Spill Contingency Plan for Water Supply and Sewage Treatment Facilities Rankin Inlet, Nunavut

Final

Prepared for:
Department of Community and Government Services,
Government of Nunavut

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1.0 Introduction

This Spill Contingency Plan (SCP) has been developed for use by the Government of Nunavut Department of Community and Government Services (GN-CGS) for the operation of the Water Supply and the Sewage Treatment Facilities (the facilities) located in Rankin Inlet, Nunavut.

The contact information for the GN-CGS is provided below:

Government of Nunavut
Department of Community and Government Services
Box 490
Rankin Inlet, NU X0E 0G0
(867) 645-2895

This SCP has been developed for the operation of the facilities and the regulatory approvals in accordance with the *Guidelines for Spill Contingency Planning* prepared by Indian and Northern Affairs Canada (INAC 2007) and the Spill Contingency Planning and Reporting Regulations issued under the Nunavut *Environmental Protection Act*.

Upon finalizing this SCP, the document will be in effect. The SCP will be updated and revised annually to reflect site-specific conditions, as needed.

1.1 PURPOSE AND SCOPE

The GN-CGS directs that all personnel working at its facilities are prepared to provide prompt response to any spills. The SCP allows for the prompt and coordinated response of the GN-CGS to any spill located at the Water Supply Facility and the Sewage Treatment Facilities.

The purpose of the SCP is to provide a guide to all site personnel during routine Facility operation and/or the accidental release of sewage, solid waste, hydrocarbons or other hazardous materials related to the operation of the Facilities. Specifically, the SCP ensures:

1. Life and property are protected;
2. Resources are used effectively;
3. Environmental impacts are minimized; and,
4. Essential reporting is completed.

The SCP identifies key response personnel and their roles and responsibilities in the event of a spill, as well as the equipment and other resources available to respond to a spill. To be effective, it is important that all personnel are familiar with their responsibilities and steps to take

in the event of a spill. Personnel should not read the SCP for the first time during an emergency. The SCP details spill response procedures that will minimize potential health and safety hazards, environmental impacts and spill response activities.

2.0 Site Description

The community of Rankin Inlet (or Kangiqliniq, meaning "deep bay/inlet", in Inuktitut) has a total land area of 20.24 km^2, with a population of 2,266 people (StatsCan 2012). Rankin Inlet is situated on Kudlulik Peninsula which protrudes into the Rankin Inlet of Hudson Bay, located approximately at 62º52'00" N, 92º00'00" W. The community is approximately 450 km north of Churchill, Manitoba and approximately 1,100 km east of Yellowknife, Northwest Territories.

The community is mostly residential with several commercial establishments including construction contracting businesses, a grocery store, and a variety of other smaller businesses. Community buildings include a high school, elementary school, arena, swimming pool, the Hamlet of Rankin Inlet office, Government of Nunavut offices and a police station. Future developments in the community include the Nunavut Arctic College Trades Training Centre, Rankin Inlet Healing Centre, Area 5 subdivision expansion project (including the construction of public and GN staff housing complexes. In recent years, the community has supported the progress of the Agnico-Eagle Meliadine Gold Project, located 24 km northwest of the community, which is currently in the advanced exploration and environmental assessment stage.

2.1 WATER SUPPLY, TREATMENT, DISTRIBUTION AND STORAGE

Water supply for the community is taken from Nipissar Lake, located approximately 2 km northwest of the community. During the summer months (June to September), Nipissar Lake is replenished with additional water pumped via a 4.05 km pipeline from the Char River (Figure 1 in Appendix A).

Water is withdrawn from Nipissar Lake and pumped to the Williamson Lake Pump house, where it is chlorinated, stored and distributed using a series of buried utilidors and water mains. For buildings that are not connected to the utilidor system, water is delivered using water trucks.

2.2 SEWAGE COLLECTION AND TREATMENT

Underground sanitary sewers are used throughout the community to direct sewage, wastewater, and storm water to the Sewage Treatment Facility (STF). Upon arrival at the STF, the sewage undergoes primary treatment before being discharged into the Hudson Bay. For buildings that are not connected to the sanitary sewage system, sewage is collected by vacuum truck and transported to the STF.

2.3 POTENTIAL CONTAMINANTS

Potential contaminants that may be released during the operation of the Facilities are identified in Table 2-1 below.

Table 2-1: Overview of Potential Contaminants

Material	Storage Location	Maximum Quantity
Sewage	Lift Stations	N/A – Continuous Flow
	Force Main	N/A – Continuous Flow
Fuel Storage	Water Treatment Plant/ Williams Lake Pump House	10,000 gallons
	Nipissar Lake Lift Station	2,500 gallons
	Con Shed Storage Facility	4 x 250 gallons
Chlorine Gas	Williams Lake Pump House	1,500 lbs (10 x 150 lbs cylinders)
	Con Shed Storage Facility	7,500 lbs (50 x 150 lbs cylinders)
Fluosilicic Acid	Williams Lake Pump House	410 L (two x 205 L drums)
	Con Shed Storage Facility	8,200 L (40 x 205 L drums)
Calcium hypochlorite	Con Shed Storage Facility	100 L (five x 20 L pails)

2.4 ADDITIONAL COPIES

Copies of the SCP are located at each of the pump houses and inside of the sea canister located adjacent to the water intake pump at the Char River. A copy of the SCP can also be located at the GN-CGS Rankin Inlet office and the Nunavut Water Board.

3.0 Response Organization

The GN-CGS will be responsible for preparing and implementing a detailed SCP during the entire Project duration. Whenever a spill is identified, the GN-CGS Regional Project Manager will be contacted as soon as possible.

The GN-CGS has limited equipment and personnel in the community to address a large spill. In the case of a large spill, it may require the combined efforts of the GN-CGS and the Hamlet of Rankin Inlet to address the issue.

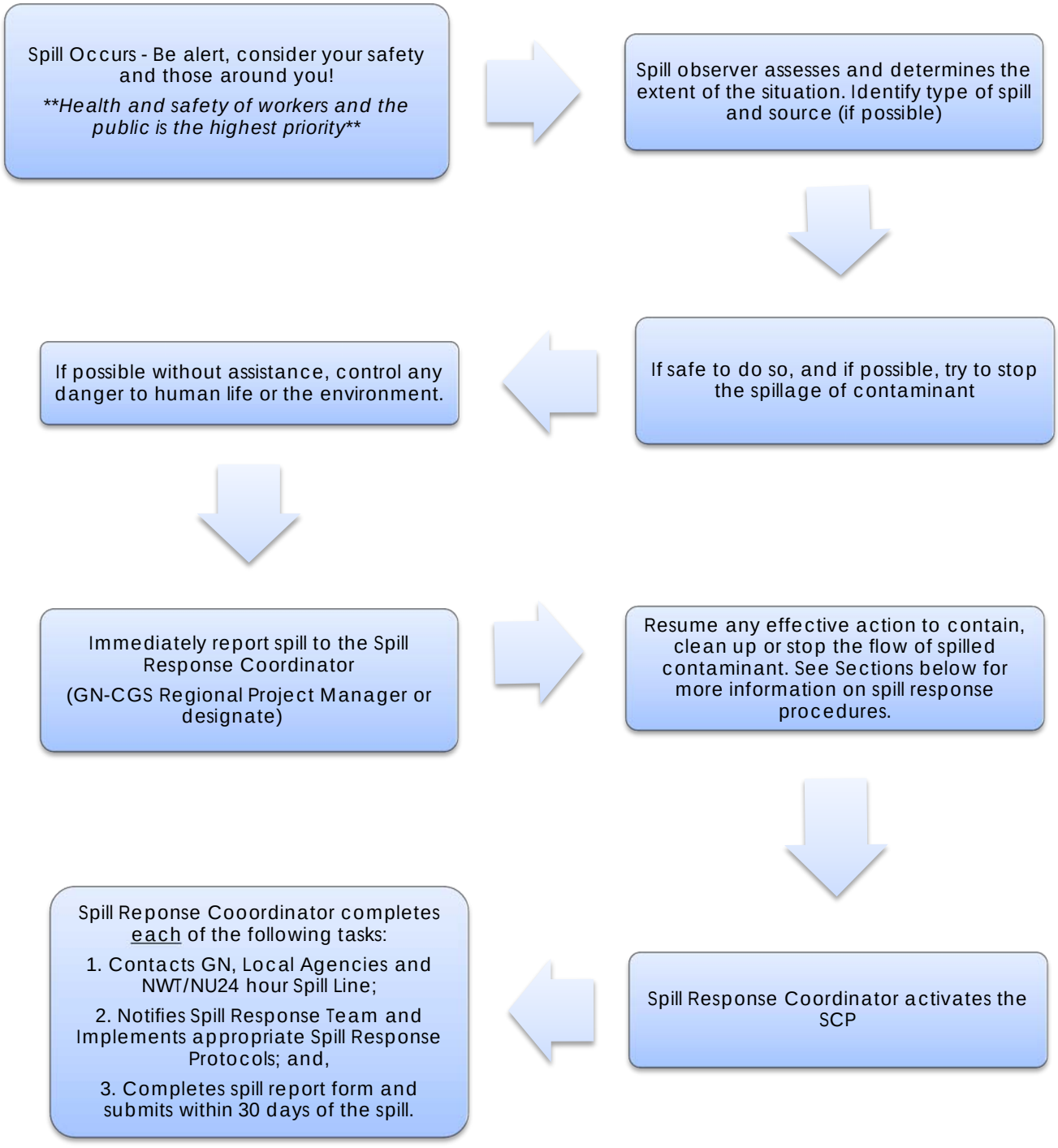
In the event of a spill, the GN-CGS Regional Project Manager or his/her Designate will serve as the Spill Response Coordinator.

The GN-CGS Regional Project Manager or his/her Designate will appoint Hamlet Public Works personnel to the Spill Response Team and will provide the necessary training.

3.1 RESPONSE ORGANIZATION PROCEDURE

The following illustration outlines the sequence of events that must be followed in the event of a spill at the Facilities:

Response Organization
May 2014



3.3 EMERGENCY CONTACT INFORMATION

Table 3-1 provides contact information for personnel who may be contacted to provide advice, expertise, and supply resources in the event of a spill.

Table 3-1: Off-Site Spill Contingency Contact Information

Contact	Location	Telephone number
Fire Department	Rankin Inlet, NU	(867) 645-2598
RCMP Detachment	Rankin Inlet, NU	(867) 645-0123
Community Health Center	Rankin Inlet, NU	(867) 645-8300
GN-CGS – Facilities Manager	Rankin Inlet, NU	(867) 645-8154
24-Hour Emergency Spill Report Line	Yellowknife, NT	(867) 920-8130
Aboriginal Affairs and Northern Development Canada – Inspector	Rankin Inlet, NU	(867) 645-2831
Government of Nunavut – Regional Engineer	Rankin Inlet, NU	(867) 645-4074
Hamlet of Rankin Inlet	Rankin Inlet, NU	(867) 645-2895

The following agencies can be contacted for assistance in spill reporting, response and/or clean-up and remediation.

Table 2-2: Regulatory agencies' Spill Contingency Contact Information

Agency	Legislation	Contact Information
Nunavut Water Board	*Nunavut Waters and Surface Right Tribunal Act*	Phone: (867) 360-6338 Fax: (867) 360-6369
Nunavut Impact Review Board	*Nunavut Land Claims Agreement Act*	Phone: (867) 983-2593
Government of Nunavut Department of Environment	*Nunavut Environmental Protection Act*	Phone: (867) 975-7700 Fax: (867) 975-7740
Environment Canada	Canadian *Environmental Protection Act*, 1999	Phone: (867) 975-4464 Fax: (867) 975-4645
Fisheries and Oceans Canada (Iqaluit)	*Fisheries Act*	Phone: (519) 383-1813 Fax: (519) 464-5128
Transport Canada (Coast Guard)	*Transportation of Dangerous Goods Act*	Phone: (867) 979-5269 Fax: (867) 979-4260

4.0 Reporting Procedure

All spills or potential spills of contaminants must be reported to the 24-hour Northwest Territories – Nunavut Emergency Spill Report Line to ensure that an investigation may be undertaken by the appropriate government authority. Reporting of any spills associated with the Project should be completed by the Spill Response Coordinator or their designate.

To Report a Spill:

1. Fill out the Northwest Territories/Nunavut Spill Report Form (found in Appendix B of this SCP) as completely as possible before calling in the spill report.
2. Contact the Government of the Northwest Territories/Nunavut 24-hour Emergency Spill Report Line:

   24-HOUR EMERGENCY SPILL REPORT LINE (867) 920-8130
3. Where fax is available, fax the completed Northwest Territories/Nunavut Spill Report Form to (867) 873-6924. Alternatively, if email is available, email the completed Northwest Territories – Nunavut Spill Report Form to spills@gov.nt.ca.

Any person reporting a spill is required to give as much information as possible. However, reporting of a spill should not be delayed if all of the necessary information is not known. Additional information can be provided later. From the Consolidation of Spill Contingency Planning and Reporting Regulations (1998), as much of the following information should be reported during the initial spill report:

- Date and time of spill
- Location of spill
- Direction if the spill is moving
- Name and phone number of a contact person close to the location of the spill
- Type of contaminant spilled and quantity
- Cause of spill
- Whether spill is continuing or has stopped
- Description of existing contaminant
- Action taken to contain, recover, clean up, and dispose of spilled contaminant
- Name, address and phone number of person reporting the spill
- Name of owner or person in charge, management or control of contaminants at the time of the spill.

In addition to reporting to the 24-hour Emergency Spill Report Line, an Aboriginal Affairs and Northern Development Canada (AANDC) Inspector must be notified of a spill immediately after occurrence. A copy of the completed Spill Report Form should be forwarded to them.

5.0 Action Plans

5.1 SPILL PREVENTION

The most likely spill possibilities at the Facilities would be spillage from sewage pump-out activities; leakage or failure from sewage lines; spillage or leakage from chlorine containment or injection lines; leakage of diesel from on-site generators; spillage when refueling generators; or, a vehicular accident. Primary spill prevention measures will include:

- All Project personnel will receive spill contingency training prior to beginning work.
- All contaminants will be stored at designated storage areas more than 30 m from the high-water mark of any waterbody.
- All fuel storage vessels will have secondary containment such as containment trays, berms, and/or double-walled tanks designed to hold 110% of total volume of stored fuel.
- All fuel storage and transfer operations will take place at a designated fuel storage area and will be conducted by trained personnel.
- Emergency spill response kits will be kept at the Nipissar Lake Pump house, Williamson Lake Pump house, the Char River sea canister and any designated fuel storage areas, in case of fluid leaks or spills from machinery.
- Spill mats and/or drip pans/trays will be placed under all mobile fueling containers and under equipment when not in use.
- All stationary activities will be conducted at least 30 m from the ordinary high water mark of any waterbody or watercourse, where possible.
- All equipment and vehicles used for operations will be in good working order and free of leaks.
- Identified equipment or vehicle deficiencies will be repaired.
- Regular inspection and maintenance will be conducted for all hoses and lines associated with the Facilities.
- All sewage and solid waste will be contained and sealed in watertight containers.
- Drips will be cleaned up immediately.

5.2 SPILL RESPONSE

The following steps outline the general spill response procedures for initial actions to be taken to contain and clean up a contaminant spill, as well as disposing of contaminated materials.

5.2.1 Chlorine Gas Release

Potential impacts of failure and release of chlorine gas would be to public health and surrounding infrastructure. The chlorine gas is held in ventilated and restricted access rooms. Chlorine gas will disperse to the atmosphere leaving no residue, however in liquid form it is corrosive and therefore should be cleaned up and disposed of using proper procedures and

equipment. Refer to the attached Transport Canada Emergency Guidebook (2012) Guide 124 – Gases – Toxic and/or Corrosive – Oxidizing.

Any person finding a discharge of chlorine gas or a malfunction of chlorine gas in the facilities should immediately report the incident to the GN-CGS Facilities Manager. Use the Response Organization to notify the proper authorities (Section 3.3). In the event of a spill or leak, enclosed spaces should be ventilated; do not access unventilated areas without proper respiratory and protective clothing/gloves. Eliminate all sources of ignition and where possible elevate the cylinder such that gas and not liquid escapes.

If there is a chlorine gas leak or spill during transportation follow the emergency response plan developed as per the TDG regulations. The TDG plan must be shipped with the dangerous goods and be readily available. If no emergency plan is available follow the Transport Canada Emergency Guidebook (2012) Guide 124 – Gases – Toxic and/or Corrosive – Oxidizing provided in Appendix C.

From the Transport Canada Emergency Guidebook (2012) the initial isolation and protective action distances for chlorine are:

Table 5-1: Chlorine Gas Initial Isolation and Protective Distances

	Small Spills (from a small package or a small leak from a large unit)			**Large Spills** (from a large package or from many small packages)		
Chemical Name	First Isolate in All directions	Then Protect Persons Downwind during		First Isolate in All directions	Then Protect Persons Downwind during	
		Day	Night		Day	Night
Chlorine	60 m	0.4 km	1.6 km	600 m	3.5 km	8.0 km

5.2.2 Fluosilicic Acid

Fluosilicic acid is a toxic substance that can cause severe burns and destruction to tissue of the mucous membranes and upper respiratory tract when inhaled. Fluosilicic acid is a liquid and should be stored in a tightly closed container in a well-ventilated area. After use, container must be resealed and kept upright to prevent leaks. Refer to the attached Transport Canada Emergency Guidebook (2012) Guide 154 – Substance – Toxic and/or Corrosive (Non-combustible) provided in Appendix C.

In the event of an accidental spill, wear respiratory protection and avoid breathing in the vapors. Evacuate personnel from the area. Any person finding a leak of fluosilicic acid in the facilities should immediately report the incident to the GN-CGS Facilities Manager. Notify the

proper authorities (Section 3.3). If inhaled, move to fresh air immediately. If the liquid has made contact with skin or eyes, rinse thoroughly with plenty of water. The substance is not combustible; however, over time, the substance may decompose to produce corrosive or toxic fumes. Use water spray, alcohol resistant foam, dry chemical or carbon dioxide to extinguish flames. More detailed information on this substance can be found on the attached MSDS sheet in Appendix D.

For clean-up, soak up with absorbent pads and contain pads in sealed containers. Dispose of pads as hazardous waste at the community landfill.

5.2.3 Other Chemicals (Gasoline, diesel, sewage)

Gasoline, diesel and sewage spills could potentially affect the public and the surrounding environment. When fuel spills, vapors may travel to sources of ignition and flash back or collect in confined areas. Raw sewage spills can be a concern to public health. If a fuel or sewage leak is observed, stop the flow of contaminant if safe to do so. Immediately report the incident to the GN-CGS Facilities Manager and notify the proper authorities (Section 3.3).

For fuel spills, isolate the spill or leak area for a minimum of 50 m in all directions. Refer to the attached Transport Canada Emergency Guidebook (2012) Guide 128 – Flammable Liquids (Non-polar/Water Immiscible), provided in Appendix C. All fuel contaminated soils should be treated in the local landfarm in accordance with normal operating procedures. Small quantities of material can be stored in labelled drums at the hazardous waste storage area in the landfill.

A small sewage spill can occur from a truck lead or household tank. If the spill is small, cleanup may be accomplished with a vacuum truck. Any residual sewage can be diluted with water. For larger spills, the area must be contained with berms. Vacuum trucks and/or excavators can be used to remove contaminated material. All sewage contaminated materials will be transported to the sewage treatment facility (liquids) or landfill facility for disposal.

5.2.3.1 Spills on Snow/Ice

1. Once a spill is identified, all sources of ignition should be turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, sewage etc.) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access (if any) of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container).
5. If the spill is too large to be controlled with the spill materials at hand, contact the GN-CGS facilities representative to report the spill immediately and request assistance (see Section 3.0 for contact information). Use materials on hand to attempt to control the spill.

6. If the spill is small enough to be controlled with the spill response materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent materials or a snow/soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g., gasoline, diesel).
7. Once the spill has been controlled and further spreading prevented, contact the GN-CGS facilities representative and report the spill (see Section 3.0 for contact information). The GN-CGS facilities representative is responsible to report the spill to the 24-Hour Emergency Spill Report Line.
8. If possible with the spill response materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for disposal. Impacted snow should be stored in drums for proper disposal.

5.2.4 Spills on Land

1. Once a spill is identified, all sources of ignition should be turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, sewage, etc.) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access (if any) of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container), or contain the spill (e.g., place a container or tarp with built up edges under the spill source to contain the spill).
5. If the spill is too large to be controlled with the spill materials at hand, contact the GN-CGS facilities representative and report the spill immediately and request assistance (see Section 3.0 for contact information). Use materials on hand to attempt to control the spill.
6. If the spill is small enough to be controlled with the spill response materials at hand, prevent spilled contaminants from spreading or entering waterways by using sorbent (oil-absorbing) materials or a soil dyke down slope from the spill. This is especially the case with liquid contaminants (e.g., gasoline, diesel).
7. If some contaminant has entered a waterway, follow procedures in Section 5.2.5 to contain and clean-up the contaminant in the water.
8. Once the spill has been controlled and further spreading prevented, contact the GN-CGS site representative and report the spill (see Section 3.0 for contact information). The GN-CGS facilities representative is responsible to report the spill to the 24-Hour Emergency Spill Report Line.
9. If possible with spill response materials at hand, clean up the remaining spilled contaminant and store contaminated materials in a secure container for proper disposal. Do not flush the affected area with water.
10. If possible, remove any contained liquid by pumping into secure drums.

5.2.5 Spills in Water

1. Once a spill is identified, all sources of ignition should be turned off (e.g., no smoking, shut off engines).
2. The spilled material (e.g., gasoline, diesel, sewage etc.) should be identified, if possible.
3. The affected area should be secured, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access (if any) of the area should be restricted.
4. If possible, identify where the spill is coming from (the source). Determine if the spill is still occurring (i.e., still leaking) or if the spillage has stopped. If the spill has not stopped, determine if it is safe to stop or control the spill (e.g., plug hole, close valve, upright container).
5. If the spill is too large to be controlled with the spill materials at hand, contact the GN-CGS facilities representative and report the spill immediately and request assistance (see Section 3.0 for contact information). Use materials on hand to attempt to control the spill.
6. If the spill is small enough to be controlled with the spill response materials at hand, use sorbent booms to contain the spill for recovery. Place sorbent sheets on the water within the boomed area to help contain the contaminant. For narrow waterways such as streams, place one or more sorbent booms across the waterway, downstream of the spill location, and anchor the booms on each bank.
7. Once the spill has been controlled and further spreading prevented, contact the GN-CGS facilities representative and report the spill (see Section 3.0 for contact information). The GN-CGS facilities representative is responsible to report the spill to the 24-Hour Emergency Spill Report Line.
8. If possible with spill response materials at hand, clean up the remaining spilled contaminant within the boom area. Store contaminated materials in a secure container for proper disposal.

5.3 ADDITIONAL SPILL DELINEATION OR MONITORING

In the event of a large spill or a spill in which not all of the spilled contaminant can be readily cleaned up with materials at hand (as described in Section 5.2), delineation of the affected area may be required. This would include subsurface investigation of the area (i.e., digging of test pits, soil sampling, installation of monitoring wells) to determine how large and how deep the contaminant affected the subsurface soil and/or groundwater (horizontal and vertical extent of the spill). The delineation would result in the development of an appropriate remediation plan for the affected area. In this case, a qualified environmental consultant should be retained to provide advice on how to proceed with delineation and remediation of a large spill.

6.0 Resource Inventory

6.1 ON-SITE RESOURCES

6.1.1 Personnel

All personnel hired to work on the sites will be trained on-site in spill prevention, response and clean-up measures (see Section 7.0).

6.1.2 Equipment

The following is a list of equipment available to respond to possible spills.

- Loader
- Dozers
- Haul/dump trucks
- Excavator
- Personnel pick-up trucks, ATVs and snowmobiles.

6.1.3 Spill Kits

6.1.3.1 Spill Kit Locations

At least one spill kit will be clearly marked and present at the Williamson Lake Pump house, the Nipissar Lake Pump house and the Char River sea canister. Additional spill kits will be placed with working equipment and crews.

6.1.3.2 Spill Kit Contents

The following outlines the recommended minimum requirements for contents of spill kits to be used; the GN-CGS facilities representative is responsible to supply the spill kits. Each spill kit will be regularly inspected to ensure it always contains the following, at a minimum:

- 1 – 205 L open top steel drum with lid, bolting ring and gasket (spill kit container)
- 10 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm) with ties
- 4 – 12.5 cm x 3 m (5 in. x 10 ft.) sorbent booms
- 10 kg bag of sorbent particulate
- 100 sheets (1 bale) of 50 cm x 50 cm sorbent sheets
- 2 large (5 m x 5 m) plastic tarps
- 1 roll duct tape
- 1 utility knife
- 1 field notebook and pencil
- 1 rake

- 1 pick-axe
- 3 spark-proof shovels
- 4 Tyvex® splash suits
- 4 pairs chemical resistant gloves
- 4 pairs of splash protective goggles
- Instruction binder, including the SCP.

The entire spill kit contents, with the exception of the spark-proof shovels, can be stored within the 205 L steel drum. The drum should be sealed securely to protect the spill kit contents though should always be accessible without the use of tools (i.e., finger tight bolt ring). The drum's bolt ring should be inspected regularly during facility inspections to ensure it turns freely and is lubricated.

Extra spill response materials should also be available for use, in addition to the spill kit contents. These include:

- 10 – 205 L open top steel drum with lid, bolting ring and gasket
- 2 spark-proof shovels
- 50 disposable large 5 mil polyethylene bags (dimensions 65 cm x 100 cm)
- 10 – 12.5 cm x 3 m (5 in. x 10 ft.) sorbent booms
- 5 – 10 kg bags of sorbent particulate
- 500 sheets (5 bales) of 50 cm x 50 cm sorbent sheets
- 2 Tyvex® splash suits
- 2 pairs of chemical resistant gloves
- 2 pairs of splash protective goggles

7.0 Training and Exercises

7.1 OUTLINE

The GN-CGS facilities representative will be responsible for providing a qualified supervisor and training personnel in spill response. All individuals hired to work at the facilities should have their basic first aid and Workplace Hazardous Materials and Information System (WHMIS) training before working at any of the Facilities.

A training session on spill prevention and response will be held for all facility employees on an annual basis, or when initially hired. Training exercises, including proper use of spill kits, will provide hands-on training for individuals on spill response procedures and equipment. Training exercises can be held during the training session for all individuals or at another time for individuals directly involved with handling of hazardous materials.

The training session should review this SCP and include information on:

- Individuals roles and responsibilities in regards to spill prevention, detection, response and clean-up
- Location(s) of hard copies of the SCP, maps and spill kits
- Equipment available for spill response
- Content of spill kits
- Initial actions and spill reporting procedures and,
- Spill response and clean-up actions.

7.2 SCHEDULE

The training session and exercises will be provided as part of the Worker Orientation and held annually thereafter.

The GN-CGS facilities representative will keep records of all individuals who attend the training session and exercises, as well as copies of their training certificates (e.g., first aid, WHMIS).

8.0 References

Indian and Northern Affairs Canada (INAC). 2007. Guidelines for Spill Contingency Planning. Water Resources Division, INAC, Yellowknife, NT. Accessed 14 February 2014. Available at: http://www.aadnc-aandc.gc.ca/eng/1100100024236/1100100024253.

Statistics Canada. 2012. Rankin Inlet, Nunavut (Code 1320) and New Brunswick (Code 13) (table). Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E (accessed April 27, 2014).

Transport Canada, U.S. Department of Transportation, Secretariat of Transport and Communications. 2012. Emergency Response Guidebook – 2012. http://www.tc.gc.ca/media/documents/canutec-eng/ERG2012.pdf (accessed May 1, 2014).

Appendix A Figures

Sources: Imagery - Microsoft BING. Thematic Data - FSC Architects and Engineers

Disclaimer: This map is for illustrative purposes to support this Stantec project; questions can be directed to the issuing agency.

Nipissar Lake Resupply Line - Site Plan

Appendix B Northwest Territories – Nunavut Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
TEL: (867) 920-8130
FAX: (867) 873-6924
EMAIL: spills@gov.nt.ca

REPORT LINE USE ONLY

A	REPORT DATE: MONTH – DAY – YEAR	REPORT TIME	☐ ORIGINAL SPILL REPORT, OR	REPORT NUMBER -
B	OCCURRENCE DATE: MONTH – DAY – YEAR	OCCURRENCE TIME	☐ UPDATE # TO THE ORIGINAL SPILL REPORT	

C	LAND USE PERMIT NUMBER (IF APPLICABLE)	WATER LICENCE NUMBER (IF APPLICABLE)
D	GEOGRAPHIC PLACE NAME OR DISTANCE AND DIRECTION FROM THE NAMED LOCATION	REGION ☐ NWT ☐ NUNAVUT ☐ ADJACENT JURISDICTION OR
E	LATITUDE DEGREES MINUTES SECONDS	LONGITUDE DEGREES MINUTES SECONDS

F	RESPONSIBLE PARTY OR VESSEL NAME	RESPONSIBLE PARTY ADDRESS OR OFFICE LOCATION	
G	ANY CONTRACTOR INVOLVED	CONTRACTOR ADDRESS OR OFFICE LOCATION	
H	PRODUCT SPILLED	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
	SECOND PRODUCT SPILLED (IF APPLICABLE)	QUANTITY IN LITRES, KILOGRAMS OR CUBIC METRES	U.N. NUMBER
I	SPILL SOURCE	SPILL CAUSE	AREA OF CONTAMINATION IN SQUARE METRES
J	FACTORS AFFECTING SPILL OR RECOVERY	DESCRIBE ANY ASSISTANCE REQUIRED	HAZARDS TO PERSONS, PROPERTY OR EQUIPMENT
K	ADDITIONAL INFORMATION, COMMENTS, ACTIONS PROPOSED OR TAKEN TO CONTAIN, RECOVER OR DISPOSE OF SPILLED PRODUCT AND CONTAMINATED MATERIALS		

L	REPORTED TO SPILL LINE BY	POSITION	EMPLOYER	LOCATION CALLING FROM	TELEPHONE
M	ANY ALTERNATE CONTACT	POSITION	EMPLOYER	ALTERNATE CONTACT LOCATION	ALTERNATE TELEPHONE

REPORT LINE USE ONLY

N	RECEIVED AT SPILL LINE BY	POSITION **Station operator**	EMPLOYER	LOCATION CALLED **Yellowknife, NT**	REPORT LINE NUMBER **(867) 920-8130**

LEAD AGENCY ☐ EC ☐ CCG ☐ GNWT ☐ GN ☐ ILA ☐ AANDC ☐ NEB ☐ TC | SIGNIFICANCE ☐ MINOR ☐ MAJOR ☐ UNKNOWN | FILE STATUS ☐ OPEN ☐ CLOSED

AGENCY	CONTACT NAME	CONTACT TIME	REMARKS
LEAD AGENCY			
FIRST SUPPORT AGENCY			
SECOND SUPPORT AGENCY			
THIRD SUPPORT AGENCY			

Appendix C 2012 Emergency Response Guidebook Guides

POTENTIAL HAZARDS

HEALTH

- **TOXIC; may be fatal if inhaled or absorbed through skin.**
- Fire will produce irritating, corrosive and/or toxic gases.
- Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
- Runoff from fire control may cause pollution.

FIRE OR EXPLOSION

- Substance does not burn but will support combustion.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- These are strong oxidizers and will react vigorously or explosively with many materials including fuels.
- May ignite combustibles (wood, paper, oil, clothing, etc.).
- Some will react violently with air, moist air and/or water.
- Cylinders exposed to fire may vent and release toxic and/or corrosive gas through pressure relief devices.
- Containers may explode when heated.
- Ruptured cylinders may rocket.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Spill

- See Table 1 - Initial Isolation and Protective Action Distances.

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

Small Fire

CAUTION: These materials do not burn but will support combustion. Some will react violently with water.

- Contain fire and let burn. If fire must be fought, water spray or fog is recommended.
- **Water only; no dry chemical, CO_2 or Halon®.**
- Do not get water inside containers.
- Move containers from fire area if you can do it without risk.
- Damaged cylinders should be handled only by specialists.

Fire involving Tanks

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Cool containers with flooding quantities of water until well after fire is out.
- Do not direct water at source of leak or safety devices; icing may occur.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
- Do not touch or walk through spilled material.
- Keep combustibles (wood, paper, oil, etc.) away from spilled material.
- Stop leak if you can do it without risk.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- Do not direct water at spill or source of leak.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Prevent entry into waterways, sewers, basements or confined areas.
- Isolate area until gas has dispersed.
- Ventilate the area.

FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Clothing frozen to the skin should be thawed before being removed.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Keep victim warm and quiet.
- Keep victim under observation.
- Effects of contact or inhalation may be delayed.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

POTENTIAL HAZARDS

HEALTH

- **TOXIC**; inhalation, ingestion or skin contact with material may cause severe injury or death.
- Contact with molten substance may cause severe burns to skin and eyes.
- Avoid any skin contact.
- Effects of contact or inhalation may be delayed.
- Fire may produce irritating, corrosive and/or toxic gases.
- Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION

- Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).
- Contact with metals may evolve flammable hydrogen gas.
- Containers may explode when heated.
- For UN3171, if Lithium ion batteries are involved, also consult GUIDE 147.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate enclosed areas.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection.
- Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible.

EVACUATION

Spill

- See Table 1 - Initial Isolation and Protective Action Distances for highlighted materials. For non-highlighted materials, increase, in the downwind direction, as necessary, the isolation distance shown under "PUBLIC SAFETY".

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

Small Fire

- Dry chemical, CO_2 or water spray.

Large Fire

- Dry chemical, CO_2, alcohol-resistant foam or water spray.
- Move containers from fire area if you can do it without risk.
- Dike fire-control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads

- Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Do not get water inside containers.
- Cool containers with flooding quantities of water until well after fire is out.
- Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- **Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.**
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.
- Keep victim warm and quiet.
- Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

POTENTIAL HAZARDS

FIRE OR EXPLOSION

- **HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.**
- Vapors may form explosive mixtures with air.
- Vapors may travel to source of ignition and flash back.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
- Vapor explosion hazard indoors, outdoors or in sewers.
- Those substances designated with a **(P)** may polymerize explosively when heated or involved in a fire.
- Runoff to sewer may create fire or explosion hazard.
- Containers may explode when heated.
- Many liquids are lighter than water.
- Substance may be transported hot.
- For UN3166, if Lithium ion batteries are involved, also consult GUIDE 147.
- **If molten aluminum is involved, refer to GUIDE 169.**

HEALTH

- Inhalation or contact with material may irritate or burn skin and eyes.
- Fire may produce irritating, corrosive and/or toxic gases.
- Vapors may cause dizziness or suffocation.
- Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY

- **CALL EMERGENCY RESPONSE Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.**
- As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions.
- Keep unauthorized personnel away.
- Stay upwind.
- Keep out of low areas.
- Ventilate closed spaces before entering.

PROTECTIVE CLOTHING

- Wear positive pressure self-contained breathing apparatus (SCBA).
- Structural firefighters' protective clothing will only provide limited protection.

EVACUATION

Large Spill

- Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire

- If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

CAUTION: For mixtures containing alcohol or polar solvent, alcohol-resistant foam may be more effective.

Small Fire

- Dry chemical, CO_2, water spray or regular foam.

Large Fire

- Water spray, fog or regular foam.
- **Do not use straight streams**.
- Move containers from fire area if you can do it without risk.

Fire 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 safety devices or discoloration of tank.
- ALWAYS stay away from tanks engulfed in fire.
- For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
- All equipment used when handling the product must be grounded.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent entry into waterways, sewers, basements or confined areas.
- A vapor suppressing foam may be used to reduce vapors.
- Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- Use clean non-sparking tools to collect absorbed material.

Large Spill

- Dike far ahead of liquid spill for later disposal.
- Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

- Move victim to fresh air.
- Call 911 or emergency medical service.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- Wash skin with soap and water.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Keep victim warm and quiet.
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

Appendix D MSDS Sheets

Brenntag Canada Inc.

BRENNTAG

MATERIAL SAFETY DATA SHEET

CHLORINE, LIQUEFIED GAS

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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

Website: http:\\www.brenntag.ca

WHMIS#:	00010002
Index:	GCD0016/10C
Effective Date:	2008 January 15
Date of Revision:	2010 August 03

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

Toronto, ON (416) 226-6117	Montreal, QC (514) 861-1211	Winnipeg, MB (204) 943-8827
Edmonton, AB (780) 424-1754	Calgary, AB (403) 263-8660	Vancouver, BC (604) 685-5036

PRODUCT IDENTIFICATION

Product Name:	Chlorine, Liquefied Gas.
Chemical Name:	Chlorine.
Synonyms:	Not available.
Chemical Family:	Halogen.
Molecular Formula:	Cl_2.
Product Use:	Bacteriacide in water treatment. Chemical intermediate.

DO NOT RE-USE EMPTY CONTAINERS. RETURN ALL CONTAINERS TO BRENNTAG CANADA.

WHMIS Classification / Symbol:

A: Compressed Gas
C: Oxidizer
D-1A: Very Toxic (acute effects)
D-2A: Very Toxic (chronic effects)
E: Corrosive

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

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

Ingredient	*CAS#*	*ACGIH TLV*		*% Concentration*
Chlorine	7782-50-5	0.5 ppm	*A4	95 - 100

A4 = Not classifiable as a human carcinogen. (ACGIH-A4).

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Corrosive! Toxic! May be fatal if inhaled. Causes severe skin and eye burns. Gas is extremely irritating to eyes and respiratory tract. See "Other Health Effects" Section. Strong, offensive odor. Strong oxidizer. Contact with other combustible material can cause fire. Liquefied compressed gas. Contents under pressure. Ruptured containers may rocket.

POTENTIAL HEALTH EFFECTS

Inhalation:	Corrosive! Toxic! Product may cause severe irritation of the nose, throat and respiratory tract. Repeated and/or prolonged exposures may cause productive cough, running nose, bronchopneumonia, pulmonary oedema (fluid build-up in lungs), and reduction of pulmonary function. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. (3,4) Toxic effects may be delayed. See "Other Health Effects" Section.
Skin Contact:	Corrosive! Chlorine vapours may cause burning and prickling sensations, reddening and blisters. Direct contact with liquid causes severe local irritation, blistering and burns. Avoid handling when the skin is moist, wet or abraded. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. (3,4) Burns (chemical) can occur if not promptly removed.
Skin Absorption:	May be absorbed through intact skin. Skin absorption is a secondary concern to the continual destruction of tissue while the product is in contact with the skin.
Eye Contact:	Extremely corrosive! This product causes corneal scarring and clouding. Glaucoma, cataracts and permanent blindness may occur. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. (3,4)
Ingestion:	Corrosive! Product is a gas. Ingestion is not a likely route of exposure.
Other Health Effects:	Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. May cause frostbite, olfactory fatigue, tooth erosion, cardiovascular effects, shock, central nervous system (CNS) depression, asphyxia and cyanosis. Olfactory fatigue is a term used to describe a condition characterized by the temporary loss of odour perception. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure. Cyanosis is characterized by navy blue, almost black lips, tongue, and mucous membranes, with skin colour being slate gray. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia. Asphyxia is characterized by increased breathing volume, accelerated pulse rate, muscular incoordination, faulty judgement, emotional instability, fatigue, nausea, vomiting, bewilderment, gasping respiration and unconsciousness. Chlorine: Inhalation exposure can result in primary irritation of the respiratory tract, gradual loss of pulmonary function and asthma-like attacks in suseptible individuals. Acute exposure is characterized by the irritation of the respiratory tract causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function. Overexposure may lead to bronchitis, bronchial spasm and pulmonary oedema. Chronic exposure may lead to asthmatic attack in certain individuals, with the following symptoms: chest tightness, wheezing, cough and shortness of breath. (3)

4. FIRST AID MEASURES

FIRST AID PROCEDURES

Inhalation:	Move victim to fresh air. Give artificial respiration ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Oxygen administration may be beneficial in this situation but should only be administered by personnel trained in its use. Obtain medical attention IMMEDIATELY.
Skin Contact:	Flush skin with running water for a minimum of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. See "Note to Physicians" below. When treating frost bite, flush affected areas with water no warmer than 44 Deg. Celsius. Do not use heated water or dry heat and frozen parts should not be rubbed before or after thawing.
Eye Contact:	Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. Do not transport victim until the recommended flushing period is completed unless flushing can be continued during transport. When treating frost bite, flush affected areas with water no warmer than 44 Deg. Celsius. Do not use heated water or dry heat and frozen parts should not be rubbed before or after thawing.
Ingestion:	Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local Poison Control Centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.

Note to Physicians:	Treatment for corrosive chemical contact with skin after initial flushing procedures: 1. Immerse the exposed part immediately in ice water to relieve pain and to prevent swelling and blistering. Place cold packs, ice or wet cloths on the burned area if immersion is not possible. 2. Remove anything that is constrictive, such as rings, bracelets or footwear, before swelling begins. 3. Cover the exposed part with a clean, preferably sterile, lint-free dressing. 4. For severe exposure, immediately seek medical attention and monitor breathing and treat for shock. Medical conditions that may be aggravated by exposure to this product include neurological, cardiovascular and skin disorders, diseases of the skin, eyes or respiratory tract.

5. FIRE-FIGHTING MEASURES

Flashpoint (°C)	*AutoIgnition Temperature (°C)*	Flammability Limits in Air (%): *LEL*	*UEL*
Not Flammable.	Not applicable.	Not applicable.	Not applicable.

Flammability Class (WHMIS):	Not regulated.
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include oxides of chlorine and irritating gases. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4)
Unusual Fire or Explosion Hazards:	Although non-combustible in air, chlorine supports the combustion of other materials. Flammable gases and vapours will form explosive mixtures with chlorine. Chlorine cylinders and tonne containers are equipped with fusible plugs. The fusible plugs are designed to melt at temperatures above 70 Deg. Celsius to reduce the internal pressure of the cylinder by releasing Chlorine gas. Expansion of liquid and change of state from liquid to vapour will allow mixture to encompass a large area. If tank is involved in a fire situation, a BLEVE (Boiling Liquid Expanding Vapour Explosion) may result. Ruptured containers may rocket. Where possible, elevate the leak to the highest position such that gas and not liquid escapes. This product is a strong oxidizer. Strong oxidizers can cause ignition of combustible or oxidizable materials. May decompose violently on contact with metals, or their salts, dusts or other contaminants.
Sensitivity to Mechanical Impact:	Not expected to be sensitive to mechanical impact.
Rate of Burning:	Not available.
Explosive Power:	Not available.
Sensitivity to Static Discharge:	Not expected to be sensitive to static discharge.
EXTINGUISHING MEDIA	
Fire Extinguishing Media:	Use media appropriate for surrounding fire and/or materials.
FIRE FIGHTING INSTRUCTIONS	
Instructions to the Fire Fighters:	Fire-exposed containers should be kept cool by spraying with water to reduce pressure. Isolate materials that are not involved in the fire and protect personnel. Cool containers with flooding quantities of water until well after the fire is out. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4) Remove containers from fire zone whenever possible. Ventilate low lying areas such as sumps or pits where dense vapours may collect.
Fire Fighting Protective Equipment:	Use self-contained breathing apparatus and special protective clothing.

6. ACCIDENTAL RELEASE MEASURES

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

Containment and Clean-Up Procedures:	In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. See Section 13, "Deactivating Chemicals". Wear respirator, protective clothing and gloves. Ruptured containers may rocket. Ventilate enclosed spaces. Where possible, elevate the leak to the highest position of the cylinder, such that gas and not liquid escapes. Apply emergency device. Eliminate all sources of ignition. Move unprotected personnel upwind of leaking container. Call emergency response naming the chemical and the type of container that is leaking. Consider the use of fog-nozzles to control vapours. Do not immerse in water. Notify applicable government authority if release is reportable or could adversely affect the environment. Vapour knock down water is corrosive and toxic, thus it should be diked for containment. Ensure compatible materials are used. For a leaking container: dispose of contents to a safe out-of-doors area or a hood with forced ventilation. Attach appropriate control valve provided with a trap or check valve and a long piece of flexible hose connected to the valve outlet. Discharge the gas at a moderate rate into an adequate amount of approximately 15% aqueous Sodium Hydroxide or other alkali or reducing solution in suitable container. When all the gas is discharged, close the cylinder valve and tag the cylinder as defective. (3)

7. HANDLING AND STORAGE

HANDLING

Handling Practices:	9 Vapours are heavier than air. Use self-contained breathing apparatus. Secure containers at all times. Fix leaks promptly. Immerse contaminated clothing in water immediately and KEEP WET until discarded or laundered. Avoid moisture contamination. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4) Do not store or transport with food or feed. Keep away from combustibles and incompatible materials.
Ventilation Requirements:	See Section 8, "Engineering Controls".
Other Precautions:	Use only with adequate ventilation and avoid breathing vapours. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

STORAGE

Storage Temperature (°C):	Ideal storage temperature is 10-27 Deg. Celsius. Do not expose sealed containers to temperatures above 51 °C or Below - 29 °C. (3)
Ventilation Requirements:	Do not use in poorly ventilated or confined areas without proper respiratory protection. Ventilation should be corrosion proof.
Storage Requirements:	Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 51 °C. Use of a Chlorine gas monitor with local and remote alarms and monitoring is strongly recommended. Secure containers at all times. Fix leaks promptly. Regularly inspect process equipment, piping and detection equipment. Chlorine cylinders and tonne containers are equipped with fusible plugs. The fusible plugs are designed to melt at temperatures above 70 Deg. Celsius to reduce the internal pressure of the cylinder by releasing Chlorine gas. Avoid storage of cylinders for more than 6 months. (3)
Special Materials to be Used for Packaging or Containers:	Chlorine is stable in steel containers at room temperatures when stored dry. Intense local heat above 200 C on steel walls can cause steel to ignite chlorine. (3) Equipment for storage, handling or transportation should NOT be made of: stainless steel. Confirm suitability of any material before using.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

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

ENGINEERING CONTROLS

Engineering Controls:	Local exhaust ventilation required. Ventilation should be corrosion proof. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Ventilate low lying areas such as sumps or pits where dense vapours may collect. Restrict access to storage area. Post warning signs. Consider leak detection and alarm systems. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper procedure must be followed. It must include consideration of, among other things, ventilation, testing of tank atmosphere, provision and maintenance of SCBA, and emergency rescue. Use the "buddy" system. The second person should be in view and trained and equipped to execute a rescue. (4)

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye Protection:	Use full face-shield and gas-tight goggles when there is potential for contact. Contact lenses should not be worn when working with this material.
Skin Protection:	Gloves and protective clothing made from neoprene, viton, butyl rubber or nitrile rubber should be impervious under conditions of use. Prior to use, user should confirm impermeability. Skin protection should be insulated against cold temperatures. Do not use gloves or protective clothing made from leather, polyethylene, PVC, rubber or plastic. Discard contaminated gloves.
Respiratory Protection:	DO NOT USE chemical cartridge respirators with oxidizable sorbents (charcoal). Chlorine: Up to 5 ppm, wear a chemical cartridge respirator with Chlorine or acid gas cartridges; up to 10 ppm self-contained breathing apparatus (SCBA). (3,4) Use an air-supplied respirator if concentrations are high or unknown. If while wearing a respiratory protection, you can smell, taste or otherwise detect anything unusual, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator to face seal is still good. If it is, replace the filter, cartridge or canister. If the seal is no longer good, you may need a new respirator. (4) Immediately Dangerous to Life and Health (IDLH) value: 10 ppm. (4) The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory equipment. In the event of failure of respiratory protective equipment, every effort should be made to exit immediately. (4)
Other Personal Protective Equipment:	Wear an impermeable apron and boots. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact. Use of a Chlorine gas monitor with local and remote alarms and monitoring is strongly recommended.

EXPOSURE GUIDELINES

SUBSTANCE	*ACGIH TLV*	*OSHA PEL*		*NIOSH REL*	
	(STEL)	*(TWA)*	*(STEL)*	*(TWA)*	*(STEL)*
Chlorine	1 ppm	---	1 ppm (Ceiling)	---	0.5 ppm (Ceiling)

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

Physical State:	Gas.
Appearance:	Greenish yellow liquified gas.
Odour:	A sharp, pungent, irritating odour.
Odour Threshold (ppm):	0.2 - 0.4 ppm. (3)
Boiling Range (°C):	-35. (3)
Melting/Freezing Point (°C):	-101. (3)
Vapour Pressure (mm Hg at 20° C):	4 788 - 5 120. (3)
Vapour Density (Air = 1.0):	2.47 - 2.67. (3)
Relative Density (g/cc):	1.33 - 1.47. (3)
Bulk Density:	88.76 lb/ft³ @ 15.6 C.
Viscosity:	0.346 mPa @ 20 C. (3)
Evaporation Rate (Butyl Acetate = 1.0):	Not available.
Solubility:	Slightly soluble in water.
% Volatile by Volume:	100. (3)
pH:	1.5 - 2.0 (0.8 % solution). (3)
Coefficient of Water/Oil Distribution:	Not applicable.
Volatile Organic Compounds (VOC):	0 %.
Flashpoint (°C):	Not Flammable.

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

Under Normal Conditions:	Stable.
Under Fire Conditions:	Although non-combustible in air, chlorine supports the combustion of other materials.
Hazardous Polymerization:	Will not occur.

Conditions to Avoid:	High temperatures, sparks, open flames and all other sources of ignition. Avoid contact with water. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4)
Materials to Avoid:	This product is a strong oxidizer. Strong oxidizers can cause ignition of combustible or oxidizable materials. May decompose violently on contact with metals, or their salts, dusts or other contaminants. Reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4) Chlorine reacts with combustible, organic or nitrogen compounds (hydrocarbons, cleaning solvents, paints or thinners, oil, grease gasoline, petroleum products, turpentine, alcohols, carbon disulphide, hydrogen acetylene, hydrogen, ether and ammonia). (3,4) Strong oxidizers. Lewis or mineral acids. Metal halides. Carbon. Lead. Sulphides. Reducing agents. Fluorine. Metal Acetylides. Halogenated compounds. Diethyl Zinc. Metal hydrides. Sulfamic Acid. Diethyl Ether. At ordinary temperatures: Dry Chlorine (gas or liquid) is not corrosive to most common metals, including steel, stainless steel, silver, iron, cast iron, nickel and its alloys, copper, brass, bronze, lead platinum and tantalum. Dry Chlorine (gas or liquid) reacts with aluminum, zinc, arsenic, gold, mercury, class 300 stainless steel, titanium, selenium, tellurium and tin. (3,4) At high temperatures: Dry Chlorine is corrosive to most metals. The reaction rate of dry Chlorine increases rapidly above a temperature which is characteristic for the metal. (3,4)
Decomposition or Combustion Products:	Thermal decomposition products are toxic and may include oxides of chlorine and irritating gases. Chlorine reacts with water or humidity to produce Hydrochloric Acid and Hypochlorous Acid. These two acids cause metal corrosion. (3,4)

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

SUBSTANCE	*LD50 (Oral, Rat)*	*LD50 (Dermal, Rabbit)*	*LC50 (Inhalation, Rat, 4h)*
Chlorine	---	---	147 ppm (1)

Carcinogenicity Data:	The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP. See "Other Studies Relevant to Material".
Reproductive Data:	No adverse reproductive effects are anticipated.
Mutagenicity Data:	No adverse mutagenic effects are anticipated.
Teratogenicity Data:	No adverse teratogenic effects are anticipated.
Respiratory / Skin Sensitization Data:	None known.
Synergistic Materials:	Mortality in Chlorine-Nickel test groups for rainbow trout was found to be higher than that of either nickel or chlorine alone. The relevance to humans is not known. Incidences of respiratory sensitization in platinum refinery workers increased following a spill of chlorine. (3)
Other Studies Relevant to Material:	Effects in rats during acute inhalation exposure to Chlorine were primarily attributed to its severe irritant effects. Repeated inhalation of Chlorine (1, 3 or 9 ppm for 6 weeks) by rats resulted in respiratory irritation, reduced body weight gain, organ weight changes, increased white blood cells, some animal deaths and changes in liver, kidney, spleen, thymus and gastric mucosa. Longer term (1 year) inhalation of Chlorine (0.1, 0.5 or 2.3 ppm) by monkeys resulted in eye and upper respiratory tract irritation. Effects observed in rabbits following repeated inhalation (up to 9 months) were weight loss, nasal irritation, sneezing and laboured respiration. Life-time inhalation of Chlorine (up to 2.5 ppm) produced nasal cell injury in rats and mice. No effects were observed in guinea pigs after repeated inhalation (87 days) or in mice after drinking chlorinated water (33 or 55 days). Repeated exposure of rats to 30 ppm Chlorine in their drinking water resulted in reduced spleen weights and immunological effects. Long term (2 years) administration of Chlorine in drinking water (70, 140 or 275 ppm) resulted in an increase in leukemia in female rats at 140 ppm only. No adverse effects on fertility, life span, growth pattern, hematology or histology were seen in rats given chlorinated water (100 mg Chlorine / Litre daily) throughout the entire lifespan for 7 consecutive generations. No birth defects were observed in mice after drinking chlorinated drinking water during pregnancy. Chlorine produced no genetic changes in standard tests using animals. A positive response was observed in a test using human cells, while mixed responses have been reported in a variet of tests using bacterial cells or animal cells. (3)

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Highly toxic to aquatic life. Fish toxicity: critical concentration = 0.3 mg/L Aesthetic: critical concentration = 0.5 mg/L Plant: critical concentration = 100 mg/L 72-HR LC50 = 0.5 mg/L, Daphnia Magna 96-HR LC50 = 0.02 mg/L, Daphnia Magna 96-HR LC50 = 0.08 to 0.18 mg/L, Brook Trout 96-HR LC50 = 0.07 mg/L, Channel Catfish Fingerlings 96-HR LC50 = 0.44 to 2.32 mg/L, Bluegill Sunfish 96-HR LC50 = 1.6 mg/L, Redsid Shiner 96-HR LC50 = 0.70 mg/L, Blackside Dance Exposure of Sand-dollar sperm to 0.002 mg/L for 5 minutes resulted in a 50 percent reduction in egg fertilization. Depressed shoot and total plant dry weight and shoot length were reported when the aquatic plant myriophyllum spicatum was continuously exposed to chlorine (as low as 0.05 mg total residual chlorine/L) for 96 hours. Chlorine is considered to be phytotoxic and has bactericidal, algicidal and fungicidal properties. Chlorine does not appear to retard seed germination. (3) This product does not bioaccumulate in aquatic or terrestrial food chains.
Environmental Fate:	In an uncontrolled spill scenario where the concentration of Chlorine is well above those used for drinking water, it can be dangerous if allowed to contaminate irrigation water supplies, lakes, streams, ponds or rivers.

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals:	Chlorine gas will disperse to the atmosphere leaving no residue. Gaseous material can be absorbed in alkaline solutions of Caustic Soda, Soda Ash or Hydrated Lime. When absorbing Chlorine in alkaline solutions, the reaction is exothermic. Ensure the absorption is controlled as to heat and reaction. (3) Since hypochlorites are formed, solutions must be treated with reducing agents such as sodium sulphite before disposal. Do not immerse container in caustic solution. Liquid and/or solid residues from neutralization must be disposed of in a permitted waste management facility. (3) Hypochlorites: Carefully neutralize by adding hydrogen peroxide: one US pint of 35 % hydrogen peroxide solution per pound of hypochlorite to be neutralized. Dilute the neutralized residue with water. (3)
Waste Disposal Methods:	This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.
Safe Handling of Residues:	See "Waste Disposal Methods".
Disposal of Packaging:	Empty containers retain product residue (liquid and/or vapour) and can be dangerous. See Section 13, "Deactivating Chemicals". Do not expose such containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death. Return empty containers. DO NOT REFILL COMPRESSED GAS CONTAINERS. RETURN TO BRENNTAG CANADA FOR CARE AND MANAGEMENT.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

CHLORINE, Class 2.3(8), UN1017.

Label(s): Toxic Gases, Corrosives. Placard: Toxic Gases.

ERAP Index: 500. Exemptions: None known.

Marine: P (Marine Pollutant).

Please consult the North American Emergency Response Guidebook, via the UN#, for guidance in addressing spills.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

CHLORINE, Class 2.3(8), UN1017.

Label(s): Poison Gas, Corrosive. Placard: Poison Gas.

CERCLA-RQ: 10 lb / 4.54 kg Exemptions: Not applicable.

Special Documentation Addition: Chlorine, Poison - Inhalation Hazard, Zone B.
Marine: P (Marine Pollutant).

IMO: Marine Pollutant: Chlorine.

Please consult the North American Emergency Response Guidebook, via the UN#, for guidance in addressing spills.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR: This material is included on the DSL under the CEPA.

CEPA - NPRI: This material is on the NPRI list of substances.

Controlled Products Regulations Classification (WHMIS):

A: Compressed Gas
C: Oxidizer
D-1A: Very Toxic (acute effects)
D-2A: Very Toxic (chronic effects)
E: Corrosive

USA

Environmental Protection Act: This material is included on the TSCA Inventory.

OSHA HCS (29CFR 1910.1200): Compressed Gas. Oxidizer. Highly Toxic. Chronic Effects. Corrosive.

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

HMIS: 4 Health, 0 Fire, 0 Reactivity (3)

INTERNATIONAL

The following component or components of this product appear on the European Inventory of Existing Commercial Chemical Substances: Chlorine.

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd ed., Vol. IIA,B,C, John Wiley and Sons, New York, 1981.
3. Supplier's Material Safety Data Sheet(s).
4. CHEMINFO chemical profile, Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.
5. Guide to Occupational Exposure Values, 2008, American Conference of Governmental Industrial Hygienists, Cincinnati, 2008.
6. Regulatory Affairs Group, Brenntag Canada Inc.
7. The British Columbia Drug and Poison Information Centre, Poison Managements Manual, Canadian Pharmaceutical Association, Ottawa, 1981.

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

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

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

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

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

Material Safety Data Sheet

Version 3.6
Revision Date 11/22/2012
Print Date 06/05/2013

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fluosilicic acid
Product Number	:	01301
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by ingestion, Corrosive

GHS Classification
Acute toxicity, Oral (Category 4)
Acute toxicity, Dermal (Category 3)
Skin corrosion (Category 1B)
Serious eye damage (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H302	Harmful if swallowed.
H311	Toxic in contact with skin.
H314	Causes severe skin burns and eye damage.

Precautionary statement(s)

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.
P310	Immediately call a POISON CENTER or doctor/ physician.

HMIS Classification

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	3

Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Skin May be harmful if absorbed through skin. Causes skin burns.
Eyes Causes eye burns.
Ingestion Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Fluorosilicic acid
Hexafluorosilicic acid
Hydrogen hexafluorosilicate

Formula : H_2F_6Si
Molecular Weight : 144.09 g/mol

Component		Classification	Concentration
Hexafluorosilicic acid			
CAS-No. EC-No. Index-No.	16961-83-4 241-034-8 009-011-00-5	Skin Corr. 1B; H314	30 - 50 %

For the full text of the H-Statements and R-Phrases mentioned in this Section, see Section 16

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.Continue rinsing eyes during transport to hospital.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Hydrogen fluoride, silicon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Hexafluorosilicic acid	16961-83-4	TWA	2.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
Remarks	Varies with compound			
		TWA	2.5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.28-1969			
		TWA	2.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Bone damage Fluorosis Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen varies			
		TWA	2.5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	clear, liquid
Colour	light yellow

Safety data

pH	1.0 - 1.2 at 10 g/l
Melting point/freezing point	no data available
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Metals, Alkalis, Strong acids, Stoneware, glass

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hydrogen fluoride, silicon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
Eyes: no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Hydrofluoric acid)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin burns.
Eyes	Causes eye burns.

Signs and Symptoms of Exposure
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1778 Class: 8 Packing group: II
Proper shipping name: Fluorosilicic acid
Reportable Quantity (RQ): 10001 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1778 Class: 8 Packing group: II EMS-No: F-A, S-B
Proper shipping name: FLUOROSILICIC ACID
Marine pollutant: No

IATA
UN number: 1778 Class: 8 Packing group: II
Proper shipping name: Fluorosilicic acid

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by ingestion, Corrosive

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Hydrofluoric acid	7664-39-3	1993-04-24

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hexafluorosilicic acid	16961-83-4	1993-04-24
Hydrofluoric acid	7664-39-3	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Hexafluorosilicic acid	16961-83-4	1993-04-24
Hydrofluoric acid	7664-39-3	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	
Hexafluorosilicic acid	16961-83-4	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Text of H-code(s) and R-phrase(s) mentioned in Section 3

H314	Causes severe skin burns and eye damage.
Skin Corr.	Skin corrosion

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.