaporation rate	Not determined
Flammability (solid/gas)	Not applicable (liquid)
Upper/lower flammability or explosive limits	Not determined
Vapour pressure	Not determined
Vapour density	Not determined
Relative density	Not determined Density: 1.12 - 1.16 g/ml at 20°C
Solubility(ies)	Not determined
Partition coefficient n-octanol/water	Not determined
Autoignition temperature	Not determined
Decomposition temperature	Not determined
Viscosity	Not determined
Explosive properties.....	Not explosive

Oxidising properties ..... Not oxidising

9.2. **Other information**
Miscibility ..... The product is miscible with water.

SECTION 10: STABILITY AND REACTIVITY

10.1. **Reactivity** ..... To our knowledge, the product has no special reactivities.

10.2. **Chemical stability** ..... Stable at ambient temperatures

10.3. **Possibility of hazardous reactions** An acid-base neutralisation reaction can be hazardous because of heat release.

10.4. **Conditions to avoid** ..... Heating of the product will produce harmful and irritant vapours.

10.5. **Incompatible materials** ..... Acids.

10.6. **Hazardous decomposition products** See subsection 5.2.

♣ SECTION 11: TOXICOLOGICAL INFORMATION

11.1. **Information on toxicological effects** * = Based on available data, the classification criteria are not met.

Product

Acute toxicity ..... The product is not expected to be harmful by inhalation, in contact with skin or if swallowed. *

Route(s) of entry - ingestion LD_{50}, oral, rat: > 2000 mg/kg (estimated)

- skin LD_{50}, dermal, rat: > 2000 mg/kg (estimated)

- inhalation LC_{50}, inhalation, rat: not available

Skin corrosion/irritation ..... Causes severe irritation/burns to skin.

Serious eye damage/irritation ..... Expected to be severely irritating to eyes with the potential to cause permanent eye damage.

Respiratory or skin sensitisation ... The product contains no ingredients known to have sensitising properties. *

Germ cell mutagenicity ..... The product contains no ingredients known to be mutagenic. *

Carcinogenicity ..... The product contains no ingredients known to be carcinogenic. *

Reproductive toxicity ..... The product contains no ingredients known to have adverse effects on reproduction.

STOT – single exposure ..... To our knowledge, no specific effects have been observed after single exposure. *

STOT – repeated exposure ..... The effects of chronic exposure are unknown, but must be expected to be severe.

Aspiration hazard ..... The product contains no ingredients known to present an aspiration pneumonia hazard. *

Symptoms and effects, acute and delayed ..... Severe irritation.

Sodium O,O-diethyl phosphorodithioate

Acute toxicity ..... The substance is harmful by ingestion and inhalation. The acute toxicity is estimated as:

Route(s) of entry - ingestion LD_{50}, oral, rat: 1000 - 2000 mg/kg

- skin LD_{50}, dermal, rat: > 2000 mg/kg *

- inhalation LC_{50}, inhalation, rat: 1-5 mg/L/4 h

Skin corrosion/irritation ..... Causes severe irritation/burns to skin.

Serious eye damage/irritation ..... Causes severe eye damage.

Respiratory or skin sensitisation ... Not expected to cause hypersensitivity. *

Sodium O,O-di-sec-butyl phosphorodithioate

Acute toxicity The substance is not expected to be harmful by single exposure, based on comparison to a similar substance. * The acute toxicity is estimated as:

Route(s) of entry - ingestion LD_{50}, oral, rat: > 2000 mg/kg

- skin LD_{50}, dermal, rat: > 2000 mg/kg

- inhalation LC_{50}, inhalation, rat: not available

Skin corrosion/irritation ..... Causes severe irritation/burns to skin.

Serious eye damage/irritation ..... Causes severe eye damage.

Respiratory or skin sensitisation ... Not expected to cause hypersensitivity. *

Sodium hydroxide

Toxicokinetics, metabolism and distribution Both sodium and hydroxide ions are normal body constituents and regulated between narrow ranges. These ranges will not be exceeded, except locally in unusual situations such as accidents.

Acute toxicity ..... No valid studies are available. However, the existing animal and human data on acute toxicity show that sodium hydroxide has a local effect and that systemic effects are not to be expected. *

Skin corrosion/irritation ..... Severely irritating to skin.

Serious eye damage/irritation ..... Severely irritating to eyes with the possibility to cause permanent eye damage.

Respiratory or skin sensitisation ... To our knowledge, no indications of allergenic properties have been recorded. *

SECTION 12: ECOLOGICAL INFORMATION

12.1. **Toxicity** ..... The toxicity of the product to fish, aquatic organisms and other wildlife is unknown, but is not expected to be severe.

12.2. **Persistence and degradability** .... The product is biodegradable. It undergoes degradation in the environment and in waste water treatment plants. No adverse effects are observed at concentrations up to 100 mg/L in waste water
treatment plants. Degradation occurs both aerobically and anaerobically.

12.3. **Bioaccumulative potential** .....

Octanol-water partition coefficients have not been determined.

Bioaccumulation is not expected.

12.4. **Mobility in soil** .....

In the environment the product is expected to be moderately mobile.

12.5. **Results of PBT and vPvB assessment** .....

None of the ingredients meets the criteria for being PBT or vPvB.

12.6. **Other adverse effects** .....

Other relevant hazardous effects in the environment are not known.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. **Waste treatment methods** ..... Remaining quantities of the material and empty but unclean packaging should be regarded as hazardous waste.

Disposal of waste and packagings must always be in accordance with all applicable local regulations.

Disposal of product ..... According to the Waste Framework Directive (2008/98/EC), possibilities for reuse or reprocessing should first be considered. If this is not feasible, the material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing.

Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

Disposal of packaging ..... It is recommended to consider possible ways of disposal in the following order:
1. Reuse or recycling should first be considered. If offered for recycling, containers must be emptied and triply rinsed (or equivalent). Do not discharge rinsing water to sewer systems.
2. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.
3. Delivery of the packaging to a licensed service for disposal of hazardous waste.
4. Disposal in a landfill or burning in open air should only occur as a last resort. For disposal in a landfill containers should be emptied completely, rinsed and punctured to make them unusable for other purposes. If burned, stay out of smoke.

♣ SECTION 14: TRANSPORT INFORMATION

ADR/RID/IMDG/IATA/ICAO classification

14.1. **UN number** 1719

14.2.	**UN proper shipping name**	Caustic alkali liquid, n.o.s. (sodium hydroxide and sodium-O,O-di-*sec*-butyldithiophosphate)
14.3.	**Transport hazard class(es)**	8
14.4.	**Packing group**	III
14.5.	**Environmental hazards**	The product is not expected to be harmful to aquatic organisms.
14.6.	**Special precautions for user**	Do not discharge to the environment.
14.7.	**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code**	The product is not transported in bulk by ship.

SECTION 15: REGULATORY INFORMATION

15.1.	**Safety, health and environmental regulations/legislation specific for the substance or mixture**	Young people under the age of 18 are not allowed to work with this product. All ingredients are covered by EU chemical legislation.
15.2.	**Chemical safety assessment**	A chemical safety assessment has not been performed.

♣ SECTION 16: OTHER INFORMATION

Relevant changes in the safety data sheet ..... Minor corrections only.

List of abbreviations .....

ACGIH	American Conference of Governmental Industrial Hygienists
CAS	Chemical Abstracts Service
Dir.	Directive
DNEL	Derived No Effect Level
EC	European Community
EINECS	European INventory of Existing Commercial Chemical Substances
GHS	Globally Harmonized classification and labelling System of chemicals, Fifth revised edition 2013
HSE	Health & Safety Executive, UK
IBC	International Bulk Chemical code
IUPAC	International Union of Pure and Applied Chemistry
LC_{50}	50% Lethal Concentration
LD_{50}	50% Lethal Dose
MAK	Maximale Arbeitspaltz-Konzentration
MARPOL	Set of rules from the International Maritime Organisation (IMO) for prevention of sea pollution
n.o.s.	Not otherwise specified
OSHA	Occupational Safety and Health Administration
PBT	Persistent, Bioaccumulative, Toxic
PEL	Personal Exposure Limit
PNEC	Predicted No Effect Concentration
Reg.	Regulation
STEL	Short-Term Exposure Limit
STOT	Specific Target Organ Toxicity
TLV	Threshold Limit Value

TWA	Time Weighed Average
vPvB	very Persistent, very Bioaccumulative
WEL	Workplace Exposure Limit

References ..... Data on the active ingredients are unpublished company data. Data on other ingredients are available from published literature and can be found several places.

Method for classification ..... Calculation rules

Used hazard statements .....

H302	Harmful if swallowed.
H332	Harmful if inhaled.
H314	Causes severe skin burns and eye damage.

Advice on training ..... This material should only be used by persons who are made aware of its hazardous properties and have been instructed in the required safety precautions.

The information provided in this safety data sheet is believed to be accurate and reliable, but uses of the product vary and situations unforeseen by Cheminova A/S may exist. The user has to check the validity of the information under local circumstances.

Prepared by: Cheminova A/S / GHB

Safety Data Sheet Potassium Iodide

Revision Date: Jan 07 2016

Section 1 Product Information

Product Identifier:	Potassium Iodide Stabilizer
Chemical Name and Synonyms:	Hydriodic acid, potassium salt
Product Use:	Industrial use, Dietary source of iodine
Distributed by:	Pestell Minerals & Ingredients Inc., New Hamburg, ON Canada N3A 2H1 1-519-662-2877 - email: qa@pestell.com
Emergency Contact:	CANUTEC: (24 Hrs) 613:996-6666

Section 2 Hazard Identification

Class D2A

DANGER! Causes skin and eye irritation. Harmful if inhaled or swallowed. Dust is irritating to respiratory tract. May cause teratogenicity effects. Can cause adverse reproductive effects.

Section 3 Hazardous Ingredients

Ingredient	Synonyms	CAS #	Concentration *
Potassium Iodide	Potassium Mon iodide , Hydriodic Acid, Potassium Salt	7681-11-0	90%
Calcium Stearate	None	1592-23-0	10%

*All concentrations are a percentage by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

Section 4 First Aid Measures

Eyes:
Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart ensure flushing of the entire surface. Call a physician.

Skin:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash contaminated clothing before reusing.

Inhalation:
Remove patient to fresh air. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Call a physician.

Ingestion:
If conscious, wash out mouth with water. Have conscious person drink 2-3 glasses of milk or water (less

effective). DO NOT induce vomiting. DO NOT give acidic agents; this may cause an exothermic reaction and burn the oesophagus. Never give anything by mouth to an unconscious or convulsing person. Call a physician.

Note to Physician:

Treat symptomatically. May cause severe pneumonitis if aspirated. If ingestion has occurred less than 2 hours earlier, carry out careful gastric lavage to prevent aspiration. Observe patient for respiratory difficulty from aspiration pneumonitis.

Section 5 Fire Fighting Measures

Extinguish Media:

Use extinguishes media appropriate for surrounding materials.

Unsuitable Extinguishing Media:

N/A

Specific Hazard:

Spilled material may cause floors and contact surfaces to become slippery.

Hazardous Combustion Products:

Oxides of potassium, hydrogen iodide, iodine fumes.

Special Protective Equipment:

Use self-contained breathing apparatus and full protective clothing.

Fire Fighting Instructions:

Fire-exposed containers should be kept cool by spraying with water to reduce pressure.

Section 6 Accidental Release Measures

Personal Precautions:

Wear respirator, protective clothing and gloves.

Environmental Precautions:

Do not flush into sewers or waterways.

Cleanup Procedure:

Dike or contain spill. Sweep up and place in an approved container, Clean up residues with water. Ventilate spill area.

Section 7 Handling and Storage

Handling:

Do not breathe mists, Do not ingest. Do not get in eyes, on skin or on clothing. Wash well after use. Do not allow smoking and food consumption while handling. Sweep up immediately to eliminate slippery hazard.

Storage:

Store in a cool, dry and well-ventilated area. Keep container tightly closed. Keep away from heat, sparks and flame. Protect against physical damage. Store away from incompatible materials.

Storage Incompatibility:

Attacks metals in presence of moisture.

Section 8 Personal Exposure Control

Exposure Limits:

Chemical Name	Type	Exposure Limit	Source
Potassium Iodide	TWA*	N/A	N/A
	STEL**	N/A	N/A
Calcium Stearate	TWA*	N/A	N/A
	STEL**	N/A	N/A

*TWA: Time-weighted average **STEL: Short term exposure limits.

Engineering Controls:
Local exhaust ventilation is recommended.
Protective Clothing:
Wear an impermeable apron and boots.
Hand Protection:
Wear neoprene, butyl rubber, natural rubber, nitrile rubber gloves. Prior to use, user should confirm impermeability.
Eye Protection:
Chemical safety goggles are recommended. Contact lenses should not be worn when working with this material.
Respiratory Protection:
No specific guidelines available. Wear NIOSH approved equipment according to the concentrations.
Other Protective Equipment:
Ensure that eyewash station and safety shower is proximal to the work-station location.

Section 9 Physical and Chemical Properties

Physical State:	Solid	**Vapor Pressure:**	N/A
Colour and Odor:	White, odorless	**Vapor Density:**	N/A
Odor Threshold:	N/A	**Specific Gravity:**	3.1
pH:	6-9 (5% solution)	**Solubility:**	Water, ethyl alcohol, methanol, acetone
Melting/Freezing Point:	680°	**Flammability:**	Not flammable
Boiling Point:	1330°C	**Flash Point:**	N/A
Decomposition Temperature:	N/A	**Auto-Ignition Temperature:**	N/A
Evaporation Rate:	N/A	**Lower Flammable Limit:**	N/A
Partition Coefficient:	N/A	**Upper Flammable Limit:**	N/A

Section 10 Stability and Reactivity

Chemical Stability:
Stable
Incompatible Materials:
Strong oxidizers, acids, salts of metals, potassium chlorate, perchlorates, dia-zonium salts, tartaric acid, metals, bromine and chlorine tri-fluorides and perchlorates

Conditions to Avoid:
Avoid high temperatures, sparks, open flames and all other sources of ignition. On long exposures to air becomes yellow due to the release of iodine. Air sensitive. Avoid moisture contamination.
Hazardous Reactions:
Hazardous polymerization will not occur.
Mechanical Impact Sensitivity:
No
Static Discharge Sensitivity:
No
Vibration Sensitivity:
N/A
Hazardous Decomposition Products:
Oxides of potassium, hydrogen iodide, iodine fumes.

Section 11 Toxicological Properties

Routes of Entry:
Inhalation and ingestion. Eye and skin contact.

Acute Health Effects
Skin Contact:
May cause drying of the skin due to absorption of moisture and oils. In the presence of moisture (perspiration, humidity, tears) the dust dissolves to form a solution which may cause burns. May cause skin sensitization.
Eye Contact:
Cause severe irritation with redness and pain, lachrymation and conjunctivitis.
Inhalation:
Irritating to the nose, throat and respiratory tract. May cause coughing and sneezing, shortness of breath.
Ingestion:
Causes severe burning and pain in the mouth, throat and abdomen. Vomiting, diarrhea and perforation of the oesophagus and stomach may occur.
Chronic Health Effects
Skin Contact:
N/A
Eye Contact:
N/A
Inhalation:
Prolonged or repeated exposure may cause headaches, weakness, thyroid effects, anemia, goiter, idoism (salivation, weakness, sneezing, and lacrimation) and central nervous system depression.
Ingestion:
N/A

Carcinogenicity	N/A	**Mutagenicity**	N/A
Teratogenicity	Possible	**Reproductive Toxicity**	Possible

Toxicity Details

Chemical Name	LD50 (rat-oral)	LC50 (rat-inh)

Potassium Iodide	4800 mg/kg	N/A
Calcium Stearate	N/A	N/A

Section 12 Ecological Information

Eco toxicity:
N/A May be harmful to aquatic life at low concentrations.
Persistence and Degradability:
N/A
Bio accumulative Potential:
N/A
Mobility in Soil:
N/A
Other Hazardous Effects:
N/A

Section 13 Disposal Considerations

General Information:
Dispose of in accordance with federal, provincial and local regulation.
Disposal Methods:
Dispose of waste material at an approved waste treatment/disposal facility. Do not dispose of waste with normal garage, or to sewer systems. Empty containers may retain product residue and can be hazardous. Treat package in the same manner as the product.

Section 14 Transport Information

Shipping Name	Hazard Class	UN #	Packing Group
Potassium Iodide Stabilized	Not regulated	Not regulated	Not regulated

Marine Pollutant:
N/A
Special Instructions:
N/A

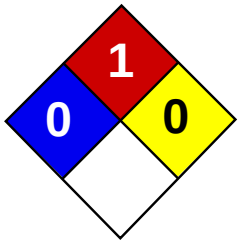
Section 15 Regulatory Information

Canada:
CEPA-NSNR: This material is included on the DSL under the CEPA.

Section 16 Other Information

Important:
The information presented herein is believed to be accurate and is offered only as a guide. Users should make their own tests to determine the suitability of these products for their own particular purposes. Users assume all risk of use, storage and handling of the product. No warranty, express or implied, is made including, but not limited to, implied warranties of merchantability and fitness for a particular purpose. Nothing contained herein shall be constructed as a license to operate under, or recommendation to infringe any patents.

Issuing Date: Jan 07, 2016



Material Safety Data Sheet
Propylene glycol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Propylene glycol

Catalog Codes: SLP1162, SLP2974

CAS#: 57-55-6

RTECS: TY2000000

TSCA: TSCA 8(b) inventory: Propylene glycol

CI#: Not applicable.

Synonym: 1,2,-propanediol, 1,2-dihydroxypropane

Chemical Name: Propylene Glycol

Chemical Formula: CH3CHOHCH2OH

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

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
Propylene glycol	57-55-6	100

Toxicological Data on Ingredients: Propylene glycol: ORAL (LD50): Acute: 20000 mg/kg [Rat]. 22000 mg/kg [Mouse]. DERMAL (LD50): Acute: 20800 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of inhalation.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

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: Not available.

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: May be combustible at high temperature.

Auto-Ignition Temperature: 371°C (699.8°F)

Flash Points: CLOSED CUP: 99°C (210.2°F). OPEN CUP: 107°C (224.6°F) (Cleveland).

Flammable Limits: LOWER: 2.6% UPPER: 12.5%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

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: When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

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. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system. 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 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 gas/fumes/ vapor/spray. Wear suitable protective clothing. 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, acids, alkalis, moisture.

Storage:
Hygroscopic. 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:
Splash goggles. Lab coat. Vapor 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 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: 10 (mg/m3) from AIHA Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Oily liquid.)

Odor: Practically Odorless.

Taste: Practically Tasteless.

Molecular Weight: 76.1g/mole

Color: Colorless. Clear

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

Boiling Point: 188°C (370.4°F)

Melting Point: -59°C (-74.2°F)

Critical Temperature: Not available.

Specific Gravity: 1.036 (Water = 1)

Vapor Pressure:
0 kPa (@ 20°C) 0.08 mmHg at 20 C 0.129 mmHg at 25 C

Vapor Density: 2.62 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: The product is more soluble in water; log(oil/water) = -0.9

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, acetone.

Solubility: Soluble in cold water, hot water, acetone.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat, exposure to moist air or water

Incompatibility with various substances: Reactive with oxidizing agents, reducing agents, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic; keep container tightly closed. Incompatible with chloroformates, strong acids (nitric acid, hydrofluloric acid), caustics, aliphatic amines, isocyanates, strong oxidizers, acid anhydrides, silver nitrate, reducing agents.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact.

Toxicity to Animals:
Acute oral toxicity (LD50): 18500 mg/kg [Rabbit]. Acute dermal toxicity (LD50): 20800 mg/kg [Rabbit].

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

Other Toxic Effects on Humans:
Hazardous in case of ingestion. Slightly hazardous in case of skin contact (irritant, permeator), of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May affect genetic material (mutagenic). May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: May cause mild skin irritation. It may be absorbed through the skin and cause systemic effects similar to those of ingestion. Eyes: May cause mild eye irritation with some immediate, transitory stinging, lacrimation, blepharospasm, and mild transient conjunctival hyperemia. There is no residual discomfort or injury once it is washed away. Inhalation: May cause respiratory tract irritation. Ingestion: It may cause gastrointestinal tract irritation. It may affect behavior/central nervous system(CNS depression, general anesthetic, convulsions, seizures, somnolence, stupor, muscle contraction or spasticity, coma), brain (changes in surface EEG), metabolism, blood (intravascular hemolysis, white blood cells - decreased neutrophil function), respiration (respiratory stimulation, chronic pulmonary edema, cyanosis), cardiovascular system(hypotension, bradycardia, arrhythmias, cardiac arrest), endocrine system (hypoglycemia), urinary system (kidneys), and liver. Chronic Potential Health Effects: Skin: Prolonged or repeated skin contact may cause allergic contact dermatitis. Ingestion: Prolonged or repeated ingestion may cause hyperglycemia and may affect behavior/CNS (symptoms similar to that of acute ingestion). Inhalation: Prolonged or repeated inhalation may affect behavior/CNS (with symptoms similar to ingestion), and spleen

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): >5000 mg/L 24 hours [Goldfish]. >10000 mg/L 48 hours [guppy]. >10000 mg/L 48

hours

[water

flea].

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:

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations:
Pennsylvania RTK: Propylene glycol Minnesota: Propylene glycol TSCA 8(b) inventory: Propylene glycol

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):
R21/22- Harmful in contact with skin and if swallowed. S24/25- Avoid contact with skin and eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

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

Health: 0

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Splash goggles.

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 Indutrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984. -The Sigma-Aldrich Library of Chemical Safety Data, Edition II. -Supplier MSDS -LOLI -RTECS -HSDB

Other Special Considerations: Not available.

Created: 10/10/2005 08:24 PM

Last Updated: 06/09/2012 12:00 PM

Sodium Carbonate, Anhydrous

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 05/13/2013 Revision date: 03/20/2018 Supersedes: 03/20/2018 Version: 1.2

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sodium Carbonate, Anhydrous
CAS-No.	:	497-19-8
Product code	:	LC22965
Formula	:	Na2CO3

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	For laboratory and manufacturing use only.
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation Category 2	H315	Causes skin irritation
Serious eye damage/eye irritation Category 2A	H319	Causes serious eye irritation

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS07

Signal word (GHS-US) : Warning

Hazard statements (GHS-US) :
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary statements (GHS-US) :
P264 - Wash exposed skin thoroughly after handling.
P280 - Wear eye protection, protective gloves.
P302+P352 - IF ON SKIN: Wash with plenty of soap and water.
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P332+P313 - If skin irritation occurs: Get medical advice/attention.
P337+P313 - If eye irritation persists: Get medical advice/attention.
P362 - Take off contaminated clothing and wash before reuse.

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification	:	None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sodium Carbonate, Anhydrous (Main constituent)	(CAS-No.) 497-19-8	100	Skin Irrit. 2, H315 Eye Irrit. 2A, H319

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Allow victim to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact : Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical advice/attention. Get medical advice/attention.

First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : Coughing.

Symptoms/effects after skin contact : Causes skin irritation.

Symptoms/effects after eye contact : Causes serious eye irritation.

Symptoms/effects after ingestion : Vomiting. Nausea.

Chronic symptoms : Not available.

4.3. Immediate medical attention and special treatment, if necessary

None.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

Fire hazard : Non combustible.

Explosion hazard : Not applicable.

Reactivity : Reacts with (some) acids.

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : None.

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : On land, sweep or shovel into suitable containers. Minimize generation of dust. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor.

Hygiene measures : Wash exposed skin thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep only in the original container in a cool, well ventilated place away from : incompatible materials. Keep container closed when not in use.

Incompatible products : Strong bases. Strong acids.

Incompatible materials : Sources of ignition. Direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Gloves. Safety glasses.

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or safety glasses

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Respiratory protection not required in normal conditions

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Solid

Appearance : White powder or lumps.

Color : white

Odor	:	odorless
Odor threshold	:	No data available
pH	:	11.6
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	1600 °C
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	No data available
Specific gravity / density	:	2.53 g/cm³
Molecular mass	:	105.99 g/mol
Solubility	:	No data available
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	Not applicable.
Oxidizing properties	:	None.

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts with (some) acids.

10.2. Chemical stability

Not established.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure : Inhalation; Skin and eye contact

Acute toxicity : Not classified

Sodium Carbonate, Anhydrous (497-19-8)	
LD50 oral rat	4090 mg/kg
ATE US (oral)	4090 mg/kg body weight

Skin corrosion/irritation : Causes skin irritation.
pH: 11.6

Serious eye damage/irritation	:	Causes serious eye irritation. pH: 11.6
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified Based on available data, the classification criteria are not met
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified Based on available data, the classification criteria are not met
Specific target organ toxicity – single exposure	:	Not classified
Specific target organ toxicity – repeated exposure	:	Not classified
Aspiration hazard	:	Not classified
Potential Adverse human health effects and symptoms	:	Based on available data, the classification criteria are not met.
Symptoms/effects after inhalation	:	Coughing.
Symptoms/effects after skin contact	:	Causes skin irritation.
Symptoms/effects after eye contact	:	Causes serious eye irritation.
Symptoms/effects after ingestion	:	Vomiting. Nausea.
Chronic symptoms	:	Not available.

SECTION 12: Ecological information

12.1. Toxicity

Sodium Carbonate, Anhydrous (497-19-8)	
LC50 fish 1	300 mg/L
EC50 Daphnia 1	265 mg/L
LC50 fish 2	740 mg/L

12.2. Persistence and degradability

Sodium Carbonate, Anhydrous (497-19-8)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Sodium Carbonate, Anhydrous (497-19-8)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Not regulated

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Carbonate, Anhydrous (497-19-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

Sodium Carbonate, Anhydrous (497-19-8)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Sodium Carbonate, Anhydrous (497-19-8)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 03/20/2018

Other information : None.

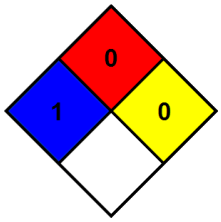
Full text of H-phrases: see section 16:

H315	Causes skin irritation
H319	Causes serious eye irritation

NFPA health hazard : 1 - Materials that, under emergency conditions, can cause significant irritation.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



Hazard Rating

Health : 1 Slight Hazard - Irritation or minor reversible injury possible

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.

Personal protection : B

B - Safety glasses, Gloves

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

SAFETY DATA SHEET
Sodium Cyanide Solid

ABN: 81 008 668 371

Section 1 – Identification of the Material and Supplier

Product Name
Sodium Cyanide Solid

Other names
Sodium cyanide, hydrocyanic acid sodium salt. Company product 1380.

Recommended use
Electroplating, Gold processing reagent, laboratory reagent, metal treatment.

Company name
Australian Gold Reagents Pty Ltd

Address	State	Postcode
Kwinana Beach Road, KWINANA	Western Australia	6167

Telephone number	Emergency telephone number
(08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas)	1800 093 333 (Australia), +61 8 9411 8444

Section 2 – Hazard Identification

Hazard Classification, including a statement of overall hazardous nature

HAZARDOUS SUBSTANCE

Sodium cyanide solid is classified as hazardous according to Australian WHS Regulations.

DANGEROUS GOODS

Sodium cyanide solid is classified for physicochemical hazards and specified as dangerous in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code), 7th Edition.

GHS classification(s)

Acute Toxicity: Oral: Category 2
Acute Toxicity: Dermal: Category 1
Acute Toxicity: Inhalation: Category 2
Skin Corrosion/Irritation: Category 2
Serious Eye Damage/Eye Irritation: Category 1
Specific Target Organ Toxicity (Repeated Exposure): Category 1
Aquatic Hazard (Chronic): Category 1
Aquatic Hazard (Acute): Category 1

Label Elements

Signal word **DANGER**

Pictograms(s)

Hazard statement(s)

H300	Fatal if swallowed.
H310	Fatal in contact with skin.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H330	Fatal if inhaled.

H372	Causes damage through organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.
AUH032	Contact with acids liberates very toxic gas.

Prevention statement(s)

P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P262	Do not get in eyes, on skin or on clothing.
P264	Wash thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.

Response statement(s)

P301 + P310	IF SWALLOWED: immediately call a POSION CENTER or doctor/physician.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at a rest position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or a doctor/physician.
P314	Get medical advice/attention if you feel unwell.
P320	Specific treatment is urgent – see first aid instructions.
P330	Rinse mouth.
P332 + P313	If skin irritation occurs: Get medical advice/attention.
P362	Take off contaminated clothing and wash before re-use.
P391	Collect spillage

Storage statement(s)

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Disposal statement(s)

P501	Dispose of contents/container in accordance with relevant regulations.

Other hazards

No information provided.

Section 3 – Composition/Information on Ingredients

Chemical identity of ingredients	Proportion of ingredients	CAS Number for ingredients
Sodium cyanide	98% +/- 1% ($^{wt}/_{wt}$)	143-33-9
Sodium carbonate	0.8% +/- 0.4% ($^{wt}/_{wt}$)	497-19-8
Other	Remainder	-

Section 4 – First Aid Measures

First Aid

TO BE EFFECTIVE, FIRST AID MUST BE PROMPT.

SODIUM CYANIDE SOLID IS POISONOUS BY INGESTION AND INHALATION OF ITS DUST. CONTACT WITH SKIN AND EYES AND MAY CAUSE IRRITATION OF THE SKIN AND EYES AND POISONING SYMPTOMS SIMILAR TO THOSE FOR INGESTION.

OF PRIME IMPORTANCE IS THE PROTECTION OF THE RESCUER. NO ATTEMPT AT RESCUE SHOULD BE PERFORMED UNTIL AN APPROPRIATE HAZARD ASSESMENT OF THE EXPOSURE SITE IS MADE AND APPROPRIATE PERSONAL PROTECTION EQUIPMENT AND PERSONNEL ARE IN PLACE.

FIRST AID ATTENTION MUST BE GIVEN AS URGENTLY AS POSSIBLE AS OUTLINED BELOW. ALL SUSPECTED SODIUM CYANIDE INGESTION, INHALATION AND CONTACT SHOULD RECEIVE MEDICAL ATTENTION. TRAINING ON HANDLING SODIUM CYANIDE INCIDENTS USING THIS MSDS SHOULD BE PROVIDED BEFORE ANY SODIUM CYANIDE HANDLING OR USE COMMENCES.

First Aid Facilities

First aid procedures, equipment, medication and training for the treatment of exposure to sodium cyanide should be in place BEFORE the use commences. First aid personnel should be aware of the nearest hospitals which are familiar with the treatment of sodium cyanide exposure.

Equipment and medication in place should be:

Safety shower and eyewash stations immediately accessible in the workplace;

Eye-wash bottle;

Personal protective equipment for use by first aid personnel;

Fresh, clean, cool drinking water;

Resuscitation bag and mask (or Oxy-Viva);

Cyanide Emergency Kit: containing Amyl Nitrite Pearls; Hydroxycobalamine and Sodium Thiosulfate;

Oxygen;

"Space" or thermal blankets for treating patients for shock.

FIRST AID PROCEDURES FOR DEALING WITH THIS PRODUCT AND EXPOSURE TO IT

1. Personal Protection By First Aid Personnel

First aid personnel providing first aid treatment to a patient exposed to sodium cyanide solid should observe the following precautions for their own personal protection:

- Avoid contact with contaminated skin, clothing and equipment by wearing protective gloves;
- Wear chemical goggles as a minimum level of eye protection to prevent sodium cyanide dust entering eyes;
- Avoid inhalation of sodium cyanide dust during rescue in contaminate areas by wearing suitable respiratory protection;
- Respiratory protection suggested is: an air supplied breathing apparatus, or positive pressure self-contained breathing apparatus.

2. Swallowed

Immediately:

- Remove the patient from the source of contamination – to fresh air, if hydrogen cyanide gas (HCN) is present;
- If the patient is not breathing, do not use mouth to mouth, or mouth to nose ventilation, because of the danger to the rescuer, instead use a resuscitation bag and mask – (Oxy-Viva);
- If pulse is absent, start external cardiac massage and follow standard Advanced Cardiovascular Life Support (ACLS) guidelines;

- Give 100% oxygen by mask (Oxy-Viva) if available;

2. Swallowed (cont..)

- Remove all contaminated clothing and footwear into a sealable collection bag – launder contaminated clothing thoroughly and wash the affected areas with soap and copious amounts of water;
- Arrange for the urgent transfer of the patient, accompanied by an attendant with the Cyanide Emergency Kit, to medical professionals;
- Those persons designated as competent may open the Cyanide Emergency Kit and commence use of any amyl nitrite pearls to treat the effects of cyanide exposure.

Amyl Nitrite should not be used unless the patient is clearly deteriorating, despite oxygen administration, and there is a reasonable confidence that cyanide intoxication is the cause.

3. Eyes

Persons with potential eye exposure should not wear contact lenses.
Immediately irrigate eye with copious amounts of water, while holding eyelids open, for at least 15 minutes.
Seek medical assistance immediately.

4. Skin

Wash affected area with copious amounts of water for at least 15 minutes.
Remove contaminated clothing and launder before re-use.
Seek medical assistance following skin contact.

5. Inhalation

Proceed as for **2. Swallowed** above.

ADVICE TO DOCTOR.

Treatment should include the following measures:

- Immediate attention should be directed towards administration of 100 % oxygen, assisted ventilation if required, insertion of intravenous lines and institution of cardiac monitoring, if available;
- Attention should be given to monitoring the level of consciousness;
- Administer antidote if signs of serious cyanide poisoning are present:
  - Insert indwelling cannula into vein:
  - Take 5 mL of blood in a plain clotted tube (red top in Western Australia) for later confirmation of diagnosis by measurement of the cyanide level. (Take blood in a heparinised tube and place on ice for immediate transfer to laboratory if direct testing for cyanide levels is available). At the same time take blood for lactic acid level (urgent). An elevated lactic acid level is a useful test to assist in confirmation of the diagnosis.

    Note: Cyanide poisoning is a clinical diagnosis and treatment is instigated on clinical grounds.
- Treatment path
  - Administer intravenously 5 to 15 grams of hydroxycobalamine over 30 minutes, or faster if necessary. In the Cyanide Emergency Kit these are made up of two 2·5 gram doses that are set to be re-constituted with the saline in the plastic transfer device. An IV giving set is to be inserted into the re-constituted IV hydroxycobalamine bottle. If this has been left in the cardboard packet, it can be hung like an IV bottle through the hole in the top of the box;
  - Also administer sodium thiosulfate 12·5 grams over 10 to 20 minutes with the hydroxycobalamine;

    Note: Hydroxycobalamine is the recommended treatment in patients in whom the diagnosis is not clear and where there is a clinical suspicion of cyanide poisoning.
  - If cyanide has been swallowed, whilst gastric lavage, charcoal and cathartics may be used after an antidote therapy, if less than two hours have passed since ingestion, there is little evidence to support a benefit and one should take the advice of an emergency care physicians prior to commencing;
  - specialist medical advice for ongoing management after the administration of antidotes is

required with prompt referral of the patient to a tertiary medical facility;

Note: The best way to treat metabolic and cardiorespiratory complications of cyanide poisoning is the use of an appropriate antidote.

Supportive care should include the following measures:

- All patients with suspected, or proven, cyanide poisoning should be taken to hospital for evaluation and observation:
- Follow the patient's progress for at least 24 hours;
- Watch for the development for pulmonary oedema and aspiration pneumonia in comatose patients;
- Consider more antidote if there is a persistent metabolic acidosis. Bicarbonate can be used cautiously. Correct metabolic acidosis with bicarbonate when blood pH falls below 7·20, and be sure to correct electrolyte imbalance (for example, hyperkalemia, hypercalcemia);
- Oxygen requirement would be expected to decrease after successful administration of the antidote.

Long Term Complications

No data available.

Further information about the treatment for exposure to this product can be obtained from the Poisons Information Centre on (08) 13 1126 (Australia only)

Section 5 – Fire Fighting Measures

Product flammability

Sodium cyanide solid is not combustible and is not considered a fire risk, but may generate toxic, flammable, corrosive and explosive hydrogen cyanide gas if in contact with water, CO_2 fire extinguishers, and some foam fire extinguishers if these contain acidic agents.

Suitable extinguishing media

DO NOT USE CARBON DIOXIDE. Extinguish fires with water spray or fog. Do not use straight stream of water. Most foams will react with sodium cyanide solid and release toxic and corrosive fumes. For small fires use dry chemical extinguishers or dry sand.

Hazard from combustion products

Although sodium cyanide itself is not combustible, intense heat may cause sodium cyanide to decompose, giving off toxic, flammable, corrosive and explosive hydrogen cyanide gas.

Special protective precautions and equipment for fire fighters

Wear full body protective clothing (PVC jackets and pants, PVC gloves and chemical resistant boots) with self-contained breathing apparatus with a full-face piece operated in pressure-demand or positive pressure mode. Prevent spillage from entering drains or waterways. Consider evacuation. Use water to control fire. Wet sodium cyanide spill will cause surfaces to be slippery and slimy. If required, use soda ash, or other suitable alkaline material, to control the pH of the water/cyanide mixture created. If safe and practicable to do so remove sodium cyanide containers from path of fire.

Equipment should be thoroughly decontaminated after use.

After intervention, take shower, remove clothing carefully, clean and check equipment.

Hazchem Code

2X

Section 6 – Accidental Release Measures

Emergency procedures

The hazardous nature of sodium cyanide, require emergency and spill procedures to be effective to avoid both human and environmental exposure. Hazardous conditions may result if material is managed improperly. Make plans in advance to handle possible emergencies, including obtaining stocks of absorbent materials.

Always wear recommended personal protective equipment and respiratory protection. Good ventilation is necessary.

Methods and Materials for containment and clean up

For **ALL** spills, evacuate unprotected personnel upwind and out of danger. Wear appropriate personal protective equipment and breathing apparatus. If safe to do so, prevent further release of sodium cyanide. Shut off all possible sources of ignition. Stay upwind of any dust or mist released. Increase ventilation and allow any dust or mist released to vent to a safe area. Restrict access to spill site. Avoid, or minimise, the use of water on spilt solid or dust. Using a shovel/front end loader as required, recover as much material as possible into dedicated drums, and where possible return collected spills to process, or manufacturer. If possible contain the surface area of a sodium cyanide solid spill by bunding with sand, earth or vermiculite.

Initial Clean Up With Ferrous Sulfate

Generously cover any remaining residue with lime or soda ash (to maintain pH at 9 or higher), add ferrous sulfate then add water and mix well. Allow about 30 minutes for complete penetration and neutralisation to take effect. Collect residue and store in dedicated container for disposal. Prevent run-off into drains and waterways. After clean up, test area for free cyanide level present; if free cyanide is more than 10 parts per million (ppm), repeat clean up using ferrous sulfate; if free cyanide is less than 10 ppm proceed with final clean up using hypochlorite solution.

Final Clean Up With Calcium/Sodium Hypochlorite

Make up a dilute aqueous chlorine solution using either calcium hypochlorite or sodium hypochlorite. Spray this chlorine solution evenly to the area to be decontaminated. After thorough contact of the chlorine solution with the contaminated area is made, test area for free cyanide present. If free cyanide is more than 1 ppm, repeat clean up using chlorine solution. Prevent run-off into drains and waterways.

For a large spill notify Fire and Rescue Services then CSBP Emergency Response.

Dispose of all neutralised solutions in accordance with the requirements of the Department of Environment Protection.

For the management of cyanide emergencies during transport by road or rail, SAA/SNZ HB76: Dangerous Goods-Initial Response Guide, Guide 40 should be consulted. This Guide should be carried at all times when sodium cyanide is being transported.

Clean up personnel will need personal full protection equipment and respiratory protection. Portable safety shower and eyewash facilities may also be needed for clean up personnel. Bags of ferrous sulfate neutralising agent, calcium/sodium hypochlorite drums, bags of soda ash, or other suitable alkaline material, chemical absorbent and substantial amounts of water will be required for large spill. A front-end loader may be required to scoop up neutralised cyanide/lime/soda ash residue, as are dedicated empty drums to store the neutralised residue.

Section 7 – Handling and Storage

Precautions for safe handling

Regulated dangerous goods as Class 6.1 Toxic. Proper protective clothing must be worn that covers the body including the face. A safety shower and eyewash should be available. Do not breathe dust or mist. Avoid contact with skin, eyes and clothing.

Do not smoke anywhere near the storage and handling of sodium cyanide solid or associated handling equipment.

Do not touch damaged containers or spilled material unless wearing appropriate personal protective equipment.

Change and wash clothing, and personal protective equipment if contaminated, or before storing and/or re-using. Wash hands and face thoroughly after handling and before work breaks, eating, drinking, smoking and using toilet facilities.

Conditions for safe storage, including any incompatibilities

Ensure sodium cyanide solid in bulk is stored and handled in accordance with Australian Standard AS 4452 *The storage and handling of toxic substances*. Ensure adequate ventilation to keep airborne concentration below exposure standard. Where necessary, use local exhaust ventilation in conjunction with P2 canister respirator, or as appropriate, self contained breathing apparatus.

Keep workplaces and stores well ventilated. Toxic concentrations of hydrogen cyanide gas can be reached when cyanide is in prolonged contact with air in a closed area. When opening a container storing cyanide, remove the lid, and move away to let the accumulated gas out of the container before returning to obtain the quantity required.

Store away from acids and water –sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with these substances. Store away from chlorinating agents. Contact with these may form toxic cyanogen chloride gas. Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

Sodium cyanide solid will absorb moisture to evolve hydrogen cyanide gas.

Section 8 – Exposure Controls/Personal Protection

National exposure standards

ES-TWA	ES-STEL	ES-Peak
5 mg/m^3 as Cyanide (CN^-) dust	No data assigned by NOHSC	No data assigned by NOHSC
10 ppm as Hydrogen Cyanide (HCN)	Peak Limitation	Peak Limitation

Biological limit values

No data available.

Engineering controls

Handle sodium cyanide solid within closed systems whenever possible. Provide adequate ventilation at all times.

Personal protective equipment

Whenever the risk of exposure exists, such as opening sodium cyanide containers, non-routine operations and emergency circumstances, the following personal protection measure are recommended:

Respiratory protection

Canister respirator P2 type if air sampling indicates hydrogen cyanide level is between 11 and 50 mg/m^3 (Australian Standard *AS 1716 Respiratory protective devices*). Air supplied, or positive pressure, self contained breathing apparatus recommended where air sampling indicates hydrogen cyanide gas concentration exceeds 50 mg/m^3.

Personal protective equipment (cont..)

Hand protection

PVC or butyl rubber gauntlet-type gloves.

Eye protection

Chemical splash goggles (gas tight type preferred) and full face shield.

Skin protection

PVC overalls or jacket and pants and butyl rubber Wellington boots.

Section 9 – Physical and Chemical Properties

Appearance (colour, physical form, shape)
White solid briquette.

Odour
Slight bitter almond odour

pH
10% solution, approximately 9.

Vapour pressure
Virtually nil at dry, ambient conditions; 100 Pa at 800 °C.

Vapour density
No data available

Boiling point/range
1,500 °C at 101·3 kPa.

Freezing/melting point
Melts between 560 and 635 °C at 101·3 kPa.

Solubility
Solubility in water approximately 48 g/100 mL at 20 °C; sparingly soluble in ethanol.

Specific gravity or density
Specific Gravity: 1·5 to 1·6 at 20 °C; Bulk Density: 0·75 to 0·90 tonne/m^3 at 20 °C

Flash point and method of detecting flash point
Not applicable

Upper and lower flammable (explosive) limits in air
Not applicable

Ignition temperature
Not applicable

Viscosity
For a 30 % ($^{wt}/_{wt}$) aqueous solution: 10·3 mPa.s at 21·5 °C.

Section 10 – Stability and Reactivity

Chemical stability
Stable at ambient conditions of use and storage.

Conditions to avoid
Hydrogen cyanide forms if heated above 300 °C. Contact with water, acids, acid salts and carbon dioxide lead to the liberation of hydrogen cyanide gas.

Incompatible materials
Incompatible with oxidizing agents, copper, zinc, magnesium, tin, or their alloys (i.e., bronze, brass, galvanised metals, etc.) and aluminium.

Hazardous decomposition products
Toxic and flammable hydrogen cyanide gas.

Hazardous reactions
Store away from acids, acid salts, water and carbon dioxide fire extinguishers – sodium cyanide will release toxic and flammable hydrogen cyanide gas in contact with these substances. Store away from chlorinating agents – contacts with these may form toxic cyanogen chloride gas.

Section 11 – Toxicological Information

HEALTH EFFECTS

When handled in accordance with the guidelines in this material safety data sheet, sodium cyanide solid should not present any health effects. If this product is mishandled, the following symptoms may develop:

Acute:

Sodium cyanide solid is a very toxic chemical asphyxiant – may cause death soon after exposure by all means of entry into the human body. It may cause caustic burns in contact with human flesh. Cyanide inhibits cytochrome oxidase preventing oxygen utilization leading to cytotoxic anoxia. Acute effects depend on the degree of cellular hypoxia. Death results from central nervous system failure. Inhalation which cause weakness, headache, dizziness, shortness of breath, chest pain, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, coma and death. Death can be very rapid. Ingestion will cause caustic burns, resulting in severe gastrointestinal tract irritation with nausea and vomiting, accompanied by severe burning sensation. Toxic amounts ingested may lead to poisoning symptoms similar for those for inhalation.

Inhalation:

Inhalation of sodium cyanide dust, or hydrogen cyanide vapour above the solid, may result in burns and irritation to the nose and upper respiratory tract, leading to coughing and sore throat. Lesions of the nasal septum and delayed pulmonary oedema may result. Toxic amounts may be inhaled leading to poisoning symptoms which include weakness, headache, dizziness, shortness of breath, chest pain, confusion, cyanosis (bluish skin due to deficient oxygenation of the blood), weak and irregular heartbeat, collapse, unconsciousness, coma and death. Death can be very rapid. The lethal oral dose of hydrogen cyanide is estimated to be approximately 50 mg in an adult (Sullivan, J.B. Jr., G.R. Krieger (eds.), *Hazardous Materials Toxicology-Clinical Principles of Environmental Health*, Baltimore, Williams and Wilkins, 1992).

Human physiological response to various concentrations of hydrogen cyanide in air are summarised in the table below:

HCN Level in		Duration in minutes	Resulting Conditions on Humans
mg/m^3	ppm		
2·2 - 5·5	2 - 5	-	Threshold of "bitter almonds" smell detectable by some people.
11	10	-	NOHSC peak limitation exposure standard.
19·8 - 39·6	18 -36	Several hours	Slight symptoms of cyanide poisoning.
48·5 -59·4	45 - 54	30 - 60 minutes	Tolerated without immediate or delayed effects.
121 - 148·5	110 - 135	30 - 60 minutes	Fatal, or dangerous to life.
148·5	135	30 minutes	Fatal.
199·1	181	10 minutes	Fatal.
297	270	Immediately	Immediately fatal.

(Simenova, F., Fishbein, L., Concise International Chemical Assessment Document 61, *Hydrogen Cyanide and Cyanides: Human Health Aspects*, International Program in Chemical Safety, Geneva, World Heath Organisation, 2004).

Skin:

Sodium cyanide solid will cause severe irritation and chemical burns. Sweat increases rate of absorption into skin. Toxic amounts may be absorbed through the skin, leading to poisoning symptoms similar to those for inhalation. LD_{50} (Dermal, rat) = 33 mg/kg.

Eye:

Sodium cyanide solid will cause severe irritation to the eye, leading to redness, pain and possible eye burns. May cause chemical conjunctivitis and corneal damage leading to loss of sight. Toxic amounts may be absorbed through the eye, leading to poisoning symptoms similar to those for inhalation.

Swallowed:

Sodium cyanide solid is very toxic and may be fatal if swallowed. It will cause caustic burns, resulting in severe gastrointestinal tract irritation with nausea and vomiting, accompanied by severe burning sensation. Toxic amounts ingested may lead to poisoning symptoms similar for those for inhalation. The mean lethal dose by mouth of cyanide in an 80 kg male human adult is thought to be in the range of 50 to 200 mg and death is rarely delayed more than one hour (Gosselin *et al*, *Clinical Toxicology of Commercial Products*. 5th Ed., Baltimore: Williams and Wilkins, 1984). LD_{50} (Oral, rat) = 6·44 mg/kg.

Chronic:

Cyanide may be highly acutely toxic, but it has lower toxicity on a chronic basis. Prolonged or repeated exposure may cause drying of the skin, dermatitis, ulceration, skin necrosis, loss of appetite, weight loss, dizziness, shortness of breath, muscle cramps and irritation to upper respiratory tract. Chronic cyanide intoxication has been associated with extremely rare neurological disorders, renal disease and isolated small observational studies of reporting effects on thyroid function. (Barnerjee et al, Evaluation of cyanide exposure and its effect on thyroid function on workers in a cable industry, J Occup Environ Med., 39(3):258-260, Barnerjee et al, Evaluation of cyanide exposure and its effect on thyroid function on workers in a cable industry, J Occup Environ Med., 39(3):258-260, 1997). As acutely toxic as cyanide is, repeated low-level doses of cyanide do not necessarily result in cumulative adverse effects.

Section 12 – Ecological Information

Ecotoxicity

Fish and aquatic invertebrates are very sensitive to cyanide exposure. Small concentrations, in the range of 5 to 20 mg cyanide per litre, causes a reduction in swimming performance, inhibiting reproduction and altering growth patterns. Increased cyanide concentrations in the range of 30 to 200 mg/L causes the deaths of many species of fish and invertebrates. Algae and macrophytes can tolerate much higher environmental concentrations of free cyanide than fish and invertebrates, but cyanide exposures may leave an aquatic plant community dominated by less sensitive species. Birds and higher mammals are susceptible to cyanide poisoning and display many symptoms associated with humans exposed to cyanide. The rapid recovery of some birds to sub-lethal doses of cyanide may be due to the rapid metabolism of cyanide to thiocyanate and its subsequent excretion. Cyanide has low persistence and is not accumulated or stored in any mammal studied.

Persistence and degradability

Potentially biodegradable by abiotic degradation. In aerobic conditions, microbial activity degrades cyanide ion (CN^-), in concentration up to 200 parts per million, to ammonia which then oxidises to nitrate (NO_3). Biological degradation may also occur under anaerobic conditions, but CN^- concentrations of more than 2 ppm are toxic to anaerobic micro organisms. Hydrogen cyanide may be hydrolysed to formic acid or ammonium formate- this reaction is not fast but may be appreciable faster in anaerobic conditions such as ground water.

- Water/Soil – in soils cyanide ion (CN^-) migrates easily to ground water and at high concentrations is toxic to soil micro organisms;
- Groundwater – persists in groundwater due to lack of sunlight/oxygen needed to degrade it to benign forms.

Mobility

- Air – HCN and small amounts of sodium cyanide present as dust particles – duration 1-3 years before settling out;

In alkaline conditions, due to approximately 2·5 % ($^{wt}/_{wt}$) total alkalinity content of sodium cyanide briquette:

- Water – considerable solubility and mobility – at surface water interface cyanide ion (CN^-) oxidises in the presence of sunlight and oxygen to yield cyanate ion (CNO^-), thiocyanate ion (SCN^-), ammonia, nitrate (NO_3) and various other compounds;
- Soil/Sediments – adsorption on minerals soil constituents possible - most persistent in groundwater and at higher pH.

Environmental fate (exposure)

Acute ecotoxicity:

Fish: 96 hr LD_{50} (Oncorhyncus mykiss): 0·028 mg/L, (as cyanide); in fresh water conditions at 6 °C;

Fish: 96 hr LD_{50} (Perca flavescens): 0·076 - 0·108 mg/L, (as cyanide); in fresh water conditions;

Fish: 96 hr LD_{50} (Pimephales promolas): 0·082 - 0·113 mg/L, (as cyanide); in fresh water conditions;

Crustaceans: 96 hr LD_{50} (Daphnia magna): 0·16 mg/L, (as cyanide), in fresh water conditions;

Soil organisms: 96 hr EC_{50} (Lumbriculus variegatus): 11 mg/L, (as cyanide);

Terrestrial plants: 32 days EC_{50} (Pimephales promolas): 22·4 mg/L, (as cyanide);

Birds: 96 days EC_{50} (Lymnaea luteola): 2·5 mg/L, (as cyanide).

Bioaccumulative potential

Low potential for human bioaccumulation. Does not bioaccumulate in fish.

Section 13 – Disposal Considerations

Disposal methods and containers

Due to its inherent properties, hazardous conditions may result if material is managed improperly. Dispose of all contained and contaminated spill residue in accordance with the requirements of the Department of the Environment. Contact CSBP Limited for technical advice on disposal method.

Special precautions for landfill or incineration

No data available

Section 14 – Transport Information

UN Number

1689

UN Proper shipping name

Sodium Cyanide

Class and subsidiary risk

Class 6.1 Toxic. No subsidiary risk.

Packing group

I

Special precautions for user

Transport in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code) and IMO. Transport only in approved packaging– typically, a sparge container, or composite intermediate bulk container (CIBC), comprising a woven polypropylene bulka-bag, a heat-sealed polyethylene box liner, and a plywood pallet-box. CIBC's may be stored on there own, but may only be transported in an approved sea container.

Hazchem code

2X

Section 15 – Regulatory Information

Australian regulatory information

SUSDP Poison Schedule 7. Licensing is required for this chemical in all States and Territories.

Listed on the Australian Inventory of Chemical Substances (AICS).

Additional national and/or international regulatory information

OSHA: Hazardous by definition of Hazard Communication Standard (29CFR 1910.1200).

This product is subject to the EC directive 82/501/EEC and amendments.

Classifications

Safework Australia criteria is based on the Globally Harmonised System (GHS) of Classification and Labelling of Chemicals.

The classifications and phrases listed below are based on Approved Criteria for Classifying Hazardous substances [NOHSC: 1008(2004)].

Hazard Codes	N	Dangerous for the environment.
	T+	Very toxic.
	Xi	Irritant.
Risk Phrases	R26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
	R32	Contact with acids liberates very toxic gas.
	R38	Irritating to skin
	R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Phrases	S1/2	Keep locked up and out of reach of children.
	S4	Keep away from living quarters.
	S7/9	Keep container tightly closed and in a well ventilated place.
	S13	Keep away from food, drink and animal feeding stuffs
	S14	Keep away from incompatible materials as listed in the reactivity section.
	S18	Handle and open container with care.
	S20/21	When using, do not eat, drink or smoke.
	S22	Do not breathe dust.
	S24/25	Avoid contact with skin and eyes.
	S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
	S27	Take off immediately all contaminated clothing
	S28	After contact with skin, wash immediately with plenty of water.
	S29	Do not empty into drains.
	S36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
	S38	In case of insufficient ventilation, wear suitable respiratory equipment.
	S40	To clean the floor and all objects contaminated by this material use [appropriate material to be specified by the manufacturer].
	S41	In case of fire and/or explosion, do not breathe fumes.
	S43	In case of fire use only the recommended extinguishing agents.
	S45	In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).
	S46	If swallowed, contact a doctor or Poisons Information Centre immediately and show container or label.
	S50	Do not mix with incompatible materials.
	S51	Use only in well ventilated areas.
	S53	Avoid exposure - obtain special instructions before use.
	S56	Dispose of this material and its container at hazardous or special waste collection point.
	S57	Use appropriate container to avoid environmental contamination.
	S59	Refer to manufacturer / supplier for information on recovery / recycling.
	S61	Avoid release to the environment. Refer to special instructions/safety data sheets.
	S63	In case of accident by inhalation, remove casualty to fresh air and keep at

	rest.
S64	If swallowed, rinse mouth with water (only if the person is conscious).

Inventory listing(s)

AUSTRALIA: AICS (Australia Inventory of Chemical Substances)

All components are listed on the AICS; or are exempt.

Section 16 – Other Information

Key / legend to abbreviations and acronyms used in the MSDS

NOEC	No Observable Effect Concentration - concentration where no effect can be seen
NOHSC	National Occupational Health and Safety Commission
SUSDP	Standard for the Uniform Scheduling of Drugs and Poisons
EC_{50}:	Environmental concentration 50. The concentration of a material, in ppm or ppb, in the environment (usually water) a single dose of which is expected to cause a biological effect on 50% of a group of test animals.
ES-TWA	Exposure Standard – Time weighted average
ES-STEL	Exposure Standard – Short term exposure level
ES-Peak	Exposure Standard – Peak level
FORS	Federal Office of Road and Safety
LC_{50}:	Lethal concentration 50, median lethal concentration
LD_{50}	Lethal dose 50. The single dose of a substance that causes the death of 50% of an animal population from exposure to the substance by any route other than inhalation
$\%(^{wt}/_{wt})$	Percent amount on a weight per weight basis
$\%(^{wt}/_{vol})$	Percent amount on a weight per volume basis
PPM	Parts per million
Zone 1 Class 1	An area where an explosive gas atmosphere can be expected to occur periodically or occasionally during normal operation. (More than 10 hours per year but less than 1000 hours per year)

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Chemalert www.chemalert.net

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Sources for data

No data available

Important Notes

1. To the best of our knowledge this document complies with the Code of Practice for the Preparation of Safety Data Sheets for Hazardous Chemicals, Safe Work Australia, December 2011.
2. This safety data sheet summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this safety data sheet and consider the information in the context of how the product will be handled and used in the workplace, including in conjunction with other products.
3. If clarification or further information is needed to ensure that an appropriate risk assessment can be made, the user should contact the Safety Department, CSBP Limited on (08) 9411 8777 (Australia), +61 8 9411 8777 (Overseas).
4. Our responsibility for products sold, is subject to our terms and conditions, a copy of which is sent to our customers, and is also available on request.
5. CSBP reserves the right to make change to L safety data sheets without notice.

CYTEC

MATERIAL SAFETY DATA

MSDS No: 01787
CAS No: 013360-78-6
Date: 03/13/2001
Supersedes: 10/14/1997

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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

SYNONYMS: Sodium diisobutyldithiophosphinate, 50% aqueous solution

CHEMICAL FAMILY: Dithiophosphinate

MOLECULAR FORMULA: C8H18PS2.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 1-973/357-3193.
EMERGENCY PHONE: For emergency involving spill, leak, fire, exposure or accident call CHEMTREC: 1-800/424-9300. Outside the USA and Canada call 1-703/527-3887.

2. COMPOSITION/INFORMATION ON INGREDIENTS

OSHA REGULATED COMPONENTS

COMPONENT	CAS. NO.	%	TWA/CEILING	REFERENCE
Sodium diisobutyl-di 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) LD50 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

If quantities greater than 15 cc are swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth or induce vomiting in an unconscious person.
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 or if otherwise necessary.
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 diisobutyldithiophosphinate causes moderate eye and mild 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_2O 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 Characteristics: 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.

	D.O.T. SHIPPING INFORMATION	IMO SHIPPING INFORMATION
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

	ICAO/IATA	TRANSPORT CANADA
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

ADDITIONAL TRANSPORT INFORMATION

TECHNICAL NAME (N.O.S.):	Not Applicable

15. REGULATORY INFORMATION

INVENTORY INFORMATION

US TSCA:	All components of this product are included on the TSCA Inventory in compliance with 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 0 Reactivity
—
Special

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

HEALTH: Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

REACTIVITY: Materials that in themselves are normally stable, even under fire exposure conditions.

REASON FOR ISSUE:

Revised Section 15

Randy Deskin, Ph.D., DABT

Sodium Hydroxide

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 07/06/1998 Revision date: 02/21/2018 Supersedes: 10/14/2013 Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sodium Hydroxide
CAS-No.	:	1310-73-2
Product code	:	LC23900
Formula	:	NaOH
Synonyms	:	anhydrous caustic soda / caustic alkali / caustic flake / caustic soda, solid / caustic white / caustic, flaked / hydrate of soda / hydroxide of soda / LEWIS red devil lye / soda lye / sodium hydrate / sodium hydroxide, pellets

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Industrial use
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation, Category 1A	H314	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation, Category 1	H318	Causes serious eye damage.
Hazardous to the aquatic environment — Acute Hazard, Category 3	H402	Harmful to aquatic life

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H314 - Causes severe skin burns and eye damage.
H402 - Harmful to aquatic life

Precautionary statements (GHS-US) :
P260 - Do not breathe dust, vapours.
P264 - Wash exposed skin thoroughly after handling.
P273 - Avoid release to the environment.
P280 - Wear eye protection, face protection, protective clothing, protective gloves.
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER/doctor

P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to Comply with applicable regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None under normal conditions.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sodium Hydroxide (Main constituent)	(CAS-No.) 1310-73-2	100	Skin Corr. 1A, H314 Eye Dam. 1, H318 Aquatic Acute 3, H402

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

First-aid measures after skin contact : Wipe off dry product from skin. Remove clothing before washing. Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Do not apply neutralizing agents. Take victim to an ophthalmologist.

First-aid measures after ingestion : Rinse mouth with water. Immediately after ingestion: give lots of water to drink. Do not induce vomiting. Do not give activated charcoal. Do not give chemical antidote. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Ingestion of large quantities: immediately to hospital. Take the container/vomit to the doctor/hospital.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : WHEN PROCESSED: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible oedema of the upper respiratory tract. Possible laryngeal spasm/oedema. Risk of lung oedema.

Symptoms/effects after skin contact : Blisters. Caustic burns/corrosion of the skin. Slow-healing wounds.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Dry/sore throat. Nausea. Abdominal pain. Blood in vomit. Difficulty in swallowing. Possible esophageal perforation. Burns to the gastric/intestinal mucosa. Bleeding of the gastrointestinal tract. Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract. Gastrointestinal complaints.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Adapt extinguishing media to the environment for surrounding fires.

5.2. Specific hazards arising from the chemical

Fire hazard	:	DIRECT FIRE HAZARD: Non combustible. INDIRECT FIRE HAZARD: Reactions involving a fire hazard: see "Reactivity Hazard".
Explosion hazard	:	INDIRECT EXPLOSION HAZARD: Reactions with explosion hazards: see "Reactivity Hazard".
Reactivity	:	May be corrosive to metals. Absorbs the atmospheric CO2. Violent to explosive reaction with (some) acids. Reacts violently with many compounds: heat release resulting in increased fire or explosion risk. Violent exothermic reaction with water (moisture): release of corrosive mist. Reacts exothermically on exposure to water (moisture) with combustible materials: risk of spontaneous ignition.

5.3. Special protective equipment and precautions for fire-fighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Take account of toxic fire-fighting water. Use water moderately and if possible collect or contain it.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Absorb spillage to prevent material damage. Dike and contain spill.

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Dust cloud production: compressed air/oxygen apparatus. Contact with moisture/water: compressed air/oxygen apparatus. Contact with moisture/water: gas-tight suit.
Emergency procedures	:	Mark the danger area. Prevent dust cloud formation. Corrosion-proof appliances. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. On contact with moisture/water: keep upwind. On contact with moisture/water: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.
Measures in case of dust release	:	In case of dust production: keep upwind. Dust production: have neighbourhood close doors and windows.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection. Do not breathe dust.
Emergency procedures	:	Stop release.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the solid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain.
Methods for cleaning up	:	Collect the spill only if it is in a dry state. Wetted substance: cover with powdered limestone or dry sand, earth, vermiculite. Scoop solid spill into closing containers. Under controlled conditions: neutralize leftovers with dilute acid solution. Possible violent reaction if you neutralize. Carefully collect the spill/leftovers. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Avoid raising dust. Avoid contact of substance with water. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Use corrosionproof equipment. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain.

Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Separate working clothes from town clothes. Launder separately.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	combustible materials. metals. Strong acids. Strong oxidizers. Protect from moisture.
Incompatible materials	:	incompatible materials. Moisture. Heat sources.
Storage temperature	:	20 °C
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. oxidizing agents. (strong) acids. metals. organic materials. water/moisture.
Storage area	:	Store in a dry area. Keep container in a well-ventilated place. Keep locked up. Unauthorized persons are not admitted. Store at ambient temperature. Keep only in the original container. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: hermetical. watertight. corrosion-proof. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
Packaging materials	:	SUITABLE MATERIAL: stainless steel. nickel. polyethylene. paper. MATERIAL TO AVOID: lead. aluminium. copper. tin. zinc. bronze. textile.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sodium Hydroxide (1310-73-2)		
ACGIH	ACGIH Ceiling (mg/m³)	2 mg/m³
OSHA	OSHA PEL (TWA) (mg/m³)	2 mg/m³
IDLH	US IDLH (mg/m³)	10 mg/m³
NIOSH	NIOSH REL (ceiling) (mg/m³)	2 mg/m³

8.2. Appropriate engineering controls

Appropriate engineering controls	:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses. Protective clothing. Gloves. Dust/aerosol mask with filter type P3.

Materials for protective clothing:

GIVE GOOD RESISTANCE: natural rubber. neoprene. nitrile rubber. GIVE LESS RESISTANCE: butyl rubber. polyethylene. PVA. GIVE POOR RESISTANCE: natural fibres

Hand protection:

Gloves

Eye protection:

Face shield. In case of dust production: protective goggles

Skin and body protection:

Corrosion-proof clothing. In case of dust production: head/neck protection

Respiratory protection:

Dust production: dust mask with filter type P3.
High dust production: self-contained breathing apparatus

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Appearance	:	Crystalline solid. Crystalline powder. Little spheres. Lumps. Needles. Scales. Flakes.
Colour	:	White
Odour	:	Odourless
Odour threshold	:	No data available
pH	:	14 (5 %)
Melting point	:	323 °C
Freezing point	:	No data available
Boiling point	:	1388 °C (1013.25 hPa)
Flash point	:	Not applicable
Relative evaporation rate (butylacetate=1)	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	< 0.1 hPa (20 °C)
Relative vapour density at 20 °C	:	No data available
Relative density	:	2.13 (20 °C)
Density	:	2130 kg/m³
Molecular mass	:	40 g/mol
Solubility	:	Exothermically soluble in water. Soluble in ethanol. Soluble in methanol. Soluble in glycerol. Water: 100 g/100ml (25 °C) Ethanol: soluble
Log Pow	:	No data available
Auto-ignition temperature	:	Not applicable
Decomposition temperature	:	No data available
Viscosity, kinematic	:	0.53 mm²/s (25 °C, 1 mol/L)
Viscosity, dynamic	:	0.997 mPa.s (25 °C, Test data)
Explosive limits	:	No data available
Explosive properties	:	Not applicable.
Oxidising properties	:	None.

9.2. Other information

Minimum ignition energy	:	Not applicable
Saturation concentration	:	671 g/m³
VOC content	:	Not applicable (inorganic)
Other properties	:	Translucent. Hygroscopic. Substance has basic reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

May be corrosive to metals. Absorbs the atmospheric CO2. Violent to explosive reaction with (some) acids. Reacts violently with many compounds: heat release resulting in increased fire or explosion risk. Violent exothermic reaction with water (moisture): release of corrosive mist. Reacts exothermically on exposure to water (moisture) with combustible materials: risk of spontaneous ignition.

10.2. Chemical stability

Hygroscopic. Unstable on exposure to air.

10.3. Possibility of hazardous reactions

Reacts violently with acids. Reacts violently with water.

10.4. Conditions to avoid

Moisture. Incompatible materials.

10.5. Incompatible materials

Water. Strong oxidizers. Strong acids. metals. combustible materials.

10.6. Hazardous decomposition products

Sodium oxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Skin and eyes contact
Acute toxicity	:	Not classified
Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: 14 (5 %)
Serious eye damage/irritation	:	Causes serious eye damage. pH: 14 (5 %)
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified (Based on available data, the classification criteria are not met)
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Potential adverse human health effects and symptoms	:	Causes severe skin burns. Causes serious eye damage.
Symptoms/effects after inhalation	:	WHEN PROCESSED: Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Respiratory difficulties. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible oedema of the upper respiratory tract. Possible laryngeal spasm/oedema. Risk of lung oedema.
Symptoms/effects after skin contact	:	Blisters. Caustic burns/corrosion of the skin. Slow-healing wounds.
Symptoms/effects after eye contact	:	Corrosion of the eye tissue. Permanent eye damage.
Symptoms/effects after ingestion	:	Dry/sore throat. Nausea. Abdominal pain. Blood in vomit. Difficulty in swallowing. Possible esophageal perforation. Burns to the gastric/intestinal mucosa. Bleeding of the gastrointestinal tract. Shock.
Chronic symptoms	:	ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Dry skin. Skin rash/inflammation. Possible inflammation of the respiratory tract. Gastrointestinal complaints.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general	:	Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.
Ecology - air	:	Not included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014). Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).
Ecology - water	:	Harmful to crustacea. Harmful to fishes. Groundwater pollutant. pH shift.

Sodium Hydroxide (1310-73-2)	
LC50 fish 1	45.4 mg/L (Other, 96 h, Salmo gairdneri, Static system, Fresh water, Experimental value)
EC50 Daphnia 1	40.4 mg/L (Other, 48 h, Ceriodaphnia sp., Experimental value)

12.2. Persistence and degradability

Sodium Hydroxide (1310-73-2)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable (inorganic)
Chemical oxygen demand (COD)	Not applicable (inorganic)
ThOD	Not applicable (inorganic)

12.3. Bioaccumulative potential

Sodium Hydroxide (1310-73-2)	
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

Sodium Hydroxide (1310-73-2)	
Ecology - soil	No (test)data on mobility of the substance available.

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Do not discharge into drains or the environment. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Should not be landfilled with household waste. Recycle/reuse. Dilute. Neutralize.

Additional information : Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN1823 Sodium hydroxide, solid, 8, II

UN-No.(DOT) : UN1823

Proper Shipping Name (DOT) : Sodium hydroxide, solid

Transport hazard class(es) (DOT) : 8 - Class 8 - Corrosive material 49 CFR 173.136

Packing group (DOT) : II - Medium Danger

Hazard labels (DOT) : 8 - Corrosive

DOT Packaging Non Bulk (49 CFR 173.xxx) : 212

DOT Packaging Bulk (49 CFR 173.xxx) : 240

DOT Special Provisions (49 CFR 172.102) : IB8 - Authorized IBCs: Metal (11A, 11B, 11N, 21A, 21B, 21N, 31A, 31B and 31N); Rigid plastics (11H1, 11H2, 21H1, 21H2, 31H1 and 31H2); Composite (11HZ1, 11HZ2, 21HZ1, 21HZ2, 31HZ1 and 31HZ2); Fiberboard (11G); Wooden (11C, 11D and 11F); Flexible (13H1, 13H2, 13H3, 13H4, 13H5, 13L1, 13L2, 13L3, 13L4, 13M1 or 13M2).
IP2 - When IBCs other than metal or rigid plastics IBCs are used, they must be offered for transportation in a closed freight container or a closed transport vehicle.
IP4 - Flexible, fiberboard or wooden IBCs must be sift-proof and water-resistant or be fitted with a sift-proof and water-resistant liner.
T3 - 2.65 178.274(d)(2) Normal..... 178.275(d)(2)
TP33 - The portable tank instruction assigned for this substance applies for granular and powdered solids and for solids which are filled and discharged at temperatures above their melting point which are cooled and transported as a solid mass. Solid substances transported or offered for transport above their melting point are authorized for transportation in portable tanks conforming to the provisions of portable tank instruction T4 for solid substances of packing group III or T7 for solid substances of packing group II, unless a tank with more stringent requirements for minimum shell thickness, maximum allowable working pressure, pressure-relief devices or bottom outlets are assigned in which case the more stringent tank instruction and special provisions shall apply. Filling limits must be in accordance with portable tank special provision TP3. Solids meeting the definition of an elevated temperature material must be transported in accordance with the applicable requirements of this subchapter.

DOT Packaging Exceptions (49 CFR 173.xxx) : 154

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 15 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 50 kg

DOT Vessel Stowage Location : A - The material may be stowed ‘‘on deck’’ or ‘‘under deck’’ on a cargo vessel and on a passenger vessel.

DOT Vessel Stowage Other : 52 - Stow ‘‘separated from’’ acids

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Hydroxide (1310-73-2)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Not subject to reporting requirements of the United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

Sodium Hydroxide (1310-73-2)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations
No additional information available

National regulations
No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 02/21/2018

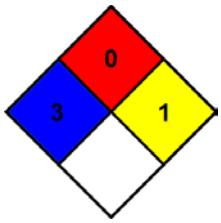
Full text of H-statements: see section 16:

H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H402	Harmful to aquatic life

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 1 - Materials that in themselves are normally stable but can become unstable at elevated temperatures and pressures.



Hazard Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability : 0 Minimal Hazard - Materials that will not burn

Physical : 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Personal protection : F

F - Safety glasses, Gloves, Synthetic apron, Dust respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

Safety Data Sheet
Sodium Hydrosulfide Solution

SDS Number: 178 **Revision:** August 6, 2018

Section 1: IDENTIFICATION

1.1 Product Name: **Sodium Hydrosulfide Solution**

1.2 Other Identification:

Chemical Family: Inorganic salt solution.
Formula: NaHS

1.3 Recommended Use of Chemical: Flotation agent for mining ore separation.
Kraft paper production process.
Tanning process (hair removal).

1.4 Manufacturer: Tessenderlo Kerley, Inc.
2255 N. 44th Street, Suite 300
Phoenix, Arizona 85008-3279

Information: (602) 889-8300

1.5 Emergency Contact: Tessenderlo Kerley, Inc. (800) 877-1737
CHEMTREC (800) 424-9300 (Domestic)
(703) 527-3887 (International)

Section 2: HAZARD(S) IDENTIFICATION

2.1 Hazard Classification:

Health	Acute Toxicity-Oral	Category 3
	Acute Toxicity-Inhalation	Category 2
	Skin Corrosion/Irritation	Category 1B
	Eye Damage/Irritation	Category 1
Physical	None	

2.2 Signal Word: **DANGER**

2.3 Hazard Statement(s):
Toxic if swallowed.
Fatal if inhaled.
Causes severe skin burns and eye damage.
Causes serious eye damage.

2.4 Symbol(s):

2.5 Precautionary Statement(s):

If swallowed: Rinse mouth. Do NOT induce vomiting. Immediately call a poison center, doctor/regional medical center.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a poison center, doctor or regional medical center. Wash contaminated clothes before reuse.
If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center, doctor or regional medical center.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing. Immediately call a poison center, doctor or regional medical center.
Wash hands and face thoroughly after handling. Do not eat, drink or smoke when using this product.
Do not breathe gas/mist/vapors.
Wear neoprene rubber gloves, chemical suit, boots and chemical goggles and full-face shield.
Use only outdoors or in a well-ventilated area. Store locked up in a well-ventilated place. Keep container tightly closed.
In case of inadequate ventilation, wear self-contained breathing apparatus (SCBA).
Dispose of contents/container in to chemical waste facility in accordance with local, state and federal regulations.
Do not allow release to aquatic waterways.

2.6 Unclassified Hazard(s): Aquatic toxicity

2.7 Unknown Toxicity Ingredient: None

Section 3: COMPOSITION/INFORMATION on INGREDIENTS

3.1 Chemical Ingredients: (See Section 8 for exposure guidelines)

Chemical	Synonym Common Name	CAS No.	EINECS No.	% by Wt.
Sodium sulfanide	Sodium hydrosulfide	16721-80-5	240-778-0	40 to 49
Di-sodium sulphide	Sodium sulfide	1313-82-2	215-211-5	<1.0, Typical
Sodium carbonate	Sodium carbonate	497-19-8	207-838-8	<3.0, Typical
Water	Water	7732-18-5	231-791-2	Remaining %

Section 4: FIRST AID MEASURES

4.1 Symptoms/Effects:

Acute: Eye contact may cause serious eye damage. Skin contact may cause damage to skin tissue. Ingestion may cause severe damage to the gastrointestinal tract.

Chronic: No known chronic effects.

4.2 Eyes: Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during

irrigation to ensure thorough flushing of the entire area of the eye and lids. Obtain immediate medical attention.

4.3 Skin: Immediately flush with large quantities of water. Remove contaminated clothing under a safety shower. Obtain immediate medical attention.

4.4 Ingestion: DO NOT INDUCE VOMITING. Give 2 to 4 glasses of water. If vomiting does occur, repeat giving fluids. Obtain immediate medical attention.

4.5 Inhalation: Remove victim from contaminated atmosphere. If breathing is labored, administer Oxygen. If breathing has ceased, clear airway and start CPR. Obtain immediate medical attention.

Section 5: FIRE FIGHTING MEASURES

5.1 Flammable Properties: (See Section 9, for additional flammable properties)

NFPA: Health - 3 Flammability - 2 Reactivity - 1

5.2 Extinguishing Media:

5.2.1 Suitable Extinguishing Media: Solution is not flammable; use media suitable for combustibles involved in fire.

5.2.2 Unsuitable Extinguishing Media: Not applicable

5.3 Protection of Firefighters:

5.3.1 Specific Hazards Arising from the Chemical:

Physical Hazards: Solution is not flammable. However, if solutions of this product are exposed to excessive heat Hydrogen sulfide vapors will be released and may form flammable mixtures with air (4.3 to 46% H_2S).

Chemical Hazards: Solution contact with acids or acidic materials will cause highly toxic Hydrogen sulfide vapors to be released.

5.3.2 Protective Equipment and Precautions for Firefighters:

Firefighters should wear self-contained breathing apparatus (SCBA) and full fire-fighting turnout gear. Keep containers/storage vessels in fire area cooled with water spray.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal Precautions: Use personal protective equipment specified in Section 8. Isolate the release area and deny entry to unnecessary, unprotected and untrained personnel.

6.2 Environmental Precautions: Keep out of "waters of the United States" because of product aquatic toxicity (See Section 12).

6.3 Methods of Containment:

Small Release: Confine and absorb small releases with sand, earth or inert absorbents.

Large Release: Shut off release if safe to do so. Dike spill area with earth, sand or other inert absorbents to prevent runoff into surface waterways (aquatic toxicity), sewers or storm drains.

6.4 Method for Cleanup:

Small Release: Spray a weak (3-5%) solution of Hydrogen peroxide over the spill area to stop the release of toxic Hydrogen sulfide (oxidation of reactive sulfides) and to help neutralize the spill area. Once neutralized spilled material can be shoveled up and placed in plastic drums for disposal as a chemical waste. Use non-sparking tools.

Large Release: Recover as much of the spilled product as possible using an air-operated diaphragm pump, hoses and non-sparking tools. If possible, use this material as originally intended. If the material is unusable it must be disposed of as a chemical waste. Treat the remaining material on the ground as a small release (above).

Section 7: HANDLING and STORAGE

7.1 Handling: Avoid contact with skin and eyes. Use only in a well-ventilated area. Wash thoroughly after handling. Avoid breathing of product vapors.

7.2 Storage: Store in well-ventilated areas. Do not store combustibles in the area of storage vessels. Keep away from any sources of heat or flame. Store totes and smaller containers out of direct sunlight at moderate temperatures. (See Section 10.5, for materials of construction)

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Exposure Guidelines:

Chemical	OSHA PELs		ACGIH TLVs	
	TWA	STEL	TWA	STEL
Hydrogen sulfide	None	20 ppm (Ceiling)	1 ppm	5 ppm
Sodium sulfanide	None	None	None	None
Di-sodium sulphide	None	None	None	None
Sodium carbonate	None	None	None	None
Water	None	None	None	None

8.2 Engineering Controls: Use adequate exhaust ventilation to prevent inhalation of product vapors. Keep eye wash/safety showers in areas where product is used.

8.3 Personal Protective Equipment (PPE):

8.3.1 Eye/Face Protection: Chemical goggles and a full face shield.

8.3.2 Skin Protection: Sodium hydrosulfide solutions are highly alkaline. Neoprene rubber gloves/boots and chemical suit should be worn to prevent liquid contact.

8.3.3 Respiratory Protection: Respiratory protection is based on potential exposure to H_2S vapors. Hydrogen sulfide is a highly toxic gas. Respiratory protection requirements should be based on a hazard assessment of the specific operation. If use conditions generate vapor, mist or aerosol and adequate ventilation (e.g., outdoor or well-ventilated are) is not available, use a NIOSH-approved gas mask respirator with hydrogen sulfide canister/cartridge to reduce potential for inhalation exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/pressure-demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the work shift) to assure breakthrough exposure does not occur.

8.3.4 Hygiene Considerations: Common good industrial hygiene practices should be followed, such as washing thoroughly after handling and before eating or drinking.

Section 9: PHYSICAL and CHEMICAL PROPERTIES

9.1 Appearance:	May be yellow to red to dark green to black liquid.
9.2 Odor:	Rotten egg odor.
9.3 Odor Threshold:	4.7 ppb (Hydrogen sulfide)
9.4 pH:	11.5 to 12.5
9.5 Melting Point/Freezing Point:	42 to 64°F (16.6 to 17.8°C)
9.6 Boiling Point:	234 to 243°F (112.2 to 117.2°C)
9.7 Flash Point:	Not determined
9.8 Evaporation Rate:	Not determined
9.9 Flammability:	Not applicable
9.10 Upper/Lower Flammability Limits:	4.3 to 46% in air (Hydrogen sulfide)
9.11 Vapor Pressure:	17 mm Hg @ 68°F
9.12 Vapor Density:	1.17 (Air = 1.0)
9.13 Relative Density:	1.27 to 1.33 (10.6 to 11.1 lbs/gal)
9.14 Solubility:	Complete
9.15 Partition Coefficient:	Not applicable
9.16 Auto-ignition Temperature:	Not applicable
9.17 Decomposition Temperature:	Not determined
9.18 Viscosity:	7 cP @ 100°F (literature)

Section 10: STABILITY and REACTIVITY

10.1 Reactivity: Sodium hydrosulfide solution reacts with all acids, including weak organic acids, liberating highly toxic Hydrogen sulfide gas. The solution also reacts with oxidizing agents which may precipitate elemental Sulfur.

10.2 Chemical Stability: This product is stable under normal (ambient) temperature and pressure.

10.3 Possibility of Hazardous Reactions: See Section 10.5.

10.4 Conditions to Avoid: See Section 10.5.

10.5 Incompatible Materials: Acids will cause the release of highly toxic Hydrogen sulfide. Sodium hydrosulfide reacts violently with diazonium salts. **Sodium hydrosulfide solution is not compatible with Copper, Zinc, Aluminum or their alloys (i.e. bronze, brass, galvanized metals, etc.). Sodium hydrosulfide is corrosive to carbon steel above 150° F (65.5° C)**. These materials of construction should not be used in handling systems or storage containers for this product. Dilution of NaHS with water will increase the evolution of Hydrogen sulfide. Dilution should be done in an enclosed container.

10.6 Hazardous Decomposition Products: Heating this product will evolve Hydrogen sulfide gas. Fire conditions will also cause the production of Sulfur dioxide. Hydrogen sulfide may form flammable mixtures (4.3 to 46% H_2S) with air. Heating to decomposition emits fumes of sulfoxides and Sodium sulfide.

Section 11: TOXICOLOGICAL INFORMATION

11.1 Oral: Ingestion Rat LD_{50}: 0.5 to 5 gm/kg (sodium hydrosulfide)
Intraperitoneal Rat LD_{50}: 14.6 mg/kg (sodium hydrosulfide)
Intraperitoneal Mus LD_{50}: 18 mg/kg (sodium hydrosulfide)
Intraperitoneal Rat TD_{LO}: 67.5 mg/kg intermittent (sodium hydrosulfide)
Intraperitoneal Mus TD_{LO}: 35 mg/km intermittent (sodium hydrosulfide)

11.2 Dermal: Subcutaneous Mouse LD_{50}: 200 mg/km (sodium hydrosulfide)

11.3 Inhalation: Inhalation-Rat LC_{50}: 444 ppm (hydrogen sulfide)
Inhalation-Mus LC_{50}: 1,500 mg/m^3 18 minutes (hydrogen sulfide)
Inhalation-Rat LC_{50}: 1,500 mg/m^3 14 minutes (hydrogen sulfide)

11.4 Eyes: Sodium sulfide in contact with human eye has been noted to cause burns which may be slow to heal owing presumably to strong alkalinity.

11.5 Chronic/Carcinogenicity: Not listed in NTP, IARC or by OSHA.

11.6 Teratology: No data available.

11.7 Reproduction: No data available.

11.8 Mutagenicity: No data available.

Section 12: ECOLOGICAL INFORMATION

12.1 Ecotoxicity: Static acute 96 hour-LC_{50} for mosquito fish is 206 mg/L (Tl_m - fresh water)
LC_{50} Fly inhalation 1,500 mg/m^3, 7 minutes
LC_{50} Fathead minnow: 0.55 mg/L, 96 hours (sodium hydrosulfide)
TL_m Gammarus 0.84 mg/L, 96 hours (hydrogen sulfide)
TL_m Ephemera 0.316 mg/L, 96 hours (hydrogen sulfide)
TL_m Fathead minnow 0.071 – 0.55 mg/L @ 6-24ºC, 96 hour flow through bioassay (hydrogen sulfide)
TL_m Bluegill 0.0090 – 0.0140 mg/L @ 20-22ºC, 96 hour flow through bioassay (hydrogen sulfide)
TL_m Brook trout 0.0216 – 0.0308 mg/L @ 8-12.5ºC, 96 hour flow through bioassay (hydrogen sulfide).
LC_{50} Fathead minnow: 1.38 mg/L, 48 hours (sodium sulfide)

12.2 Persistence & Degradability: No data available.

12.3 Bioaccumulative Potential: This product is not bioaccumulative.

12.4 Mobility in Soil: No data available.

12.5 Other Adverse Effects: None

Section 13: DISPOSAL CONSIDERATIONS

Consult federal, state and local regulations for disposal requirements.

Section 14: TRANSPORT INFORMATION

14.1 Basic Shipping Description:

- **14.1.1 Proper Shipping Name:** Corrosive liquids, toxic, n.o.s. (sodium hydrosulfide solution)
- **14.1.2 Hazard Classes:** 8, (6.1)
- **14.1.3 Identification Number:** UN2922
- **14.1.4 Packing Group:** II
- **14.1.5 Hazardous Substance:** Yes
- **14.1.6 Marine Pollutant:** No (domestic)

14.2 Additional Information:

14.2.1 Other DOT Requirements:

14.2.1.1 Reportable Quantity: Yes 5,000 lbs (2,268 kg)

14.2.1.2 Placard(s): Corrosive
14.2.1.3 Label(s): Corrosive, toxic

14.2.2 USCG Classification: Class – caustics Chris Code: SHR

14.2.3 International Transportation:

14.2.3.1 IMO: Corrosive liquids, toxic, n.o.s. (sodium hydrosulphide solution – Marine Pollutant)
14.2.3.2 IATA: Corrosive liquids, toxic, n.o.s. (sodium hydrosulphide)
14.2.3.3 TDG (Canada): Corrosive liquids, toxic, n.o.s. (sodium hydrosulphide)
14.2.3.4 ADR (Europe): Corrosive liquids, toxic, n.o.s. (sodium hydrosulphide)
14.2.3.5 ADG (Australia): Corrosive liquids, toxic, n.o.s. (sodium hydrosulphide)

14.2.4 Emergency Response Guide: 154

14.2.5 ERAP - Canada: Yes

14.2.6 Special Precautions: Not applicable

Section 15: REGULATORY INFORMATION

15.1 U.S. Federal Regulations:

15.1.1 OSHA: This product is considered hazardous under the criteria of the Federal OSHA Hazard Communication Standard (29 CFR 1910.1200).

15.1.2 TSCA: Product is contained in USEPA Toxic Substance Control Act Inventory.

15.1.3 CERCLA: Reportable Quantity Yes 5,000 lbs (2,268 kg)

15.1.4 SARA Title III:

15.1.4.1 Extremely Hazardous Substance (EHS): No

15.1.4.2 Section 312 (Tier II) Ratings:

Immediate (acute)	Yes
Fire	Yes
Sudden Release	No
Reactivity	Yes
Delayed (chronic)	No

15.1.4.3 Section 313 (FORM R): No, however a release of NaHS may include a release of hydrogen sulfide which is reportable.

15.1.5 RCRA: Possible D002, D003 waste

15.1.6 CAA (Hazardous Air Pollutant/HAP): Not applicable

15.2 International Regulations:

15.2.1 Canada:

15.2.1.1 WHMIS: E, D1

15.2.1.2 DSL/NDSL: Yes, DSL Record No. 10481

15.3 State Regulations:

15.3.1 CA Proposition 65: ⚠**WARNING:** This product can expose you to chemicals including benzene, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65.Warnings.ca.gov.

Section 16: OTHER INFORMATION

REVISIONS: This SDS was reformatted to comply with the new Hazard Communication Standard dated March 26, 2012, by the Regulatory Affairs Department of Tessenderlo Kerley, Inc. 9/26/2014.
Revised sections 2, 5.3, 8, 10 and 15. 6/10/2016.
Revised section 15. 8/6/2018.

The information above is believed to be accurate and represents the best information currently available to Tessenderlo Kerley, Inc. (TKI). No warranty of merchantability, fitness for any particular purpose, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from the use of this information or the product, the safety of this product, or the hazards related to its use. Users should make their own investigations to determine the suitability of the information for their particular purpose and on the condition that they assume the risk of their use thereof. TKI reserves the right to revise this Safety Data Sheet periodically as new information becomes available.

MATERIAL SAFETY DATA SHEET

Sodium Hypochlorite 3-20%

Section 01 - Product And Company Information

Product Identifier ..... Sodium Hypochlorite (3-20%)

Product Use ..... Disinfectant, bleaching agent, source of available chlorine, deodorizer.

Supplier Name..... ClearTech Industries Inc.
1500 Quebec Avenue
Saskatoon, SK. Canada
S7K 1V7

Prepared By..... ClearTech Industries Inc. Technical Department
Phone: (306)664-2522

Preparation Date..... September 5, 2015

24-Hour Emergency Phone..... 306-664-2522

Section 02 - Composition / Information on Ingredients

Hazardous Ingredients.....	Sodium Hypochlorite	3.02-16.80%
CAS Number.....	Sodium Hypochlorite	7681-52-9
Synonym (s).....	Industrial bleach, hypo, bleach, Javel water, household bleach, Hypochlor-12	

Section 03 - Hazard Identification

Inhalation..... Irritant of the nose and throat, causing coughing, difficulty breathing, and pulmonary edema.

Skin Contact / Absorption..... Causes severe skin irritation with blistering and ulceration.

Eye Contact..... Causes severe irritation of the mucous membranes of the eyes. May cause severe eye damage.

Ingestion..... Burning of the mouth and throat, abdominal cramps, nausea, vomiting, diarrhea, shock. May lead to convulsions, coma, and even death.

Exposure Limits..... ACGIH/TLV-TWA: 0.5ppm (chlorine)

Section 04 - First Aid Measures

Inhalation..... Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek immediate medical attention.

Skin Contact / Absorption..... Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persists.

Eye Contact..... Flush immediately with water for at least 20 minutes. Forcibly hold eyelids apart to ensure complete irrigation of eye tissue. Seek immediate medical attention.

Ingestion..... Do not induce vomiting. If vomiting occurs, lean victim forward to prevent breathing in vomitus. Give large amounts of water. Do not give anything by mouth to an unconscious or convulsing person. Seek immediate medical attention.

Additional Information..... Not available

Section 05 - Fire Fighting Measures

Conditions of Flammability..... Non-flammable

Means of Extinction..... Product does not burn. Use appropriate extinguishing media for material that is supplying the fuel to the fire.

Flash Point..... Not applicable

Auto-ignition Temperature..... Not applicable

Upper Flammable Limit …….. Not applicable

Lower Flammable Limit...…….. Not applicable

Hazardous Combustible Products... Decomposition may produce chlorine gas and/or hydrogen chloride gas.

Special Fire Fighting Procedures..... Wear NIOSH-approved self-contained breathing apparatus and protective clothing.

Explosion Hazards……... Pressure buildup in containers could result in an explosion when heated or in contact with acidic fumes. Vigorous reaction with oxidizable organic materials may result in a fire.

Section 06 - Accidental Release Measures

Leak / Spill.....…….. Wear appropriate personal protective equipment. Ventilate area. Stop or reduce leak if safe to do so. Restrict access to spill area until clean up is complete. Prevent material from entering sewers, waterways or confined spaces. Soak up smaller spills with absorbent material that does not react with spilled material. Flush with water to remove any residue.

Deactivating Materials...……... Spills can be carefully neutralized first with sodium sulphite, sodium metabisulphite or other dechlorination agent for no chlorine residual, then a pH adjustment may be required with hydrochloric acid until the pH is 7. Note neutralization reactions may produce heat so necessary precautions must be taken. Local regulatory agencies should also be contacted for proper disposal.

Section 07 - Handling and Storage

Handling Procedures.....…….. Use proper equipment for lifting and transporting all containers. Use sensible industrial hygiene and housekeeping practices. Wash thoroughly after handling. Avoid all situations that could lead to harmful exposure.

Storage Requirements.....……..…. Store in a cool, dry, well-ventilated place. Keep container tightly closed, and away from incompatible materials. Venting of containers is advisable.

Section 08 - Personal Protection and Exposure Controls

Protective Equipment

Eyes.…….. Chemical goggles, full-face shield, or a full-face respirator is to be worn at all times when product is handled. Contact lenses should not be worn; they may contribute to severe eye injury.

Respiratory..... A NIOSH-approved respirator suitable for chlorine is recommended. Where a higher level of protection is required, use a self-contained breathing apparatus.

Gloves..... Impervious gloves of chemically resistant material (rubber or PVC) should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Clothing..... Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse.

Footwear..... Impervious boots of chemically resistant material should be worn at all times.

Engineering Controls

Ventilation Requirements..... Mechanical ventilation (dilution or local exhaust), process or personnel enclosure and control of process conditions should be provided. Supply sufficient replacement air to make up for air removed by exhaust systems.

Other..... Emergency shower and eyewash should be in close proximity.

Section 09 - Physical and Chemical Properties

Physical State..... Liquid

Odor and Appearance..... Strong chlorine odour. Clear, greenish-yellow solution.

Odor Threshold..... Not available

Specific Gravity (Water=1)..... 1.17 at 20℃ (12% trade)

Vapor Pressure (mm Hg, 20C)..... 12.1mm Hg at 20℃ (12.5 wt %)

Vapor Density (Air=1)..... Not available

Evaporation Rate..... Not available

Boiling Point..... Slowly decomposes above 40°C.

Freeze/Melting Point..... ~ -15℃ (12% trade)

pH..... < 12

Water/Oil Distribution Coefficient.... Not available

Bulk Density..... Not available

% Volatiles by Volume..... Not available

Solubility in Water..... Complete

Molecular Formula..... NaOCl

Molecular Weight..... 74.44

Section 10 - Stability and Reactivity

Stability..... Unstable at temperatures above 40℃, in sunlight, a nd in contact with acid.

Incompatibility..... Incompatible with strong acids, ammonia, oxidizable materials, nickel, copper, tin, manganese, and iron.

Hazardous Products of Decomposition.. Chlorine (by reaction with acids), oxygen (by reaction with nickel, copper, tin, manganese, iron), sodium chloride, sodium chlorate, with increased temperature.

Polymerization..... Will not occur

Section 11 - Toxicological Information

Irritancy..... Strong irritant

Sensitization..... Not available

Chronic/Acute Effects..... If over-exposed to the solution, there will be constant irritation of the eyes, nose, and throat.

Synergistic Materials..... Not available

Animal Toxicity Data..... LD_{50}(oral,rat): 8910mg/kg (undiluted sodium hypochlorite)

Carcinogenicity..... Not considered to be carcinogenic (IARC and ACGIH).

Reproductive Toxicity..... Not available

Teratogenicity..... Not available

Mutagenicity..... Not available

Section 12 - Ecological Information

Fish Toxicity..... Not available

Biodegradability..... Not available

Environmental Effects..... Not available

Section 13 - Disposal Consideration

Waste Disposal..... Dispose in accordance with all federal, provincial, and/or local regulations including the Canadian Environmental Protection Act.

Section 14 - Transport Information

TDG Classification

Class..... 8 (not regulated at solutions below 7%)

Group..... III (not regulated at solutions below 7%)

PIN Number..... UN 1791(not regulated at solutions below 7%)

Other..... Secure containers (full and/or empty) with suitable hold down devises during shipment.

Section 15 - Regulatory Information

WHMIS Classification.....E

NOTE: THE PRODUCT LISTED ON THIS MSDS HAS BEEN CLASSIFIED IN ACCORDANCE WITH THE HAZARD CRITERIA OF THE CANADIAN CONTROLLED PRODUCTS REGULATIONS. THIS MSDS CONTAINS ALL INFORMATION REQUIRED BY THOSE REGULATIONS.

NSF Certification.....Product is certified under NSF/ANSI Standard 60 for disinfection and oxidation at a maximum dosage for the following:

sodium hypochlorite 5%: 174mg/L
sodium hypochlorite 6%: 145mg/L
sodium hypochlorite 7%: 125mg/L
sodium hypochlorite 8%: 109mg/L
sodium hypochlorite 9%: 97mg/L
sodium hypochlorite 10%: 87mg/L
sodium hypochlorite 11%: 79mg/L
sodium hypochlorite 12%: 72mg/L
sodium hypochlorite 13%: 67mg/L
sodium hypochlorite 14%: 62mg/L
sodium hypochlorite 15%: 58mg/L

sodium hypochlorite 16%: 55mg/L
sodium hypochlorite 17%: 51mg/L
sodium hypochlorite 18%: 48mg/L
sodium hypochlorite 19%: 46mg/L
sodium hypochlorite 20%: 43mg/L

NOTE: Any product strength below 7% is not regulated by TDG.

Sanitizer Use: to obtain 10 liters of a 200 mg/L solution as available chlorine, use 16.7 mL of Hypochlor-12 for each 10 liters of clean, potable water.

Section 16 - Other Information

Note: The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment. The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations.

Attention: Receiver of the chemical goods / MSDS coordinator

As part of our commitment to the Canadian Association of Chemical Distributors (CACD) Responsible Distribution® initiative, ClearTech Industries Inc. and its associated companies require, as a condition of sale, that you forward the attached Material Safety Data Sheet(s) to all affected employees, customers, and end-users. ClearTech will send any available supplementary handling, health, and safety information to you at your request.

If you have any questions or concerns please call our customer service or technical service department.

ClearTech Industries Inc. - Locations

Corporate Head Office: 1500 Quebec Avenue, Saskatoon, SK, S7K 1V7
Phone: 306-664-2522
Fax: 306-665-6216

www.ClearTech.ca

Location	Address	Postal Code	Phone Number	Fax Number
Richmond, B.C.	12431 Horseshoe Way	V7A 4X6	604-272-4000	604-272-4596
Calgary, AB.	5516E - 40th St. S.E.	T2C 2A1	403-279-1096	403-236-0989
Edmonton, AB.	11750 - 180th Street	T5S 1N7	780-452-6000	780-452-4600
Saskatoon, SK.	19 Peters Ave, North Corman Park	S7K 1V7	306-933-0177	306-933-3282
Regina, SK.	555 Henderson Drive	S42 5X2	306-721-7737	306-721-8611
Winnipeg, MB.	340 Saulteaux Crescent	R3J 3T2	204-987-9777	204-987-9770
Mississauga, ON.	7480 Bath Road	L4T 1L2	905-612-0566	905-612-0575

24 Hour Emergency Number - All Locations - 306-664-2522

Safety Data Sheet

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: **SIPX**

Other name(s): Sodium isopropyl xanthate; Carbonodithioic acid, O-isopropyl ester, sodium salt.

Recommended Use of the Chemical and Restrictions on Use Mineral floatation.

Supplier: Ixom Operations Pty Ltd
ABN: 51 600 546 512
Street Address: Level 8, 1 Nicholson Street
East Melbourne Victoria 3002
Australia

Telephone Number: +61 3 9906 3000
Emergency Telephone: **1 800 033 111 (ALL HOURS)**

Please ensure you refer to the limitations of this Safety Data Sheet as set out in the "Other Information" section at the end of this Data Sheet.

2. HAZARDS IDENTIFICATION

Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Self-heating substances and mixtures - Category 1
Acute Oral Toxicity - Category 4
Acute Dermal Toxicity - Category 4
Skin Irritation - Category 2
Eye Irritation - Category 2A
Toxic to Reproduction - Category 2
Specific target organ toxicity (repeated exposure) - Category 2

The following health/environmental hazard categories fall outside the scope of the Workplace Health and Safety Regulations:
Acute Aquatic Toxicity - Category 2
Chronic Aquatic Toxicity - Category 2

SIGNAL WORD: DANGER

Hazard Statement(s):
H251 Self-heating; may catch fire.
H302+H312 Harmful if swallowed or in contact with skin.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

Precautionary Statement(s):

Prevention:
P102 Keep out of reach of children.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P235+P410 Keep cool. Protect from sunlight.
P260 Do not breathe dust.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P273 Avoid release to the environment.
P280 Wear protective gloves / protective clothing / eye protection / face protection.
P281 Use personal protective equipment as required.

Response:
P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P330 Rinse mouth.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.
P312 Call a POISON CENTER or doctor/physician if you feel unwell.
P321 Specific treatment (see First Aid Measures on Safety Data Sheet).
P322 Specific measures (see First Aid Measures on Safety Data Sheet).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P363 Wash contaminated clothing before re-use.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313 If eye irritation persists: Get medical advice/attention.
P314 Get medical advice/attention if you feel unwell.
P391 Collect spillage.

Storage:
P405 Store locked up.
P407 Maintain air gap between stacks/pallets.
P420 Store away from other materials.

Disposal:
P501 Dispose of contents and container in accordance with local, regional, national, international regulations.

Other Hazards:
AUH031 Contact with acids liberates toxic gas.

Poisons Schedule (SUSMP): None allocated.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Components	CAS Number	Proportion	Hazard Codes
Sodium isopropyl xanthate	140-93-2	>=90%	H302 H312 H315 H319 H361fd H373 H411

4. FIRST AID MEASURES

For advice, contact a Poisons Information Centre (e.g. phone Australia 131 126; New Zealand 0800 764 766) or a doctor.

Inhalation:
Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. If patient finds breathing difficult and develops a bluish discolouration of the skin (which suggests a lack of oxygen in the blood - cyanosis), ensure airways are clear of any obstruction and have a qualified person give oxygen through a face mask. Apply artificial respiration if patient is not breathing. Seek immediate medical advice.

Skin Contact:
If skin or hair contact occurs, immediately remove any contaminated clothing and wash skin and hair thoroughly with running water and soap. If swelling, redness, blistering or irritation occurs seek medical assistance.

Eye Contact:
If in eyes, hold eyelids apart and flush the eye continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre or a doctor, or for at least 15 minutes.

Ingestion:
Rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Never give anything by the mouth to an unconscious patient. Seek immediate medical assistance.

Indication of immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Suitable Extinguishing Media:
Coarse water spray, fine water spray, normal foam, dry agent (carbon dioxide, dry chemical powder).

Hazchem or Emergency Action Code: 1Y

Specific hazards arising from the chemical:
Substance liable to spontaneous combustion. Environmentally hazardous.

Special protective equipment and precautions for fire-fighters:
Heating can cause expansion or decomposition of the material, which can lead to the containers exploding. If safe to do so, remove containers from the path of fire. Decomposes on heating emitting toxic fumes, including those of carbon disulphide . Fire fighters to wear self-contained breathing apparatus and suitable protective clothing if risk of exposure to products of decomposition.

6. ACCIDENTAL RELEASE MEASURES

Emergency procedures/Environmental precautions:
Shut off all possible sources of ignition. Clear area of all unprotected personnel. Do not allow container or product to get into drains, sewers, streams or ponds. If contamination of sewers or waterways has occurred advise local emergency services.

Personal precautions/Protective equipment/Methods and materials for containment and cleaning up:
Wear protective equipment to prevent skin and eye contact and breathing in vapours/dust. DO NOT allow material to get wet. Air-supplied masks are recommended to avoid inhalation of toxic material. Vacuum solid spills instead of sweeping. Collect and seal in properly labelled containers or drums for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling:
Avoid skin and eye contact and breathing in dust. In common with many organic chemicals, may form flammable dust clouds in air. For precautions necessary refer to Safety Data Sheet "Dust Explosion Hazards". When using do not eat, drink or smoke. Wash hands thoroughly after handling.

Conditions for safe storage, including any incompatibilities:
Store in a cool, dry, well ventilated place and out of direct sunlight. Store away from sources of heat or ignition. Store away from foodstuffs. Store away from incompatible materials described in Section 10. Keep dry - reacts with water, may lead to drum rupture. Keep containers closed when not in use - check regularly for spills.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters: No value assigned for this specific material by Safe Work Australia. However, supplier recommended Workplace Exposure Standard(s):

TWA = 5 ppm (skin)

However, Workplace Exposure Standard(s) for decomposition product(s):

Carbon disulfide: 8hr TWA = 31 mg/m^3 (10 ppm), Sk

As published by Safe Work Australia Workplace Exposure Standards for Airborne Contaminants.

TWA - The time-weighted average airborne concentration of a particular substance when calculated over an eight-hour working day, for a five-day working week.

`Sk' (skin) Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur.

These Workplace Exposure Standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These workplace exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.

Appropriate engineering controls:
Ensure ventilation is adequate to maintain air concentrations below Workplace Exposure Standards. Keep containers closed when not in use.

If in the handling and application of this material, safe exposure levels could be exceeded, the use of engineering controls such as local exhaust ventilation must be considered and the results documented. If achieving safe exposure levels does not require engineering controls, then a detailed and documented risk assessment using the relevant Personal Protective Equipment (PPE) (refer to PPE section below) as a basis must be carried out to determine the minimum PPE requirements.

Individual protection measures, such as Personal Protective Equipment (PPE):
The selection of PPE is dependent on a detailed risk assessment. The risk assessment should consider the work situation, the physical form of the chemical, the handling methods, and environmental factors.

OVERALLS, SAFETY SHOES, CHEMICAL GOGGLES, GLOVES, DUST MASK.

Wear overalls, chemical goggles and impervious gloves. Avoid generating and inhaling dusts. If determined by a risk assessment an inhalation risk exists, wear a dust mask/respirator meeting the requirements of AS/NZS 1715 and AS/NZS 1716. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Powder or Pellets
Colour:	Yellow
Odour:	Slight Characteristic
Molecular Formula:	(CH3)2CH-O-(C=S)S.Na
Solubility:	Soluble in water.
Specific Gravity:	ca. 0.8
Relative Vapour Density (air=1):	Not available
Vapour Pressure (20 °C):	Not available
Flash Point (°C):	Not available
Flammability Limits (%):	1.25-50 (for carbon disulfide gas)
Autoignition Temperature (°C):	Not available
Melting Point/Range (°C):	150-250
pH:	>12

10. STABILITY AND REACTIVITY

Reactivity:	Reacts with moisture liberating highly flammable carbon disulfide vapours.
Chemical stability:	Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
Possibility of hazardous reactions:	Reacts exothermically with water . Reacts with acids liberating toxic gas.
Conditions to avoid:	Avoid exposure to moisture. Avoid exposure to heat. Avoid dust generation.
Incompatible materials:	Incompatible with acids , oxidising agents , moisture .
Hazardous decomposition products:	Carbon disulfide. Oxides of carbon.

11. TOXICOLOGICAL INFORMATION

No adverse health effects expected if the product is handled in accordance with this Safety Data Sheet and the product label. Symptoms or effects that may arise if the product is mishandled and overexposure occurs are:

Ingestion:	Swallowing may result in irritation of the gastrointestinal tract.
Eye contact:	An eye irritant.

Skin contact: Contact with skin will result in irritation. Will liberate carbon disulfide upon contact with moist skin. Carbon disulfide can be absorbed through the skin with resultant adverse effects.

Inhalation: Breathing in dust may result in respiratory irritation. May cause coughing and shortness of breath.

Acute toxicity:
Oral LD50 (rat): 1500 mg/kg.

Chronic effects:

Mutagenicity: No information available.
Carcinogenicity: Not listed as carcinogenic according to the International Agency for Research on Cancer (IARC).
Reproductive toxicity: Suspected of damaging fertility or the unborn child.
Specific Target Organ Toxicity (STOT) - single exposure: No information available.
Specific Target Organ Toxicity (STOT) - repeated exposure: May cause damage to organs through prolonged or repeated exposure.
Aspiration hazard: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity Avoid contaminating waterways.

Persistence/degradability: No information available.

Bioaccumulative potential: No information available.

Mobility in soil: No information available.

Aquatic toxicity: Toxic to aquatic organisms. May cause long lasting harmful effects to aquatic life.

13. DISPOSAL CONSIDERATIONS

Disposal methods:
Refer to Waste Management Authority. Dispose of material through a licensed waste contractor. Advise flammable nature.

14. TRANSPORT INFORMATION

Road and Rail Transport
Classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for Transport by Road and Rail; DANGEROUS GOODS.

UN No: 3342
Transport Hazard Class: 4.2 Spontaneously Combustible
Packing Group: II
Proper Shipping Name or Technical Name: XANTHATES

Hazchem or Emergency Action Code: 1Y

Marine Transport
Classified as Dangerous Goods by the criteria of the International Maritime Dangerous Goods Code (IMDG Code) for transport by sea; DANGEROUS GOODS.

UN No:	3342
Transport Hazard Class:	4.2 Spontaneously Combustible
Packing Group:	II
Proper Shipping Name or Technical Name:	XANTHATES
IMDG EMS Fire:	F-A
IMDG EMS Spill:	S-J

Air Transport
Classified as Dangerous Goods by the criteria of the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air; DANGEROUS GOODS. TRANSPORT PROHIBITED under the International Air Transport Association (IATA) Dangerous Goods Regulations for transport by air in Passenger and Cargo Aircraft; may be transported by Cargo Aircraft Only.

UN No:	3342
Transport Hazard Class:	4.2 Spontaneously Combustible
Packing Group:	II
Proper Shipping Name or Technical Name:	XANTHATES

15. REGULATORY INFORMATION

Classification:
This material is hazardous according to Safe Work Australia; HAZARDOUS CHEMICAL.

Classification of the chemical:
Self-heating substances and mixtures - Category 1
Acute Oral Toxicity - Category 4
Acute Dermal Toxicity - Category 4
Skin Irritation - Category 2
Eye Irritation - Category 2A
Toxic to Reproduction - Category 2
Specific target organ toxicity (repeated exposure) - Category 2

The following health/environmental hazard categories fall outside the scope of the Workplace Health and Safety Regulations:
Acute Aquatic Toxicity - Category 2
Chronic Aquatic Toxicity - Category 2

Hazard Statement(s):
H251 Self-heating; may catch fire.
H302+H312 Harmful if swallowed or in contact with skin.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure.
H411 Toxic to aquatic life with long lasting effects.

Poisons Schedule (SUSMP): None allocated.

This material is listed on the Australian Inventory of Chemical Substances (AICS).

16. OTHER INFORMATION

This safety data sheet has been prepared by Ixom Operations Pty Ltd (Toxicology & SDS Services).

Reason(s) for Issue:
Update in Toxicological Information
Change in Hazardous Chemical Classification

This SDS summarises to our best knowledge at the date of issue, the chemical health and safety hazards of the material and general guidance on how to safely handle the material in the workplace. Since Ixom Operations Pty Ltd cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, assess and control the risks arising from its use of the material.

If clarification or further information is needed, the user should contact their Ixom representative or Ixom Operations Pty Ltd at the contact details on page 1.

Ixom Operations Pty Ltd's responsibility for the material as sold is subject to the terms and conditions of sale, a copy of which is available upon request.

SAFETY DATA SHEET

Creation Date 08-February-2010 **Revision Date** 18-January-2018 **Revision Number** 5

1. Identification

Product Name **Sodium metabisulfite**

Cat No. : **S242-12; S242-212; S242-400LB; S242-500; S243-10; S244-3; S244-500**

CAS-No 7681-57-4
Synonyms Sodium pyrosulfite; Disodium pyrosulfite; Disodium Disulfite (Granular/Powder/NF/FCC/Laboratory/Certified ACS)

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Importer/Distributor
Fisher Scientific
112 Colonnade Road,
Ottawa, ON K2E 7L6,
Canada
Tel: 1-800-234-7437

Manufacturer
Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number
CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

WHMIS 2015 Classification Classified as hazardous under the Hazardous Products Regulations (SOR/2015-17)

Acute oral toxicity	Category 4
Serious Eye Damage/Eye Irritation	Category 1
Health Hazards Not Otherwise Classified	Category 1

Contact with acids liberates toxic gas

Label Elements

Signal Word
Danger

Hazard Statements
Harmful if swallowed
Causes serious eye damage
Contact with acids liberates toxic gas

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Take any precaution to avoid mixing with acids
Do not breathe dust/fumes/gas/mist/vapours/spray
Wear respiratory protection
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing
Immediately call a POISON CENTER/doctor
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Rinse mouth
Disposal
Dispose of contents/container to an approved waste disposal plant

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Sodium metabisulfite	7681-57-4	>95

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Get medical attention immediately if symptoms occur.

Inhalation Move to fresh air. 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. Get medical attention immediately if symptoms occur. If not breathing, give artificial respiration.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects Causes eye burns. Causes severe eye damage.
Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature

Explosion Limits

Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products
Sodium oxides Sulfur oxides
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	0	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Avoid dust formation. Sweep up or vacuum up spillage and collect in suitable container for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Do not breathe dust. Do not get in eyes, on skin, or on clothing. Keep away from acids.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Do not store near acids.

8. Exposure controls / personal protection

Exposure Guidelines

Component	Alberta	British Columbia	Ontario TWAEV	Quebec	ACGIH TLV	OSHA PEL	NIOSH IDLH
Sodium metabisulfite	TWA: 5 mg/m^3	TWA: 5 mg/m^3	TWA: 5 mg/m^3	TWA: 5 mg/m^3	TWA: 5 mg/m^3	(Vacated) TWA: 5 mg/m^3	TWA: 5 mg/m^3

Legend
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Goggles

Hand Protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Glove material	Breakthrough time	Glove thickness	Glove comments
Natural rubber Nitrile rubber Neoprene PVC	See manufacturers recommendations	-	Splash protection only

Inspect gloves before use. observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information) gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion. gloves with care avoiding skin contamination.

Respiratory Protection
When workers are facing concentrations above the exposure limit they must use appropriate certified 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.
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly
Recommended Filter type: Particulates filter conforming to EN 143

When RPE is used a face piece Fit Test should be conducted

Environmental exposure controls
Prevent product from entering drains.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing before re-use. Wash hands before breaks and at the end of workday.

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Off-white
Odor	pungent
Odor Threshold	No information available
pH	4-6 5% aq.sol
Melting Point/Range	150 °C / 302 °F
Boiling Point/Range	No information available
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	Not applicable
Specific Gravity	1.4
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	120 °C
Viscosity	Not applicable
Molecular Formula	Na2 O5 S2
Molecular Weight	190.1

10. Stability and reactivity

Reactive Hazard Yes

Stability Air sensitive. Moisture sensitive.

Conditions to Avoid Avoid dust formation. Incompatible products. Excess heat. Exposure to air or moisture over prolonged periods.

Incompatible Materials Acids, Strong oxidizing agents

Hazardous Decomposition Products Sodium oxides, Sulfur oxides

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions Contact with acids liberates toxic gas.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium metabisulfite	LD50 = 1310 mg/kg (Rat)	LD50 > 2 g/kg (Rat)	Not listed

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Risk of serious damage to eyes

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Sodium metabisulfite	7681-57-4	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Do not empty into drains. Contains a substance which is:. Harmful to aquatic organisms. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Sodium metabisulfite	EC50: = 40 mg/L, 96h (Desmodesmus	LC50: = 32 mg/L, 96h static (Lepomis macrochirus)	EC50 = 56 mg/L 17 h	EC50: = 89 mg/L, 24h (Daphnia magna Straus)

	subspicatus) EC50: = 48 mg/L, 72h (Desmodesmus subspicatus)			

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Sodium metabisulfite	-3.7

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

14. Transport information

DOT Not regulated
TDG Not regulated
IATA Not regulated
IMDG/IMO Not regulated

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	DSL	NDSL	TSCA	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Sodium metabisulfite	X	-	X	231-673-0	-		X	X	X	X	X

Canada

SDS in compliance with provisions of information as set out in Canadian Standard - Part 4, Schedule 1 and 2 of the Hazardous Products Regulations (HPR) and meets the requirements of the HPR (Paragraph 13(1)(a) of the Hazardous Products Act (HPA)).

16. Other information

Prepared By
Regulatory Affairs
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Print Date 18-January-2018
Revision Summary This document has been updated to comply with the requirements of WHMIS 2015 to align with the Globally Harmonised System (GHS) for the Classification and Labelling of Chemicals.

Disclaimer
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

Sodium Sulfate, Anhydrous

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 11/21/2014 Revision date: 04/11/2018 Supersedes: 04/11/2018 Version: 1.1

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sodium Sulfate, Anhydrous
CAS-No.	:	7757-82-6
Product code	:	LC24880
Formula	:	Na2SO4

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	For laboratory and manufacturing use only.
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number	:	CHEMTREC: 1-800-424-9300 or +1-703-741-5970

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Not classified

2.2. GHS Label elements, including precautionary statements

Not classified as a hazardous chemical.

Other hazards not contributing to the classification	:	None under normal conditions.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sodium Sulfate, Anhydrous (Main constituent)	(CAS-No.) 7757-82-6	100	Not classified

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general	:	Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
First-aid measures after inhalation	:	Allow victim to breathe fresh air. Allow the victim to rest.
First-aid measures after skin contact	:	Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.
First-aid measures after eye contact	:	Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persists.
First-aid measures after ingestion	:	Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects : Not expected to present a significant hazard under anticipated conditions of normal use.

4.3. Immediate medical attention and special treatment, if necessary

Treat symptomatically.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Specific hazards arising from the chemical

No additional information available

5.3. Special protective equipment and precautions for fire-fighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Safety glasses.

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : On land, sweep or shovel into suitable containers. Minimize generation of dust. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Keep container closed when not in use.

Incompatible products : Strong acids.

Incompatible materials : Sources of ignition. Direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Safety glasses.

Hand protection:

Wear protective gloves.

Eye protection:

Chemical goggles or safety glasses

Respiratory protection:

Dust formation: dust mask

Other information:

Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Solid
Color	:	white
Odor	:	None.
Odor threshold	:	No data available
pH	:	5.2 - 9.2 5% solution
Melting point	:	884 °C
Freezing point	:	No data available
Boiling point	:	No data available
Flash point	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available
Flammability (solid, gas)	:	Non flammable.
Vapor pressure	:	No data available
Relative vapor density at 20 °C	:	No data available
Relative density	:	No data available
Molecular mass	:	142.04 g/mol
Solubility	:	Soluble in water. Water: 20 g/100ml
Log Pow	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosion limits	:	No data available
Explosive properties	:	No data available
Oxidizing properties	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
Not established.

10.4. Conditions to avoid
Direct sunlight. Extremely high or low temperatures.

10.5. Incompatible materials
Strong acids.

10.6. Hazardous decomposition products
Sulfur compounds.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure : Inhalation; Skin and eye contact

Acute toxicity : Not classified

Sodium Sulfate, Anhydrous (7757-82-6)	
LD50 oral rat	10000 mg/kg
ATE US (oral)	10000 mg/kg

Skin corrosion/irritation : Not classified
pH: 5.2 - 9.2 5% solution

Serious eye damage/irritation : Not classified
pH: 5.2 - 9.2 5% solution

Respiratory or skin sensitization : Not classified

Germ cell mutagenicity : Not classified
Based on available data, the classification criteria are not met

Carcinogenicity : Not classified

Reproductive toxicity : Not classified
Based on available data, the classification criteria are not met

Specific target organ toxicity – single exposure : Not classified

Specific target organ toxicity – repeated exposure : Not classified

Aspiration hazard : Not classified

Potential Adverse human health effects and symptoms : Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - water : Toxic to aquatic life.

Sodium Sulfate, Anhydrous (7757-82-6)	
LC50 fish 1	13500 - 14500 ml/L
EC50 Daphnia 1	2564 mg/L

12.2. Persistence and degradability

Sodium Sulfate, Anhydrous (7757-82-6)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Sodium Sulfate, Anhydrous (7757-82-6)	
Bioaccumulative potential	Not established.

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects

Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to comply with local, state and federal regulations.

Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Not regulated

SECTION 15: Regulatory information

15.1. US Federal regulations

Sodium Sulfate, Anhydrous (7757-82-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

15.2. International regulations

CANADA

Sodium Sulfate, Anhydrous (7757-82-6)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Sodium Sulfate, Anhydrous (7757-82-6)
Not listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

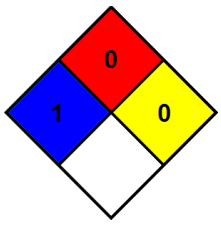
Revision date : 04/11/2018

Other information : None.

NFPA health hazard : 1 - Materials that, under emergency conditions, can cause significant irritation.

NFPA fire hazard : 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



Hazard Rating		
Health	:	1 Slight Hazard - Irritation or minor reversible injury possible
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.
Personal protection	:	E E - Safety glasses, Gloves, Dust respirator

SDS US LabChem

Sulfuric Acid, ACS

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 10/01/1998 Revision date: 02/28/2018 Supersedes: 01/23/2018 Version: 1.3

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Substance name	:	Sulfuric Acid, ACS
CAS-No.	:	7664-93-9
Product code	:	LC25550
Formula	:	H2SO4
Synonyms	:	battery acid / brown acid / brown oil of vitriol / dihydrogen sulfate / dipping acid / electrolyte acid / nordhausen acid / oil of vitriol / sulphuric acid

1.2. Recommended use and restrictions on use

Use of the substance/mixture	:	Industrial use Laboratory chemical Battery: component
Recommended use	:	Laboratory chemicals
Restrictions on use	:	Not for food, drug or household use

1.3. Supplier

LabChem Inc
Jackson's Pointe Commerce Park Building 1000, 1010 Jackson's Pointe Court
Zelienople, PA 16063 - USA
T 412-826-5230 - F 724-473-0647
info@labchem.com - www.labchem.com

1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 or 011-703-527-3887

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Skin corrosion/irritation, Category 1A	H314	Causes severe skin burns and eye damage.
Serious eye damage/eye irritation, Category 1	H318	Causes serious eye damage.

Full text of H statements : see section 16

2.2. GHS Label elements, including precautionary statements

GHS-US labelling

Hazard pictograms (GHS-US) :

GHS05

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H314 - Causes severe skin burns and eye damage.

Precautionary statements (GHS-US) : P260 - Do not breathe mist, vapours, spray.
P264 - Wash exposed skin thoroughly after handling.
P280 - Wear protective gloves, protective clothing, eye protection, face protection.
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER/doctor
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container to comply with local, state and federal regulations

2.3. Other hazards which do not result in classification

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Substance type : Mono-constituent

Name	Product identifier	%	GHS-US classification
Sulfuric Acid, ACS (Main constituent)	(CAS-No.) 7664-93-9	96	Skin Corr. 1A, H314 Eye Dam. 1, H318

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures general : Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

First-aid measures after inhalation : Remove the victim into fresh air. Immediately consult a doctor/medical service.

First-aid measures after skin contact : Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

First-aid measures after eye contact : Rinse immediately with plenty of water for 15 minutes. Take victim to an ophthalmologist. Do not apply neutralizing agents. Remove contact lenses, if present and easy to do. Continue rinsing.

First-aid measures after ingestion : Rinse mouth with water. Do not induce vomiting. Do not give activated charcoal. Immediately consult a doctor/medical service. Call Poison Information Centre (www.big.be/antigif.htm). Take the container/vomit to the doctor/hospital. Ingestion of large quantities: immediately to hospital. Do not give chemical antidote.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER INGESTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

4.3. Immediate medical attention and special treatment, if necessary

Obtain medical assistance.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media

Suitable extinguishing media : Quick-acting ABC powder extinguisher. Quick-acting BC powder extinguisher. Quick-acting CO2 extinguisher. Class B foam (alcohol-resistant); after consulting specialist.

Unsuitable extinguishing media : Water (quick-acting extinguisher, reel); risk of puddle expansion. Quick-acting class B foam extinguisher. Water.

5.2. Specific hazards arising from the chemical

Fire hazard : DIRECT FIRE HAZARD: Non combustible. INDIRECT FIRE HAZARD: Reactions involving a fire hazard: see "Reactivity Hazard".

Explosion hazard : INDIRECT EXPLOSION HAZARD: Reactions with explosion hazards: see "Reactivity Hazard".

Reactivity	:	Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion. Violent exothermic reaction with water (moisture): release of corrosive gases/vapours.

5.3. Special protective equipment and precautions for fire-fighters

Precautionary measures fire	:	Exposure to fire/heat: keep upwind. Exposure to fire/heat: consider evacuation. Exposure to fire/heat: seal off low-lying areas. Exposure to fire/heat: have neighbourhood close doors and windows.
Firefighting instructions	:	Cool tanks/drums with water spray/remove them into safety. When cooling/extinguishing: no water in the substance. Dilute toxic gases with water spray.
Protection during firefighting	:	Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment	:	Gloves. Face-shield. Corrosion-proof suit. Large spills/in enclosed spaces: compressed air apparatus. Large spills/in enclosed spaces: gas-tight suit.
Emergency procedures	:	Mark the danger area. No naked flames. Keep containers closed. Avoid ingress of water in the containers. Wash contaminated clothes. Large spills/in confined spaces: consider evacuation. In case of hazardous reactions: keep upwind. In case of reactivity hazard: consider evacuation.

6.1.2. For emergency responders

Protective equipment	:	Equip cleanup crew with proper protection.
Emergency procedures	:	Stop leak if safe to do so. Ventilate area.

6.2. Environmental precautions

Prevent soil and water pollution. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

For containment	:	Contain released product, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Hazardous reaction: measure explosive gas-air mixture. Reaction: dilute combustible gas/vapour with water curtain. Take account of toxic/corrosive precipitation water. Heat exposure: dilute toxic gas/vapour with water spray.
Methods for cleaning up	:	Take up liquid spill into inert absorbent material, e.g.: dry sand/earth/vermiculite. Scoop absorbed substance into closing containers. Carefully collect the spill/leftovers. Damaged/cooled tanks must be emptied. Clean contaminated surfaces with an excess of water. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Keep away from naked flames/heat. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection. Comply with the legal requirements. Remove contaminated clothing immediately. Clean contaminated clothing. Keep the substance free from contamination. Thoroughly clean/dry the installation before use. Do not discharge the waste into the drain. Never add water to this product. Never dilute by pouring water to the acid. Always add the acid to the water.
Hygiene measures	:	Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible products	:	Strong bases. metals. combustible materials.
Heat and ignition sources	:	KEEP SUBSTANCE AWAY FROM: heat sources.
Prohibitions on mixed storage	:	KEEP SUBSTANCE AWAY FROM: combustible materials. reducing agents. (strong) bases. highly flammable materials. metals. cellulosic materials. organic materials. alcohols. amines. water/moisture.
Storage area	:	Store in a dry area. Ventilation at floor level. Keep locked up. Provide for a tub to collect spills. Unauthorized persons are not admitted. Meet the legal requirements.
Special rules on packaging	:	SPECIAL REQUIREMENTS: closing. dry. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.

Packaging materials : SUITABLE MATERIAL: stainless steel. carbon steel. polyethylene. polypropylene. glass. stoneware/porcelain. MATERIAL TO AVOID: monel steel. lead. copper. zinc.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Sulfuric Acid, ACS (7664-93-9)		
ACGIH	ACGIH TWA (mg/m³)	0.2 mg/m³ (Thoracic fraction)
OSHA	OSHA PEL (TWA) (mg/m³)	1 mg/m³
IDLH	US IDLH (mg/m³)	15 mg/m³
NIOSH	NIOSH REL (TWA) (mg/m³)	1 mg/m³

8.2. Appropriate engineering controls

Appropriate engineering controls : Emergency eye wash fountains should be available in the immediate vicinity of any potential exposure. Provide adequate general and local exhaust ventilation.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:

Gloves. Face shield. Chemical resistant apron. Safety glasses. Protective goggles. Gas mask with filter type E.

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. polyethylene. tetrafluoroethylene. GIVE LESS RESISTANCE: neoprene. PVC. viton. GIVE POOR RESISTANCE: natural rubber. nitrile rubber. PVA

Hand protection:

Gloves

Eye protection:

Face shield

Skin and body protection:

Corrosion-proof clothing

Respiratory protection:

Full face mask with filter type E at conc. in air > exposure limit

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid
Appearance : Liquid.
Colour : Pure substance: colourless Unpurified: yellow to brown
Odour : Almost odourless
Odour threshold : > 1 mg/m³
pH : < 1
Melting point : 10 °C
Freezing point : No data available
Boiling point : 288 °C
Flash point : Not applicable
Relative evaporation rate (butylacetate=1) : No data available
Flammability (solid, gas) : No data available

Vapour pressure	:	< 1 hPa (20 °C)
Relative vapour density at 20 °C	:	3.4
Relative density	:	1.8
Density	:	1840 kg/m³
Molecular mass	:	98.08 g/mol
Solubility	:	Exothermically soluble in water. Soluble in ethanol. Water: complete
Log Pow	:	-2.2 (Estimated value)
Auto-ignition temperature	:	No data available
Decomposition temperature	:	> 340 °C
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available
Explosive limits	:	No data available
Explosive properties	:	No data available.
Oxidising properties	:	No data available.

9.2. Other information

VOC content	:	0 %
Other properties	:	Gas/vapour heavier than air at 20°C. Clear. Hygroscopic. Slightly volatile. Substance has acid reaction.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts violently with (some) bases: heat release resulting in increased fire or explosion risk. Reacts with many compounds e.g.: with (strong) reducers, with organic material and with combustible materials: (increased) risk of fire/explosion. Violent exothermic reaction with water (moisture): release of corrosive gases/vapours.

10.2. Chemical stability

Unstable on exposure to moisture.

10.3. Possibility of hazardous reactions

Reacts violently with water. Reacts violently with (some) bases: release of heat.

10.4. Conditions to avoid

Incompatible materials. Moisture.

10.5. Incompatible materials

Water. Strong bases. Organic compounds. metals. Halogens. cyanides. combustible materials.

10.6. Hazardous decomposition products

Sulfur compounds.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure	:	Skin and eyes contact
Acute toxicity	:	Not classified

Sulfuric Acid, ACS (7664-93-9)	
LD50 oral rat	2140 mg/kg bodyweight (Rat, Experimental value)
ATE US (oral)	2140 mg/kg bodyweight

Skin corrosion/irritation	:	Causes severe skin burns and eye damage. pH: < 1
Serious eye damage/irritation	:	Causes serious eye damage. pH: < 1
Respiratory or skin sensitisation	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified

Sulfuric Acid, ACS (7664-93-9)	
Additional information	Strong inorganic acid mists containing sulfuric acid are carcinogenic to humans
National Toxicology Program (NTP) Status	2 - Known Human Carcinogens

Reproductive toxicity : Not classified

Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : Not classified

Aspiration hazard : Not classified

Potential adverse human health effects and symptoms : Odour threshold is well above the exposure limit. Causes severe skin burns. Irritant to the respiratory organs. Causes serious eye damage.

Symptoms/effects after inhalation : Dry/sore throat. Coughing. Irritation of the respiratory tract. Irritation of the nasal mucous membranes. ON CONTINUOUS EXPOSURE/CONTACT: Corrosion of the upper respiratory tract. FOLLOWING SYMPTOMS MAY APPEAR LATER: Possible laryngeal spasm/oedema. Risk of pneumonia. Risk of lung oedema. Respiratory difficulties.

Symptoms/effects after skin contact : Caustic burns/corrosion of the skin.

Symptoms/effects after eye contact : Corrosion of the eye tissue. Permanent eye damage.

Symptoms/effects after ingestion : Nausea. Abdominal pain. Blood in stool. Blood in vomit. Burns to the gastric/intestinal mucosa. AFTER INGESTION OF HIGH QUANTITIES: Shock.

Chronic symptoms : ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Red skin. Dry skin. Itching. Skin rash/inflammation. Affection/discolouration of the teeth. Inflammation/damage of the eye tissue.

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008.

Ecology - air : Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009).

Ecology - water : Harmful to crustacea. Harmful to fishes. Groundwater pollutant. Mild water pollutant (surface water). Inhibition of activated sludge. pH shift. Toxic to plankton.

Sulfuric Acid, ACS (7664-93-9)	
LC50 fish 1	42 mg/L (96 h, Gambusia affinis)
EC50 Daphnia 1	29 mg/L (24 h, Daphnia magna)

12.2. Persistence and degradability

Sulfuric Acid, ACS (7664-93-9)	
Persistence and degradability	Biodegradability: not applicable.
Biochemical oxygen demand (BOD)	Not applicable
Chemical oxygen demand (COD)	Not applicable
ThOD	Not applicable
BOD (% of ThOD)	Not applicable

12.3. Bioaccumulative potential

Sulfuric Acid, ACS (7664-93-9)	
Log Pow	-2.2 (Estimated value)
Bioaccumulative potential	Not bioaccumulative.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Regional legislation (waste) : LWCA (the Netherlands): KGA category 01.

Waste disposal recommendations	:	Treat using the best available techniques before discharge into drains or the aquatic environment. Use appropriate containment to avoid environmental contamination. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals. Recycle/reuse. Remove to an authorized dump (Class I). Remove for physico-chemical/biological treatment.
Additional information	:	Hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.
Ecology - waste materials	:	Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	:	UN1830 Sulfuric acid (with more than 51 percent acid), 8, II
UN-No.(DOT)	:	UN1830
Proper Shipping Name (DOT)	:	Sulfuric acid with more than 51 percent acid
Transport hazard class(es) (DOT)	:	8 - Class 8 - Corrosive material 49 CFR 173.136
Packing group (DOT)	:	II - Medium Danger
Hazard labels (DOT)	:	8 - Corrosive

DOT Packaging Non Bulk (49 CFR 173.xxx)	:	202
DOT Packaging Bulk (49 CFR 173.xxx)	:	242
DOT Special Provisions (49 CFR 172.102)	:	A3 - For combination packagings, if glass inner packagings (including ampoules) are used, they must be packed with absorbent material in tightly closed metal receptacles before packing in outer packagings. A7 - Steel packagings must be corrosion-resistant or have protection against corrosion. B3 - MC 300, MC 301, MC 302, MC 303, MC 305, and MC 306 and DOT 406 cargo tanks and DOT 57 portable tanks are not authorized. B83 - Bottom outlets are prohibited on tank car tanks transporting sulfuric acid in concentrations over 65.25 percent. B84 - Packagings must be protected with non-metallic linings impervious to the lading or have a suitable corrosion allowance for sulfuric acid or spent sulfuric acid in concentration up to 65.25 percent. IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. N34 - Aluminum construction materials are not authorized for any part of a packaging which is normally in contact with the hazardous material. T8 - 4 178.274(d)(2) Normal..... Prohibited TP2 - a. The maximum degree of filling must not exceed the degree of filling determined by the following: (image) Where: tr is the maximum mean bulk temperature during transport, tf is the temperature in degrees celsius of the liquid during filling, and a is the mean coefficient of cubical expansion of the liquid between the mean temperature of the liquid during filling (tf) and the maximum mean bulk temperature during transportation (tr) both in degrees celsius. b. For liquids transported under ambient conditions may be calculated using the formula: (image) Where: d15 and d50 are the densities (in units of mass per unit volume) of the liquid at 15 C (59 F) and 50 C (122 F), respectively. TP12 - This material is considered highly corrosive to steel.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	154
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	1 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	30 L
DOT Vessel Stowage Location	:	C - The material must be stowed ‘‘on deck only’’ on a cargo vessel and on a passenger vessel.

DOT Vessel Stowage Other : 14 - For metal drums, stowage permitted under deck on cargo vessels

Other information : No supplementary information available.

SECTION 15: Regulatory information

15.1. US Federal regulations

Sulfuric Acid, ACS (7664-93-9)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Not subject to reporting requirements of the United States SARA Section 313 Subject to reporting requirements of United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 302 Threshold Planning Quantity (TPQ)	1000 lb
SARA Section 311/312 Hazard Classes	Health hazard - Skin corrosion or Irritation Health hazard - Serious eye damage or eye irritation

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory

Chemical(s) subject to the reporting requirements of Section 313 or Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372.

Sulfuric Acid, ACS	CAS-No. 7664-93-9	100%

15.2. International regulations

CANADA
No additional information available

EU-Regulations
No additional information available

National regulations

Sulfuric Acid, ACS (7664-93-9)
Listed on IARC (International Agency for Research on Cancer) Listed as carcinogen on NTP (National Toxicology Program)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

SECTION 16: Other information

Revision date : 02/28/2018

Full text of H-statements: see section 16:

H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.

NFPA health hazard : 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard : 0 - Materials that will not burn under typical dire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA reactivity : 2 - Materials that readily undergo violent chemical change at elevated temperatures and pressures.

NFPA specific hazard : W - Materials that react violently or explosively with water.

Hazard Rating		
Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	2 Moderate Hazard - Materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air.
Personal protection	:	H H - Splash goggles, Gloves, Synthetic apron, Vapor respirator

SDS US LabChem

Information in this SDS is from available published sources and is believed to be accurate. No warranty, express or implied, is made and LabChem Inc assumes no liability resulting from the use of this SDS. The user must determine suitability of this information for his application.

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

Product information

Trade name	:	TMT 15®
Use of the Substance / Preparation	:	For industrial use
Function		Precipitant
Company	:	Evonik Degussa Corporation USA 299 Jefferson Road Parsippany,NJ 07054-0677 USA
Telephone	:	973-929-8000
Telefax	:	973-929-8040
US: CHEMTREC EMERGENCY NUMBER	:	800-424-9300
CANADA: CANUTEC EMERGENCY NUMBER	:	613-996-6666
Product Regulatory Services	:	973-929-8060

2. HAZARDS IDENTIFICATION

***** EMERGENCY OVERVIEW *****

***Form**-liquid* ***Color**-colourless to yellowish* **Odor**-*almost odourless*

Irritating to eyes.

Eye contact
irritating

Skin Contact
Slightly irritating.

Inhalation
No hazard expected in normal use.

Ingestion
No hazard expected in normal use.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature

Aqueous preparation
Content min. 15 %

The preparation contains:

Information on ingredients / Hazardous components

1,3,5-triazine-2,4,6(1H,3H,5H)-trithione, trisodium salt
CAS-No. 17766-26-6 Percent (Wt./ Wt.) 15 %

Other information

This material is classified as hazardous under OSHA regulations.

4. FIRST AID MEASURES

General advice

Pay attention to self-protection.
Remove victims from hazardous area. Immediately remove soiled or soaked clothing and remove it to a safe distance. Keep victim warm, in a stabilized position and covered.
Do not leave victims unattended.
If the casualty is unconscious: Place the victim in the recovery position.

Inhalation

Potential for exposure by inhalation if aerosols or mists are generated.
Move victims into fresh air.
With labored breathing: Provide with oxygen. Consult a doctor.
If the casualty is not breathing: Perform mouth-to-mouth resuscitation, notify emergency physician immediately.

Skin contact

Wash off affected area immediately with plenty of water for at least 15 minutes.
If symptoms persist, consult a physician for treatment.

Eye contact

With eye held open, thoroughly rinse immediately with plenty of water for at least 10 minutes.
Consult an ophthalmologist immediately if the symptoms persist.

Ingestion

Rinse out mouth.
Immediately give large quantities of water to drink.
Consult a physician immediately.

Notes to physician

The initial focus is only on the local action, possibly characterized by a progressive tissue irritation.
In the eye, irritating liquids cause, depending on the intensity of exposure, irritation of the conjunctiva and, in exceptional cases, damage to the cornea.
There is a danger of blindness if corneas are damaged!
Superficial irritations and only infrequent damage with ulcerations develop on the skin.
An irritation of the mucous membranes may develop and lead to coughing after inhalation.

5. FIRE-FIGHTING MEASURES

Flash point	does not flash
Lower explosion limit	No data available
Upper explosion limit	No data available
Autoignition temperature	not applicable

Suitable extinguishing media

water, mist, quenching powder, foam

Extinguishing media which must not be used for safety reasons

None known

Specific hazards during fire fighting

In the case of fire, the following hazardous smoke fumes may be produced: nitric oxides, sulphur oxides.

Special protective equipment for fire-fighters

As in any fire, wear self-contained positive-pressure breathing apparatus, (MSHA/NIOSH approved or equivalent) and full protective gear.

Further information

Standard procedure for chemical fires.
Ensure there are sufficient retaining facilities for water used to extinguish fire. Water used to extinguish fire should not enter drainage systems, soil or stretches of water. Contaminated fire-extinguishing water must be disposed of in accordance with the regulations issued by the appropriate local authorities. Fire residues should be disposed of in accordance with the regulations.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Wear personal protective equipment; see section 8.

Environmental precautions

Observe regulations on prevention of water pollution (collect, dam up, cover up).
Do not allow the product into the following compartments:
surface water
stretches of water

Obey relevant local, state, provincial and federal laws and regulations. Do not contaminate any lakes, streams, rivers, groundwater or soil.

Methods for cleaning up

Absorb with liquid-binding material (e.g. inert absorbent or universal binder).
Dispose of absorbed material in accordance with the regulations.
see section 13.
Rinse away any residue with plenty of water.

Additional advice

Isolate and seal off defective containers immediately.

7. HANDLING AND STORAGE

Handling

Safe handling advice

Handle in accordance with good industrial hygiene and safety practices.

Avoid contact with skin and eyes.

Wear personal protective equipment.
For personal protection see section 8.
Immediately change moistened and saturated work clothes.

No eating, drinking, smoking, or snuffing tobacco at work.

Wash hands before breaks and at the end of workday.
preventive skin protection

Advice on protection against fire and explosion

The product is not combustible.

Storage

Requirements for storage areas and containers

clean, dry.
Use shatterproof containers.
Protect from frost.
Transport and store container in upright position only.
Always close container tightly after removal of product.

Further information

Use by date of the product: min. 2 years.
Use alkaliresistant materials.

Advice on common storage

Store away from: oxidizing agents, acids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Remarks No substance-specific limiting value being known.

Component occupational exposure guidelines

Engineering measures

No dangerous reactions are known to occur with correct handling and storage.

Personal protective equipment

Respiratory protection

A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2 or applicable federal/provincial requirements must be followed whenever workplace conditions warrant respirator use. NIOSH's "Respirator Decision Logic" may be useful in determining the suitability of various types of respirators.

Hand protection

Applies to handling for brief periods or of small amounts

Glove material	Nitrile, for example, Dermatril P 743, Kächele-Cama Latex GmbH (KCL), Germany
Material thickness	0.20 mm
Break through time	> 480 min
Method	DIN EN 374

Applies to handling for longer periods or of large amounts

Glove material	Chloroprene, for example: Camapren 720, Kächele-Cama Latex GmbH (KCL), Germany
Material thickness	0.65 mm
Break through time	> 480 min
Method	DIN EN 374

The above mentioned hand protection is based on knowledge of the chemistry and anticipated uses of this product but it may not be appropriate for all workplaces. A hazard assessment should be conducted prior to use to ensure suitability of gloves for specific work environments and processes prior to use.

Eye protection

wear basket-shaped glasses or safety goggles with side-shields.

Skin and body protection

A safety shower and eye wash fountain should be readily available.
To identify additional Personal Protective Equipment (PPE) requirements, it is recommended that a hazard assessment in accordance with the OSHA PPE Standard (29CFR1910.132) be conducted before using this product.

Hygiene measures

No eating, drinking, smoking, or snuffing tobacco at work.
Wash face and/or hands before break and end of work.
Avoid contaminating clothes with product.
Immediately change moistened and saturated work clothes.

Protective measures

Avoid contact with skin and eyes.
Handle in accordance with good industrial hygiene and safety practices.
Wear suitable protective clothing, gloves and eye/face protection.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Color	colourless to yellowish
Odor	almost odourless

Safety data

pH	ca. 12.3 (22.5 °C)
Melting point/range	-3 °C
Boiling point/range	101 °C
Flash point	does not flash
Flammability	not applicable
Autoignition temperature:	not applicable
Autoinflammability	not spontaneously flammable
Explosiveness	not applicable
Lower explosion limit	No data available
Upper explosion limit	No data available
Vapor pressure	22 mbar (20 °C)
Density	ca. 1.12 g/cm3 (20 °C)
Relative density	No data available
Water solubility	No data available
Partition coefficient (n-octanol/water)	log Pow: < -2 Method: (calculated)
Viscosity, dynamic	1.6 mPa.s (20 °C)
conductivity	ca. 60 mS/cm (22 °C)
Molecular Weight	243.22 g/Mol

Further information

Miscibility in water	completely miscible

10. STABILITY AND REACTIVITY

Conditions to avoid	frost.
Materials to avoid	strong oxidant, acids.
Hazardous decomposition products	None known

Thermal decomposition	> 370 °C solid No decomposition if stored and applied as directed.
Hazardous reactions	No dangerous reactions are known to occur with correct handling and storage. product is stable.

11. TOXICOLOGICAL INFORMATION

Product Acute oral toxicity	LD50 Rat: 7878 mg/kg Method: analogy OECD-method related to substance: TMT (15%)
Product Acute inhalation toxicity	No data available
Product Acute dermal toxicity	LD50 Rat: > 2000 mg/kg Method: OECD Test Guideline 402 related to substance: TMT (55%) LD50 Rat: 7333 mg/kg (calculated based on TMT 55%) related to substance: TMT (15%)
Product Skin irritation	Rabbit / 4 h slightly irritating Method: OECD Test Guideline 404 related to substance: TMT (55%)
Product Eye irritation	Rabbit irritant Method: OECD Test Guideline 405 related to substance: TMT (55%)
Product Sensitization	maximization test guinea pig: not sensitizing Method: OECD Test Guideline 406 related to substance: TMT (55%)
Product Repeated dose toxicity	Oral Rat Testing period: 30 d NOAEL: 526 mg/kg target organ/effect: Erythrocytes Method: OECD Test Guideline 407 related to substance: TMT (55%) Oral Rat Testing period: 30 d NOAEL: 1929 mg/kg target organ/effect: Erythrocytes (calculated based on TMT 55%) related to substance: TMT (15%)

Product Gentoxicity in vitro	Ames test S. typhimurium / E. coli negative Method: analogy OECD-method related to substance: TMT (15%)
Product Gentoxicity in vivo	Micronucleus test mouse Oral negative Method: OECD TG 474 related to substance: TMT (15%)
Product Carcinogenicity	No data available
Product Toxicity to reproduction	No data available
Product Human experience	To date handling this product has not been known to cause any detrimental effects.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Biodegradability

aerobic
inoculum: Activated sludge
Not readily biodegradable.
0 %
Exposure time: 28 d
Method: OECD TG 302 B
related to substance: TMT (15%)

anaerobic
inoculum: Activated sludge
Not readily biodegradable.
0 %
Exposure time: 60 d
Method: CO2 Evolution Test
related to substance: TMT (15%)

Ecotoxicity effects

Toxicity to fish

LC0 static test Leuciscus idus melanotus: 1000 mg/L / 96 h
Analytical monitoring: no
Method: DIN 38412 Teil 15
related to substance: TMT (acid form)

LC0 static test Leuciscus idus melanotus: 9147 mg/L / 96 h
(calculated based on TMT (15%))
related to substance: TMT (15%)

LC0 static test Leuciscus idus melanotus: 1500 mg/L / 48 h
Analytical monitoring: no
Method: DIN 38412 Teil 15

related to substance: TMT (acid form)

LC0 static test Leuciscus idus melanotus: 13720 mg/L / 48 h
(calculated based on TMT (15%))

LC50 semi-static test Brachydanio rerio: > 560 - 1000 mg/L / 96 h
Analytical monitoring: no
Method: OECD TG 203
Noxious effect due to pH shift
pH: 8 - 11
related to substance: TMT (60%)

LC50 semi-static test Brachydanio rerio: 2240 - 4000 mg/L / 96 h
Noxious effect due to pH shift
pH: 8 - 11
(calculated from TMT (60%))

LC50 static test Pimephales promelas (fathead minnow): 190.1 mg/L / 96 h
Analytical monitoring: yes
Method: ASTM
related to substance: TMT (15%)

Toxicity to daphnia

EC50 Daphnia magna: 38 mg/L / 48 h
Method: OECD TG 202
related to substance: TMT (acid form)

EC50 Daphnia magna: 253 mg/L / 48 h
(calculated based on TMT (15%))

Toxicity to algae

IC 50 scenedesmus subspicatus: 273 mg/L / 72 h
End point: Biomass
Analytical monitoring: no
Method: OECD 201
related to substance: TMT (15%)

Toxicity to bacteria

EC50 Activated sludge: 1036 mg/L / 3 h
Analytical monitoring: no
Method: DEV L3 (TTC test)
related to substance: TMT (60%)

EC50 Activated sludge: 4144 mg/L / 3 h
(calculated from TMT (60%))

Further information on ecology

Chemical Oxygen Demand (COD)

TMT (15%)

Biochemical Oxygen Demand (BOD)	0 mg/g Concentration: 16 mg/L (BOD5) Method: DEV H5/a2 (dilution method) related to substance: TMT (60%) 0 mg/g Concentration: 64 mg/L (BOD5) (Calculated from TMT 60%). related to substance: TMT (15%)
AOX	The product does not contain any organically bonded halogen.
General Ecological Information	Does not contain any heavy metals and compounds from EC directive 76/464 Is adsorbed to activated sludge

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL

Advice on disposal	Waste must be disposed of in accordance with local, state, provincial and federal laws and regulations. Empty containers must be handled with care due to product residue.

14. TRANSPORT INFORMATION

Transport/further information

Not dangerous according to transport regulations.

15. REGULATORY INFORMATION

Information on ingredients / Non-hazardous components

This product contains the following non-hazardous components

Water

CAS-No. 7732-18-5 Percent (Wt./ Wt.) 85 %

US Federal Regulations

OSHA

If listed below, chemical specific standards apply to the product or components:

- None listed

Clean Air Act Section (112)

If listed below, components present at or above the de minimus level are hazardous air pollutants:

- None listed

CERCLA Reportable Quantities

If listed below, a reportable quantity (RQ) applies to the product based on the percent of the named component:

- None listed

SARA Title III Section 311/312 Hazard Categories

The product meets the criteria only for the listed hazard classes:

- Acute Health Hazard

SARA Title III Section 313 Reportable Substances

If listed below, components are subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

- None listed

Toxic Substances Control Act (TSCA)

If listed below, non-proprietary substances are subject to export notification under Section 12 (b) of TSCA:

- None listed

State Regulations

California Proposition 65

A warning under the California Drinking Water Act is required only if listed below:

- None listed

International Chemical Inventory Status

Unless otherwise noted, this product is in compliance with the inventory listing of the countries shown below. For information on listing for countries not shown, contact the Product Regulatory Services Department.

• Europe (EINECS/ELINCS)	Listed/registered
• USA (TSCA)	Listed/registered
• Canada (DSL)	Listed/registered
• Australia (AICS)	Listed/registered
• Japan (MITI)	Listed/registered
• Korea (TCCL)	Listed/registered
• Philippines (PICCS)	Listed/registered
• China	Listed/registered

16. OTHER INFORMATION

HMIS Ratings

Health :	2
Flammability :	0
Physical Hazard :	0

Further information

Data for the production of the safety data sheet from the studies available and from the literature. Further information about the characteristics of the product can be found in the product code of practice or in the Product-Brochure .

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

ZINC SULPHATE SOLUTION
SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Zinc Sulphate Solution.

Trade Names and Synonyms: Zinc Sulfate Solution, Zinc Electrolyte, Neutral Zinc Sulfate.

Manufacturer:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:
Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8

Preparer:
Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 15, 2015.

Date of Last Edit: June 15, 2015.

Product Use: Used as a micronutrient in fertilizer and feed supplements, may also be used as a floatation additive in mining.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health		Physical	Environmental
Acute Toxicity (Oral, Inhalation)	– Does not meet criteria	Does not meet criteria for any Physical Hazard	**Aquatic Toxicity – Short Term – Category 1**
Skin Corrosion/Irritation	– Does not meet criteria		
Eye Damage/Eye Irritation	**– Category 2A**		
Respiratory or Skin Sensitization	– Does not meet criteria		
Mutagenicity	– Does not meet criteria		
Carcinogenicity	– Does not meet criteria		
Reproductive Toxicity	– Does not meet criteria		
Specific Target Organ Toxicity			
Acute Exposure	– Does not meet criteria		
Chronic Exposure	– Does not meet criteria		

LABEL:

Symbols:

Signal Word:

WARNING

Hazard Statements	Precautionary Statements:
WARNING! Causes serious eye irritation. Very toxic to aquatic life.	Wear eye protection/face protection. Wash contaminated skin thoroughly after handling. Avoid release to the environment. Collect spillage. IF IN EYES: Rinse continuously with water for several minutes. If eye irritation persists: get medical advice/ attention.

Emergency Overview: A clear or slightly opaque solution that does not burn or readily decompose. It consists principally of dissolved zinc sulphate. The solution is relatively non-toxic to humans and poses little immediate hazard to personnel in an emergency situation but contains a high concentration of dissolved zinc and can pose a threat to watercourses.

Potential Health Effects: Direct eye contact with the solution may cause mild eye irritation. Dried residues may cause eye, nose & throat irritation and, when heated strongly in air, will generate zinc oxide fume. Inhalation of freshly formed zinc oxide fume can result in metal fume fever, a temporary flu-like condition (see Toxicological Information, Section 11).

Potential Environmental Effects: As this product is a solution, the contained zinc, in elevated concentrations, is directly bioavailable and is potentially toxic to aquatic and soil organisms and plants (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENTS	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Zinc Sulphate	7733-02-0	29-34%
Magnesium Sulphate	7487-88-9	0.4-1.5%
Manganese Sulphate	7785-87-7	0.3-0.5%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. If irritation occurs, cautiously rinse eyes with lukewarm, gently flowing water for 5 minutes, while holding the eyelids open. If eye irritation persists: Get medical advice/attention.

Skin Contact: *Symptoms:* Mild irritation. Rinse/wash with lukewarm, gently flowing water (and mild soap) for 5 minutes or until product is removed. If skin irritation occurs or you feel unwell: Get medical advice/attention.

Inhalation: *Symptoms:* Respiratory irritation. Get medical advice/attention if you feel unwell or are concerned.

Ingestion: *Symptoms:* Stomach upset. If swallowed, no specific intervention is indicated as this material is not likely to be hazardous by ingestion. If you feel unwell or are concerned: Get medical attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: This product is not considered a fire or explosion hazard.

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: As with any fire, fire fighters should be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Stop release if possible to do so safely. Contain spill, isolate hazard area, and deny entry. Pump back into system if possible. Otherwise absorb with any suitable absorbent such as vermiculite or clay. Place contaminated material in suitable, labeled containers for final disposal. Dispose of waste material consistent with the requirements of waste disposal authorities.

Personal Precautions: Impervious chemical-resistant gloves, rubber boots and coveralls or other protective clothing are recommended for persons responding to an accidental release (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with the solution.

Environmental Precautions: Spilled product can pose immediate risks to aquatic and terrestrial environments. Released product should be prevented from reaching soil or entering watercourses in the vicinity of product handling areas.

SECTION 7. HANDLING AND STORAGE

Store in a dry, cool, well-ventilated area away from incompatible substances.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

Component	ACGIH TLV	OSHA PEL	NIOSH REL
Zinc Sulphate	None Established	None Established	None Established
Magnesium Sulphate	None Established	None Established	None Established
Manganese Sulphate	0.02 mg Mn/m³ Respirable 0.1 mg Mn/m^3 Inhalable	5 mg Mn/m³ **Ceiling**	1 mg Mn/m³ TWA

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.
ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of aerosol mists well below recommended occupational exposure limits.

Protective Clothing: Impervious, chemical-resistant gloves are recommended when handling bulk solution. Eye protection should be worn where mist is generated and where any possibility exists that eye contact may occur.

Respirators: Where liquid aerosol mists are generated and cannot be controlled to within acceptable levels, use appropriate NIOSH-approved respiratory protection equipment (42 CFR 84 Class N, R or P-95 particulate filter as a minimum).

General Hygiene Considerations: Always practice good personal hygiene. Refrain from eating, drinking, or smoking in work areas. Thoroughly wash hands after handling and before eating, drinking, or smoking in appropriate designated areas only.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Clear to slightly opaque liquid	**Odour:** None	**Odour Threshold:** Not Applicable	**pH:** Approx. 4.5 – 5.0
Vapour Pressure: Negligible @ 20°C	**Vapour Density:** Not Applicable	**Freezing Point/Range:** No Data	**Boiling Point/Range:** No Data
Relative Density (Water = 1)**:** 1.25- 1.35	**Evaporation Rate:** Not Applicable	**Coefficient of Water/Oil Distribution:** No Data	**Solubility:** Aqueous Solution
Flash Point: None	**Flammable Limits (LEL/UEL):** Not Flammable	**Auto-ignition Temperature:** None	**Decomposition Temperature:** None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: This material is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur.

Incompatibilities: None have been identified.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting, electric arc welding or overheating of dried residues will generate zinc oxide fume which, on inhalation in sufficient quantity, can produce metal fume fever. Under such conditions, sulphur dioxide will also be generated and can cause respiratory distress.

SECTION 11. TOXICOLOGICAL INFORMATION

General: In the form in which this product is sold it is relatively non-toxic. The major route of exposure would be through the generation and inhalation of aerosol mist, or the generation of zinc oxide fume through welding or burning around dried residues.

Acute:
Skin/Eye: Contact with liquid may cause local irritation but would not cause tissue damage. Dust or fume from burning or welding on dried residues may also cause local irritation.

Inhalation: Acute inhalation of mists will result in irritation of the nose, throat and upper respiratory passages. Symptoms may include discomfort, coughing, tingling sensation, sneezing and/or shortness of breath and wheezing. Excessive heating of dried zinc sulphate residues will generate zinc oxide fume. If inhaled, this fume can result in the condition called metal fume fever. The symptoms of metal fume fever will occur within 3 to 10 hours of exposure, and include immediate dryness and irritation of the throat, tightness of the chest, and coughing which may later be followed by flu-like symptoms of fever, malaise, perspiration, frontal headache, muscle cramps, low back pain, occasionally blurred vision, nausea, and vomiting. The symptoms are temporary and generally disappear, without medical intervention, within 24 to 48 hours of onset. There are no recognized complications, after affects, or chronic affects that result from this condition.

Ingestion: Zinc sulphate is very astringent, and when ingested in excessive quantities, can irritate the stomach, resulting in nausea and spontaneous vomiting.

Chronic: Prolonged skin contact with zinc sulphate solution may cause skin dermatitis. Zinc, magnesium and manganese are not listed as carcinogens by the Occupational Safety and Health Administration (OSHA), the National Toxicology Program (NTP), the International Agency for Research on Cancer (IARC), or the American Conference of Governmental Industrial Hygienists (ACGIH).

Animal Toxicity:

Hazardous Ingredient:	Acute Oral Toxicity: †	Acute Dermal Toxicity:	Acute Inhalation Toxicity: ‡
Zinc Sulphate	1,538 mg/kg	No data	No data
Magnesium Sulphate	>5,000 mg/kg	No data	No data
Manganese Sulphate	2,150 mg/kg	No data	No data

† LD_{50}, Rat, Oral, ‡ LC_{50}, Rat, Inhalation, 4 hour

SECTION 12. ECOLOGICAL INFORMATION

In elevated concentrations, zinc sulphate in solution is potentially toxic to aquatic and terrestrial organisms. However, processes in the environment may alter its bioavailability in diluted form. In aquatic systems, zinc has the potential to bioaccumulate in both plants and animals. In terrestrial systems, the mobility of zinc in soil depends primarily on soil conditions, such as cation exchange capacity, pH, redox potential, and chemical species present in the soil. Zinc also bioaccumulates in terrestrial plants, vertebrates, and mammals, with plant uptake from soil dependent on plant species, soil pH, and soil composition.

SECTION 13. DISPOSAL CONSIDERATIONS

Do not wash down drain. Dike area around spill and pump uncontaminated solution back to process if possible, then absorb any remaining liquid in a solid absorbent such as vermiculite or clay. Place contaminated material in suitable, labeled containers for final disposal. Dispose of waste material consistent with the requirements of waste disposal authorities.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME U.S. DOT ..... Environmentally Hazardous Substance, Liquid, n.o.s. (contains Zinc Sulfate)
TRANSPORT CANADA CLASSIFICATION ..... Not regulated
U.S. DOT CLASSIFICATION..... Class 9, Packing Group III (RQ)
PRODUCT IDENTIFICATION NUMBER..... UN3082
MARINE POLLUTANT..... No
IMO CLASSIFICATION ..... Not regulated

SECTION 15. REGULATORY INFORMATION

U.S.

INGREDIENTS LISTED ON TSCA INVENTORY..... Yes
HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD..... No Ingredients Qualify
CERCLA SECTION 103 HAZARDOUS SUBSTANCES ..... Zinc Sulfate.....RQ: 1,000lbs.
Manganese Compounds ...RQ: None Assigned
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE..... No Ingredients Qualify
EPCRA SECTION 311/312 HAZARD CATEGORIES..... No Hazard Categories Apply
EPCRA SECTION 313 TOXIC RELEASE INVENTORY:..... Zinc Compounds (Zinc Sulfate)
CAS No. 7733-02-0
Percent by Weight 29-34%
Manganese Compounds (Manganese Sulfate)
CAS No. 7785-87-7
Percent by Weight 0.3-0.5%

SECTION 16. OTHER INFORMATION

Date of Original Issue: May 9, 2001 **Version:** 01 *(First edition)*
Date of Latest Revision: June 15, 2015 **Version:** 10

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, 2015, Guide to Occupational Exposure Values.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben Ed.) 1995.
- Canadian Centre for Occupational Health and Safety (CCOHS) CHEMpendium Chemical Information Data Base, 2015.
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 31 January 2015.
- International Agency for Research on Cancer (IARC), Monograms on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards. CD-ROM Edition, September 2005.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, Registry of Toxic Effects of Chemical Substances (RTECS) online version last accessed 2010-06-29.
- U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, National Toxicology Program (NTP), 11th Report on Carcinogens, January 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck Metals Ltd. extends no warranty and assumes no responsibility for the accuracy of the content and expressly disclaims all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Acetylene	**Trade Name:**	Acetylene
Product Use:	Metal industry: Welding and cutting of metals.		
Chemical Name:	Acetylene	**Synonym:**	Acetylen, Ethine, Ethyne, Narcylene
Chemical Formula:	C_2H_2	**Chemical Family:**	Alkyne
Telephone:	**Emergencies:** * 1-800-363-0042	**Supplier /Manufacture:**	Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
		Phone:	905-803-1600
		Fax:	905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Hazards Identification

Emergency Overview

DANGER! **Flammable gas under pressure. Can form explosive mixtures with air. Fusible plugs in top, bottom, or valve melt at 98 - 104 C. Do not discharge at pressures above 103 kPa. May cause dizziness and drowsiness. Self-contained breathing apparatus may be required by rescue workers. At normal temperature and pressure, commercial acetylene is a colourless gas with a distinctive garlic-like odour.**

ROUTES OF EXPOSURE: Inhalation.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION: Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headaches, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconciousness. The vapour from a liquid (acetone) release may also cause incoordination and abdominal pain. Lack of oxygen can kill.

SKIN CONTACT: No harm expected. Liquid (acetone) may cause frostbite.

SKIN ABSORPTION: No harm expected. Liquid (acetone) may cause frostbite.

SWALLOWING: An unlikely route of exposure, but frostbite of the lips and mouth may result from contact with the liquid (acetone). If swallowed, the liquid may cause nausea.

EYE CONTACT: Vapour containing acetone may cause irritation. Liquid (acetone) may cause irritation and frosbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

NOTE: Acetylene cylinders are filled with a porous material containg acetone into which the acetylene is dissolved. ACGIH has established a TLV-TWA of 500 ppm for acetone and a STEL of 750 ppm.

WORKING WITH WELDING AND CUTTING MAY CREATE ADDITIONAL HEALTH HAZARDS. FUMES AND GASES can be dangerous to your health and may cause serious lung disease.* Keep your head out of the fumes. Do not breathe fumes and gases caused by the process. Use enough ventilation, local exhaust, or both to keep fumes and gases from your breathing zone and the general area. The type and amount of fumes and gases depend on the equipment and supplies used. Possibly dangerous materials may be found in fluxes, coatings, gases, metals etc. Obtain a Material Safety Data Sheet (MSDS) for each material used. Air samples can be used to find out what respiratory protection is needed. Short term overexposure to fumes may result in discomfort such as dizziness, nausea, or dryness or irritation of nose, throat, or eyes.

***NOTES TO PHYSICIAN:**

Acute: Gases, fumes, and dusts may cause irritation to the eyes, lungs, nose, and throat. Some toxic gases associated with welding and related processes may cause pulmonary edema, asphyxiation, and death. Acute overexposure may include signs and symptoms such as watery eyes, nose and throat irritation, headache, difficulty breathing frequent coughing, or chest pains.

Chronic: Protracted inhalation of air contaminants may lead to their accumulation in the lungs, a condition which may be seen as dense areas on chest x-rays. The severity of change is proportional to the length of exposure. The changes seen are not necessarily associated with symptoms or signs of reduced lung function or disease. In addition, the changes on x-rays may be caused by non-work related factors such as smoking, etc.

OTHER EFFECTS OF OVEREXPOSURE:

None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Repeated or prolonged exposure is not known to aggravate medical condition.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

3. Composition and Information on Ingredients

COMPONENTS	CAS NUMBER	CONCENTRATION % by Mole
Acetylene	74-86-2	>99.9*

*Note: Acetylene cylinders are filled with a porus material containing acetone (CAS 67-64-1)into which the acetylene is dissolved.

4. First Aid Measures

INHALATION:

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

SKIN CONTACT:

In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

SWALLOWING:

If liquid is swallowed, do not induce vomiting. Call a physician.

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. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN:

Aspired acetone may cause severe lung damage. If a large quantity of material has been swallowed, stomach contents should be evacuated quickly in a manner which avoids aspiration. Otherwise, treatment should be directed at the control of symptoms and the clinical condition. No specific antidote is known.

5. Fire Fighting Measures

FLAMMABLE : Yes. **IF YES, UNDER WHAT CONDITIONS?** See "Unusual Fire and Explosion Hazards" in this section.

EXTINGUISHING MEDIA: See paragraphs below.

PRODUCTS OF COMBUSTION: These products are carbon oxides (CO, CO2).

PROTECTION OF FIREFIGHTERS:

DANGER! Refer to CGA safety bulletin SB-4, "Handling Acetylene Cyinders in Fire Situations". Evacuate all personnel from danger area. Immediately cool containers with water spray from maximum distance taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidently extinguished, explosive re-ignition may occur. Use self-contained breathing apparatus. Stop flow of gas if without risk while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out.

SPECIFIC PHYSICAL AND CHEMICAL HAZARDS:

Extremely flammable gas. Forms explosive mixtures with air and oxidizing agents. Container may rupture due to heat of fire. Do not extinguish flames due to possibility of explosive re-ignition. No part of a container should be subjected to temperature higher than 52 C. Most containers are provided with a pressure relief device designed to vent contents when they are exposed to elevated temperature. Contact with copper, silver, or mercury or their alloys or halogens can cause explosion. Vapours form from this product and may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved device.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Possible, See Section 7.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS:

Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

FLAMMABLE LIMITS IN AIR, % by volume:

LOWER: 2.5 **UPPER:** 100

FLASH POINT: CLOSED CUP: -17.8°C (0°F). (Tag)

AUTOIGNITION TEMPERATURE: 305°C (581°F)

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Personal Precautions:

DANGER! **Flammable, high-pressure gas.** Forms explosive mixtures with air. Immediately evacaute all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce gas with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable gas may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

Environmental Precautions:

Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING:

Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. All piped acetylene systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Leak check with soapy water; never use a flame. Never use copper piping for acetylene service; use only steel or wrought iron. Open acetylene cylinder valves the minimum amount required for acceptable flow; this will allow you to close valves as quickly as possible in an emergency. Do not open acetylene cylinder valves more than 1½ turns. Never use acetylene at pressures exceeding 103.5 kPa (15 psig). Acetylene cylinders are heavier than other cylinders because they are packed with a porous material and acetone. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using acetylene, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6.1 m or use a barricade of non-combustible material. This barricade should be at least 1.53 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Flammable high-pressure gas. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. ***May form explosive mixtures with air.*** Ground all equipment. ***Gas can cause rapid suffocation due to oxygen deficiency.*** Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. ***Prevent reverse flow.*** *Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder.* ***When returning cylinder to supplier,*** *be sure valve is closed, then install valve outlet plug tightly.* ***Never work on a pressurized system.*** *If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak.* ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

RECOMMENDED PUBLICATIONS:

Additional information on storage, handling, and use of this product is provided in **NFPA 55:** ***Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders***, published by the National Fire Protection Association.

See also Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

INGREDIENTS	CAS NUMBER	LD_{50} (Species & Routes)	LC_{50} (Rat, 4 hrs.)	Exposure Limits
Acetylene	74-86-2	Not available.	Not available.	Simple asphyxiant.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH):

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. Train the worker to keep his head out of the fumes.

MECHANICAL (General): Use a local exhaust system, if necessary, to maintain an adequate supply of oxygen in the worker's breathing zone.

SPECIAL: Use only in a closed system.

OTHER: Use local exhaust ventilation or handle in a ventilated enclosure.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV (acetone) or the applicable TLVs for fumes, gases, and other by-products of welding with acetylene. Select in accordance with the provincial regulations or guidelines. Selection should also be based on the current CSA standards Z94.4, "Selection, care and use of respirators". Respirators should be approved by NIOSH and MSHA

SKIN PROTECTION: Welding gloves recommended.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE:	Gas.	**FREEZING POINT:**	-82.2°C (-116°F) 6170 KPa abs	**pH:**	Not applicable.
BOILING POINT	-75.2°C (-103.4°F) 6170 KPa abs	**VAPOUR PRESSURE**	4476.8 kPa (@ 20°C)	**MOLECULAR WEIGHT:**	26.04 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1)	Not applicable.	**SOLUBILITY IN WATER,**	Not applicable.		
SPECIFIC GRAVITY: VAPOUR (air = 1)	0.906	**EVAPORATION RATE** (Butyl Acetate=1):	Not applicable.	**COEFFICIENT OF WATER/OIL DISTRIBUTION:**	Not applicable.
VAPOUR DENSITY:	0.00117 g/ml @ 0 C	**% VOLATILES BY VOLUME:**	100% (v/v).	**ODOUR THRESHOLD:**	657 mg/m3

APPEARANCE & ODOUR: Colourless. Odour: Acetylene of 100% purity is odourless, but commercial acetylene has a distinctive garlic-like odour.

10. Stability and Reactivity

STABILITY:	Unstable.
CONDITIONS OF CHEMICAL INSTABILITY:	Stable as shipped. Avoid use at pressure above 15 psig.
INCOMPATIBILITY (materials to avoid):	Avoid contact with copper, silver, mercury or their alloys, oxidizing agents, acids, halogens, moisture.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition or burning may produce carbon monoxide/carbon dioxide. The welding and cutting process may form reaction products such as carbon monoxide and carbon dioxide.
HAZARDOUS POLYMERIZATION:	Will not occur.
CONDITIONS TO AVOID:	Elevated temperatures and pressures and/or presence of a catalyst.
CONDITIONS OF REACTIVITY:	Fire or explosion mayresult from use at elevated temperatures & pressures or from use with incompatible materials.

11. Toxicological Information

ACUTE DOSE EFFECTS: No known effects from acetylene gas. The welding process may generate hazardous fumes and gases. (See section 8, 10, 15 and 16.)

STUDY RESULTS:

None known.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Acetylene, dissolved

HAZARD CLASS:	IDENTIFICATION #:	PRODUCT REPORTABLE QUANTITY (PRQ):
CLASS 2.1: Flammable gas.	UN1001	Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more.

SHIPPING LABEL(s): Flammable gas

PLACARD (When Required): Flammable gas

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS (Canada): CLASS A: Compressed gas.
CLASS B-1: Flammable gas.
CLASS F: Dangerously reactive material.

This product is on the DSL list.

International Regulations:

EINECS: Not available.

DSCL (EEC): This product is not classified according to the EU regulations.

International Lists: No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH	2
FLAMMABILITY	4
PHYSICAL HAZARD	2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	CGA-510, CGA-520, CGA-200
PIN-INDEXED YOKE:	None.
ULTRA-HIGH-INTEGRITY CONNECTION:	None.

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

AV-1	Safe Handling and Storage of Compressed Gas
G-1	Acetylene
G-1.1	Commodity Specification for Acetylene
G-1.2	Recommendation for Chemical Acetylene Metering
G-1.3	Acetylene Transmission for Chemical Synthesis
P-1	Safe Handling of Compressed Gases in Containers
P-14	Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmosphere
SB-2	Oxygen-Deficient Atmospheres
V-1	Compressed Gas Cylinder Valve Inlet and Outlet Connections
V-7	Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
---	Handbook of Compressed Gases, Fifth Edition

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

PREPARATION INFORMATION:

DATE:	**Oct 15, 2016**
DEPARTMENT:	**Safety and Environmental Services**
TELEPHONE:	**905-803-1600**

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety nformation, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

Praxair Canada Inc.
1 City Centre Drive
Suite 1200
Mississauga, ON L5B 1M2

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Oxygen	**Trade Name:**	Oxygen, Medipure®
Product Use:	Many.		
Chemical Name:	Oxygen	**Synonym:**	Dioxygen
Chemical Formula:	O_2	**Chemical Family:**	Permanent Gas.
Telephone:	**Emergencies:** * 1-800-363-0042	**Supplier /Manufacture:**	Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
		Phone:	905-803-1600
		Fax:	905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Hazards Identification

Emergency Overview

WARNING! **High pressure, oxidizing gas. Vigorously accelerates combustion. Self-contained breathing apparatus may be required by rescue workers.**

ROUTES OF EXPOSURE: Inhalation.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION: Breathing 80% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing oxygen at higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness and convulsions. Breathing of oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.

SKIN CONTACT: No harm expected.

SKIN ABSORPTION: No evidence of adverse effects from available information.

SWALLOWING: This product is a gas at normal temperature and pressure.

EYE CONTACT: No evidence of adverse effects from available information.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

No evidence of adverse effects from available information.

OTHER EFFECTS OF OVEREXPOSURE:

See "Notes to Physician", in the "First Aid" section.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

See "Notes to Physician", in the "First Aid" section.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None currently known.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

3. Composition and Information on Ingredients

COMPONENTS	CAS NUMBER	CONCENTRATION % by Mole
Oxygen	7782-44-7	100

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. Keep patient warm and at rest. Get medical attention. Advise the physician that the victim has been exposed to high concentration of oxygen.

SKIN CONTACT:

No harm expected.

SWALLOWING:

This product is a gas at normal temperature and pressure.

EYE CONTACT:

No harm expected.

NOTES TO PHYSICIAN:

Supportive treatment should include immediate sedation, anti-convulsive therapy if needed, and rest. Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increase the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity. Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachian tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce "vacuum-type" headache. Newborn premature infants exposed to high oxygen concentrations may suffer delayed retinal damage, which can progress, to retinal detachment and blindness (retrolental fibroplasia). Retinal damage can also occur in adults exposed to 100% oxygen under greater that atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised.

All individuals exposed for only periods to oxygen at high pressure and all that exhibit overt oxygen toxicity should have ophthalmologic examination.

5. Fire Fighting Measures

FLAMMABLE : No. **IF YES, UNDER WHAT CONDITIONS?** VigorousLy acceLerates combustion.

EXTINGUISHING MEDIA:

Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (i.e., safety shower) is the preferred extinguishing media for clothing fires.

PRODUCTS OF COMBUSTION:

None.

PROTECTION OF FIREFIGHTERS:

WARNING! Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk.

SPECIFIC PHYSICAL AND CHEMICAL HAZARDS:

Oxidizing agent, vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion. Container may rupture due to heat of fire. Vapours are extremely irritating. Contact may cause burns to skin and eyes. No part of a container should be subjected to a temperature higher than 52 C. See incompatibility in Section 10. Most containers are provided with a pressure relief divice designed to vent contents when they are exposed to elevated temperature. Smoking, flames and electrric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Not applicable.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS:

Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

FLAMMABLE LIMITS IN AIR, % by volume:

LOWER: Not applicable. **UPPER:** Not applicable.

FLASH POINT:

Not applicable.

AUTOIGNITION TEMPERATURE:

Not applicable.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Personal Precautions:

WARNING! Shut off flow if you can do so without risk. Ventilate area or move cylinder to a well-ventilated area. Remove all flammable materials from vicinity. Oxygen must never be permitted to strike an oily surface, greasy clothes, or other combustible material.

Environmental Precautions:

Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, provincial, and local regulations. If necessary call your local supplier.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING:

Use piping and equipment adequately designed to withstand pressures to be encountered. Ground all equipment. Store and use with adequate ventilation at all times. Use only in a closed system constructed of corrosion resistant materials. NOTE: Reverse flow into cylinder may cause rupture. Use a check valve or other protective apparatus in any lines or piping from the cylinder to prevent reverse flow. For additional information refer to CGA pamphlet P-1. (See section 16 for more details).

WHEN USED IN WELDING AND CUTTING: Read and understand the namufacturer's instructions and the precautionary label on the product. See American Standard Z49.1 "Safety in Welding and Cutting" published by the American Welding Society, P.O. Box 351040, Miami, Florida, 33135.

Note: Suitability for use as a component in underwater breathing gas mixtures is to be determined by or under the

supervision of personnel experienced in the use of underwater breathing gas mixtures. Become familiar with the effects, methods, frequency and duration of use, hazards, side effects and precautions to be taken.

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6 m or use a barricade of non-combustible material. This barricade should be at least 1.5 m high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 52 C. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods. For additional information refer to CGA pamphlet P-2305(for welding and cutting). See section 16.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

High-pressure, oxidizing gas. Use piping and equipment adequately designed to withstand pressures to be encountered. ***Vigorously accelerates combustion.*** *Keep oil, grease, and combustibles away.* ***Store and use with adequate ventilation at all times.*** *Close valve after each use; keep closed even when empty.* ***Prevent reverse flow.*** *Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder.* ***When returning cylinder to supplier,*** *be sure valve is closed, then install valve outlet plug tightly.* ***Never work on a pressurized system.*** *If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak.* ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

RECOMMENDED PUBLICATIONS:

Additional information on storage, handling, and use of this product is provided in **NFPA 55:** ***Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders***, published by the National Fire Protection Association.

See also Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

INGREDIENTS	CAS NUMBER	LD_{50} (Species & Routes)	LC_{50} (Rat, 4 hrs.)	Exposure Limits
Oxygen	7782-44-7	Not applicable.	Not applicable.	None.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH):

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST: Use a local exhaust system, if necessary, to prevent increased oxygen concentration and, in welding, to keep hazardous fumes and gases below applicable TLVs in the worker's breathing zone.

MECHANICAL (General): General exhaust ventilation may be acceptable if it can maintain a supply of air that is not too rich in oxygen an, during welding, can keep hazardous fumes and gases below the applicable TLVs in the worker's breathing zone.

SPECIAL: None.

OTHER: None.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: None required under normal use. However, air-supplied respirators are required while working in confined spaces with this product. For welding, use air-purifying or air-supplied respirators, as appropriate, where local or general exhaust ventilation is inadequate. Adequate ventilation must keep worker exposure below applicable TLVs for fumes, gases and other by-products of welding with oxygen. Selection should be based on the current CSA standard Z94.4, “Selection, Care, and Use of Respirators”. Respirators should be approved by NIOSH and MSHA.

SKIN PROTECTION: Wear work gloves when handling cylinders.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE:	Gas.	**FREEZING POINT:**	-218.78°C (-361.8°F)	**pH:**	Not applicable.
BOILING POINT	-182.96°C (-297.3°F)	**VAPOUR PRESSURE**	Not applicable.	**MOLECULAR WEIGHT:**	32 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1)	Not applicable.	**SOLUBILITY IN WATER,**	Negligible.		
SPECIFIC GRAVITY: VAPOUR (air = 1)	1.105 g/ml @ 21.1°C	**EVAPORATION RATE** (Butyl Acetate=1):	Not applicable.	**COEFFICIENT OF WATER/OIL DISTRIBUTION:**	Not applicable.
VAPOUR DENSITY:	0.0013 g/ml @ 21.1°C	**% VOLATILES BY VOLUME:**	100% (v/v).	**ODOUR THRESHOLD:**	Ordourless.
APPEARANCE & ODOUR:	Colourless.	Odourless.			

10. Stability and Reactivity

STABILITY:	The product is stable.
CONDITIONS OF CHEMICAL INSTABILITY:	Compatibility with plastics should be confirmed prior to use.
INCOMPATIBILITY (materials to avoid):	Combustible materials, asphalt, flammable materials, especially oils and greases. Oxygen reacts with many materials.
HAZARDOUS DECOMPOSITION PRODUCTS:	None.
HAZARDOUS POLYMERIZATION:	Will not occur.

CONDITIONS TO AVOID: None known.

CONDITIONS OF REACTIVITY: None known.

11. Toxicological Information

ACUTE DOSE EFFECTS: The welding process may generate hazardous fumes and gases. See Sections 10 and 16 for additional information.

STUDY RESULTS:

At atmospheric concentration and pressure, oxygen poses no toxicity hazards. At high concentrations, newborn premature infants may suffer delayed retinal damage (retrolental fibroplasia) that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hours) or at greater than atmospheric pressure, particularly in individuals whose retinal circulation has been previously compromised. All individuals exposed for long periods to oxygen at high pressure and all who exhibit overt oxygen toxicity should have ophthalmologic examinations.

At two or more atmospheres, toxicity to the Central Nervous System (CNS) occurs. Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes, and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours; at six atmospheres, in only a few minutes.

Patients with chronic obstructive pulmonary disease retain carbon dioxide abnormally. If oxygen is administered, raising their blood oxygen concentration, their breathing becomes depressed and retained carbon dioxide rises to a dangerous level.

Animal studies suggest that the administration of certain drugs, including phenothiazine drugs and chloroquine, increases the susceptibility to toxicity from oxygen at high concentrations or pressures. Animal studies also indicate that vitamin E deficiency may increase susceptibility to oxygen toxicity.

Airway obstruction during high oxygen tension may cause alveolar collapse following absorption of the oxygen. Similarly, occlusion of the eustachians tubes may cause retraction of the eardrum and obstruction of the paranasal sinuses may produce vacuum-type headache.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Oxygen, Compressed

HAZARD CLASS:	**IDENTIFICATION #:**	**PRODUCT REPORTABLE QUANTITY(PRQ):**
CLASS 2.2(5.1): Non-flammable,non-corrosive, non-toxic and oxidizing material	UN1072	Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more·

SHIPPING LABEL(s):	Special Oxidizer with Class 2 at bottom.
PLACARD (When Required):	Special Oxidizer with Class 2 at bottom.

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, provincial, and local regulations. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

WHMIS (Canada): CLASS A: Compressed gas.
CLASS C: Oxidizing material.

This product is on the DSL list.

International Regulations:

EINECS: Not available.

DSCL (EEC): R8- Contact with combustible material may cause fire.

International Lists: No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMIS RATINGS:

HEALTH	**0**
FLAMMABILITY	**0**
PHYSICAL HAZARD	**3**

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	0-3000 psig CGA-540 3001-4000 CGA-577 4001-5500 CGA-701
PIN-INDEXED YOKE:	CGA-870
ULTRA-HIGH-INTEGRITY CONNECTION:	CGA-714

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

AV-1	Safe Handling and Storage of Compressed Gases
AV-8	Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen
G-4	Oxygen
G-4.1	Cleaning Equipment for Oxygen Service
G-4.3	Commodity Specification for Oxygen
P-1	Safe Handling of Compressed Gases in Containers
P-2	Characteristics and Safe Handling of Medical Gases
P-14	Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres
SB-8	Use of Oxy-Fuel Gas Welding and Cutting Apparatus
V-1	Compressed Gas Cylinder Valve Inlet and Outlet Connections
---	Handbook of Compressed Gases, Fifth Edition

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

PREPARATION INFORMATION:

DATE: **October 15, 2016**

DEPARTMENT: **Safety and Environmental Services**

TELEPHONE: **905-803-1600**

The opinions expressed herein are those of qualified experts within Praxair Canada Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety nformation, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

Praxair Canada Inc.
1 City Centre Drive
Suite 1200
Mississauga, ON L5B 1M2

Material Safety Data Sheet

Section 1 – Product and Company Information

Product Name: Propane

Trade Name: LPG (Liquefied Petroleum Gas)

WHMIS Classification: Class A – Compressed Gas
Class B, Division I – Flammable Gas

Chemical Formula: C3H8

Supplier: Super-Save Enterprises Ltd. dba Super Save Propane
19395 Langley Bypass
Surrey, BC V3S 6K1
1-800-665-2800

Non-Medical Emergency: 24 hour Emergency Contact
CANUTEC – (613) 996-6666

Application and Use: Propane is commonly used as fuel for heating, cooking, automobiles, forklift trucks, crop drying and welding and cutting operations. Propane is used in industry as a refrigerant, solvent and as a chemical feedstock. **Propane is highly flammable.**

Section 2 – Hazardous Ingredients

Components	CAS Registry No.	Proportion of Product	LC50	LD50
Propane	74-98-6	95% – 98%	N/A	N/A
Ethane	74-84-0	3% - 5%	N/A	N/A
Butane	106-97-8	1% - 3%	N/A	N/A
Iso-Butane	75-28-5	0.1% - 0.3%	N/A	N/A
Methane	74-82-8	0.1% - 0.2%	N/A	N/A

Note: Composition given is typical for Grade 1 Propane; exact composition will vary from shipment to shipment.
N/A = not available

Section 3 – Chemical and Physical Data

Form:	When stored under pressure – liquid and/or vapour	**Coefficient of Water/Oil Distribution:**	Not available
Boiling Point:	-42°C atm	**PH:**	Not available
Freezing Point:	-188°C	**Soluble in Water:**	6.1% by Volume @ 17.8°C and 753 mmHg
Evaporation Rate:	Rapid (Gas at Normal Ambient Conditions)	**Specific Gravity:**	0.51 (Water = 1)
Vapour Pressure:	1,013 (kPa) @ 26.0°C	**Odour Threshold:**	4800 PPM
Vapour Density:	1.52 (Air = 1)		

Appearance: Colourless liquid and vapour while stored under pressure. Colourless and odourless gas in natural state at any concentration. Commercial propane has an odorant added with is commonly ethyl mercaptan, which has an odour similar to boiling cabbage or rotten eggs. Odourants are not completely effective warning agents in all cases; certain odourants are polar and/or chemically reactive and may be depleted by reaction or absorption; sensitivity to odourants differs from person to person.

Section 4 – Fire and Explosion Hazard

Flash Point:	-103.4°C	**Method:**	Closed Cup
Flammable Limits:	Lower 2.4%, Upper 9.5%		
Auto Ignition Temperature:	432°C		
Products Evolved Due to Heat or Combustion:	Carbon monoxide can be produced when primary and secondary airs are deficient while combustion is taking place.		
Fire and Explosive Hazards:	Explosive air-vapour mixtures may form if allowed to leak to atmosphere.		
Sensitivity to Impact:	No	**Sensitivity to Static Discharge:**	Yes

Fire Extinguishing Precautions: DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS THE LEAK CAN BE STOPPED. Use water spray to cool exposed cylinders or tanks. Fire can be extinguished with carbon dioxide and/or dry chemical (BC). Container metal shells require cooling with water to prevent flame impingement and the weakening of metal. If weakening occurs, the area must be evacuated. If gas has not been ignited, liquid and vapour may be dispersed by water spray or flooding. Apply cooling water to containers that are exposed to flames until well after fire is out. Stay away from ends of tanks. Containers exposed to fire may explode or vent through pressure-relief devices.

Unusual Fire and Explosion Hazards: The highly flammable vapours are heavier than air and may accumulate in low area and/or spread along the ground to distant ignition sources and flash back.

Special Fire Fighting Equipment: Protective clothing (thermal protective clothing when the fire involves liquefied propane), hose monitors, fog nozzles, self-contained breathing apparatus.

Section 5 – Reactivity Data

Stability:	Stable
Conditions to Avoid:	Keep separate from oxidizing agents. Gas explodes spontaneously when mixed with chlorine dioxide.
Incompatibility:	Remove sources of ignition and observe distance requirements for storage tanks from combustible material, drains, and openings to buildings.
Hazardous Decomposition Products:	Deficient primary and secondary air can produce carbon monoxide.
Hazardous Polymerization:	Will not occur.

Section 6 – Toxicological Properties of Material

Routes of Exposure: Eyes, Skin, Respiratory System (Ingestion not considered to be a hazard)
As a gas, exposure has no known health effects on eye or skin contact. Liquid can cause burns if in direct contact with skin (frostbite) or eyes (“cold burns”).

Respiratory System: Little physiological effect at concentrations below 10,000 PPM. Exposure to concentrations above 10,000 PPM may cause dizziness, unconsciousness and death due to asphyxiation. Propane is classified as an asphyxiate by the American Conference of Governmental Industrial Hygienists. There is no recommended “Threshold Limit Value.”

Chronic Exposure: No reported effects from long-term, low-level exposure.

Carcinogenicity, Teratogenicity, Mutagenicity: Not determined. Lead 210 may be found in tank sludge or scale and inner surfaces of equipment used to transfer propane (piping, hoses, pumps and compressors).

Section 7 – Preventative Measures

Eyes: Use of safety glasses with side shields, safety goggles or face shields.

Skin: Use insulated gloves when handling liquefied propane. Neoprene and nitrile gloves are recommended. Protective apron and trousers worn over flame-retardant coveralls (ie Nomex) for handling liquefied propane.

Inhalation: In atmosphere, where the concentration of propane would reduce oxygen level below 18% in inhaled air, self - contained breathing apparatus is required. Respirator should be used where large propane concentration is anticipated, and the exposure level is unknown or where an oxygen-deficient atmosphere may exist.

Ventilation: The area where the product is used, stored and handled should be well ventilated. Ventilation equipment must be explosion-proof, and should be grounded and separate from other exhaust ventilation systems.

Section 8 – Emergency and first Aid Measures

First Aid:
Eyes: Should eye contact with liquid occur, flush eyes with lukewarm water for 15 minutes. Obtain immediate medical care.

Skin: Remove contaminated clothing. In case of “cold burn” from contact with liquid, immediately place affected area in lukewarm water and keep at this temperature until circulation returns. If fingers or hands are frostbitten, have the victim hold his hand next to his body such as the armpit. Obtain immediate medical care.

Inhalation: Move the victim to an area of fresh air. Give CPR or artificial respiration as needed, and give oxygen if breathing is difficult. Keep victim at rest and obtain immediate medical care.

Ingestion: Not expected to be a route of exposure.

Spill or Leak:
Eliminate leak if possible.
Eliminate source of ignition.
Ensure cylinder is upright.
Disperse vapours with hose streams using fog nozzles, watch for low area, as propane is heavier than air and can settle in low areas. Remain upwind of leak, keep people away.
Prevent vapour and/liquid from entering into sewers, basements or confined areas.
Do not touch spilled liquefied propane with bare skin to avoid frostbite/freeze burn.

Section 9 – Transportation, Handling and Storage

Transport and store cylinders and tanks secured in an upright position in a ventilated space, away from ignition source (so relief valve is in contact with vapour space of cylinder or tank).

Cylinders that are not in use must have the valves in the closed position and be equipped with a protective cap or guard.

Do not store with oxidizing agents, oxygen or chlorine cylinders.

Transport, handle and store according to applicable federal and provincial regulations (CGAB149.2).

TDG Classification: 2.1 (gas)
TDG Shipping Name: Liquefied Petroleum Gas (Propane)
TDG Special Provisions: 56, 90 and 102
PIN UN: 1075

Section 10 – Preparation Information

Prepared By: Super-Save Enterprises Ltd. dba Super Save Propane
(604) 533-4423
Date Prepared: July 2015

The information contained herein is believed to be accurate as of the date prepared. It is provided independently of any sale of the product. It is not intended to constitute performance information concerning the product. No express warranty or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product information contained herein, and neither Super-Save Enterprises Ltd. nor any of its affiliates, related entities or assigns assumes any liability whatsoever for the accuracy or completeness of the information provided herein. The customer or person receiving this information and product are to, at all times, make their own determination as to the suitability of the product for their particular purposes and are to inform themselves completely as to the proper use, safety protocols and risks associated with the product identified herein and such customer or person fully assumes the risk of use of such product.

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1052
Date: 10/02/2018
Supersedes: 06/10/2016

Product Identifier
Product Form: Mixture
Product Name: Bulk Emulsion

Other Means of Identification
Synonyms:

DYNO GOLD®
DYNO GOLD® LITE
EXTRAMITE 1000
RUG-1 (Canada Only)
TITAN® 1000
TITAN® 1000 GREEN
TITAN® 1000G
TITAN® 1000G GREEN
TITAN® XL1000
SMS 1116, 1116A, 1126P, 1136P, 1146P
DX5037
TITAN® 2000
TITAN® 2000G
TITAN® PB 1000
TITAN® PB 2000
TITAN® PB 2000 HF
TITAN® SME 1000
TITAN® SME 1000 GREEN
TITAN® XL1000 GREEN
TITAN® HD
TITAN® SME 2000
TITAN® 5000
TITAN® 5000 G

Intended Use of the Product
Industrial blasting applications as emulsion explosive precursor

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Ox. Liq. 2	H272
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304
Eye Irrit. 2B	H320

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS03 GHS07 GHS08

Signal Word (GHS-US) : Danger

Hazard Statements (GHS-US) : H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H304 – May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H320 – Causes eye irritation
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements (GHS-US) : P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P220 - Keep/Store away from clothing, combustible materials, combustibles
P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles
P233 - Keep container tightly closed
P260 - Do not breathe dust, fume, mist, spray, vapors
P264 - Wash exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P308+P313 - If exposed or concerned: Get medical advice/attention
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P370+P378 - In case of fire: Use appropriate media to extinguish
P403+P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards

Hazards Not Otherwise Classified (HNOC): Not available

Other Hazards: Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	45 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272

			Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Methylamine nitrate	(CAS No) 22113-87-7	0.1 – 3	Expl. 1.5, H205 Skin Corr. 1A, H314 Eye Dam. 1 – H318
**Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 10	Flam. Liq. 4, H227 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304

* This ingredient is not used in most products, including in GREEN-named products.
** This ingredient is not used in GREEN-named products.
Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).
Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything orally to an unconscious person. If you feel unwell, seek medical advice (provide this Safety Data Sheet to medical personnel).

Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing for at least 15 minutes. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

Most Important Symptoms and Effects Both Acute and Delayed

General: May be harmful if swallowed. May cause eye or skin irritation.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause eye irritation.

Ingestion: Likely to be harmful if swallowed.

Chronic Symptoms: Contains an ingredient which may cause cancer. Causes damage to organs through prolonged or repeated exposure.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.

Unusual Fire and Explosion Hazards: May explode or detonate under fire conditions. Burning material may produce toxic vapors.

Unsuitable Extinguishing Media: Not available

Special Hazards Arising from the Substance or Mixture

In large, intense fires the emulsion can behave more like an explosive and detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if a largeamount of emulsion is involved in a large fire.

Fire Hazard: May intensify fire; oxidizer. Will burn if exposed to heat, and in addition, will accelerate the burning of other combustibles, resulting in more rapid spread of fire.
Explosion Hazard: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials.
Advice for Firefighters
Precautionary Measures Fire: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.
Protection During Firefighting: When controlling fire before involvement of explosives or explosive precursors, fire-fighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.
Hazardous Combustion Products: Nitrogen oxides. Carbon oxides (CO, CO_2). Ammonia.
Other information: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.
Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
General Measures: Avoid all contact with skin, eyes, or clothing. Avoid breathing dust, mist, or spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition. Evacuate danger area.
For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.
For Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
For Containment: Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.
Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate state, federal and local regulations.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.
Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Do not puncture or incinerate containers.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.
Conditions for Safe Storage, Including Any Incompatibilities

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep /store away from combustible materials, extremely high or low temperatures, direct sunlight, ignition sources, incompatible materials.
Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Calcium nitrate	(CAS No) 10124-37-5	None	None
Methylamine nitrate	(CAS No) 22113-87-7	None	None
Fuels, diesel, no. 2	(CAS No) 68476-34-6	100 ppm	None
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	5 mg/m^3 (mist)	None

Exposure Controls
Under normal conditions of use, over-exposure is not expected to occur.
Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas. Keep containers tightly sealed.
Personal Protective Equipment: Protective goggles. Gloves. Protective clothing.

Materials for Protective Clothing: Chemically resistant materials and fabrics.
Hand Protection: Wear chemically resistant protective gloves.
Eye Protection: Chemical goggles or face shield.
Skin and Body Protection: Not available.
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits. Under normal conditions of use and handling there is minimal likelihood for the this exposure limit to be reached.
Other Information: When using or handling, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Liquid
Appearance	:	Translucent to opaque viscous liquid.
Odor	:	Fuel
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butylacetate=1)	:	< 1
Melting Point	:	Not available
Freezing Point	:	Not available
Boiling Point	:	Not available
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available

Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not available
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	0.8 - 1.5 g/cc
Solubility	:	Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire. May accelerate the burning of other combustible materials.

Chemical Stability: May intensify fire. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

Incompatible Materials: Corrosives, strong acids, strong bases and alkalis.

Hazardous Decomposition Products: Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

SECTION 11 - TOXICOLOGICAL INFORMATION

Under normal conditions of use, over-exposure is not expected to occur. Minor skin exposure is most likely.

Information on Toxicological Effects - Product

Acute Toxicity: Harmful if swallowed.

LD50 and LC50 Data: ATE Oral 1,510 (mg/kg)

Skin Corrosion/Irritation: Causes skin irritation.

Serious Eye Damage/Irritation: May cause eye irritation

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Contains a substance which has been shown to cause cancer in laboratory animals. IARC Group 2A Probably carcinogenic to humans.

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure.

Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: May be fatal if swallowed and enters airways.
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: May cause eye irritation.
Symptoms/Injuries After Ingestion: May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.
Chronic Symptoms: May cause cancer. May cause damage to organs through prolonged or repeated exposure.
Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg (REACH dossier 2950 mg/kg)
LC50 Inhalation Rat	> 88.8 mg/L/4h
ATE CLP (oral)	2217.000 mg/kg body weight

Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg (REACH dossier 3430 mg/kg)
ATE CLP (oral)	1267.000 mg/kg body weight

Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/L/4h

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Harmful to aquatic life with long lasting effects.

Ammonium nitrate (6484-52-2)	
LC50 Fish 1	95-102 mg/L (Exposure time: 48 h - Cyprinus carpio (Common carp))
EC 50 Aquatic Invertebrates	490 mg/L (Exposure time 48 h - Daphnia magna)

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/L (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/L (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Fuels, diesel, no. 2 (68476-34-6)	
LC50 Fish 1	35 mg/L (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Calcium nitrate (10124-37-5)	
LC50 Fish 1	10000 mg/L (Exposure time: 96 h - Species: Lepomis macrochirus [static])

Persistence and Degradability

Bulk Emulsion	
Persistence and Degradability	Not established.

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential	
Bulk Emulsion	
Bioaccumulative Potential	Not established.
Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
Sodium nitrate (7631-99-4)	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

Mobility in Soil Not available
Other Adverse Effects
Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Treatment Methods: Contact manufacturer for advice on proper disposal methods.
Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.
Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Label Codes : 5.1

Packing Group : II
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Hazard Class : 5.1
Identification Number : UN3375
Packing Group : II
Label Codes : 5.1
EmS-No. (Fire) : F-H
EmS-No. (Spillage) : S-Q

14.3 In Accordance with IATA

Proper Shipping Name : AMMONIUM NITRATE EMULSION
Identification Number : UN3375
Hazard Class : 5
Label Codes : 5.1

ERG Code (IATA) : 5L

14.4 In Accordance with TDG

No UN number exists for blasting intermediates for Transport Canada (use the following for Canadian shipments)
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332

Label Codes	: 1.5D	

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Bulk Emulsion

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard Reactive hazard Delayed (chronic) health hazard Fire hazard

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)

U.S. – California – Air Toxics “Hot Spots” (A-I)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. – Rhode Island – RTK (Right to Know) List

Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. – Rhode Island – RTK (Right to Know) List

Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

Canadian Regulations

Bulk Emulsion

WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

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

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 10/02/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
Ox. Liq. 2	Oxidizing liquids Category 2
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H227	Combustible liquid
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H318	Causes serious eye damage
H319	Causes serious eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure
H373	May cause damage to organs (Thymus, Liver, bone marrow) through prolonged or repeated exposure

Party Responsible for the Preparation of This Document

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Salt Lake City, Utah 84121
Phone: 801-364-4800

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Dyno Nobel SDS

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: **1063**
Date: **10/12/2018**
Supersedes: 02/02/2017

Product Identifier
Product Form: Mixture
Product Name: Packaged Emulsion Explosives

Trade Name(s):
Synonyms:

BLASTEX®
BLASTEX® PLUS
BLASTEX® TX
BLASTGEL® TX

Other Means of Identification
Product Class: Emulsion Explosives, Packaged

Intended Use of the Product:
Industrial blasting applications

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL **CHEMTREC (USA)** **800-424-9300**
CANUTEC (CANADA) **613-996-6666**

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture

Classification (GHS-US)
Expl. 1.5 H205

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS07

Signal Word (GHS-US) : Danger
Hazard Statements (GHS-US) : H205 – May mass explode in fire
Precautionary Statements (GHS-US) : P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P264 - Wash exposed areas. thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P373 - DO NOT fight fire when fire reaches explosives
P370+P380 - In case of fire: Evacuate area
P372 - Explosion risk in case of fire
P401 – Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.

P501 - Dispose of contents/container according to local, regional, national, and international regulations

Other Hazards

Hazards Not Otherwise Classified (HNOC): Not available
Other Hazards: None

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	65 - 85	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Sodium nitrate	(CAS No) 7631-99-4	0.1 – 10	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
Aluminum	(CAS No) 7429-90-5	0.1 - 3	Comb. Dust, H232 Flam. Sol. 1, H228 Water-react. 2, H261
Mineral Oil	(CAS No) 64742-54-7	0 – 2	Asp. Tox. 1, H304
Wax (paraffin)	(CAS No) 8002-72-2	0.0 – 2.2	Not Classified

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).
Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

This is a packaged product that will not result in exposure to the contents under normal conditions of use. In the event of contact, administer first aid appropriate for symptoms present.

General: Never give anything by mouth to an unconscious person. If exposed or concerned, seek medical advice and attention.

Inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing. Gently wash with plenty of soap and water followed by rinsing with water for at least 15 minutes. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do not induce vomiting. Immediately call a POISON CENTER or doctor/physician.

Most Important Symptoms and Effects Both Acute and Delayed

General: Avoid ingestion, contact with eyes or skin.

Inhalation: May cause respiratory irritation.

Skin Contact: May cause skin irritation.

Eye Contact: May cause serious eye irritation.

Ingestion: Seek medical attention.

Chronic Symptoms: None expected under normal conditions of use.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate

all personnel to a predetermined safe location, no less than 2,500 feet in all directions.
Unsuitable Extinguishing Media: DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS
Special Hazards Arising From the Substance or Mixture
Fire Hazard: Can explode or detonate under fire conditions. Burning material may produce toxic vapors.
Explosion Hazard: This product is an explosive with mass detonation hazard. Heating may cause an explosion.
Reactivity: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in a large quantity.

Advice for Firefighters
Firefighting Instructions: DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Guard against re-entry.
Protection During Firefighting: See above
Hazardous Combustion Products: Nitrogen Oxides (NO_x), Carbon Monoxide (CO). Ammonia.
Reference to Other Sections: Refer to section 9 for flammability properties.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures
General Measures: Avoid all contact with skin, eyes, or clothing. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition.
For Non-Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Evacuate unnecessary personnel.
For Emergency Personnel
Protective Equipment: Use appropriate personal protection equipment (PPE).
Emergency Procedures: Eliminate ignition sources. Ventilate area.

Environmental Precautions
Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up
Methods for Cleaning Up: Protect from all ignition sources. If no fire danger is present, and product is undamaged and/or uncontaminated, pick up or sweep up and repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State, and local spill reporting requirements.
Reference to Other Sections
See heading 8, Exposure Controls and Personal Protection. Concerning disposal elimination after cleaning, see section 13.

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling
This is a packaged product that will not result in exposure to the contents under normal conditions of use.
Additional Hazards When Processed: This product is an explosive and should only be used under the supervision of trained and licensed personnel. Use accepted safe industry practices when handling and using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work. Do not eat, drink or smoke when using this product.
Conditions for Safe Storage, Including Any Incompatibilities
Technical Measures: Store as defined in the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR Part 555.
Storage Conditions: Store in cool, dry, well-ventialated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of

heat. Isolate from incompatibles.
Incompatible Materials: Corrosives (strong acids and strong bases or alkalis)
Specific End Use(s) For industrial blasting applications.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Aluminum	(CAS No) 7429-90-5	10 mg/m^3 (dust)	15 mg/m^3 (total)
Mineral Oil	(CAS No) 64742-54-7	5 mg/m^3 (mist)	5 mg/m^3 (mist)
Wax (paraffin)	(CAS No) 8002-72-2	2-10 mg/m^3 (wax fume)	None

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

Exposure Controls
Appropriate Engineering Controls: Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal Protective Equipment: Gloves. Protective goggles. Protective clothing.
Materials for Protective Clothing: protective clothing.
Hand Protection: Protect against incidental skin contact.
Eye Protection: Chemical goggles or safety glasses.
Skin and Body Protection: Wear suitable protective clothing.
Respiratory Protection: Use a NIOSH-approved respirator or self-contained breathing apparatus whenever exposure may exceed established Occupational Exposure Limits.
Environmental Exposure Controls: Do not allow the product to be released into the environment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	White or pink opaque semi-solid, which will appear gray if product contains aluminum. Typically paper or plastic chub packaging.
Odor	:	Faint petroleum odor
Odor Threshold	:	Not available
pH	:	Not applicable
Evaporation Rate	:	< 1
Melting Point	:	Not applicable
Freezing Point	:	Not applicable
Boiling Point	:	Not applicable
Flash Point	:	Not applicable

Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Ammonium nitrate: 210 °C (410 °F)
Flammability (solid, gas)	:	Not applicable
Lower Flammable Limit	:	Not applicable
Upper Flammable Limit	:	Not applicable
Vapor Pressure	:	Not applicable
Relative Vapor Density at 20 °C	:	Not applicable
Relative Density	:	Not applicable
Density	:	1.20 - 1.30 g/cc
Specific Gravity	:	Not applicable
Solubility	:	Partially soluble in water
Partition coefficient: n-octanol/water	:	Not available
Viscosity	:	Not available
Explosive properties	:	Explosive; mass explosion hazard
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: Stable under normal conditions, may explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in a large quantity.
Chemical Stability: Stable under normal temperature and pressure.
Possibility of Hazardous Reactions: Hazardous polymerization will not occur.
Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.
Incompatible Materials: Corrosives (strong acids and strong bases or alkalis).
Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO), Ammonia

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product
Acute Toxicity: Not classified
LD50 and LC50 Data: Not available
Skin Corrosion/Irritation: Not classified
Serious Eye Damage/Irritation: May cause eye irritation.
Respiratory or Skin Sensitization: Not classified
Germ Cell Mutagenicity: Not classified
Teratogenicity: Not classified
Carcinogenicity: Not classified
Specific Target Organ Toxicity (Repeated Exposure): Not classified
Reproductive Toxicity: Not classified
Specific Target Organ Toxicity (Single Exposure): Not classified
Aspiration Hazard: Not classified
Symptoms/Injuries After Inhalation: May cause respiratory irritation.
Symptoms/Injuries After Skin Contact: May cause skin irritation.
Symptoms/Injuries After Eye Contact: Causes eye irritation.
Symptoms/Injuries After Ingestion: If ingested, seek medical attention.

Information on Toxicological Effects - Ingredient(s)
LD50 and LC50 Data:

Sodium nitrate (7631-99-4)

LD50 Oral Rat	> 2000 mg/kg
Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/L/4h

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Sodium nitrate (7631-99-4)	
LC50 Fish 1	2000 mg/L (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/L (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

Persistence and Degradability

Sodium nitrate (7631-99-4)	
Persistence and Degradability	**Readily biodegradable in water.**

Bioaccumulative Potential

Sodium nitrate (7631-99-4)	
Bioaccumulative Potential	Not expected to bioaccumulate.

Ammonium nitrate (6484-52-2)	
BCF fish 1	No bioaccumulation expected.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.

Toxicity Not classified

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

Additional Information: None

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E or Agent blasting, Type E

Hazard Class : 1.5D

Identification Number : UN0332

Label Codes : 1.5D

Packing Group : II

ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)

Hazard Class : 1.5D

Identification Number : UN0332

Label Codes : 1.5D
EmS-No. (Fire) : F-B
EmS-No. (Spillage) : S-Y

14.3 In Accordance with IATA
Proper Shipping Name : AGENT, BLASTING TYPE E
Identification Number : UN0332
Hazard Class : 1
Label Codes : 1.5D

ERG Code (IATA) : 1L

14.4 In Accordance with TDG
Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E
Packing Group : II
Hazard Class : 1.5D
Identification Number : UN0332
Label Codes : 1.5D

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Packaged Emulsion Explosives

Bureau of Alcohol Tobacco & Firearms (BATF)
Department of Transportation (DOT)
Mine Safety & Health Administration (MSHA)

Canadian Regulations

Packaged Emulsions

WHMIS Classification	**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

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

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 10/12/2018
Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

GHS Full Text Phrases:

Expl. 1.5	Explosive Category 1.5
H205	May mass explode in fire

Party Responsible for the Preparation of This Document
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Dyno Nobel SDS

Safety Data Sheet

SECTION 1 – IDENTIFICATION

Name, Address, and Telephone of the Responsible Party

Dyno Nobel Inc.
2795 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121
Phone: 801-364-4800 Fax 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com www.dynonobel.com

SDS #: 1020
Date: 09/10/2018
Supersedes: 05/15/2015

Product Identifier
Product Name: Superprill
Formula: NH4NO3

Other Means of Identification
Synonyms: Superprill™, Prilled Ammonium Nitrate, Industrial Grade LoDAN, Ammonium Nitrate, Industrial Grade HiDAN, Ammonium Nitrate, Agricultural Grade

Intended Use of the Product
Industrial applications

Emergency Telephone Number
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

SECTION 2 – HAZARD(S) IDENTIFICATION

Classification of the Substance or Mixture
Classification (GHS-US)

Ox. Sol. 3	H272
Eye Irrit. 2A	H319

Label Elements
GHS-US Labeling
Hazard Pictograms (GHS-US) :

GHS03 GHS07

Signal Word (GHS-US) : Warning

Hazard Statements (GHS-US) : H272 - May intensify fire; oxidizer
H319 - Causes serious eye irritation

Precautionary Statements (GHS-US) : P210 - Keep away from heat, sparks, open flames, hot surfaces. - No smoking
P220 - Keep/Store away from combustible materials, clothing, incompatible materials
P221 - Take any precaution to avoid mixing with combustibles, organic material, clothing, incompatible materials
P260 - Do not breathe fume, dust.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling
P270 - Do not eat, drink or smoke when using this product.
P273 - Avoid release to the environment.
P280 - Wear protective gloves, protective clothing, eye protection
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337+P313 - If eye irritation persists: Get medical advice/attention
P370+P378 - In case of fire: Use water only on AN fires.
P405 - Store locked up.
P501 - Dispose of contents/container according to local, regional, national, territorial, provincial, and international regulations*

*Do not perform hot work on contaminated equipment.

Other Hazards

Other Hazards: Aquatic Acute 3 H402

H402 – Harmful to aquatic life

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	98 - 100	Ox. Sol. 3, H272 Eye Irrit. 2A, H319

Full text of H-phrases: see section 16

SECTION 4 - FIRST AID MEASURES

Description of First Aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

Skin Contact: Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

Eye Contact: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

Ingestion: Rinse mouth. Do NOT induce vomiting. Seek medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Irritation to eyes, skin and respiratory tract.

Inhalation: May cause irritation to the respiratory tract, sneezing, coughing, burning sensation of throat with constricting sensation of the larnyx and difficulty breathing.

Skin Contact: May cause skin irritation.

Eye Contact: Causes serious eye irritation.

Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: None known.

Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If ingested, may cause methemoglobenemia – emergency response should treat appropriately, such as by intravenous administration of methylene blue.

SECTION 5 - FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Evacuate the area for 1 mile if ammonium nitrate is involved in a fire. Only water shall be used on ammonium nitrate fires. Dry chemical, foams, steam and smothering devices are not effective and can lead to possible explosion of the ammonium nitrate. General extinguishers may be used on fires **not involving the ammonium nitrate** such as conveyors, electrical equipment, tires, bearings, general plant equipment or the like when only minimal amounts of ammonium nitrate are present. For large fires use unmanned monitor nozzles if available.

Unsuitable Extinguishing Media: Dry chemical, carbon dioxide, or regular foam.

Special Hazards Arising From the Substance or Mixture In intense fires, the ammonium nitrate can melt and detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if the ammonium nitrate is involved in a fire.

Fire Hazard: May intensify fire; oxidizer. Will accelerate the burning of other combustibles, resulting in more rapid spread of fire.

Explosion Hazard: Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. Smothering, contact with organic material, or combustible material may cause an explosive situation.

Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials. Smothering,

contact with organic material, or combustible material may cause an explosive situation.

Advice for Firefighters

Precautions for Firefighting: Evacuate the area for 1 mile if ammonium nitrate is involved in a fire. Only fires which are in the initial or beginning stage or those involving minimal amounts of ammonium nitrate in a manufacturing setting or in an area where ammonium nitrate is stored or in vehicles transporting ammonium nitrate should be attacked using manual fire extinguishing methods (fire extinguishers, hose streams, etc.) that require a human operator. If a fire in an area where ammonium nitrate is stored or in vehicles transporting ammonium nitrate progresses beyond the incipient stage or involves the ammonium nitrate, evacuation is required. Fire fighters downwind from a fire should wear self-contained breathing apparatus. Fire fighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves and rubber boots.

Hazardous Combustion Products: Nitrogen oxides. Toxic fumes are released. Carbon oxides (CO, CO_2). Ammonia.

Additional Information: If a fire has not reached the ammonium nitrate, cool the ammonium nitrate or container thereof to prevent the fire from reaching it. Ammonium nitrate does not burn by itself and thus needs to be kept separate from combustible materials. Ammonium nitrate is an oxidizer and will significantly increase the burning rate of combustible materials.

When in confinement and in the presence of a strong detonation sources the material can explode when subject to sudden shock, pressure, or high temperatures. Avoid temperatures above 210 C (410 F) which may cause thermal decomposition or explosion, especially in confined or poorly ventilated spaces.

Do not allow run-off from fire fighting to enter drains or water courses.

Reference to Other Sections: Refer to section 9 for flammability properties. Not flammable.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Handle in accordance with good industrial hygiene and safety practice. Avoid breathing (dust, vapor, mist, gas). Avoid getting in eyes or on skin. Keep away from combustible material.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Use appropriate personal protection equipment (PPE).

Emergency Procedures: Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters.

Methods and Material for Containment and Cleaning Up

For Containment: Avoid generation of dust during clean-up of spills. Use a broom for small spills do not mix with other materials.

Methods for Cleaning Up: Collect spillage for possible reuse. Clean up spills immediately and dispose of waste safely. Contact competent authorities after a spill. Do not take up in combustible material such as: saw dust or cellulosic material.

Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

SECTION 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Additional Hazards When Processed: When heated to decomposition, emits toxic fumes. Smothering, contact with organic material, or combustible material in a fire situation may be an explosive situation. Do not puncture or incinerate container.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations 29 CFR 1910.109(i).

Storage Conditions: Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store

away from combustible materials, ignition sources, and incompatible materials.
Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. halogens (F, Cl, Br, I). Chlorine compounds, chlorinated inorganics (potassium, calcium and sodium hypochlorite) and hydrogen peroxides. Organic materials. Combustible materials.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

No Occupational Exposure Limits (OELs) have been established for this product or its chemical components.

Exposure Controls

Appropriate Engineering Controls: Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment: Approved safety glasses. Gloves. If insufficient ventilation: wear respiratory protection. Protective clothing when appropriate as indicated by air monitoring or if engineering controls are insufficient.

Materials for Protective Clothing: Chemically resistant materials and fabrics.
Hand Protection: Wear protective gloves.
Eye Protection: Approved safety glasses
Skin and Body Protection: Not available
Respiratory Protection: Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.
Other Information: When using, do not eat, drink or smoke.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	Colorless to off-white prills
Odor	:	Odorless
Odor Threshold	:	Not available
pH	:	Not available
Relative Evaporation Rate (butylacetate=1)	:	Not available
Melting Point	:	170 °C (337°F)
Freezing Point	:	Not available
Boiling Point	:	177 - 210 °C Decomposition (350 - 410°F)
Flash Point	:	Not available
Auto-ignition Temperature	:	Not available
Decomposition Temperature	:	Not available
Flammability (solid, gas)	:	Not flammable
Lower Flammable Limit	:	Not available
Upper Flammable Limit	:	Not available
Vapor Pressure	:	Not available
Relative Vapor Density at 20 °C	:	Not available
Relative Density	:	Not available
Specific Gravity	:	1.72 - 1.00 (Poured bulk density)
Solubility	:	Soluble in water. Water: 192 g/100 ml @ 20 °C (68 °F); 118 g/100 ml @ 0 °C (32 °F)
Partition coefficient: n-octanol/water	:	Not applicable. (inorganic)

Viscosity	:	Not available
Explosion Data – Sensitivity to Mechanical Impact	:	Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	:	Not sensitive to static discharge.

SECTION 10 - STABILITY AND REACTIVITY

Reactivity: May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials. Smothering, contact with organic material, or combustible material may cause an explosive situation.

Chemical Stability: May intensify fire; oxidizer.

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Extremely high temperatures. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

Incompatible Materials: Strong acids. Strong bases. Strong oxidizers. Halogens. Chlorine compounds, chlorinated inorganics (potassium, calcium and sodium hypochlorite) and hydrogen peroxides.

Hazardous Decomposition Products: Nitrogen oxides. Toxic vapors. Ammonia. Nitric acid

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on Toxicological Effects – Product

Acute Toxicity: Not classified

LD50 and LC50 Data: Not available

Skin Corrosion/Irritation: Not classified

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: May cause respiratory irritation.

Symptoms/Injuries After Skin Contact: May cause skin irritation.

Symptoms/Injuries After Eye Contact: Causes serious eye irritation.

Symptoms/Injuries After Ingestion: Ingestion is likely to be harmful or have adverse effects.

Chronic Symptoms: None known.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/L/4h
ATE CLP (oral)	2217.000 mg/kg body weight

SECTION 12: ECOLOGICAL INFORMATION

Toxicity Not classified

Persistence and Degradability

Superprill	
Persistence and Degradability	Not established.

Bioaccumulative Potential	
Superprill	
Bioaccumulative Potential	Not established.
Ammonium nitrate (6484-52-2)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

Mobility in Soil Not available
Other Adverse Effects
Other Information: Avoid release to the environment.

SECTION 13 – DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.
Additional Information: Clean up even minor leaks or spills if possible without unnecessary risk.

SECTION 14 - TRANSPORT INFORMATION

14.1 In Accordance with DOT

Proper Shipping Name : AMMONIUM NITRATE with not more than 0.2% total combustible material, including any organic substance, calculated as carbon to the exclusion of any other added substance
Hazard Class : 5.1
Identification Number : UN1942
Label Codes : 5.1

Packing Group : III
ERG Number : 140

14.2 In Accordance with IMDG

Proper Shipping Name : AMMONIUM NITRATE
Hazard Class : 5.1
Identification Number : UN1942
Packing Group : III
Label Codes : 5.1
EmS-No. (Fire) : F-H
EmS-No. (Spillage) : S-Q

14.3 In Accordance with IATA

Proper Shipping Name : AMMONIUM NITRATE
Packing Group : III
Identification Number : UN1942
Hazard Class : 5
Label Codes : 5.1

ERG Code (IATA) : 5L

14.4 In Accordance with TDG

Proper Shipping Name : AMMONIUM NITRATE with not more than 0.2 per cent combustible substances, including any organic substance calculated as carbon, to the exclusion of any other added substance
Packing Group : III

Hazard Class	:	5.1
Identification Number	:	UN1942
Label Codes	:	5.1

SECTION 15 - REGULATORY INFORMATION

US Federal Regulations

Superprill

SARA Section 311/312 Hazard Classes	Immediate (acute) health hazard

Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

US State Regulations

Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

Canadian Regulations

Superprill

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Ammonium nitrate (6484-52-2)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects

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

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 09/10/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

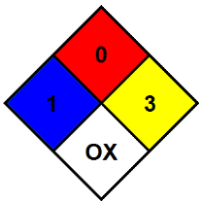
GHS Full Text Phrases:

Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Ox. Sol. 3	Oxidizing solids Category 3
H272	May intensify fire; oxidizer
H319	Causes serious eye irritation

NFPA Health Hazard : 1 - Exposure could cause irritation but only minor residual injury even if no treatment is given.

NFPA Fire Hazard : 0 - Materials that will not burn.

NFPA Reactivity	:	3 - Capable of detonation or explosive reaction, but requires a strong initiating source or must be heated under confinement before initiation, or reacts explosively with water.
NFPA Specific Hazard	:	OX - This denotes an oxidizer, a chemical which can greatly increase the rate of combustion/fire.



Party Responsible for the Preparation of This Document

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Dyno Nobel SDS

USED OIL

MATERIAL SAFETY DATA SHEET

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: **USED OIL**

SYNONYMS: Waste oil; Used lubricating oil; Oil and water mixture

PRODUCT PART NUMBER(S): Not applicable.

PRODUCT USE: Oil or water mixture for re-refining or reprocessing.
If this product is used in combination with other products, refer to the Material Safety Data Sheets for those products.

These numbers are for emergency use only. If you desire non-emergency product information, please call a phone number listed below.

24-HOUR EMERGENCY PHONE NUMBERS
MEDICAL AND TRANSPORTATION (SPILL):

1-800-468-1760

MANUFACTURER/ SUPPLIER: Safety-Kleen Systems, Inc.
5400 Legacy Drive
Cluster II, Building 3
Plano, Texas 75024
USA
1-800-669-5740
www.Safety-Kleen.com

TECHNICAL INFORMATION: 1-800-669-5740 Press 1 then 1 then Extension 7500

MSDS FORM NUMBER: 81451 **ISSUE:** September 20, 2007

ORIGINAL ISSUE: January 15, 1990 **SUPERSEDES:** June 11, 2007

PREPARED BY: Product MSDS Coordinator **APPROVED BY:** MSDS Task Force

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

				OSHA PEL		ACGIH TLV®			
WT%	NAME	SYNONYM	CAS NO.	TWA	STEL	TWA	STEL	LD[a]	LC[b]
80 to 100	Lubricating oils, used	Used oil	70514-12-4	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.
0 to 20*	Water/solids	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.
0 to 10*	Hydrocarbon solvents. May include gasoline, diesel fuel, jet fuel, mineral spirits, etc.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.
0 to 1.5*	Metals. May include lead, iron, zinc, copper, chromium, arsenic, nickel, and others: each below 1.0 WT%.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.
0 to 1.0*	Polynuclear aromatics. May include naphthalene, fluoranthene, phenanthrene, pyrene, and others: each below 0.3 WT%.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.
0 to 0.5*	Chlorinated solvents.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.	N. Av.

N.Av. = Not Available

*Even though the concentration range does not fall under the ranges prescribed by WHMIS, this is the actual range which varies with each batch of the product.

[a] Oral-Rat LD_{50} (mg/kg)

[b] Inhalation-Rat LC_{50}

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

APPEARANCE
Liquid, black and viscous (thick), petroleum odor.

WARNING!
PHYSICAL HAZARDS
Combustible liquid.

HEALTH HAZARDS
May be harmful if inhaled.
May be harmful if absorbed through skin.
May be harmful or fatal if swallowed.
May irritate the respiratory tract (nose, throat, and lungs), eyes, and skin.
Suspect cancer hazard. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.
Contains material which can cause birth defects.
Contains material which can cause central nervous system damage.

ENVIRONMENTAL HAZARDS
Product may be toxic to fish, plants, wildlife, and/or domestic animals.

POTENTIAL HEALTH EFFECTS

Effects may vary depending on material composition. Typical effects may include:

INHALATION (BREATHING): High concentrations of vapor or mist may be harmful if inhaled. High concentrations of vapor or mist may irritate the respiratory tract (nose, throat, and lungs). High concentrations of vapor or mist may cause nausea, vomiting, headaches, dizziness, loss of coordination, numbness, and other central nervous system effects. Massive acute overexposure may cause rapid central nervous system depression, sudden collapse, coma, and/or death.

EYES: May cause irritation.

SKIN: May cause irritation. Product may be absorbed through the skin and cause harm as noted under **INHALATION (BREATHING)**.

INGESTION (SWALLOWING): May be harmful or fatal if swallowed. May cause throat irritation, nausea, vomiting, and central nervous system effects as noted under **INHALATION (BREATHING)**. Breathing product into the lungs during ingestion or vomiting may cause lung injury and possible death.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with pre-existing cardiovascular, liver, kidney, respiratory tract (nose, throat, and lungs), central nervous system, eye, and/or skin disorders may have increased susceptibility to the effects of exposure.

CHRONIC: Prolonged or repeated inhalation may cause oil pneumonia, lung tissue inflammation, fibrous tissue formation, and/or toxic effects as noted under **INHALATION (BREATHING)**. Prolonged or repeated eye contact may cause inflammation of the membrane lining the eyelids and covering the eyeball (conjunctivitis). Prolonged or repeated skin contact may cause drying, cracking, redness, itching, and/or swelling (dermatitis).

CANCER INFORMATION: This product contains mineral oils, untreated or mildly treated, which can cause cancer. This product may contain hydrocarbon and chlorinated solvents; metals, and polynuclear aromatics which can cause cancer. Risk of cancer depends on duration and level of exposure. For more information, see **SECTION 11: CARCINOGENICITY**.

POTENTIAL ENVIRONMENTAL EFFECTS

Product may be toxic to fish, plants, wildlife, and/or domestic animals.
Also see **SECTION 12: ECOLOGICAL INFORMATION**.

SECTION 4: FIRST AID MEASURES

INHALATION: (BREATHING) Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Oxygen should only be administered by qualified personnel. Someone should stay with victim. Get medical attention if breathing difficulty persists.

EYES: If irritation or redness from exposure to vapor develops, move away from exposure into fresh air. Upon contact, immediately flush eyes with plenty of lukewarm water, holding eyelids apart, for 15 minutes. Get medical attention.

SKIN: Remove affected clothing and shoes. Wash skin thoroughly with soap and water. Get medical attention if irritation or pain develops or persists.

INGESTION: (SWALLOWING) Do NOT induce vomiting. Immediately get medical attention. Call 1-800-468-1760 for additional information.
If spontaneous vomiting occurs, keep head below hips to avoid breathing the product into the lungs. Never give anything to an unconscious person by mouth.

NOTE TO PHYSICIANS: Treat symptomatically and supportively. Treatment may vary with condition of victim and specifics of incident. Call 1-800-468-1760 for additional information.

SECTION 5: FIRE FIGHTING MEASURES

FLASH POINT: >200°F (93°C) (minimum) Pensky-Martens Closed Cup

FLAMMABLE LIMITS IN AIR: Not available.

AUTOIGNITION TEMPERATURE: Not available.

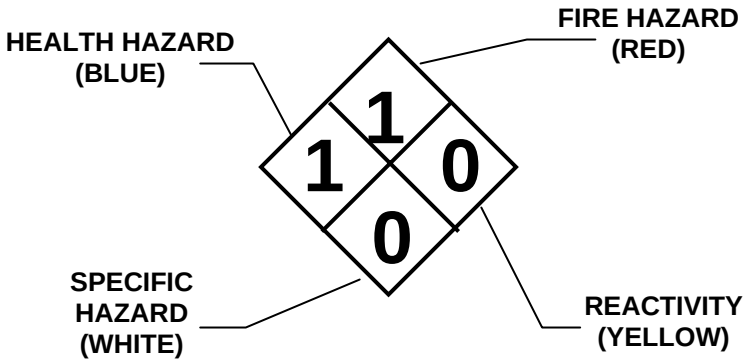
HAZARDOUS COMBUSTION PRODUCTS: Decomposition and combustion materials may be toxic. Burning may produce phosgene gas, nitrogen oxides, carbon monoxide, and unidentified organic compounds.

CONDITIONS OF FLAMMABILITY: Heat, sparks, or flame. Product may burn but does not ignite readily.

EXTINGUISHING MEDIA: Use carbon dioxide, regular foam, dry chemical, water spray, or water fog.

NFPA 704 HAZARD IDENTIFICATION:

This information is intended solely for the use by individuals trained in this system.



FIRE FIGHTING INSTRUCTIONS:

Keep storage containers cool with water spray. A positive-pressure, self-contained breathing apparatus (SCBA) and full-body protective equipment are required for fire emergencies.

FIRE AND EXPLOSION HAZARDS:

Heated containers may rupture. "Empty" containers may retain residue and can be dangerous. Product is not sensitive to mechanical impact. Product may be sensitive to static discharge, which could result in fire or explosion.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Remove all ignition sources. Do not touch or walk through spilled product. Stop leak if you can do it without risk. Wear protective equipment and provide engineering controls as specified in **SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Ventilate area and avoid breathing vapor or mist. A vapor suppressing foam may be used to reduce vapors. Contain spill away from surface waters and sewers. Contain spill as a liquid for possible recovery, or sorb with compatible sorbent material and shovel with a clean, sparkproof tool into a sealable container for disposal.

Additionally, for large spills: Water spray may reduce vapor, but may not prevent ignition in closed spaces. Dike far ahead of liquid spill for collection and later disposal.

There may be specific federal regulatory reporting requirements associated with spills, leaks, or releases of this product. Also see **SECTION 15: REGULATORY INFORMATION.**

SECTION 7: HANDLING AND STORAGE

HANDLING: Keep away from heat, sparks, or flame. Where flammable mixtures may be present, equipment safe for such locations should be used. Use clean, sparkproof tools and explosion-proof equipment. When transferring product, storage tanks, tanker trucks, and rail tank cars should be grounded and bonded. Do not breathe vapor or mist. Use in a well ventilated area. Avoid contact with eyes, skin, clothing, and shoes. Do not smoke while using this product.

SHIPPING AND STORING: Keep container tightly closed when not in use and during transport. Do not pressurize, cut, weld, braze, solder, drill, or grind containers. Keep containers away from heat, flame, sparks, static electricity, or other sources of ignition. Empty product containers may retain product residue and can be dangerous. See **SECTION 14: TRANSPORT INFORMATION** for Packing Group information.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Use general ventilation, process enclosures, local exhaust ventilation, or other engineering controls to control air-borne levels. Where explosive mixtures may be present, equipment safe for such locations should be used.

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION: A respiratory protection program which meets USA's OSHA General Industry Standard 29 CFR 1910.134 or Canada's CSA Standard Z94.4-M1982 requirements must be followed whenever workplace conditions warrant a respirator's use. Consult a qualified Industrial Hygienist or Safety Professional for respirator selection guidance.

EYE PROTECTION: Wearing chemical goggles is recommended.
Contact lens may be worn with eye protection.

SKIN PROTECTION: Where prolonged or repeated skin contact is likely, wear neoprene, nitrile (4 mil minimum), PVC (polyvinyl chloride), or equivalent protective gloves; wearing natural rubber or equivalent gloves is not recommended.

When product is heated and skin contact is likely, wear heat-insulating gloves, boots, and other protective clothing.

To avoid prolonged or repeated contact with product where spills and splashes are likely, wear appropriate chemical-resistant faceshield, boots, apron, whole body suits, or other protective clothing.

PERSONAL HYGIENE:	Wash thoroughly with soap and water after handling product and before eating, drinking, or using tobacco products. Clean affected clothing, shoes, and protective equipment before reuse. Discard affected clothing, shoes, and/or protective equipment if they cannot be thoroughly cleaned. Discard leather articles, such as shoes, saturated with the product.
OTHER PROTECTIVE EQUIPMENT:	Where spills and splashes are likely, facilities storing or using this product should be equipped with an emergency eyewash and shower, both equipped with clean water, in the immediate work area.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE, APPEARANCE, AND ODOR:	Liquid, black and viscous (thick), petroleum odor.
ODOR THRESHOLD:	Not available.
MOLECULAR WEIGHT:	Not applicable.
SPECIFIC GRAVITY:	0.8 to 1.0 at 60°F (15.6°C) (water = 1)
DENSITY:	6.7 to 8.3 LB/US gal (800 to 1000 g/L) (approximately)
VAPOR DENSITY:	greater than 1 (air = 1) (based on kerosene)
VAPOR PRESSURE:	Not available.
BOILING POINT:	Not available.
FREEZING/MELTING POINT:	Not available.
pH:	Not applicable.
EVAPORATION RATE:	less than 1 (butyl acetate = 1)
SOLUBILITY IN WATER:	Slight.
FLASH POINT:	>200°F (93°C) (minimum) Pensky-Martens Closed Cup
FLAMMABLE LIMITS IN AIR:	Not available.
AUTOIGNITION TEMPERATURE:	Not available.

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Stable under normal temperatures and pressures. Avoid heat, sparks, or flame.

INCOMPATIBILITY: Avoid acids, alkalies, oxidizing agents, reducing agents, reactive halogens, or reactive metals.

REACTIVITY: Polymerization is not known to occur under normal temperatures and pressures. Not reactive with water.

HAZARDOUS DECOMPOSITION PRODUCTS: None under normal temperatures and pressures. Also see **SECTION 5: HAZARDOUS COMBUSTION PRODUCTS**.

SECTION 11: TOXICOLOGICAL INFORMATION

SENSITIZATION: Based on best current information, there may be known human sensitization associated with this product.

MUTAGENICITY: Based on best current information, there may be mutagenicity associated with this product.

CARCINOGENICITY: Mineral oils, untreated or mildly treated are listed by IARC as a known carcinogen. Mineral oils, untreated or mildly treated are classified by NTP as having limited evidence of carcinogenicity in humans or sufficient evidence of carcinogenicity in experimental animals.

There may be hydrocarbon and chlorinated solvents; metals, and polynuclear aromatics present in this product which are listed by OSHA as known carcinogens. There may be hydrocarbon and chlorinated solvents; metals, and polynuclear aromatics present in this product which are listed by IARC as known, probable, or possible carcinogens. There may be hydrocarbon and chlorinated solvents; metals, and polynuclear aromatics present in this product which are classified by NTP as known carcinogens or as having limited evidence of carcinogenicity in humans or sufficient evidence of carcinogenicity in experimental animals. There may be hydrocarbon and chlorinated solvents; metals, and polynuclear aromatics present in this product which are recognized by ACGIH as confirmed or suspected human carcinogens.

Also see **SECTION 3: CANCER INFORMATION**.

REPRODUCTIVE TOXICITY: Based on best current information, there may be reproductive toxicity associated with this product.

TERATOGENICITY: Based on best current information, there may be teratogenicity associated with this product.

TOXICOLOGICALLY SYNERGISTIC PRODUCT(S): Based on best current information, there may be toxicologically synergistic products associated with this product.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICITY: Not available.

OCTANOL/WATER PARTITION COEFFICIENT: Not available.

VOLATILE ORGANIC COMPOUNDS: Not available.
As per 40 CFR Part 51.100(s).

SECTION 13: DISPOSAL CONSIDERATIONS

Dispose in accordance with federal, state, provincial, and local regulations. Regulations may also apply to empty containers. The responsibility for proper waste disposal lies with the owner of the waste. Contact Safety-Kleen regarding proper recycling or disposal.

SECTION 14: TRANSPORT INFORMATION

DOT: Not regulated.

TDG: Not regulated.

EMERGENCY RESPONSE GUIDE NUMBER: Not applicable.
Reference *North American Emergency Response Guidebook*

SECTION 15: REGULATORY INFORMATION

USA REGULATIONS SARA SECTIONS 302 AND 304: Based on the ingredient(s) listed in **SECTION 2**, this product does not contain any "extremely hazardous substances" listed pursuant to Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) Section 302 or Section 304 as identified in 40 CFR Part 355, Appendix A and B.

SARA SECTIONS 311 AND 312: This product poses the following physical and health hazards as defined in 40 CFR Part 370 and is subject to the requirements of sections 311 and 312 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA):

Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard

SARA SECTION 313: This product may contain "toxic" chemicals subject to the requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR Part 372.

CERCLA: This product may contain “hazardous substances” listed pursuant to Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) in 40 CFR Part 302, Table 302.4.

TSCA: Not available.

CALIFORNIA: This product is not for sale or use in the State of California.

CANADIAN REGULATIONS
WHMIS: Not regulated

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA): Not available.

SECTION 16: OTHER INFORMATION

REVISION INFORMATION: Change from MSIS to MSDS.

LABEL/OTHER INFORMATION: Not available.

PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)	Rating	Protective Clothing	DOT (pictograms)
	Health Hazard 2* Fire Hazard 1 Reactivity 0 Personal Protection H	0 Insignificant 1 Slight 2 Moderate 3 High 4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**ANTIFREEZE**	**Code**	W269
		DSL	On the DSL.
Synonym	Universal Antifreeze, Radiator Antifreeze, Diesel Antifreeze, Petro-Canada Antifreeze-Coolant, Petro-Canada Heavy Duty Antifreeze-Coolant, Pre-Mix Antifreeze, Petro-Canada Premium Radiator Antifreeze.	**TSCA**	On TSCA list.
Manufacturer	PETRO-CANADA P.O. Box 2844 Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as an engine antifreeze coolant.		

Section II. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
1) Ethylene glycol	107-21-1	≥55	Not established	Not established	100 mg/m³ (aerosol)
2) Sodium tetraborate pentahydrate	1330-43-4	≤5	1 mg/m³	Not established	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Contact can cause slight irritation of skin, eyes and respiratory tract. Extremely dangerous in case of ingestion. For more information, refer to Section 11.

Section IV. First Aid Measures

Eye Contact	IMMEDIATELY flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek medical attention.
Skin Contact	Remove contaminated clothing - launder before reuse. Wash gently and thoroughly the contaminated skin with running water and non-abrasive soap. Seek medical attention.
Inhalation	Evacuate the victim to a safe area as soon as possible. If the victim is not breathing, perform artificial respiration. Allow the victim to rest in a well ventilated area. Seek medical attention.
Ingestion	DO NOT induce vomiting because of danger of aspirating liquid into lungs. Seek medical attention.
Note to Physician	Not available

Section V. Fire-fighting Measures

Flammability	May be combustible at high temperature.	**Flammable Limits**	Lower: 3.2%, Upper: 15.3%
Flash Points	Closed Cup: 116ºC (Tagliabue) Open Cup: 116ºC (Cleveland)	**Auto-Ignition Temperature**	413ºC
Fire Hazards in Presence of Various Substances	Combustible in presence of open flames and sparks.	**Explosion Hazards in Presence of Various Substances**	Not a product presenting risks of explosion.
Products of Combustion	Carbon oxides (CO, CO2), smoke and irritating vapours as products of incomplete combustion.		
Fire Fighting Media and Instructions	SMALL FIRE: Use DRY chemicals, CO2, water spray or foam. LARGE FIRE: Use water spray, fog or foam. DO NOT use water jet.		

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Section VI. Accidental Release Measures

Material Release or Spill	Small spill or leak: Dilute with water and mop up or absorb with an inert DRY material and place in an appropriate waste disposal container. Large spill or leak: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Dispose of in accordance with regional regulations.

Section VII. Handling and Storage

Handling	Avoid contamination with reactive substances. After handling, always wash hands thoroughly with soap and water.
Storage	Keep container dry. Keep container tightly closed. Keep in a cool, well-ventilated place.

Section VIII. Exposure Controls/Personal Protection

Engineering Controls	For normal application, special ventilation is not necessary. If user's operations generate vapours or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. Make-up air should always be supplied to balance air removed by exhaust ventilation. Ensure that eyewash station and safety shower are close to work-station.
Personal Protection -	***The selection of personal protective equipment varies, depending upon conditions of use.***
Eyes	Eye protection (i.e., safety glasses, safety goggles and/or face shield) should be determined based on conditions of use. If product is used in an application where splashing may occur, the use of safety goggles and/or a face shield should be considered.
Body	Wear appropriate clothing to prevent skin contact. As a minimum long sleeves and trousers should be worn.
Respiratory	Where concentrations in air may exceed the occupational exposure limits given in Section 2 (and those applicable to your area) and where engineering, work practices or other means of exposure reduction are not adequate, NIOSH approved respirators may be necessary to prevent overexposure by inhalation.
Hands	Wear appropriate chemically protective gloves. When handling hot product ensure gloves are heat resistant and insulated.
Feet	Wear appropriate footwear to prevent product from coming in contact with feet and skin.

Section IX. Physical and Chemical Properties

Physical State and Appearance	Clear viscous liquid.	**Viscosity**	Not available
Colour	Green.	**Pour Point**	Not available
Odour	Odourless.	**Softening Point**	Not applicable.
Odour Threshold	Not available	**Dropping Point**	Not applicable.
Boiling Point	129 to 197°C (264 to 387°F)	**Penetration**	Not applicable.
Density	1.115 to 1.145 (Water = 1)	**Oil / Water Dist. Coeff.**	Not available
Vapour Density	2.1 (Air=1).	**Ionicity (in water)**	Not available
Vapour Pressure	0.06 mmHg @ 20°C (68ºF).	**Dispersion Properties**	Not available
Volatility	0% (w/w)	**Solubility**	Soluble in water, methanol and diethyl ether.

Section X. Stability and Reactivity

Corrosivity	Not available		
Stability	The product is stable.	**Hazardous Polymerization**	Will not occur under normal working conditions.
Incompatible Substances / Conditions to Avoid	Reactive with oxidizing agents, acids and alkalis.	**Decomposition Products**	May release COx, smoke and irritating vapours when heated to decomposition.

Section XI. Toxicological Information

Routes of Entry	Eye contact and ingestion.
Acute Lethality	LD50: 4700 mg/kg (oral/rat). [Ethylene Glycol] LD50: 9530 mg/kg (dermal/rabbit). [Ethylene Glycol]
Chronic or Other Toxic Effects	
Dermal Route:	Slightly hazardous in case of skin contact (irritant).
Inhalation Route:	Slightly hazardous in case of inhalation (lung irritant). Can cause nausea, headaches and vomiting.
Oral Route:	Extremely dangerous in case of ingestion.
Eye Irritation/Inflammation:	Slightly hazardous in case of eye contact (irritant).
Immunotoxicity:	Not available
Skin Sensitization:	Not available
Respiratory Tract Sensitization:	Not available
Mutagenic:	Not available

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Reproductive Toxicity:	Not available
Teratogenicity/Embryotoxicity:	Fetotoxic and teratogenic in mice at levels below maternal toxicity.
Carcinogenicity (ACGIH):	ACGIH A4: not classifiable as a human carcinogen.
Carcinogenicity (IARC):	Not available
Carcinogenicity (NTP):	Not available
Carcinogenicity (IRIS):	Not available
Carcinogenicity (OSHA):	Not available
Other Considerations	The substance may be toxic to kidneys and liver. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section XII. Ecological Information

Environmental Fate	Not available	**Persistance/ Bioaccumulation Potential**	Not available
BOD5 and COD	Not available	**Products of Biodegradation**	Not available
Additional Remarks	No additional remark.		

Section XIII. Disposal Considerations

Waste Disposal	Preferred waste management priorities are: (1) recycle or reprocess; (2) incineration with energy recovery; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations. Consult your local or regional authorities.

Section XIV. Transport Information

DOT Classification	Not a DOT controlled material (United States).	**Special Provisions for Transport**	Not applicable.

Section XV. Regulatory Information

Other Regulations	This product is acceptable for use under the provisions of WHMIS-CPR. All components of this formulation are listed on the CEPA-DSL (Domestic Substances List). All components of this formulation are listed on the US EPA-TSCA Inventory. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR. Please contact Product Safety for more information.		
DSD/DPD (EEC)	Not evaluated.	**WHMIS (Canada)**	D-2A
ADR (Europe) (Pictograms)	**NOT EVALUATED FOR EUROPEAN TRANSPORT** **NON ÉVALUÉ POUR LE TRANSPORT EUROPÉEN.**	**TDG (Canada) (Pictograms)**	

Section XVI. Other Information

References Available upon request.
* Marque de commerce de Petro-Canada - Trademark

Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ADR - Agreement on Dangerous goods by Road (Europe)
ASTM - American Society for Testing and Materials (
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemicals Hazard Information and Packaging Approved Supply List
COD5 - Chemical Oxygen Demand in 5 days
CPR - Controlled Products Regulations
DOT - Department of Transport
DSCL - Dangerous Substances Classification and Labeling (Europe)
DSD/DPD - Dangerous Substances or Dangerous Preparations Directives (Europe)
DSL - Domestic Substance List
EEC/EU - European Economic Community/European Union
EINECS - European Inventory of Existing Commercial Chemical Substances
EPCRA - Emergency Planning and Community Right to Know Act
IRIS - Integrated Risk Information System
LD50/LC50 - Lethal Dose/Concentration kill 50%
LDLo/LCLo - Lowest Published Lethal Dose/Concentration
NAERG'96 - North American Emergency Response Guide Book (1996)
NFPA - National Fire Prevention Association
NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NSNR - New Substances Notification Regulations (Canada)
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)
TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLm - Median Tolerance Limit
TLV-TWA - Threshold Limit Value-Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency

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FDA - Food and Drug Administration
FIFRA - Federal Insecticide, Fungicide and Rodenticide Act
HCS - Hazardous Communication System
HMIS - Hazardous Material Information System
IARC - International Agency for Research on Cancer
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

For Copy of MSDS
Western Canada, telephone: 403-296-4158; fax: 403-296-6551
Ontario & Central Canada, telephone: 1-800-668-0220; fax: 1-800-837-1228
Quebec & Eastern Canada, telephone: 514-640-8308; fax: 514-640-8385

For Product Safety Information: (905) 804-4752

Prepared by Product Safety - TAR on 7/3/2001.

Data entry by Product Safety - JDW.

APPENDIX B: PPE SUMMARY TABLE

Substance Name	Common Name	Hazard Class	Division	Reporting Threshold	Special Precautions	PPE Required for Spill Cleanup	Special Cleanup or Disposal Method
Acetone	n/a	3	II	200 L	Extremely Flammable	Safety goggles, Chemical resistant gloves	Use water to reduce vapours, eliminate ignition sources and use non-sparking tools. Incinerate spill pads and contaminated material in the incinerator.
Aero 5100 Promoter	n/a	3	III	200 L	Combustible liquid and vapour, Very toxic to aquatic organisms	Safety goggles, Chemical resistant gloves	Eliminate ignition sources. Biodegrades quickly, clean up liquid, rinse with water
Ammonium Hydroxide	n/a	8	III	5 L	Corrosive and toxic, harmful to aquatic life at low concentrations	Safety goggles, Face shield, Chemical resistant gloves, Self contained breathing apparatus (SCBA), Full protective suit	Eliminate ignition sources, ventilate area, flush with water once cleaned up, put spilled material into containment, dispose into tailings waste stream
Carbamothioic acid, ethyl ester	Danafloat 262	9	III	200 L	The product may be hazardous in the aquatic environment, can cause irritation to skin. It is harmful by ingestion.	Safety goggles, Chemical resistant gloves, Respirator	Dilute with water (insoluble in cold water), product is biodegradable, contaminated can be disposed of in landfill, waste liquid disposed into tailings waste stream.
Concentrate (Zn, Cu, Pb)	n/a	9	III	5 Kg or 5 L	Avoid breathing dust	Safety goggles, Chemical resistant gloves, Dust mask	Avoid potential for water runoff. Attempt to recover for reprocess, dispose in tailings
Cupric Sulphate Pentahydrate	Copper Sulphate	9	III	1 Kg or 1 L	Harmful to aquatic life at low concentrations	Safety goggles, Chemical resistant gloves, Respirator	Collect solid and dispose of in tailings
Diesel Fuel	n/a	3	III	200 L	Combustible	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
Engine Oil	n/a	n/a	n/a	n/a	Flammable, if heated	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
Ethylene Glycol	Antifreeze	9	III	5 L	Very toxic to animals and aquatic life	Safety goggles, Chemical resistant gloves	Soak up with general absorbent pads, or pump into sealed containers for disposal. Animal attractant: Do not leave any pools open to wildlife. Contaminated material can be disposed of in LTF, or incinerated if standards are met.
Ferric Sulphate	Ferrifloc, flocculant	8	III	5 L	Corrosive, reacts with metals to produce hydrogen	Safety goggles, Chemical resistant gloves, Full protective suit	When spilled on land, neutralize with lime or water, and dispose in landfill or tailings. Recovered liquid can be diluted with water and disposed of in tailings.
Gasoline Fuel	n/a	3	II	200 L	Flammable	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
Hydraulic Fluid	n/a	n/a	n/a	200 L	n/a	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
Hydrochloric Acid	n/a	8	II	5 L	Corrosive, poisonous liquid	Safety goggles, Face shield, SBCA, Chemical resistant gloves, Boots, Full protective suit	Stay upwind, absorb with dry earth, neutralize with sodium carbonate or lime. Dispose of contaminated material into the tailings
Isobutyl dithiophosphate	Aero 3477 Promoter	8	II	5 L	pH >12, Caustic, can produce hydrogen sulphide under fire conditions	Safety goggles, Face shield, Chemical resistant gloves, Respirator, Full protective suit	Ventilate area, neutralize with weak acid or water
Jet A Aviation Fuel	n/a	3	II	200 L	Flammable	Safety goggles, Chemical resistant gloves	Issue "flammable" warning, prevent possible ignition, clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment if safe to do so. Dispose of contaminated material into LTF
Lime	n/a	n/a	n/a	n/a	Corrosive, Do not use water to clean spill site	Safety goggles, Chemical resistant gloves, Respirator	Remove material to landfill
Methyl Isobutyl Carbinol	MIBC	3	III	200 L	Flammable liquid and vapour	Safety goggles, Chemical resistant gloves	Incinerate if authorised
Nitric Acid	n/a	8	II	5 L	Corrosive, poisonous, oxidizing agent, harmful to aquatic life at low concentrations	Safety goggles, Face shield, SBCA, Chemical resistant gloves, Full protective suit	Ventilate area, neutralise with lime, avoid contact with combustible material, rinse with water once area is cleaned. Dispose of contaminated material into the tailings
Perchloric Acid	n/a	8	I	5 L	Corrosive, powerful oxidizing agent	Safety goggles, SBCA, Chemical resistant gloves, Full protective suit	Ventilate area, neutralise with lime, avoid contact with combustible material, rinse with water once area is cleaned, dispose into the tailings facility
Phosphorodithioic acid, O,O-bis(1-methylpropyl) ester, sodium salt	Danafloat 468	8	III	5 L	Severe irritatant on skin, eyes, upper digestive tract, and respiratory tract	Safety goggles, SBCA, Chemical resistant gloves, Full protective suit	Cover surface water drains, minor spills should be absorbed with universal binder (i.e. bentonite) and collect material for disposal in suitable container.
Potassium Iodide	n/a	n/a	n/a	n/a	May be harmful to aquatic life	Safety goggles, Respirator	Rinse area with water once spill has been contained. Waste liquid can be disposed of into tailings waste stream.
Propylene Glycol	Antifreeze	9	III	5 L	Not considered toxic	Safety goggles, Chemical resistant gloves	Animal attractant: Do not leave any pools open for wildlife. Contaminated material can be disposed of in LTF, or incinerated if standards are met
Sodium Carbonate	n/a	n/a	n/a	n/a	Dust is an irritant	Safety goggles, Chemical resistant gloves, Respirator	Sweep and dispose into landfill
Sodium Cyanide	n/a	6	I	5 Kg	Poisonous Solid	Safety goggles, SBCA, Chemical resistant gloves, Full protective suit	Do not attempt to clean up without proper training. Avoid adding any water source, sweep up dry material and contain, flush area with dilute sodium hypochlorite. Disposal off site, or into process waste stream
Sodium diisobutyldithiophosphinate	Aerophine 3418A	n/a	n/a	n/a	Mild skin and moderate eye irritation	Safety goggles, Chemical resistant gloves, Respirator	Cover spills with some inert absorbent material; sweep up and place in a waste disposal container. Flush area with water.
Sodium Hydroxide	Caustic Soda	8	II	5 L or 5 Kg	Corrosive	Safety goggles, SBCA (for large spills), Chemical resistant gloves, Full protective suit	Rinse area with water once spill has been contained. Neutralise contaminated material before disposal into tailings facility
Sodium Hydrosulphide	NaHS	8	II	5 L or 5 Kg	Corrosive	Safety goggles, SBCA, Chemical resistant gloves, Full protective suit	Provide maximum ventilation. Recover spilled material on adsorbents, such as sand or vermiculite, and place in covered containers for reclamation or disposal.
Sodium Hypochlorite	Bleach	8	III	5 L	Oxidizing agent	Safety goggles, Chemical resistant gloves	Contain, dilute with water
Sodium Isopropyl Xanthate	A343/SPIX	4	III	25 Kg	Flammable gas production when mixed with water	Safety goggles, Chemical resistant gloves, Respirator	No water should be used for cleanup, eliminate ignition sources, place spilled material in a sealable container to be disposed of off site.
Sodium Metabisulfite	SMBS	n/a	n/a	n/a	Acidic when diluted	Safety goggles, Chemical resistant gloves, Respirator	Shovel solid for disposal, mix with lime and dispose in landfill, rinse area with water
Sodium sulphate	n/a	n/a	n/a	n/a	Not classified as hazardous chemical	Safety goggles, Chemical resistant gloves	Sweep or shovel into suitable containers
Sulfuric Acid	n/a	8	II	5 L	Very corrosive, poisonous	Safety goggles, SCBA (or face shield and respirator), Chemical resistant gloves, Full protective suit	Dilute small spills with excess water, neutralise with lime. Remove contaminated material immediately, dispose in landfill if neutralised. Waste liquid should be diluted and disposed of into tailings waste stream.

Substance Name	Common Name	Hazard Class	Division	Reporting Threshold	Special Precautions	PPE Required for Spill Cleanup	Special Cleanup or Disposal Method
Transmission Oil	n/a	n/a	n/a	n/a	mild skin irritation	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
TMT 15 Organosulphide	1,3,5-triazine-2,4,6(1H,3H,5H)-trithione, trisodium salt	n/a	n/a	n/a	Mild skin and eye irritant	Safety goggles, Chemical resistant gloves, Respirator	Absorb with liquid-binding material (e.g. inert absorbent or universal binder).
Zinc Sulphate Monohydrate	n/a	9	III	5 Kg	serious eye damage, harmful if swallowed, skin irritant	Safety goggles, Chemical resistant gloves, Respirator	Prevent dust cloud. Use clean non-sparking tools to collect material for reuse or disposal into tailings
Gasses under pressure							
Acetylene	n/a	2	II	Container larger than 100 litres, or where the spill results from equipment failure, error, or deliberate action or inaction.	Flammable gas under pressure	Use SCBA when needed	Consult supplier if container needs disposal
Oxygen	n/a	2	II		Gas under pressure, strong oxidizer	Safety goggles, Chemical resistant gloves	Consult supplier if container needs disposal
Propane	n/a	2	I		Flammable gas under pressure, boiling point: -42°C (liquid below this temperature at 1 atm)	Safety goggles, Chemical resistant gloves	Evacuate area, shut off flow if without risk, shut off ignition sources if without risk. Consult supplier if container needs disposal
Explosives							
Bulk Emulsion	n/a	1	II	Any	Oxidizing agent and irritant	Safety goggles, Chemical resistant gloves, Respirator, Full protective suit	Consult with on site blasters and manufacturers for disposal
Blastex	n/a	1	II	Any	Oxidizing agent and irritant		
Superprill	n/a	1	II	Any	Oxidizing agent and irritant		
Special Waste							
Waste Oil				**Within a 24 hour period:** ≥500 g solid or 500 mL liquid waste **Within a 30 day period:** ≥5 Kg solid or 5 L liquid waste	Flammable	Safety goggles, Chemical resistant gloves	Clean up as per hydrocarbon protocol, use absorbent pads, pump free liquid into containment. Dispose of liquid in waste oil burner, and contaminated material into LTF
Waste Antifreeze					Toxic to animals and aquatic life	Safety goggles, Chemical resistant gloves	Soak up with general absorbent pads, or pump into sealed containers for disposal. Animal attractant: Do not leave any pools open to wildlife. Contaminated material can be disposed of in LTF, or incinerated if standards are met.

APPENDIX C: EXPLOSIVES MANAGEMENT PLAN

KUDZ ZE KAYAH PROJECT

EXPLOSIVES MANAGEMENT PLAN

REV 03

December 2023

BMC MINERALS LTD.

This Management Plan has been developed to meet the appropriate subject objectives based on existing regulatory requirements, current or planned site activities, existing and expected site conditions, and designed outcomes at the time of writing. Operational processes/practices for achievement of licence terms and conditions may be updated from time to time as appropriate due to changes to relevant legislation and regulations, changes to site activities or conditions, differences from expected objective outcomes, or improvement of management practices. All rates, capacities, dimensions, weights, volumes and durations in text or figures are based on current feasibility level designs and are subject to change based on final design, licence conditions or site conditions encountered. Updates will be resubmitted to government authorities and/or stakeholders as required.

LIST OF REVISIONS

Issue Date	Revision Number	Description of Revision
August 25, 2020	Rev 00	For Issue to Agencies
November 19, 2020	Rev 01	Updated with commitments and Final Screening Report Recommendations
July 18, 2022	Rev 02	Update with final edits from BMC
December 14, 2013	Rev 03	Updated in response to Phase 2/3 IR from EMR dated May 5, 2023

LIST OF ACRONYMS

AN	Ammonium Nitrate
ANFO	Ammonium Nitrate Fuel Oil
BMC	BMC Minerals Ltd.
Kt	Kilo tonnes
NRCan	Natural Resources Canada
t	tonnes
WSCA	*Workers' Safety and Compensation* Act

GLOSSARY

Blast agent: Any material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified as an explosive and in which none of the ingredients are classified as an explosive, provided that the finished product, as mixed and packaged for use or shipment, cannot be detonated by means of a No. 8 test blasting cap when unconfined.

Blasting Cap: See detonator.

Cast Booster: A cast, extruded or pressed, solid high explosive used to detonate less sensitive explosive materials.

Detonator: A device used to trigger an explosive. Detonators can be chemically, mechanically, or electrically initiated.

Explosive: Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat.

Powder factor: A relationship between how much rock is broken and how much explosive is used to break it.

Prill: A small aggregate or globule of a material, most often a dry sphere.

Magazine: Any building, storehouse, structure or place in which any explosive or detonator is kept or stored.

Oxidizer: A substance that oxidizes another substance: a chemical other than a blasting agent or explosive that initiates or promotes combustion in other materials.

Yukon Environmental and Socio-economic Assessment Board: An independent arms-length body, responsible for implementation of the assessment responsibilities under the *Yukon Environmental and Socio-economic Assessment Act.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

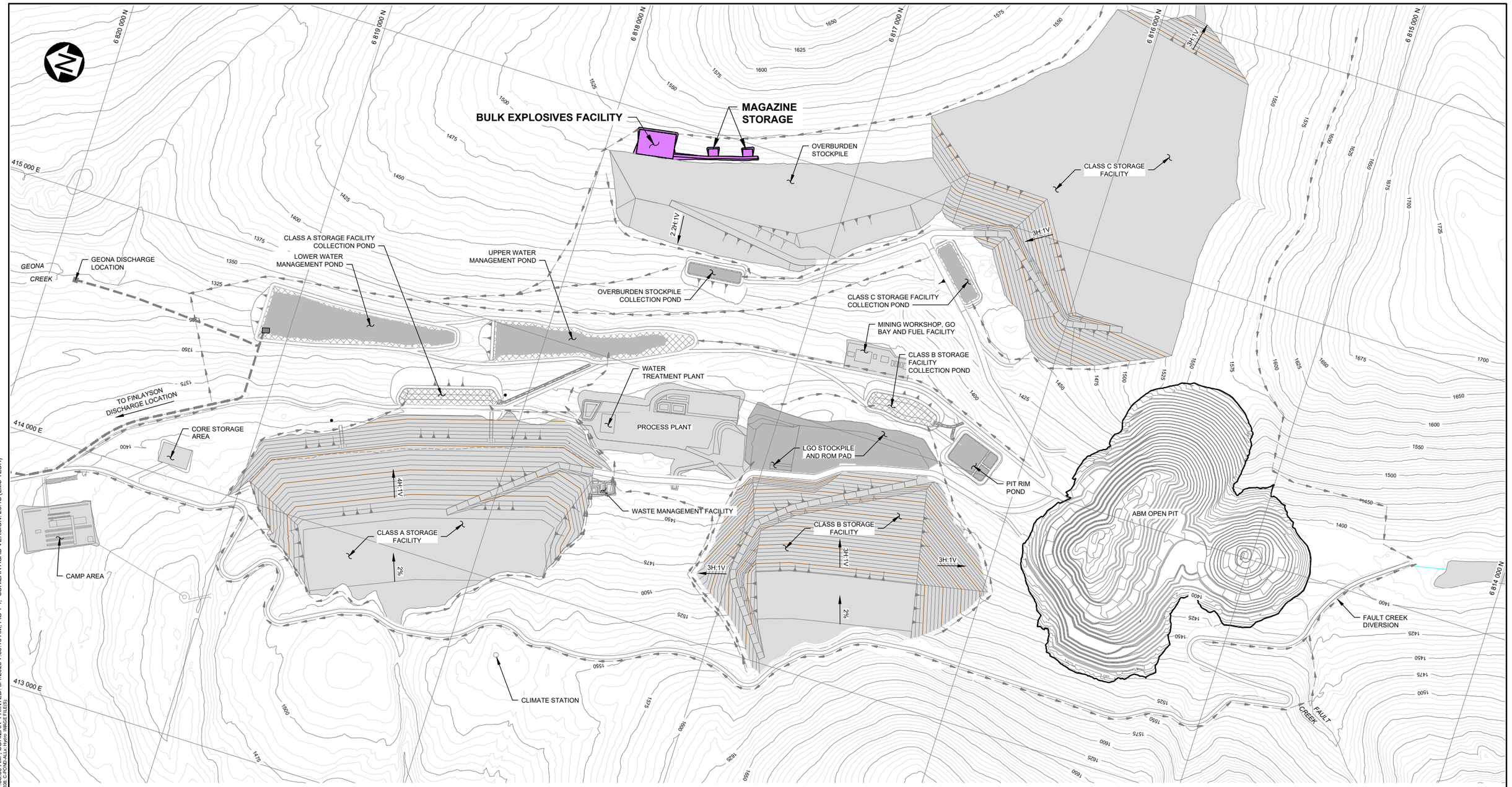
BMC Minerals Ltd. (BMC) is the owner of the Kudz Ze Kayah Project (the Project). Since acquiring the project in 2015, BMC has actively engaged in assessing historical work, optimizing design, resource drilling, economic assessment, baseline environmental studies, and First Nations and community engagement as well as the successful completion of the Executive Committee Screening by the Yukon Environmental and Social-Economic Assessment Board.

The mining operations at the Project will include the use of explosives for rock breaking. The predominant explosives used for ore and overburden removal will be emulsion and ANFO.

The purpose of this Explosives Management Plan is to describe processes to integrate the safe use of explosives into Mine operations while minimizing environmental effects. Control and use of explosives are covered by both federal and territorial regulations. Operating procedures to ensure that explosives are handled safely, in a manner that minimizes the chance of environmental contamination by explosives will be produced prior to any use, storage or transport of explosive materials to site, and only trained competent staff will be allowed to work with explosives.

For the mining operations, bulk explosives will be stored and handled on site by a licensed contractor who will provide a detailed operation manual for transportation, storage and handling of explosives. The recommended formulations are of commercial quality, industry-proven and accepted worldwide. The contractor will also provide down-the-hole delivery of the product to the blast hole by means of equipment to be licensed and approved by National Resources Canada, Explosives Regulatory Division.

In addition to bulk explosives, the explosives contractor will provide commercial packaged explosives and accessories that will be transported to the Mine site. This will include detonators, boosters, detonating cord and packaged explosives for specialty applications. These materials will be stored on site in approved explosive magazines until issued for use. The location of the AN/Emulsion Storage Area and the explosive magazines is shown in Figure 1-1.



NOTES:

1. COORDINATE GRID IS UTM NAD 83 9N.
2. TOPOGRAPHIC DETAIL PROVIDED OCTOBER, 2017.
3. PIT SHELLS PROVIDED BY BMC, APRIL 26, 2019.
4. CONTOUR INTERVAL IS 5 METRES.
5. ALL ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
6. PROGRESSIVE RECLAMATION NOT SHOWN.

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SCALE A 150 75 0 250 500 750 m

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PREPARED FOR:

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BMC MINERALS (NO. 1) LTD.

KUDZ ZE KAYAH PROJECT

AN/EMULSION AND EXPLOSIVE MAGAZINE STORAGE AREAS

Knight Piésold CONSULTING

P/A NO. VA101-640/11

REF NO. 16

FIGURE 1-1

REV A

2 EXPLOSIVES MANAGEMENT PLAN OBJECTIVES

The objectives of the Explosives Management Plan are as follows:

- Communicate a methodical approach to explosives management for the Project;
- Ensure that infrastructure constructed for explosives is compliant with all applicable regulations;
- Ensure that structures are constructed to prevent safety or environmental incidents relating to on site explosives storage;
- Ensure that handling of explosives is undertaken in a manner that will minimize the possibility of safety or environmental incidents;
- Prescribe safe and environmentally sound measures for disposal or destruction of explosives;
- Prescribe procedures for safe blasting;
- Prescribe procedures for dealing with spills of explosives materials; and
- Indicate the chain of responsibility for explosives management.

3 APPLICABLE LEGISLATION AND EXPLOSIVE PERMITS REQUIRED

3.1 APPLICABLE LEGISLATION FOR THE MANAGEMENT OF EXPLOSIVES

The control and use of explosives within Canada and Yukon is covered by federal and territorial acts and regulations. The Project will implement operational policies and procedures that meet or exceed the required acts and regulations. Table 3-1 lists the applicable federal and territorial acts, regulations, and guidelines applicable to the management of explosives at the Project.

Table 3-1: Applicable Federal and Yukon Legislation for Explosives

Acts	Regulations	Guidelines
Federal		
Fisheries Act (Government of Canada, 2019a)	*Metal and Diamond Mining Effluent Regulations* (Government of Canada, 2019b)	Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters
Explosives Act (RSC 1985 c.E-17) (Government of Canada, 2015)	*Explosives Regulations* (Government of Canada, 2019c)	Not applicable
Transportation of Dangerous Goods Act (Government of Canada, 2019d)	*Transportation of Dangerous Goods Regulations* (Government of Canada, 2019e*)*	Not applicable
Territorial		
Workers' Safety and Compensation Act (Yukon Government, 2021)	*Workplace Health and Safety Regulations* (Yukon Government, 2022)	Not applicable
Dangerous Goods Transportation Act (Yukon Government, 2013)	*Dangerous Goods Transportation Regulations* (Yukon Government, 1995)	Not applicable

3.2 EXPLOSIVES PERMITS REQUIRED

Various permits are required for explosives use; for transportation, storage, manufacture and usage. A brief summary of the permits and licences required are listed below:

- Manufacturing and Storage Licence – Required under the *Explosives Act* (Government of Canada, 2015);
- Permit for Use of Explosives – Required under the *Explosives Act* (Government of Canada, 2015);
- Explosives Magazine Permit – Required under the *Explosives Act* (Government of Canada, 2015);
- Explosive Transportation Permits – Required under the *Explosives Act* (Government of Canada, 2015); and
- Blasting Permit – Required under the *Workplace Health and Safety Regulations* (Yukon Government, 2022).

3.2.1 Contractor Requirements

BMC will contract an explosives company to manage explosives use and obtain the above listed permits on BMC's behalf. The contractor's responsibilities will include supplying, transporting and storing blasting agents; manufacturing explosive products on site; and delivering explosives products to blast sites. The mining contractor, with oversite from BMC, will supervise the loading of the blast patterns and undertake pattern tie-ins. The objectives of the contract with an explosives company are identified as follows:

- Clearly specify the responsibilities of the contractor and that of BMC and the scope of explosives operations;
- Establish an effective means of communication between the contractor and BMC, including planned daily activities, inventory reports on explosives on-hand, regular meetings, and exchange of weekly reports;
- Note the facilities/activities that are the responsibility of the contractor and those that are the responsibility of BMC;
- Describe the access and egress control and security of the Project; and
- Agree to jointly develop a detailed Bulk Explosives Emergency Response Plan and a Security Plan. The Bulk Explosives Emergency Response Plan will provide details on emergency responses to instances involving explosives and the materials used to manufacture explosives on site. The Security Plan will address security measures for the Project's explosives facilities.

The contract, and all required plans and procedures, will be finalized prior to explosive usage on the Project.

4 TYPES OF EXPLOSIVES TO BE USED ON SITE

BMC plans to use the following types of explosive equipment and supplies during blasting operations:

- Bulk AN;
- Emulsion (bulk and packaged);
- Nitroglycerin based explosives;
- Cast pentaerythritol tetranitrate boosters;
- Non-electric, surface delay and in-hole detonator assembly;
- Non-electric, short delay, trunk-line assembly;
- Electronic detonators;
- Lead-in line (shock tube); and
- Detonating cord.

Descriptions of each type of explosive are provided in the following sections.

4.1 BULK AMMONIUM NITRATE (AN)

Bulk AN is classified as an oxidizer and will be transported and stored on site as bulk emulsion compatible AN prill. Mixing AN with fuel oil (FO) at a AN/FO ratio of 94%/ 6% by weight creates ANFO a blasting agent. ANFO is water soluble and under most conditions is blasting cap insensitive.

4.2 EMULSION (BULK AND PACKAGED)

Emulsion explosives will be used because of expected wet conditions. Emulsion is water resistant and can be blended with ANFO for a product that is better suited to variable moisture conditions.

The Project is expected to use an emulsion mixed at the drillhole by specialised trucks, which uses the same ammonium nitrate/fuel oil chemistry as ANFO but differs in that the reactants become significantly denser than ANFO as well as being water-resistant. The product is a mixture of emulsion and ammonium nitrate prill (usually 70:30, respectively).

4.3 NITROGLYCERIN BASED EXPLOSIVES

Nitroglycerin based explosives combine nitroglycerine with adsorbents and stabilizers, rendering it safe to use but retaining the powerful explosive properties of nitroglycerin. Pre-packaged explosives may be kept on site for small, selective blast requirements, such as fragmenting boulders and removal of high spots on the pit floor.

4.4 CAST BOOSTERS

The explosives contractor will use cast boosters which are detonator sensitive, high density, high energy molecular explosives available in various sizes designed to optimize initiation of all booster sensitive explosives. Cast boosters are stable and have a long shelf life when stored under recommended conditions. Cast boosters are formulated from pentaerythritol tetranitrate, are water resistant and are relatively unaffected by extremely low temperatures.

4.5 NON-ELECTRIC DETONATOR

The explosives contractor will have the option to use a non-electric detonation method. In this case, the initiation system is composed of a series of shock tubes connected to detonation devices. The shock tubes transmit shock waves to the non-electric detonators to initiate the blast. Non-electric detonating systems include the surface delay and in-hole detonator assembly, trunk-line assembly and lead-in line. The use of non-electric systems eliminates the danger of premature detonation owing to radio frequency energy or stray static electricity (e.g., wind, low humidity, plastic liners are sources of static electricity). Such systems can be used under most weather conditions, provide accurate surface and in-hole timing, and can be used in conjunction with lead-in line shock tube and detonating cord.

4.6 ELECTRONIC DETONATORS

If warranted, electronic detonation may be used to increase the accuracy of detonator delay timing using programmable detonators. The precision timing provided by electronic detonators may allow for a more uniform rock breakage when conducting controlled pit blasting in different rock units.

4.7 DETONATING CORD

Detonating cord is a thin, flexible plastic tube filled with pentaerythritol tetranitrate. Detonating cord may be used by the explosives contractor as a high-speed connection capable of detonating multiple charges almost simultaneously. This may be used to initiate pre-splitting blasts or for detonating large boulders simultaneously with the blast.

5 EXPLOSIVE QUANTITIES

Powder factors have been calculated for the different rock types and blasting parameters. The factors average 0.63 kg/m^3 for ore and 0.42 kg/m^3 for bulk waste. Table 5-1 provides estimated yearly production figures for the ABM open pit and approximate explosive usage over the life of Mine. Mine development and production will give more information on the practical blasting characteristics of the rock types and as this information becomes available the actual usage of explosives will be refined.

Table 5-1: Quantities of Explosives

	Construction	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Blasted waste rock (kilo tonnes [kt])	4,896	10,325	30,310	30,900	24,646	8,771	7,320	5,728	2,328
Blasted ore (kt)	223	1,773	2,132	1,800	2,147	2,204	1,414	1,531	772
Explosives (tonnes [t])	840	2,390	5,020	4,720	4,120	1,960	1,450	1,310	580
Drilling (no of Holes)	8,360	36,520	55,320	46,640	49,210	32,630	22,650	23,620	11,080

6 EXPLOSIVE PREPARATION

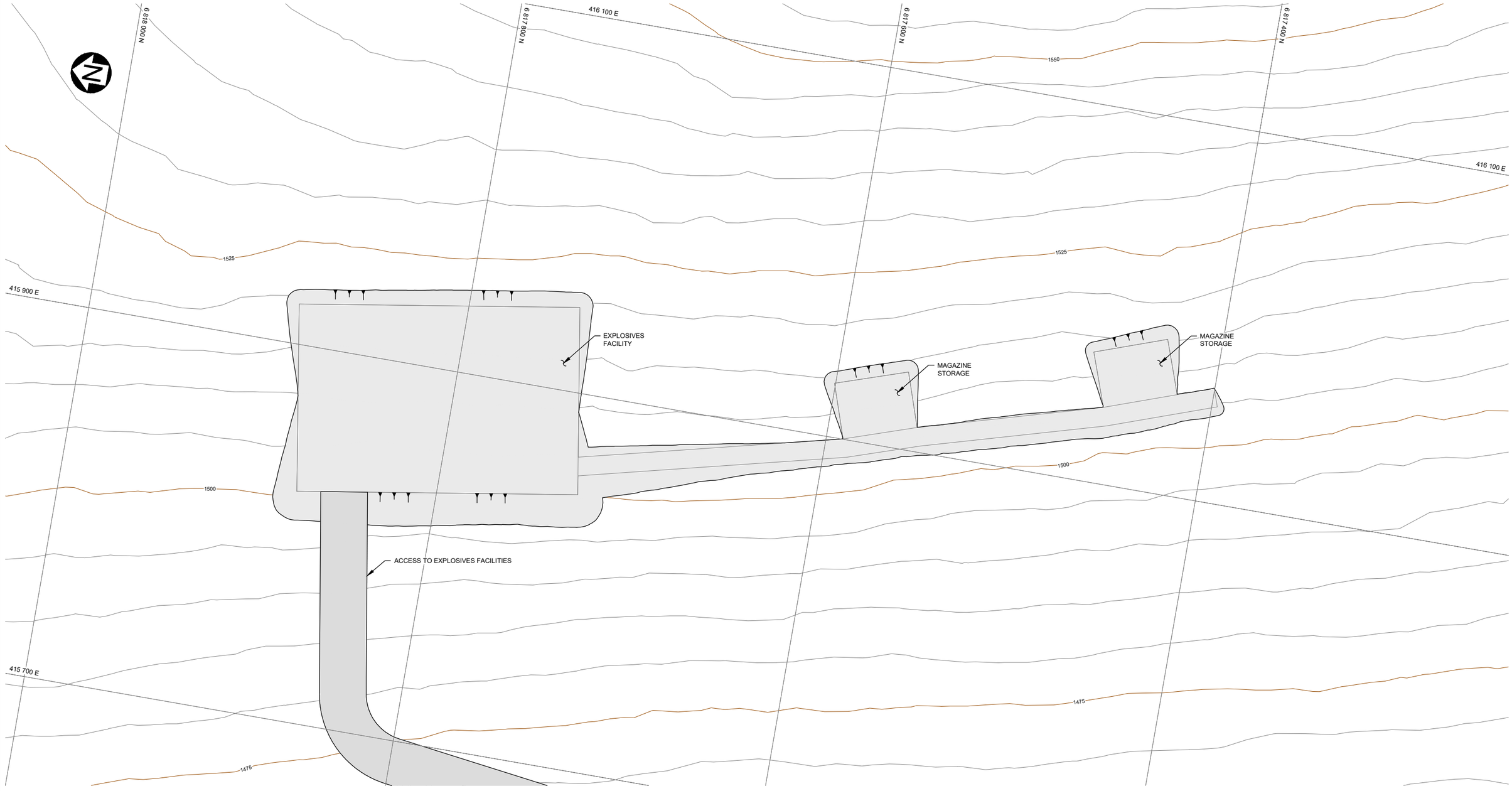
The explosive contractor will be responsible for all activities related to the use and preparation of explosives and delivery to the blastholes. Explosive preparation will include:

- Delivery of ammonium nitrate prill, emulsifying agent and gasifying agent to the Project site;
- Filling blast hole delivery trucks with appropriate non-explosive components;
- Mobilizing the trucks to the blasting area; and
- Manufacture of emulsion explosive at the blasthole for immediate use through mixing with emulsifying agent and chemical gassing agent.

7 EXPLOSIVES STORAGE

Explosives storage at the Project site will consist of three main components: bulk AN storage, bulk emulsion storage, and explosive and blasting accessories storage magazines. The storage facilities will be designed to meet all government regulations, including sections 14.24 to 14.29 of the Workplace Health and Safety regulations and will be located according to required separation distances as regulated by the Explosives Regulatory Division of Natural Resources Canada (NRCan).

All explosives and accessories will be stored at the planned magazine site and explosive storage facility site. The magazine and the explosive storage facility are approximately 960 m from any other infrastructure as per the distance requirements under the *Explosives Act* (Government of Canada, 2015). A plan of the proposed explosive storage locations is shown in Figure 7-1.



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SCALE A 20 10 0 20 40 60 80 100 m

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EXPLOSIVES AND MAGAZINE STORAGE FACILITY

Knight Piésold CONSULTING

P/A NO. VA101-640/11

REF NO. 16

FIGURE 7-1

REV A

7.1 AMMONIUM NITRATE PRILL STORAGE

Ammonium nitrate will be stored in silos at the bulk explosives storage facility shown in Figure 1-1. It is estimated that up to 100 tonnes (t) of explosive will be used per week during peak operations and that approximately 30 t of AN prill will be required for the manufacture of that amount. Regular explosives deliveries will minimize the on site storage of the product.

The AN silo's will be constructed and operated by an experienced explosive operator.

7.2 EMULSION STORAGE

Bulk emulsion are expected to be stored in International Organisation for Standardisation (ISO) tanks at the bulk explosives storage facility shown in Figure 1-1. It is estimated that up to 70 t of emulsion will be used per week during peak operations. Regular emulsion deliveries will minimize the on site storage of the product.

7.3 MAGAZINES

Two containers, constructed according to NRCan regulations, will be placed at the explosive magazine site as shown in Figure 1-1. These will be used as explosive storage magazines and will be used to store the detonators, shock tubes, detonating cord, boosters, explosives in cartridge form and any old explosives prior to destruction. The layout of the magazine will be designed to comply with explosive regulations and will include:

- Pre-constructed detonator magazine for detonators and shock tubes, and
- Powder magazine for boosters and cartridges.

The explosive magazines will be barricaded with rock berms and constructed appropriate distance apart for the designed total storage in accordance with distance requirements for explosives storage facilities as specified in the *Explosives Act* (Government of Canada, 2015).

8 ON SITE HANDLING

The explosives contractor will be responsible for all on site handling, including operation of ammonium nitrate and emulsion storage facilities and explosives magazines. Explosives handling will be undertaken by qualified personnel using equipment designed for the handling and transport of such materials. Safe handling practices will apply to the handling and transport of explosives waste to the disposal site in accordance with the Material Safety Data Sheets.

8.1 AUTHORIZED PERSONNEL

Only authorized personnel will be permitted to enter the magazine and explosives storage areas. The personnel will be listed in a register, maintained by the Mine Manager. A daily log of the persons entering the magazine will be maintained. The following are the types of personnel who will be permitted to enter the magazine and explosive storage areas:

- Appointed blasters;
- Explosive contractor employees;
  - Personnel required for explosive delivery; and
  - Personnel involved in site maintenance.
- Blasting assistants;
- Security guards (external area only, no magazine access);
- Mine Manager, or appointed representative;
- Mines or explosives inspectors; and
- Royal Canadian Mounted Police.

8.2 HAZARDOUS MATERIAL MANAGEMENT

All personnel who will work with explosives will be trained and competent on the procedures for handling explosive materials. Explosives are hazardous materials due to their corrosive nature, and personnel will be required to wear personal protective equipment to prevent accidental exposure to the explosive materials. This will include:

- Safety glasses or goggles for eye protection;
- Appropriate coveralls;
- Impervious gloves;
- Boots; and
- Dust masks if required.

Personnel will also be trained on Spill Contingency Plan requirements relevant to explosives and to general mine site operations (BMC, 2020a).

8.3 HOUSEKEEPING

To effectively manage explosives on site it is imperative that areas used for explosive storage and magazines are well maintained, and not used for storage of any other materials. Good housekeeping will be maintained for the magazines and explosive storage areas. At the blast site, empty boxes used for explosive storage will be removed and burnt or otherwise disposed of in a safe manner, in accordance with the Waste Management Plan (BMC, 2020b). As far as practical, the specialized explosive mixing truck delivering explosive to the blast drill holes will only be filled with the amount required for each blast. At the end of every shift, the outside of the truck will be thoroughly cleaned. There may be a certain amount of explosive that the delivery system cannot extract from the truck. This will not be cleaned out of the truck unless the truck is no longer going to be used for explosive delivery, in which case it will be removed and disposed of appropriately.

Access to explosives magazines will be kept in good condition regardless of the time of year. Road maintenance in this area will be a priority, particularly during winter, as adverse weather conditions will increase the risk associated with transporting explosives.

8.4 EXPLOSIVES DISPOSAL

BMC is committed to the safe disposal of explosives when disposal is necessary. Safe disposal of explosives may be required if blasting material has been damaged during transport, or if it has deteriorated and become unfit for use. BMC, or the explosives contractor, will consult the manufacturer of the defective explosives, and confirm with the NRCan Explosives Regulatory Division, prior to disposal. Deteriorated explosives will be packaged according to the *Transportation of Dangerous Goods Regulations* (Government of Canada, 2019) for transportation to a destruction site. Disposal of explosives will be done in accordance with BMC's commitments to environmental protection, and the associated regulations.

The main cause of deterioration of explosives is temperature fluctuations, causing breakdown of the structures of the product, excessive moisture in the case of AN prill and excessive cold temperatures. To minimize the effects of temperature and moisture the containing structures will be heated and enclosed to minimize the amount of moist air that can enter.

Two methods of explosives disposal that will be employed are destruction by detonation and by combustion. The primary method of disposal will be to detonate small amounts of damaged explosives in a blast hole as part of a production blast. This will be done providing the explosives are still in good condition and can be transported to a production blast. Combustion is another method of disposal and will be done in a remote location, as there remains the chance of explosion during the burning process. During combustion, only one type of explosive is to be disposed of at a time. Special attention will be given to make sure no detonation devices are burned along with the explosives. Initiation devices are best disposed of by detonation at a location separate from the disposal site of the other explosives.

9 BLASTING OPERATIONS

9.1 SAFETY REQUIREMENTS

There are precautions related to explosive loading and blasting, that are required to be in place for the safety of everyone involved in the Project.

Each blast will be overseen by the holder of a Yukon Blaster's Certificate (the designated blaster). During explosive loading operations the blaster will have complete control over the area to be blasted. The following elements will be included in the procedure to maximize safety and to provide a clear logical plan of operations:

- The mine plan will be assessed to determine which blast is being executed and the applicable dimensions;
- The designated blaster will examine the planned blast area for misfires, unsafe face conditions above and below the bench to be blasted, and the blaster will ensure that the area into which the rock will be blasted is clear of any infrastructure or personnel;
- After drilling of the holes, the blaster will measure the holes to ensure they are drilled correctly and for determining quantities of explosives and accessories;
- Modifications due to field conditions will be noted and reported;
- The blaster will follow the loading quantities of the engineered design;
- The explosives and accessories will be drawn from the magazines, and the explosive blend truck will be loaded;
- The explosives contractor will deliver the bulk product to the hole and log the quantity;
- The blaster will sign for the delivery and file all paperwork for each blast undertaken;
- The blasting site will be manned by a blasting assistant to ensure that no unauthorized person enters the site, or no other activity takes place at the site that could interfere with loading procedures;
- Blasting accessories will be delivered to the blast in an approved explosive transportation vehicle, with appropriate warning decals;
- The blaster will check the correct quantities of accessories have been delivered;
- Boosters and down the hole initiation systems will then be distributed to the holes;
- The blaster will then commence with charging of the blast with help from blast assistants;
- When using pumped emulsion, the blaster will ensure that the emulsion rises prior to closing the holes with stemming;
- Once the holes are charged and the emulsion has risen, the stemming will be placed into the holes; and

- Once stemming is complete the blaster will connect the down hole initiation system with trunk lines.

During blasting, blasters will have complete authority to control all activities at the mine site. The designated blaster therefore will personally oversee the evacuation to a safe distance of all personnel working within the clearance zone of the open pit prior to blasting. Key factors that will be implemented for ensuring that evacuation processes are safely and efficiently performed include:

- Effective communication with mine personnel prior to blast;
- Clearly defined safe distances from blast site;
- Effective barricading of entrances to blast sites;
- Blaster will leave the blast site last after checking that the site is clear and connecting the initiating detonator;
- Blaster will confirm that all blasting guards are in place and that all is clear prior to initiating the blast, and
- Alarm used will be designed to be heard by all personnel within 500 m of the blast to be executed.

Post blast inspections shall be completed by the blaster:

- Any hazards shall be identified by the blaster and controlled before other work resumes in the blasted area;
- The blaster will inspect the blasted area for undetonated explosives and other hazards;
- The blaster will attend to any undetonated explosives and hazards;
- The blaster will note the results of the post blast inspection, and any actions taken in the log book, which will be signed off by the designated blaster; and
- The blaster will give permission for work to proceed.

9.2 TRAINING

Only trained and certified persons will be permitted to work with explosives. Employees working with explosives will undertake formal training and on-the-job training to ensure compliance with legislation. Safety training will include the identification of hazards, safety systems required for the handling, transport and manufacture of explosives, and any other specific rules needed to protect workers and facilities (NRCan, 2018). Training requirements will include theoretical and practical aspects of explosives including, but not necessarily limited to:

- General safety induction;
- Safety-critical procedures and controls related to explosives;
- First aid;
- Use of personal protective equipment;

- Workplace Hazardous Materials Information System so that the employees have the necessary information regarding the hazards of explosives, Material Safety Data Sheets, and proper labelling;
- The safety basis on why tasks are to be performed as specified;
- Emergency response; and
- Transportation of dangerous goods.

The explosives contractor and BMC will certify that their workers have received the necessary training to perform the duties required of their job and understand the hazards of the materials to which they may be exposed in the course of their duties. Detailed standard operating procedures will be developed specific to critical functions involving explosives. Should standard operating procedures change, training will be provided to those employees who will be implementing the revised procedures.

Training records, including the subjects covered in each course, will be retained by the Safety Department, which will notify the employee and their supervisor when refresher training is required. Training records will be made available for inspection to relevant federal and territorial inspectors, if requested. The explosives contractor will keep a training record of its on site staff.

9.3 EXPLOSIVES TRANSPORT EQUIPMENT

The explosives contractor will transport the explosives from the AN/Emulsion Storage Area to the blast site using a truck designed for the safe delivery of ANFO and Emulsion. The truck used for product transport will be capable of delivering explosives blends suited for both wet and dry conditions. The explosive blend truck will meet all conditions specified under the Yukon *Workers' Safety and Compensation Act* (WSCA) (Yukon Government, 2002). Placards will be displayed on the side of all explosives transporting equipment as per the *Transportation of Dangerous Goods Regulations* (Government of Canada, 2019).

The explosives blend truck will be equipped with a metering system that will enable BMC to reconcile the amount of explosives used with the amount of explosives delivered to site. The reconciliation will be an integral part of maintaining responsible explosives use on the Project.

Explosives delivery equipment will be managed under a strict maintenance program. The program will be designed to prevent mechanical failures that would endanger personnel or have a negative effect on mine production.

Blasting accessories such as detonators, delays, boosters and detonating cord, will be transported to the blast site in a separate vehicle to the blend truck. The detonators and packaged explosives will be stored separately in closed metal containers lined with wood, or other suitable material. The container will be secured to the vehicle to prevent unintentional unloading during transport.

The following inspection, as required under the WSCA, including sections 14.13 to 14.20 of the Workplace Health and Safety regulations, will be performed on each vehicle prior to the transport of any explosives:

- Fire extinguishers are filled and in working order with up to date inspection tag;
- The electrical wiring is completely insulated and firmly secured;
- The fuel tank and feed lines have no leaks;
- The chassis, engine, pan and bottom of the conveyance are reasonably clean and free from surplus of oil and grease;
- The brakes and steering are in good working order; and
- The conveyance is in sound mechanical condition.

9.4 MANUFACTURE OF EXPLOSIVES AT THE BLASTHOLE

Ammonium nitrate and emulsion will be transported by the explosives blend truck and subsequently mixed and gassed as the explosives are loaded into the blastholes. The explosives blend truck will be placarded accordingly and meet conditions specified under the Yukon WSCA. The blast planner, in communication with the explosives contractor, will determine daily the quantity of AN and emulsion required such that the volume of explosives remaining in the truck after the blast holes are loaded is minimized.

The explosives blend truck(s) will be washed on a regular basis in a self-contained wash bay system to ensure that any explosives residue that may be present on the vehicle remains contained, and that the chassis and engine body are clean and free of excess oil and grease. All wash water will be collected and treated in an oil water separator and recycled within the wash bay. Any residual solids will be packed in approved packaging and subsequently loaded into a blast hole to be consumed during the next blast.

9.5 ADVERSE WEATHER CONDITIONS

Safety precautions will be employed during adverse weather conditions. The blasting supervisor will advise personnel on the best way to proceed based on the severity of the adverse weather. Under no circumstances will blasting take place during an electrical storm. The blast site will be evacuated, and no electrical detonation equipment will be connected.

Snow removal will be a priority along the explosives transportation route. In the event of a snowstorm, the road between the explosives storage area and the blast site will be cleared of snow in preparation for blasting activities to resume. Road maintenance will be important after freshet and periods of heavy rainfall. Erosion due to water movement will be corrected to ensure the viability of the transportation route.

Adequate lighting will be made available at the blasting site in preparation for foggy and winter lighting conditions. Explosives equipment will be equipped with high visibility equipment, and communication measures will be employed to alert mine personnel of the presence of explosives.

9.6 BLASTING FUMES, DUST, AND FLY ROCK

Blasting creates by-product gases as a function of the chemical reactions involved. These gases include carbon monoxide and dioxide as well as oxides of nitrogen and can be harmful to humans in higher concentrations. The gas concentrations are related to product quality, which can degrade due to factors such as groundwater conditions, length of time between loading and blasting, or the manufacturing process. The amount of gases produced is also directly related to the amount of the explosive used per tonne of blasted material, known as the powder factor. The lower the powder factor the more efficient the blasting is, and the less gases are produced.

The blaster will not give the "*all-clear*" until completely satisfied that the gases have dispersed, and that the area is safe to approach. At that time, the guards will be removed allowing access to the area. The process for establishing that the site can be given the "all clear" will in principle be:

- waiting for a set period of time following the blast (typically 15 minutes),
- visually observing the dust / fume cloud to verify that it has dispersed, and
- when both above criteria have been met, the designated blaster will approach the blasted area (alone) and inspect the area looking for evidence of potential misfires and confirming by smell that the fumes have dissipated. Blast fumes have a very strong smell and are an irritant and it will be readily apparent if fumes are taking longer to disperse than that normally experienced.

Fly rock from blasting is potentially dangerous to personnel close to the blasting site and can be minimized by using appropriate practices in blast design, loading, and stemming. The designated blaster and blasting assistant will assess the potential for fly rock in every blast and determine the blasting danger zone (minimum 500 m) and to where guards and personnel will be evacuated.

9.7 MISFIRES

Current blasting technology when handled by trained and competent personnel is designed to reduce the possibility of misfires, through construction materials, sensitivity of explosives and precise initiation systems. Nevertheless, there is always a residual risk of misfires, for which a procedure will be put in place to prevent injury due to unexploded explosives.

Misfires will be dealt with as specified in the Yukon WSCA, including sections 14.69 to 14.72 of the Workplace Health and Safety regulations. If there is evidence or suspicion that a misfire has occurred when using electronic detonation equipment, a minimum of 10 minutes will be allowed to elapse from the time the blasting cable is disconnected and short circuited.

The personnel tasked with dealing with a misfire will be kept to a minimum and restricted to personnel trained for blasting or handling of explosives.

The designated blasting will direct the removal of as much material as possible to assess the situation. Equipment for handling misfires will only be used as directed by qualified blast personnel. The blaster will ensure that the lighting of the blast site is adequate, and the proper safety precautions have been taken to prevent accidental detonation.

When a misfire is suspected, the area will be roped off using non-metal markers in a manner approved by the designated blaster. A minimum of 8 m will be maintained around the collar of a misfired hole. Any misfired explosive will not be removed but will be primed and blasted without delay.

If drilling is required following a misfire, the blaster will determine the location, direction, and depth of any hole required for blasting the misfired charge. The blaster making this decision will remain on site and supervise the drilling of this hole. The new hole will be drilled a minimum distance of 1.5 m away from the misfired hole. The location of any remaining misfired shot will also be recorded at the end of the shift.

9.8 INVENTORY MANAGEMENT

Explosives and blasting agents deteriorate through improper storage and extended time stored. Although modern explosives are designed to have an extended shelf life, rotation of stocks is essential to maintain explosives in an optimal condition and to minimize wastage. All explosives stored on site will be stocked, stored and issued to ensure that inventory is rotated to ensure older stock is used first.

The federal *Explosives Act* requires that the following explosives products records be kept:

- Quantity and strength of each explosive manufactured; and
- Quantity of each explosive issued to the Mine Site from the explosive blend truck, including the dates of shipments and quantity of each explosive on site.

The explosives contractor will perform weekly inventories of AN and emulsion silos and will keep a record of explosives used to ensure an accurate inventory is documented. The inventory of blasting materials and the amount used will be provided to mine management on a weekly basis.

The explosives contractor will conduct daily inspections of the magazines that store the dynamite, boosters, delays, lead-in lines, and detonating cords, and will provide an inventory to mine management. Both the explosives contractor and BMC will keep a logbook of the inspections and inventories and provide weekly reports to mine management.

9.9 REPORTS AND RECORD KEEPING

As part of permit and licensing requirements for explosive use, accurate record keeping will be undertaken. The following records will be kept:

- All permits and licences will be available for inspection;
- Certificates of blasting personnel;
- Records of regular facility inspections;
- Design plans for magazines and explosive storage facilities;
- Explosive delivery records (weigh bills);
- Magazine stock taking records;
- Records of explosive withdrawals from magazines and explosive storage facilities;
- Climate data for explosive storage facilities and magazines to ensure that temperature thresholds have not been exceeded;
- Blast records showing date, blast number, blast layout, explosive quantities used, name of person initiating the blast, and results of post blast inspection; and
- Disposal of explosives.

These records will be kept in an orderly state and kept in a safe dry area. The records shall be maintained for at least five years on site, before being archived.

9.10 INSPECTIONS

Weekly Scheduled inspections by the explosives contractor and BMC staff will be conducted to ensure compliance with the regulations, licences, procedures, and policies. An annual audit will also be undertaken. These audits will be undertaken following written procedures and will record action items and subsequent corrective actions taken. Inspection records will be made available to the NRCan upon request (NRCan, 2018).

Access to and use of explosives on site will be under the ultimate control of BMC. BMC staff who have received proper training will be responsible for inspection of all explosives equipment and facilities, including the AN and emulsion storage areas, as well as the magazines. The explosives blend truck(s) and the parking garage will be inspected by the explosives contractor who will provide independent inspection reports to mine management.

BMC staff will provide weekly reports to mine management that will include:

- Change in the duties of personnel and new staffing;
- Safety concerns or incidents noted in the use of explosives;
- Total explosives consumption;
- Quantity of AN and emulsion remaining on site; and
- Inventory of other explosives and accessories.

9.11 SPILL CONTROL AND MANAGEMENT

Spills of AN and emulsion will be cleaned up immediately, collected, and disposed of in the same manner as other explosive waste produced on site. The method of disposal will be by transportation to a current blasting site and loading into a hole so that the material can be consumed in the blast.

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APPENDIX D: CYANIDE MANAGEMENT PLAN

KUDZ ZE KAYAH PROJECT

CYANIDE MANAGEMENT PLAN

REV02

December 2023

BMC MINERALS LTD.

This Management Plan has been developed to meet the appropriate subject objectives based on existing regulatory requirements, current or planned site activities, existing and expected site conditions, and designed outcomes at the time of writing. Operational processes/practices for achievement of licence terms and conditions may be updated from time to time as appropriate due to changes to relevant legislation and regulations, changes to site activities or conditions, differences from expected objective outcomes, or improvement of management practices. All rates, capacities, dimensions, weights, volumes and durations in text or figures are based on current feasibility level designs and are subject to change based on final design, licence conditions or site conditions encountered. Updates will be resubmitted to government authorities and/or stakeholders as required.

LIST OF REVISIONS

Issue Date	Revision Number	Description of Revision
August 25, 2020	Rev 00	For Issue to Agencies
November 19, 2020	Rev 01	Updated with commitments and Final Screening Report Recommendations
December 14, 2023	Rev 02	Updated in response to Phase 2/3 IR from EMR dated May 5, 2023

LIST OF ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
BC	British Columbia
BMC	BMC Minerals Ltd.
CANUTEC	Canadian Transport Emergency Centre
Cyanide Code	International Cyanide Management Code
ERT	Emergency Response Team
ERHSP	Emergency Response and Health and Safety Plan
HCN	Hydrogen Cyanide
ICMI	International Cyanide Management Institute
Kaska	Kaska First Nation
km	Kilometre
MDMER	Metal and Diamond Mine Effluent Regulations
SDS	Material Safety Data Sheets
NaCN	Sodium Cyanide
OIC	Order in Council
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
SOP	Standard Operating Procedures
TDG	*Transportation of Dangerous Goods Act*
TEAP	Transportation Emergency Assistance Program
the Plan	Cyanide Management Plan
the Project	Kudz Ze Kayah Project
WHMIS	Workplace Hazardous Materials Information System
YG	Yukon Government

GLOSSARY

Cyanide Code: The International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold.

International Cyanide Management Institute: A non-profit organization established to administer the Cyanide Code.

Reagent: A substance or mixture for use in chemical reaction.

Supply Chain: Multiple transportation and distribution operations and activities involved in transporting goods from its point of manufacture to a mining operation.

TABLE OF CONTENTS

FIGURES

LIST OF APPENDICES

1 INTRODUCTION

BMC Minerals Ltd. (BMC) is the owner of the Kudz Ze Kayah Project (the Project). Since acquiring the project in 2015, BMC has actively engaged in assessing historical work, optimizing design, resource drilling, economic assessment, baseline environmental studies, and First Nations and community engagement as well as the successful completion of the Executive Committee Screening by the Yukon Environmental and Social-Economic Assessment Board.

1.1 CYANIDE MANAGEMENT PLAN DESCRIPTION

The Project will process ore through a traditional flotation process, consisting of primary crushing, semi-autogenous grinding milling/ball milling, gravity gold recovery, flotation of copper, lead and zinc concentrates, and concentrate thickening and filtration. Sodium cyanide will be used as a depressant in the lead flotation circuit.

The purpose of this Cyanide Management Plan (the Plan) is to describe the measures that will be implemented to minimize the risk to the public, employees, contractors, and the environment from the transport and use of cyanide in the production process.

The Plan focuses on the safe management of cyanide throughout all aspects of the Project's life cycle and includes commitments on the transportation of cyanide to site, storage on site, usage in flotation operations, and health and safety precautions, including worker training and spill response.

The Plan has been written to include recommended practices under the International Cyanide Management Code (Cyanide Code) (International Cyanide Management Institute (ICMI), 2018).

The Plan will be updated over the life of the Project, based on changes that may result from:

- Changes to the Process Plant and/or mining processes;
- Regulatory changes specified in federal or territorial Acts or Regulations, including the *Metal and Diamond Mine Effluent Regulations* (MDMER);
- Regulatory changes specified in the Quartz Mining Licence or Water Use Licence;
- Changes to the International Cyanide Management Code;
- Periodic internal and external review of the Plan;
- Change in the company supplying the cyanide or change in the transportation route; or
- Consultation with government regulators, First Nations, communities and public, leading to agreed inclusions and/or changes to the Plan.

1.2 TERRITORIAL AND FEDERAL ACTS AND REGULATIONS

Sodium cyanide is classified as a hazardous material. Both federal and territorial legislation regulate the management of hazardous materials in Yukon. A number of acts, regulations, and guidelines provide specific requirements for the management of cyanide. These include but are not limited to:

Federal Acts:

- *Fisheries Act*, (Government of Canada, 2019a);
- *Metal and Diamond Mining Effluent Regulations* (Government of Canada, 2018)
- *Transportation of Dangerous Goods Act* (Government of Canada, 2019b); and
- *Canadian Environmental Protection Act* (Government of Canada, 2019c).

Yukon Acts:

- *Workers' Safety and Compensation Act* (Yukon Government, 2021);
- *Dangerous Goods Transportation Act* (Yukon Government, 2013);
- *Yukon Environment and Socio-economic Act* (Yukon Government, 2019); and
- *Quartz Mining Act* (Yukon Government, 2016).

The management of cyanide, as outlined in the Plan, will be in accordance with the above, and, as necessary, other applicable territorial and federal Acts and Regulations.

1.3 INTERNATIONAL CYANIDE MANAGEMENT CODE

The Cyanide Code focuses exclusively on the safe management of cyanide that is produced, transported and used for the recovery of gold and silver. Companies that adopt the Cyanide Code are subject to auditing by an independent third party to determine the status of implementation and may result in certification under the Cyanide Code. Audit results are made public to inform stakeholders of the status of cyanide management practices at the certified operation (ICMI, 2018).

The Cyanide Code addresses the production of cyanide, its transport from the producer to the mine; its on site storage and use; decommissioning and financial assurance; worker safety; emergency response; training; stakeholder involvement; and verification of implementation. The Cyanide Code is a voluntary industry program developed through a multi-stakeholder dialogue under the auspices of the United Nations Environment Program and administered by the International Cyanide Management Institute.

While not signatories as the Project is not a gold or silver mining operation, cyanide management on site will uphold relevant principles and standards of practice of the Cyanide Code, including:

- Designing and constructing unloading, storage, mixing and transfer facilities consistent with sound, accepted engineering practices and quality control and quality assurance procedures, spill prevention and spill containment measures;
- Operating unloading, storage, mixing and transfer facilities using inspections, preventative maintenance and contingency plans to prevent or contain releases and control and respond to worker exposures;
- Developing standard operating procedures for the handling, storage, and use of cyanide;
- Providing appropriate training to all workers involved in storing, handling, and mixing cyanide and workers will wear personal hydrogen cyanide gas monitors and appropriate personal protective equipment (PPE);
- Providing spill prevention or containment measures for process tanks and pipelines; and
- Implementing quality control/quality assurance procedures to confirm that cyanide facilities are constructed according to accepted engineering standards and specifications.

2 CYANIDE TRANSPORTATION

A detailed description of the requirements for the transportation of hazardous materials is included in the Hazardous Materials Management Plan (BMC, 2020a). To ensure the protection of communities and the environment during transport of cyanide to the 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 between BMC and producers, distributors and transporters; and
- Emergency response plans and management measures will be established by cyanide transporters.

Sodium cyanide (NaCN) can be produced and transported to site in a number of forms, including:

- Briquettes in 1 tonne bulk bag/boxes;
- Briquettes in 20 tonne sparge boxes; and
- Liquid cyanide in 1,000 litre bulk liquid boxes.

BMC expects that the most likely form of cyanide delivery will be in briquette form (Figure 2-1), although as the Project continues to advance this may be revised to better suit operational and safety requirements. The briquettes will likely be delivered in 1,000 kg bulk bags, packed in plywood pallet crates and transported to the Project site in standard steel intermodal containers, 20 bags to a container (Figure 2-2). The containers will be sealed and shipped to site by truck. In addition to supplying the cyanide required by the Project, the producer will assume responsibility for the transport of the cyanide to the Mine site via the Access Road. Although the supplier has not been determined, comparable details of the sodium cyanide to be used at the Project are provided in the sample Safety Data Sheet (SDS), Appendix A.

Figure 2-1: NaCN Briquettes[1]

Figure 2-2: Typical NaCN Transport Container

[1] Image from http://info.noahtech.com/blog/turning-cyanide-into-gold-sodium-cyanide-applications-in-mining.

Transportation of sodium cyanide to the Project will comply with the federal *Transportation of Dangerous Goods Act* (Government of Canada, 2019b) and *Transportation of Dangerous Goods Regulations* (Government of Canada, 2019d) and the territorial *Dangerous Goods Transportation Act* (Yukon Government, 2013), which requires transporters to have a certified contractor and a spill response plan for all goods to be transported. The transporter will be required to ensure:

- Material Safety Data Sheets (SDS) accompany all goods and materials;
- Non-compatible materials will be transported in separate shipments;
- Fire extinguisher and fire prevention materials will be adequate and appropriate for the material being transported;
- Containers will be appropriate for the material being shipped;
- Containers will be properly secured;
- Containers and trucks will be properly marked, labelled, and placarded;
- Manifests will be maintained in accordance with federal, territorial (Yukon), and provincial (British Columbia) regulations;
- Spill response materials will be adequate and appropriate for the materials being transported; and
- Drivers will be adequately trained and equipped for spill first response, containment, and communication.

All BMC employees and contractors using the Access Road will be equipped with a radio set to the Access Road frequency, which will be posted on the information sign at the turn off from the Robert Campbell Highway. Line-of-sight radio communication will also provide communications between vehicles in close proximity to each other.

Upon arrival at the Project site, the cyanide container trucks will be guided by Mine staff to the purpose-built reagent storage area. Custody of the shipping container and its contents will pass to BMC at the Mine site. All cyanide brought on site will be recorded in an Inventory Register to confirm all containers are safely delivered and are accounted for. Appendix A provides example SDS's for solid NaCN, solution NaCN, and hydrogen cyanide gas (HCN) that will be stored on site. The purpose of the Inventory Register is to facilitate efficient audit functions, as well as for environmental and safety management.

A written Emergency Response Assistance Plan will be developed by the producer/transporter. The Emergency Response Assistance Plan will outline strategies in the event of an emergency and will include procedures and current contact information for notifying the transporter's home base, the Project site, regulatory agencies, medical facilities and potentially affected communities. The trucks will carry health and safety equipment, and spill response supplies to be used in the event of an accident or loss of product. Safety is a paramount concern and all drivers will have training in responding to spills while wearing appropriate PPE. The Emergency Response Assistance Plan will be provided to and reviewed by BMC. A copy of the transporter's Emergency Response Assistance

Plan will also be provided to the mine's Emergency Response Team (ERT) for their use, should they need to respond to an incident involving a truck carrying cyanide.

If a transportation accident were to occur, the driver will contact his or her home office and the Project site, even if NaCN was not spilled. The information that will be provided includes the name of the driver, location and nature of the accident, proximity to surface water, the nature of any injuries, amount of material released, if any, weather conditions, and proximity to a populated area. In the event of a spill, the driver will follow proper spill response and spill reporting procedures, and will report the spill to the relevant provincial or territorial jurisdiction in which the event occurred, in accordance with territorial, provincial and federal requirements (Chapter 6 of the Plan).

3 CYANIDE HANDLING, STORAGE, AND USE

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

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

General handling and storage measures that will be implemented to avoid, control, and mitigate risk include:

- Manufacturers will provide safe packaging and labelling for packaged materials, as a condition of purchase agreements;
- Storage areas will be appropriately climate controlled, dry, and well ventilated;
- Storage for transport will utilize a "*triple sealed*" method; sealed bags inside wood packing boxes inside a sealed sea container;
- Containers holding the materials will remain sealed to prevent accidental leakage and/or spillage;
- Incompatible chemicals will be stored separately to prevent deleterious chemical reactions and cross contamination;
- Chemical storage areas will be designated as non-smoking areas and located away from food storage areas;
- All personnel handling dangerous goods will be trained and provided with appropriate PPE; and
- All bulk chemical storage sites will be outfitted with concrete or lined floors and will be bunded with walls capable of containing 110% of the volume of the largest vessel in the area or as stipulated by appropriate legislation or permits.

Solid sodium cyanide will be stored in it's as-delivered packaging in the reagent storage area on the eastern side of the main Process Plant building (Figure 3-1) until required for use. The reagent storage shed will be a steel framed structure with metal roofing and metal siding to keep reagents dry and protected from the sun and elements.

Sodium cyanide will be mixed in a dedicated area located on the west side of the main Process Plant building (Figure 3-1). A general arrangement drawing of the cyanide area is provided in Figure 3-2, which includes application of engineering controls to prevent workers from coming into direct contact with cyanide briquettes while mixing. Dry cyanide briquettes will be added to the water filled mixing tank to an approximate 10% NaCN solution. The cyanide area will include a cyanide bag hoist, a fully enclosed bag splitter (with entry doors for the bag), dust hood, vent fan, and dust filter. During mixing the hood and ventilation equipment will operate under negative ventilation pressure so that any airborne NaCN dust cannot be released. Ventilation for the mixing area will be through a local

exhaust ventilation system, in accordance with Section 8 of the Workplace Health Regulations. Mixed cyanide solution will be pumped to the cyanide storage tank ready for use in the flotation area.

The cyanide mixing and storage tanks will be equipped with level measurement and indication, to ensure that spills do not occur during operation. The cyanide area will be designed as a wet area, with sloped concrete floors draining to a spillage sump for containment. A dedicated spillage pump will return spillage from the sump to the mixing tank for re-use in the Process Plant. The mixing and storage tanks will be in a covered storage area and will be equipped with a ventilation system that vents to atmosphere.

All tanks, piping, valves, and secondary containment structures will be subject to regular inspections. As is normal for a facility of this type:

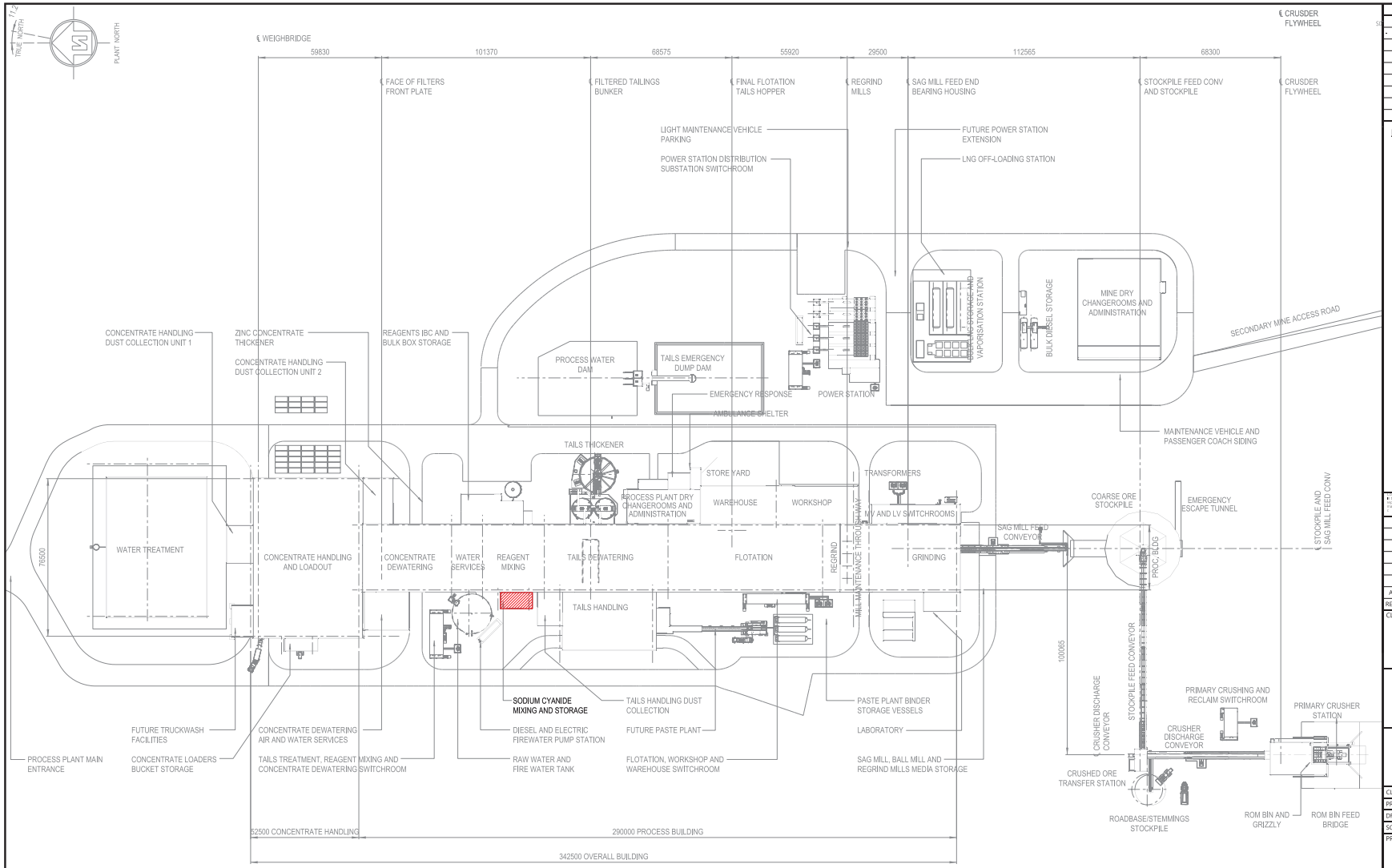
- Standard operating procedures for preventive maintenance will be developed for all aspects of the Process Plant;
- Tanks and pipeline inspections will focus on signs of corrosion or leakage, and legibility of labels, colour-coding or other markings indicating pipeline contents and direction of flow;
- Secondary containment and associated piping will be inspected for signs of cracks or leakage, and presence of fluids. If deficiencies are found or the presence of fluids noted, follow-up corrective actions will be initiated and tracked;
- Records of the inspections and corrective actions will be retained on site. The mixing facility will have a stationary HCN gas monitor, set to alarm at 10 ppm, and a video monitoring system that will be connected to the Process Plant control room;
- First aid equipment will be located at the mixing facility;
- A carmoisine dye, which is non-hazardous, will be added to each batch prepared in the mixing tank to give the cyanide solution a highly visible red colour[2]; and
- The storage tank will also have overflow and tank level indicators monitored in the control room and this will be set to produce an alarm should the solution level become too high.

Unloading and storage area design issued for construction drawings will be prepared and 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;
- Employee safe-handling training and PPE;

[2] The International Cyanide Management Code requirement is that "*high strength*" cyanide solutions (with NaCN concentration of 15% or more) will have carmoisine dye added, with effect from July 2019. At the intended 10% NaCN concentration, adding the dye is not strictly required for the Project.

- Fire suppression equipment; and
- Waste disposal methods (empty cyanide containers).



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KUDZ ZE KAYAH PROJECT DEFINITIVE FEASIBILITY STUDY

TITLE:

PROCESS PLANT FACILITY LAYOUT WITH REAGENT STORAGE AND MIXING AREA

DWG NO: **FIGURE 3-1** REV: **A**

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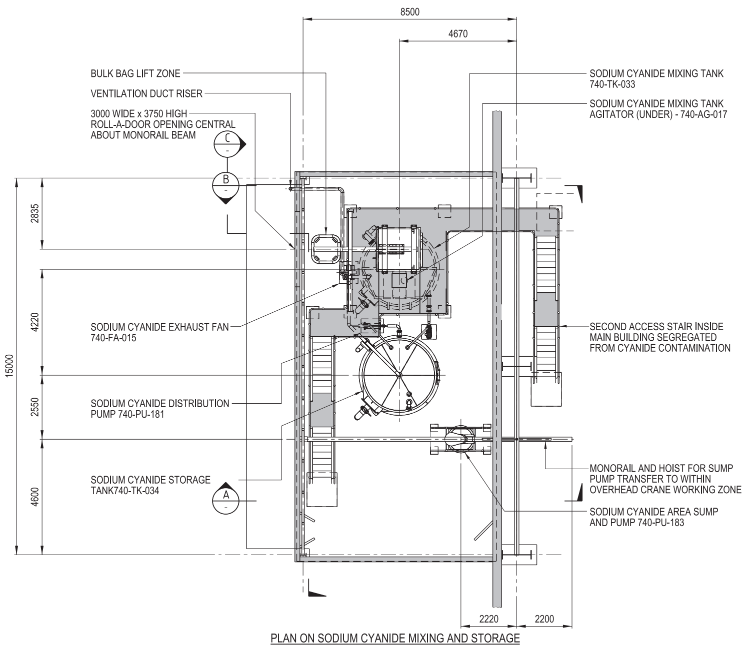
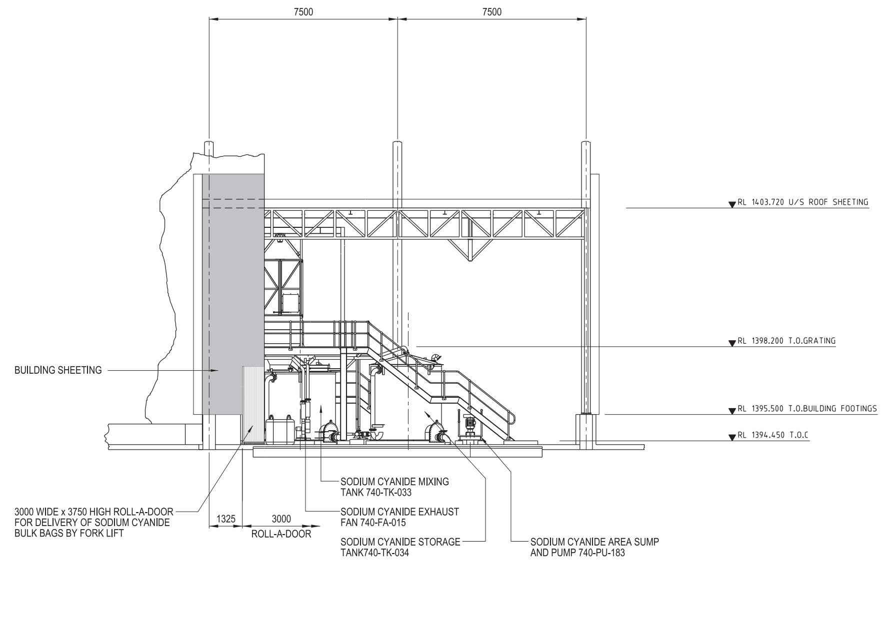


PLAN ON SODIUM CYANIDE MIXING AND STORAGE



SECTION C
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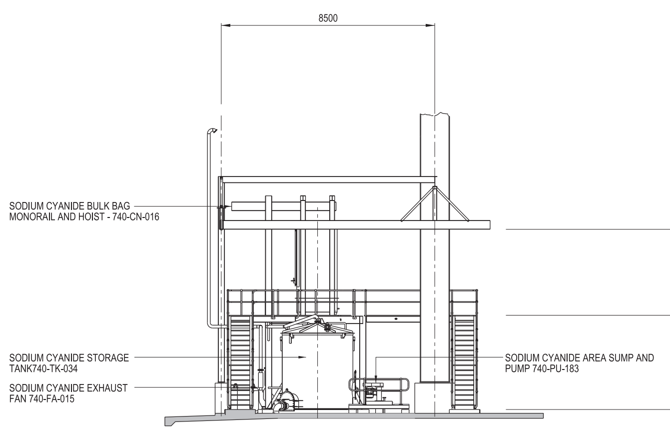

SECTION A
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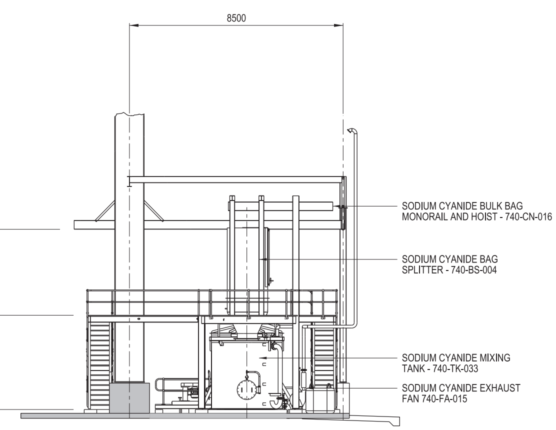

SECTION B
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REFERENCE DRAWINGS

DRAWING NO	DRAWING DESCRIPTION/TITLE	REF
S077-000-DRG-GN-001	PROPOSED PRIMARY SETOUT - PLAN	1

NOTES:

1. X

ISSUED FOR
REVIEW
Dateyyyy/mmm/dd

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
A	19 04 05	ISSUED FOR REVIEW	MPE	MB

CLIENT: BMC MINERALS

Allnorth

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CLIENT NO:	-	DRWN:	MPE	DATE:	APR 19
PROJECT NO:	17BVA0080	DSGN:	FC	DATE:	APR 19
DRAWING SIZE:	ANSI "D"	CHKD:	FC	DATE:	APR 19
SCALE:	SCALE	APVD:	MB	DATE:	19 04 05

PROJECT:

KUDZ ZE KAYAH PROJECT DEFINITIVE FEASIBILITY STUDY

TITLE:

CYANIDE AREA GENERAL ARRANGEMENT

DWG NO: **FIGURE 3-2** REV: **A**

4 PERSONAL PROTECTIVE EQUIPMENT AND WORKER SAFETY

BMC will provide personal protective equipment (PPE) to its employees, and contractors will be required to supply PPE to their on site employees. At a minimum, all employees and contractors will be required to wear a hard hat, reflective vest or markings, safety glasses, and steel toed boots when on site, with the exception of the offices, dining, and accommodation complex. Depending on the work location, protective gloves, hearing protection, and coveralls may also be required.

At no time will employees need to physically handle the solid NaCN. However, BMC will provide employees involved in the storage, handling and mixing of cyanide PPE specific to cyanide management as follows:

- **Eyes**: Impact resistant chemical protective goggles, face-shield with brow;
- **Skin**: Natural Rubber, Nitrile, Polychloroprene with natural latex rubber, PVC. Wear chemical protective suit; and
- **Respiration**: A respiratory protection program that meets OSHA 1910.134 and ANSI Z88.2.

The reagent storage and mixing area will have SDS sheets, eyewash station, emergency shower, and non-acidic dry fire extinguishers, all of which will be clearly marked with signs. Both areas, as well as the NaCN dosing point into the lead flotation circuit will have fixed local audible and visual HCN alarm systems that will also relay an alarm signal to the process plant control room. Working in the cyanide mixing or reagent storage area will require two workers who will wear the appropriate PPE and carry portable HCN gas monitors. All fixed and portable alarm systems will be set to sound an alarm at 4.7 ppm. If any alarms are triggered, all workers will immediately evacuate the reagent storage and mixing area. The alarm will sound in the mixing facility and Process Plant. The source of the HCN gas detection will be indicated on a screen in the Process Plant control room. Video surveillance will confirm that all workers have left the area. If the alarm sounds in the Process Plant the building will be evacuated, including the control room, and personnel will report to the muster station.

The process plant control room will be adequately ventilated under positive pressure.

A typical SDS for solid and solution NaCN and hydrogen cyanide gas is provided in Appendix A, which will be updated once suppliers and specific hazardous materials have been selected. The SDS will be reviewed and updated at any point where alternative suppliers are selected during the life of the Project. At a minimum, paper copies of the SDS for cyanide will be kept in the Process Plant control room, with the first aid equipment near the control room, in the reagent storage and mixing area, and in other areas where employees could be exposed to cyanide. The Health and Safety Department and the First-aid room will have paper copies as well. This will ensure that any person entering this area has immediate SDS access.

5 TRAINING AND WORKER SAFETY

BMC will apply the following Cyanide Code principles related to training and worker safety:

- Protect workers' health and safety from exposure to cyanide;
- Protect communities and the environment through the development of emergency response strategies and capabilities; and
- Train workers and emergency response personnel to manage cyanide in a safe and environmentally protective manner.

The Project will establish and maintain cyanide management and operating systems designed to protect the work force and surrounding environment. Safety is a top priority for BMC during the handling, storage, preparation, and use of cyanide throughout all Project phases. Standard operating procedures (SOPs) will be developed for the handling, storage, and use of NaCN to prevent cyanide releases in the workplace or to the environment, prevent exposure of workers and contractors, and minimize any effects to the extent possible. These SOPs will be provided as Appendices in future revisions to the Plan and will be routinely reviewed and updated over the life of the Project.

SDSProcess Plant workers will be trained in the handling of cyanide, and will receive information on its potential health effects, how to recognize symptoms of cyanide exposure, and procedures to follow in the event of exposure (e.g.; use of the emergency shower). Specialized training will be provided for workers mixing cyanide in the reagent mixing area. Personnel will also be trained on the hazards cyanide poses to the environment, and which situations require response from the ERT.

The locations of emergency showers, eyewash stations, and emergency first-aid stations will be prominently displayed at the reagent mixing area and in the Process Plant, and workers will be trained in their use. Additionally, training will cover the use of cyanide-specific PPE, first-aid procedures, and evacuation procedures in the event of high HCN gas alarm. Training will incorporate taking direct action to control or contain a cyanide release, if it is safe to do so and only while wearing proper PPE (e.g., NaCN solution spilled on a dry floor in the process facilities).

The Project will design its facilities and develop SOPs that strictly limit worker exposure to NaCN. Workers will be required to comply with all applicable precautions and handling procedures for cyanide products. They will be expected to report any concerns to their supervisors, the Occupational Health and Safety Committee, or senior management. Suggestions by the work force for improvements will be reviewed and incorporated into SOPs as appropriate.

Workers will also be trained in spill response. If an employee is a first responder to a cyanide emergency, he or she will raise the alarm on the radio, which will lead to the activation of an emergency response.

The ERT will receive training in how to respond to cyanide incidents, the use of cyanide-specific PPE, such as self-contained breathing apparatus, and what actions to take to neutralize and decontaminate the workplace.

Training records will be retained by the Health and Safety Department, who will alert individuals and their departments when and what training is required for employees, including any refresher training for courses previously completed. Contractors will be responsible for keeping records for their employees working on site.

5.1 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM

As a hazardous material, employees and contractors who transport and use cyanide will be required to complete Workplace Hazardous Materials Information System (WHMIS) training. Training will be provided by BMC's Health and Safety Department. Re-certification is required every three years.

Requirements by WHMIS for employers and contractors include the following:

- Ensure that employees are trained in handling hazardous materials;
- Establish communications between the supplier and the Project prior to hazardous materials being transported to the site;
- Provide proper safe and secure storage for hazardous materials and have WHMIS and SDS placards prominently displayed on storage areas;
- Keep incompatible hazardous materials in separate storage locations;
- Ensure that storage areas have adequate ventilation and, if available, automatic monitoring equipment specific to the materials being stored (e.g., automatic hydrogen cyanide gas monitoring devices in areas where sodium cyanide is used in the workplace);
- Ensure that storage areas are regularly inspected with any deficiencies being immediately rectified;
- Provide appropriate spill kits and PPEs required for responses to spills of hazardous materials; and
- Provide emergency response equipment such as fire extinguishers, first aid kits, eye wash stations, and emergency showers.

5.2 TRANSPORTATION OF DANGEROUS GOODS

Employees responsible for receiving the cyanide shipment from the transporter will be trained in the transportation of dangerous goods following recommended guidance provided by Transport Canada:

- Definition of the nine classes of dangerous goods and their associated hazards;
- Safety marks such as labels and placards that are used to identify the different classes of dangerous goods normally encountered on the job;
- Knowledge of the information that must be on a shipping document, including types of placards, labels, signs, numbers, and other safety marks, what they mean, and when and where to display them;

- The requirements regarding mixed loads and the need for segregation of incompatible dangerous goods;
- The proper selection and means of hazardous materials containment including safe practices on their loading and stowage; e.g., containers secured for transport will be upright, in good condition and not overfilled;
- What to do if the shipping documents, placards, labels, other safety marks, or means of containment seem inadequate or incorrect;
- What constitutes an accidental release and the reporting requirements if an accident happens;
- Proper use of all equipment used in the handling, offering for transport, and transportation of dangerous goods; and
- Loading, unloading, packing, or unpacking hazardous materials at the Mine Site.

BMC will train and certify employees are adequately trained to undertake their responsibilities in receiving cyanide from the transporter. Refresher training will be held annually for all trained employees and contractors.

6 EMERGENCY AND SPILL RESPONSE

Most major transportation providers in Yukon are members of the Transportation Emergency Assistance Program (TEAP), a national emergency response network for managing a chemical transportation incident across Canada. One of the responsibilities of this organization is the sharing of resources, consumables, equipment and personnel in the event of a spill. The transporter will be responsible for contacting TEAP in the event of a spill of materials being transported in their custody.

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

6.1 EMERGENCY RESPONSE

Emergency response will be detailed in the ERHSP (BMC, 2020b). Emergency response scenarios that may be developed in relation to sodium cyanide may include unanticipated events such as:

- Process Plant or reagent mixing area HCN gas levels are above 4.7. ppm;
- Cyanide levels in the environment are above MDMER or water use licence criteria; and
- Safety alarms are triggered in the Process Plant or reagent mixing area.

As described in Chapter 2 of this Plan, an Emergency Response Assistance Plan will be required to be provided by the production and transportation contractor to BMC. The Emergency Response Assistance Plan will outline strategies in the event of an emergency during the shipment of NaCN briquettes and will include procedures and current home base contact information for notifying his/her home base, the Project site, regulatory agencies, medical facilities and potentially-affected communities. The trucks will carry health and safety equipment, and spill response supplies to be used in the event of an accident or loss of product. Safety is a paramount concern and the driver will have training in responding to spills while wearing appropriate PPE. A copy of the Emergency Response Assistance Plan will be provided to the ERT, should they need to respond to an incident involving a truck carrying cyanide.

Site health care workers and strategic members of the ERT will be trained in how to administer medical oxygen and amyl nitrite antidote in instances of cyanide exposure that necessitate medical intervention. A cyanide antidote kit as well as medical oxygen and resuscitators will be located in the Process Plant near the control room in the event of any such occurrence. A cyanide antidote kit will also be located in the First Aid room. As part of emergency response planning, BMC will consult the Watson Lake Community Hospital and Whitehorse General Hospital, and their medical practitioners, as they will serve as back-up in the event of a serious cyanide incident.

6.2 SPILL RESPONSE

NaCN spills greater than 5 kg or 5 liters, or a spill of any amount that enters Geona Creek, Finlayson Creek, or any of their tributaries, must be reported to external authorities, following the requirements for a "*reportable spill*" under the *Yukon Spill Regulations* (OIC 1996/193), pursuant to the *Environment Act*, as follows:

The Environmental Manager or delegate will call the 24-hour Yukon Spill Report Line (envprot@gov.yk.ca or **1-867-667-7244**).

1. BMC's designated Environmental Manager will ensure that the following information is collected before reporting to the Spill Report line:
    - Location of the spill or leak;
    - Time of spill or leak;
    - Severity of spill or leak;
    - Type of spill;
    - Product spilled;
    - Nearest watercourse;
    - Potential to enter surface water;
    - Fire hazard;
    - Hazard to life and limb, injuries;
    - Environmental effect expected, if any;
    - Equipment and clean-up consumables on hand; and
    - Actions to contain the spill.

Other external contacts are provided in the Spill Contingency Plan.

Sodium cyanide is a hazard class 6 division 1 chemical, as defined by the *Transportation of Dangerous Goods Act* (TDG). This means that NaCN is a "*product or substance that is a poison as defined in sections 3.19(a) to (e) and 3.20(a) of the Federal Regulations*". Actions required for spill response are outlined in the SDS (Appendix A), but special precautions include:

- PPE: Self containing breathing apparatus, full suit, chemical resistant gloves and safety goggles;
- Do not attempt to clean up a spill without proper training;
- Call the ERT;
- DO NOT ADD WATER: After cleaning up as much the spilled cyanide solution as possible, decontaminate the spill area using a small amount of caustic solution (i.e., 30 grams per

23 litres hypochlorite solution). This will keep the pH above 11.5 and suppress the formation of HCN gas; and

- Dispose of contaminated material off site, or into the process waste stream.

Further details on spill response will be outlined in the Spill Contingency Plan (BMC, 2020c).

7 REFERENCES

BMC Minerals Ltd. (BMC). 2020a. *Kudz Ze Kayah Project – Hazardous Materials Management Plan.*

BMC Minerals Ltd. (BMC). 2020b. *Kudz Ze Kayah Project – Emergency Response and Health and Safety Plan.*

BMC Minerals Ltd. (BMC). 2020c. *Kudz Ze Kayah Project – Spill Contingency Plan.*

Government of Canada. 2018. *Metal and Diamond Mining Effluent Regulations.* SOR/2002-222.

Government of Canada. 2019a. *Fisheries Act.* R.S.C., 1985, c. F-14

Government of Canada. 2019b. *Transportation of Dangerous Goods Regulation.* SOR/2019-101.

Government of Canada. 2019c. *Canadian Environmental Protection Act.* S.C. 1999, c. 33.

Government of Canada. 2019d. *Transportation of Dangerous Goods Regulation.* SOR/2019-101.

International Cyanide Management Institute (ICMI). 2018. *The International Cyanide Management Code.* Washington, D.C., USA. Available at: http://www.cyanidecode.org. Accessed April 2019.

Yukon Government. 2013. *Dangerous Goods Transportation Act*. RSY 2002, c.50.

Yukon Government. 2016. *Quartz Mining Act.* SY 2003 c.14.

Yukon Government. 2019. *Environment Act.* RSY 2002, c.50.

Yukon Government. 2021. *Workers' Safety and Compensation Act.* RSY 2021, C. 11.

APPENDIX E: REAGENT STORAGE INSPECTION FORM

Reagent Mixing and Storage Area Weekly Inspection Form

Date:

Inspector:

Inspection Item:	**Yes**	**No**
Are all containers properly labeled with WHMIS labels visible? If no, install proper signage.		
Are all reagent containers in good condition and free of leaks? If no contact your supervisor and replace containers, if safe to do so.		
Are MSDS present for all materials currently in storage?		
Are spills visible?		
Are all emergency and safety response equipment present? If no, immediately restock missing supplies.		

Observations, Comments, and Corrective Actions Needed:

APPENDIX F: TABLE OF CONCORDANCE

Reference No.	Proponent Commitment / Mitigation	Where addressed
Project Proposal Section 18.3	The conceptual management plan (presented in the Project Proposal) outlines mitigation measures to minimize potential effects to Surface Water, Aquatic Ecosystems and Resources and Wildlife and Wildlife Habitat Valued Component from Project activities	Hazardous Materials Management Plan
Project Proposal Chapter 9	Safe practices will be applied when handling explosives and during blasting to reduce undetonated explosive residues to a minimum and to minimize impacts to groundwater from ammonia, nitrite, and nitrate.	Section 3.1.2 and Appendix C of Hazardous Materials Management Plan
Project Proposal Chapter 15	Risks from hazardous materials through truck transportation of concentrates will be mitigated through the application of the Hazardous Materials Management Plan (Section 18.3 of the Project Proposal).	Section 3.3 of the Hazardous Materials Management Plan
Project Proposal Chapter 18	BMC's general management policies related to hazardous waste include the following requirements: o Store, handle, and transport hazardous materials to avoid loss and to allow containment and recovery in the event of a spill in accordance with all applicable legislation, including, but not limited to the National Fire Code of Canada and the Transportation of Dangerous Goods Act; o Designate areas for the transfer and limited temporary storage of hazardous materials and wastes. The area(s) shall be located at least 15 m from the ordinary high water mark of any non-fish bearing water body and 30 m for fish bearing water bodies, clearly labelled and appropriately controlled; o Adequately train site personnel in the handling and transportation of hazardous materials; o Dispose of hazardous wastes generated during construction in compliance with the Environmental Protection Act; o Where Project activities involve the handling, storage, and removal of hazardous wastes, BMC will maintain the following records: o Inventories of types and volumes of wastes generated, stored, or removed; o Manifests identifying licensed waste haulers and disposal destinations; and o Disposal certification documents.	Chapter 3 Hazardous Materials Management Plan Chapter 5 Hazardous Materials Management Plan Chapter 3 Hazardous Materials Management Plan Chapter 5 Hazardous Materials Management Plan Chapter 5 Hazardous Materials Management Plan
Project Proposal Chapter 18	Full inventory of dangerous goods and hazardous materials will be maintained at the mine site and will list all chemicals on site, including Safety Data Sheets (SDS) and WHMIS information on the products to ensure that Project personnel have all the necessary information for their safe transportation, use, and disposal. The full inventory will be provided as an appendix to the Hazardous Materials Management plan and maintained and updated by site's safety manager or Environmental Manager. Before any chemical is brought to the site, the supplier or contractor will supply a SDS for the product, and the chemical will be added to the inventory and master table. SDS sheets for the Project will be kept with the Hazardous Materials Management plan.	Chapter 2 and Appendix A of Hazardous Materials Management Plan
Project Proposal Chapter 18	All process reagents will be stored in the reagent area with the exception of quicklime which will be stored in a silo adjacent to the Process Plant. The reagent storage tanks will be equipped with volume level indicators and instrumentation to ensure that spills do not occur during operation. The reagent mixing and distribution area has been designed as a wet area, with sloped concrete floors draining to sumps for containment. In addition, appropriate ventilation and fire and safety protection will be provided.	Section 2.3 of Hazardous Materials Management Plan

Reference No.	Proponent Commitment / Mitigation	Where addressed
Project Proposal Chapter 18	Transportation of dangerous goods and materials to the Project will comply with the Transportation of Dangerous Goods Act and Transportation of Dangerous Goods Regulations. Transportation of dangerous goods is regulated under the Dangerous Goods Transportation Act, which requires transporters to have a certified contractor and a spill response plan for all goods to be transported. The transporter will be required to ensure: o SDSs accompany all goods and materials; o Non-compatible materials will be transported in separate shipments; o Fire extinguisher and fire prevention materials will be adequate and appropriate for the material being transported; o Containers will be appropriate for the material being shipped; o Containers will be properly secured; o Containers and trucks will be properly marked, labelled, and placarded; o Manifests will be maintained in accordance with federal, territorial (Yukon), and provincial (BC) regulations; o Spill response materials will be adequate and appropriate for the materials being transported; and o Drivers will be adequately trained and equipped for spill first response, containment, and communication.	Section 3.3 of Hazardous Materials Management Plan
Project Proposal Chapter 18	Hazardous materials will be stored in appropriate containers in suitably contained areas and will comply with WHMIS. A figure outlining all hazardous material storage locations at the site will be provided in the final plan as part of Licensing. General handling and storage measures that will be implemented to avoid, control, and mitigate risk include: o Manufacturers will provide safe packaging and labelling for packaged materials, as a condition of purchase agreements; o Storage areas will be appropriately climate-controlled, dry, and well-ventilated; o Containers holding the materials will remain sealed to prevent accidental leakage and/or spillage; o Incompatible chemicals will be stored separately to prevent deleterious chemical reactions and cross contamination; o Chemical storage areas will be designated as non-smoking areas and located away from food storage areas; o All personnel handling dangerous goods will be trained and provided with appropriate personal protective equipment; and o All bulk chemical storage sites will be outfitted with concrete or lined floors and walls capable of containing 110% of the volume of the largest vessel in the area or as stipulated by appropriate legislation or permits.	Chapter 4 of Hazardous Materials Management Plan This figure will be generated as part of the final design of the Project.
Project Proposal Chapter 18	All employees (and contractors) involved with handling hazardous materials will receive training on safe and appropriate use as per WHMIS from the Regulations of the Workers' Safety and Compensation Act (Yukon Government, 2021). All employees will follow Workers' Safety and Compensation Act and Regulations and use appropriate personal protective equipment as well as proper handling procedures when using hazardous materials. All new employees will receive an induction and appropriate training before being required to work with hazardous materials. All employees will be required to wear the appropriate company supplied personal protective equipment prior to being permitted to handle hazardous materials. Employees will be trained in proper use of personal protective equipment, as required. In the event of accidental exposure to the hazardous substance, first aid will be administered as directed in the SDS and dependent on the severity of the exposure. Emergency response procedures are detailed further in the Health, Safety and Emergency Response Plan (Section 18.15 of the Project Proposal).	Chapter 3 of Hazardous Materials Management Plan
Project Proposal Chapter 18	BMC will adhere to its Cyanide Management Plan which was provided to YESAB as Appendix R3-G of Response Report #3A.	Appendix D of Hazardous Materials Management Plan

Reference No.	Proponent Commitment / Mitigation	Where addressed
Project Proposal Chapter 18	Reagents will be transported to the Project in appropriate containers by contracted suppliers. The reagent mixing area on site will be a fully contained area equipped with sumps and sump pumps to return any spills to the appropriate stock tank. The reagent containment area will be designed to accommodate 110% of the volume of a spill from the largest stock tank or mix tank in the area. All reagent mixing and stock tanks will be equipped with level sensors to prevent overfilling. Any reagent spills on site will be responded to as per the SDS and will be based on the product type, quantity, and environmental and safety conditions.	Section 2.3 and Chapter 4 of Hazardous Materials Management Plan
Project Proposal Chapter 18	BMC will develop a detailed training program to ensure all employees and contractors are aware of their responsibilities and appropriate practices that everyone on site must adhere to. The emergency response team will receive training as necessary for immediate spill response. Spill response employees will be trained in: o Workplace Hazardous Materials Information System; o Transportation of Dangerous Goods; o Spill Training (Spill Responder); o Site specific spill orientation including site procedures, location of spill kits and type of substances stored and used on site; o Safety orientation including reference to the location of the SDS sheets and to proper chemical handling and storage procedures; and o Workers' Safety and Compensation Act and regulations and use of appropriate personal protective equipment and chemical/product handling procedures.	Chapter 3 of Hazardous Materials Management Plan
YESAB R271	Any special waste as defined by the *Environment Act* Regulations would be transported off site and out of the Yukon to authorized sites in Southern Canada. Collection and transportation of wastes will be handled by authorized contractors, with the responsibility for sourcing these outside facilities.	Chapter 5 of the Hazardous Materials Management Plan
YESAB R3-41	The Cyanide Management Plan has been detailed at a conceptual level to inform the assessment of effects currently underway at a screening level under YESAB and will be updated and subsequently provided in conjunction with several other plans to meet the requirements for a Quartz Mining License application and a Water Use Licence application under the Quartz Mining Act and the Waters Act, respectively.	Appendix D of the Hazardous Materials Management Plan