



a wholly-owned subsidiary of NorZinc Ltd

POST-EA INFORMATION PACKAGE INCLUDING AN UPDATED PROJECT DESCRIPTION ALL SEASON ROAD TO PRAIRIE CREEK MINE



APPENDIX 17-1

SUBMITTED IN SUPPORT OF:

Water Licences MV/PC2014L8-0006, and
Land Use Permits MV/PC2014F0013

SUBMITTED TO:

Mackenzie Valley Land and Water Board
Yellowknife, NT X1A 2N7

Parks Canada,
Nahanni National Park Reserve
Fort Simpson, NT X0E 0N0

SUBMITTED BY:

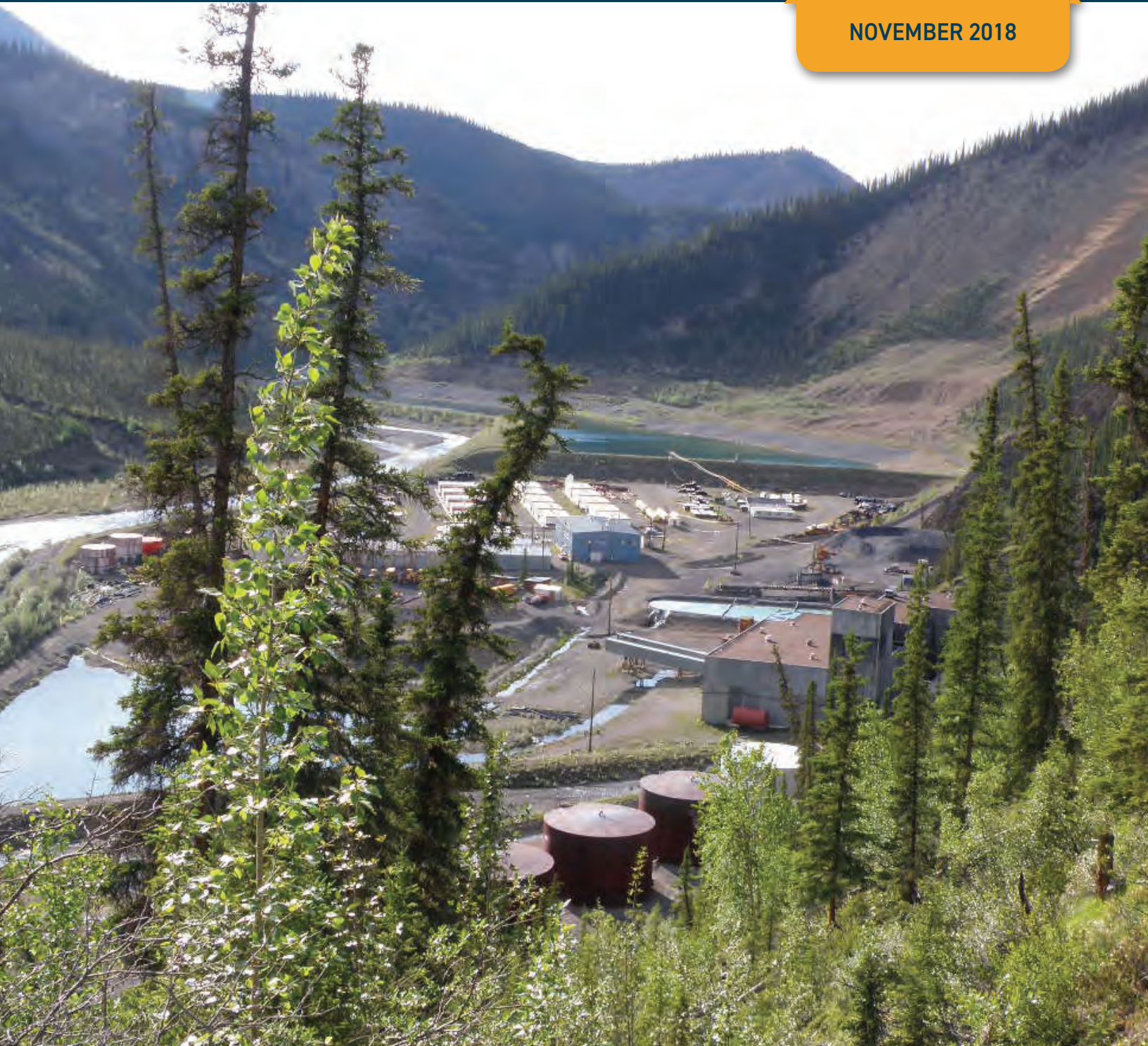
Canadian Zinc Corporation
Vancouver, BC, V6B 4N9

February 2019

PRAIRIE CREEK ACCESS ROAD

Spill Contingency Plan

NOVEMBER 2018



This page intentionally left blank.

Revision History

Revision	Description	Revised By (Initials)	Revision Date
A	Initial Version	Tetra Tech	2018-10-24
B	Updated Content		2018-11-30

Review and Approval

The following signatures indicate that the undersigned have read and agreed to the contents of this document, and that they approve and accept its distribution and use.

Description	Authority	Signature	Date
Document Owner	David Harpley VP Environment & Permitting		2018-11-30
Reviewed by: Full Name, Job Title			
Approved by: Full Name, Job Title			

Distribution List

This Plan and the most recent revisions have been distributed to:

Copy #1 –

Copy #2 –

PLAIN ENGLISH SUMMARY

The purpose of Canadian Zinc Corporation (CZN) Spill Contingency Plan (SCP) is to provide a plan for quickly and effectively dealing with and cleaning up an accidental spill of fuel or other hazardous material associated with the construction and operation of the access road to the Prairie Creek Mine.

The SCP identifies key response people that will be available from the Mine, their responsibilities in the event of a spill, and the equipment and other resources that could be brought in to help in responding to a spill. The SCP also outlines the spill response strategies, tactics and procedures that will be used to minimize potential health and safety hazards and reduce potential environmental effects.

Incident Response Team

The initial CZN incident response team will come from the mine and will typically consist of six people including the Incident Commander, a Safety Officer and four responders, one of which will be a mechanic. The responders will work on the 'buddy system' in teams of two. Any required increase in the number of responders will also be in teams of two. The Incident Commander will be responsible for all communications off the spill site and will make sure that all activities undertaken are properly logged.

The Safety Officer will be an experienced employee with intimate knowledge of the operations and safe operating procedures. The Safety Officer's main responsibility will be to assess hazardous and unsafe situations and develop measures for assuring personnel safety. As mechanical equipment such as pumps and skimmers could be involved, a mechanic with appropriate tools has been included as part of the response team. The team would be supported by other units delivering additional equipment, as necessary.

In the event that the spill incident needs additional external resources, including specific technical expertise, additional equipment, etc. the Incident Commander will also be responsible for obtaining these resources in a timely manner from the off-site resources listed in Section 5.2 of this SCP.

Spill Control Points

When a spill occurs, there is a potential for spilled material to enter a water body and flow either above or below any ice cover. A number of areas exist where a spill could enter a watercourse. Sensitive areas have been identified along Prairie and Funeral creeks, especially the upper section of Funeral Creek, Sundog Creek, and the Polje, Tetcela and Grainger stream crossings. "Control Points" will be established at pre-determined locations from which spill containment and recovery operations can be mounted to limit the migration of a spilled substance from an upstream location.

Spill Response Equipment

Necessary spill response equipment and supplies to be delivered to the appropriate Control Point for operations will include booms, absorbents, in addition to materials needed to create temporary dams, such as board weirs, sand bags and other inert materials that would be stored at the location. Shovels will also be left on site for use in constructing berms, dams, etc. A supply of soda ash will also be kept at Control Points to neutralize any potential acid spill.

To help respond to a spill incident quickly, spill kits will be carried in all haul trucks. In addition, custom-built and stocked road trailers dedicated to spill response and containing more equipment, materials and tools will be maintained at the Cat Camp, the Km 87 Maintenance Camp and the Grainger Gap Camp during operations.

One or more of these trailers could be readily hooked up and towed to a spill site. There is no need to locate the trailers in high-risk locations because responders will still need to travel to the spill location and bring in the nearest trailer on the way. The tractor/trailer units would also provide emergency assistance if mechanical issues or adverse weather conditions occur. The trailers would also be used for preventative maintenance and spill response training.

During ASR construction and operation of the associated winter roads, spill response equipment will be focused on diesel, and the location and type of equipment will be suitable for the season.

Spill Response Training

All members of the Spill Response Team will be trained and familiarized with the spill response resources, including their location and access, this SCP and appropriate spill response methodologies and reporting.

Operators stationed at the road maintenance camps will also receive appropriate spill response training. Response training will include classroom study, equipment deployment instruction and spill exercises. Training for individual employees/contractors would be commensurate with the duties each is to perform in their day to day functions plus basic spill response procedures.

The SCP is a living document that will be updated throughout the life of the Project to adapt to and incorporate any changes (in terms of both the Project or available technologies) that may arise. This will also include the results of ongoing engagement with the potentially-affected Indigenous groups, including Nahanni Butte Dene Band, Liidlii Kué First Nation, and Dehcho First Nations, and applicable regulators and land managers.

TABLE OF CONTENTS

PLAIN ENGLISH SUMMARY	II
LIST OF ACRONYMS	IV
GLOSSARY	V
1.0 INTRODUCTION	1
1.1 Company Name, Location and Mailing Address	1
1.2 Purpose and Scope	1
1.3 CZN Environmental Policy	2
1.4 Project Description	2
1.5 Project Setting	3
1.5.1 Terrain Physiography and Vegetation	3
1.5.2 Surface Waters	4
1.5.3 Fish and Wildlife	4
2.0 POTENTIAL HAZARDOUS MATERIALS	7
2.1 Potential Spills	8
2.1.1 Fuel	8
2.1.2 Concentrate	9
2.1.3 Sulphuric Acid	9
3.0 RESPONSE ORGANIZATION	10
3.1 Response System	10
3.2 Response Team	10
4.0 ACTION PLAN	12
4.1 Spill Prevention	12
4.2 Initial Actions	13
4.3 Spill Reporting	15
4.4 Spill Response Actions	16
4.4.1 General	16
4.4.2 Spill Control Points	16
4.4.3 Containment	16
4.4.4 Spills on Land	18
4.4.5 Spills on Snow	18
4.4.6 Spills on Ice	18
4.4.7 Spills into Water	19
4.5 Spill Delineation and Monitoring	20
4.6 Disposal of Waste from Response Activities	20
4.7 Restoration of Affected Areas	20
5.0 RESOURCE INVENTORY	21
5.1 On-Site Resources	21
5.1.1 Personnel	21

5.1.2	Spill Equipment.....	21
5.1.3	Spill Kit Contents	21
5.1.4	Spill Response Trailer Contents	22
5.1.5	Initial Winter Roads.....	23
5.2	Off-Site Resources	23
6.0	TRAINING AND EXERCISES	24
6.1	Training	24
6.2	Spill Response Exercises	24
6.3	Adaptive Management.....	25
	REFERENCES	26

LIST OF TABLES IN TEXT

Table 2-1: Construction Fuel and Containment Requirements.....	7
Table 2-2: Estimated Quantities of Potentially Hazardous Products Transported during Operations.....	8
Table 4-1: Summary of Spill Response Actions	17

LIST OF FIGURES IN TEXT

Figure 1: Prairie Creek Mine Overview	5
Figure 2: Proposed All-Season Road Alignment	6
Figure 3: Initial CZN Incident Response Team.....	11
Figure 4: CZN Incident Response and Reporting Flowchart.....	14

APPENDIX SECTIONS

APPENDICES

Appendix A	NT-NU Spill Report Form
Appendix B	Immediate Reportable Spill Quantities
Appendix C	Safety Data Sheets
Appendix D	All-Season Road Map Book
Appendix E	Spill Response Trailer Tentative Equipment List
Appendix F	Limitations on the use of this Document

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of CZN Ltd. and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than CZN Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

LIST OF ACRONYMS

Acronyms/Abbreviations	Definition
AMSL	Above Mean Sea Level
ASR	All Season Road
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CZN	Canadian Zinc Corporation
DFO	Department of Fisheries and Oceans
ENR	Environment and Natural Resources, Government of the Northwest Territories
Envision	Envision Response Solutions Inc.
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GNWT	Government of the Northwest Territories
HDPE	High-Density Polyethylene
ICS	Incident Command System
km	kilometre
L	litres
m	metre
m ³	cubic metre
M	Million
Mine	Prairie Creek Mine
MSDS	Material Safety Data Sheet (now SDS)
NNPR	Nahanni National Park Reserve
NWT	Northwest Territories
Plan	Spill Response Plan (also called SCP)
PPE	Personal Protective Equipment
Project	Prairie Creek Mine Access Road
ROMP	Road Operations and Maintenance Plan
ROW	Right-of-Way
SCP	Spill Contingency Plan
SDS	Safety Data Sheet (formerly Materials Safety Data Sheet - MSDS)
Tetra Tech	Tetra Tech Canada Inc.
ULSDF	Ultra-Low-Sulfur Diesel Fuel
WHMIS	Workplace Hazardous Materials Information System

GLOSSARY

Concentrate	Mineral Concentrate containing Zinc, Lead and Silver produced from the Prairie Creek Mine/Mill
Control Points	Places along the Access Road where spill response equipment will be positioned to assist in responding to a spill incident
Flammable Liquids	Liquid products such as diesel fuel, gasoline, and other petroleum-based products that can burn.
Hazardous Materials	Materials that can cause harm to human health and the environment.
Non-hazardous Materials	Materials such as food wastes, paper, wood, plastics, glass, and scrap metals that are not harmful to human health or the environment but still need to be properly managed or in the event of a spill cleaned up.
Petroleum Products	Materials such as diesel fuel, gasoline, grease and other products made from oil.
Safety Data Sheets	Safety Data Sheets (SDSs) are summary documents that provide information about the hazards of a product and advice about safety precautions.

1.0 INTRODUCTION

This Spill Contingency Plan (SCP) was prepared for Canadian Zinc Corporation (CZN) by Tetra Tech Canada Inc. (Tetra Tech) with the assistance of Mr. Peter Devenis of Envision Response Solutions Inc. (Envision). The primary purpose of this SCP is to describe the actions that will be undertaken for all types of spill incidents and conditions associated with the construction and operation of the access road to CZN's Prairie Creek Mine (the Project). All road users employed by CZN will be required to read, understand and sign-off on the contents of this SCP.

This SCP has been developed for the Project and regulatory approvals in accordance with the *Guidelines for Spill Contingency Planning* (INAC 2007) and the Guide to the Spill Contingency Planning and Reporting Regulations issued under the *Environmental Protection Act* (Environment and Natural Resources 2011).

1.1 Company Name, Location and Mailing Address

Head Office:

Suite 1710-650 West Georgia Street, Vancouver, BC, V6B 4N9

Phone: 604-688-2001

Fax: 604-688-2043

Email: David.Harpley@canadianzinc.com

Prairie Creek Mine:

Iridium 9555 Satellite Phone 1 (yellow) 011-8816-315-30998

Iridium 9505A Satellite Phone 2 (black) 011-8816-315-30997

Iridium 9505A Satellite Phone 3 (orange) 011-8816-315-30996

Ground-To-Air Radio Handheld FREQ 122.800

1.2 Purpose and Scope

The purpose of the SCP is to provide a guide to all road users employed by CZN in the event of an accidental release of fuel or other hazardous material associated with the construction and operation of the access road to the Prairie Creek Mine.

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. It details spill response strategies, tactics and procedures designed to minimize potential health and safety hazards and reduce potential environmental effects related to a spill incident. All persons involved with the Project (Prairie Creek Mine Access Road) must read and be familiar with the SCP. All drivers will be expected to know the following:

- Location and content of the SCP;
- Properties and hazards associated with the cargo(s) being carried including vehicle fuel;
- Inventory and proper use of the spill response kit within the vehicle;
- Required appropriate personal protective equipment (PPE); and
- Required notification procedures to be employed in the event of an incident and details to be communicated

Details of the road, together with the schedule of road construction and operations, are provided in the CZN Road Operations Plan (ROP). A map book of the road is provided in Appendix D and Figures 1 and 2 illustrate the location of the Mine and the access road.

In terms of spill response, CZN will be responsible for all loads, except those carried by dedicated trucks for acid and explosive chemicals delivery. In these cases, the carrier would have primary responsibility, but CZN will provide assistance in the event of a spill. In addition, CZN will stipulate in contracts with 3rd party contractors building or using the access road, that a copy of this SCP will be provided and that their staff must be fully familiar with its contents and their duties and responsibilities. Compliance will be verified as part of the ROP. Copies of relevant portions of the contracts will be made available for public review.

1.3 CZN Environmental Policy

It is CZN's policy to achieve and maintain a high standard of environmental care in conducting its business as a resource company, and through its developments, contribute to sustaining society's material needs. CZN's approach to environmental management seeks continuous improvement in performance by incorporating evolving scientific knowledge and community expectations into its operations.

Specifically, it is CZN's policy to:

- Comply with and adopt the spirit of all applicable laws, regulations and standards, and where laws do not adequately protect the environment, apply standards that minimize any adverse environmental impacts resulting from its operations, products and services.
- Communicate openly and in a timely manner with government on environmental issues, and contribute to the development of policies, legislation and regulations that may affect CZN and its operations.
- Recognize local communities as stakeholders and engage with them in a process of open consultation and timely communication regarding environmental management issues and impacts and seek to involve them in decision making and implementation.
- Ensure that employees and suppliers of goods and services are informed about this policy and that they are aware of their environmental responsibilities in relation to CZN's business.
- Develop and implement management systems to identify, control and monitor potential environmental risks arising from operations, and be prepared to respond to adversity.

1.4 Project Description

Canadian Zinc is planning to operate the Prairie Creek Mine. The Mine is located at approximately 61° 33' north latitude and 124° 48' west longitude adjacent to Prairie Creek, a tributary of the South Nahanni River, southwest Northwest Territories (NWT) (Figure 1).

A 170 km All-Season Road (ASR) connecting the Mine (at Km 0) to the Liard Highway via the Nahanni Butte access road (Figure 2) will generally follow the alignment of a previously permitted Winter Road, while reflecting the terrain, site characteristics, and road specifications suitable and preferred for the ASR. Approximately half of the proposed ASR (85 km between Km 17 to Km 102) is located within the Nahanni National Park Reserve (NNPR). The NNPR, a world heritage site, is known for its globally-significant karst terrain, as well as the South Nahanni River, a Canadian Heritage River. Approximately half of the ASR alignment will directly overlap with the alignment of a previously permitted Winter Road.

Construction of the ASR will take approximately three years to complete. Initial winter roads will be built to gain access to the Mine, allow further investigation of the ASR alignment in order to complete detailed design, and to provide access for ASR construction. CZN's intent is to build the initial winter roads on the ASR alignment as much as possible to minimize the total extent of disturbance.

The ASR will cross approximately 18 major streams with clear span bridges or large diameter culverts, and 85 minor streams with culvert diameters ranging from 800 mm to 2,000 mm based on the size of the stream. Construction of the ASR will be supported by temporary camps at Km 23 (Sundog), Km 42, Km 65, Km 87, Km 121 (Grainger Gap), Km 151 or Km 158, and Km 177.5. The camps at Km 42, Km 87 and Km 121 will likely be retained in a reduced form to support on-going road maintenance.

Borrow sources have been identified all along the road route to provide material for the road sub-grade (fill) and surfacing (gravel). 86 borrow sources have been defined for use in road construction, with another 30 as back-up in the event any of the 86 are subsequently found to be unsuitable. Currently, approximately 44 of the 86 borrow sources are considered preferred locations and about nine of these sources may require blasting and/or crushing activities. Blasting may also be required along the ASR alignment at a number of locations such as Km 5, Km 23, Km 25 to Km 29, Km 32, and Km 36 to Km 37. Some of the surfacing borrow sources will be retained to support road maintenance. The remainder will be closed and reclaimed immediately after road construction. Most borrow sources are proximal to, or within the road corridor. Some will require short access roads.

Water sources will be utilized in winter for winter road construction and during summer for dust control. Water sources have been defined at Km 0 (the Mine), Km 39 (Cat Camp), Km 60 (Mosquito Lake), Km 70, Km 100, Km 121 (Gap Lake), Km 139, Km 141 and the Liard River. Winter water extraction from lakes will be conducted in conformance with Department of Fisheries and Oceans' (DFO) water withdrawal protocol, limiting extraction to less than 10% of lake volume. Summer water extraction from lakes will similarly be limited to avoid significant water level drawdown and will be monitored using installed staff gauges.

1.5 Project Setting

The currently permitted Winter Road and approximate location of the proposed ASR, including major realignments, is shown in Figure 2. The access road will be located in the southwest NWT. The road will begin at the Nahanni Butte access road and pass through the Mackenzie Mountains and the NNPR to the Prairie Creek mine site. Approximately half of the 170 km access road will pass through NNPR (Figure 2). From the Nahanni Butte access road, the ASR crosses lowland terrain and the Liard River before passing through a gap in the Front Range (Grainger Gap), crossing the Silent Hills (Wolverine Pass), Fishtrap Creek and the Tetcela River before ascending and crossing the Ram Plateau. Thereafter, the road enters the Mackenzie Mountains and follows Sundog Creek, Funeral Creek and Prairie Creek to reach the Mine.

1.5.1 Terrain Physiography and Vegetation

The proposed route of the ASR passes through a variety of natural regions including valleys, Sub-Alpine Shrub and Alpine Tundra (max elevation of 1,530 m AMSL), Riparian Alluvial habitat, open-forest parkland, muskeg, and mixed forest. The road alignment crosses terrain that includes discontinuous permafrost and karst, with the potential occurrence of thermokarst, sinkholes, debris flows and thaw slumps, as well as rock fall, rock slides and snow avalanches in mountainous terrain. The route is underlain by sedimentary rock sequences generally consisting of combinations of limestone, dolostone, siltstone, shale and mudstone.

The road area is located primarily within the Taiga Cordillera and Taiga Plains Ecozones of the Northwest Territories and is characterized by several significant topographic features (e.g., Mackenzie Mountains, the Nahanni Range and the Liard floodplain). This has resulted in an array of growing conditions, and consequently, numerous vegetation species assemblages (Ecosystem Classification Group 2007). Wildfires occasionally occur in the region and have influenced forested ecosystems throughout much of the landscape.

1.5.2 Surface Waters

The main surface water basins crossed by the ASR alignment are, from west to east, Prairie Creek, Sundog Creek, Tetcela River, Fishtrap Creek, an unnamed creek, Grainger River, and the Liard River (Figure 2).

Seasonal hydrological characteristics of the various larger streams crossed by the ASR generally mirror the pattern of Prairie Creek, for which there is a good and lengthy record. Higher monthly flows occur in the spring and summer coincident with freshet and summer storms. The annual low flow month is typically March when flows are approximately 50 times less than in June. Peak flows observed in the area occur during intense summer rainfall events. Freeze-up usually begins in mid-October, and spring thaw in mid-April.

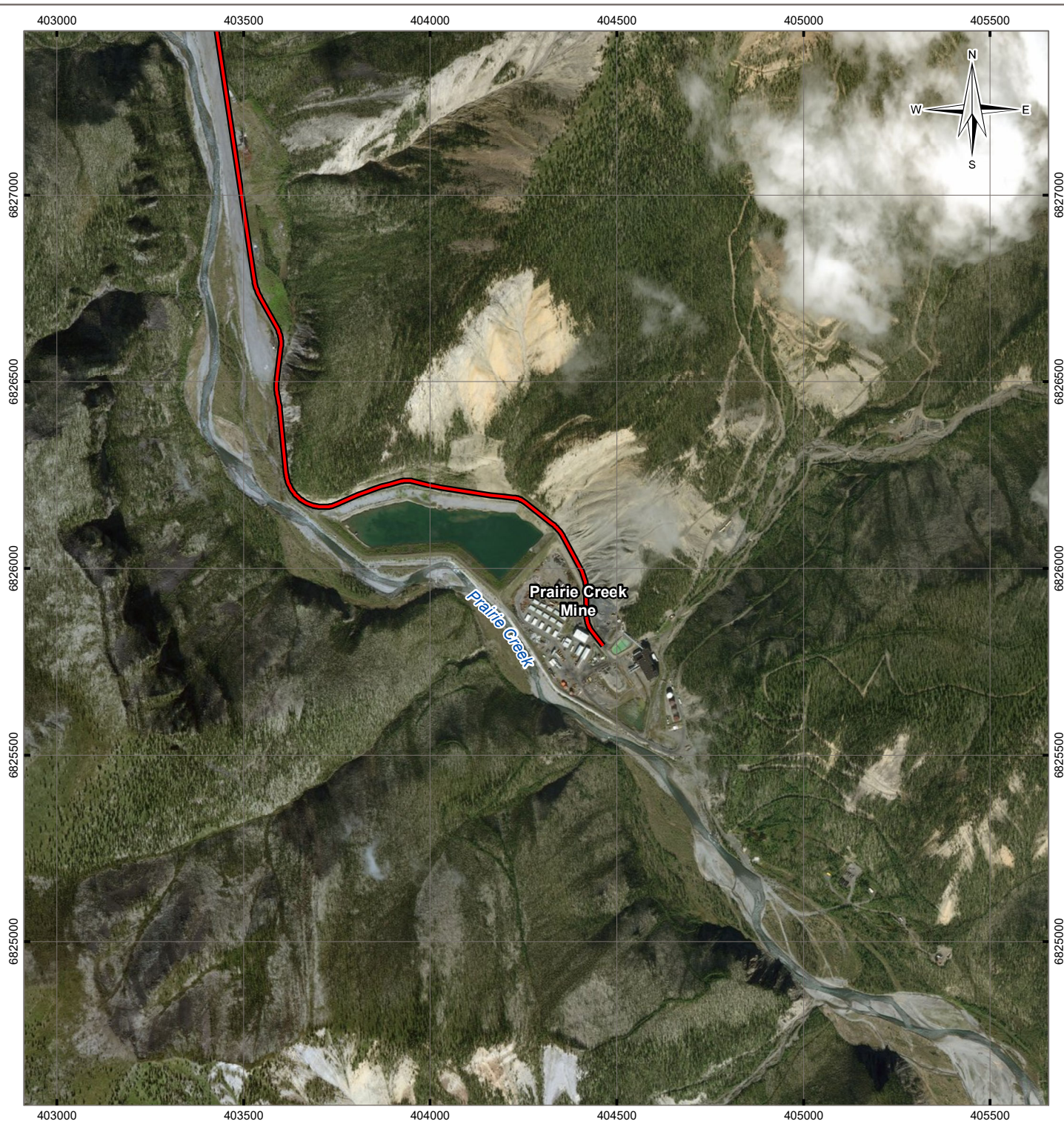
1.5.3 Fish and Wildlife

Both bull trout and mountain whitefish spawn in Prairie Creek upstream of the mine site, the former most likely in Funeral Creek. Arctic grayling are known to inhabit lower Prairie Creek and many other creeks and rivers in the area. Bull trout have not been found east of the Prairie basin. In total, there are 13 stream crossings along the ASR alignment where the presence of fish has been confirmed or is suspected.

Wildlife species at risk or maybe at risk that are potentially present along the ASR corridor include boreal woodland caribou, northern mountain woodland caribou, wood bison, grizzly bear and collared pika. In addition, five bird species at risk occur or may potentially occur in the area including Peregrine Falcon, Short-eared Owl, Common Nighthawk, Olive-sided Flycatcher, Bank Swallow, and Canada Warbler.

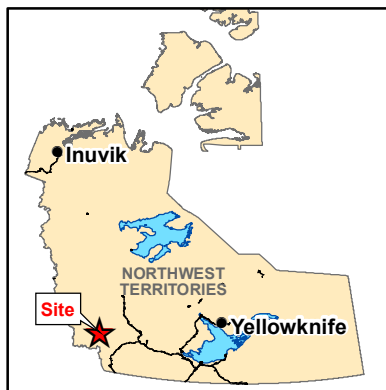
Additional wildlife species that have known distributions along or near the ASR include Dall's sheep, moose and furbearers (including grey wolf, beaver, marten and wolverine). A number of waterfowl species, including Trumpeter Swan, frequent the area of the ASR alignment; the Project area contains habitat for breeding and/or staging for short periods during annual migration. In addition to waterfowl, raptors are expected to occur and nest near the entire ASR alignment, and documented occurrences include Golden Eagle, Bald Eagle, Peregrine Falcon, American Kestrel, Red-tailed Hawk, Northern Harrier, and Gyrfalcon.

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_Figure1.mxd modified 1/16/2019 by megan.verburg



LEGEND

 Proposed Prairie Creek Access Road



NOTES

Base data source:
Imagery from ESRI; DigitalGlobe (2016).

STATUS
ISSUED FOR USE

PRAIRIE CREEK ACCESS ROAD

Prairie Creek Mine Overview

PROJECTION

NWT Lambert

DATUM

NAD83

CLIENT



Scale: 1:15,000

200 100 0 200

Metres

FILE NO.

EARC03145-01_Figure1.mxd

OFFICE

Ti-VANC

DWN

SL

CKD

BB

APVD

RH

REV

0

DATE

January 16, 2019

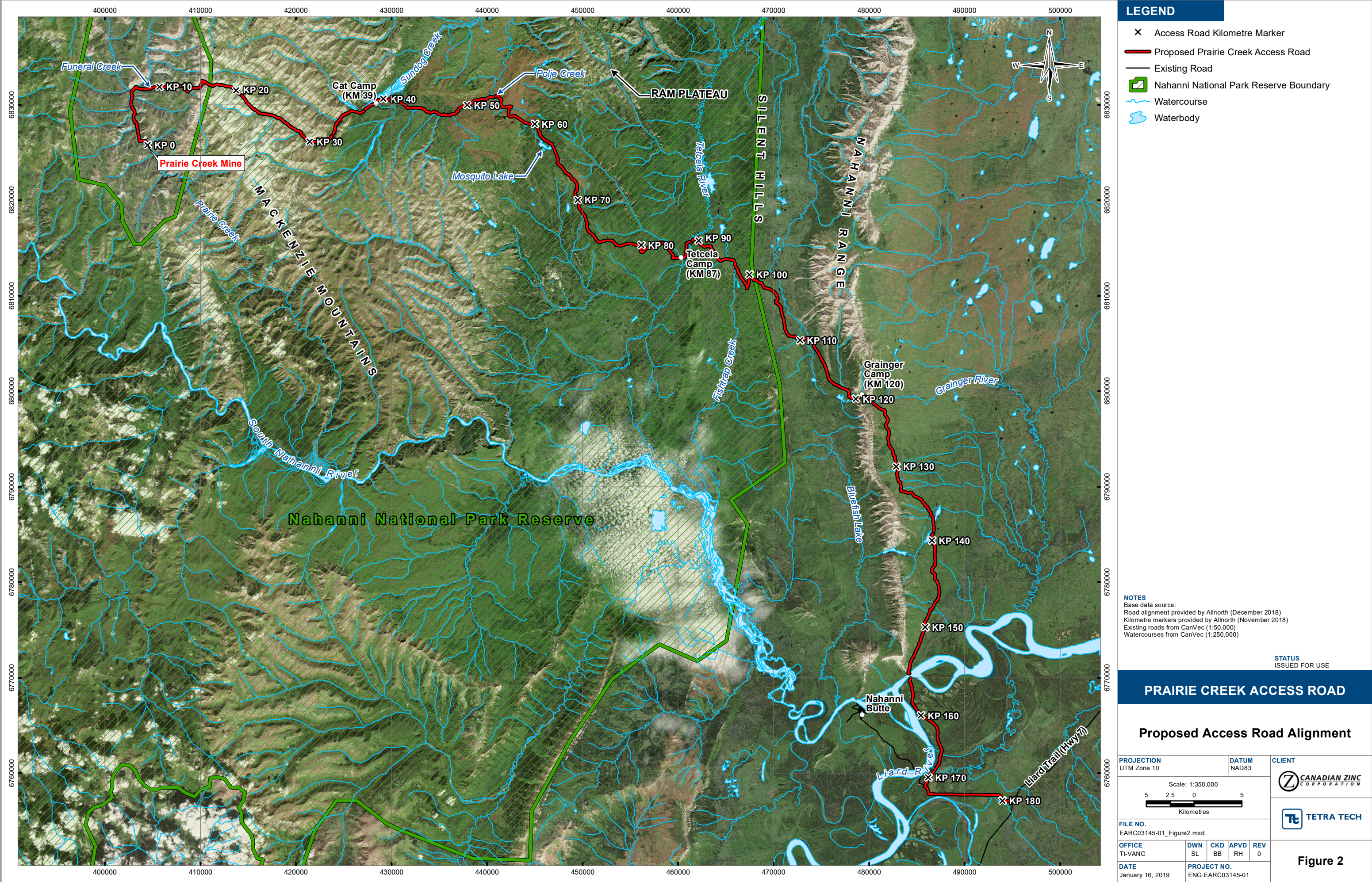
PROJECT NO.

ENG.EARC03145-01



Figure 1

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_Figure2.mxd modified 1/16/2019 by megan.verburg



2.0 POTENTIAL HAZARDOUS MATERIALS

During the construction and operation of ASR, a number of hazardous materials may be transported, used or generated that could potentially be contaminants if released to the environment, including:

- Fuels: gasoline and diesel
- Lubricating oils and grease
- Hydraulic and motor oil
- Antifreeze and other coolants
- Hydrocarbon-contaminated soil, snow/ice and/or water.

In addition, during the long-term operations phase, the following products will be transported on the ASR:

- Mineral concentrates
- Sulphuric acid
- Mill supplies and reagents
- Water treatment reagents
- Underground mine explosives components.

Safety Data Sheets (SDS) for the key hazardous materials to be transported on the ASR are included in Appendix C. Canada recently aligned the Workplace Hazardous Materials Information System (WHMIS) with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Estimated construction fuel and containment requirements are presented in Table 2-1.

Table 2-1: Construction Fuel and Containment Requirements

Type of Fuel and Total Estimated Volume	Capacity of Containers (L)	Containment Type (including secondary)
Diesel P-50 (ULSDF) 13,500 L	Tanker 10,000 L double-walled tanks	Fuel trucks Other vehicles Single walled fuel tanks (6) positioned within a sleigh-mounted steel tub designed to hold 110% of total volume of stored fuel
Gasoline Mid-Grade 4,100 L ¹	Sealed drums	Sealed drums
Oils and Grease	Sealed containers	Sealed containers

Notes:

ULSDF = Ultra Low Sulfur Diesel Fuel

¹ Fuel will be transported to camp sites in manageable volumes through the course of the construction program. There will be one or two sleigh-mounted diesel fuel sloops at any given time and gasoline drums will be replenished as needed.

During ASR construction in winter, diesel will also be hauled into the Mine site by tanker trucks.

Estimated quantities of potentially hazardous products to be transported during the operations phase are presented in Table 2-2. These products would also be transported over the last (3rd) winter road of the 3-year ASR construction period prior to Mill operations.

Table 2-2: Estimated Quantities of Potentially Hazardous Products Transported during Operations

Product	Form	Package Capacity of Containers (L)	Units per load (max)	Number of Loads/year
Diesel P-50 (ULSDF)	Liquid	5,100 L double-walled tanks	1	800 attached to concentrate haul truck/trailer
Gasoline Mid-Grade	Liquid	Sealed drums		4
Jet Fuel	Liquid	Sealed drums		4
Oils and Grease	Liquid	Sealed drums		4
Mineral Concentrate	Solid	20 tonne containers	27 or 2	3,077 Two containers with lockable lids per truck/trailer 40 tonnes/truck load
Sulphuric Acid	Liquid	1,400 L rigid HDPE totes	14	22 Rigid (HDPE) totes
MIBC	Liquid	Drums (litres)	98	7.2
Copper sulphate	Solid	bag (kg)	20	19
Sodium sulphide	Solid	bag (kg)	20	8.7
Sodium nitrate	Solid	bag (kg)	600	6
Ammonium nitrate	Solid	bag (kg)	30	10.5
Ferro Silicon	Solid	bag (kg)	20	7.2
<i>Ferric sulphate (Ferix 3)</i>	Solid	bag (kg)	20	3
Glycol	Liquid	Drums (litres)	98	1
Soda ash	Solid	bag (kg)	20	21.1
Lime	Solid	bag (kg)	20	12

Notes:

ULSDF - Ultra Low Sulfur Diesel Fuel

HDPE - High-Density Polyethylene

2.1 Potential Spills

The following describes the types of potential spills and associated environmental impacts that may occur in relation to the construction and operation of the ASR. Potential worst-case scenarios (Bulk Fuel; Concentrates and Bulk Acid) are discussed below, as per the Guidelines for Spill Contingency Planning (INAC 2007).

2.1.1 Fuel

Diesel fuel will be back-hauled to the Mine by the concentrate trucks in dedicated double walled tanks. The lead trailer of each B-train will have one such tank attached to the vehicle, with approximate tank capacity of 5,100 L. Up to 800 loads per year of fuel are expected to be required. Response equipment and supplies have been identified based on the potential quantity of the spill. Dedicated spill response trailers and truck-mounted spill kits (Section 5.1.2) will be stocked with appropriate response material to address tank spills. A vacuum truck, with a capacity of at least 10,000 L, will be on stand-by at the Mine. In addition, CZN proposes the use of bladders to facilitate the rapid commencement of spilled liquid recovery and temporary storage operations.

Currently, CZN proposes to acquire two bladders with a capacity of at least 5,000 L. One would be stationed with a pump at the mine for ready deployment to the appropriate Control Point, while the second bladder would be stored with a pump on the trailer to be stationed at Cat Camp.

Sections of the ASR which have been identified as environmentally sensitive to spills include any specific karst areas as well as Prairie Creek, Funeral Creek and Sundog Creek. CZN has focussed spill preventative measures on road design improvements and establishing rules of the road for drivers to minimize the risk of incidents. In addition, CZN has addressed the ability to respond rapidly to a spill incident by ensuring access to appropriate, mobile spill response equipment. Pre-identified Control Point locations along the ASR will be established to facilitate quick response and as a result, reduce or prevent the wider migration of spills of diesel fuel. Other locations may be used for containment/recovery of a spill, should they be deemed appropriate at the time of the incident.

The worst-case scenario for a spill of bulk fuel (diesel) or any of the other hydrocarbon products transported, would be a road accident along the ASR resulting in the fuel truck overturning. This could cause a fuel tank rupture and release onto surrounding terrain and any nearby waterbodies. This may lead to impacts to aquatic life and indirectly affect wildlife feeding habitat. Rapid and effective containment and recovery of the spilled product would limit the potential environmental impacts of such an incident.

2.1.2 Concentrate

Approximately 800 loads/year of mineral concentrate in 40 tonne loads will leave the Mine in two 20 tonne containers. The concentrates retain approximately 8% moisture, and in winter conditions are expected to be frozen at the time of transport. In the event of an accident and truck overturn, the containers are expected to remain sealed. In the event of a spill, reasonable and worst-case spilled quantities are assumed to be 5 to 20 tonnes.

Spilled concentrate will be contained and recovered, utilizing a bobcat or back hoe. Any concentrate-contaminated soil would be recovered from the impacted area after excavation for testing to confirm presence/absence of concentrate contamination.

A worst-case scenario is if concentrate containers were to roll down a steep grade after an accident and the lids come undone. Under these conditions, and if heavy machinery access is not possible, then shovels and manpower would be required. Clean-up of spilled concentrate would be completed to the satisfaction of the applicable inspector. Spill exercises addressing this specific potential type of spill incident will be undertaken (Refer to Section 6.0 Training and Exercises).

2.1.3 Sulphuric Acid

Sulphuric acid (required for water treatment) will be transported to the mine in 1,400 L rigid HDPE totes. These vessels are robust and resistant to puncture. Totes will be transported one at a time (each one is expected sustain operations for 2-2.5 weeks), with approximately 22 loads expected per year. Reasonable and worst-case spilled quantities are assumed to be 50 L and 200 L.

The response strategy would be to limit, to the extent possible, the migration of an acid spill from the spill site and to neutralize the acid as quickly as possible. Spill containment strategies such as berming or trenching would be implemented on site followed by the application of soda ash and or lime. Caches of soda ash will be stored at high-risk locations in wildlife-proof containers (salt is an attractant to ungulates) and exchanged seasonally (to avoid caking in wet conditions).

3.0 RESPONSE ORGANIZATION

3.1 Response System

An incident management system will be used to organize the response to any potential spills. The Incident Command System (ICS), a standardized approach to the command, control, and coordination of emergency response is widely used by government and industry will be adopted for the Project. This allows regulators, contractors and other external resources to quickly integrate with and augment the CZN spill response team.

A spill classification system widely used in industry will also be adopted, as follows:

- Level 1** A **minor** event that is confined to the immediate ASR alignment and can be handled by CZN/available contractor personnel using the response resources, manpower and equipment at hand. The Incident Commander will be the Mine Shift Supervisor.
- Level 2** A **moderate** event where an incident has spread beyond the ASR alignment, or where employee safety is at risk or where external resources (i.e., emergency services, or contractors/external resources are required. Public safety however is not threatened. The Incident Commander will be the Mine Manager or his delegate.
- Level 3** A **major** event where public safety or property is endangered, or major off-site environmental impacts have occurred or could occur, and external resources are required. The Incident Commander will be the Mine Manager or a Vice President.

3.2 Response Team

The initial CZN incident response team (comprised of Mine personnel), illustrated in Figure 3, will typically consist of six personnel: one Incident Commander, one Safety Officer, and four responders, one of which will be a mechanic. The responders will work on the 'buddy system' in teams of two. Any required increase in the number of responders will also be in teams of two. The Incident Commander will be responsible for all communications off the spill site and will direct and document the operations undertaken in a chronological log. Communications will be relayed via the Incident Commander to the JMS Co-ordinator for the ASR. Road traffic would likely be halted until the emergency phase of the spill response is completed. The JMS Co-ordinator would relay information to Mine management for required external notification to regulators and communication with local stakeholders.

The Safety Officer will be an experienced employee with intimate knowledge of the operations and safe operating procedures. The Safety Officer's primary responsibility will be to assess hazardous and unsafe situations and develop measures for assuring personnel safety. The Safety Officer may also assist with response operations in the early stages of an incident or assist from time to time if required, but safety remains his priority.

As mechanical equipment such as pumps and skimmers could be involved, a mechanic with appropriate tools has been included as part of the response team. The team would be supported by other units delivering additional equipment, as necessary.

In the event that the spill incident requires additional external resources, including specific technical expertise, addition equipment, etc. the Incident Commander will be responsible for obtaining these resources in a timely manner from the off-site resources listed in Section 5.2 of this SCP.

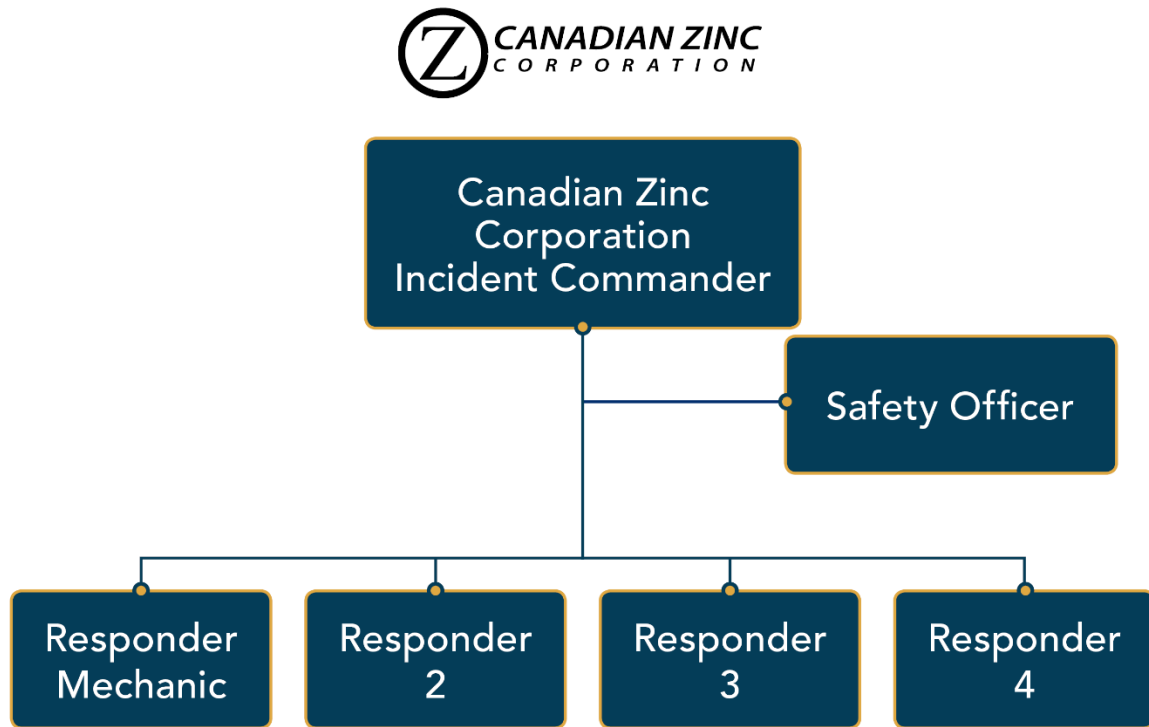


Figure 3: Initial CZN Incident Response Team

4.0 ACTION PLAN

4.1 Spill Prevention

The preferred manner to deal with spills is first by avoidance through appropriate storage, handling, and transportation measures. The prevention of spills is achieved through actions such as:

Containment and Storage:

- All potentially hazardous materials will be stored at a designated storage area (e.g., fuel sloop) 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 tanks, including secondary containment and gas cans will be inspected daily during operations.
- All sewage and solid waste will be contained and sealed in watertight containers.
- Spill mats and/or drip pans/ trays will be placed under all mobile fueling containers and under equipment when not in use, defined as idling or parked for greater than two hours.

Design:

- All stationary activities (i.e., camp activities) will be conducted at least 30 m from the ordinary high-water mark of any waterbody or watercourse.
- Tanks used for transporting greywater will be watertight and designed to reduce surge during transport

Emergency spill response kits will be kept at each road construction camp and during the operations phase at each road maintenance camp.

Inspection, Maintenance and Monitoring:

- All equipment used for operations will be in good working order and free of leaks.
- Regular inspection and maintenance will be conducted for all heavy equipment and vehicles, including fuel transfer hoses and fuel/oil lines, associated with the Project.
- Identified equipment or vehicle deficiencies will be repaired.
- Tanks used for transporting greywater will be regularly and properly inspected and maintained by the operator.
- Drips that make contact with the ground will be cleaned up immediately.
- All vehicles and camp units will be equipped with fire extinguishers.

Training:

- As part of the comprehensive Health, Safety and Environmental orientation and training effort, all personnel workers will receive SCP training prior to beginning work.

4.2 Initial Actions

Before responding to any spill, it is important to first STOP and THINK:

- Identify Hazards
- Assess Risks
- Control Risks

There are three basic priorities when responding to a spill:

- Respond Quickly
- Respond Safely
- Full Notification and Reporting

The following initial actions should be taken by the first person(s) who identifies a spill:

1. Be alert, ensure your safety and the safety of others first.
2. For a hydrocarbon spill, isolate, remove or extinguish all ignition sources.
3. Assess the hazard to persons and the environment in the vicinity of the spill or leak, identify escape routes.
4. Report the spill, leak or system failure without delay to the JMS Coordinator, who will in turn notify the Spill Response Team.
5. Before undertaking a response action proximal to the spill, ensure personnel have and wear the appropriate personal protective equipment (PPE).
6. Block spill drainage paths and, if possible, implement spill response measures at the site and appropriate Control Points.
7. If possible, without further assistance, control any danger to people and the environment.
8. Assess whether the spill, leak or system failure can be readily stopped or brought under control.
9. When safe to do so, stop the leak and/or flow of the spilled material. For an acid spill, ensure the proper PPE is worn and avoid the potential for direct or indirect contact.
10. Gather information on the event and the status of the situation, including the nature, extent and approximate amount of the spill and, if spill is into a waterbody, estimate speed of water flow.
11. Resume any safe, effective action to contain, clean up, or stop the flow of the spilled product. Await the arrival of the Spill Response Team.

Figure 4 outlines the initial actions and procedures to be undertaken in response to a spill incident.

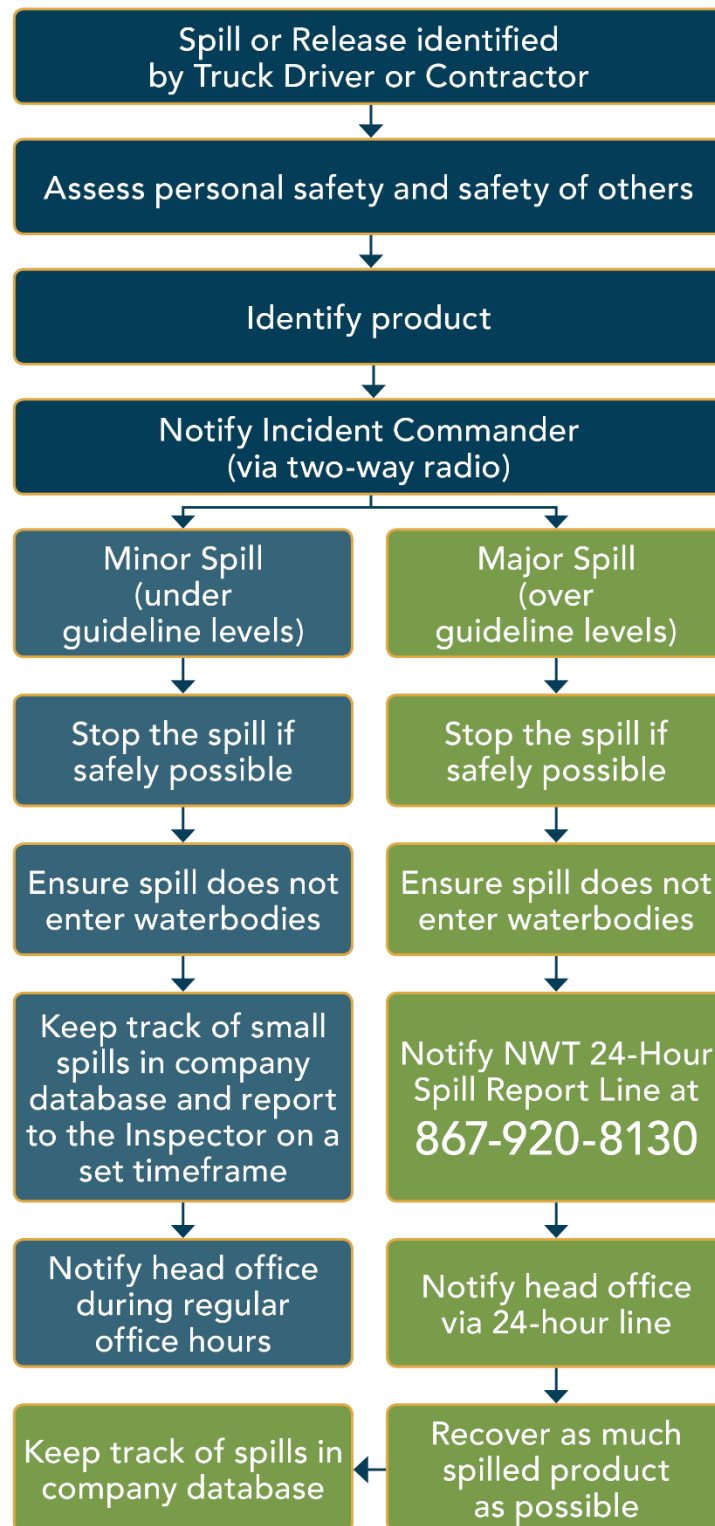


Figure 4: CZN Incident Response and Reporting Flowchart

4.3 Spill Reporting

The CZN Incident Response Team Supervisor must be notified immediately about the occurrence of any spill. An immediately “reportable” spill is defined as a release of a substance that is likely to be an imminent environmental or human health hazard or meets or exceeds the volumes outlined in Appendix B.

A spill that meets these criteria must be reported to the NWT 24-hour Spill Report Line at **867-920-8130** and the NT-NU Spill Form provided in Appendix A will be completed and emailed to spills@gov.nt.ca.

The Incident Response Supervisor will subsequently be responsible for:

- Determining if the spill is reportable as outlined in **Appendix B**.
- Reporting the spill incident to the NT-NU 24-Hour Spill Report Line (**867-920-8130**).
- Completing the NT-NU Spill Report Form (**Appendix A**).
- Notifying Mine management, the Parks Canada office in Fort Simpson, and the Band office in Nahanni Butte.

To Report a Spill:
Fill out the NT-NU Spill Report Form (Appendix A) as completely as possible before calling in the spill report.
Contact the 24-HOUR EMERGENCY SPILL REPORT LINE: 867-920-8130
Where fax is available, fax the completed NT-NU Spill Report Form to 867-873-6924 . Alternatively, if email is available, email the completed NT-NU Spill Report Form to spills@gov.nt.ca

The Incident Response Supervisor will also ensure that all other spill reporting (i.e., Monthly Spill Report) is completed and submitted to the applicable inspector. Spills of flammable liquids, such as diesel and gasoline, are reportable if the spilled quantity exceeds 100 L. Spills of waste oil, vehicle fluids and wastewater are reportable if the spilled quantity exceeds 100 L or 100 kg. Spills are also reportable if they are near or into a water body, irrespective of quantity. For more details, consult the reportable quantities presented in Appendix B.

The spill report will be completed in accordance with the Guide to the Spill Contingency Planning and Reporting Regulations issued under the *Environmental Protection Act* (Environment and Natural Resources 2011), and contain the following information:

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

4.4 Spill Response Actions

4.4.1 General

The potential exists for spills of both petroleum products and/or various chemicals being transported for use at the receiving site. A spill may be in the form of a liquid as in petroleum products, or in the form of a solid. A dry chemical spill may transform into a liquid chemical spill if it is allowed to gain access to a water body (lake or stream) prior to being contained and successfully cleaned up.

Spills may occur on land, snow, ice or in the water or to a combination of one or more depending on the conditions at the time of spill. Various proven practical methods of containment and recovery are well documented for use in northern climates and are summarized in the following documentation.

The first initial action is to prevent any direct health risk to responding personnel. Persons not directly associated with the clean-up operations are to be directed to leave the immediate area. The area should be isolated and limited to traffic as directed by the response team personnel.

The ability to contain and recover spilled materials is influenced by the spill location, the size and rate of release, transport and terrain conditions. This information needs to be matched against the time needed to deploy response personnel and equipment. The following response elements need to be considered:

- Equipment and support material mobilization time
- Personnel mobilization, transmit and assembly at spill site
- Actual equipment set-up and deployment time.

4.4.2 Spill Control Points

When a spill occurs, there is a potential for spilled material to enter a water body and flow either above or below any ice cover. Flow can also occur in a dry watercourse. Contaminants can be carried away from the spill site. A number of areas exist where a spill could enter a watercourse. Sensitive areas have been identified along Prairie and Funeral creeks, especially the upper section of Funeral Creek, Sundog Creek, and the Polje, Tetcela and Grainger stream crossings. As a result, Control Points will be established on two Funeral Creek tributaries at their confluence with the main stem. Similar Control Points will also be established on Sundog Creek in two locations (one just above the main falls and one just before the creek flows onto the fluvial outwash plain), and downstream of the Polje Creek, Tetcela River and Grainger River crossings. An additional Control Point will be established at the toe of the Silent Hills on the west side since the road section above is considered to have a high risk of a spill.

4.4.3 Containment

The type and size of the containment method chosen will depend on the following factors:

- **Size of spill** - Berms surrounding large spills that cover extensive areas are difficult and time consuming to build. Earth and snow berms may be more easily put into place than sand bag containment. It is also important to build the berm as close to the source as possible to minimize any spreading.
- **Terrain** - Steep or varied terrain can make an effective response difficult, particularly with heavy equipment. Spills will travel faster on steep inclines and require faster response times. Larger, flat areas will require longer berms to contain a spill; however, spills travel much slower allowing additional time frames for the construction of barriers.

- **Soil types** - Loose, coarse or dry soils will allow liquid spills to be absorbed and require additional work to remove contaminated materials. Frozen soils create a natural barrier that aid in clean up. Trenches or berms can be difficult to construct without the use of heavy machinery.
- **Proximity to water** - It is important that every precaution be taken to ensure that spills do not enter a waterway. If there is any possibility of contamination, a stream or river should be protected by diversion of the spill from the watercourse.
- **Weather** - Weather can play an important role in spill response operation, particularly if the ground is frozen (or beginning to thaw). The presence of water (either from rainfall or spring melt) can increase the clean-up requirements. Water will also increase the tendency for the spill to spread and pose a hindrance to the effective clean up. Soluble chemicals are also a concern when water is present as contamination can spread rapidly.
- **Location** - the location that the spill occurs will greatly influence the type of containment measures and the ability to successfully clean up the spill.
- **Daylight** - during the winter daylight is at a minimum. This greatly reduces the ability to assess the spill and provide an adequate response. Insufficient light requires that additional sources be available to affect the cleanup.
- **Temperature** - Air temperatures of the north, with the extremes during the winter, demand attention by response personnel to ensure the safety of the response team. Although the extreme cold can be beneficial to the containment of a spill on land, it can also be detrimental in the efficiency and response time to control and contain the spill.

Table 4-1 summarizes the Spill Response Actions for hydrocarbon spill incidents on Land, on Snow/Ice and on Water.

Table 4-1: Summary of Spill Response Actions

General Actions	<ul style="list-style-type: none"> ▪ Stop source if safe to do so ▪ No Smoking - eliminate ignition sources ▪ Block entry of spills to waterways by building berm or trench ▪ Ground electrical containers when transferring fuel ▪ Avoid contact with solvents or other chemicals ▪ Plan and request additional cleanup assistance, if required
On Land	<ul style="list-style-type: none"> ▪ No Smoking - eliminate ignition sources ▪ Block entry into waterways by building a berm or trench ▪ Contain with earth berm or other barrier ▪ Capture minor spills with appropriate sorbent pads ▪ Recover large spills with pumps or vacuum equipment
On Snow/Ice	<ul style="list-style-type: none"> ▪ No Smoking - eliminate ignition sources ▪ Block entry into waterways and contain with snow berm or other barrier ▪ Trench or ditch to intercept or contain fuel on snow, where feasible ▪ Compact the snow around the outside perimeter of the spill area ▪ Construct a berm with snow, either manually or with shovels or heavy equipment such as Bobcats and Front-end Loaders as available ▪ Contain or collect contaminated snow ▪ Use synthetic liners to contain on site if feasible ▪ Recover minor spills with appropriate sorbent pads or snow
On Water	<ul style="list-style-type: none"> ▪ Contain spill as close to release point as possible ▪ Use spill containment boom to concentrate slicks for recovery ▪ Use protection (diversionary) booming using sorbent booms to deflect slicks from nearby sensitive areas ▪ On small spills, recover using appropriate sorbent pads ▪ Do not use sorbent booms/pads in fast currents and turbulent water ▪ Intercept moving slicks in quiet areas using sorbent booms

4.4.4 Spills on Land

- Once a spill is identified, all sources of ignition should be turned off (e.g., no smoking, shut off engines).
- Identify the product involved, the source of the leak or spill, and if safe to do so and If readily possible, stop the leak or spill.
- Contain the spill to ensure the potential for the spilled material reaching a body of water is minimized;
- Secure the affected area, ensuring the area is safe for entry and does not represent a threat to human health and safety of the spill responders. Public access of the area should be restricted.
- Deploy spill kits as appropriate and consider a berm or dyke around the spill to contain the liquid product; block drainage paths down-gradient.
- Leaks from a tank may be stopped by utilizing patching kits.
- Spills (on gravel, rock, soil, vegetation) may be contained by building a soil berm down slope of the running or seeping product. Plastic tarps can be placed over the berm and at the foot of it, to permit the spilled product to pool on the tarp for easy capture.
- Absorbent pads can be used for this purpose, and the pads can be squeezed into empty drums and re-used. Larger pools can be pumped back into drums, empty storage tanks, or “TIDY” tanks.
- It is especially important to prevent the liquid product from entering a body of water as potential environmental impacts may be greater. Even if a spill is contained, it is important to collect free product as soon as possible because seepage into a permeable ground surface can occur.
- Stains on rock may be soaked up with absorbent sheeting. The sheeting should be placed in drums for disposal in an approved manner.
- Contaminated soil and vegetation may have to be removed and disposed of in an environmentally acceptable manner.

4.4.5 Spills on Snow

The presence of snow can assist in containing spilled liquid and functions as a natural absorbent to facilitate containment and recovery.

- Containment on snow is readily achieved and is very effective due to its absorbent qualities. Some liquid spills will become immobile within snow and are easily recovered for transport or disposal.
- Snow can be used in construction of berms. Whenever possible, snow should be left in place to avoid contaminating the underlying substrate berm and lined with plastic sheeting.
- A snow berm can be strengthened by spraying it with a fine water mist that forms an ice layer on top of the snow.
- The snow-liquid mixture can be scraped up and stored in a lined area or in drums for subsequent disposal.

4.4.6 Spills on Ice

For spills that occur on ice, from either direct spillage or migration, containment is greatly affected by the strength of the ice. If the spill does not penetrate the ice, and the ice is safe to work on, then the methods of containment

are similar to those employed for a spill on land. Where the spill has penetrated the ice, the situation should be handled similar to that on open water.

- Once a spill is identified, all sources of ignition should be turned off (e.g. no smoking, shut off engines).
- Where a spill occurs on ice, snow should be compacted around the edge of the spill to serve as a berm (and lined with plastic sheeting). The ice will limit seepage of fuel into the water, but the contaminated snow/ice must be immediately scraped up.
- For spills on thin ice, in situ burning should be considered but requires regulatory approval (contact the 24-Hour NWT/Nunavut Spill Reporting Line).
- Remaining contaminated snow can be placed in drums or in a lined berm (on land) for subsequent approved disposal.

4.4.7 Spills into Water

It is important to immediately control the release of liquid product spilled into water and to contain it to the immediate spill area if possible. Assuming that product has entered water, actions to be taken can include:

- Deploy boom (s) to contain the spill area or to deflect the liquid product into a backwater area if available for containment/recovery of product. The effectiveness of this action can be limited by winds, currents (in the case of moving water) and other factors.
- Apply absorbent pads and similar materials to capture small product spills on water.
- Absorbent booms can be drawn in slowly to encircle spilled product and absorb it. Absorbent booms are often utilized as a secondary barrier to recover any hydrocarbons that escape containment booms.
- Contaminated material must be subsequently placed in drums or portable tanks for subsequent approved disposal.
- In the event of a larger spill on water, immediately seek the assistance of the response team.
- A skimmer may be deployed once a boom has been secured to capture the spilled product. The skimmer utilizes a mechanism to draw and recover hydrocarbons It is then pumped through hoses to empty fuel drums or other temporary liquid storage devices.
- Culverts can permit water flow while capturing and collecting fuel by using a board to control the water level. It can be staked and surrounded with absorbent material to capture the liquid product on the water surface for recovery.

Open water along the ASR typically occurs from May to November. During late fall/early winter construction and ASR operations between the Mine and the Km 87 maintenance camp, there may still be open water, specifically along Prairie Creek, lower Funeral Creek, and in Polje Creek. All other creeks are expected to be dry or completely frozen during the winter period. Road design and operations measures (guard rails, use of chains etc.) will be implemented to minimize the risks of spill incidents.

Spill response personnel will be trained and prepared for open water response situations. The personnel will be prepared and equipped for rapid response given that open water conditions may potentially mean that a spilled liquid product could migrate more quickly than in frozen conditions.

4.5 Spill Delineation and Monitoring

In the event of a large spill or a spill where not all the spilled liquid product can be readily cleaned up with materials on hand (as described above), delineation of the affected area may be required. This could include subsurface investigation of the area (i.e., digging of test pits, soil sampling, installation of monitoring wells) to determine the horizontal and vertical extent of the spill in the soil and groundwater.

For spill-related field monitoring programs that may need to be implemented, samples collected for chemistry and benthic community assemblage assessment would include at least one upstream sample (for reference purposes) and multiple downstream samples. All other endpoints would normally include an upstream and downstream sample only. As appropriate, for a spill impacting on Funeral Creek would include an assessment of juvenile occupancy following methodologies developed by Neil Mochantz of DFO.

The results of such monitoring would assist in the development of an appropriate remediation plan for the affected area. In these cases, qualified environmental consultants would be retained to provide advice on how to proceed with delineation monitoring and remediation of the spill.

4.6 Disposal of Waste from Response Activities

Used absorbent materials from hydrocarbon spill response actions will be incinerated in the Mine incinerator. Plastics are not incinerated and will be taken off-site for approved disposal.

Spill incidents associated with the ASR are most likely to involve hydrocarbon products, concentrate (metals), or acids. Soil contaminated with hydrocarbons will be temporarily stored in steel drums at the spill site and then taken to the Solid Waste Facility at the Mine. The contaminated material will then be transferred to a lined-cell for bioremediation. The material may be relatively heterogeneous and may include gravel and rock. This material would not be included in samples to verify completion of remediation and would remain on site and be incorporated into the Waste Rock Pile.

Soil contaminated with metals could be processed through the Mill, provided the soil does not contain any material that could interfere with the Mill process. Representative samples would be tested to verify the appropriate remedial approach. Target treatment concentrations would be the CCME Soil Quality Guidelines for the Protection of Environmental and Human Health, Residential/Parkland.

Soil and/or vegetation contaminated with acid will also be temporarily stored in steel drums at the spill site and then taken to the Solid Waste Facility. The contaminated material could be managed in the bioremediation cell depending on the strength of the acid and provided the cell liner is protected. Soda ash is effective at neutralizing acid. If this is used and sludge is produced, the sludge can be drummed and taken to the Mine for inclusion in the Mine backfill mix.

Water contaminated with hydrocarbons will be processed through an activated carbon vessel at the Mine. Water contaminated with metals can be treated at the Mine Water Treatment Plant.

4.7 Restoration of Affected Areas

Following initial spill response and containment, the approach to final cleanup and restoration of the affected area will be discussed and a plan developed in consultation with the applicable inspector prior to implementation.

Where necessary, site-specific studies may be undertaken to ensure appropriate cleanup objectives are met and a site-specific approach for soil replacement and revegetation is implemented.

5.0 RESOURCE INVENTORY

5.1 On-Site Resources

5.1.1 Personnel

All personnel working in the field on the Project will be trained on-site in spill prevention, response and clean-up measures. Further information on the spill response training to be provided is presented in Section 6.0.

5.1.2 Spill Equipment

Spill kits will also be carried in vehicles with materials appropriate for the loads (i.e. type of sorbent). All concentrate trucks will carry sorbent specific to hydrocarbons.

For the operating period, comprehensive spill kits (drums) will be maintained at the Mine site, Cat Camp, the Km 87 Maintenance Camp and the Grainger Gap Camp. In addition, custom-built and stocked road trailers dedicated to spill response will be on hand, containing equipment, materials and tools. This will include absorbents and soda ash. The trailers will be stationed at Cat Camp, the Km 87 Maintenance Camp and Grainger Gap to be approximately evenly spaced along the road. One or more of the trailers could be readily hooked up and towed to a spill site.

There is no need to locate the trailers in high-risk locations because responders will still need to travel to the spill location and bring in the nearest trailer on the way. The tractor/trailer units would provide emergency assistance if mechanical issues or adverse weather conditions occur. In addition, all trucks will have 24-hour communications with road operations and dispatch using either 2-way radio or GPS tracking devices.

Non-dedicated equipment such as backhoes, dozers, crane trucks, dump trucks, vacuum trucks etc. would be called to spill sites on a priority basis in the event of need. The Mine and maintenance camps will have heavy equipment available during the operating period. This would be made available immediately in the event of need.

Equipment at the Control Points will include booms, absorbents, in addition to materials needed to create temporary dams, such as board weirs, sand bags and other inert materials that would be stored at the location. Shovels will also be left on site for use in constructing berms, dams, etc. A supply of soda ash will also be kept at Control Points to neutralize any potential acid spill.

5.1.3 Spill Kit Contents

The following outlines the recommended minimum requirements for contents of spill kits to be used for the ASR. Each spill kit will be regularly inspected to ensure that they each contain 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 mm 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 (universal and hydrocarbon)
- 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
- Equipment list and initial spill response actions (in laminated sheets).

The entire spill kit contents, with the exception of the spark-proof shovels, will be stored within the 205 L steel drum. The drum will 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 will be inspected regularly during facility inspections to ensure it turns freely and is lubricated.

5.1.4 Spill Response Trailer Contents

As previously indicated, custom-built road trailers stocked with additional spill response equipment will be stationed at each of Cat Camp, the Km 87 Maintenance Camp and Grainger Gap during the operating period. One or more of the trailers could be readily hooked up and towed to a spill site. The tentative list of equipment to be stored in each of the trailers is extensive and is provided in Appendix E. Included in the inventory of additional spill response equipment will be:

- Decon kits
- Containment and sorbent booms
- Sorbents (sorbent pads, rolls and socks and granular/vermiculite)
- Skimmers (Manta Ray or equivalent) (
- Electrical Equipment & Generators
- Miscellaneous (Hand tools etc.)
- Ropes & Rope Reels
- Safety Equipment - General
- Safety Equipment - Personnel Protective Equipment (PPE),
- Sampling Equipment (soil & water)
- Portable Tanks & Related Equipment
- Totes
- Hose and Transfer pumps
- Light Plants and Generators
- Equipment list and initial spill response actions (in laminated sheets)

5.1.5 Initial Winter Roads

During ASR construction, including the initial winter roads that will also be used to transport supplies into the Mine, the main substance of concern will be diesel fuel. Since the majority of the construction, and the mine haul periods, will be in winter, spill migration concerns will be less since snow is a natural absorbant. However, other absorbants and spill containment and clean-up materials for diesel will be on-hand, the amount and type of which will be suitable for the location and season.

5.2 Off-Site Resources

CZN will endeavour to contract a bulk fuel service company located in the region, preferably close to the haul route, which has an established mobile spill response unit that would be available 24 hours a day. The company would assist CZN in its response to any large bulk fuel spill along the ASR or highways during the operation of the winter road. This service company may also provide training on spill containment and cleanup to CZN employees and contractors, but this and all other items would be defined in the contract.

Additional resources and assistance will be drawn from the following sources:

Esso Bulk Fuels Agency (Fort Simpson)	867-695-2351
Environmental Protection Section, Environment Division, GNWT	867-873-7654
CIRNAC (Fort Simpson) Resource Management Officer	867-695-2626
Contaminants Phone Hot Line	800-661-0827
RCMP (Yellowknife)	867-920-8311
RCMP (Fort Simpson)	867-695-3111
Fire Dept. (Fort Simpson)	867-695-2222
Fire Dept. (Fort Liard)	867-770-2222
Ambulance (Fort Nelson)	250-774-2344
Hospital (Fort Nelson)	250-774-8100
Hospital (Fort Simpson)	867-695-7000
Hospital (Fort Simpson after hours)	867-695-3232
Fixed Wing (VILLERS Fort Nelson)	250-774-2072
Fixed Wing (WOLVERINE Fort Simpson)	867-695-2263
Helicopters (CANADIAN, Fort Nelson)	250-774-6171
(GREAT SLAVE HELI, Yellowknife)	867-873-2081

For large or more complicated spills, Esso Bulk Fuels can be contacted – they have a spill response team available for deployment. This could be facilitated by aircraft.

6.0 TRAINING AND EXERCISES

6.1 Training

All members of the Spill Response Team will be trained and familiarized with the spill response resources, including their location and access, this SCP and appropriate spill response methodologies and reporting.

Operators stationed at the road maintenance camps will also receive appropriate spill response training. Response training will include classroom study, equipment deployment instruction and spill exercises. Training for individual employees/contractors would be commensurate with the duties each is to perform in their day to day functions plus basic spill response procedures. It is envisaged that this would cover responses to Level 1 and smaller Level 2 incidents.

Training for Spill Response Team members will be of a much higher order, up to and including large Level 3 events. Fuel handling crews will be trained in the safe operation of these facilities, spill prevention techniques and initial spill response actions.

A typical training session will include review of the components of the SCP including:

- Action plan
- Initial actions and spill reporting procedures
- Individuals' roles and responsibilities regarding 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 and response trailers
- Spill response and clean-up strategies and techniques.

6.2 Spill Response Exercises

Response training will include spill response exercises where attendees will take appropriate actions and deploy suitable equipment and materials to combat a specifically designed, realistic, spill scenario. The simulated spill will involve a test medium which poses no environmental hazard but behaves like those requiring a response if spilled.

Spill exercises will be undertaken in summer (initial training) and winter (final training) conditions, and at locations representing the range of environmental conditions that exist on the road. Spill simulations will include the use of the bags to be used to transport concentrates on the road. Popcorn, puffed wheat or a heavier inert substance will be used to simulate the "spill".

Spill response training is anticipated to be performed at the Mine. However, if any exercises are contemplated within the NNPR, park staff will be notified first and if the plans are approved, invited to observe or participate. Parks staff will also be consulted regarding the provision of additional resources and assistance for responding to a spill, although their assistance would not be relied on.

The training sessions and exercises will be held prior to the start of each construction season or operations year as part of a Worker Orientation Seminar. This will ensure all returning individuals receive a refresher while any new individuals become familiar with on-site spill prevention and response measures.

CZN will retain records of all individuals who attend the training session and exercises, as well as copies of their training certificates (e.g., first aid, WHIMS).

6.3 Adaptive Management

Adaptive Management is a systematic, rigorous approach designed to link environmental monitoring to management actions. The results and lessons learned from spill incidents that may occur and response/cleanup efforts undertaken during the access road construction and long-term ASR operations phase will be applied to all spill incident and response efforts through the life of the Project.

REFERENCES

- Indian and Northern Affairs Canada (INAC). 2007. Guidelines for Spill Contingency Planning. Water Resources Division, INAC, Yellowknife, NT Available online:
<http://www.aadcc-aandc.gc.ca/eng/1100100024236/1100100024253> (19 November 2012).
- NWT Environment and Natural Resources, 2011. A Guide to the Spill Contingency Planning and Reporting Regulations.

APPENDIX A

NT-NU 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: MM DD YY	Report Time:	<input type="checkbox"/> Original Spill Report OR <input type="checkbox"/> Update # _____ to the Original Spill Report	Report Number:	
	B Occurrence Date: MM DD YY	Occurrence Time:			
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: <input type="checkbox"/> NT <input type="checkbox"/> Nunavut <input type="checkbox"/> Adjacent Jurisdiction or Ocean		
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: <input type="checkbox"/> Potential Spill	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 Environment:		
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:	Employer:	Location Called:	Report Line Number:
Lead Agency: <input type="checkbox"/> EC <input type="checkbox"/> CCG/TCMSS <input type="checkbox"/> GNWT <input type="checkbox"/> GN <input type="checkbox"/> ILA <input type="checkbox"/> AANDC <input type="checkbox"/> NEB <input type="checkbox"/> Other: _____			Significance: <input type="checkbox"/> Minor <input type="checkbox"/> Major <input type="checkbox"/> Unknown		File Status: <input type="checkbox"/> Open <input type="checkbox"/> Closed
Agency:		Contact Name:	Contact Time:	Remarks:	
Lead Agency:					
First Support Agency:					
Second Support Agency:					
Third Support Agency:					

APPENDIX B

IMMEDIATE REPORTABLE SPILL QUANTITIES

TDG Class	Substance for NWT 24 Hour Spill Line	Immediately Reportable Quantities
1 2.3 2.4 6.2 7 None	Explosives Compressed gas (toxic) Compressed gas (corrosive) Infectious substances Radioactive Unknown substance	Any amount
2.1 2.2	Compressed gas (flammable) Compressed gas (non-corrosive, non-flammable)	Any amount of gas from containers with a capacity greater than 100 L
3.1 3.2 3.3	Flammable liquids	> 100 L
4.1 4.2 4.3	Flammable solids Spontaneously combustible solids Water reactant	> 25 kg
5.1 9.1	Oxidizing substances Miscellaneous products or substances excluding PCB mixtures	> 50 L or 50 kg
5.2 9.2	Organic peroxides Environmentally hazardous	> 1 L or 1 kg
6.1 8 9.3	Poisonous substances Corrosive substances Dangerous wastes	> 5 L or 5 kg
9.1	PCB mixtures of 5 or more ppm	> 0.5 L or 0.5 kg
None	Other contaminants (e.g. crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, waste water, etc.)	> 100 L or 100 kg
None	Sour natural gas (i.e. contains H ₂ S) Sweet natural gas	Uncontrolled release or sustained flow of 10 minutes or more

In addition, all releases of harmful substances, regardless of quantity, are to be reported to the NWT spill line if the release is near or into a water body, is near or into a designated sensitive environment or sensitive wildlife habitat, poses imminent threat to human health or safety, poses imminent threat to a listed species at risk or its critical habitat, or is uncontrollable.

APPENDIX C

SAFETY DATA SHEETS

Hydrocarbons

1. Arctic Fuel – Diesel P-50 (ULSDF)
2. Gasoline Mid-Grade
3. Jet Fuel – Aviation Turbine Fuel
4. Ethylene Glycol

Mine Reagents/Products

5. Ammonium Nitrate
6. Copper Sulphate
7. Ferric Sulphate (Ferix 3)
8. Ferro Silicon
9. Lafarge Redimix Concrete
10. MIBC
11. SIBX
12. Soda Ash
13. Sodium Nitrate
14. Sulphuric Acid
15. Sodium Sulphide
16. Sodium Phosphate
17. Sodium Silicate
18. Sodium Sulphate
19. Sodium Thiosulphate
20. Sulfuric Acid
21. Zinc Sulphate



MATERIAL SAFETY DATA SHEET

Product Name: Arctic Diesel Fuel (3090)

SECTION 1 – PRODUCT IDENTIFICATION AND USE

Product name	Arctic Diesel Fuel	PIN #, UN #	1202
Chemical name	None	TDG, DOT class	Class 3
Common names and Product use	Diesel fuel No. 1, Fuel oil #1-D	Packing group	III
WHMIS classification	Combustible liquid Class B Division 3 Toxic material Class D Division 2 Subdivision B	Shipping name	Diesel Fuel
Hazard codes	NFPA Health 2 Flammability 2 Reactivity 0 HMIS Health 2 Flammability 2 Reactivity 0		
<i>NFPA & HMIS Ratings: 0=Insignificant/No Hazard. 1=Slight Hazard. 2=Moderate Hazard. 3=High/Serious Hazard. 4=Extreme/Severe</i>			
Supplier	Irving Oil Limited, Refining Division Box 1260, Saint John New Brunswick Canada E2L 4H6	Phone Emergency Refinery	(506) 202-2000 1-800-424-9300 (506) 202-3000

SECTION 2 – HAZARDOUS INGREDIENTS

Ingredients	CAS#	Wt (%)	ACGIH-TLVs (2004)	OSHA PELs (general industry) (2004)	NIOSH RELs (2004)	LD ₅₀ (rat, oral)	LC ₅₀ (rat, 4 hours)
Diesel fuel no. 1	68334-30-5	100	200 mg/m ³ TWA (total hydrocarbon vapour)	NAv for this product name or	100 mg/m ³ TWA	>5 g/kg	~5g/m ³
<i>May contain:</i> Benzene	71-43-2	Trace	0.5 ppm TWA 2.5 ppm STEL	1 ppm TWA 5 ppm STEL	0.1 ppm TWA 1.0 ppm STEL	930 mg/kg	13,200 ppm
<i>May also contain:</i> Sulphur	7704-34-9	Trace	NAv	NAv	NAv	>8.4 mg/kg	NAv
<i>Which, under certain circumstances, may result in the evolution of:</i> Hydrogen sulphide (H ₂ S)	7783-04-6	NAp	10 ppm TWA 15 ppm STEL	20 ppm CEILING	10 ppm CEILING	NAp	444 ppm
<i>Arctic diesel is a complex mixture of hydrocarbons. Its exact composition depends on the source of the crude oil from which it was produced and the refining methods used. Arctic diesel contains hundreds of individual organic chemicals. This section identifies only some of the well-known chemical constituents.</i>							

SECTION 3 – PHYSICAL DATA

Form	Liquid	Vapour	10.5 mm Hg @ 38°C
Colour	Colourless to pale yellow	Evaporation rate	NAv
Odour	Kerosene-like	Boiling point	157 to 261°C (315 to 501°F)
Odour	Not available	Freezing point	- 47°C (- 53°F)
Specific gravity	0.81 @ 15°C	pH	NAp
Vapour density	4.5	Coefficient of water/oil	3.3 to >6(Log P _{oct})

SECTION 4 – FIRE AND EXPLOSION HAZARDS

Flammability	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Conditions	Easily ignited by heat, sparks or flames.
Flash point	40°C (104°F) (cc)	Auto ignition	210°C (410°F)
Lower flammable limit	0.7%	Upper flammable limit	5%
Explosion data: Sensitivity		Mechanical impact	Not expected to be sensitive
Means of extinction	In general, do not extinguish fire unless flow can be stopped. Use carbon dioxide, dry chemical, or foam. Cool containers with flooding quantities of water until well after the fire is out.		
Special precautions	Vapour is heavier than air. It will spread along the ground and collect in low or confined areas (sewers, basements, tanks). Vapour may travel to source of ignition and flash back. Containers may explode when heated		
Hazardous combustion products	Carbon monoxide. Nitrogen oxides. Aromatic hydrocarbons.		

The information contained in this form is based on data from sources considered to be reliable but Irving Oil Limited does not guarantee the accuracy or completeness thereof. The information is provided as a service to the persons purchasing or using the material to which it refers and Irving Oil Limited expressly disclaims all liability for loss or damage including consequential loss or for injury to persons including death. The information shall not be reproduced, published or distributed in any manner without prior consent in writing of Irving Oil Limited



MATERIAL SAFETY DATA SHEET

Product Name: Arctic
Diesel Fuel (3090)

SECTION 5 – REACTIVITY INFORMATION

Stability	Stable
Conditions to avoid	Sources of ignition. Static discharges. High temperatures.
Incompatible substances	Oxidizers such as peroxides, nitric acid, and perchlorates.
Hazardous decomposition products	Carbon monoxide. Nitrogen oxides. Aromatic hydrocarbons. H ₂ S and sulphur dioxide (SO ₂) may be produced from minor amounts of sulphur in the product.

SECTION 6 – HEALTH HAZARD INFORMATION

Route of Entry	<input type="checkbox"/> Eye <input checked="" type="checkbox"/> Skin absorption Diesel fuel itself, as well as some components <input checked="" type="checkbox"/> Inhalation <input checked="" type="checkbox"/> Ingestion	Hazardous Contact	<input type="checkbox"/> Eye <input checked="" type="checkbox"/> Skin contact
Acute exposure	Headache and other symptoms of central nervous system (CNS) depression, such as nausea and dizziness, as well as burning sensation in chest following inhalation. Aspiration into the lungs can cause severe pneumonitis (serious lung irritation), chest pain, and/or pulmonary edema (swelling). Ingestion may produce nausea, vomiting, and cramping. Note: H₂S may offgas from the product in confined spaces such as the headspace in tanks, even though the concentration of sulphur in the product is minimal. H ₂ S is very toxic. At concentrations as low as 1 to 5 ppm, nausea and severe eye irritation may occur. Sense of smell may be impaired at about 20 ppm, with headache and respiratory tract lung irritation. At 250 to 500 ppm, potentially fatal pulmonary edema (fluid in the lungs) may occur. Dizziness, sudden (often fatal) collapse, unconsciousness, and death occur at higher concentrations. Pulmonary edema may be delayed as long as 48 hours.		
Chronic exposure	Dermatitis. Possibly blood and nervous system disorders. Fatigue, and severe nervous and respiratory system symptoms may follow survival of H ₂ S poisoning.		
Carcinogenicity	Benzene is known to be carcinogenic. Exposure to fuel oils during refining is considered "probably carcinogenic to humans". IARC and NTP classify untreated and mildly treated mineral oils as known human carcinogens. ACGIH, EPA, NIOSH, and OSHA have not classified them.	Mutagenicity	Not known to be mutagenic
		Sensitization	No
		Irritancy	Skin, respiratory
		Teratogenicity	NAV
		Reproductive toxicity	NAV
Toxicologically synergistic	Other CNS depressants can be expected to produce additive or synergistic effects. May increase photosensitizing ability of certain chemicals, such as dinitrochlorobenzene (DNCB).		

SECTION 7 – FIRST AID

Inhalation	Move victim to fresh air. Give artificial respiration if breathing has stopped and if a qualified AR administrator is available. Apply CPR if both pulse and breathing have stopped. Obtain medical attention immediately.
Ingestion	Never give anything by mouth if the person is unconscious, rapidly losing consciousness, or convulsing. If the person is conscious, have them drink 8 to 10 ounces of water or milk to dilute the material in the stomach. Do not induce vomiting. If vomiting occurs spontaneously, have the person lean forward to avoid aspiration. Obtain medical attention immediately.
Eye	If irritation occurs, flush eye with lukewarm, gently flowing fresh water for at least 10 minutes.
Skin	Quickly and gently blot away excess chemical. Gently remove contaminated clothing and shoes under running water. Wash gently and thoroughly with water and non-abrasive soap. Obtain medical assistance.

SECTION 8 – PRECAUTIONARY MEASURES

Do not attempt rescue of an H₂S knockdown victim without the use of proper respiratory protective equipment.

Personal protective equipment	Gloves: Nitrile, Viton™, polyethylene preferred. Eye: Chemical safety goggles or face shield, as a good general safety practice. Respiratory: NIOSH-approved. SCBA or air line respirator with escape cylinder for confined spaces or work with sulphur-containing product. A qualified occupational health and safety professional should advise on respirator selection. If an air-purifying respirator is appropriate, use organic vapour.
Clothing & footwear	Coveralls to prevent skin contact with product. If clothing or footwear becomes contaminated with product, completely decontaminate it before re-use, or discard it.

The information contained in this form is based on data from sources considered to be reliable but Irving Oil Limited does not guarantee the accuracy or completeness thereof. The information is provided as a service to the persons purchasing or using the material to which it refers and Irving Oil Limited expressly disclaims all liability for loss or damage including consequential loss or for injury to persons including death. The information shall not be reproduced, published or distributed in any manner without prior consent in writing of Irving Oil Limited.



MATERIAL SAFETY DATA SHEET

Product Name: Arctic
Diesel Fuel (3090)

Engineering controls	Enclose processes. Use local exhaust ventilation to remove vapour at its site of generation. Handle laboratory samples in a fume hood. Use mechanical ventilation in confined spaces.
Handling procedures & equipment	Avoid heating open containers of product so as to minimize vapour production and accumulation. Use non-sparking equipment, explosion-proof ventilation, and intrinsically safe electrical equipment. Ground handling equipment. Have clean emergency eyewash and shower readily available in the work area.
Leak & spill procedure	Keep unauthorized persons away. Eliminate all sources of ignition. Ventilate area. Stop leak if it can be done safely. Prevent entry into sewers, waterways, or confined spaces. Absorb or cover with dry earth, sand or other non-combustible material and use clean, non-sparking tools to transfer to container.
Waste disposal	Consult local authorities for advice.
Storage	Cool, dry, well-ventilated area. No ignition sources. Containers should be vented and have flame
Shipping	Stable during transport. May be transported hot.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared by	Irving Oil Limited, Refining Division	Phone	(506) 202-3000
Revision date	July 26, 2005	To re-order MSDS,	(506) 202-2000

The information contained in this form is based on data from sources considered to be reliable but Irving Oil Limited does not guarantee the accuracy or completeness thereof. The information is provided as a service to the persons purchasing or using the material to which it refers and Irving Oil Limited expressly disclaims all liability for loss or damage including consequential loss or for injury to persons including death. The information shall not be reproduced, published or distributed in any manner without prior consent in writing of Irving Oil Limited.

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

SECTION 1. IDENTIFICATION

Product name : GASOLINE, UNLEADED

Synonyms : Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending, Conventional Gasoline, RUL, MUL, SUL, PUL.

Product code : 100127, 100126, 101823, 100507, 101811, 101814, 100141, 101813, 101810, 101812, 100063, 101822, 100138, 101821, 100064, 101820, 101819, 100506, 101818, 101816, 101817, 100488

Manufacturer or supplier's details
Petro-Canada
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number
Suncor Energy: +1 403-296-3000;
Canutec Transportation: 1-888- 226-8832 (toll-free) or 613-996-6666;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Clear liquid.
Colour	Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	Gasoline

GHS Classification

Flammable liquids : Category 1

Skin irritation : Category 2

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

Germ cell mutagenicity	: Category 1B
Carcinogenicity	: Category 1A
Reproductive toxicity	: Category 2
Specific target organ toxicity - single exposure	: Category 3 (Central nervous system)
Specific target organ toxicity - repeated exposure	: Category 1
Aspiration hazard	: Category 1

GHS label elements

Hazard pictograms	:			
-------------------	---	---	---	--

Signal word	: Danger
-------------	----------

Hazard statements	: Extremely flammable liquid and vapour. May be fatal if swallowed and enters airways. Causes skin irritation. May cause drowsiness or dizziness. May cause genetic defects. May cause cancer. Suspected of damaging the unborn child. Causes damage to organs () through prolonged or repeated exposure.
-------------------	--

Precautionary statements	: Prevention: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ ventilating/ lighting/ equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. Wash skin thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/ protective clothing/ eye protection/ face protection. Response: IF SWALLOWED: Immediately call a POISON CENTER/doctor. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove person to fresh air and keep comfortable
--------------------------	---

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

for breathing. Call a POISON CENTER/doctor if you feel unwell.
IF exposed or concerned: Get medical advice/ attention.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

Storage:

Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal:

Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry	: Eye contact Ingestion Inhalation Skin contact
Target Organs	: Blood Immune system
Inhalation	: Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
Skin	: Causes skin irritation.
Eyes	: May irritate eyes.
Ingestion	: Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	: Chronic exposure to benzene may result in increased risk of leukemia and other blood disorders.
Aggravated Medical Condition	: None known.

Other hazards

None known.

IARC

Group 1: Carcinogenic to humans

Benzene 71-43-2

OSHA

OSHA specifically regulated carcinogen

Benzene 71-43-2

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

NTP

Known to be human carcinogen

Benzene

71-43-2

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration
gasoline, natural	8006-61-9	95 - 100 %
toluene	108-88-3	1 - 40 %
benzene	71-43-2	0.5 - 1.5 %
ethanol	64-17-5	0.1 - 0.3 %

SECTION 4. FIRST AID MEASURES

- If inhaled : Artificial respiration and/or oxygen may be necessary.
Move to fresh air.
Seek medical advice.
- In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.
- In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.
- If swallowed : Rinse mouth with water.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Never give anything by mouth to an unconscious person.
Seek medical advice.
- Most important symptoms and effects, both acute and delayed : None known.
- Protection of first-aiders : First Aid responders should pay attention to self-protection and use the recommended protective clothing
It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

SECTION 5. FIREFIGHTING MEASURES

- | | |
|---------------------------------------|--|
| Suitable extinguishing media | : Dry chemical
Carbon dioxide (CO ₂)
Water fog.
Foam |
| Unsuitable extinguishing media | : Do NOT use water jet. |
| Specific hazards during fire-fighting | : Cool closed containers exposed to fire with water spray. |
| Hazardous combustion products | : Carbon oxides (CO, CO ₂), nitrogen oxides (NO _x), polynuclear aromatic hydrocarbons, phenols, aldehydes, ketones, smoke and irritating vapours as products of incomplete combustion. |
| Further information | : Prevent fire extinguishing water from contaminating surface water or the ground water system. |

SECTION 6. ACCIDENTAL RELEASE MEASURES

- | | |
|---|---|
| Personal precautions, protective equipment and emergency procedures | : Use personal protective equipment.
Ensure adequate ventilation.
Evacuate personnel to safe areas.
Material can create slippery conditions. |
| Environmental precautions | : If the product contaminates rivers and lakes or drains inform respective authorities. |
| Methods and materials for containment and cleaning up | : Prevent further leakage or spillage if safe to do so.
Remove all sources of ignition.
Soak up with inert absorbent material.
Non-sparking tools should be used.
Ensure adequate ventilation.
Contact the proper local authorities. |

SECTION 7. HANDLING AND STORAGE

- | | |
|-------------------------|--|
| Advice on safe handling | : For personal protection see section 8.
Smoking, eating and drinking should be prohibited in the application area.
Use only with adequate ventilation.
In case of insufficient ventilation, wear suitable respiratory equipment.
Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Avoid contact with skin, eyes and clothing.
Do not ingest.
Keep away from heat and sources of ignition.
Keep container closed when not in use. |
|-------------------------|--|

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
gasoline, natural	8006-61-9	TWA	300 ppm 900 mg/m ³	OSHA P0
		STEL	500 ppm 1,500 mg/m ³	OSHA P0
		TWA	500 ppm 2,000 mg/m ³	OSHA Z-1
		STEL	500 ppm 1,500 mg/m ³	CAL PEL
		PEL	300 ppm 900 mg/m ³	CAL PEL
toluene	108-88-3	TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m ³	NIOSH REL
		ST	150 ppm 560 mg/m ³	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm (10 minutes)	OSHA Z-2
		TWA	100 ppm 375 mg/m ³	OSHA P0
		STEL	150 ppm 560 mg/m ³	OSHA P0
		PEL	10 ppm 37 mg/m ³	CAL PEL
		C	500 ppm	CAL PEL
		STEL	150 ppm 560 mg/m ³	CAL PEL
benzene	71-43-2	TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes)	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

		PEL	1 ppm	CAL PEL
		STEL	5 ppm	CAL PEL
ethanol	64-17-5	TWA	1,000 ppm 1,900 mg/m3	NIOSH REL
		TWA	1,000 ppm 1,900 mg/m3	OSHA Z-1
		TWA	1,000 ppm 1,900 mg/m3	OSHA P0
		STEL	1,000 ppm	ACGIH
		PEL	1,000 ppm 1,900 mg/m3	CAL PEL

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sam-pling time	Permissible concentra-tion	Basis
Toluene	108-88-3	Toluene	In blood	Prior to last shift of work-week	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI

Engineering measures

- : Use only in well-ventilated areas. Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection

- : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type

- : A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection Material

- : polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness,

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Remarks	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	: Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	: Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	: Wash contaminated clothing before re-use.
Hygiene measures	: Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Clear liquid.
Colour	: Clear to slightly yellow or green, undyed liquid. May be dyed red for taxation purposes.
Odour	: Gasoline
Odour Threshold	: No data available
pH	: No data available
Pour point	: No data available
Boiling point/boiling range	: 25 - 225 °C (77 - 437 °F)
Flash point	: -50 - -38 °C (-58 - -36 °F) Method: Tagliabue.
Auto-Ignition Temperature	: 257 °C (495 °F)
Evaporation rate	: No data available
Flammability	: Extremely flammable in presence of open flames, sparks, shocks, and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. Rapid escape of vapour may generate static charge causing ignition. May accumulate in confined spaces.
Upper explosion limit	: 7.6 %(V)

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

Lower explosion limit	: 1.3 %(V)
Vapour pressure	: < 802.5 mmHg (20 °C / 68 °F)
Relative vapour density	: 3
Relative density	: 0.685 - 0.8
Solubility(ies)	
Water solubility	: insoluble
Partition coefficient: n-octanol/water	: No data available
Viscosity	
Explosive properties	: Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire. Vapours may form explosive mixtures with air.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	: Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	: Extremes of temperature and direct sunlight.
Incompatible materials	: Reactive with oxidising agents, acids and interhalogens.
Hazardous decomposition products	: May release CO _x , NO _x , phenols, polycyclic aromatic hydrocarbons, aldehydes, ketones, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Eye contact
Ingestion
Inhalation
Skin contact

Acute toxicity

Product:

Acute oral toxicity	: Remarks: No data available
Acute inhalation toxicity	: Remarks: No data available
Acute dermal toxicity	: Remarks: No data available

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

Components:

toluene:

- Acute oral toxicity : LD50 (Rat): 5,580 mg/kg,
- Acute inhalation toxicity : LC50 (Rat): 7585 ppm
Exposure time: 4 h
Test atmosphere: dust/mist
- Acute dermal toxicity : LD50 (Rabbit): 12,125 mg/kg,

benzene:

- Acute oral toxicity : LD50 (Rat): 2,990 mg/kg,
- Acute inhalation toxicity : LC50 (Rat): 13700 ppm
Exposure time: 4 h
Test atmosphere: dust/mist
- Acute dermal toxicity : LD50 (Rabbit): > 8,240 mg/kg,

ethanol:

- Acute oral toxicity : LD50 (Rat): 7,060 mg/kg,
- Acute inhalation toxicity : LC50 (Rat): > 32380 ppm
Exposure time: 4 h
Test atmosphere: vapour

Skin corrosion/irritation

Product:

Remarks: No data available

Serious eye damage/eye irritation

Product:

Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

STOT - repeated exposure

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish : Remarks: No data available

Toxicity to daphnia and other aquatic invertebrates : Remarks: No data available

Toxicity to algae : Remarks: No data available

Toxicity to bacteria : Remarks: No data available

Persistence and degradability

Product:

Biodegradability : Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

Contaminated packaging : Do not re-use empty containers.

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

Revision Date 2017/04/20

Print Date 2017/04/20

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No. : UN 1203
Proper shipping name : Gasoline
Class : 3
Packing group : II
Labels : Class 3 - Flammable Liquid
Packing instruction (cargo aircraft) : 364

IMDG-Code

UN number : UN 1203
Proper shipping name : GASOLINE

Class : 3
Packing group : II
Labels : 3
EmS Code : F-E, S-E
Marine pollutant : no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

National Regulations

49 CFR

UN/ID/NA number : UN 1203
Proper shipping name : Gasoline

Class : 3
Packing group : II
Labels : Class 3 - Flammable Liquid
ERG Code : 128
Marine pollutant : no

SECTION 15. REGULATORY INFORMATION

The components of this product are reported in the following inventories:

DSL

On the inventory, or in compliance with the inventory

TSCA

All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.

EINECS

On the inventory, or in compliance with the inventory

SAFETY DATA SHEET

GASOLINE, UNLEADED



000003000644

Version 2.0

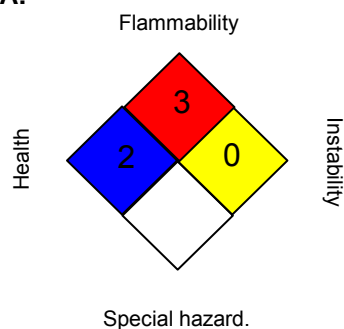
Revision Date 2017/04/20

Print Date 2017/04/20

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	3*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 = Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of SDS

: Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by

: Product Safety: +1 905-804-4752

Revision Date

: 2017/04/20

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.

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

SECTION 1. IDENTIFICATION

Product name : JET A/A-1 AVIATION TURBINE FUEL

Synonyms : Jet A-1; Jet A-1-DI; Aviation Turbine Kerosene (ATK); JP-8; NATO F-34; Jet F-34; Aviation Turbine Fuel, Kerosene Type (CAN/CGSB 3.23 & CAN/CGSB 3.24)

Product code : 101851, 100123

Manufacturer or supplier's details
Petro-Canada
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number : Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Used as aviation turbine fuel. May contain a fuel system icing inhibitor. In the arctic, Jet A-1 may also be used as diesel fuel (if it contains a lubricity additive) and heating oil.

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Clear liquid.
Colour	Clear and colourless
Odour	Kerosene-like.

GHS Classification

Flammable liquids : Category 3

Skin irritation : Category 2

Reproductive toxicity : Category 2

Specific target organ toxicity - single exposure : Category 3 (Central nervous system)

Aspiration hazard : Category 1

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

GHS label elements

Hazard pictograms



Signal word

: Danger

Hazard statements

: Flammable liquid and vapour.
May be fatal if swallowed and enters airways.
Causes skin irritation.
May cause drowsiness or dizziness.
Suspected of damaging fertility or the unborn child.

Precautionary statements

: **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ eye protection/ face protection.
Use personal protective equipment as required.
Response:
IF SWALLOWED: Immediately call a POISON CENTER/doctor.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.
IF exposed or concerned: Get medical advice/ attention.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry

: Eye contact
Ingestion
Inhalation

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

Skin contact

- Inhalation : Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
- Skin : May irritate skin.
- Eyes : May irritate eyes.
- Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Other hazards

None known.

IARC

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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.

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.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration
kerosine (petroleum)	8008-20-6	90 - 100 %
2-(2-methoxyethoxy)ethanol	111-77-3	0 - 0.2 %

SECTION 4. FIRST AID MEASURES

- If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.
- In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081



Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

- and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.
- In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.
- If swallowed : Rinse mouth with water.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Never give anything by mouth to an unconscious person.
Seek medical advice.
- Most important symptoms and effects, both acute and delayed : First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

- Suitable extinguishing media : Dry chemical
Carbon dioxide (CO₂)
Water fog.
Foam
- Unsuitable extinguishing media : Do NOT use water jet.
- Specific hazards during fire-fighting : Cool closed containers exposed to fire with water spray.
- Hazardous combustion products : Carbon oxides (CO, CO₂), nitrogen oxides (NO_x), sulphur oxides (SO_x), smoke and irritating vapours as products of incomplete combustion.
- Further information : Prevent fire extinguishing water from contaminating surface water or the ground water system.
- Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.
Ensure adequate ventilation.
Evacuate personnel to safe areas.
Material can create slippery conditions.
- Environmental precautions : If the product contaminates rivers and lakes or drains inform respective authorities.

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20



Methods and materials for containment and cleaning up : Prevent further leakage or spillage if safe to do so.
Remove all sources of ignition.
Soak up with inert absorbent material.
Non-sparking tools should be used.
Ensure adequate ventilation.
Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : For personal protection see section 8.
Smoking, eating and drinking should be prohibited in the application area.
Use only with adequate ventilation.
In case of insufficient ventilation, wear suitable respiratory equipment.
Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Avoid contact with skin, eyes and clothing.
Do not ingest.
Keep away from heat and sources of ignition.
Keep container closed when not in use.

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
kerosine (petroleum)	8008-20-6	TWA	100 mg/m ³	NIOSH REL
		TWA	500 ppm 2,000 mg/m ³	OSHA Z-1
		TWA	200 mg/m ³ (total hydrocarbon vapor)	ACGIH
		TWA	400 ppm 1,600 mg/m ³	OSHA P0

Engineering measures : Use only in well-ventilated areas.
Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

Respiratory protection	: Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Filter type	: A NIOSH-approved air-purifying respirator with an organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.
Hand protection Material	: polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	: Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	: Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	: Wash contaminated clothing before re-use.
Hygiene measures	: Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Clear liquid.
Colour	: Clear and colourless
Odour	: Kerosene-like.
Odour Threshold	: No data available

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

pH	: No data available
Pour point	: -51 °C (-60 °F) No data available
Boiling point/boiling range	: 140 - 300 °C (284 - 572 °F)
Flash point	: > 38 °C (100 °F) Method: Tagliabue
Auto-Ignition Temperature	: 210 °C (410 °F)
Evaporation rate	: No data available
Flammability	: Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite. May accumulate in confined spaces.
Upper explosion limit	: 5 %(V)
Lower explosion limit	: 0.7 %(V)
Vapour pressure	: 5.25 mmHg (20 °C / 68 °F)
Relative vapour density	: 4.5
Relative density	: 0.775 - 0.84 (15 °C / 59 °F)
Solubility(ies)	
Water solubility	: No data available
Partition coefficient: n-octanol/water	: No data available
Viscosity	
Viscosity, kinematic	: 1.0 - 1.9 cSt (40 °C / 104 °F)
Explosive properties	: Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Containers may explode in heat of fire.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	: Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	: Extremes of temperature and direct sunlight.

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL



000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

Incompatible materials	: Reactive with oxidising agents, acids and alkalis.
Hazardous decomposition products	: May release CO _x , NO _x , SO _x , aldehydes, acids, ketones, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Eye contact
Ingestion
Inhalation
Skin contact

Acute toxicity

Product:

Acute oral toxicity	: Remarks: No data available
Acute inhalation toxicity	: Remarks: No data available
Acute dermal toxicity	: Remarks: No data available

Components:

kerosine (petroleum):

Acute oral toxicity	: LD50 (Rat): > 5,000 mg/kg,
Acute inhalation toxicity	: LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	: LD50 (Rabbit): > 2,000 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Serious eye damage/eye irritation

Product:

Remarks: No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081



Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish : Remarks: No data available

Toxicity to daphnia and other aquatic invertebrates : Remarks: No data available

Toxicity to algae : Remarks: No data available

Toxicity to bacteria : Remarks: No data available

Persistence and degradability

Product:

Biodegradability : Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081

Version 2.0

Revision Date 2016/07/20

Print Date 2016/07/20



Contaminated packaging : Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No. : UN 1863
Proper shipping name : Fuel, aviation, turbine engine
Class : 3
Packing group : III
Labels : Class 3 - Flammable Liquid
Packing instruction (cargo aircraft) : 366

IMDG-Code

UN number : UN 1863
Proper shipping name : FUEL, AVIATION, TURBINE ENGINE

Class : 3
Packing group : III
Labels : 3
EmS Code : F-E, S-E
Marine pollutant : no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

National Regulations

49 CFR

UN/ID/NA number : UN 1863
Proper shipping name : Fuel, aviation, turbine engine

Class : 3
Packing group : III
Labels : Class 3 - Flammable Liquid
ERG Code : 128
Marine pollutant : no

SECTION 15. REGULATORY INFORMATION

The components of this product are reported in the following inventories:

DSL

On the inventory, or in compliance with the inventory

TSCA

All chemical substances in this product are either listed on the TSCA Inventory or are in compliance with a TSCA Inventory exemption.

EINECS

On the inventory, or in compliance with the inventory

SAFETY DATA SHEET

JET A/A-1 AVIATION TURBINE FUEL

000003001081

Version 2.0

Revision Date 2016/07/20

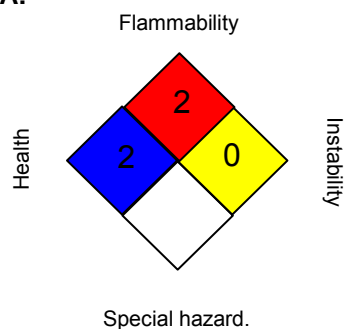
Print Date 2016/07/20



SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	2
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 = Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS

: Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by

: Product Safety: +1 905-804-4752

Revision Date

: 2016/07/20

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.



Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON L9S 3W4
Canada

Information (M-F 8:00-5:00): 705-436-5580

Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 1 of 10

SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product identifier used on the label

: **Ethylene Glycol**

Product Code(s) : Not available.

Recommended use of the chemical and restrictions on use

: Antifreeze; Plasticiser; Solvent
Use pattern: Professional Use Only
Restriction on use: None known

Chemical family : Glycols.

Name, address, and telephone number
of the supplier:

Comet Chemical Company Ltd.

3463 Thomas Street

Innisfill, ON, Canada

L9S 3W4

Supplier's Telephone # : 705-436-5580

24 Hr. Emergency Tel # : TERRRAPURE ENVIRONMENTAL : 800-567-7455

Name, address, and telephone number of
the manufacturer:

Refer to supplier

SECTION 2. HAZARDS IDENTIFICATION

Classification of the chemical

Clear colourless liquid. Odorless.

This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015).

Hazard classification

Acute toxicity, oral - Category 4

Reproductive toxicity- Category 2

Specific target organ toxicity, single exposure - Category 2 (kidneys)

Specific Target Organ Toxicity, Single Exposure - Category 3 (cns)

Label elements

Hazard pictogram(s)



Signal Word

Warning!

Hazard statement(s)

Harmful if swallowed.

Suspected of damaging the unborn child.

May cause damage to the kidneys if swallowed.

May cause drowsiness or dizziness.



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 2 of 10

SAFETY DATA SHEET

Precautionary statement(s)

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Do not breathe mist or vapor.
Wear protective gloves/clothing and eye/face protection.
If exposed or concerned: Call a POISON CENTER or doctor/physician.

IF SWALLOWED: Call a POISON CENTRE or doctor/physician if you feel unwell.
Rinse mouth.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a POISON CENTER or doctor/physician if you feel unwell.

Store locked up.
Store in a well-ventilated place. Keep container tightly closed.

Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards

Other hazards which do not result in classification:
May cause eye, skin and respiratory tract irritation.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance

<u>Chemical name</u>	<u>Common name and synonyms</u>	<u>CAS #</u>	<u>Concentration</u>
Ethylene glycol	1,2-Ethanediol 1,2-Dihydroxyethane EG	107-21-1	100.00

SECTION 4. FIRST-AID MEASURES

Description of first aid measures

- Ingestion* : Call a physician or poison control centre immediately. Induce vomiting ONLY under the direct supervision of qualified medical personnel or a poison control centre. Never give anything by mouth to an unconscious person.
- Inhalation* : Immediately remove person to fresh air. If breathing has stopped, give artificial respiration. Get medical attention.
- Skin contact* : Immediately flush with plenty of water, while removing contaminated clothing. If irritation persists, seek prompt medical attention. Launder clothing before reuse.
- Eye contact* : Immediately flush eye(s) with plenty of water. After initial flushing, remove any contact lenses if worn, and continue flushing for at least 5 to 10 minutes. If irritation persists, seek prompt medical attention.

Most important symptoms and effects, both acute and delayed

- : Harmful if swallowed. May cause damage to the kidneys if swallowed. May cause drowsiness or dizziness. Symptoms may include pain, headache, nausea, vomiting, dizziness, drowsiness and other central nervous system effects. May cause slight eye and skin irritation. Symptoms include: Redness, swelling, itching and dryness. Suspected of damaging the unborn child.

Indication of any immediate medical attention and special treatment needed

- : Immediate medical attention is required. May be harmful or fatal if swallowed. Use of ethanol may be helpful to counter the toxic effects of ethylene glycol by interfering with the absorption rate in the stomach and intestine. Onset of symptoms may be delayed for 18 to 24 hours after ingestion. Symptoms may be delayed.



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 3 of 10

SAFETY DATA SHEET

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media

- : Use media suitable to the surrounding fire such as water fog or fine spray, alcohol foams, carbon dioxide and dry chemical.

Unsuitable extinguishing media

- : Do not use a solid water stream as it may scatter and spread fire.

Special hazards arising from the substance or mixture / Conditions of flammability

- : Burning produces obnoxious and toxic fumes.

Flammability classification (OSHA 29 CFR 1910.106)

- : Not flammable.

Hazardous combustion products

- : Carbon oxides, formaldehyde and other irritating fumes and smoke.

Special protective equipment and precautions for firefighters

Protective equipment for fire-fighters

- : Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Special fire-fighting procedures

- : Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if safe to do so. Water spray may be useful in cooling equipment exposed to heat and flame.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

- : Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. All persons dealing with clean-up should wear the appropriate protective equipment including self-contained breathing apparatus. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment.

Environmental precautions

- : Ensure spilled product does not enter drains, sewers, waterways, or confined spaces. If necessary, dike well ahead of the spill to prevent runoff into drains, sewers, or any natural waterway or drinking supply.

Methods and material for containment and cleaning up

- : Ventilate the area. Stop spill or leak at source if safely possible. Dike for water control. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand), then place absorbent material into a container for later disposal (see Section 13).

Special spill response procedures

- : If a spill/release in excess of the EPA reportable quantity is made into the environment, immediately notify the national response center in the United States (phone: 1-800-424-8802).
US CERCLA Reportable quantity (RQ): Ethylene glycol (5000 lbs / 2270 kg).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 4 of 10

SAFETY DATA SHEET

- : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. This material is a harmful liquid. Wear protective gloves/clothing and eye/face protection. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment. Use with adequate ventilation. Do not ingest. Do not breathe mist or vapor. Avoid contact with eyes, skin and clothing. Wash with soap and water after handling. Keep away from extreme heat and flame. Keep away from acids and other incompatibles. Use caution when opening cap. Keep containers tightly closed when not in use. Empty containers retain residue (liquid and/or vapour) and can be dangerous.
- Conditions for safe storage** : Store in a cool, dry, well-ventilated area. Store away from areas of excessive heat, open flames, sparks, and other possible sources of ignition. Keep away from incompatibles. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Inspect periodically for damage or leaks.
- Incompatible materials** : Alkalies ;Strong oxidizing agents;Strong acids.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:

<u>Chemical Name</u>	<u>ACGIH TLV</u>		<u>OSHA PEL</u>	
	<u>TWA</u>	<u>STEL</u>	<u>PEL</u>	<u>STEL</u>
Ethylene glycol	100 mg/m ³ (aerosol) (Ceiling)	N/Av	50 ppm (final rule limit)	N/Av

Exposure controls

Ventilation and engineering measures

- : Use sufficient mechanical ventilation to maintain exposures below the TLV. Use local exhaust if mist or spray is generated.

Respiratory protection

- : Respiratory protection is required if the concentrations exceed the TLV. NIOSH-approved respirators are recommended. Seek advice from respiratory protection specialists. Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134) or CSA Z94.4-02.

Skin protection

- : Wear impervious gloves, such as butyl rubber. Advice should be sought from glove suppliers.

Eye / face protection

- : Chemical goggles are recommended when there is a potential for splashing.

Other protective equipment

- : Emergency showers and eyewash facilities should be nearby. Wear a chemically resistant apron and long sleeves when dispensing, to prevent skin contact.

General hygiene considerations

- : Do not breathe mist or vapor. Avoid contact with eyes, skin and clothing. When using do not eat or drink. When using do not smoke. Upon completion of work, wash hands before eating, drinking, smoking or use of toilet facilities. Remove soiled clothing and wash it thoroughly before reuse.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance** : Clear, colourless liquid.
- Odour** : Little or no odour.
- Odour threshold** : N/Av
- pH** : N/Av
- Melting/Freezing point** : - 13°C (8.6°F)
- Initial boiling point and boiling range** : 198°C (388°F)



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 5 of 10

SAFETY DATA SHEET

Flash point : 111°C (232°F)
Flashpoint (Method) : closed cup
Evaporation rate (BuAe = 1) : N/Av
Flammability (solid, gas) : Not applicable.
Lower flammable limit (% by vol.) : 3.2%
Upper flammable limit (% by vol.) : 15.0%
Oxidizing properties : None known.
Explosive properties : Not explosive
Vapour pressure : 0.05
Vapour density : 2.1
Relative density / Specific gravity : 1.12
Solubility in water : Complete
Other solubility(ies) : Soluble in most organic solvents.
Partition coefficient: n-octanol/water or Coefficient of water/oil distribution : -1.36
Auto-ignition temperature : 398°C (748°F)
Decomposition temperature : Not available.
Viscosity : 21 cp @ 20°C (68°F)
Volatiles (% by weight) : No information available.
Volatile organic Compounds (VOC's) : N/Av
Absolute pressure of container : N/Ap
Flame projection length : N/Ap
Other physical/chemical comments : Molecular Weight: :: 62.07
Molecular formula: C2-H6-O2

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Not normally reactive.
Chemical stability : Stable under normal conditions.
Possibility of hazardous reactions : No dangerous reaction known under conditions of normal use.
Conditions to avoid : Avoid excessive heat, sparks and open flame. Do not use in areas without adequate ventilation. Avoid contact with incompatible materials.
Incompatible materials : Alkalies ;Strong oxidizing agents;Strong acids.
Hazardous decomposition products : None known, refer to hazardous combustion products in Section 5.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Routes of entry inhalation : YES
Routes of entry skin & eye : YES
Routes of entry Ingestion : YES
Routes of exposure skin absorption : YES



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 6 of 10

SAFETY DATA SHEET

Potential Health Effects:

Signs and symptoms of short-term (acute) exposure

Sign and symptoms Inhalation

- : If mists are inhaled, may cause tearing, general anesthesia, headache, coughing, respiratory stimulation, nausea, vomiting, pulmonary, kidney and liver damage.

Sign and symptoms ingestion

- : Harmful or fatal if swallowed. Human poison by ingestion (lethal dose of Ethylene glycol for humans reported to be 100 mL). Symptoms may include pain, headache, nausea, vomiting, dizziness, drowsiness and other central nervous system effects. Initially, the central nervous system is stimulated, followed by depression. Could cause cyanosis (bluish discoloration of the skin due to deficient oxygenation of the blood). May potentially result in lethal kidney damage. Could also cause convulsions, coma, respiratory arrest and death.

Sign and symptoms skin

- : May cause mild skin irritation. Product may be absorbed and cause symptoms similar to those listed for ingestion.

Sign and symptoms eyes

- : May cause mild eye irritation. Symptoms may include inflammation and tearing.

Potential Chronic Health Effects

- : Prolonged or repeated ingestion may cause bladder or kidney stones.

Mutagenicity

- : Not expected to be mutagenic.

Carcinogenicity

- : No components are listed as carcinogens by ACGIH, IARC, OSHA or NTP.

Reproductive effects & Teratogenicity

- : This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification:
Reproductive toxicity -Category 2
Suspected of damaging the unborn child.

Sensitization to material

- : Not expected to be a skin or respiratory sensitizer.

Specific target organ effects

- : Eyes, skin, respiratory system, central nervous system, liver and kidneys.
This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Classification:
Specific target organ toxicity, single exposure-Category 2
Specific Target Organ Toxicity, Single Exposure - Category 3 (cns)
May cause damage to the kidneys if swallowed.
May cause drowsiness or dizziness.

Not classified as a specific target organ toxicity-repeated exposure.

Medical conditions aggravated by overexposure

- : Pre-existing skin or eye disorders, and impaired liver or kidney functions.

Synergistic materials

- : Not available.

Toxicological data

- : See below for toxicological data on the substance.

<u>Chemical name</u>	<u>LC₅₀(4hr)</u>	<u>LD₅₀</u>	
	<u>inh, rat</u>	<u>(Oral, rat)</u>	<u>(Rabbit, dermal)</u>
Ethylene glycol	4300 ppm (10.92 mg/L) (aerosol)	4000 mg/kg (rat) The estimated human lethal dose is: 1110 - 1665 mg/kg	9530 mg/kg

Other important toxicological hazards

- : CNS depression may result from extreme exposures.



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 7 of 10

SAFETY DATA SHEET

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity : See the following tables for individual ingredient ecotoxicity data.

Ecotoxicity data:

<u>Ingredients</u>	CAS No	Toxicity to Fish		
		LC50 / 96h	NOEC / 21 day	M Factor
Ethylene glycol	107-21-1	22 810 mg/L (Rainbow trout)	N/Av	None.

<u>Ingredients</u>	CAS No	Toxicity to Daphnia		
		EC50 / 48h	NOEC / 21 day	M Factor
Ethylene glycol	107-21-1	49 000 mg/L (Daphnia magna)	7500 - 15 000 mg/L	None.

<u>Ingredients</u>	CAS No	Toxicity to Algae		
		EC50 / 96h or 72h	NOEC / 96h or 72h	M Factor
Ethylene glycol	107-21-1	6500 - 13 000 mg/L/96hr (Green algae)	10 000 mg/L/96hr	None.

Persistence and degradability

: Ethylene glycol is considered to be readily biodegradable.

Bioaccumulation potential

: No data is available on the product itself.

<u>Components</u>	<u>Partition coefficient n-octanol/ater (log Kow)</u>	<u>Bioconcentration factor (BCF)</u>
Ethylene glycol (CAS 107-21-1)	- 1.36	10

Mobility in soil : No data is available on the product itself.

Other Adverse Environmental effects

: No data is available on the product itself.

SECTION 13. DISPOSAL CONSIDERATIONS

Handling for Disposal : Handle waste according to recommendations in Section 7.

Methods of Disposal : Dispose in accordance with all applicable federal, state, provincial and local regulations. Contact your local, state, provincial or federal environmental agency for specific rules.

RCRA : If this product, as supplied, becomes a waste in the United States, it may meet the criteria of a hazardous waste as defined under RCRA, Title 40 CFR 261. It is the responsibility of the waste generator to determine the proper waste identification and disposal method. For disposal of unused or waste material, check with local, state and federal environmental agencies.

SECTION 14. TRANSPORTATION INFORMATION



Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON L9S 3W4
Canada



Information (M-F 8:00-5:00): 705-436-5580

Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 8 of 10

SAFETY DATA SHEET

Regulatory Information	UN Number	UN proper shipping name	Transport hazard class(es)	Packing Group	Label
49CFR/DOT	None	Not regulated.	Not regulated	none	
49CFR/DOT Additional information	If the quantity of Ethylene glycol is greater than 5000 pounds per container, the following DOT shipping description applies: RQ UN3082, Environmentally hazardous substances, liquid, n.o.s. (Ethylene glycol), 9, III.				
TDG	None	Not regulated.	Not regulated	none	
TDG Additional information	None.				

Special precautions for user : None known or reported by the manufacturer.

Environmental hazards : See ECOLOGICAL INFORMATION, Section 12.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

: Not available.

SECTION 15 - REGULATORY INFORMATION

US Federal Information:

Components listed below are present on the following U.S. Federal chemical lists:

<u>Ingredients</u>	CAS #	TSCA Inventory	CERCLA Reportable Quantity(RQ) (40 CFR 117.302):	SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355:	SARA TITLE III: Sec. 313, 40 CFR 372, Specific Toxic Chemical	
					Toxic Chemical	de minimus Concentration
Ethylene glycol	107-21-1	Yes	5000 lb/ 2270 kg	None.	Yes	1%

SARA TITLE III: Sec. 311 and 312, SDS Requirements, 40 CFR 370 Hazard Classes: Immediate (Acute) health hazard; Chronic health hazard. Under SARA Sections 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are 500 pounds for the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

US State Right to Know Laws:

The following chemicals are specifically listed by individual States:

<u>Ingredients</u>	CAS #	California Proposition 65		State "Right to Know" Lists					
		Listed	Type of Toxicity	CA	MA	MN	NJ	PA	RI
Ethylene glycol	107-21-1	No	N/Ap	Yes	Yes	Yes	Yes	Yes	Yes

Canadian Information:

WHMIS Classification: Refer to Section 2 for a WHMIS Classification for this product.
All ingredients are present on the DSL.



Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 9 of 10

SAFETY DATA SHEET

International Information:

Components listed below are present on the following International Inventory list:

Ingredients	CAS #	European EINECs	Australia AICS	Philippines PICCS	Japan ENCS	Korea KECI/KECL	China IECSC	NewZealand IOC
Ethylene glycol	107-21-1	203-473-3	Present	Present	(2)-230	KE-13169	Present	HSR001534

SECTION 16. OTHER INFORMATION

Legend

: ACGIH: American Conference of Governmental Industrial Hygienists
CA: California
CAS: Chemical Abstract Services
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR: Code of Federal Regulations
CNS: Central Nervous System
COC: Cleveland Open Cup
CSA: Canadian Standards Association
DOT: Department of Transportation
EPA: Environmental Protection Agency
HMIS: Hazardous Materials Identification System
HSDB: Hazardous Substances Data Bank
IARC: International Agency for Research on Cancer
Inh: Inhalation
LC: Lethal Concentration
LD: Lethal Dose
MA: Massachusetts
MN: Minnesota
N/Ap: Not Applicable
N/Av: Not Available
NFPA: National Fire Protection Association
NIOSH: National Institute of Occupational Safety and Health
NJ: New Jersey
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PA: Pennsylvania
PEL: Permissible exposure limit
RCRA: Resource Conservation and Recovery Act
RI: Rhode Island
RTECS: Registry of Toxic Effects of Chemical Substances
SARA: Superfund Amendments and Reauthorization Act
STEL: Short Term Exposure Limit
TLV: Threshold Limit Values
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Identification System

References

: Canadian Centre for Occupational Health and Safety, CCHInfoWeb Databases, 2015 (Chempendium, RTECs, HSDB, INCHEM).
European Chemicals Agency, Classification Legislation, 2015
Material Safety Data Sheet from manufacturer.
OECD- The Global Portal to Information on Chemical Substances - eChemPortal, 2015

Preparation Date (mm/dd/yyyy)

: 08/20/2015

Other special considerations for handling

: Provide adequate information, instruction and training for operators.



Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON L9S 3W4
Canada

Information (M-F 8:00-5:00): 705-436-5580

Ethylene Glycol

SDS Preparation Date (mm/dd/yyyy): 08/20/2015

Page 10 of 10

SAFETY DATA SHEET

HMIS Rating : * - Chronic hazard 0 - Minimal 1 - Slight 2 - Moderate 3 - Serious 4 - Severe
Health: *2 *Flammability:* 1 *Reactivity:* 0

NFPA Rating : 0 - Minimal 1 - Slight 2 - Moderate 3 - Serious 4 - Severe
Health: 2 *Flammability:* 1 *Instability:* 0 *Special Hazards:* None

<u>Prepared for:</u> Comet Chemical Company Ltd. 3463 Thomas Street Innisfill, ON L9S 3W4 Information (M-F 8:00-5:00): 705-436-5580 www.cometchemical.com	
<u>Prepared by:</u> ICC The Compliance Center Inc. Telephone: (888) 442-9628 (U.S.): (888) 977-4834 (Canada) http://www.thecompliancecenter.com	

DISCLAIMER

This Safety Data Sheet was prepared by ICC The Compliance Center Inc using information provided by / obtained from Comet Chemical Company Ltd.. and CCOHS' Web Information Service. The information in the Safety Data Sheet is offered for your consideration and guidance when exposed to this product. ICC The Compliance Center Inc and Comet Chemical Company Ltd. expressly disclaim all expressed or implied warranties and assume no responsibilities for the accuracy or completeness of the data contained herein. The data in this SDS does not apply to use with any other product or in any other process.

This Safety Data Sheet may not be changed, or altered in any way without the expressed knowledge and permission of ICC The Compliance Center Inc and Comet Chemical Company Ltd.

END OF DOCUMENT

Ammonium Nitrate, Mini-Prill

Section 1. Identification

Product identifier : Ammonium Nitrate, Mini-Prill

Other means of identification : Product code: 2499-12958
Historic MSDS #:12958

Product type : Solid.

Relevant identified uses of the substance or mixture and uses advised against

Identified uses	
Industrial use for the formulation of preparations, intermediate use, and end use in industrial settings. Professional use in formulation of preparations and end-use.	
Uses advised against	Reason
Consumer use. Restricted to professional users.	U.S. and Canadian Federal regulations

Supplier's details : Agrium Wholesale
13131 Lake Fraser Drive, S.E.
Calgary, Alberta, Canada, T2J 7E8

Agrium U.S. Inc.
Suite 1700, 4582 South Ulster St.
Denver, Colorado, U.S.A., 80237

Company phone number (North America):
1-800-403-2861 (Customer Service)

Emergency telephone number (with hours of operation) : Agrium 24 Hr Emergency Telephone Numbers:
English:
Transportation Emergencies: 1-800-792-8311
Medical Emergencies: 1-303-389-1653

French or Spanish:
Transportation or Medical Emergencies: 1-303-389-1654

Section 2. Hazard identification

Classification of the substance or mixture : OXIDIZING SOLIDS - Category 3
EYE IRRITATION - Category 2A

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

GHS label elements

Hazard pictograms :



Signal word : Warning

Hazard statements : May intensify fire; oxidizer.
Causes serious eye irritation.

Precautionary statements

General : Not applicable.

Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.
No smoking. Keep away from clothing and other combustible materials. Wash hands thoroughly after handling.

Section 2. Hazard identification

Response	: 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 attention.
Storage	: Not applicable.
Disposal	: Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	: None known.
Other hazards which do not result in classification	: Explosion risk in case of fire. Risk of explosion if heated under confinement. Risk of vigorous reaction, ignition and explosion in contact with combustible or flammable substances.

Section 3. Composition/information on ingredients

Substance/mixture : Multi-constituent substance

Ingredient name	% (w/w)	CAS number
Ammonium nitrate	99.5	6484-52-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

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

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First-aid measures

Description of necessary first aid measures

Eye contact	: Begin eye irrigation immediately. Eye exposures to nitrates may require medical evaluation following decontamination if pain or irritation persists. Immediately rinse eyes with large quantities of water or saline for a minimum of 15 minutes. If possible, remove contact lenses being careful not to cause additional eye damage. If the initial water supply is insufficient, keep the affected area wet with a moist cloth and transfer the person to the nearest place where rinsing can be continued for the recommended length of time. For additional advice call the medical emergency number on this SDS or your poison center or doctor.
Inhalation	: Remove person to fresh air. No known significant effects. Seek medical attention for any signs of wheezing and/or breathing difficulties. For additional advice call the medical emergency number on this SDS or your poison center or medical provider.
Skin contact	: No known significant effects. Rinse the affected areas with water. Remove contaminated clothing, jewelry, and shoes. Wash/clean items before reuse. Seek medical attention for persistent skin pain or irritation. For additional advice call the medical emergency number on this SDS or your poison center or doctor.
Ingestion	: Ammonium nitrate-based fertilizer. May be irritating to mouth, throat and stomach. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Oral exposures: if the affected person requires CPR, avoid mouth to mouth contact. Do not induce vomiting. If vomiting occurs, attempt to keep head lower than chest so that vomit does not enter the lungs. Wash (decontaminate) face and mouth with water to remove visible material. If the exposed person is conscious and can swallow, give 1-2 sips of water. Do not give anything else by mouth. Loosen tight clothing such as collar, tie, belt or waistband to prevent any breathing restrictions. Call for emergency transportation to a hospital if the exposed person feels sick or has breathing difficulties, or a large amount is suspected ingested. For additional advice, call the medical emergency number on this SDS or your poison center or doctor.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Section 4. First-aid measures

- Inhalation** : No known significant effects or critical hazards. Persons with asthma may be more sensitive.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : May be irritating to the digestive tract. May cause nausea, vomiting, diarrhea, and abdominal pain. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Persons with methemoglobinemia may have blue tinge color to lips, nails, and skin. Also they may have shortness of breath or trouble breathing. Persons more susceptible to methemoglobinemia include: very young (less than 3 months), the elderly, those with chronic obstructive pulmonary disease (COPD), anemia, coronary artery disease, recent surgery or infection, and those with a genetic deficiency of G-6-PD.

Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:
pain or irritation
watering
redness
- Inhalation** : The substance will not burn. Undergoes thermal decomposition at elevated temperatures to release toxic and flammable gases. Decomposition products may include the following materials:
Ammonia
nitrogen oxides
- Adverse symptoms may include the following:
headache
respiratory tract irritation
coughing
- Skin contact** : No specific data is available about overexposure under normal working conditions.
- Ingestion** : Over-exposure by ingestion is unlikely under normal working conditions. Adverse symptoms may include the following:
nausea or vomiting
stomach pains
diarrhea
Methemoglobinemia (see Acute Health Effects)

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : In case of inhalation of decomposition products (carbon monoxide, carbon dioxide, nitrogen oxides) in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for up to 72 hours. In cases of suspected methemoglobinemia, monitor methemoglobin blood levels. Treatment is supportive; methylene blue may be indicated based on patient severity. 24 Hr Medical Emergency telephone number for professional support: English: 1-303-389-1653; French or Spanish: 1-303-389-1654.
- Specific treatments** : Call the medical emergency number on this SDS or your poison center or doctor immediately if large quantities have been ingested. In cases of suspected methemoglobinemia, methylene blue may be indicated based on patient severity.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. Mouth-to-mouth resuscitation of oral exposure patients is not recommended. First-aiders with contaminated clothing should be properly decontaminated.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Product with the capacity to undergo self-sustaining and progressive thermal decomposition. The product acts as an oxidizing agent, and supports combustion by liberating oxygen even if smothered. Evacuate area and fight fire remotely due to the risk of explosion. Use flooding quantities of water.

Unsuitable extinguishing media : Do not attempt to smother the fire. The product acts as an oxidizing agent, and supports combustion by liberating oxygen even if smothered. Do not use CO₂, dry chemicals, foam, or water fog.

Specific hazards arising from the chemical : May intensify fire; oxidizer. Molten ammonium nitrate presents an elevated risk of explosion if heated under confinement, if impacted by falling debris, or if contaminated by incompatible substances or organic matter including wood, asphalt, or other structural construction materials.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides
Ammonia

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons at least 800 meters (1/2 mile) from the vicinity of the incident if there is a fire. Assign emergency response personnel to guard the exclusion perimeter in all directions from the incident site.

If responding to a fire and the structure or vehicle is significantly involved, set up and use unmanned hose holders or monitor nozzles. Emergency responders should control remote firefighting apparatus from a location offering protection against possible explosion. Maintain the maximum possible distance from the fire consistent with the use of fire-fighting equipment. Apply flooding quantities of water to the ammonium nitrate until the fire is out, to cool the product and reduce risk of deflagration.

If safe to do so, ventilate the structure to minimize heat and pressure. Move containers from fire area if this can be done without risk. If safe firefighting is impossible, withdraw from area and let the fire burn.

Refer to the NFPA 400 Hazardous Materials Code Annex E for further information on the safe handling of ammonium nitrate and suggested firefighting procedures.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Remark : Contain and collect the water used to fight the fire for later treatment and disposal.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Provide adequate ventilation. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Section 6. Accidental release measures

- Small spill** : Use suitable protective equipment (section 8). Move containers from spill area. Avoid dust generation. Use appropriate equipment to put the spilled substance in a container for reuse or disposal. Place spilled material in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Put on appropriate personal protective equipment (see Section 8). Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Use appropriate equipment to put the spilled substance in a container for reuse or disposal. Avoid dust generation. Do not dry sweep. Recycle to process, if possible.
or
Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Keep away from clothing, incompatible materials and combustible materials. Keep away from heat. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. May form steep piles that can collapse without warning when stored in bulk. Avoid forming steep slopes when removing product. Ensure that bulk bags or smaller packaged products stored in tiers are stacked, racked, blocked, interlocked, or otherwise secured to prevent sliding, rolling, or collapse. Use caution when opening truck or railcar doors as product may have shifted during transport.

Must be stored in a dry location. Absorbs moisture on long-term storage under high humidity conditions. Store away from incompatible materials (see Section 10). When product is stored in sealable containers, keep container tightly closed and sealed until ready for use. Sealable containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Ensure compliance with OSHA 29CFR1910.109 requirements.

Separate from reducing agents and combustible materials. Use appropriate containment to avoid environmental contamination. Refer to NFPA 400 Hazardous Materials Code for further information on the safe storage and handling of hazardous materials.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Canadian Regulations: Ammonium nitrate	Alberta TWA: 10 mg/m ³ Inhalable, 3 mg/m ³ Respirable, for Particles Not Otherwise Regulated.

Section 8. Exposure controls/personal protection

U.S. Federal Regulations:
Ammonium nitrate

OSHA (United States):

Particulates not otherwise regulated (PNOR)
TWA (8 hours), Total dust: 15 mg/m³;
Respirable fraction: 5 mg/m³.

- Appropriate engineering controls** : Good general ventilation should be sufficient to control worker exposure to airborne contaminants.
- Environmental exposure controls** : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

- Hygiene measures** : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
- Eye/face protection** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: sealed eyewear
- Skin protection**
- Hand protection** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Body protection** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: disposable overall
- Other skin protection** : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory protection** : Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary. For U.S. work sites where respiratory protection is required, ensure that a respiratory protection program meeting 29 CFR 1910.134 requirements is in place.

Section 9. Physical and chemical properties

Appearance

- Physical state** : Granular solid.
- Color** : Off-white.
- Odor** : Odorless.
- Odor threshold** : Not available.
- pH** : Not available.
- Melting point** : 169.6°C (337.3°F)
- Boiling point** : Decomposition temperature: >210°C (>410°F)
- Flash point** : Not applicable.
- Burning time** : Not applicable. Decomposes.
- Evaporation rate** : Not applicable.
- Flammability (solid, gas)** : Non-flammable.
- Lower and upper explosive (flammable) limits** : Not applicable. Inorganic salt.

Section 9. Physical and chemical properties

Vapor pressure	: Not available.
Vapor density	: Not available.
Relative density	: No results available.
Solubility	: Easily soluble in the following materials: hot water. Soluble in the following materials: cold water.
Solubility in water	: 1900 g/l
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: >210°C (>410°F)
Viscosity	: Not available.

Section 10. Stability and reactivity

Reactivity	: The pure product is stable at normal storage temperatures and pressures. May react explosively when mixed with chlorinated materials such as hypochlorites. May react explosively even in the absence of air at elevated pressure and/or temperature. Reactive or incompatible with the following materials: Flammable material Combustible material. Metal powder. Metal salt. halogenated compounds acids alkalis
Chemical stability	: The pure product is stable at normal storage temperatures and pressures.
Possibility of hazardous reactions	: Hazardous reactions or instability may occur under certain conditions of storage or use. Conditions may include the following: Contact with incompatible materials, such as acids, alkalis, heavy metal compounds and reducing agents, will result in hazardous decomposition. contact with combustible materials fire or heat Reactions may include the following: risk of causing or intensifying fire hazardous decomposition pressure build-up risk of explosion with or without contact with air
Conditions to avoid	: Prevent product contamination. Avoid contamination by any source including metals, dust and organic materials. Avoid high temperatures in combination with high pressures.
Incompatible materials	: See above
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ammonium nitrate	LD50 Oral	Rat	2217 mg/kg	-
-	LD50 Oral	Rat - Male, Female	2950 mg/kg	-
-	LD50 Dermal	Rat - Male, Female	>5000 mg/kg	-

Conclusion/Summary : Not available. Very low toxicity to humans or animals.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Ammonium nitrate	Skin	Rabbit	0	-	72 hours
	Eyes - Edema of the conjunctivae	Rabbit	3	-	3 days

Conclusion/Summary

Skin : Non-irritating to the skin.

Eyes : Irritating to the eyes.

Sensitization

Product/ingredient name	Route of exposure	Species	Result
Ammonium nitrate	skin	Mouse	Not sensitizing

Conclusion/Summary

Skin : Non-sensitizer.

Respiratory : Non-sensitizer.

Mutagenicity

Product/ingredient name	Test	Experiment	Result
Ammonium nitrate	OECD 471 Bacterial Reverse Mutation Test	Experiment: In vitro Subject: Bacteria	Negative
	OECD 476 <i>In vitro</i> Mammalian Cell Gene Mutation Test	Experiment: In vitro Subject: Mammalian-Animal	Negative

Conclusion/Summary : No mutagenic effect.

Carcinogenicity

Not available.

Conclusion/Summary : Not available. Potential for nitrosamine formation if ingested. Do not ingest.

Reproductive toxicity

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Dose	Exposure
Ammonium nitrate	Negative	Negative	Negative	Rat - Male, Female	Oral: 1500 mg/kg	53 days; 7 days per week

Conclusion/Summary : Not considered to be toxic to the reproductive system.

Teratogenicity

Product/ingredient name	Result	Species	Dose	Exposure
Ammonium nitrate	Negative - Oral	Rat - Female	1500 mg/kg	53 days

Conclusion/Summary : No known significant effects or critical hazards.

Specific target organ toxicity (single exposure)

Not available.

Section 11. Toxicological information

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : No known significant effects or critical hazards. Persons with asthma may be more sensitive.
- Skin contact** : No known significant effects or critical hazards.
- Ingestion** : May be irritating to the digestive tract. May cause nausea, vomiting, diarrhea, and abdominal pain. May cause methemoglobinemia (a condition that interferes with the oxygen-carrying capacity of the blood) if ingested in large quantities or over a prolonged period of time. Persons with methemoglobinemia may have blue tinge color to lips, nails, and skin. Also they may have shortness of breath or trouble breathing. Persons more susceptible to methemoglobinemia include: very young (less than 3 months), the elderly, those with chronic obstructive pulmonary disease (COPD), anemia, coronary artery disease, recent surgery or infection, and those with a genetic deficiency of G-6-PD.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
pain or irritation
watering
redness
- Inhalation** : The substance will not burn. Undergoes thermal decomposition at elevated temperatures to release toxic and flammable gases. Decomposition products may include the following materials:
Ammonia
nitrogen oxides

Adverse symptoms may include the following:
headache
respiratory tract irritation
coughing
- Skin contact** : No specific data is available about overexposure under normal working conditions.
- Ingestion** : Over-exposure by ingestion is unlikely under normal working conditions. Adverse symptoms may include the following:
nausea or vomiting
stomach pains
diarrhea
Methemoglobinemia (see Acute Health Effects)

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

- Potential immediate effects** : Eye irritation
Infant-methemoglobinemia
- Potential delayed effects** : Not available.

Long term exposure

- Potential immediate effects** : Not available.
- Potential delayed effects** : Not available.

Section 11. Toxicological information

Potential chronic health effects

General	: No known significant effects or critical hazards.
Carcinogenicity	: Potential for nitrosamine formation if ingested. Do not ingest.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.
Developmental effects	: No known significant effects or critical hazards.
Fertility effects	: No known significant effects or critical hazards.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Ammonium nitrate	Chronic NOEC 6 to 12 mg/l Fresh water	Crustaceans - Cladocera	21 days
-	NOEC >1700 mg/l Marine water	Algae	10 days
	Acute EC50 490 mg/l Fresh water	Daphnia	48 hours
	Acute LC50 447 mg/l Fresh water	Fish	48 hours

Conclusion/Summary : Very low acute toxicity to fish. Practically non-toxic to aquatic organisms.

Persistence and degradability

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Ammonium nitrate	-	-	Readily

Bioaccumulative potential

Not available.






Mobility in soil

Soil/water partition coefficient (K_{oc})	: Not applicable. Inorganic salt. Bioaccumulative potential - low
Other adverse effects	: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods	: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
-------------------------	--

Section 14. Transport information

	TDG Classification	DOT Classification	Mexico Classification	IMDG	IATA
UN number	1942	1942	1942	1942	1942
UN 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 (ammonium nitrate, solid)	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 (ammonium nitrate, solid)	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 solid	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	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
Transport hazard class(es)	5.1 	5.1 	5.1 	5.1 	5.1 
Packing group	III	III	III	III	III
Environmental hazards	No.	No.	No.	No.	No.
Additional information	<u>Explosive Limit and Limited Quantity Index</u> 5 <u>Passenger Carrying Road or Rail Index</u> 25 <u>Special provisions</u> Special Provisions re TDG: 37 Classification per the current revision, Transportation of Dangerous Goods Regulation, Part 2, Sec 2.3.	<u>Packaging instruction</u> Passenger aircraft Quantity limitation: 25 kg Cargo aircraft Quantity limitation: 100 kg <u>Special provisions</u> A1, A29, B120, IB8, IP3, T1, TP33 Classification per the current revision, Transportation of Dangerous Goods Regulation, Part 2, Sec 2.3.	-	<u>Emergency schedules (EmS)</u> F-H, S-Q	<u>Passenger and Cargo Aircraft</u> Quantity limitation: 25 kg Packaging instructions: 516 <u>Cargo Aircraft</u> <u>Only</u> Quantity limitation: 100 kg Packaging instructions: 518 <u>Limited Quantities - Passenger Aircraft</u> Quantity limitation: 10 kg Packaging instructions: Y516

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according
to Annex II of MARPOL and
the IBC Code

Section 15. Regulatory information

Canadian lists

Canadian NPRI : The following components are listed: Total of ammonia (NH₃ — CAS RN 7664-41-7) and the ammonium ion (NH₄⁺ — CAS RN 14798-03-9) in solution, expressed as ammonia.

CEPA Toxic substances : None of the components are listed.

Canada inventory : All components are listed or exempted.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Inform Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia	: All components are listed or exempted.
China	: All components are listed or exempted.
Europe	: This material is listed or exempted.
Japan	: All components are listed or exempted.
Malaysia	: All components are listed or exempted.
New Zealand	: All components are listed or exempted.
Philippines	: All components are listed or exempted.
Republic of Korea	: All components are listed or exempted.
Taiwan	: All components are listed or exempted.
Turkey	: Not determined.

U.S. Federal Regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined
TSCA 8(b) inventory:: All components are listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304 Composition/information on ingredients

SARA 304 RQ : Not applicable.

Section 15. Regulatory information

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Ammonium nitrate	99.5	Yes.	No.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Ammonium nitrate	6484-52-2	100
Supplier notification	Ammonium nitrate	6484-52-2	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: Ammonium nitrate
New York : None of the components are listed.
New Jersey : The following components are listed: Ammonium nitrate; Nitric acid, ammonium salt
Pennsylvania : The following components are listed: Nitric acid, ammonium salt
California Prop. 65 : Not listed.

Section 16. Other information

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

Health	2
Flammability	0
Physical hazards	3

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA).

The customer is responsible for determining the PPE code for this material.

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



Copyright ©2013, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 7/4/2016

Date of issue/Date of revision : 7/4/2016

Section 16. Other information

Date of previous issue : 2/10/2016

Version : 2.1

Indicates information that has changed from previously issued version.

This Safety Data Sheet has been revised to comply with Hazcom 2012 and WHMIS 2015 requirements.

Key to abbreviations :

- ATE = Acute Toxicity Estimate
- BCF = Bioconcentration Factor
- GHS = Globally Harmonized System of Classification and Labelling of Chemicals
- IATA = International Air Transport Association
- IBC = Intermediate Bulk Container
- IMDG = International Maritime Dangerous Goods
- LogPow = logarithm of the octanol/water partition coefficient
- MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
- UN = United Nations
- HPR = Hazardous Products Regulations

Procedure used to derive the classification

Classification	Justification
OXIDIZING SOLIDS - Category 3 EYE IRRITATION - Category 2A	Expert judgment On basis of test data

References :

- Transportation of Dangerous Goods Act and Clear Language Regulations, current edition at time of (M)SDS preparation, Transport Canada;
- Hazardous Products Act and Regulations, current revision at time of (M)SDS preparation, Health Canada;
- Domestic Substances List, current revision at time of (M)SDS preparation, Environment Canada;
- 29 CFR Part 1910, current revision at time of SDS preparation, U.S. Occupational Safety and Health Administration;
- 40 CFR Parts 1-799, current revision at time of SDS preparation, U.S. Environmental Protection Agency;
- 49 CFR Parts 1-199, current revision at time of SDS preparation, U.S. Department of Transport;
- Threshold Limit Values for Chemical Substances, current edition at time of SDS preparation, American Conference of Governmental Industrial Hygienists;
- NFPA 400, National Fire Codes, National Fire Protection Association, current edition at time of SDS preparation;
- NFPA 704, National Fire Codes, National Fire Protection Association, current edition at time of SDS preparation;
- Corrosion Data Survey, Sixth Edition, 1985, National Association of Corrosion Engineers;
- ERG 2012, Emergency Response Guidebook, U.S. Department of Transport, Transport Canada, and the Secretariat of Transportation and Communications of Mexico
- Hazardous Substances Data Bank, current revision at time of SDS preparation, National Library of Medicine, Bethesda, Maryland
- Integrated Risk Information System, current revision at time of SDS preparation, U.S. Environmental Protection Agency, Washington, D.C.
- Pocket Guide to Chemical Hazards, current revision at time of SDS preparation, National Institute for Occupational Safety and Health, Cincinnati, Ohio ;
- Agency for Toxic Substances and Disease Registry Databank, current revision at time of SDS preparation, U.S. Department of Health and Human Services, Atlanta, Georgia
- National Toxicology Program, Report on Carcinogens, Division of the National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina.
- Registry of Toxic Effects of Chemical Substances. National Institute for Occupational Safety and Health, Cincinnati, Ohio
- The Fertilizer Institute, Product Toxicology Testing Program Results, TFI, Washington , D.C., 2003

Notice to reader

Section 16. Other information

DISCLAIMER AND LIMITATION OF LIABILITY

The information and recommendations contained in this Safety Data Sheet ("SDS") relate only to the specific material referred to herein (the "Material") and do not relate to the use of such Material in combination with any other material or process. The information and recommendations contained herein are believed to be current and correct as of the date of this SDS. HOWEVER, THE INFORMATION AND RECOMMENDATIONS ARE PRESENTED WITHOUT WARRANTY, REPRESENTATION OR LICENSE OF ANY KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THEIR ACCURACY, CORRECTNESS OR COMPLETENESS, AND THE SELLER, SUPPLIER AND MANUFACTURER OF THE MATERIAL AND THEIR RESPECTIVE AFFILIATES (COLLECTIVELY, THE "SUPPLIER") DISCLAIM ALL LIABILITY FOR RELIANCE ON SUCH INFORMATION AND RECOMMENDATIONS. This SDS is not a guarantee of safety. A buyer or user of the Material (a "Recipient") is responsible for ensuring that it has all current information necessary to safely use the Material for its specific purpose.

FURTHERMORE, THE RECIPIENT ASSUMES ALL RISK IN CONNECTION WITH THE USE OF THE MATERIAL. THE RECIPIENT ASSUMES ALL RESPONSIBILITY FOR ENSURING THE MATERIAL IS USED IN A SAFE MANNER IN COMPLIANCE WITH APPLICABLE ENVIRONMENTAL, HEALTH, SAFETY AND SECURITY LAWS, POLICIES AND GUIDELINES. THE SUPPLIER DOES NOT WARRANT THE MERCHANTABILITY OF THE MATERIAL OR THE FITNESS OF THE MATERIAL FOR ANY PARTICULAR USE AND ASSUMES NO RESPONSIBILITY FOR INJURY OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY OR RELATED TO THE USE OF THE MATERIAL.

SAFETY DATA SHEET

Copper Sulfate

1. PRODUCT AND COMPANY IDENTIFICATION

MSDS Name: Copper Sulfate
Product ID: SOL-CS10
CAS no: Mixture, refer to **Section 3**
Chemical Present: Refer to **Section 3**

Company Identification: Solvet
411- 19th Street South East
Calgary, Alberta Canada
T2E6J7
www.solvvet.ca

For information, call: (403) 456-2245
Emergency number: (613) 996-6666 (CANUTEC)
1-80 463-5060 OR
(418) 656-8090 (Control Poison Center)

2. HAZARDS IDENTIFICATION

Eye Contact: Citric Acid: May cause irritation, redness and pain.
Skin Contact/Absorption: Citric acid: Dust may cause redness and irritation. Repeated contact may cause skin irritation, itching of skin and localized discoloration of the skin.
Can cause allergic contact dermatitis.
Inhalation: Citric Acid: Dust is irritating to eyes, nose, throat and respiratory tract, and may cause sore throat, coughing and difficulty breathing.
Ingestion: Contact a poison control center or physician for treatment advice immediately. Have affected person sip a glass of water if able to swallow. Do not give anything by mouth if victim is unconscious. Do not induce vomiting unless instructed to do so. Seek immediate medical attention.

3. COMPOSITION / INFORMATION ON INGREDIENTS

CAS #	Chemical Name	Chemical Formula	Common Name	% by weight
7758-99-8	Copper Sulfate Pentahydrate	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	Bluestone, Blue vitriol	80%
77-92-9	Citric Acid	$\text{C}_6\text{H}_8\text{O}_7$	Citronensaeure	20%

4. FIRST AID MEASURES

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 if irritation persists.
Skin Contact:	Remove contaminated clothing. Wash affected area with soap and water. Seek medical attention if irritation occurs or persist.
Inhalation:	Remove victim to fresh air. Give artificial respiration only if breathing has stopped. If breathing is difficult, give oxygen. Seek medical Attention if difficulties persist.
Ingestion:	Contact a poison control center or physician for treatment advice immediately. Have affected person sip a glass of water if able to swallow. Do not give anything if victim is unconscious. Do not induce vomiting unless to do so. Seek immediate medical attention.

5. FIRE FIGHTING MEASURES

Condition of Flammability	Not flammable
Means of Extinction	Product does not burn. Use appropriate extinguishing media for surrounding fire.
Flash Point	Not applicable
Auto-ignition Temperature	Not applicable
Upper Flammable Limit	Not applicable
Lower Flammable Limit	Not applicable
Hazardous Combustible Products	Copper Sulfate: at temperatures above 600°C the material will decompose into cupric oxide and sulphur dioxide. Citric Acid: May evolve oxides of carbon (CO, CO ₂) under fire conditions.
Special Fire Fighting Procedures	Wear NIOSH-approved self-contained breathing apparatus and protective clothing.
Explosion Hazards	Not applicable

6. ACCIDENTAL RELEASE MEASURES

Leak / Spill	Wear appropriate personal protective equipment if required. Stop or reduce leak if safe to do so. Vacuum or sweep up spilled material, making sure to avoid generation of dust. If material is diluted with water, prevent from entering sewers and carefully neutralize with lime or soda ash to form insoluble copper salts which should be disposed of by approved method.
Deactivating Materials	Lime or soda ash

7. 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. Storage material compatible for sulphate storage include polypropylene, PVC or other plastic material. Keep away from galvanized piping and nylon material.

8. EXPOSURE CONTROLES/PERSONAL PROTECTION

Protective Equipment	
Eyes	Chemical goggles, full face shield or a full face respirator is to be worn at all times when product is handled.
Respiratory	Use NIOSH/MSHA approved respiratory protection when airborne dust is expected. In dusty atmosphere, use an approved dust respirator.
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.
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	Keep an eye wash fountain and safe shower available and in close proximity to work area.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Physical State:	Powder/ Solid
Color:	Blue powder
Odor:	Odorless
Odor Threshold:	No test data available
pH:	Not applicable
Solubility in water:	All component chemicals are soluble in water.

10. STABILITY AND REACTIVITY

Stability	Stable
Incompatibles	<p>Citric Acid: Metal nitrates (potentially explosive reaction), alkali carbonates and bicarbonates, potassium tartrate. Will corrode copper, zinc, aluminum and their alloys.</p> <p>Copper Sulfate: Hydroxylamine, magnesium aluminum, ammonia, acetylene, sodium hypobromite and nitromethane can be corrosive to most ferrous based metals when moist.</p>
Conditions to avoid	Heating to decomposition. Incompatible materials
Decomposition Products	<p>CO, CO₂ may form when citric acid heated to decomposition. Contact with magnesium metal can generate dangerous levels of hydrogen gas.</p> <p>Aluminum will evolve less hydrogen gas upon contact. Copper dust or mist may react with acetylene gas to form shock sensitive copper acetylides.</p> <p>Contact with hydroxylamine will ignite hydroxylamine. Copper sulphate is very hygroscopic and will absorb moisture from air to form a solution.</p>
Hazardous Polymerization	Will not occur

11. TOXICOLOGICAL INFORMATION

Principle Routes of Exposure

Ingestion: May be harmful if swallowed. May cause severe gastrointestinal tract with nausea, vomiting and possible burns.

Skin Contact: May cause skin irritation. May be harmful if absorbed through skin. Repeated or prolonged contact may cause irritation.

Inhalation: May be harmful if inhaled. May cause respiratory tract irritation. May cause ulceration of nose and throat.

Eye Contact: may cause severe eye contact. May cause clouding of the cornea.

Carcinogenicity: Not listed in IARC and ACGIH

Reproduction Toxicity: Not Available

Teratogenicity: Not Available

Embryotoxicity: Not Available

Mutagenicity: Not Available

Additional Information: Prolonged skin contact may cause irritation and eczema.

12. ECOLOGICAL INFORMATION

Ingredients	Ecotoxicity – Fish Species Data	Acute Crustaceans Toxicity:	Ecotoxicity – Freshwater Algae Data
Copper Sulphate	LC50 96h (Oncorhynchus mykiss) 0.1mg/L	Not Available	Not Available

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 recycle or disposed of through an approved waste management facility.

14. TRANSPORT INFORMATION

DOT (USA):

DOT Shipping Name: ENVIRONNEMENTALE HAZARDOUS SUBSTANCE, SOLID, N.O.S (COPPER SULPHATE)

Dot Hazardous Class: 9

DOT UN Number: UN3077

DOT Packaging Group: III

Dot Reportable Quantity (lbs): Not Available

Note: No Additional remark

Marine Pollutant: Yes

TDG (Canada):

TDG Shipping Name: ENVIRONNEMENTALE HAZARDOUS SUBSTANCE, SOLID, N.O.S (COPPER SULPHATE)

Hazardous Class: 9

UN Number: UN3077

Packaging Group: III

Note: Regulated for marine transportation only, if transported by road or rail product is not Regulated

Marine Pollutant: Yes

15. REGULATORY INFORMATION

U.S. TSCA Inventory Status: All components of this product are either on the Toxic 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

CERCLA/SARA - Section 302 and 313:

SARA (311,312) Hazard Class:

California Proposition 65:

MA Right to Know List:

WHMIS Hazardous Class: D1B TOXIC MATERIALS
D2B TOXIC MATERIALS



16. OTHER INFORMATION

SDS Number: SOL001

SDS creation date: July 10, 2013

Revised date: May 24, 2016

Revision due: May 31, 2018

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

***This product has been classified in accordance with the hazard criteria of the CPR
and the SDS contains all of the information required by the CPR***



Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Revision Date: 05/10/2018

Date of Issue: 05/08/2015

Version: 4.0

SECTION 1: IDENTIFICATION

Product Identifier

Product Form: Mixture

Product Name: Ferric Sulfate 60%

Intended Use of the Product

Municipal and industrial water and wastewater treatment for the removal of turbidity, color, suspended solids and phosphorus. Sludge conditioning, compaction and volume reduction. Oily wastewater clarification and dissolved air flotation. Emulsion breaking.

Name, Address, and Telephone of the Responsible Party

Manufacturer

CHEMTRADE LOGISTICS INC.

155 Gordon Baker Road

Suite 300

Toronto, Ontario M2H 3N5

For SDS Info: (416) 496-5856

www.chemtradelogistics.com

Emergency Telephone Number

Emergency Number :

Canada: CANUTEC +1-613-996-6666 / US: CHEMTREC +1-800-424-9300

INTERNATIONAL: +1-703-741-5970

Chemtrade Emergency Contact: (866) 416-4404

For Chemical Emergency, Spill, Leak, Fire, Exposure, or Accident, call CHEMTREC – Day or Night

SECTION 2: HAZARDS IDENTIFICATION

Classification of the Substance or Mixture

GHS Classification

Met. Corr. 1	H290
Acute Tox. 4 (Oral)	H302
Skin Corr. 1A	H314
Eye Dam. 1	H318

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

Label Elements

GHS Labeling

Hazard Pictograms



Signal Word

: Danger

Hazard Statements

: H290 - May be corrosive to metals.
H302 - Harmful if swallowed.
H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.

Precautionary Statements

: P234 - Keep only in original container.
P260 - Do not breathe vapors, mist, or spray.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves, protective clothing, and eye protection.
P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
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.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

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.

P321 - Specific treatment (see section 4 on this SDS).

P330 - Rinse mouth.

P363 - Wash contaminated clothing before reuse.

P390 - Absorb spillage to prevent material damage.

P405 - Store locked up.

P406 - Store in corrosive resistant container with a resistant inner liner.

P501 - Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Other Hazards

May produce explosive hydrogen gas on contact with incompatibilities or upon thermal decomposition.

Unknown acute toxicity

No data available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Name	Product Identifier	%*	GHS Ingredient Classification
Water	(CAS-No.) 7732-18-5	25 - 64	Not classified
Sulfuric acid, iron(3+) salt (3:2)**	(CAS-No.) 10028-22-5	45 - 70 ⁺	Met. Corr. 1, H290 Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Dam. 1, H318
Sulfuric acid***	(CAS-No.) 7664-93-9	1 – 5 ⁺	Skin Corr. 1A, H314 Eye Dam. 1, H318 Carc. 1A, H350 Aquatic Acute 3, H402

Full text of H-phrases: see section 16

*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

**As Fe₂(SO₄)₃•9H₂O (Dry Ferric Sulfate)

***Strong inorganic acid aerosols/mists containing this substance are carcinogenic to humans. However, under conditions of normal use this is not a potential route of exposure, and does not warrant a carcinogenicity classification for the mixture.

⁺The actual concentration of the ingredient(s) is withheld as a trade secret in accordance with Regulations Amending the Hazardous Products Regulations (HPR) SOR/2018-68 and 29 CFR 1910.1200.

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: When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

Skin Contact: Remove contaminated clothing. Immediately flush skin with plenty of water for at least 30 minutes. Wash contaminated clothing before reuse. Get immediate medical advice/attention.

Eye Contact: Rinse cautiously with water for at least 30 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

Ingestion: Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

Most Important Symptoms and Effects Both Acute and Delayed

General: Harmful if swallowed. Causes severe skin burns and eye damage. May be corrosive to the respiratory tract.

Inhalation: May be corrosive to the respiratory tract.

Skin Contact: Causes severe irritation which will progress to chemical burns.

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva.

Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

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. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

Extinguishing Media

Suitable Extinguishing Media: Water spray, dry chemical, foam, carbon dioxide.

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but may burn at high temperatures.

Explosion Hazard: Contact with metallic substances may release flammable hydrogen gas.

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Sulfur oxides. Corrosive vapors.

Other Information: 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.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray.

For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area.

Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment. Collect spillage.

Methods and Materials for Containment and Cleaning Up

For Containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. As an immediate precautionary measure, isolate spill or leak area in all directions.

Methods for Cleaning Up: Clean up spills immediately and dispose of waste safely. Cautiously neutralize spilled liquid. Absorb spillage to prevent material damage. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

Precautions for Safe Handling

Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing. Do not breathe mist, spray, vapors.

Additional Hazards When Processed: May be corrosive to metals. May release corrosive vapors.

Hygiene Measures: Handle in accordance with good industrial hygiene and safety procedures.

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Comply with applicable regulations.

Storage Conditions: Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from extremely high or low temperatures and incompatible materials. Store in original container or corrosive resistant and/or lined container.

Incompatible Materials: Strong acids, strong bases, strong oxidizers. Alkalis. Metals.

Specific End Use(s)

Municipal and industrial water and wastewater treatment for the removal of turbidity, color, suspended solids and phosphorus.

Sludge conditioning, compaction and volume reduction. Oily wastewater clarification and dissolved air flotation. Emulsion breaking.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), Canadian provincial governments, or the Mexican government.

Sulfuric acid (7664-93-9)		
Mexico	OEL TWA (mg/m ³)	1 mg/m ³
USA ACGIH	ACGIH TWA (mg/m ³)	0.2 mg/m ³ (thoracic particulate matter)
USA ACGIH	ACGIH chemical category	Suspected Human Carcinogen contained in strong inorganic acid mists
USA OSHA	OSHA PEL (TWA) (mg/m ³)	1 mg/m ³
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	1 mg/m ³
USA IDLH	US IDLH (mg/m ³)	15 mg/m ³
Alberta	OEL STEL (mg/m ³)	3 mg/m ³
Alberta	OEL TWA (mg/m ³)	1 mg/m ³
British Columbia	OEL TWA (mg/m ³)	0.2 mg/m ³ (Thoracic, contained in strong inorganic acid mists)
Manitoba	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic particulate matter)
New Brunswick	OEL STEL (mg/m ³)	3 mg/m ³
New Brunswick	OEL TWA (mg/m ³)	1 mg/m ³
Newfoundland & Labrador	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic particulate matter)
Nova Scotia	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic particulate matter)
Nunavut	OEL STEL (mg/m ³)	0.6 mg/m ³ (thoracic fraction)
Nunavut	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic fraction)
Northwest Territories	OEL STEL (mg/m ³)	0.6 mg/m ³ (thoracic fraction, strong acid mists only)
Northwest Territories	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic fraction, strong acid mists only)
Ontario	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic)
Prince Edward Island	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic particulate matter)
Québec	VECD (mg/m ³)	3 mg/m ³
Québec	VEMP (mg/m ³)	1 mg/m ³
Saskatchewan	OEL STEL (mg/m ³)	0.6 mg/m ³ (thoracic fraction)
Saskatchewan	OEL TWA (mg/m ³)	0.2 mg/m ³ (thoracic fraction)
Yukon	OEL STEL (mg/m ³)	1 mg/m ³
Yukon	OEL TWA (mg/m ³)	1 mg/m ³

Exposure Controls

Appropriate Engineering Controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Personal Protective Equipment: Gloves. Protective clothing. Protective goggles. Face shield. Insufficient ventilation: wear respiratory protection.



Materials for Protective Clothing: Acid-resistant clothing.

Hand Protection: Wear protective gloves.

Eye Protection: Chemical safety goggles and face shield.

Skin and Body Protection: Wear suitable protective clothing.

Respiratory Protection: If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Environmental Exposure Controls: Do not allow the product to be released into the environment.

Consumer Exposure Controls: Do not eat, drink, or smoke during use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Appearance	: Reddish brown
Odor	: Not available
Odor Threshold	: Not available
pH	: < 1
Evaporation Rate	: Not available
Melting Point	: < -18 °C (< -0.4 °F)
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not applicable
Auto-ignition Temperature	: Not applicable
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not flammable
Lower Flammable Limit	: Not applicable
Upper Flammable Limit	: Not applicable
Vapor Pressure	: Not available
Relative Vapor Density at 20°C	: Not available
Relative Density	: Not available
Specific Gravity	: 1.24 - 1.62
Solubility	: 100%
Partition Coefficient: N-Octanol/Water	: Not available
Viscosity	: Not available
VOC content	: < 1 %

SECTION 10: STABILITY AND REACTIVITY

Reactivity: May be corrosive to metals. Contact with metals may evolve flammable hydrogen gas. May react exothermically with water releasing heat. Adding an acid to a base or base to an acid may cause a violent reaction.

Chemical Stability: Stable under recommended handling and storage conditions (see section 7).

Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

Conditions to Avoid: Extremely high or low temperatures and incompatible materials.

Incompatible Materials: Strong acids, strong bases, strong oxidizers. Alkalis. Metals.

Hazardous Decomposition Products: Thermal decomposition generates: Corrosive vapors. Sulfur oxides.

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

SECTION 11: TOXICOLOGICAL INFORMATION

Information on Toxicological Effects - Product

Acute Toxicity (Oral): Oral: Harmful if swallowed.

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data:

Ferric Sulfate 60%	
ATE (Oral)	802.10 mg/kg body weight

Skin Corrosion/Irritation: Causes severe skin burns and eye damage.

pH: < 1

Eye Damage/Irritation: Causes serious eye damage.

pH: < 1

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: 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/Effects After Inhalation: May be corrosive to the respiratory tract.

Symptoms/Effects After Skin Contact: Causes severe irritation which will progress to chemical burns.

Symptoms/Effects After Eye Contact: Causes permanent damage to the cornea, iris, or conjunctiva.

Symptoms/Effects After Ingestion: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: None expected under normal conditions of use.

Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	
LD50 Oral Rat	500 - 2000 mg/kg
Sulfuric acid (7664-93-9)	
LD50 Oral Rat	2140 mg/kg
Water (7732-18-5)	
LD50 Oral Rat	> 90000 mg/kg
Sulfuric acid (7664-93-9)	
IARC Group	1
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

Toxicity No additional information available

Sulfuric acid (7664-93-9)	
LC50 Fish 1	500 mg/l (Exposure time: 96 h - Species: Brachydanio rerio [static])
LC50 Fish 2	42 mg/l (Exposure time: 96 h - Species: Gambusia affinis [static])

Persistence and Degradability

Ferric Sulfate 60%	
Persistence and Degradability	May cause long-term adverse effects in the environment.

Bioaccumulative Potential

Ferric Sulfate 60%	
Bioaccumulative Potential	Not established.
Sulfuric acid (7664-93-9)	
BCF Fish 1	(no bioaccumulation)

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Mobility in Soil Not available

Other Adverse Effects

Other Information: Avoid release to the environment.





SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions.

Ecology - Waste Materials: Avoid release to the environment. This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

SECTION 14: TRANSPORT INFORMATION

TRANSPORTATION CLASSIFICATION	DOT	TDG	IMDG	IATA
Identification Number	UN3264	UN3264	UN3264	UN3264
Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)	CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S. (CONTAINS FERRIC SULFATE, SULFURIC ACID)
Transport Hazard Class(es)	8	8	8	8
				
Packing Group	II	II	II	II
Environmental Hazards	Marine Pollutant : No	Marine Pollutant : No	Marine Pollutant : No	Marine Pollutant: N/A
Emergency Response	ERG Number : 154	ERAP Index: Not applicable	EMS: F-A, S-B	ERG code (IATA): 8L
Additional Information	Not applicable	Not applicable	Not applicable	Not applicable

SECTION 15: REGULATORY INFORMATION

US Federal Regulations

Chemical Name (CAS No.)	CERCLA RQ	EPCRA 304 RQ	SARA 302 TPQ	SARA 313
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	1000 lb	Not applicable	Not applicable	No
Sulfuric acid (7664-93-9)	1000 lb	1000 lb	1000 lb	Yes

SARA 311/312

Ferric Sulfate 50%
Immediate (acute) health hazard

US TSCA Flags Not present

US State Regulations

California Proposition 65

Chemical Name (CAS No.)	Carcinogenicity	Developmental Toxicity	Female Reproductive Toxicity	Male Reproductive Toxicity
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	No	No	No	No
Sulfuric acid (7664-93-9)	Yes	No	No	No

State Right-To-Know Lists

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)
--

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

U.S. - Massachusetts - Right To Know List - Yes
U.S. - New Jersey - Right to Know Hazardous Substance List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances - No
U.S. - Pennsylvania - RTK (Right to Know) List - Yes

Sulfuric acid (7664-93-9)

U.S. - Massachusetts - Right To Know List - Yes
U.S. - New Jersey - Right to Know Hazardous Substance List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List - Yes
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances - No
U.S. - Pennsylvania - RTK (Right to Know) List - Yes

Canadian Regulations

Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)

Listed on the Canadian DSL (Domestic Substances List)
Not listed on the Canadian NDSL (Non-Domestic Substances List)

Sulfuric acid (7664-93-9)

Listed on the Canadian DSL (Domestic Substances List)
Not listed on the Canadian NDSL (Non-Domestic Substances List)

International Inventories/Lists

Chemical Name (CAS No.)	Australia AICS	Turkey CICR	Korea ECL	EU EINECS	EU ELINCS	EU SVHC	EU NLP	Mexico INSQ
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	Yes	No	Yes	Yes	No	No	No	Yes
Sulfuric acid (7664-93-9)	Yes	No	Yes	Yes	No	No	No	No
Chemical Name (CAS No.)	China IECSC	Japan ENCS	Japan ISHL	Japan PDSCL	Japan PRTR	Philippines PICCS	New Zealand NZIOC	US TSCA
Sulfuric acid, iron(3+) salt (3:2) (10028-22-5)	Yes	Yes	No	No	No	Yes	Yes	Yes
Sulfuric acid (7664-93-9)	Yes	Yes	No	Yes	No	Yes	Yes	Yes

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 05/10/2018

Revision Summary

Section	Change	Date Changed
3	HPR Statement	05/10/2018
3	NFPA/HMIS update	05/10/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR).

GHS Full Text Phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Met. Corr. 1	Corrosive to metals Category 1
Skin Corr. 1A	Skin corrosion/irritation Category 1A
Skin Irrit. 2	Skin corrosion/irritation Category 2
H290	May be corrosive to metals
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage

Ferric Sulfate 60%

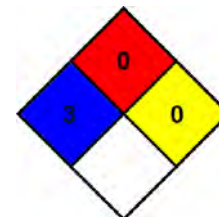
Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

H315	Causes skin irritation
H318	Causes serious eye damage
H402	Harmful to aquatic life

NFPA 704

NFPA Health Hazard : 3
NFPA Fire Hazard : 0
NFPA Reactivity Hazard : 0



HMIS Rating

Health : 3
Flammability : 0
Physical : 2
PPE See Section 8

Abbreviations and Acronyms

AICS – Australian Inventory of Chemical Substances
ACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
ATE - Acute Toxicity Estimate
BCF - Bioconcentration factor
BEI - Biological Exposure Indices (BEI)
CAS No. - Chemical Abstracts Service number
CERCLA RQ - Comprehensive Environmental Response, Compensation, and Liability Act - Reportable Quantity
CICR - Turkish Inventory and Control of Chemicals
DOT – 49 CFR – US Department of Transportation – Code of Federal Regulations Title 49 – Transportation.
EC50 - Median effective concentration
ECL - Korea Existing Chemicals List
EINECS - European Inventory of Existing Commercial Chemical Substances
ELINCS - European List of Notified Chemical Substances
EmS - IMDG Emergency Schedule Fire & Spillage
ENCS - Japanese Existing and New Chemical Substances Inventory
EPA – Environmental Protection Agency
EPCRA 304 RQ – EPCRA 304 Extremely Hazardous Substance Emergency Planning and Community Right-to-Know-Act – Reportable Quantity
ERAP Index – Emergency Response Assistance Plan Quantity Limit
ErC50 - EC50 in Terms of Reduction Growth Rate
ERG code (IATA) - Emergency Response Drill Code as found in the International Civil Aviation Organization (ICAO)
ERG No. - Emergency Response Guide Number
HCCL - Hazard Communication Carcinogen List
HMIS – Hazardous Materials Information System
IARC - International Agency for Research on Cancer
IATA - International Air Transport Association – Dangerous Goods Regulations
IDLH - Immediately Dangerous to Life or Health
IECSC - Inventory of Existing Chemical Substances Produced or Imported in China
IMDG - International Maritime Dangerous Goods Code
INSQ - Mexican National Inventory of Chemical Substances
ISHL - Japan Industrial Safety and Health Law

LC50 - Median Lethal Concentration
LD50 - Median Lethal Dose
LOAEL - Lowest Observed Adverse Effect Level
LOEC - Lowest-observed-effect Concentration
Log Pow - Octanol/water Partition Coefficient
NFPA 704 – National Fire Protection Association - Standard System for the Identification of the Hazards of Materials for Emergency Response
NIOSH - National Institute for Occupational Safety and Health
NLP - Europe No Longer Polymers List
NOAEL - No-Observed Adverse Effect Level
NOEC - No-Observed Effect Concentration
NZIOC - New Zealand Inventory of Chemicals
OEL - Occupational Exposure Limits
OSHA – Occupational Safety and Health Administration
PEL - Permissible Exposure Limits
PICCS - Philippine Inventory of Chemicals and Chemical Substances
PDSCL - Japan Poisonous and Deleterious Substances Control Law
PPE – Personal Protective Equipment
PRTR - Japan Pollutant Release and Transfer Register
REL - Recommended Exposure Limit
SADT - Self Accelerating Decomposition Temperature
SARA - Superfund Amendments and Reauthorization Act
SARA 302 - Section 302, 40 CFR Part 355
SARA 311/312 - Sections 311 and 312, 40 CFR Part 370 Hazard Categories
SARA 313 - Section 313, 40 CFR Part 372
SRCL - Specifically Regulated Carcinogen List
STEL - Short Term Exposure Limit
SVHC – European Candidate List of Substance of Very High Concern
TDG – Transport Canada Transport of Dangerous Goods Regulations
TLM - Median Tolerance Limit
TLV - Threshold Limit Value
TPQ - Threshold Planning Quantity
TSCA – United States Toxic Substances Control Act
TWA - Time Weighted Average
WEEL - Workplace Environmental Exposure Levels

Ferric Sulfate 60%

Safety Data Sheet

According to U.S. Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations and according to Canada's Hazardous Products Regulation, February 11, 2015.

Handle product with due care and avoid unnecessary contact. This information is supplied under U.S. OSHA'S "Right to Know" (29 CFR 1910.1200) and Canada's WHMIS regulations. Although certain hazards are described herein, we cannot guarantee these are the only hazards that exist. The information contained herein is based on data available to us and is believed to be true and accurate but it is not offered as a product specification. No warranty, expressed or implied, regarding the accuracy of this data, the hazards connected with the use of the product, or the results to be obtained from the use thereof, is made and Chemtrade and its affiliates assume no responsibility. Chemtrade is a member of the CIAC (Chemistry Industry Association of Canada) and adheres to the codes and principles of Responsible Care™.



Chemtrade NA GHS SDS 2015

**FERROSILICON**

Safety Data Sheet SIF4910.0

Date of issue: 05/23/2016

Version: 1.0

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Product form : Substance
 Physical state : Solid
 Substance name : FERROSILICON
 Product code : SIF4910.0
 Formula : FeSi₂
 Synonyms : IRON SILICIDE
 Chemical family : INORGANIC SILICATE

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Chemical intermediate
 For research use only

1.3. Details of the supplier of the safety data sheet**GELEST, INC.**

11 East Steel Road
 Morrisville, PA 19067

USA

T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST

info@gelest.com - www.gelest.com
1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazards identification**2.1. Classification of the substance or mixture****GHS-US classification**

Water-react. 3 H261
 Acute Tox. 3 (Inhalation:dust,mist) H331
 Full text of H statements : see section 16

2.2. Label elements**GHS-US labeling**

Hazard pictograms (GHS-US) :



GHS02



GHS06

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) : H261 - In contact with water releases flammable gases
 H331 - Toxic if inhaled

Precautionary statements (GHS-US) : P280 - Wear protective gloves/protective clothing/eye protection/face protection
 P231+P232 - Handle under inert gas. Protect from moisture
 P261 - Avoid breathing dust
 P271 - Use only outdoors or in a well-ventilated area
 P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
 P311 - Call a doctor
 P321 - Specific treatment (see first aid instructions on this label)
 P370+P378 - In case of fire: Use media other than water to extinguish
 P402+P404 - Store in a dry place. Store in a closed container
 P403+P233 - Store in a well-ventilated place. Keep container tightly closed
 P405 - Store locked up
 P501 - Dispose of contents/container to licensed waste disposal facility

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

No data available

FERROSILICON

Safety Data Sheet

SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type : Mono-constituent
Name : FERROSILICON
CAS No : 8049-17-0

Name	Product identifier	%	GHS-US classification
Ferrosilicon	(CAS No) 8049-17-0	97 - 100	Water-react. 3, H261 Acute Tox. 3 (Inhalation), H331

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.

First-aid measures after skin contact : Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Never give anything by mouth to an unconscious person. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Toxic if inhaled. Danger of serious damage to health by prolonged exposure through inhalation. May cause irritation to the respiratory tract.

Symptoms/injuries after skin contact : May cause skin irritation. May be harmful in contact with skin.

Symptoms/injuries after eye contact : May cause eye irritation.

Symptoms/injuries after ingestion : May be harmful if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Not combustible.

Unsuitable extinguishing media : Do not use straight streams.

5.2. Special hazards arising from the substance or mixture

Fire hazard : In contact with water releases flammable gases.

5.3. Advice for firefighters

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection. Avoid contact with skin and eyes. Do not breathe dust.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Protective equipment : Wear protective equipment as described in Section 8.

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for cleaning up : Sweep or shovel spills into appropriate container for disposal.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

FERROSILICON

Safety Data Sheet

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : While not flammable, the ability of particles to generate static charge may present a hazard when used in combination with flammable liquids.
- Precautions for safe handling : Avoid contact with skin and eyes. Do not breathe dust. Avoid dust formation. Handle under inert gas. Protect from moisture. Use only outdoors or in a well-ventilated area.
- Hygiene measures : 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 container tightly closed. Store locked up. Store in a dry place. Store in a closed container.
- Incompatible materials : Acids.
- Storage area : Store in a well-ventilated place. Store away from heat.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Ferrosilicon (8049-17-0)

USA OSHA	OSHA PEL (TWA) (mg/m ³)	10 mg/m ³ total dust
----------	-------------------------------------	---------------------------------

8.2. Exposure controls

- Appropriate engineering controls : Handle in an enclosing hood with exhaust ventilation.
- Personal protective equipment : Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
- Hand protection : Neoprene or nitrile rubber gloves.
- Eye protection : Chemical goggles. Contact lenses should not be worn.
- Skin and body protection : Wear suitable protective clothing.
- Respiratory protection : Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified dust and mist (orange cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

- Physical state : Solid
- Appearance : Coarse. Powder.
- Molecular mass : 112.02 g/mol
- Color : Silver-gray.
- Odor : No data available
- Odor threshold : No data available
- Refractive index : No data available
- pH : No data available
- Relative evaporation rate (butyl acetate=1) : No data available
- Melting point : 1360 °C
- Freezing point : No data available
- Boiling point : No data available
- Flash point : No data available
- Auto-ignition temperature : No data available
- Decomposition temperature : No data available
- Flammability (solid, gas) : No data available
- Vapor pressure : < 0.01 mm Hg @ 20°C
- Relative vapor density at 20 °C : No data available
- Relative density : 4.75
- VOC content : 100 %
- Solubility : Insoluble in water.
- Log Pow : No data available
- Log Kow : No data available
- Viscosity, kinematic : No data available
- Viscosity, dynamic : No data available
- Explosive properties : No data available

FERROSILICON

Safety Data Sheet

Oxidizing properties : No data available
Explosion limits : 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.

10.3. Possibility of hazardous reactions

Dry mixtures with sodium hydroxide react incandescently when water is added. Reacts with acids liberating hydrogen.

10.4. Conditions to avoid

No additional information available

10.5. Incompatible materials

Acids.

10.6. Hazardous decomposition products

None known.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation:dust,mist: Toxic if inhaled.

FERROSILICON (8049-17-0)	
ATE US (dust, mist)	0.500 mg/l/4h
Toxicity information	194 mg/m ³ TOXICITY- Inhalation toxicity-rat: TCLo 6H/26W-I; LUNGS, THORAX, OR RESPIRATION: Other changes; LUNGS, THORAX, OR RESPIRATION: Changes in lung weight; BIOCHEMICAL: Metabolism (intermediary): Lipids, including transport;
Ferrosilicon (8049-17-0)	
LD50 dermal rabbit	> 20 g/kg
ATE US (gases)	700.000 ppmV/4h
ATE US (vapors)	3.000 mg/l/4h
ATE US (dust, mist)	0.500 mg/l/4h

Skin corrosion/irritation : Not classified
Serious eye damage/irritation : Not classified
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
Symptoms/injuries after inhalation : Toxic if inhaled. Danger of serious damage to health by prolonged exposure through inhalation. May cause irritation to the respiratory tract.
Symptoms/injuries after skin contact : May cause skin irritation. May be harmful in contact with skin.
Symptoms/injuries after eye contact : May cause eye irritation.
Symptoms/injuries after ingestion : May be harmful if swallowed.

SECTION 12: Ecological information

12.1. Toxicity

No additional information available

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

FERROSILICON

Safety Data Sheet

12.5. Other adverse effects

Other adverse effects	: This substance may be hazardous to the environment.
Effect on ozone layer	: No additional information available
Effect on the global warming	: No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Sewage disposal recommendations	: Do not dispose of waste into sewer.
Waste disposal recommendations	: Landfill. Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials	: Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number

UN-No.(DOT)	: 1408
DOT NA no.	UN1408

14.2. UN proper shipping name

Proper Shipping Name (DOT)	: Ferrosilicon with 30 percent or more but less than 90 percent silicon
Class (DOT)	: 4.3 - Class 4.3 - Dangerous when wet material 49 CFR 173.124
Hazard labels (DOT)	: 4.3 - Dangerous when wet 6.1 - Poison



Packing group (DOT)	: III - Minor Danger
DOT Packaging Exceptions (49 CFR 173.xxx)	: 151
DOT Packaging Non Bulk (49 CFR 173.xxx)	: 213
DOT Packaging Bulk (49 CFR 173.xxx)	: 240

14.3. Additional information

Emergency Response Guide (ERG) Number	: 139
Other information	: No supplementary information available.

Transport by sea

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	: 13 - Keep as dry as reasonably practicable, 40 - Stow "clear of living quarters", 52 - Stow "separated from" acids, 53 - Stow "separated from" alkaline compounds, 85 - Under deck stowage must be in mechanically ventilated space, 103 - Only to be loaded under dry weather conditions

Air transport

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	: 25 kg
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	: 100 kg

SECTION 15: Regulatory information

15.1. US Federal regulations

FERROSILICON (8049-17-0)

TSCA Exemption/Exclusion	CAUTION: This material is supplied for research and development purposes subject to the R&D exemption under TSCA, 40 CFR 720.36, and must meet the requirements of the exemption, including supervision by a "technically qualified individual" as defined by 40 CFR 720.3(ee). The use of this material for "commercial purposes" as defined by 40 CFR 720.3(r) is not permitted in the United States
--------------------------	--

Ferrosilicon (8049-17-0)

Not listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

FERROSILICON

Safety Data Sheet

Ferrosilicon (8049-17-0)

Listed on the Canadian DSL (Domestic Substances List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)

15.3. US State regulations

FERROSILICON(8049-17-0)

U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No

Ferrosilicon (8049-17-0)

U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Non-significant risk level (NSRL)
No	No	No	No	

Ferrosilicon (8049-17-0)

U.S. - New Jersey - Right to Know Hazardous Substance List
--

SECTION 16: Other information

Abbreviations and acronyms

: Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development.

Full text of H-phrases::

H261	In contact with water releases flammable gases
H331	Toxic if inhaled

HMIS III Rating

Health : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability : 3 Serious Hazard
Physical : 1 Slight Hazard

Prepared by safety and environmental affairs.

Date of issue: 05/23/2016 Version: 1.0

SDS US (GHS HazCom 2012) - Custom

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

The information contained in this document has been gathered from reference materials and/or Gelest, Inc. test data and is to the best knowledge and belief of Gelest, Inc. accurate and reliable. Such information is offered solely for your consideration, investigation and verification. It is not suggested or guaranteed that the hazard precautions or procedures described are the only ones which exist. Gelest, Inc. makes no warranties, express or implied, with respect to the use of such information and assumes no responsibility therefore. Information on this safety data sheet is not intended to constitute a basis for product specifications.

© 2016 Gelest Inc. Morrisville, PA 19067

Material Safety Data Sheet

Section 1: PRODUCT AND COMPANY INFORMATION

Product Name(s): Lafarge Ready Mix Concrete (Concrete)

Product Identifiers: Ready Mix Concrete, Concrete Ready Mix, Portland Cement Concrete, Ready Mix Stucco, Ready Mix Grout, Ready Mix, Concrete, Freshly Mixed Concrete, Colloidal Concrete, Permeable Concrete, Shotcrete, Gunitite, Polymer-Portland Cement Concrete, Colored Concrete, Flowable Fill, Roller-Compacted Concrete, Fiber Reinforced Concrete, Weathermix, UltraCurb™, UltraDrive™, UltraFlo-Fil™, UltraHorizontal™, UltraFooting™, UltraPatio™, UltraStamp™, UltraTilt™, UltraVertical™, Agrifarge™ Plus, Agrifarge™ RP, Agrifarge™ 20, 25, 30, 32, ArteviaColor™, Chronolia™, Extensia™, Agilia® Screed C.

Manufacturer: Lafarge North America Inc.
12018 Sunrise Valley Drive, Suite 500
Reston, VA 20191

Information Telephone Number: 703-480-3600 (9am to 5pm EST)

Emergency Telephone Number: 1-800-451-8346 (3E Hotline)

Product Use: Concrete is widely used as a structural component in construction applications.

Note: This MSDS covers many types of Concrete. Individual composition of hazardous constituents will vary between types of Concrete.



Section 2: COMPOSITION/INFORMATION ON INGREDIENTS

Component	Percent (By Weight)	CAS Number	OSHA PEL -TWA (mg/m ³)	ACGIH TLV-TWA (mg/m ³)	LD ₅₀ (mouse)	LC ₅₀
Crystalline Silica	0-90	14808-60-7	[(10) / (%SiO ₂ +2)] (R); [(30) / (%SiO ₂ +2)] (T)	0.025 (R)	NA	NA
Calcium Carbonate*	25-65	1317-65-3	15 (T); 5 (R)	3 (R); 10 (T)	NA	NA
Portland Cement*	10-30	65997-15-1	15 (T); 5 (R)	1 (R)	NA	NA
Calcium Hydroxide	15-25	1305-62-0	15 (T); 5 (R)	5 (T)	7300 mg/kg (oral)	NA
Fly Ash	0-20	68131-74-8	NA	NA	NA	NA
Calcium Oxide	0-5	1305-78-8	5 (T)	2 (T)	3059 mg/kg (intraperitoneal)	NA
Magnesium Oxide	0-4	1309-48-4	15 (T)	10 (I)	NA	NA
Calcium Sulfate*	0-2	13397-24-5	15 (T); 5 (R)	10 (I)	NA	NA
Particulate Not Otherwise Regulated	-	NA	15 (T); 5 (R)	10 (T); 3 (R)	NA	NA

Note: Exposure limits for components noted with an * contain no asbestos and <1% crystalline silica

Concrete contains cement which is manufactured from materials mined from the earth and is processed using energy provided by fuels. Trace amounts of chemicals may be detected during chemical analysis such as: potassium and sodium sulfate compounds, chromium compounds, nickel compounds, and other trace compounds.

Section 3: HAZARD IDENTIFICATION

	<p style="text-align: center;">WARNING</p> <p>Corrosive - Causes severe burns. Toxic - Harmful by inhalation. (Contains crystalline silica)</p> <p>Use proper engineering controls, work practices, and personal protective equipment to prevent exposure to wet or dry product.</p> <p>Read MSDS for details.</p>	 <p>Respiratory Protection Eye Protection</p> <p>Waterproof Gloves Waterproof Boots</p>
---	---	--

Section 3: HAZARD IDENTIFICATION (continued)

Emergency Overview: Unhardened concrete is an odorless semi-fluid, flowable, granular paste of varying color and texture. It is not combustible or explosive. Exposure of sufficient duration to wet concrete can cause serious, potentially irreversible tissue (skin, eye, respiratory tract) damage due to chemical (caustic) burns, including third degree burns.

Potential Health Effects:

Eye Contact (acute): Concrete may cause immediate or delayed irritation or inflammation. Eye contact with wet concrete can cause moderate eye irritation, chemical burns and blindness. Eye exposures require immediate first aid and medical attention to prevent significant damage to the eye.

Skin Contact (acute): Concrete may cause dry skin, discomfort, irritation, severe burns, and dermatitis.

Burns: Exposure of sufficient duration to wet concrete can cause serious, potentially irreversible damage to skin, eye, respiratory and digestive tracts due to chemical (caustic) burns, including third degree burns. A skin exposure may be hazardous even if there is no pain or discomfort.

Dermatitis: Unhardened concrete is capable of causing dermatitis by irritation and allergy. Skin affected by dermatitis may include symptoms such as, redness, itching, rash, scaling, and cracking.

Irritant dermatitis is caused by the physical properties of concrete including alkalinity and abrasion.

Sensitization: Allergic contact dermatitis is caused by sensitization to hexavalent chromium (chromate) present in concrete. The reaction can range from a mild rash to severe skin ulcers. Persons already sensitized may react to the first contact with wet concrete. Others may develop allergic dermatitis after years of repeated contact with wet concrete.

Inhalation (acute): Breathing dust may cause nose, throat lung or mucous membrane irritation, including choking, depending on the degree of exposure. Inhalation of high levels of dust can cause chemical burns to the nose, throat and lungs.

Inhalation (chronic): Risk of injury depends on duration and level of exposure.

Silicosis: This product contains crystalline silica. Prolonged or repeated inhalation of respirable crystalline silica from this product can cause silicosis, a seriously disabling and fatal lung disease. See Note to Physicians in Section 4 for further information.

Carcinogenicity: Concrete is not listed as a carcinogen by IARC or NTP; however, concrete contains trace amounts of crystalline silica and hexavalent chromium which are classified by IARC and NTP as known human carcinogens.

Autoimmune Disease: Some studies show that exposure to respirable crystalline silica (without silicosis) or that the disease silicosis may be associated with the increased incidence of several autoimmune disorders such as scleroderma (thickening of the skin), systemic lupus erythematosus, rheumatoid arthritis and diseases affecting the kidneys.

Tuberculosis: Silicosis increases the risk of tuberculosis.

Renal Disease: Some studies show an increased incidence of chronic kidney disease and end-stage renal disease in workers exposed to respirable crystalline silica.

Section 3: HAZARD IDENTIFICATION (continued)

Ingestion: Do not ingest concrete. Although ingestion of small quantities of concrete is not known to be harmful, large quantities can cause chemical burns in the mouth, throat, stomach, and digestive tract.

Medical Conditions Aggravated by Exposure: Individuals with lung disease (e.g. bronchitis, emphysema, COPD, pulmonary disease) or sensitivity to hexavalent chromium can be aggravated by exposure.

Section 4: FIRST AID MEASURES

Eye Contact: Rinse eyes thoroughly with water for at least 15 minutes, including under lids, to remove all particles. Seek medical attention for abrasions and burns.

Skin Contact: Wash with cool water and a pH neutral soap or a mild skin detergent. Seek medical attention for rash, burns, irritation, dermatitis, and prolonged unprotected exposures to wet concrete.

Inhalation: Move person to fresh air. Seek medical attention for discomfort or if coughing or other symptoms do not subside.

Ingestion: Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention or contact poison control center immediately.

Note to Physician: The three types of silicosis include:

- Simple chronic silicosis – which results from long-term exposure (more than 20 years) to low amounts of respirable crystalline silica. Nodules of chronic inflammation and scarring provoked by the respirable crystalline silica form in the lungs and chest lymph nodes. This disease may feature breathlessness and may resemble chronic obstructive pulmonary disease (COPD).
- Accelerated silicosis – occurs after exposure to larger amounts of respirable crystalline silica over a shorter period of time (5-15 years). Inflammation, scarring, and symptoms progress faster in accelerated silicosis than in simple silicosis.
- Acute silicosis – results from short-term exposure to very large amounts of respirable crystalline silica. The lungs become very inflamed and may fill with fluid, causing severe shortness of breath and low blood oxygen levels.

Progressive massive fibrosis may occur in simple or accelerated silicosis, but is more common in the accelerated form. Progressive massive fibrosis results from severe scarring and leads to the destruction of normal lung structures.

Section 5: FIREFIGHTING MEASURES

Flashpoint & Method:	Non-combustible	Firefighting Equipment:	Concrete poses no fire-related hazard. A SCBA is recommended to limit exposures to combustion products when fighting any fire.
General Hazard:	Avoid breathing dust. Wet concrete is caustic.		
Extinguishing Media:	Use extinguishing media appropriate for surrounding fire.	Combustion Products:	None.

Section 6: ACCIDENTAL RELEASE MEASURES

- General:** Place spilled material into a container. Avoid contact with skin. Wear appropriate protective equipment as described in Section 8. Scrape wet concrete and place in container. Allow material to dry or solidify before disposal. Do not wash concrete down sewage and drainage systems or into bodies of water (e.g. streams).
- Waste Disposal Method:** Dispose of concrete according to Federal, State, Provincial and Local regulations.

Section 7: HANDLING AND STORAGE

- Usage:** Cutting, crushing or grinding hardened cement, concrete or other crystalline silica-bearing materials will release respirable crystalline silica. Use all appropriate measures of dust control or suppression, and Personal Protective Equipment (PPE) described in Section 8 below.
- Storage Temperature:** Unlimited. **Storage Pressure:** Unlimited.
- Clothing:** Promptly remove and launder clothing that is wet with concrete. Thoroughly wash skin after exposure to wet concrete.

Section 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

- Engineering Controls:** Use local exhaust or general dilution ventilation or other suppression methods to maintain dust levels below exposure limits.

Personal Protective Equipment (PPE):

- Respiratory Protection:** Under ordinary conditions no respiratory protection is required. Wear a NIOSH approved respirator that is properly fitted and is in good condition when exposed to dust above exposure limits.
- Eye Protection:** Wear ANSI approved glasses or safety goggles when handling wet concrete to prevent contact with eyes. Wearing contact lenses, when using concrete, is not recommended.
- Skin Protection:** Wear gloves, boot covers and protective clothing impervious to water to prevent skin contact. Do not rely on barrier creams, in place of impervious gloves. Remove clothing and protective equipment that becomes saturated with wet cement and immediately wash exposed areas.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

- | | | | |
|--------------------------|---------------------------------------|-----------------------------|-----------------------|
| Physical State: | Semi-fluid, Flowable, granular paste. | Evaporation Rate: | NA. |
| Appearance: | Variety of color (usually gray) | pH (in water): | 12 – 13 |
| Odor: | None. | Boiling Point: | NA |
| Vapor Pressure: | NA. | Freezing Point: | NA. |
| Vapor Density: | NA. | Viscosity: | Varies. |
| Specific Gravity: | 1.9 – 2.4 | Solubility in Water: | Slightly (0.1 - 1.0%) |

Section 10: STABILITY AND REACTIVITY

Stability:	Hardened concrete is stable. Avoid contact with incompatible materials.		
Incompatibility:	Wet concrete is alkaline and is incompatible with acids, ammonium salts and aluminum metal. Cement dissolves in hydrofluoric acid, producing corrosive silicon tetrafluoride gas. Cement reacts with water to form silicates and calcium hydroxide. Silicates react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.		
Hazardous Polymerization:	None.	Hazardous Decomposition:	None.

Section 11 and 12: TOXICOLOGICAL AND ECOLOGICAL INFORMATION

For questions regarding toxicological and ecological information refer to contact information in Section 1.


Section 13: DISPOSAL CONSIDERATIONS

Dispose of waste and containers in compliance with applicable Federal, State, Provincial and Local regulations.

Section 14: TRANSPORT INFORMATION

This product is not classified as a Hazardous Material under U.S. DOT or Canadian TDG regulations.

Section 15: REGULATORY INFORMATION

OSHA/MSHA Hazard Communication:	This product is considered by OSHA/MSHA to be a hazardous chemical and should be included in the employer's hazard communication program.
CERCLA/SUPERFUND:	This product is not listed as a CERCLA hazardous substance.
EPCRA SARA Title III:	This product has been reviewed according to the EPA Hazard Categories promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 and is considered a hazardous chemical and a delayed health hazard.
EPRCA SARA Section 313:	This product contains none of the substances 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.
RCRA:	If discarded in its purchased form, this product would not be a hazardous waste either by listing or characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste.
TSCA:	Portland cement and crystalline silica are exempt from reporting under the inventory update rule.
California Proposition 65:	Crystalline silica (airborne particulates of respirable size) and Chromium (hexavalent compounds) are substances known by the State of California to cause cancer.
WHMIS/DSL: 	Products containing crystalline silica and calcium carbonate are classified as D2A, E and are subject to WHMIS requirements.

Section 16: OTHER INFORMATION

Abbreviations:

>	Greater than	NA	Not Applicable
ACGIH	American Conference of Governmental Industrial Hygienists	NFPA	National Fire Protection Association
CAS No	Chemical Abstract Service number	NIOSH	National Institute for Occupational Safety and Health
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	NTP	National Toxicology Program
		OSHA	Occupational Safety and Health Administration
CFR	Code for Federal Regulations	PEL	Permissible Exposure Limit
CL	Ceiling Limit	pH	Negative log of hydrogen ion
DOT	U.S. Department of Transportation	PPE	Personal Protective Equipment
EST	Eastern Standard Time	R	Respirable Particulate
HEPA	High-Efficiency Particulate Air	RCRA	Resource Conservation and Recovery Act
HMIS	Hazardous Materials Identification System	SARA	Superfund Amendments and Reauthorization Act
IARC	International Agency for Research on Cancer	T	Total Particulate
		TDG	Transportation of Dangerous Goods
LC ₅₀	Lethal Concentration	TLV	Threshold Limit Value
LD ₅₀	Lethal Dose	TWA	Time Weighted Average (8 hour)
mg/m ³	Milligrams per cubic meter	WHMIS	Workplace Hazardous Materials Information System
MSHA	Mine Safety and Health Administration		

This MSDS (Section 1) was revised on March 1, 2011.

An electronic version of this MSDS is available at: www.lafarge-na.com under the Sustainability section.

Lafarge North America Inc. (LNA) believes the information contained herein is accurate; however, LNA makes no guarantees with respect to such accuracy and assumes no liability in connection with the use of the information contained herein which is not intended to be and should not be construed as legal advice or as insuring compliance with any federal, state or local laws or regulations. Any party using this product should review all such laws, rules, or regulations prior to use, including but not limited to US and Canada Federal, Provincial and State regulations.

NO WARRANTY IS MADE, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OTHERWISE.

SECTION 1: Identification

1.1. Identification

Product form	: Substance
Trade name	: Methyl Isobutyl Carbinol
Chemical name	: Methyl Isobutyl Carbinol
CAS-No.	: 108-11-2
Product code	: HP-040788-FP
Formula	: C ₆ H ₁₄ O
Synonyms	: Isobutylmethylethanol / 2-Methyl-4-pentanol / Pentan-2-ol, 4-methyl- / 4-Pentanol, 2-methyl- / Methyl-2-pentanol, 4- / 4-Methyl-2-pentanol / 4-Methylpentan-2-ol / 1,3-Dimethyl-1-butanol / MIBC / Methylisobutylcarbinol / 4-Methyl-2-amyl alcohol / Methyl isobutyl carbinol / Methyl(2-methylpropyl) carbinol / 4-Methylpent-2-one

1.2. Recommended use and restrictions on use

Use of the substance/mixture	: Solvent, organic synthesis, brake fluids
Use of the substance/mixture	: Solvent

1.3. Supplier

Monument Chemical
16717 Jacintoport Blvd.
Houston, TX 77015 - USA
T (281) 452-5951 - F (281) 457-1127
sds@monumentchemical.com - www.monumentchemical.com

1.4. Emergency telephone number

Emergency number	: 24 HR CHEMTREC: 1-800-424-9300; 24 HR Emergency Assistance: 1-832-376-2026
------------------	--

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture



GHS-US classification

Flammable liquids Category 3	H226	Flammable liquid and vapour
Serious eye damage/eye irritation Category 2A	H319	Causes serious eye irritation
Specific target organ toxicity (single exposure) Category 3	H335	May cause respiratory irritation

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)	: Warning
Hazard statements (GHS-US)	: H226 - Flammable liquid and vapour H319 - Causes serious eye irritation H335 - May cause respiratory irritation
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 dust, fume, gas, mist, spray, vapors. P264 - Wash hands, forearms and face thoroughly after handling. P271 - Use only outdoors or in a well-ventilated area. P280 - Wear eye protection, protective clothing, protective gloves.

Methyl Isobutyl Carbinol

Safety Data Sheet

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

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
P312 - Call a doctor, a POISON CENTER if you feel unwell
P337+P313 - If eye irritation persists: Get medical advice/attention.
P370+P378 - In case of fire: Use alcohol resistant foam, carbon dioxide (CO2), dry extinguishing powder, Water spray to extinguish.
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.
P501 - Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation

2.3. Other hazards which do not result in classification

No additional information available

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	%
Methyl Isobutyl Carbinol (Main constituent)	(CAS-No.) 108-11-2	>= 99

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 : Call a poison center/doctor/physician if you feel unwell.
First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. Call a poison center/doctor/physician if you feel unwell.
First-aid measures after skin contact : Rinse skin with water/shower. Remove/Take off immediately all contaminated clothing.
First-aid measures after eye contact : 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.
First-aid measures after ingestion : Call a poison center/doctor/physician if you feel unwell.

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

Symptoms/effects after inhalation : May cause respiratory irritation.
Symptoms/effects after skin contact : Slight irritation. Red skin. Dry skin. Itching.
Symptoms/effects after eye contact : Irritation of the eye tissue. Eye irritation.
Symptoms/effects after ingestion : Vomiting. Abdominal pain. AFTER INGESTION OF HIGH QUANTITIES: Dizziness. Headache. Disturbances of consciousness.
Chronic symptoms : No effects known.

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 : Water spray. Dry powder. Foam. Carbon dioxide.

5.2. Specific hazards arising from the chemical

Fire hazard : Flammable liquid and vapour.
Reactivity : Reacts with (some) acids: (increased) risk of fire/explosion. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Flammable liquid and vapour.

5.3. Special protective equipment and precautions for fire-fighters

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

Methyl Isobutyl Carbinol

Safety Data Sheet

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

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 clothing. Large spills/in enclosed spaces: compressed air apparatus.
- Emergency procedures : Ventilate spillage area. No open flames, no sparks, and no smoking. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes.

6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Avoid release to the environment.

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. Provide equipment/receptacles with earthing. Do not use compressed air for pumping over spills. Heating: dilute combustible gas/vapour with water curtain.
- Methods for cleaning up : Take up liquid spill into absorbent material. Notify authorities if product enters sewers or public waters.
- Other information : Dispose of materials or solid residues at an authorized site.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Precautions for safe handling : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Flammable vapors may accumulate in the container. Use explosion-proof equipment. Wear personal protective equipment. Use only outdoors or in a well-ventilated area. Avoid breathing dust/fume/gas/mist/vapors/spray. Avoid contact with skin and eyes.
- Hygiene measures : Observe normal hygiene standards. Keep container tightly closed. Do not eat, drink or smoke when using this product. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Ground/bond container and receiving equipment.
- Storage conditions : Store in a well-ventilated place. Keep cool. Keep container tightly closed. Store locked up.
- Heat-ignition : KEEP SUBSTANCE AWAY FROM: heat sources. ignition sources.
- Information on mixed storage : KEEP SUBSTANCE AWAY FROM: oxidizing agents. (strong) acids. (strong) bases. amines.
- Storage area : Ventilation at floor level. Fireproof storeroom. Provide for a tub to collect spills. Provide the tank with earthing. Store at ambient temperature. Meet the legal requirements.
- Special rules on packaging : SPECIAL REQUIREMENTS: closing. clean. correctly labelled. meet the legal requirements. Secure fragile packagings in solid containers.
- Packaging materials : SUITABLE MATERIAL: steel. stainless steel. carbon steel. aluminium. zinc. polyethylene. glass. tin.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methyl Isobutyl Carbinol (108-11-2)		
ACGIH	Local name	Methyl isobutyl carbinol
ACGIH	ACGIH TWA (ppm)	25 ppm [SKIN]
ACGIH	ACGIH STEL (ppm)	40 ppm
ACGIH	Remark (ACGIH)	URT & eye irr; CNS impair
ACGIH	Regulatory reference	ACGIH 2018
OSHA	OSHA PEL (TWA) (mg/m³)	100 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	25 ppm [SKIN]
OSHA	Limit value category (OSHA)	prevent or reduce skin absorption

Methyl Isobutyl Carbinol

Safety Data Sheet

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

Methyl Isobutyl Carbinol (108-11-2)		
OSHA	Regulatory reference (US-OSHA)	OSHA
IDLH	US IDLH (ppm)	400 ppm
NIOSH	NIOSH REL (TWA) (mg/m³)	100 mg/m³
NIOSH	NIOSH REL (TWA) (ppm)	25 ppm [SKIN]
NIOSH	NIOSH REL (STEL) (mg/m³)	165 mg/m³
NIOSH	NIOSH REL (STEL) (ppm)	40 ppm
NIOSH	US-NIOSH chemical category	Potential for dermal absorption

8.2. Appropriate engineering controls

Appropriate engineering controls : Ensure good ventilation of the work station.
Environmental exposure controls : Avoid release to the environment.

8.3. Individual protection measures/Personal protective equipment

Materials for protective clothing:

GIVE EXCELLENT RESISTANCE: butyl rubber. GIVE GOOD RESISTANCE: butyl rubber. PVC. neoprene

Hand protection:

Protective gloves

Eye protection:

Safety glasses

Skin and body protection:

Protective clothing

Respiratory protection:

In case of insufficient ventilation, wear suitable respiratory equipment

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid
Appearance : Clear, colorless liquid.
Color : Colorless
Odor : mild
Odor threshold : No data available
pH : No data available
Melting point : -90 °C
Freezing point : -90 °C ; -130.0 °F
Boiling point : 132 °C ; 269.6 °F
Critical temperature : 291 °C
Flash point : 41 °C ; 105.8 °F closed cup
Relative evaporation rate (butyl acetate=1) : 0.3
Relative evaporation rate (ether=1) : 33
Flammability (solid, gas) : Not applicable.
Vapor pressure : 2.8 mm Hg (at 25 °C)
Vapor pressure at 50 °C : 34 hPa
Relative vapor density at 20 °C : 3.5
Relative density : 0.82
Relative density of saturated gas/air mixture : 1
Specific gravity / density : 807.5 kg/m³ (at 20 °C)
Molecular mass : 102.2 g/mol

Methyl Isobutyl Carbinol

Safety Data Sheet

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

Solubility	: Moderately soluble in water. Soluble in ethanol. Soluble in ether. Water: 2 g/100ml (at 25 °C)
Log Pow	: 1.43 (at 25 °C)
Auto-ignition temperature	: 305 °C ; 581 °F
Decomposition temperature	: No data available
Viscosity, kinematic	: 5.08 mm²/s (25 °C)
Viscosity, dynamic	: 4.116 mPa.s (25 °C)
Explosion limits	: 1 - 5.5 vol % 42 - 235 g/m³ LEL: 1 vol % UEL: 5.5 vol %
Explosive properties	: No data available
Oxidizing properties	: No data available

9.2. Other information

Specific conductivity	: 70000 pS/m
Saturation concentration	: 25 g/m³
VOC content	: 100 %
Other properties	: Gas/vapour heavier than air at 20°C. Clear. Slightly volatile. Substance has neutral reaction. May generate electrostatic charges.

SECTION 10: Stability and reactivity

10.1. Reactivity

Reacts with (some) acids: (increased) risk of fire/explosion. Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion. Flammable liquid and vapour.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No dangerous reactions known under normal conditions of use.

10.4. Conditions to avoid

Avoid contact with hot surfaces. Heat. No flames, no sparks. Eliminate all sources of ignition.

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
----------------	------------------

Methyl Isobutyl Carbinol (108-11-2)	
LD50 oral rat	2600 mg/kg
LD50 dermal rabbit	2880 mg/kg
LC50 inhalation rat (mg/l)	> 16000 mg/m³ (Equivalent or similar to OECD 403, 4 h, Rat, Male/female, Experimental value)
LC50 inhalation rat (ppm)	> 4600 ppm (Exposure time: 2 h)
ATE US (oral)	2600 mg/kg body weight
ATE US (dermal)	2880 mg/kg body weight

Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Causes serious eye irritation.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified
Reproductive toxicity	: Not classified
Specific target organ toxicity – single exposure	: May cause respiratory irritation.

Methyl Isobutyl Carbinol

Safety Data Sheet

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

Specific target organ toxicity – repeated exposure	: Not classified
Aspiration hazard	: Not classified
Symptoms/effects after inhalation	: May cause respiratory irritation.
Symptoms/effects after skin contact	: Slight irritation. Red skin. Dry skin. Itching.
Symptoms/effects after eye contact	: Irritation of the eye tissue. Eye irritation.
Symptoms/effects after ingestion	: Vomiting. Abdominal pain. AFTER INGESTION OF HIGH QUANTITIES: Dizziness. Headache. Disturbances of consciousness.
Chronic symptoms	: No effects known.

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).

Methyl Isobutyl Carbinol (108-11-2)

LC50 fish 1	360 mg/l 24hr; Goldfish
-------------	-------------------------

12.2. Persistence and degradability

Methyl Isobutyl Carbinol (108-11-2)

Biochemical oxygen demand (BOD)	2.12 g O ₂ /g substance
Chemical oxygen demand (COD)	2.6 g O ₂ /g substance
ThOD	2.8 g O ₂ /g substance
BOD (% of ThOD)	0.76 (Calculated value)

12.3. Bioaccumulative potential

Methyl Isobutyl Carbinol (108-11-2)

Log Pow	1.43 (at 25 °C)
---------	-----------------

12.4. Mobility in soil

Methyl Isobutyl Carbinol (108-11-2)

Surface tension	0.023 N/m
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

Regional legislation (waste)	: LWCA (the Netherlands): KGA category 03.
Waste treatment methods	: Dispose of contents/container in accordance with licensed collector's sorting instructions.
Additional information	: Flammable vapors may accumulate in the container.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	: UN2053 Methyl isobutyl carbinol, 3, III
UN-No.(DOT)	: UN2053
Proper Shipping Name (DOT)	: Methyl isobutyl carbinol
Class (DOT)	: 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT)	: III - Minor Danger

Methyl Isobutyl Carbinol

Safety Data Sheet

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

Hazard labels (DOT) : 3 - Flammable liquid



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

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

DOT Special Provisions (49 CFR 172.102) : B1 - If the material has a flash point at or above 38 C (100 F) and below 93 C (200 F), then the bulk packaging requirements of 173.241 of this subchapter are applicable. If the material has a flash point of less than 38 C (100 F), then the bulk packaging requirements of 173.242 of this subchapter are applicable.

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).

T2 - 1.5 178.274(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) : 60 L

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 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.

Emergency Response Guide (ERG) Number : 129

Other information : No supplementary information available.

Transport by sea

Transport document description (IMDG) : UN 2053 METHYL ISOBUTYL CARBINOL, 3, III (41°C c.c.)

UN-No. (IMDG) : 2053

Proper Shipping Name (IMDG) : METHYL ISOBUTYL CARBINOL

Class (IMDG) : 3 - Flammable liquids

Packing group (IMDG) : III - substances presenting low danger

Limited quantities (IMDG) : 5 L

EmS-No. (1) : F-E

EmS-No. (2) : S-D

Air transport

Transport document description (IATA) : UN 2053 Methyl isobutyl carbinol, 3, III

UN-No. (IATA) : 2053

Proper Shipping Name (IATA) : Methyl isobutyl carbinol

Class (IATA) : 3 - Flammable Liquids

Packing group (IATA) : III - Minor Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Methyl Isobutyl Carbinol (108-11-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA

Methyl Isobutyl Carbinol (108-11-2)

Listed on the Canadian DSL (Domestic Substances List)

Methyl Isobutyl Carbinol

Safety Data Sheet

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

EU-Regulations

Methyl Isobutyl Carbinol (108-11-2)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations

Methyl Isobutyl Carbinol (108-11-2)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)
Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

Methyl Isobutyl Carbinol (108-11-2)

State or local regulations	U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
----------------------------	--

SECTION 16: Other information

Revision date : 04/06/2018

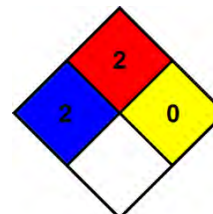
Full text of H-phrases:

H226	Flammable liquid and vapour
H319	Causes serious eye irritation
H335	May cause respiratory irritation

NFPA health hazard : 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA fire hazard : 2 - Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

NFPA reactivity : 0 - Material that in themselves are normally stable, even under fire conditions.



SDS US (GHS HazCom 2012)

DISCLAIMER: Monument Chemical believes that the information expressly set forth in this Safety Data Sheet (SDS) is accurate as of the date of publication. MONUMENT CHEMICAL EXPRESSLY DISCLAIMS ALL WARRANTIES OF EVERY KIND AND NATURE, EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Monument Chemical assumes no responsibility for any use of or reliance upon the data provided in this SDS. Given the variety of factors that can affect the use of the material, some of which are uniquely within the user's knowledge and control, the user should independently evaluate (i) the completeness and accuracy of the information provided herein and (ii) the material to determine whether it is suitable and safe for the user's intended use.

Monument Chemical provides information in electronic form as a service to its customers. Due to the remote possibility that electronic transfer may have resulted in errors, omissions or alterations in this information, Monument Chemical makes no representations as to its completeness or accuracy. In addition, information obtained from a database may not be as current as the information in the SDS available directly from Monument Chemical.



Safety Data Sheet
Sodium isobutyl xanthate (SIBX)
Revision 4, Date 17 Aug 2017

1. IDENTIFICATION

Product Name	Sodium isobutyl xanthate (SIBX)
Other Names	Sodium O-isobutyl dithiocarbonate
Uses	Flotation agent in mining and metal extraction.
Chemical Family	Xanthates
Chemical Formula	C ₅ H ₉ NaOS ₂
Chemical Name	Carbonodithioic acid, O-(2-methylpropyl) ester, sodium salt
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Not Scheduled

Globally Harmonised System



Hazard Classification	Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Hazard Categories	Self-heating Substances and Mixtures - Category 2 Acute Toxicity (Oral) - Category 4 Acute Toxicity (Dermal) - Category 4 Skin Corrosion/Irritation - Category 2 Serious Eye Damage/Irritation - Category 2A Specific Target Organ Toxicity (Single Exposure) - Category 3

Pictograms	 
-------------------	---

Signal Word	Warning
--------------------	---------

Hazard Statements	H252	Self-heating in large quantities; may catch fire.
	H302 + H312	Harmful if swallowed or in contact with skin.
	H315	Causes skin irritation.
	H319	Causes serious eye irritation.
	H335	May cause respiratory irritation.

Precautionary Statements	Prevention	P280	Wear protective gloves/protective clothing/eye protection/face protection.
		P261	Avoid breathing dust.
		P235 + P410	Keep cool. Protect from sunlight.
		P270	Do not eat, drink or smoke when using this product.
		P271	Use only outdoors or in a well-ventilated area.
	Response	P312	Call a POISON CENTER or doctor/physician if you feel unwell.
		P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
		P337 + P313	If eye irritation persists: Get medical advice/attention.
		P330	Rinse mouth.
		P332 + P313	If skin irritation occurs: Get medical advice/attention.
		P362	Take off contaminated clothing and wash before reuse.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
	Storage	P407	Maintain air gap between stacks/pallets.
		P420	Store away from other materials.
		P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
		P405	Store locked up.
	Disposal	P501	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
 Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)
---------------------------------------	---

Environmental Protection Authority (New Zealand)
 Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Physical Hazards	4.2B	Spontaneously combustible substances: self-heating substances: medium hazard
	Health Hazards	6.1D	Substances that are acutely toxic - Harmful
		6.3A	Substances that are irritating to the skin
		6.4A	Substances that are irritating to the eye
	Environmental Hazards	9.3B	Substances that are ecotoxic to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Sodium isobutyl xanthate	C ₅ H ₉ NaOS ₂	25306-75-6	>=90 %
Free alkali (Sodium hydroxide)	NaOH	1310-73-2	<=0.2 %
Other, non-hazardous ingredients	Unspecified	Unspecified	Balance %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	IF SWALLOWED: Rinse mouth, then drink 200 - 300 ml of water. Do not induce vomiting. Call a Poison Centre or doctor/physician for advice.
Eye	IF IN EYES: Immediately flush eyes with running water for several minutes, holding eyelids open and occasionally lifting the upper and lower lids. Remove contact lenses if present and easy to do. Continue rinsing for at least 15 minutes. Call a Poison Centre or doctor/physician for advice.
Skin	IF ON SKIN (or hair): Remove contaminated clothing and shoes immediately. Wash skin and hair with plenty of soap and water. Call a Poison Centre or doctor/physician if you feel unwell. If skin irritation occurs, get medical advice/attention. Wash contaminated clothing and shoes before reuse.
Inhaled	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a Poison Centre or doctor/physician for advice. Apply resuscitation if victim is not breathing. Administer oxygen if breathing is difficult.
Advice to Doctor	Treat symptomatically. Ensure that attending medical personnel are aware of identity and nature of the product(s) involved, and take precautions to protect themselves. Effects of exposure may be delayed.
Medical Conditions Aggravated by Exposure	No information available.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, move undamaged containers from fire area. Cool containers with water spray until well after fire is out - Avoid getting water inside containers or in contact with substance.
Flammability Conditions	SPONTANEOUSLY COMBUSTIBLE SUBSTANCE: May ignite on contact with air, moist air or water.
Extinguishing Media	Use dry chemical, dry sand, soda ash or lime for extinction OR withdraw and let fire burn. Do NOT use water, Carbon dioxide (CO ₂) or foam on the substance itself. Try to exclude Oxygen.
Fire and Explosion Hazard	Risk of violent reaction or explosion - May react vigorously or explosively on contact with water. May produce flammable, toxic and/or corrosive gases on contact with air, moist air or water. May re-ignite after fire is extinguished. Containers may explode when heated.
Hazardous Products of Combustion	Fire will produce irritating, toxic and/or corrosive gases, including Carbon disulfide, Hydrogen sulfide.
Special Fire Fighting Instructions	Contain runoff from fire control water - Runoff may pollute waterways; Runoff may create multiple fire or explosion hazard.
Personal Protective Equipment	Wear self-contained breathing apparatus (SCBA) in combination with normal firefighting clothing (full fire kit).
Flash Point	No Data Available

Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	1Y

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Try to exclude Oxygen. ELIMINATE all ignition sources (no smoking, flares, sparks or flames). Do not touch or walk through spilled material. Avoid breathing dust and prevent contact with eyes, skin and clothing.
Clean Up Procedures	Vacuum or use clean, non-sparking tools to collect material and place it into suitable, labelled containers for disposal (see SECTION 13). Do NOT get water inside containers or in contact with substance.
Containment	Stop leak if safe to do so – Prevent entry into waterways, drains or confined areas. Prevent dust cloud - Cover with DRY earth, sand or other dry, non-combustible material. Keep the spill compact - Do not permit material to scatter or spread.
Decontamination	After cleaning, flush away any residual traces with water.
Environmental Precautionary Measures	Spillages and decontamination runoff should be prevented from entering drains and watercourses.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away. Keep upwind and to higher ground. Large spill: Consider downwind evacuation of areas within at least 250 m.
Personal Precautionary Measures	Do not touch damaged containers or spilled material unless wearing appropriate protective clothing (see SECTION 8).

7. HANDLING AND STORAGE

Handling	Safety showers and eyewash facilities should be provided within the immediate work area for emergency use. Use only outdoors or in a well-ventilated place. Handle in accordance with good industrial hygiene and safety practice. Avoid dust formation. Avoid breathing dust and prevent contact with eyes, skin and clothing. Wear protective gloves/protective clothing/eye protection/face protection (see SECTION 8). Keep away from heat and sources of ignition - No smoking. Take precautionary measures against static discharge.
Storage	Store in a cool, dry and well-ventilated place. Protect from sunlight. Keep container tightly closed - Check regularly for spills. Avoid exposure to air and water/moisture (hygroscopic). Maintain air gap between stacks/pallets. Keep away from heat and sources of ignition. Store away from foodstuffs and other/incompatible materials (see SECTION 10). Store locked up.
Container	Keep in the original container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	<p>No specific exposure standards are available for this product. For dusts from solid substances without specific occupational exposure standards:</p> <ul style="list-style-type: none"> - Safe Work Australia Exposure Standard (Nuisance dusts): 8 hr TWA = 10 mg/m³ (measured as inhalable dust). - New Zealand WES (Particulates not otherwise classified): TWA = 10 mg/m³ (total); TWA = 3 mg/m³ (respirable). <p>COMPONENT: Sodium hydroxide (CAS No. 1310-73-2):</p> <ul style="list-style-type: none"> - Safe Work Australia Exposure Standard: TWA = 2 mg/m³ Peak limitation. <p>DECOMPOSITION PRODUCT: Carbon disulphide (CAS No. 75-15-0):</p> <ul style="list-style-type: none"> - Safe Work Australia Exposure Standard: TWA = 10 ppm (31 mg/m³); Absorption through the skin may be a significant source of exposure (Sk).
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Use explosion-proof electrical/ventilating/lighting equipment.
Personal Protection Equipment	- Respiratory protection: Wear respiratory protection if an inhalation risk exists. Recommended: Dust mask/particulate respirator; Supplied-air respirator if risk of exposure to products of decomposition (refer to AS/NZS 1715 & 1716).

- Eye/face protection: Wear appropriate eye protection to prevent eye contact. Recommended: Chemical goggles.
- Hand protection: Wear protective gloves. Recommended: Impervious gloves.
- Skin/body protection: Wear appropriate personal protective clothing to prevent skin contact. Recommended: Overalls, safety shoes.

Special Hazards Precautions

No information available.

Work Hygienic Practices

Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Remove contaminated clothing and shoes immediately and wash before storage or reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Powder or pellets
Odour	Unpleasant; Sulphurous
Colour	Yellow or grey
pH	No Data Available
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Soluble in water
Specific Gravity	1.17 - 1.18
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	173.255 g/mol (SIBX)
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No information available.
Potential for Dust Explosion	Dust may form explosive mixtures with air.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No information available.
Properties That May Initiate or Contribute to Fire Intensity	SPONTANEOUSLY COMBUSTIBLE SUBSTANCE: May ignite on contact with air, moist air or water.

Reactions That Release Gases or Vapours

May produce toxic and/or corrosive gases on contact with air, moist air or water. Fire will produce irritating, toxic and/or corrosive gases, including Carbon disulfide, Hydrogen sulfide.

Release of Invisible Flammable Vapours and Gases

May produce flammable gases on contact with air, moist air or water.

10. STABILITY AND REACTIVITY

General Information

Reacts exothermically on contact with water producing Carbon disulfide.

Chemical Stability

Stable under normal conditions of use.

Conditions to Avoid

Avoid dust formation. Avoid exposure to moisture/water. Keep away from heat and sources of ignition.

Materials to Avoid

Incompatible/reactive with water, oxidising agents, combustible materials, acids, phosgene, sulfur chlorides, copper and copper alloys.

Hazardous Decomposition Products

May produce toxic and/or corrosive gases on contact with air, moist air or water. Fire will produce irritating, toxic and/or corrosive gases, including Carbon disulfide, Hydrogen sulfide.

Hazardous Polymerisation

Will not occur.

11. TOXICOLOGICAL INFORMATION

General Information

- Acute toxicity: Harmful if swallowed and in contact with skin. May cause nausea, vomiting, diarrhoea, abdominal pain, convulsions and loss of consciousness. Will liberate Carbon disulfide in contact with moist skin, which can be absorbed through the skin.
- Skin corrosion/irritation: Causes skin irritation.
- Eye damage/irritation: Causes serious eye irritation.
- Respiratory/skin sensitisation: No information available.
- Germ cell mutagenicity: No information available.
- Carcinogenicity: No information available.
- Reproductive toxicity: No information available on the product itself. DECOMPOSITION PRODUCT: Carbon disulfide (CAS No. 75-15-0) is suspected of damaging fertility and suspected of damaging the unborn child.
- STOT (single exposure): May cause respiratory irritation; High concentrations can produce central nervous system depression, leading to loss of co-ordination, impaired judgement and unconsciousness.
- STOT (repeated exposure): No information available on the product itself. DECOMPOSITION PRODUCT: Carbon disulfide (CAS No. 75-15-0) causes damage to organs through prolonged or repeated exposure if inhaled.
- Aspiration toxicity: No information available.

Acute**Ingestion**

Acute toxicity (Oral):
COMPONENT: Sodium isobutyl xanthate (CAS No. 25306-75-6):
- LD50, Rats: 500 mg/kg bw.

Carcinogen Category

None

12. ECOLOGICAL INFORMATION

Ecotoxicity

No information available.

Persistence/Degradability

No information available.

Mobility

No information available.

Environmental Fate

Prevent entry into soils, drains and waterways.

Bioaccumulation Potential

No information available.

Environmental Impact

No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of contents/container through a licensed waste contractor and in accordance with local/regional/national regulations.
Special Precautions for Land Fill	No information available.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
EPG	25 Spontaneously Combustible Substances (Air And/Or Water Reactive)
UN Number	3342
Hazchem	1Y
Pack Group	III
Special Provision	No Data Available

Land Transport (Malaysia)
ADR Code

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
EPG	25 Spontaneously Combustible Substances (Air And/Or Water Reactive)
UN Number	3342
Hazchem	1Y
Pack Group	III
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
EPG	25 Spontaneously Combustible Substances (Air And/Or Water Reactive)
UN Number	3342
Hazchem	1Y
Pack Group	III
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
ERG	135 Substances - Spontaneously Combustible
UN Number	3342
Hazchem	1Y

Pack Group	III
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
UN Number	3342
Hazchem	1Y
Pack Group	III
Special Provision	No Data Available
EMS	F-A, S-J
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	XANTHATES
Class	4.2 Flammable Solids - Substances liable to spontaneous combustion
Subsidiary Risk(s)	No Data Available
UN Number	3342
Hazchem	1Y
Pack Group	III
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)
---------------------------------------	---

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Not Scheduled

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR006714
----------------------	-----------

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined

China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACH)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	SOISBX1000, SOISBX1001, SOISBX1002, SOISBX1003, SOISBX1004, SOISBX1005, SOISBX1006, SOISBX1007, SOISBX1008, SOISBX1009, SOISBX1010, SOISBX1011, SOISBX1012, SOISBX1013, SOISBX1014, SOISBX1015, SOISBX1016, SOISBX1017, SOISBX1018, SOISBX1019, SOISBX1020, SOISBX1021, SOISBX1022, SOISBX1023, SOISBX1024, SOISBX1025, SOISBX1026, SOISBX1027, SOISBX2000, SOISBX2001, SOISBX2002, SOISBX3000, SOISBX3500, SOISBX3800, SOISBX4000, SOISBX4100, SOISBX4500, SOISBX4501, SOISBX4600, SOISBX4700, SOISBX5000, SOISBX5400, SOISBX5500, SOISBX6000, SOISBX4510, SOISBX4502, SOISBX8650
Revision	4
Revision Date	17 Aug 2017
Reason for Issue	Updated SDS
Key/Legend	<p>< Less Than > Greater Than AICS Australian Inventory of Chemical Substances atm Atmosphere CAS Chemical Abstracts Service (Registry Number) cm² Square Centimetres CO₂ Carbon Dioxide COD Chemical Oxygen Demand deg C (°C) Degrees Celcius EPA (New Zealand) Environmental Protection Authority of New Zealand deg F (°F) Degrees Farenheit g Grams g/cm³ Grams per Cubic Centimetre g/l Grams per Litre HSNO Hazardous Substance and New Organism IDLH Immediately Dangerous to Life and Health immiscible Liquids are insoluable in each other. inHg Inch of Mercury inH₂O Inch of Water K Kelvin kg Kilogram kg/m³ Kilograms per Cubic Metre lb Pound LC₅₀ LC stands for lethal concentration. LC₅₀ is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. LD₅₀ LD stands for Lethal Dose. LD₅₀ is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. ltr or L Litre m³ Cubic Metre</p>

mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH₂O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Health and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

MATERIAL SAFETY DATA SHEET

SODIUM CARBONATE / SODA ASH, SOLID

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

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

WHMIS#: 00060696
Index: GCD0040/14B
Effective Date: 2014 June 05
Date of Revision: 2014 June 05

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

EMERGENCY TELEPHONE NUMBER (For Emergencies Involving Chemical Spills or Releases)

1 855 273 6824

PRODUCT IDENTIFICATION

Product Name: Sodium Carbonate / Soda Ash, Solid.
Chemical Name: Carbonic acid, disodium salt.
Synonyms: Disodium Carbonate; Solvay Soda; Bisodium Carbonate; Soda Monohydrate; Calcined Soda; pH + Soda Ash; Soda Ash Dense; Soda Ash Light.
Chemical Family: Sodium salts.
Molecular Formula: Na_2CO_3 .
Product Use: Photography. Water treatment. pH control of water. Chemical intermediate.

WHMIS Classification / Symbol:

D-2B: Toxic (eye irritant)
E: Corrosive



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

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

<i>Ingredient</i>	<i>CAS#</i>	<i>ACGIH TLV (TWA)</i>	<i>% Concentration</i>
Sodium Carbonate	497-19-8	---	99 - 100

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Causes eye irritation. Sodium Carbonate is corrosive to aluminum. Dust is irritating to respiratory tract. See "Other Health Effects" Section. Can decompose at high temperatures forming toxic gases.

POTENTIAL HEALTH EFFECTS

Inhalation: Product is irritating to the nose, throat and respiratory tract.
Skin Contact: This product may cause irritation. May cause more severe response if skin is abraded (scratched, scraped or cut). Prolonged, confined (especially under the finger nails, under rings or watch bands) or repeated exposure may cause skin irritation and possibly lead to (chemical) burns. Solid sodium carbonate is corrosive to aluminum but not to human tissue.
Skin Absorption: A single, prolonged skin exposure is not likely to result in the absorption of toxic amounts of the material.
Eye Contact: This product causes irritation, redness and pain and lachrymation (excessive tears).

Ingestion:	May irritate mouth, esophagus, and stomach. Ingestion of large amounts may cause nausea, gastrointestinal upset and abdominal pain. Ingestion is not a likely route of exposure.
Other Health Effects:	Effects (irritancy) on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. Sodium salts have a hypothetical risk of hypernatremia. Hypernatraemia is a term that describes an abnormally high plasma concentration of sodium ions. This condition may lead to weakness, restlessness, dizziness, headache, convulsions and coma. (6) In the presence of moisture (perspiration), soda ash and lime dusts (CaO) combine to form corrosive caustic soda which may cause burns. (3) Long-term or repeated contact with sodium carbonate may result in dermatitis due to its' hygroscopic nature. (4) Prolonged inhalation of sodium carbonate dust has been related to perforations of the nasal septum. (4)

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. Obtain medical attention IMMEDIATELY.
Skin Contact:	Start flushing while removing contaminated clothing. Wash affected areas thoroughly with soap and water. If irritation, redness, or a burning sensation develops and persists, repeat flushing and obtain medical attention.
Eye Contact:	Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. Take care not to rinse contaminated water into the unaffected eye or onto the face. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY. If a contact lens is present, do not delay irrigation or attempt to remove the lens until flushing is done. (4)
Ingestion:	Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. IMMEDIATELY contact local Poison Control Centre. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. IMMEDIATELY transport victim to an emergency facility.
Note to Physicians:	Treat symptomatically. Medical conditions that may be aggravated by exposure to this product include diseases of the skin, eyes or respiratory tract.

5. FIRE-FIGHTING MEASURES

<i>Flashpoint (°C)</i>	<i>Autolgnition Temperature (°C)</i>	Flammability Limits in Air (%):	
		<i>LEL</i>	<i>UEL</i>
Not available.	Not applicable.	Not applicable.	Not applicable.
Flammability Class (WHMIS):	Not regulated.		
Hazardous Combustion Products:	Thermal decomposition products are toxic and may include oxides of carbon, sodium and irritating gases.		
Unusual Fire or Explosion Hazards:	Minimize air borne spreading of dust. In the presence of moisture (perspiration), soda ash and lime dusts (CaO) combine to form corrosive caustic soda which may cause burns. (3)		
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: Isolate materials that are not involved in the fire and protect personnel. Use water spray to cool fire-exposed containers or structures. Use water spray to disperse vapours. Spilled material may cause floors and contact surfaces to become slippery.

Fire Fighting Protective Equipment: Use self-contained breathing apparatus and 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: See Section 13, "Deactivating Chemicals". In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS.

Minimize air borne spreading of dust. Wear respirator, protective clothing and gloves. Avoid dry sweeping. Do not use compressed air to clean surfaces. Vacuuming or wet sweeping is preferred. Return all material possible to container for proper disposal. Do not allow to enter sewers or watercourses. Any recovered product can be used for the usual purpose, depending on the extent and kind of contamination. Where a package (drum or bag) is damaged and / or leaking, repair it, or place it into an over-pack drum immediately so as to avoid or minimize material loss and contamination of surrounding environment. Replace damaged containers immediately to avoid loss of material and contamination of surrounding atmosphere. For release to land, or storm water runoff, contain discharge by constructing dikes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment.

7. HANDLING AND STORAGE

HANDLING

Handling Practices: Use normal "good" industrial hygiene and housekeeping practices. In the presence of moisture (perspiration), soda ash and lime dusts (CaO) combine to form corrosive caustic soda which may cause burns. (3)

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

Other Precautions: Use only with adequate ventilation and avoid breathing dusts. 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): See below.

Ventilation Requirements: Ventilation should be corrosion proof.

Storage Requirements: Store in a cool, dry and well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Avoid moisture contamination. Prolonged storage may result in lumping or caking.

Special Materials to be Used for Packaging or Containers: Equipment for storage, handling or transportation should NOT be made of: aluminum, lead or tin. Attacks some types of rubber, plastics and coatings. 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: General exhaust is acceptable. Local exhaust ventilation preferred. Ventilation should be corrosion and explosion proof. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye Protection: Safety glasses with side shields are recommended to prevent eye contact. Use dust-tight chemical safety goggles when there is potential for eye contact. Contact lenses should not be worn when working with this material.

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

Respiratory Protection: No specific guidelines available. A NIOSH/MSHA approved dust mask for concentrations of nuisance dust up to 100 mg/m³ particulate. An air-supplied respirator if concentrations are higher or unknown.

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.

EXPOSURE GUIDELINES

Particulate Not Otherwise Classified:

ACGIH	OSHA
10 mg/m ³ - Inhalable particulate	50 mppcf* or 15 mg/m ³ - Total Dust
3 mg/m ³ - Respirable particulate	15 mppcf* or 5 mg/m ³ - Respirable Fraction

* mppcf = million particles per cubic foot

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

Physical State:	Solid.
Appearance:	White granular solid.
Odour:	Odourless
Odour Threshold (ppm):	Not applicable.
Boiling Range (°C):	Not applicable.
Melting/Freezing Point (°C):	851.
Vapour Pressure (mm Hg at 20° C):	Not applicable.
Vapour Density (Air = 1.0):	Not applicable.
Relative Density (g/cc):	2.509 - 2.564.
Bulk Density:	950 - 1 035.
Viscosity:	Not applicable.
Evaporation Rate (Butyl Acetate = 1.0):	Not applicable.
Solubility:	Soluble in water. Hygroscopic (readily absorbs water).
% Volatile by Volume:	Not available.
pH:	11.4 (1 % solution).
Coefficient of Water/Oil Distribution:	Not available.
Volatile Organic Compounds (VOC):	Not applicable.
Flashpoint (°C):	Not available.

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY

Under Normal Conditions: Stable.

Under Fire Conditions: Not flammable.

Hazardous Polymerization: Will not occur.

Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition. Minimize air borne spreading of dust. Clean up immediately to eliminate slipping hazard. Decomposition will occur above 400 °C. Hygroscopic.

Materials to Avoid: Strong oxidizers. Lewis or mineral acids. Vigorous effervescence results on mixture with acids. Product can react explosively with: Magnesium, Sulphuric Acid, aluminum, lead, tin, Phosphorus Pentoxide. Silver Nitrate. Ammonia. Can react violently with red hot aluminum metal; fluorine gas; lithium and 2,4,6-trinitrotoluene. (3) Attacks some types of rubber, plastics and coatings.

Decomposition or Combustion Products: Thermal decomposition products are toxic and may include oxides of carbon, sodium and irritating gases.

11. TOXICOLOGICAL INFORMATION

TOXICOLOGICAL DATA:

SUBSTANCE	LD50 (Oral, Rat)	LD50 (Dermal, Rabbit)	LC50 (Inhalation, Rat, 4h)
Sodium Carbonate	2 800 - 4 090 mg/kg (1,4)	> 2 000 mg/kg (4)	1150 mg/m ³ (1,4)

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:	None known.
Other Studies Relevant to Material:	Sodium Carbonate: Excessive contact may produce "soda ulcers" on hand and perforation of the nasal septum. Sensitivity reactions may occur from prolonged and repeated exposure. (3)

12. ECOLOGICAL INFORMATION

Ecotoxicity:	Low acute toxicity to aquatic organisms.
Environmental Fate:	Not available. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals:	Neutralize carefully with weak acid to a pH of 6 to 9. Neutralization is expected to be exothermic. Vigorous effervescence results.
Waste Disposal Methods:	This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.
Safe Handling of Residues:	See "Waste Disposal Methods".
Disposal of Packaging:	Empty containers retain product residue and may be hazardous. Treat package in the same manner as the product. Dispose of waste material at an approved waste incineration facility in accordance with applicable local, provincial and federal regulations. Do not re-use empty container.

14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

This product is not regulated by TDG.

Label(s): Not applicable. Placard: Not applicable.

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

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

This product is not regulated by DOT.

Label(s): Not applicable. Placard: Not applicable.

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

15. REGULATORY INFORMATION

CANADA

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

CEPA - NPRI: Not included.

Controlled Products Regulations Classification (WHMIS):

D-2B: Toxic (eye irritant)

E: Corrosive

USA

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

OSHA HCS (29CFR 1910.1200): Eye Irritant.

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

HMIS: 2 Health, 0 Fire, 0 Reactivity (3)

INTERNATIONAL

Sodium Carbonate is found on the following inventories: EINECS (European Inventory of Existing Commercial Chemical Substances), Australia (ACQIN), Japan (MITI) and Korea (ECL).

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, 2011, American Conference of Governmental Industrial Hygienists, Cincinnati, 2011.
6. Regulatory Affairs Group, Brenntag Canada Inc.

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

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

Ontario: 43 Jutland Road, Toronto, ON, M8Z 2G6

Phone: (416) 259-8231 Facsimile: (416) 259-5333

Quebec: 2900 Jean Baptiste Des., Lachine, PQ, H8T 1C8

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

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

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

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

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 1 of 7

Sodium Nitrate

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : Sodium Nitrate

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: S25558B

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:



Oxidizing

Oxidizing solids, category 2



Irritant

Eye irritation, category 2A

Eye Irritation 2

HNOC: Combustible Dust

Oxidizing Solid 2

Signal word : Danger

Hazard statements:

May intensify fire; oxidizer

Causes serious eye irritation

Precautionary statements:

If medical advice is needed, have product container or label at hand

Keep out of reach of children

Read label before use

Keep away from heat/sparks/open flames/hot surfaces. No smoking

Keep wetted with ...

Wash ... thoroughly after handling

Wear protective gloves/protective clothing/eye protection/face protection

Do not eat, drink or smoke when using this product

In case of fire: Use ... for extinction

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

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 2 of 7

Sodium Nitrate

Combustible Dust Hazard: :

May form combustible dust concentrations in air (during processing).

Other Non-GHS Classification:

WHMIS



NFPA/HMIS



NFPA SCALE (0-4)

Health	2
Flammability	1
Physical Hazard	3
Personal Protection	X

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:

CAS 7631-99-4

Sodium Nitrate

>95 %

Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position. If breathing difficult, give oxygen. Remove to fresh air. Give artificial respiration if necessary. Seek immediate medical attention or advice.

After skin contact: Rinse area with water for 10-15 minutes. Seek immediate medical attention or advice.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned. Seek immediate medical attention or advice.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Seek immediate medical attention or advice. Have exposed individual drink sips of water or milk.

Most important symptoms and effects, both acute and delayed:

Nausea, Headache, Shortness of breath. Redness, tearing. Pain. Irritation, all routes of exposure; Prolonged exposure can lead to methemoglobinemia

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician. Note to physician: Treat symptomatically.

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 3 of 7

Sodium Nitrate

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: If in laboratory setting, follow laboratory fire suppression procedures. Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Combustion products may include carbon oxides or other toxic vapors. Thermal decomposition can lead to release of irritating gases and vapors. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible. Use spark-proof tools and explosion-proof equipment.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Transfer to a disposal or recovery container. Avoid contact with skin and eyes, and clothing. Use spark-proof tools and explosion-proof equipment. Use respiratory protective device against the effects of fumes/dust/aerosol. Keep unprotected persons away. Ensure adequate ventilation. Keep away from ignition sources. Protect from heat. Stop the spill, if possible. Contain spilled material by diking or using inert absorbent.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Do not allow this material to enter the environment..

Methods and material for containment and cleaning up:

If in a laboratory setting, follow Chemical Hygiene Plan procedures. Collect liquids using vacuum or by use of absorbents. Place into properly labeled containers for recovery or disposal. If necessary, use trained response staff/contractor. Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Clean up spills immediately. Always obey local regulations.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Minimize dust generation and accumulation. Wash hands after handling. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Follow good hygiene procedures when handling chemical materials. Do not eat, drink, smoke, or use personal products when handling chemical substances. If in a laboratory setting, follow Chemical Hygiene Plan. Use only in well ventilated areas. Avoid generation of dust or fine particulate. Avoid contact with eyes, skin, and clothing.

Conditions for safe storage, including any incompatibilities:

Store in a cool location. Avoid storage on wood floors. Provide ventilation for containers. Store away from foodstuffs. Store away from oxidizing agents. Store in cool, dry conditions in well sealed containers. Keep container tightly sealed. Store away from combustible materials. Protect from freezing and physical damage. Keep away from sources of ignition. Store protected from moisture and direct sunlight.

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 4 of 7

Sodium Nitrate

SECTION 8 : Exposure controls/personal protection



Control Parameters:

No applicable occupational exposure limits

Appropriate Engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or dusts (total/respirable) below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Use under a fume hood. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Respiratory protection:

Not required under normal conditions of use. Use suitable respiratory protective device when high concentrations are present. Use suitable respiratory protective device when aerosol or mist is formed. For spills, respiratory protection may be advisable.

Protection of skin:

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation being used/handled. Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation.

Eye protection:

Safety glasses with side shields or goggles.

General hygienic measures:

The usual precautionary measures are to be adhered to when handling chemicals. Keep away from food, beverages and feed sources. Immediately remove all soiled and contaminated clothing. Wash hands before breaks and at the end of work. Do not inhale gases/fumes/dust/mist/vapor/aerosols. Avoid contact with the eyes and skin.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	White solid	Explosion limit lower: Explosion limit upper:	Not determined Not determined
Odor:	Odorless	Vapor pressure:	Not determined
Odor threshold:	Not determined	Vapor density:	Not determined
pH-value:	5.5-8 5% aq. solution	Relative density:	Not determined
Melting/Freezing point:	306 C / 582.8 F	Solubilities:	Soluble in water
Boiling point/Boiling range:	380 C / 716 F	Partition coefficient (n-octanol/water):	Not determined
Flash point (closed cup):	Not determined	Auto/Self-ignition temperature:	Not determined

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 5 of 7

Sodium Nitrate

Evaporation rate:	Not determined	Decomposition temperature:	380 C
Flammability (solid,gaseous):	Not determined	Viscosity:	a. Kinematic:Not determined b. Dynamic: Not determined
Density: Not determined Specific Gravity: 2.2600 g/cm3			

SECTION 10 : Stability and reactivity

Reactivity: Oxidizer: Contact with combustible/organic material may cause fire.

Chemical stability: No decomposition if used and stored according to specifications.

Possible hazardous reactions: This material is an oxidizer; it greatly increases the burning rate of combustible materials. Reacts with acids to emit toxic nitrogen dioxide fumes. Contact with incompatibles may cause an explosion

Conditions to avoid: Combustible materials. Incompatible materials. Dust generation. Excess heat. Exposure to moist air or water

Incompatible materials: Strong acids. Fibrous organic material (jute, wood, paper, etc.) can become highly combustible by nitrate impregnation. Reducing agents, finely powdered metals, combustible materials, easily oxidizing materials, organic materials. : Reacts with acids to emit toxic nitrogen dioxide fumes. Strong bases. Boron phosphide. Cyanides. Barium rhodanide. Sodium thiosulfate. Sodium hypophosphite. Sulfur plus charcoal. Powdered aluminum and aluminum oxide

Hazardous decomposition products: Carbon oxides (CO, CO₂). Nitrogen oxides (NO_x). sodium oxides

SECTION 11 : Toxicological information

Acute Toxicity:		
Oral:	1267 mg/kg	LD50 (rat)
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Ocular:	Section 2	Classified as an eye irritant
Sensitization:	No additional information.	
Single Target Organ (STOT):	May cause adverse liver effects. May cause central nervous system depression	
Numerical Measures:	No additional information.	
Carcinogenicity:	May cause cancer. : Tumorigenic effects have been reported in experimental animals.	
Mutagenicity:	No additional information.	
Reproductive Toxicity:	Experiments have shown reproductive toxicity effects on laboratory animals.	

SECTION 12 : Ecological information

Ecotoxicity

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 6 of 7

Sodium Nitrate

Fish: LC50 (96h) L. macrochius: 2000 mg/L

Fish: LC50 (96h) O. mykiss : 994.4-1107 mg/L

Persistence and degradability: Readily degradable in the environment.

Bioaccumulative potential:

Mobility in soil:

Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Do not allow product to reach sewage system or open water. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Consult federal state/ provincial and local regulations regarding the proper disposal of waste material that may incorporate some amount of this product. Dilute with water and flush to sewer if regulations allow.

SECTION 14 : Transport information

UN-Number

1498

UN proper shipping name

Sodium Nitrate

Transport hazard class(es)



Class:

5.1 Oxidizing substances

Packing group:III

Environmental hazard:

Transport in bulk:

Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Reactive, Acute

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Safety Data Sheet

according to 29CFR1910/1200 and GHS Rev. 3

Effective date : 12.14.2014

Page 7 of 7

Sodium Nitrate

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

7631-99-4 Sodium nitrate

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. 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 applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

IMDG: International Maritime Code for Dangerous Goods

PNEC: Predicted No-Effect Concentration (REACH)

CFR: Code of Federal Regulations (USA)

SARA: Superfund Amendments and Reauthorization Act (USA)

RCRA: Resource Conservation and Recovery Act (USA)

TSCA: Toxic Substances Control Act (USA)

NPRI: National Pollutant Release Inventory (Canada)

DOT: US Department of Transportation

IATA: International Air Transport Association

GHS: Globally Harmonized System of Classification and Labelling of Chemicals

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

WHMIS: Workplace Hazardous Materials Information System (Canada)

DNEL: Derived No-Effect Level (REACH)

Effective date : 12.14.2014

Last updated : 03.19.2015

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 1 of 11

SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product identifier used on the label

: **Sulphuric Acid**

Product Code(s) : Not available.

Recommended use of the chemical and restrictions on use

: Reagent ;Chemical intermediate.
Use pattern: Professional Use Only
Recommended restrictions: None known.

Chemical family : Inorganic acid

Name, address, and telephone number
of the supplier:

Comet Chemical Company Ltd.

3463 Thomas Street

Innisfill, ON, Canada
L9S 3W4

Supplier's Telephone # : 705-436-5580

24 Hr. Emergency Tel # : TERRRAPURE ENVIRONMENTAL : 800-567-7455

Name, address, and telephone number of
the manufacturer:

Refer to supplier

SECTION 2. HAZARDS IDENTIFICATION

Classification of the chemical

Clear to cloudy liquid. Odorless.

This material is classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015).

Hazard classification :

Corrosive to metals: Category 1

Acute toxicity, inhalation - Category 2 (mist)

Eye damage/irritation: Category 1

Skin corrosion/irritation: Category 1

Note: This material also has the following additional Hazard classification according to U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015):
Hazards Not Otherwise Classified (HNOC) / Health Hazards Not Otherwise Classified - Category 1

Label elements

Hazard pictogram(s)



Signal Word

DANGER!

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 2 of 11

SAFETY DATA SHEET

Hazard statement(s)

May be corrosive to metals.
Fatal if inhaled.
Causes severe skin burns and eye damage.
Corrosive to the respiratory tract.

Precautionary statement(s)

Keep only in original container.
Wash thoroughly after handling.
Do not breathe mists.
Wear protective gloves/clothing and eye/face protection.
[In case of inadequate ventilation] wear respiratory protection.

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.
IF IN EYES: 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.
Absorb spillage to prevent material damage.

Store in corrosive resistant container with a resistant inner liner.
Store locked up.

Dispose of contents/container in accordance with local/regional/national/international regulations.

Other hazards

Other hazards which do not result in classification:

Ingestion may cause severe irritation to the mouth, throat and stomach. Contact with metals may release small amounts of flammable hydrogen gas. Prolonged skin contact may cause dermatitis (rash), characterized by red, dry, itching skin. Prolonged or repeated inhalation of fumes or vapours, may cause chronic lung effects, such as bronchitis, and tooth enamel erosion. Chronic skin contact with low concentrations may cause dermatitis.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Chemical name</u>	<u>Common name and synonyms</u>	<u>CAS #</u>	<u>Concentration (% by weight)</u>
Sulfuric acid	Battery acid; Hydrogen sulfate; Oil of vitriol	7664-93-9	92.0 - 98.0

SECTION 4. FIRST-AID MEASURES

Description of first aid measures

- | | |
|---------------------|---|
| <i>Ingestion</i> | : Do NOT induce vomiting. Have victim rinse mouth with water, then give one to two glasses of water to drink. Seek immediate medical attention/advice. Never give anything by mouth if victim is unconscious. |
| <i>Inhalation</i> | : Immediately remove person to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen by qualified medical personnel only. Seek immediate medical attention/advice. |
| <i>Skin contact</i> | : Take off all contaminated clothing immediately. Immediately flush skin with gently flowing, running water for at least 20 minutes. Do not rub area of contact. Cover wound with sterile dressing. Seek immediate medical attention/advice. Wash contaminated clothing before reuse. Leather and shoes that have been contaminated with the solution may need to be destroyed. |

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 3 of 11

SAFETY DATA SHEET

Eye contact : Immediately flush eyes with running water for at least 20 minutes. Protect unharmed eye. Seek immediate medical attention/advice.

Most important symptoms and effects, both acute and delayed

: May cause serious eye irritation or damage. Symptoms may include redness, pain, tearing and conjunctivitis. Direct skin contact may cause corrosive skin burns, deep ulcerations and possibly permanent scarring. May cause severe irritation and corrosive damage in the mouth, throat and stomach. Symptoms may include abdominal pain, vomiting, burns, perforations, bleeding and eventually death. Corrosive to the respiratory tract. Symptoms may include coughing, choking and wheezing. Could result in pulmonary edema (fluid accumulation). Symptoms of pulmonary edema (chest pain, shortness of breath) may be delayed. Prolonged or repeated inhalation of fumes or vapours, may cause chronic lung effects, such as bronchitis, and tooth enamel erosion.

Indication of any immediate medical attention and special treatment needed

: Immediate medical attention is required. Causes burns. Treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media

: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Use water with caution. Contact with water will generate considerable heat.

Unsuitable extinguishing media

: Do not use a solid water stream as it may scatter and spread fire.

Special hazards arising from the substance or mixture / Conditions of flammability

: Not considered flammable. Burning produces obnoxious and toxic fumes. Contact with metals may release small amounts of flammable hydrogen gas. Reacts violently with a wide variety of organic and inorganic chemicals including alcohol, carbides, chlorates, picrates, nitrates and metals. Contact with water will generate considerable heat.

Flammability classification (OSHA 29 CFR 1910.106)

: Non-flammable.

Hazardous combustion products

: Sulphur oxides. Carbon dioxide and carbon monoxide. Oxygen.

Special protective equipment and precautions for firefighters

Protective equipment for fire-fighters

: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Special fire-fighting procedures

: Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. A full-body chemical resistant suit should be worn. Move containers from fire area if safe to do so. Water spray may be useful in cooling equipment exposed to heat and flame. Dike for water control. Do not allow run-off from fire fighting to enter drains or water courses.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

: All persons dealing with clean-up should wear the appropriate protective equipment including self-contained breathing apparatus. Keep all other personnel upwind and away from the spill/release. Restrict access to area until completion of clean-up. Refer to Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION, for additional information on acceptable personal protective equipment.

Environmental precautions : Do not allow material to contaminate ground water system. For large spills, dike the area to prevent spreading.

Methods and material for containment and cleaning up



Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 4 of 11

SAFETY DATA SHEET

- : Remove all sources of ignition. Ventilate area of release. Stop spill or leak at source if safely possible. Dike for water control. Neutralize with sodium bicarbonate or a mixture of soda ash/slaked lime. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g. sand), then place absorbent material into a container for later disposal (see Section 13). Contact the proper local authorities.

Special spill response procedures

- : If a spill/release in excess of the EPA reportable quantity is made into the environment, immediately notify the national response center in the United States (phone: 1-800-424-8802).

US CERCLA Reportable quantity (RQ): Sulfuric acid (1000 lbs / 454 kg)

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling

- : Use in a well-ventilated area. Wear protective gloves/clothing and eye/face protection. See Section 8 for additional personal protection advice when handling this product. Do not ingest. Avoid breathing vapour or mist. Avoid contact with skin, eyes and clothing. Keep away from extreme heat and flame. Keep away from bases, metals and other incompatibles. Keep container tightly closed when not in use. Keep only in original container. Wash thoroughly after handling. During preparation or dilution, always add liquid slowly to water and with constant stirring.

- Conditions for safe storage** : Store in a cool, dry, well-ventilated area. Store locked up. Store away from incompatibles and out of direct sunlight. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Inspect periodically for damage or leaks. Store in corrosion-resistant containers. Keep only in original container.

- Incompatible materials** : Strong oxidizing agents; Metals (e.g. Aluminum, brass, copper); Alkalies; Aldehydes ; Reducing agents; Water; Organic materials; Acids Chlorate .

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:

<u>Chemical Name</u>	<u>ACGIH TLV</u>		<u>OSHA PEL</u>	
	<u>TWA</u>	<u>STEL</u>	<u>PEL</u>	<u>STEL</u>
Sulfuric acid	0.2 mg/m ³ (thoracic fraction)	N/Av	1 mg/m ³	N/Av

Exposure controls

Ventilation and engineering measures

- : Use general or local exhaust ventilation to maintain air concentrations below recommended exposure limits.

- Respiratory protection** : If the TLV is exceeded, a NIOSH/MSHA-approved respirator is advised. Confirmation of which type of respirator is most suitable for the intended application should be obtained from respiratory protection suppliers. Respirators should be selected based on the form and concentration of contaminants in air, and in accordance with OSHA (29 CFR 1910.134) or CSA Z94.4-02.

- Skin protection** : Wear chemically protective gloves (impervious), boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Wear impervious gloves, such as butyl rubber. Unsuitable material: polyvinyl alcohol. Advice should be sought from glove suppliers.

- Eye / face protection** : Chemical splash goggles must be worn when handling this material. A full face shield may also be necessary.

- Other protective equipment** : Other equipment may be required depending on workplace standards. An eyewash station and safety shower should be made available in the immediate working area.

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 5 of 11

SAFETY DATA SHEET

General hygiene considerations

- : Do not breathe mist or vapor. Avoid contact with skin, eyes and clothing. Do not eat, drink, smoke or use cosmetics while working with this product. Upon completion of work, wash hands before eating, drinking, smoking or use of toilet facilities. Remove and wash contaminated clothing before re-use. Do not take contaminated clothing home.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Clear, oily, colourless liquid

Odour : Odorless.

Odour threshold : 1mg/m³

pH : <0.5

Melting/Freezing point : -40°C (-40°F)

Initial boiling point and boiling range

: 102°C (215.6°F)

Flash point : Not applicable.

Flashpoint (Method) : Not applicable.

Evaporation rate (BuAe = 1) : Slower than ether.

Flammability (solid, gas) : Not applicable.

Lower flammable limit (% by vol.)

: Not applicable.

Upper flammable limit (% by vol.)

: Not applicable.

Oxidizing properties : None known.

Explosive properties : Not explosive

Vapour pressure : <0.002 mmHg @75°F

Vapour density : 3.4

Relative density / Specific gravity

: 1.84

Solubility in water : Soluble

Other solubility(ies) : None known.

Partition coefficient: n-octanol/water or Coefficient of water/oil distribution

: N/Av

Auto-ignition temperature : N/Av

Decomposition temperature : 340°C (644°F)

Viscosity : N/Av

Volatiles (% by weight) : Not available.

Volatile organic Compounds (VOC's)

: Not available.

Absolute pressure of container

: N/Av

Flame projection length : N/Av

Other physical/chemical comments

: None.

SECTION 10. STABILITY AND REACTIVITY

Reactivity : Contact with metals may release small amounts of flammable hydrogen gas. Corrosive in contact with metals Avoid contact with incompatible materials. Contact with water will generate considerable heat. Reacts vigorously, violently or explosively with many organic and inorganic chemicals, such as strong acids, acid chlorides, acid anhydrides, ketones, glycols, and organic peroxides.

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 6 of 11

SAFETY DATA SHEET

- Chemical stability** : Stable under the recommended storage and handling conditions prescribed.
- Possibility of hazardous reactions** : Hazardous polymerization does not occur. Contact with metals may release small amounts of flammable hydrogen gas.
- Conditions to avoid** : Avoid heat and open flame. Ensure adequate ventilation, especially in confined areas. Avoid contact with incompatible materials.
- Incompatible materials** : Strong oxidizing agents; Metals (e.g. Aluminum, brass, copper); Alkalies; Aldehydes ; Reducing agents; Water; Organic materials; Acids Chlorate .
- Hazardous decomposition products** : Decomposes at 340 deg C into sulfur trioxide and water.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure:

Routes of entry inhalation : YES

Routes of entry skin & eye : YES

Routes of entry Ingestion : YES

Routes of exposure skin absorption

: NO

Potential Health Effects:

Signs and symptoms of short-term (acute) exposure

Sign and symptoms Inhalation

- : Fatal if inhaled. Inhalation of high concentrations of fumes or mists may cause severe irritation and corrosive damage to the nose, throat and upper respiratory tract. Symptoms may include coughing, choking and wheezing. Could result in pulmonary edema (fluid accumulation). Symptoms of pulmonary edema (chest pain, shortness of breath) may be delayed.

Sign and symptoms ingestion

- : May be harmful if swallowed. May cause severe irritation and corrosive damage in the mouth, throat and stomach. Symptoms may include abdominal pain, vomiting, burns, perforations, bleeding and eventually death.

Sign and symptoms skin

- : This material is classified as hazardous under OSHA regulations (29CFR 1910.1200) (Hazcom 2012). Classification: Skin corrosion/irritation: Category 1 Causes severe skin burns and eye damage. Direct skin contact may cause corrosive skin burns, deep ulcerations and possibly permanent scarring.

Sign and symptoms eyes

- : This material is classified as hazardous under OSHA regulations (29CFR 1910.1200) (Hazcom 2012). Classification: Eye damage/irritation: Category 1 Causes serious eye damage. Symptoms may include severe pain, tearing, redness, swelling and blurred vision. Contact may lead to permanent injury and blindness.

Potential Chronic Health Effects

- : Chronic skin contact with low concentrations may cause dermatitis. Prolonged or repeated inhalation of fumes or vapours, may cause chronic lung effects, such as bronchitis, and tooth enamel erosion.

Mutagenicity

- : Not expected to be mutagenic in humans.

Carcinogenicity

- : This material is not classified as hazardous under U.S. OSHA regulations (29CFR 1910.1200) (Hazcom 2012) and Canadian WHMIS regulations (Hazardous Products Regulations) (WHMIS 2015). Strong inorganic acid mist containing sulfuric acid is classified as a Group 1 Human Carcinogen by the IARC. However, this classification does not apply to liquid forms of sulfuric acid.

Reproductive effects & Teratogenicity

- : Not expected to cause reproductive effects.



Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 7 of 11

SAFETY DATA SHEET

Sensitization to material : Not expected to be a skin or respiratory sensitizer.
Specific target organ effects : Target Organs:: Eyes, skin, respiratory system and digestive system.

This material is classified as hazardous under OSHA regulations (29CFR 1910.1200) (Hazcom 2012). Classification: Hazards Not Otherwise Classified (HNOC) / Health Hazards Not Otherwise Classified :Category 1 Corrosive to the respiratory tract.

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Medical conditions aggravated by overexposure

: Pre-existing skin, eye and respiratory disorders.

Synergistic materials

: Not available.

Toxicological data

: See below for toxicological data on the substance.

The calculated ATE values for this mixture are:

ATE inhalation (mists) = 0.43 mg/L

<u>Chemical name</u>	<u>LC₅₀(4hr)</u>	<u>LD₅₀</u>	
	<u>inh, rat</u>	<u>(Oral, rat)</u>	<u>(Rabbit, dermal)</u>
Sulfuric acid	0.375mg/L	2140 mg/kg	N/Av

Other important toxicological hazards

: None known or reported by the manufacturer.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity : Because of the low pH of this product, it would be expected to produce significant ecotoxicity upon exposure to aquatic organisms and aquatic systems. The product should not be allowed to enter drains or water courses, or be deposited where it can affect ground or surface waters.

Ecotoxicity data:

<u>Ingredients</u>	<u>CAS No</u>	<u>Toxicity to Fish</u>		
		<u>LC50 / 96h</u>	<u>NOEC / 21 day</u>	<u>M Factor</u>
Sulfuric acid	7664-93-9	N/Av	N/Av	None.

<u>Ingredients</u>	<u>CAS No</u>	<u>Toxicity to Daphnia</u>		
		<u>EC50 / 48h</u>	<u>NOEC / 21 day</u>	<u>M Factor</u>
Sulfuric acid	7664-93-9	N/Av	N/Av	None.

<u>Ingredients</u>	<u>CAS No</u>	<u>Toxicity to Algae</u>		
		<u>EC50 / 96h or 72h</u>	<u>NOEC / 96h or 72h</u>	<u>M Factor</u>
Sulfuric acid	7664-93-9	>100mg/L(Green algae)	N/Av	None.

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 8 of 11

SAFETY DATA SHEET

Persistence and degradability

: Biodegradation is not applicable to inorganic materials.

Bioaccumulation potential

: No data is available on the product itself.

<u>Components</u>	<u>Partition coefficient n-octanol/water (log Kow)</u>	<u>Bioconcentration factor (BCF)</u>
Sulfuric acid (CAS 7664-93-9)	N/Ap	no bioaccumulation

Mobility in soil : No data is available on the product itself.

Other Adverse Environmental effects

: No additional information.

SECTION 13. DISPOSAL CONSIDERATIONS

Handling for Disposal

: Handle waste according to recommendations in Section 7. Empty containers retain residue (liquid and/or vapour) and can be dangerous.





Methods of Disposal

: Dispose in accordance with all applicable federal, state, provincial and local regulations.

RCRA

: If this product, as supplied, becomes a waste in the United States, it may meet the criteria of a hazardous waste as defined under RCRA, Title 40 CFR 261. It is the responsibility of the waste generator to determine the proper waste identification and disposal method. For disposal of unused or waste material, check with local, state and federal environmental agencies.

SECTION 14. TRANSPORTATION INFORMATION

Regulatory Information	UN Number	UN proper shipping name	Transport hazard class(es)	Packing Group	Label
49CFR/DOT	UN1830	SULFURIC ACID ; or SULPHURIC ACID	8	II	
49CFR/DOT Additional information	May be shipped as a limited quantity in receptacles not exceeding 1.0 Liters, according to 49 CFR 173.154.				
TDG	UN1830	SULPHURIC ACID	8	II	
TDG Additional information	May be shipped as LIMITED QUANTITY when transported in containers no larger than 1.0 Litre, in packages not exceeding 30 kg gross mass.				
ICAO/IATA	UN1830	Sulphuric acid	8	II	
ICAO/IATA Additional information	Refer to ICAO/IATA Packing Instruction				
IMDG	UN1830	SULFURIC ACID or SULPHURIC ACID	8	II	
IMDG Additional information	May be shipped as a limited quantity. Consult the IMDG regulations for more information.				

Special precautions for user : None known.



Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 9 of 11

SAFETY DATA SHEET

Environmental hazards : See ECOLOGICAL INFORMATION, Section 12.
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
: Not applicable.

SECTION 15 - REGULATORY INFORMATION

US Federal Information:

Components listed below are present on the following U.S. Federal chemical lists:

<u>Ingredients</u>	CAS #	TSCA Inventory	CERCLA Reportable Quantity(RQ) (40 CFR 117.302):	SARA TITLE III: Sec. 302, Extremely Hazardous Substance, 40 CFR 355:	SARA TITLE III: Sec. 313, 40 CFR 372, Specific Toxic Chemical	de minimus Concentration
Sulfuric acid	7664-93-9	Yes	1000 lb/ 454 kg	1000 lb TPQ	Yes	1%

SARA TITLE III: Sec. 311 and 312, SDS Requirements, 40 CFR 370 Hazard Classes: Acute Health Hazard.

Under SARA Sections 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are 500 pounds for the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

US State Right to Know Laws:

The following chemicals are specifically listed by individual States:

<u>Ingredients</u>	CAS #	California Proposition 65		State "Right to Know" Lists					
		Listed	Type of Toxicity	CA	MA	MN	NJ	PA	RI
Sulfuric acid	7664-93-9	No	N/Ap	Yes	Yes	Yes	Yes	Yes	Yes

Canadian Information:

Canadian Environmental Protection Act (CEPA) information: All ingredients listed appear on the Domestic Substances List (DSL).

WHMIS information: Refer to Section 2 for a WHMIS Classification for this product.

International Information:

Components listed below are present on the following International Inventory list:

<u>Ingredients</u>	CAS #	European EINECS	Australia AICS	Philippines PICCS	Japan ENCS	Korea KECI/KECL	China IECSC	NewZealand IOC
Sulfuric acid	7664-93-9	231-639-5	Present	Present	(1)-724; (1)-430	KE-32570	Present	HSR001572, HSR001573, HSR001588 (dilution)

SECTION 16. OTHER INFORMATION

Legend : ACGIH: American Conference of Governmental Industrial Hygienists
CA: California
CAS: Chemical Abstract Services
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 10 of 11

SAFETY DATA SHEET

of 1980
CFR: Code of Federal Regulations
DOT: Department of Transportation
EPA: Environmental Protection Agency
HMIS: Hazardous Materials Identification System
HSDB: Hazardous Substances Data Bank
IARC: International Agency for Research on Cancer
Inh: Inhalation
IUCID: International Uniform Chemical Information Database
MA: Massachusetts
MN: Minnesota
MSHA: Mine Safety and Health Administration
N/Ap: Not Applicable
N/Av: Not Available
NFPA: National Fire Protection Association
NIOSH: National Institute of Occupational Safety and Health
NJ: New Jersey
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PA: Pennsylvania
PEL: Permissible exposure limit
RCRA: Resource Conservation and Recovery Act
RI: Rhode Island
RTECS: Registry of Toxic Effects of Chemical Substances
SARA: Superfund Amendments and Reauthorization Act
STEL: Short Term Exposure Limit
TDG: Canadian Transportation of Dangerous Goods Act & Regulations
TLV: Threshold Limit Values
TWA: Time Weighted Average
WHMIS: Workplace Hazardous Materials Identification System

References :

1. ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices for 2015.
2. Canadian Centre for Occupational Health and Safety, CCInfoWeb Databases, 2016 (Chempendium, RTECs, HSDB, INCHEM).
3. IARC Monographs. Overall Evaluation of Carcinogenicity
4. Material Safety Data Sheet from manufacturer.
5. OECD - The Global Portal to Information on Chemical Substances - eChemPortal, 2015.
6. California Proposition 65 List

Preparation Date (mm/dd/yyyy)

: 01/29/2016

Other special considerations for handling

: Provide adequate information, instruction and training for operators.

Prepared for:

Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON L9S 3W4
Information (M-F 8:00-5:00): 705-436-5580
www.cometchemical.com



Prepared by:

ICC The Compliance Center Inc.
Telephone: (888) 442-9628 (U.S.): (888) 977-4834 (Canada)
<http://www.thecompliancecenter.com>





Comet Chemical Company Ltd.
3463 Thomas Street
Innisfill, ON, Canada, L9S 3W4
Telephone: (705) 436 5580

Sulphuric Acid

SDS Preparation Date (mm/dd/yyyy): 01/29/2016

Page 11 of 11

SAFETY DATA SHEET

DISCLAIMER

This Safety Data Sheet was prepared by ICC The Compliance Center Inc using information provided by / obtained from Comet Chemical Company Ltd. and CCOHS' Web Information Service. The information in the Safety Data Sheet is offered for your consideration and guidance when exposed to this product. ICC The Compliance Center Inc and Comet Chemical Company Ltd. expressly disclaim all expressed or implied warranties and assume no responsibilities for the accuracy or completeness of the data contained herein. The data in this SDS does not apply to use with any other product or in any other process.

This Safety Data Sheet may not be changed, or altered in any way without the expressed knowledge and permission of ICC The Compliance Center Inc and Comet Chemical Company Ltd.

END OF DOCUMENT

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifier**

- | | |
|---------------------|--|
| - Trade name | SODIUM SULFIDE - FLAKES 60-62 % |
| - Chemical name | Disodium sulfide |
| - Synonyms | SODIUM SULFIDE HYDRATED |
| - Molecular formula | Na ₂ S xH ₂ O; x >= 2,66 |

1.2 Relevant identified uses of the substance or mixture and uses advised against**Uses of the Substance / Mixture**

- Chemical industry
- Waste treatment
- Water treatment
- De-hairing agent
- Textile industry
- Manufacture of pulp, paper and paper products

Uses advised against

- none

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

SOLVAY FLUORIDES, LLC
3737 Buffalo Speedway,
Suite 800,
Houston, TX 77098
USA
Tel: 800-515-6065

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CONTACT CHEMTREC (24-Hour Number): 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although OSHA has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects.

2.1 Classification of the substance or mixture**HCS 2012 (29 CFR 1910.1200)**

Corrosive to Metals, Category 1
Acute toxicity, Category 3
Skin corrosion, Category 1B
Serious eye damage, Category 1

H290: May be corrosive to metals.
H301: Toxic if swallowed.
H314: Causes severe skin burns and eye damage.
H318: Causes serious eye damage.

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

2.2 Label elements**HCS 2012 (29 CFR 1910.1200)****Pictogram****Signal Word**

- Danger

Hazard Statements

- H290 May be corrosive to metals.
- H301 Toxic if swallowed.
- H314 Causes severe skin burns and eye damage.

Precautionary Statements**Prevention**

- P234 Keep only in original container.
- P260 Do not breathe dusts or mists.
- P264 Wash skin thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response

- P301 + P310 + P330 IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
- 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 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
- P305 + P351 + P338 + P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
- P363 Wash contaminated clothing before reuse.
- P390 Absorb spillage to prevent material damage.

Storage

- P405 Store locked up.
- P406 Store in corrosive resistant container with a resistant inner liner.

Disposal

- P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards which do not result in classification

- H400: Very toxic to aquatic life.

SECTION 3: Composition/information on ingredients**3.1 Substance**

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

Hazardous Ingredients and Impurities

Chemical name	Identification number CAS-No.	Concentration [%]
Disodium sulfide (hydrate)	27610-45-3	$\geq 90 - < 95$
Sodium hydrogensulfide (hydrate)	207683-19-0	$\geq 5 - < 10$
Carbonic acid sodium salt (1:2)	497-19-8	$\geq 1 - < 5$
Thiosulfuric acid (H ₂ S ₂ O ₃), sodium salt (1:2)	7772-98-7	$\geq 1 - < 5$

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

3.2 Mixture

Not applicable, this product is a substance.

SECTION 4: First aid measures**4.1 Description of first-aid measures****In case of inhalation**

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

In case of skin contact

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

In case of eye contact

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

In case of ingestion

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

4.2 Most important symptoms and effects, both acute and delayed**In case of inhalation****Symptoms**

P01000021638

Version : 1.08 / US (Z)

www.solvay.com



SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

- At high concentrations:
- slight irritation

Effects

- No hazards to be specially mentioned.

In case of skin contact**Symptoms**

- Redness
- Swelling of tissue
- Burn

Effects

- Corrosive

In case of eye contact**Symptoms**

- Redness
- Lachrymation
- Swelling of tissue
- Burn

Effects

- May cause irreversible eye damage.
- May cause blindness.

In case of ingestion**Symptoms**

- Nausea
- Abdominal pain
- Bloody vomiting
- Diarrhea
- Suffocation
- Cough
- Severe shortness of breath

Effects

- If ingested, severe burns of the mouth and throat, as well as a danger of perforation of the esophagus and the stomach.

4.3 Indication of any immediate medical attention and special treatment needed

- no data available

SECTION 5: Firefighting measures**Flash point**

Not applicable, inorganic

Autoignition temperature

> 806 °F (> 430 °C)

Flammability / Explosive limit

No data available

5.1 Extinguishing media**Suitable extinguishing media**

- Foam

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

- powder

Unsuitable extinguishing media

- Water
- Carbon dioxide (CO₂)

5.2 Special hazards arising from the substance or mixture**Specific hazards during fire fighting**

- Not combustible.
- Hazardous decomposition products

Hazardous combustion products:

- Sulfur oxides

5.3 Advice for firefighters**Special protective equipment for fire-fighters**

- Exposure to decomposition products may be a hazard to health.
- In the event of fire, wear self-contained breathing apparatus.
- Use personal protective equipment.
- Wear chemical resistant oversuit
- Cool containers/tanks with water spray.
- Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures****Advice for emergency responders**

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

Advice for non-emergency personnel

- Prevent further leakage or spillage if safe to do so.

Advice for non-emergency personnel

- Sweep up to prevent slipping hazard.
- Avoid dust formation.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

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

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

SECTION 7: Handling and storage**7.1 Precautions for safe handling**

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

Hygiene measures

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

7.2 Conditions for safe storage, including any incompatibilities**Technical measures/Storage conditions**

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

Packaging material**Suitable material**

- Steel drum
- Polyethylene

7.3 Specific end use(s)

- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters**Components with workplace occupational exposure limits**

Ingredients	Value type	Value	Basis
Carbonic acid sodium salt (1:2)	TWA	10 mg/m3	Solvay Acceptable Exposure Limit

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

8.2 Exposure controls**Control measures****Engineering measures**

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

Individual protection measures**Respiratory protection**

- In case of insufficient ventilation, wear suitable respiratory equipment.
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- In case of decomposition (see section 10), face mask with combined type B-P3 cartridge.
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.

Hand protection

- chemical resistant gloves

Suitable material

- PVC
- Neoprene
- Natural Rubber

Eye protection

- Goggles

Skin and body protection

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

Hygiene measures

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

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties**Appearance**

Form: flakes
Physical state: solid
Color: yellow
Particle size: 3,500 µm
d 50

Odor

odorless rotten-egg like slight

Odor Threshold

No data available

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

<u>Molecular weight</u>	132.09 g/mol
<u>pH</u>	12.9 (1 %) 13.1 saturated aqueous solution
<u>Melting point/freezing point</u>	<u>Melting point/range:</u> 156 - 199 °F (69 - 93 °C) (ca. 747.81 mmHg (997 hPa))
<u>Initial boiling point and boiling range</u>	<u>Boiling point/boiling range:</u> Not applicable
<u>Flash point</u>	Not applicable, inorganic
<u>Evaporation rate (Butylacetate = 1)</u>	Not applicable, inorganic
<u>Flammability (solid, gas)</u>	The product is not flammable.
<u>Flammability / Explosive limit</u>	<u>Explosiveness:</u> Not explosive
<u>Autoignition temperature</u>	> 806 °F (> 430 °C)
<u>Vapor pressure</u>	Not applicable, inorganic
<u>Vapor density</u>	Not applicable, inorganic
<u>Density</u>	
<u>Relative density</u>	1.64 (70 °F (21 °C))
<u>Solubility</u>	<u>Water solubility:</u> 178 g/l (68 °F (20 °C)) <u>Solubility in other solvents:</u> Alcohol : slightly soluble
<u>Partition coefficient: n-octanol/water</u>	Not applicable, inorganic
<u>Decomposition temperature</u>	Not applicable
<u>Viscosity</u>	<u>Viscosity, dynamic :</u> Solid form, Not applicable
<u>Explosive properties</u>	No data available
<u>Oxidizing properties</u>	Not considered as oxidizing.

9.2 Other information

<u>Corrosion of Metals</u>	Corrosive to metals
-----------------------------------	---------------------

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

SECTION 10: Stability and reactivity**10.1 Reactivity**

- Contact with acids liberates toxic gas.

10.2 Chemical stability

- Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

- Corrosive in contact with metals, Contact with acids liberates toxic gas.

10.4 Conditions to avoid

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

10.5 Incompatible materials

- Carbon dioxide (CO₂)
- Acids
- Oxidizing agents
- Metals

10.6 Hazardous decomposition products

- Sulfur oxides
- Hydrogen sulfide (H₂S)

SECTION 11: Toxicological information**11.1 Information on toxicological effects****Acute toxicity****Acute oral toxicity**

Disodium sulfide (hydrate)

LD50 : 246 mg/kg - Rat , male and female

Method: OECD Test Guideline 401

This product is classified as acute toxicity category 3

Acute inhalation toxicity

Corrosive to the respiratory tract.

Acute dermal toxicity

Disodium sulfide (hydrate)

study scientifically unjustified

Acute toxicity (other routes of administration)

No data available

Skin corrosion/irritation

Disodium sulfide (hydrate)

Corrosive

Serious eye damage/eye irritation

Disodium sulfide (hydrate)

Corrosive

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

Respiratory or skin sensitization

Disodium sulfide (hydrate) study scientifically unjustified

Mutagenicity**Genotoxicity in vitro**

Disodium sulfide (hydrate)

Ames test
with and without metabolic activation

negative
Method: OECD Test Guideline 471

Gene mutation assays in mammalian cells.
Strain: mouse lymphoma cells
with and without metabolic activation

negative
Method: OECD Test Guideline 476

Genotoxicity in vivo

Disodium sulfide (hydrate)

In vivo micronucleus test - Mouse
male and female
Intraperitoneal route
Method: OECD Test Guideline 474

negative

Carcinogenicity

No data available

This product does not contain any ingredient designated as probable or suspected human carcinogens by:

NTP
IARC
OSHA

Toxicity for reproduction and development**Toxicity to reproduction / fertility**

Disodium sulfide (hydrate)

By analogy

Reproduction / developmental toxicity screening test - Rat, male and female
Inhalation
Fertility NOAEL Parent: 80 ppm
Method: OECD Test Guideline 421
Test substance, Hydrogen sulfide

Developmental Toxicity/Teratogenicity

Disodium sulfide (hydrate)

By analogy

Inhalation
Teratogenicity NOAEL: 80ppm
Method: OECD Test Guideline 421
Test substance, Hydrogen sulfide

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

STOT**STOT-single exposure**

Disodium sulfide (hydrate)

The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.

STOT-repeated exposure

Disodium sulfide (hydrate)

The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.

Disodium sulfide (hydrate)

By analogy

- Rat

- Mouse

Inhalation (vapor) 90-day , male and female

NOAEC: 80 ppm(m)

Test substance: Hydrogen sulfide

Experience with human exposure

No data available

Aspiration toxicity

No data available

SECTION 12: Ecological information**12.1 Toxicity****Aquatic Compartment****Acute toxicity to fish**

Disodium sulfide (hydrate)

LC50 - 96 h : 0.0027 mg/l - Fish

Test substance: Hydrogen sulfide

By analogy

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

Acute toxicity to daphnia and other aquatic invertebrates.

Disodium sulfide (hydrate) EC50 - 96 h : 0.02 mg/l - Crustaceans
 Test substance: Hydrogen sulfide
 Fresh water
 By analogy

EC50 - 96 h : 0.032 mg/l - Crustaceans
 Test substance: Hydrogen sulfide
 salt water
 By analogy

Toxicity to aquatic plants

Disodium sulfide (hydrate) EC50 - 120 h : 1,900 mg/l
 Analytical monitoring: yes
 Fresh water
 By analogy

EC50 - 4 h : 0.104 mg/l - Skeletonema costatum (marine diatom)
 Analytical monitoring: yes
 salt water
 By analogy

Toxicity to microorganisms

No data available

Chronic toxicity to fish

Disodium sulfide (hydrate) NOEC: 0.0046 mg/l - 826 Days - Lepomis macrochirus (Bluegill sunfish)
 Test substance: Hydrogen sulfide
 By analogy

Chronic toxicity to daphnia and other aquatic invertebrates.

No data available

Chronic Toxicity to aquatic plants

No data available

M-Factor

Disodium sulfide (hydrate) Acute aquatic toxicity = 100
 (according to the Globally Harmonized System (GHS))

12.2 Persistence and degradability**Abiotic degradation**

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

Stability in water

Disodium sulfide (hydrate)

Water, Soil, complexation/precipitation of inorganic and organic materials
Water, Soil, Oxidation, Degradation products:, sulfates**Photodegradation**

Disodium sulfide (hydrate)

Chemical degradation
Half-life (direct photolysis): 1 h
Sensitizer: sensitizer: OH/O3 radicals
Degradat. indirect photolysis: 0.6 - 2 %
Test substance: Hydrogen sulfide
Air
Degradation products:
Sulphur dioxide
sulfates
Sulfides**Physical- and photo-chemical
elimination**

No data available

Biodegradation**Biodegradability**aerobic
Method: Oxidation
Test substance: Sulfides
Degradation products:
sulfites
sulfates

anaerobic
Method: biodegradation by sulforeduction
Test substance: sulfates
Degradation products:
Hydrogen sulfide

anaerobic
Method: methanogenesis
Test substance: sulfates
Inhibitor**Degradability assessment**

Not applicable, inorganic substance

12.3 Bioaccumulative potential**Partition coefficient: n-
octanol/water**

Not applicable, inorganic substance

Bioconcentration factor (BCF)

Disodium sulfide (hydrate)

Not potentially bioaccumulable

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

12.4 Mobility in soil**Adsorption potential (Koc)**

Disodium sulfide (hydrate)

Water/soil
considerable solubility and mobilityAir
mobility as solid aerosols**Known distribution to environmental compartments**

No data available

12.5 Results of PBT and vPvB assessment

Not applicable

12.6 Other adverse effects

No data available

Remarks

Very toxic to aquatic organisms., Product fate is highly dependent on environmental conditions: pH, temperature, redox potential, mineral and organic content of the medium ,...

SECTION 13: Disposal considerations**13.1 Waste treatment methods****Product Disposal**

- In accordance with local and national regulations.
- Where possible recycling is preferred to disposal or incineration.
- Use an FeCl₃ solution to precipitate FeS.
- Filtrate the product and send the cake to a landfill for industrial waste.

Waste Code

- Environmental Protection Agency
- Hazardous Waste – YES
- Environmental Protection Agency
- Hazardous Waste – YES
- RCRA Hazardous Waste (40 CFR 302)
- D003 - Reactive waste – (R)
- RCRA Hazardous Waste (40 CFR 302)
- D002 - Corrosive waste – (C)
- D003 - Reactive waste – (R)

Advice on cleaning and disposal of packaging

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

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.

The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

DOT

14.1 UN number	UN 1849
14.2 Proper shipping name	SODIUM SULFIDE, HYDRATED
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	153
14.5 Environmental hazards	YES
Marine pollutant	Marine Pollutant

TDG

14.1 UN number	UN 1849
14.2 Proper shipping name	SODIUM SULFIDE, HYDRATED
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	153
14.5 Environmental hazards	YES
Marine pollutant	Marine Pollutant

NOM

14.1 UN number	UN 1849
14.2 Proper shipping name	SODIUM SULPHIDE, HYDRATED
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
ERG No	153
14.5 Environmental hazards	YES
Marine pollutant	

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

IMDG

14.1 UN number	UN 1849
14.2 Proper shipping name	SODIUM SULPHIDE, HYDRATED
14.3 Transport hazard class	8
Label(s)	8
14.4 Packing group	
Packing group	II
14.5 Environmental hazards	YES
Marine pollutant	
14.6 Special precautions for user	
EmS	F-A , S-B

For personal protection see section 8.

IATA

14.1 UN number	UN 1849
14.2 Proper shipping name	SODIUM SULPHIDE, HYDRATED
14.3 Transport hazard class	8
Label(s):	8
14.4 Packing group	
Packing group	II
Packing instruction (cargo aircraft)	863
Max net qty / pkg	50.00 kg
Packing instruction (passenger aircraft)	859
Max net qty / pkg	15.00 kg
14.5 Environmental hazards	YES
14.6 Special precautions for user	
For personal protection see section 8.	

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

SECTION 15: Regulatory information**15.1 Notification status**

Inventory Information	Status
United States TSCA Inventory	- Listed on Inventory
Mexico INSQ (INSQ)	- Listed on Inventory - Anhydrous form
Canadian Domestic Substances List (DSL)	- Listed on Inventory
New Zealand. Inventory of Chemical Substances	- Listed on Inventory - Anhydrous form
Australia Inventory of Chemical Substances (AICS)	- Listed on Inventory
Japan. CSCL - Inventory of Existing and New Chemical Substances	- Listed on Inventory
Korea. Korean Existing Chemicals Inventory (KECI)	- Listed on Inventory
China. Inventory of Existing Chemical Substances in China (IECSC)	- Listed on Inventory
Philippines Inventory of Chemicals and Chemical Substances (PICCS)	- Listed on Inventory
EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)	- If product is purchased from Solvay in Europe it is in compliance with REACH, if not please contact the supplier.

15.2 Federal Regulations**US. EPA EPCRA SARA Title III****SARA HAZARD DESIGNATION SECTIONS 311/312 (40 CFR 370)**

Corrosive to Metals	Yes
Acute toxicity (any route of exposure)	Yes
Skin corrosion or irritation	Yes
Serious eye damage or eye irritation	Yes

The categories not mentioned are not relevant for the product.

Section 313 Toxic Chemicals (40 CFR 372.65)

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.

Section 302 Emergency Planning Extremely Hazardous Substance Threshold Planning Quantity (40 CFR 355)

This material does not contain any components with a section 302 EHS TPQ.

Section 302 Emergency Planning Extremely Hazardous Substance Reportable Quantity (40 CFR 355)

This material does not contain any components with a SARA 302 RQ.

Section 304 Emergency Release Notification Reportable Quantity (40 CFR 355)

This material does not contain any components with a section 304 EHS RQ.

SODIUM SULFIDE - FLAKES 60-62 %

Revision Date 01/24/2018

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Ingredients	CAS-No.	Reportable quantity
Sodium hydrosulfide (hydrate)	207683-19-0	5000 lb

Calculated RQ exceeds reasonably attainable upper limit.

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

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

SECTION 16: Other information**NFPA (National Fire Protection Association) - Classification**

Health	3 serious
Flammability	1 slight
Instability or Reactivity	1 slight
Special Notices	None

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health	3 serious
Flammability	1 slight
Reactivity	1 slight
PPE	Determined by User; dependent on local conditions

Further information

- Product evaluated under the US GHS format.

Date Prepared: 01/24/2018

- ACGIH American Conference of Governmental Industrial Hygienists
- OSHA Occupational Safety and Health Administration
- NTP National Toxicology Program
- IARC International Agency for Research on Cancer
- NIOSH National Institute for Occupational Safety and Health

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. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.

[Back to Sodium Phosphate Dibasic Heptahydrate \(Crystalline/Certified ACS\)](#)

Material Safety Data Sheet

Sodium Phosphate Dibasic Heptahydrate

ACC# 21535

Section 1 - Chemical Product and Company Identification

MSDS Name: Sodium Phosphate Dibasic Heptahydrate**Catalog Numbers:** BP331 1, BP331 500, BP331-1, BP331-500, BP3311, BP331500, BW13640300, BW13645250, BW1364550, S373 3, S373 50, S373 500, S373-3, S373-50, S373-500, S373250LB, S3733, S3733LC, S37350, S373500, S471-10, S471-3, S471-500, S471300LB**Synonyms:** Sodium monohydrogen phosphate heptahydrate; phosphoric acid, disodium salt, heptahydrate; disodium phosphate heptahydrate; sodium phosphate; disodium phosphate; sodium phosphate, dibasic**Company Identification:**Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410**For information, call:** 201-796-7100**Emergency Number:** 201-796-7100**For CHEMTREC assistance, call:** 800-424-9300**For International CHEMTREC assistance, call:** 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7782-85-6	DISODIUM ORTHOPHOSPHATE HEPTAHYDRATE	100.0	unlisted

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white. **Caution!** Causes eye and skin irritation. Causes digestive and respiratory tract irritation.**Target Organs:** None.**Potential Health Effects****Eye:** May cause eye irritation.**Skin:** May cause skin irritation.**Ingestion:** May cause gastrointestinal irritation with nausea, vomiting and diarrhea.**Inhalation:** May cause respiratory tract irritation.**Chronic:** No information found.

Section 4 - First Aid Measures

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

Skin: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid.

Inhalation: Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Notes to Physician: Treat symptomatically and supportively.

Antidote: None reported.

Section 5 - Firefighting Measures

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

Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam.

Autoignition Temperature: Not applicable.

Flash Point: Not applicable.

NFPA Rating: Not published. Explosion Limits, Lower: Not available. Upper: Not available.

Section 6 - Accidental Release Measures

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

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions.

Section 7 - Handling and Storage

Handling: Use with adequate ventilation. Avoid prolonged or repeated contact with skin. Avoid contact with eyes. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
DISODIUM			

ORTHOPHOSPHATE HEPTAHYDRATE	none listed	none listed	none listed
--------------------------------	-------------	-------------	-------------

OSHA Vacated PELs: DISODIUM ORTHOPHOSPHATE HEPTAHYDRATE: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

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

Skin: Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance: white

Odor: None reported

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate:

Viscosity: Not available.

Boiling Point: Not applicable.

Freezing/Melting Point: 48.00 deg C

Decomposition Temperature: Not available.

Solubility: 154 g/l (20 C)

Specific Gravity/Density: 1.6790

Molecular Formula: HNa₂O₄P₇H₂O

Molecular Weight:

Section 10 - Stability and Reactivity

Chemical Stability: Stable. Stable under normal temperatures and pressures.

Conditions to Avoid: Acids, metals.

Incompatibilities with Other Materials: Strong acids.

Hazardous Decomposition Products: Oxides of phosphorus, sodium oxide.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 7782-85-6: WC4600000

LD50/LC50:

CAS# 7782-85-6:

Oral, rat: LD50 = 12930 mg/kg;

Carcinogenicity:

CAS# 7782-85-6: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.**Teratogenicity:** No data available.**Reproductive Effects:** No data available.**Neurotoxicity:** No data available.**Mutagenicity:** No data available.**Other Studies:** No data available.

Section 12 - Ecological Information

Ecotoxicity: No information found.**Environmental Fate:** No information reported.**Physical/Chemical:** No information found.**Other:** No information found.

Section 13 - Disposal Considerations

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

RCRA D-Series Maximum Concentration of Contaminants: None listed.**RCRA D-Series Chronic Toxicity Reference Levels:** None listed.**RCRA F-Series:** None listed.**RCRA P-Series:** None listed.**RCRA U-Series:** None listed.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	No information available.	No information available.	No information available.	No information available.	SODIUM PHOSPHATE, DIBASIC
Hazard Class:					9.2
UN Number:					UN9147
Packing Group:					III
Additional Info:					REGULATED LIMIT 230 KG

Section 15 - Regulatory Information

US FEDERAL**TSCA**

CAS# 7782-85-6 is not listed on the TSCA inventory. It is for research and development use only.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA**Section 302 (RQ)**

None of the chemicals in this material have an RQ.

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 7782-85-6 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

Not available.

Risk Phrases:**Safety Phrases:**

S 24/25 Avoid contact with skin and eyes. S 7 Keep container tightly closed.

WGK (Water Danger/Protection)

CAS# 7782-85-6: No information available.

Canada

None of the chemicals in this product are listed on the DSL/NDL list. This product has a WHMIS classification of D2B.

CAS# 7782-85-6 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

Section 16 - Additional Information
--

MSDS Creation Date: 10/23/1995

Revision #6 Date: 9/02/1997

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

MATERIAL SAFETY DATA SHEET

Revised

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**MSDS NUMBER :** M35887**ISSUE DATE :** 09-06-01**PRODUCT NAME :** SODIUM SILICATE LIQUID SILICEOUS (ALL GRADES)

Manufacturer's Name and Address : Occidental Chemical Corporation, Occidental Tower
5005 LBJ Freeway, P.O. Box 809050
Dallas, TX 75380 (972) 404-3800

24 HOUR EMERGENCY TELEPHONE : 1-800-733-3665 OR 972-404-3228**TO REQUEST AN MSDS :** 1-800-699-4970**CUSTOMER SERVICE :** 1-800-752-5151

PRODUCT USE : Adhesives; pulp and paper; deinking; detergents;
gels; catalysts; soil stabilization; textiles

CHEMICAL NAME : Sodium silicate liquid, siliceous**CHEMICAL FORMULA :** $\text{Na}_2\text{O} \cdot x\text{SiO}_2$ ($x =$ or > 2.30 by wt.)

SYNONYMS/COMMON NAMES : Liquid sodium silicate
Water glass
Sodium silicate liquid siliceous

Revised

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS NUMBER / NAME
7732-18-5 Water

EXPOSURE LIMITS

PEL: Not Established
TLV: Not Established
PELZ2: Not Established

PERCENTAGE

VOL	ND
WT	51-80

COMMON NAMES:
(MW 18.02)

Listed On (List Legend Below) :
00 19 22 23 51

2. COMPOSITION/INFORMATION ON INGREDIENTS (Continued)

1344-09-8 Silicic acid, sodium salt

EXPOSURE LIMITS

PEL: Not Established
TLV: Not Established
PELZ2: Not Established

PERCENTAGE

VOL ND
WT 20-49

COMMON NAMES:

Sodium Silicate

Listed On(List Legend Below):

00 19 22 23 51

LIST LEGEND

00 TSCA INVENTORY
22 CANADIAN DOMESTIC SUB LIST
51 EINECS

19 PA REQUIREMENT- 3% OR GREATER
23 NJ REQUIREMENT- 1% OR GREATER

Revised

3. HAZARDS IDENTIFICATION

***** EMERGENCY OVERVIEW *****
*
* IRRITATING TO EYES AND SKIN. *
*
* Colorless, turbid liquid; none to slightly soapy odor. *

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY:

Inhalation, Ingestion.

TARGET ORGANS:

Eyes, Skin, Respiratory Tract, Gastrointestinal Tract.

IRRITANCY:

Potentially by all routes of exposure.

SENSITIZING CAPABILITY:

None known.

REPRODUCTIVE EFFECTS:

None known.

CANCER INFORMATION:

Not classified as carcinogenic by NTP, IARC, OSHA, ACGIH, or NIOSH.

3. HAZARDS IDENTIFICATION (Continued)

SHORT-TERM EXPOSURE (ACUTE)

INHALATION:

May be irritating.

EYES:

Irritating.

SKIN:

May be irritating.

INGESTION:

May be irritating.

REPEATED EXPOSURE (CHRONIC)

None known.

SYNERGISTIC MATERIALS:

None known.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

None known.

Revised

4. FIRST AID MEASURES

EYES:

Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Immediately flush contaminated areas with water. Remove contaminated clothing and footwear. Wash contaminated areas with plenty of soap and water. Wash clothing before reuse. Discard footwear which cannot be decontaminated. GET MEDICAL ATTENTION IMMEDIATELY.

INHALATION:

Remove to fresh air if safe to transport. Otherwise attempt to provide fresh air by ventilation. If breathing is difficult, have a trained person administer oxygen. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY (911 or emergency transport services).

4. FIRST AID MEASURES (Continued)

INGESTION:

Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:

No specialized procedures. Treat for clinical symptoms.

Revised

5. FIRE FIGHTING MEASURES

Flash Point: Not applicable

Method: Not applicable

Autoignition Temperature: Not applicable

FLAMMABLE LIMITS IN AIR, BY % VOLUME

Upper: Not applicable

Lower: Not applicable

EXTINGUISHING MEDIA:

Non-flammable / Non-combustible.

Use agents appropriate for surrounding fire.

FIRE FIGHTING PROCEDURES:

Wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing.

FIRE AND EXPLOSION HAZARD:

None known.

SENSITIVITY TO MECHANICAL IMPACT:

Not sensitive.

SENSITIVITY TO STATIC DISCHARGE:

Not sensitive.

Revised

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Evacuate unnecessary personnel.

6. ACCIDENTAL RELEASE MEASURES (Continued)

Follow protective measures provided under Personal Protection in Section 8.

ENVIRONMENTAL PRECAUTIONS:

Contain spill with dike to prevent entry into sewers or waterways.

Spills or releases should be reported, if required, to the appropriate local, state and federal agencies.

METHODS FOR CLEANING UP:

Dry material can be shoveled up, liquid material can be removed with a vacuum truck. Neutralize remaining traces with any dilute inorganic acid (hydrochloric, sulfuric or acetic acid). Flush spill area with water followed by a liberal covering of sodium carbonate. All clean-up material should be removed for proper treatment or disposal. Spills on other than pavement (eg. dirt or sand) may be handled by removing the affected soil and placing in approved containers.

Revised

7. HANDLING AND STORAGE

HANDLING:

Wear personal protective equipment as described in Exposure Controls/Personal Protection (Section 8) of the MSDS.

Do not get in eyes, on skin or clothing.

Avoid breathing airborne particulates; wear respiratory protection when exposure is possible.

Wash contaminated clothing before reuse.

Wash thoroughly with soap and water after handling.

SPECIAL MIXING AND HANDLING INSTRUCTIONS:

Do not allow contact with materials as noted in Section 10.

Contact with acids will cause gelling and the evolution of heat.

STORAGE:

Keep container tightly closed and properly labeled.

Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen gas can be generated.

Revised

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Use adequate local exhaust ventilation where dust, mist or spray may be generated.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION (Continued)

PERSONAL PROTECTION

RESPIRATORY:

A NIOSH approved respirator with a dust, fume and mist filter may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure.

A respiratory protection program that meets 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant use of a respirator.

EYE/FACE:

Wear chemical safety goggles plus full face shield to protect against contact when appropriate (ANSI Z87.1).

SKIN:

Wear protective clothing to minimize skin contact.

Wear chemical resistant gloves such as rubber, neoprene or vinyl.

Wash contaminated clothing and dry before reuse.

OTHER:

Emergency shower and eyewash facility should be in close proximity (ANSI Z358.1).

Revised

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Principal Grades*					
	40	42	47	49FG	JW25	52
Weight Ratio SiO ₂ :Na ₂ O	3.22	3.22	2.84	2.58	2.54	2.4
Total Solids, %	38.3	39.3	43.1	44.5	37.5	47.3
Specific Gravity @20°C (H ₂ O=1)	1.40	1.41	1.48	1.51	1.41	1.56
pH	11.2	11.2	11.6	11.6	11.7	11.8
Density, lb/gal @ 20°C (68°F)	11.7	11.8	12.3	12.6	11.7	13.0
Odor Threshold	Not applicable					
Vapor Pressure	Not applicable					
Vapor Density (Air=1)	Not applicable					
Evaporation Rate	Not applicable					
% Volatiles by Wt.	<80%					

9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

Boiling Point @ 760 mm Hg 214-216°F (101-102°C)
Freezing Point 30°F (-1°C)
Solubility in H2O, % by Wt. 100%
Octanol/Water Partition Coefficient Not applicable
Thermal Decomposition Temperature Not applicable
VOC (g/l by wt.) Not applicable
*Includes typical data for principal grades. Contact Oxychem's
Technical Service Department for information regarding other grades.
Appearance and Odor: Colorless, turbid liquid; none to slightly
soapy odor.

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY:

 X STABLE UNSTABLE

REACTS WITH:

<u> </u> AIR	<u> </u> OXIDIZERS	<u> X </u> METALS
<u> </u> WATER	<u> X </u> ACIDS	<u> </u> OTHER
<u> </u> HEAT	<u> </u> ALKALIS	<u> </u> NONE

HAZARDOUS POLYMERIZATION:

 OCCURS X WILL NOT OCCUR

COMMENTS:

Contact with acids will cause gelling and the evolution of heat.
Prolonged contact with aluminum may produce flammable hydrogen gas.

HAZARDOUS DECOMPOSITION PRODUCTS:

None.

Revised

11. TOXICOLOGICAL INFORMATION

[1344-09-8] Silicic acid, sodium salt, siliceous. This substance is not corrosive. It is slightly toxic by the oral route. It is irritating but not corrosive to the eyes and skin.

For further information call or write the address shown on page 1 of the MSDS.

Revised

12. ECOLOGICAL INFORMATION

1344-09-8 Silicic acid, sodium salt

TOXICITY: This material is believed to be non-toxic to aquatic life.

PERSISTENCE: This material is believed to be likely to persist in the environment. This substance is inorganic and not subject to biodegradation.

BIOACCUMULATION: No data available. This material is believed to be unlikely to bioaccumulate.

For further information call or write the address shown on page 1 of the MSDS.

13. DISPOSAL CONSIDERATIONS

Dispose of all waste and contaminated equipment in accordance with all applicable federal, state and local health and environmental regulations.

Revised

14. TRANSPORT INFORMATION

DOT INFORMATION: Not Regulated

Revised

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, material safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Material Safety Data Sheet available to your employees.

TSCA:

All components of this product that are required to be on the TSCA inventory are listed on the inventory.

SARA/TITLE III HAZARD CATEGORIES:

If the word "YES" appears next to any category, this product may be reportable by you under the requirements of 40 CFR 370. Please consult those regulations for details.

Immediate(Acute) Health:	<u>YES</u>	Reactive Hazard	<u>NO</u>
Delayed(Chronic) Health:	<u>NO</u>	Sudden Release of Pressure	<u>NO</u>
Fire Hazard:	<u>NO</u>		

15. REGULATORY INFORMATION (Continued)

HMIS HAZARD RATINGS:

HEALTH HAZARD: 2 FIRE HAZARD: 0 REACTIVITY: 0

STATE REGULATIONS:

See Section 2. COMPOSITION/INFORMATION ON INGREDIENTS list legend for applicable state regulation.

Consult local laws for applicability.

INTERNATIONAL REGULATIONS:

Consult the regulations of the importing country.

CANADA:

WHMIS Hazard Class: NOT CLASSIFIABLE

16. OTHER INFORMATION

For additional non-emergency health, safety or environmental information telephone (972) 404-2076 or write to:

Occidental Chemical Corporation
Product Stewardship Department
5005 LBJ Freeway
P.O. Box 809050
Dallas, Texas 75380

MSDS LEGEND:

ACGIH = American Conference of Governmental Industrial Hygienists

CAS = Chemical Abstracts Service Registry Number

CEILING = Ceiling Limit (15 Minutes)

CEL = Corporate Exposure Limit

OSHA = Occupational Safety and Health Administration

PEL = Permissible Exposure Limit (OSHA)

STEL = Short Term Exposure Limit (15 Minutes)

TDG = Transportation of Dangerous Goods (Canada)

TLV = Threshold Limit Value (ACGIH)

TWA = Time Weighted Average (8 Hours)

WHMIS = Worker Hazardous Materials Information System (Canada)

* = See Section 3 Hazards Identification - Repeated Exposure (Chronic) Information

16. OTHER INFORMATION (Continued)

IMPORTANT: The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, OR OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any federal, state or local laws, rules, regulations or ordinances.

This Material Safety Data Sheet (MSDS) covers the following materials:

- SODIUM SILICATE LIQUID SILICEOUS - PILOT SPECIAL
- SODIUM SILICATE LIQUID SILICEOUS (ALL GRADES)
- SODIUM SILICATE LIQUID SILICEOUS - JW 25
- SODIUM SILICATE LIQUID SILICEOUS - JW CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - JW-27
- SODIUM SILICATE LIQUID SILICEOUS - 20 CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 20 SPECIAL CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 30 CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 33
- SODIUM SILICATE LIQUID SILICEOUS - 3.4
- SODIUM SILICATE LIQUID SILICEOUS - 40
- SODIUM SILICATE LIQUID SILICEOUS - 40 CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 40 L
- SODIUM SILICATE LIQUID SILICEOUS - 40 L CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 40 SPECIAL
- SODIUM SILICATE LIQUID SILICEOUS - 40 SPECIAL CLEAR
- SODIUM SILICATE LIQUID SILICEOUS - 42
- SODIUM SILICATE LIQUID SILICEOUS - 42 H
- SODIUM SILICATE LIQUID SILICEOUS - 42 L
- SODIUM SILICATE LIQUID SILICEOUS - 42 SPECIAL
- SODIUM SILICATE LIQUID SILICEOUS - 45
- SODIUM SILICATE LIQUID SILICEOUS - 47
- SODIUM SILICATE LIQUID SILICEOUS - 47 L
- SODIUM SILICATE LIQUID SILICEOUS - 47 SPECIAL
- SODIUM SILICATE LIQUID SILICEOUS - 49 FG
- SODIUM SILICATE LIQUID SILICEOUS - 49 FG SPECIAL
- SODIUM SILICATE LIQUID SILICEOUS - 52
- SODIUM SILICATE LIQUID SILICEOUS - 52 L
- SODIUM SILICATE LIQUID SILICEOUS - 52 SPECIAL

Revised

17. WARNING LABEL INFORMATION

SIGNAL WORD:

WARNING

HAZARD WARNINGS:

IRRITATING TO EYES AND SKIN.

17. WARNING LABEL INFORMATION (Continued)

PRECAUTIONS:

Avoid contact with eyes, skin and clothing.

Avoid breathing dust, vapors or mist.

Use with adequate ventilation.

Wash thoroughly after handling.

Keep container tightly closed and properly labeled.

Before using, read Material Safety Data Sheet (MSDS) for this material.

FIRST AID

EYES:

Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Immediately flush contaminated areas with water. Remove contaminated clothing and footwear. Wash contaminated areas with plenty of soap and water. Wash clothing before reuse. Discard footwear which cannot be decontaminated. GET MEDICAL ATTENTION IMMEDIATELY.

INHALATION:

Remove to fresh air if safe to transport. Otherwise attempt to provide fresh air by ventilation. If breathing is difficult, have a trained person administer oxygen. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY (911 or emergency transport services).

INGESTION:

Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

IN CASE OF SPILL OR LEAK:

Contain spill with dike to prevent entry into sewers or waterways.

Dry material can be shoveled up, liquid material can be removed with a vacuum truck. Neutralize remaining traces with any dilute inorganic acid (hydrochloric, sulfuric or acetic acid). Flush spill area with water followed by a liberal covering of sodium carbonate. All clean-up material should be removed for proper treatment or disposal. Spills on other than pavement (eg. dirt or sand) may be handled by removing the affected soil and placing in approved containers.

17. WARNING LABEL INFORMATION (Continued)

FIRE:

Non-flammable / Non-combustible.

Use agents appropriate for surrounding fire.

HANDLING AND STORAGE:

Wear a NIOSH/MSHA approved respirator, chemical splash goggles, full face shield, protective clothing and chemical resistant gloves.

Avoid contact with acids.

Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen gas can be generated.

DISPOSAL:

Dispose of all waste and contaminated equipment in accordance with all applicable federal, state and local health and environmental regulations.

INFORMATION REQUIRED BY FEDERAL, STATE OR LOCAL REGULATIONS:**This Product Contains:**

CAS#	NAME
7732-18-5	Water
1344-09-8	Silicic acid, sodium salt

HMIS RATING: HEALTH 2 FLAMMABILITY 0 REACTIVITY 0

LABEL NUMBER: 0901M35887

For Industrial Use Only




255 Norman.
Lachine (Montreal), Que
H8R 1A3

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
Not controlled under WHMIS (Canada).		Not controlled under TDG (Canada). PIN: Not applicable. PG: Not applicable.
		

Section I. Product Identification and Uses

Product name	SODIUM SULFATE	CI#	Not available.
Chemical formula	Na ₂ SO ₄	CAS#	7757-82-6
Synonyms	Disodium sulfate, Sodium sulfate anhydrous, Salt cake, Sulfuric acid disodium salt, Sodium sulphate, Thenardite, Mirabilite, AC-8515, AC-8515T, 85330, 85376	Code	AC-8515
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3	Formula weight	142.04
		Supersedes	8515-0
Material uses	For laboratory use only.		

Section II. Ingredients

Name	CAS #	%	TLV
1) SODIUM SULFATE	7757-82-6	60-100	Not established by ACGIH

Toxicity values of the hazardous ingredients

SODIUM SULFATE:
ORAL (LD50): Acute: 5989 mg/kg (Mouse).
INTRAVENOUS (LDLo): Acute: 1220 mg/kg (Mouse).

Section III. Physical Data

SODIUM SULFATE

page 2/4

Physical state and appearance / Odor	Odorless, white crystalline powder.
pH (1% soln/water)	5.2-9.2 @ (5%, 25°C)
Odor threshold	Not available.
Percent volatile	Not applicable.
Freezing point	884 to 888°C
Boiling point	Decomposes at 1100°C.
Specific gravity	2.7 (Water = 1)
Vapor density	Not applicable.
Vapor pressure	Not applicable.
Water/oil dist. coeff.	Not available.
Evaporation rate	Not applicable.
Solubility	Soluble in cold water.

Section IV. Fire and Explosion Data

Flash point	Not applicable.
Flammable limits	Not applicable.
Auto-ignition temperature	Not available.
Fire degradation products	Oxides of sulfur and sodium.
Fire extinguishing procedures	Use DRY chemical, carbon dioxide, foam or water spray. Wear adequate personal protection to prevent contact with material or its combustion products. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode. Cool containing vessels with flooding quantities of water.
Fire and Explosion Hazards	The sensitivity to impact is not applicable. The sensitivity to static discharge is not applicable. Emits toxic fumes under fire conditions.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Skin contact. Eye contact.
Effects of Acute Exposure	May be harmful by inhalation, in contact with skin and if swallowed.
Eye	May cause irritation and conjunctivitis.
Skin	May cause irritation and erythema.
Inhalation	Material is irritating to mucous membranes and upper respiratory tract.
Ingestion	May cause gastrointestinal irritation. May cause blood in stools, dehydration, hypotension, diarrhea, purging, and stomach pain.

Section V. Toxicological Properties

SODIUM SULFATE

page 3/4

Effects of Chronic Overexposure

Sulfates may cause asthma. Carcinogenic effects: Not available. Mutagenic effects: Not available. Teratogenic effects: Not available. Toxicity of the product to the reproductive system: Not available. To the best of our knowledge, the chemical, physical, and toxicity of this substance has not been fully investigated.

Section VI. First Aid Measures

Eye contact

Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Call a physician.

Skin contact

Immediately flush skin with plenty of water and soap for at least 15 minutes while removing contaminated clothing and shoes. If irritation occurs or persists seek medical attention. 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 several glasses of water to dilute. Call a physician. Never give anything by mouth to an unconscious or convulsing person.

Section VII. Reactivity Data

Stability

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

Hazardous decomp. products

Not available.

Incompatibility

Bases, acids, aluminum, magnesium.

Reaction Products

Violent explosions will occur when sodium sulfate is melted with aluminum or magnesium. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

SODIUM SULFATE

page 4/4

Protective Clothing in case of spill and leak Wear respirator, safety glass, rubber boots and heavy rubber glove

Spill and leak Evacuate the area. Sweep up and place in container for disposal. Avoid raising dust. Ventilate area and wash spill site after material pick up is complete.

Waste disposal According to all applicable regulations. Harmful to aquatic life at low concentrations. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Storage and Handling Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Keep container tightly closed and dry. Manipulate in a well ventilated area or under an adequate fume hood. Avoid raising dust. Handle and open container with care. Product is highly hygroscopic. This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling.

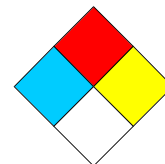
Section IX. Protective Measures

Protective clothing Splash goggles. Impervious rubber gloves, coveralls, and/or other resistant protective clothing. Sufficient to protect skin. If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.

Engineering controls Manipulate in a well ventilated area or under an adequate fume hood. Do not use in unventilated spaces.

Section X. Other Information

Special Precautions or comments Do not breathe dust. Avoid all contact with the product. Manipulate in a well ventilated area or under an adequate fume hood. Handle and open container with care. Container should be opened only by a technically qualified person.
RTECS NO: WE1650000 (Sodium sulfate).



NFPA

Prepared by MSDS Department/Département de F.S..

Validated 10-Jul-2009

Telephone# (514) 489-5711

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.



**Anachemia**

255 Norman.
Lachine (Montreal), Que
H8R 1A3

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
WHMIS CLASS: D-2B		Not controlled under TDG (Canada). PIN: Not applicable. PG: Not applicable.
		

Section I. Product Identification and Uses

Product name	SODIUM THIOSULFATE, ANHYDROUS	CI#	Not available.
Chemical formula	Na ₂ S ₂ O ₃	CAS#	7772-98-7
Synonyms	Sodium hyposulfite, Sodium thiosulfate, AC-8547, 85786	Code	AC-8547
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3	Formula weight	158.11
		Supersedes	
Material uses	For laboratory use only.		

Section II. Ingredients

Name	CAS #	%	TLV
1) SODIUM THIOSULFATE	7772-98-7	100	Not established by ACGIH: ACGIH (Sulfur dioxide) TWA 2 ppm (5.2 mg(SO ₂)/m ³); STEL 5 ppm (13 mg(SO ₂)/m ³)

Toxicity values of the hazardous ingredients

SODIUM THIOSULFATE:
INTRAPERITONEAL (LD₅₀): Acute: 5200 mg/kg (Mouse).

Section III. Physical Data**SODIUM THIOSULFATE, ANHYDROUS**

page 2/4

Physical state and appearance / Odor	Clear to white granules or crystals. Odorless.
pH (1% soln/water)	8.6
Odor threshold	Not available.
Percent volatile	0% at 21°C
Freezing point	Transition at 48°C
Boiling point	Decomposes at >100°C.
Specific gravity	1.66-1.73 (Water = 1)
Vapor density	Not applicable.
Vapor pressure	Not applicable.
Water/oil dist. coeff.	Not available.
Evaporation rate	Not applicable.
Solubility	33% (in H ₂ O)

Section IV. Fire and Explosion Data

Flash point	Not available.
Flammable limits	Not available.
Auto-ignition temperature	Not available.
Fire degradation products	Oxides of sulfur and sodium. Hydrogen sulfide. Sodium sulfide.
Fire extinguishing procedures	Use DRY chemical, carbon dioxide, foam or water spray. Wear adequate personal protection to prevent contact with material or its combustion products. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode. Disperse vapors with water spray if they have not ignited. Cool containing vessels with flooding quantities of water until well after fire is out.
Fire and Explosion Hazards	The sensitivity to impact is not applicable. The sensitivity to static discharge is not applicable. Heating above 100°C yields a flammable residue sodium sulfide. Contact with oxidizers may cause fire and/or explosion. Emits toxic fumes under fire conditions.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Eye contact. Skin contact.
Effects of Acute Exposure	May be harmful by ingestion, inhalation, or skin absorption. Irritant.
Eye	May irritate or burn eyes and cause temporary conjunctivitis.
Skin	May cause skin irritation. Aqueous solutions or dust may cause irritation from repeated or prolonged contact.
Inhalation	Dust or mist may cause severe irritation to the respiratory tract. Exposure may cause coughing, chest pains, and difficulty in breathing. If heated to the point where sulfur dioxide gas is driven off, then this gas is highly irritating to the respiratory tract.
Ingestion	May cause gastrointestinal irritation. May cause nausea, vomiting, purging, cyanosis. Doses of 8 g/kg (oral, rat) were non-toxic.

Section V. Toxicological Properties

SODIUM THIOSULFATE, ANHYDROUS page 3/4

Effects of Chronic Overexposure

Carcinogenic effects: Not available. Mutagenic effects: Not available. Teratogenic effects: Not available. Toxicity of the product to the reproductive system: Not available. To the best of our knowledge, the chemical, physical, and toxicity of this substance has not been fully investigated.

Section VI. First Aid Measures

Eye contact

Immediately flush eyes with copious quantities of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Seek immediate medical attention.

Skin contact

Immediately flush skin with plenty of water and soap 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. Seek immediate medical attention.

Ingestion

If conscious, wash out mouth with water. Have conscious person drink several glasses of water to dilute. Seek immediate medical attention. Never give anything by mouth to an unconscious or convulsing person.

Section VII. Reactivity Data

Stability

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

Hazardous decomp. products

Not available.

Incompatibility

Oxidizing agents (e.g., nitrates, sodium nitrite, halogens) cause vigorous exothermic reactions. Acids release sulfur dioxide gas. Water-reactive materials such as sodium, cause strong exothermic reaction. Mercury salts, lead, silver, iodides, iodine, mercury.

Reaction Products

Sulfur dioxide gas which is toxic, corrosive, and an oxidizer, is driven off above 100°C leaving, a sodium sulfide residue which is flammable, a strong irritant to skin and tissue and is also incompatible with acids. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

SODIUM THIOSULFATE, ANHYDROUS

page 4/4

Protective Clothing in case of spill and leak	Wear respirator, chemical safety goggles, rubber boots and heavy rubber gloves.
Spill and leak	Evacuate the area. Sweep up and place in container for disposal. Avoid raising dust. Ventilate area and wash spill site after material pick up is complete. DO NOT empty into drains. DO NOT touch damaged container or spilled material. Avoid run off.
Waste disposal	According to all applicable regulations.
Storage and Handling	Store in a cool place away from heated areas, sparks, and flame. Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Keep away from direct sunlight or strong incandescent light. Keep container tightly closed and dry. Manipulate in a well ventilated area or under an adequate fume hood. Avoid raising dust. Handle and open container with care. Minimize dust generation and exposure - use dust mask or appropriate protection. This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling.

Section IX. Protective Measures

Protective clothing	Splash goggles. Impervious gloves, apron, coveralls, and/or other resistant protective clothing. Sufficient to protect skin. If use conditions generate dusts, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full facepiece or a half mask air-purifying cartridge respirator with particulate filters, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.
Engineering controls	Local mechanical exhaust ventilation capable of minimizing dust emissions at the point of use. Do not use in unventilated spaces.

Section X. Other Information

Special Precautions or comments	Irritant! Do not breathe dust. Avoid all contact with the product. Avoid prolonged or repeated exposure. Manipulate in a well ventilated area or under an adequate fume hood. Keep away from heat, sparks and flame. Handle and open container with care. Container should be opened only by a technically qualified person. RTECS NO: XN6472000.
---------------------------------	--



NFPA

Prepared by MSDS Department/Département de F.S..

Validated 28-Jul-1999

Telephone# (514) 489-5711

While the company believes the data set forth herein are accurate as of the date hereof, the company makes no warranty with respect thereto and expressly disclaims all liability for reliance thereon. Such data are offered solely for your consideration, investigation and verification.

MSDS Number: **Z4560** * * * * * *Effective Date: 11/10/05* * * * * * *Supersedes: 01/10/03*

MSDS**Material Safety Data Sheet**

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865



Mallinckrodt
CHEMICALS



24 Hour Emergency Telephone: 800-856-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-696-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Zinc Sulfate, 7-Hydrate

1. Product Identification

Synonyms: Sulfuric acid, zinc salt (1:1) heptahydrate; Zinc vitriol, heptahydrate; Zinc sulfate, heptahydrate

CAS No.: 7733-02-0 (Anhydrous) 7446-20-0 (heptahydrate)

Molecular Weight: 287.56

Chemical Formula: ZnSO₄·7H₂O

Product Codes:

J.T. Baker: 4382, 4383, 4384

Mallinckrodt: 7805, 8872, 8880

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Zinc Sulfate	7733-02-0	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

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

Health Rating: 2 - Moderate (Life)

Flammability Rating: 0 - None

Reactivity Rating: 1 - Slight

Contact Rating: 3 - Severe

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

Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:

Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath.

Ingestion:

As with other soluble zinc salts, zinc sulfate may hydrolyze into acid if swallowed. Severe irritation and burns of the mouth, throat and digestive system may occur. Symptoms may include vomiting, stomach pain, increased pulse rate without blood pressure decrease, blood pressure decrease, acute pulmonary edema (fluid in the lungs), diarrhea, kidney damage, other gastrointestinal disturbances and hemorrhagic pancreatitis. A fatality following ingestion of 10 grams has been reported.

Skin Contact:

Causes irritation to skin. Symptoms include redness, itching, and pain.

Eye Contact:

Irritant, can cause pain and redness, possible mechanical harm. May cause severe irritation.

Chronic Exposure:

Chronic exposure may cause fatigue, slow tendon reflexes, intestinal inflammation (with bleeding), diarrhea, blood effects, central nervous system depression, tremors and paralysis of the extremities. Repeated skin or eye contact can cause skin and eye effects.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:

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

Ingestion:

If swallowed, give several glasses of water to drink. Vomiting may occur spontaneously, but **DO NOT INDUCE!** Never give anything by mouth to an unconscious person. Get

medical attention.

Skin Contact:

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

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

5. Fire Fighting Measures

Fire:

Not considered to be a fire hazard.

Explosion:

Sealed containers may rupture when heated.

Fire Extinguishing Media:

Use any means suitable for extinguishing surrounding fire. Use water carefully as material will react with water to form acidic solution. Water spray may be used to keep fire exposed containers cool.

Special Information:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Zinc sulfate can decompose at high temperatures to form toxic oxides, sulfur and zinc oxide as well as water vapor. Sealed containers of this material may rupture at moderate temperatures (release of water vapor). Forms acidic solutions in water.

6. Accidental Release Measures

Ventilate area of leak or spill. Keep unnecessary and unprotected people away from area of spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust. Material dissolves in water to form an acidic solution. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Material dissolves in water to form an acidic solution. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:

None established.

Ventilation System:

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

Personal Respirators (NIOSH Approved):

For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Colorless crystals or granules.

Odor:

Odorless.

Solubility:

Soluble in water.

Specific Gravity:

1.97

pH:

ca. 4.5 Aqueous solution

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

0

Boiling Point:

> 500C (> 932F) Decomposes.

Melting Point:

100C (212F) Loses all water at 280C.

Vapor Density (Air=1):

No information found.

Vapor Pressure (mm Hg):

No information found.

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:

Oxides of sulfur and oxides of zinc. Reacts with water to form sulfuric acid.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Lead, calcium, strontium salts, borax, alkali carbonates and hydroxides, silver protein and tannins.

Conditions to Avoid:

Heat, moisture, incompatibles.

11. Toxicological Information

Hydrate: Oral rat LD50: 2150 mg/kg. Investigated as a mutagen.

For anhydrous zinc sulfate: oral rat LD50: 1710 mg/kg; Irritation, rabbit eye, standard Draize: 420 ug, moderate. Investigated as a tumorigen, mutagen, reproductive effector.

-----\Cancer Lists\-----			
Ingredient	---NTP Carcinogen---		IARC Category
	Known	Anticipated	
Zinc Sulfate (7733-02-0)	No	No	None

12. Ecological Information

Environmental Fate:

No information found.

Environmental Toxicity:

The LC50/96-hour values for fish are between 1 and 10 mg/l. This material is expected to be toxic to aquatic life.

13. Disposal Considerations

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

14. Transport Information

Not regulated.

15. Regulatory Information

```
-----\Chemical Inventory Status - Part 1\-----
Ingredient                                     TSCA  EC   Japan  Australia
-----
Zinc Sulfate (7733-02-0)                       Yes  Yes   Yes    Yes
```

```
-----\Chemical Inventory Status - Part 2\-----
Ingredient                                     Korea DSL   NDSL  Phil.
-----
Zinc Sulfate (7733-02-0)                       Yes  Yes   No    Yes
```

```
-----\Federal, State & International Regulations - Part 1\-----
Ingredient                                     -SARA 302-  -SARA 313-----
RQ      TPQ      List  Chemical Catg.
-----
Zinc Sulfate (7733-02-0)                       No    No      No    Zinc compoun
```

```
-----\Federal, State & International Regulations - Part 2\-----
Ingredient                                     CERCLA  -RCRA-  -TSCA-
261.33  8(d)
-----
Zinc Sulfate (7733-02-0)                       1000    No      No
```

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

Australian Hazchem Code: None allocated.

Poison Schedule: S6

WHMIS:

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

16. Other Information

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

Label Hazard Warning:

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Label Precautions:

Avoid breathing dust.

Keep container closed.

Use only with adequate ventilation.

Wash thoroughly after handling.

Avoid contact with eyes, skin and clothing.

Label First Aid:

If swallowed, give several glasses of water to drink. Vomiting may occur spontaneously, but DO NOT INDUCE! Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, wipe off excess material from skin then immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:

Laboratory Reagent.

Revision Information:

No Changes.

Disclaimer:

Mallinckrodt Baker, Inc. 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 using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

Prepared by: Environmental Health & Safety

Phone Number: (314) 654-1600 (U.S.A.)

APPENDIX D

ALL-SEASON ROAD MAP BOOK

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: DigitalGlobe, 2016

STATUS

ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

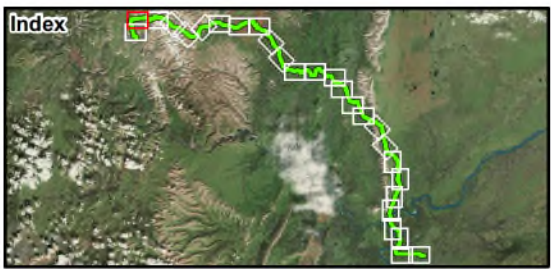
PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TI-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A1

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody


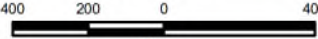



NOTES
Base data source: CanVec; GeoBase.
Base imagery source: DigitalGlobe, 2016

STATUS
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10		DATUM NAD83		CLIENT <div>CANADIAN ZINC CORPORATION</div>	
Scale: 1:20,000 <div></div> Metres		<div>TETRA TECH</div>			
FILE NO. EARC03145-01_FigureA.mxd					
OFFICE TI-VANC		DWN MRV	CKD SL	APVD TB	REV 4
DATE January 16, 2019		PROJECT NO. ENG.EARC03145-01			A2

Q:\Vancouver\GIS\ENGINEERING\EARC\03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ✦ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ✦ 2014 Testpit (Tetra Tech EBA, 2014)
- ✦ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- 🔴 Prairie Creek Access Road (December 2018)
- 🟡 Potential Permafrost Section
- 🟢 Nahanni National Park Reserve Boundary
- 🟢 Potential Borrow Source
- ~ Contour (40 m)
- 🌊 Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: DigitalGlobe, 2016

STATUS

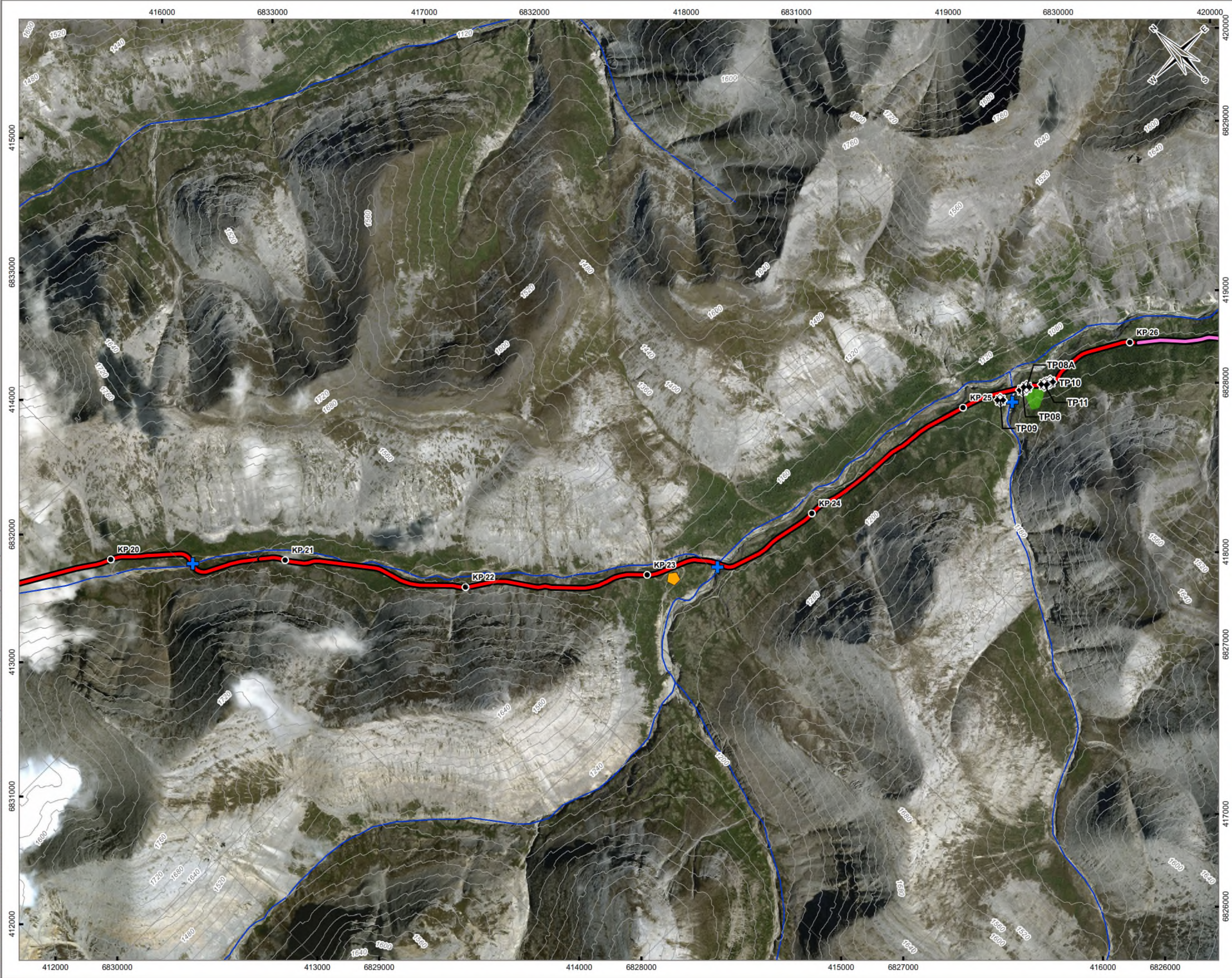
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION			
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH			
FILE NO. EARC03145-01_FigureA.mxd		A3			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- 🔴 Prairie Creek Access Road (December 2018)
- 🟡 Potential Permafrost Section
- 🟢 Nahanni National Park Reserve Boundary
- 🟢 Potential Borrow Source
- 📏 Contour (40 m)
- 🌊 Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: DigitalGlobe, 2016

STATUS

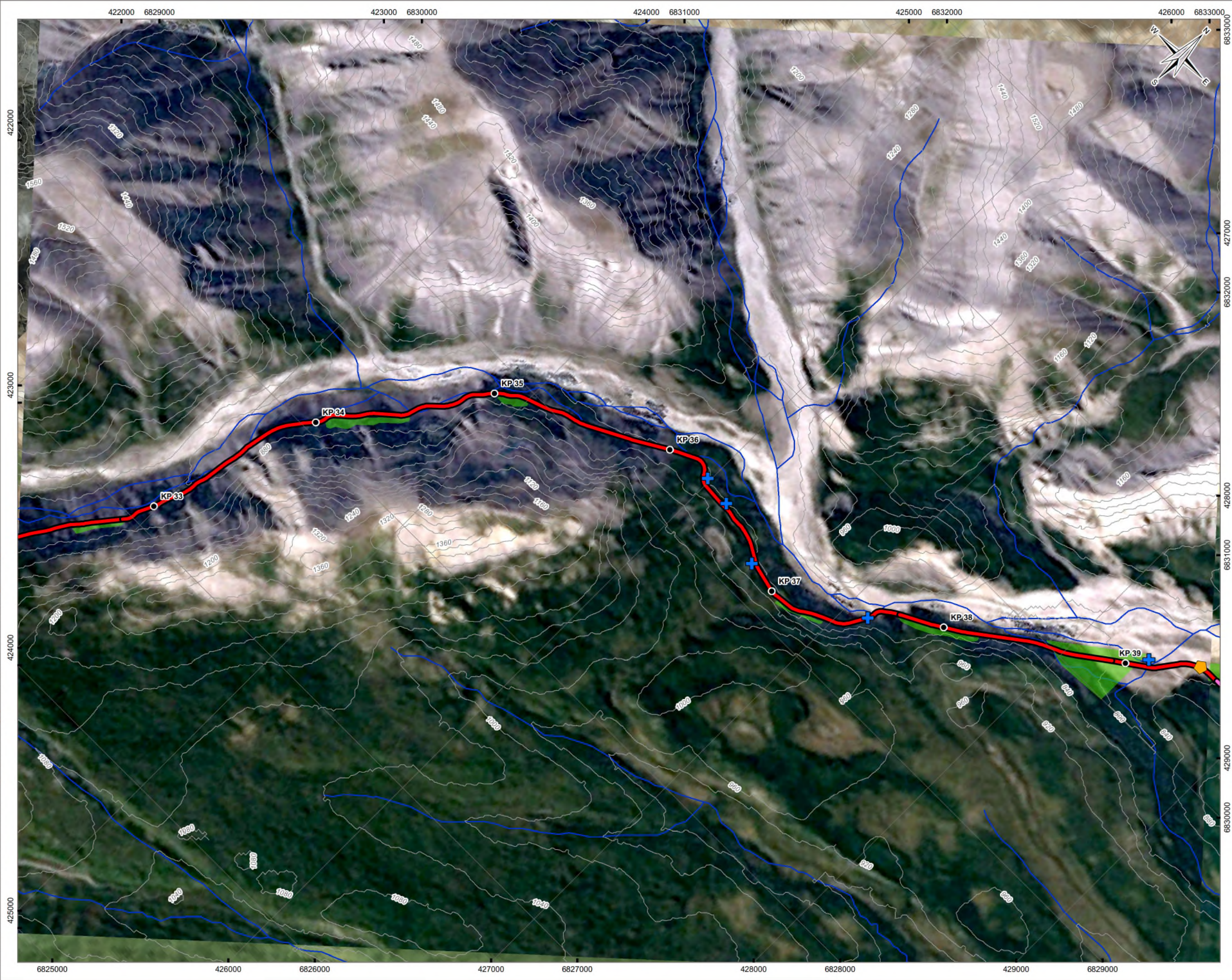
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd		A4			
OFFICE TI-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- 🛣️ Prairie Creek Access Road (December 2018)
- 🟡 Potential Permafrost Section
- 🟢 Nahanni National Park Reserve Boundary
- 🟢 Potential Borrow Source
- 📏 Contour (40 m)
- 🌊 Watercourse
- 💧 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

ISSUED FOR REVIEW

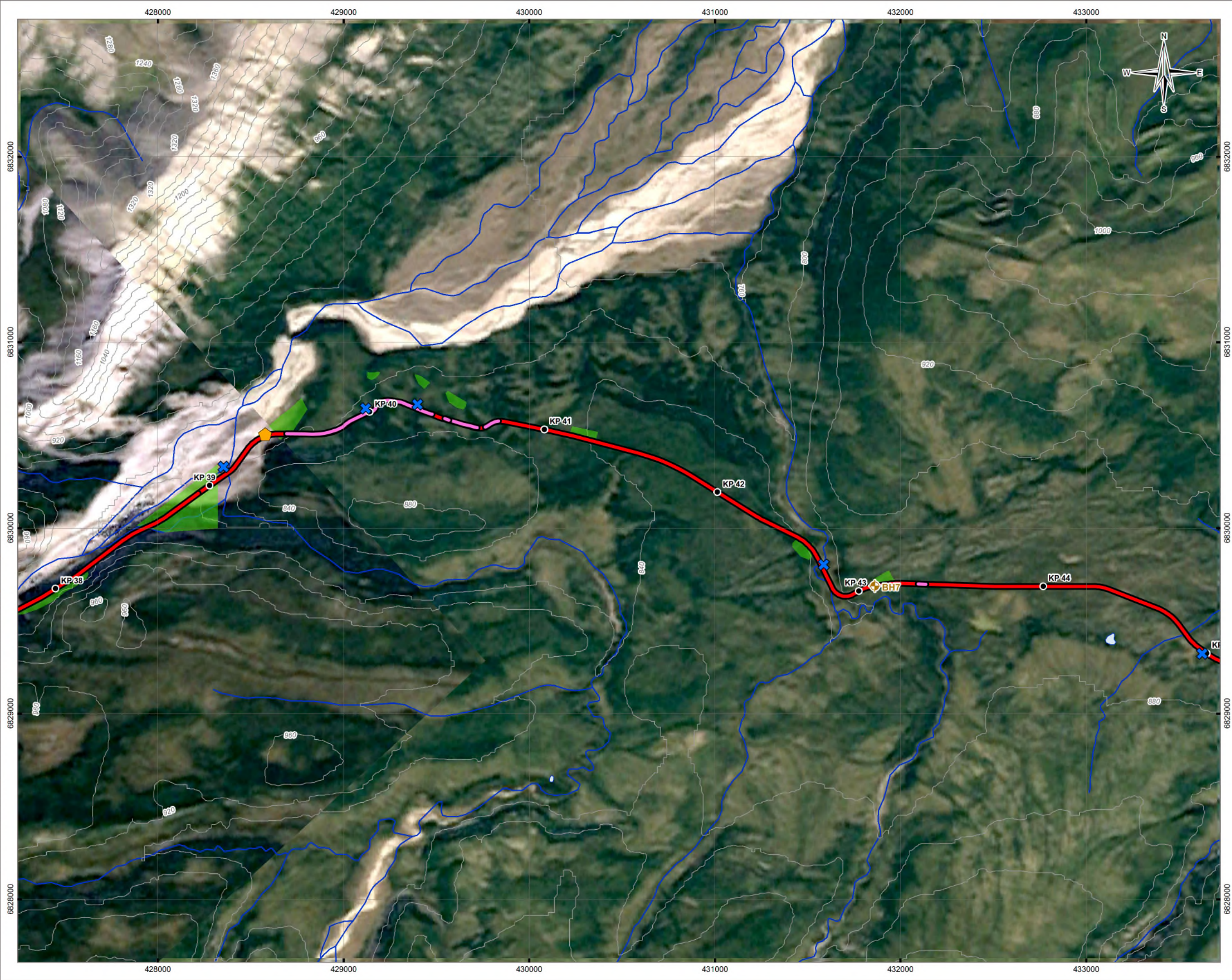
PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd		TETRA TECH			
OFFICE Tl-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

A6

Q:\Vancouver\GIS\ENGINEERING\EARC\03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

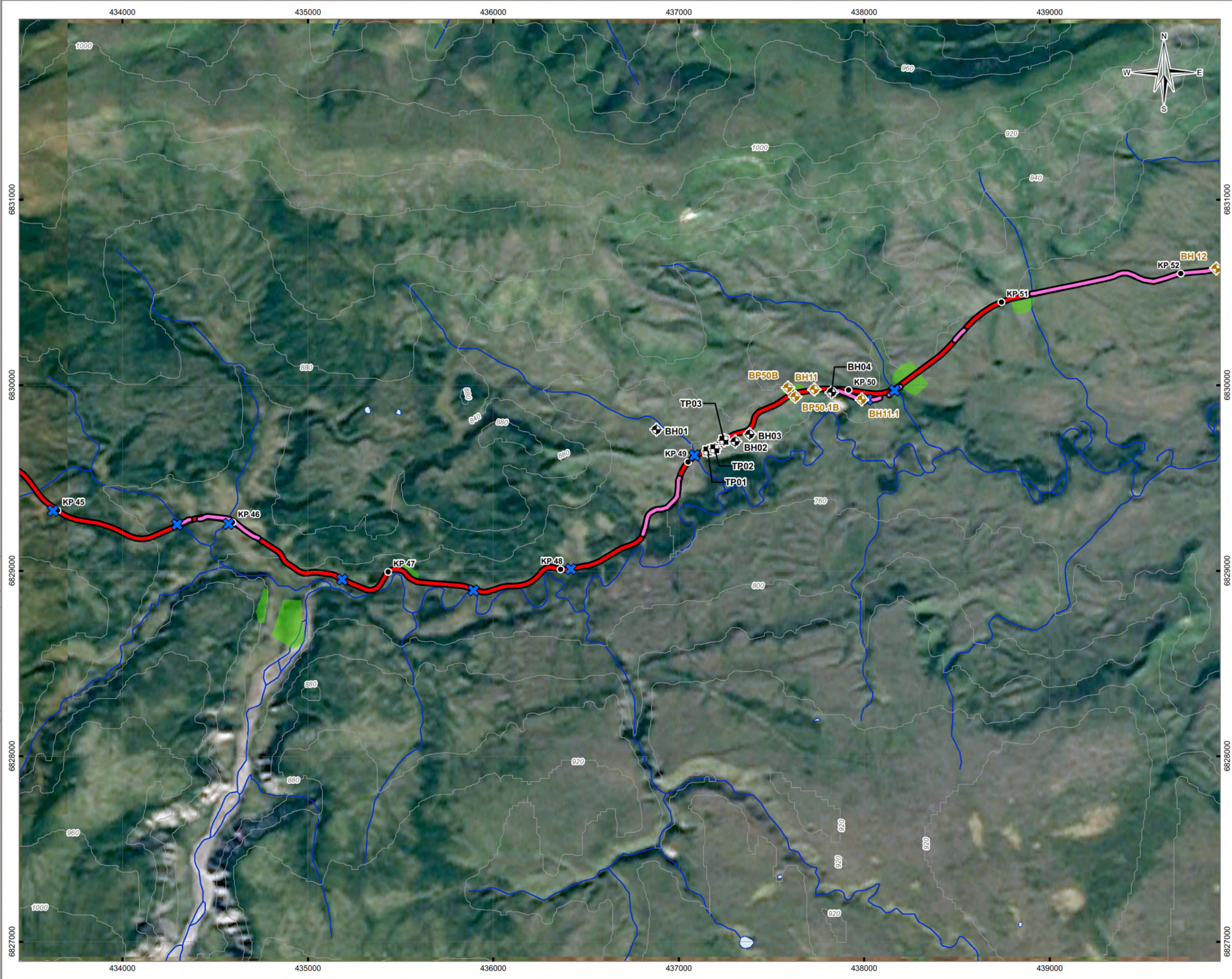
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd					
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				A7

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- ~ Contour (40 m)
- ~ Watercourse
- ~ Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

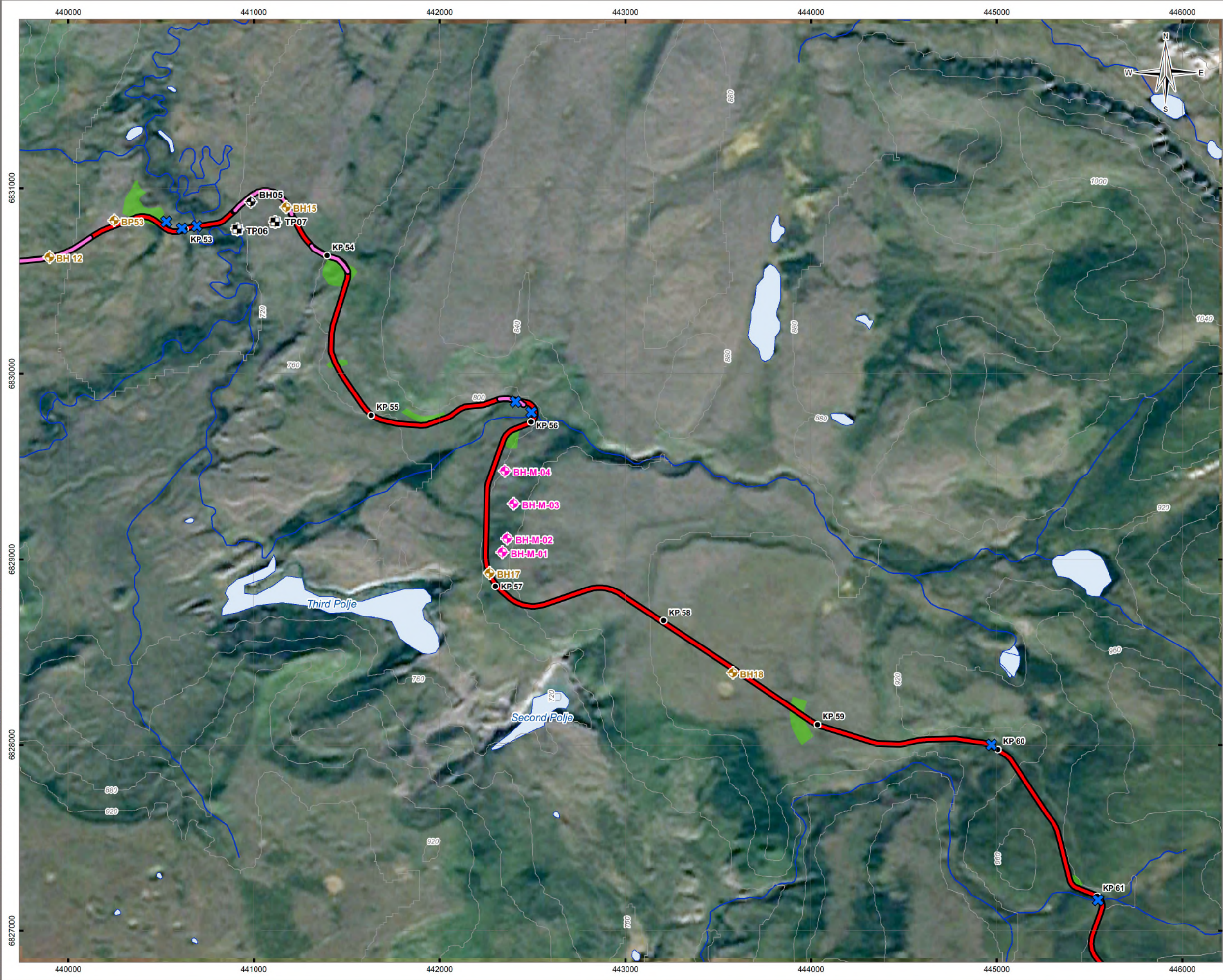
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A8

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- Prairie Creek Access Road (December 2018)
- Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

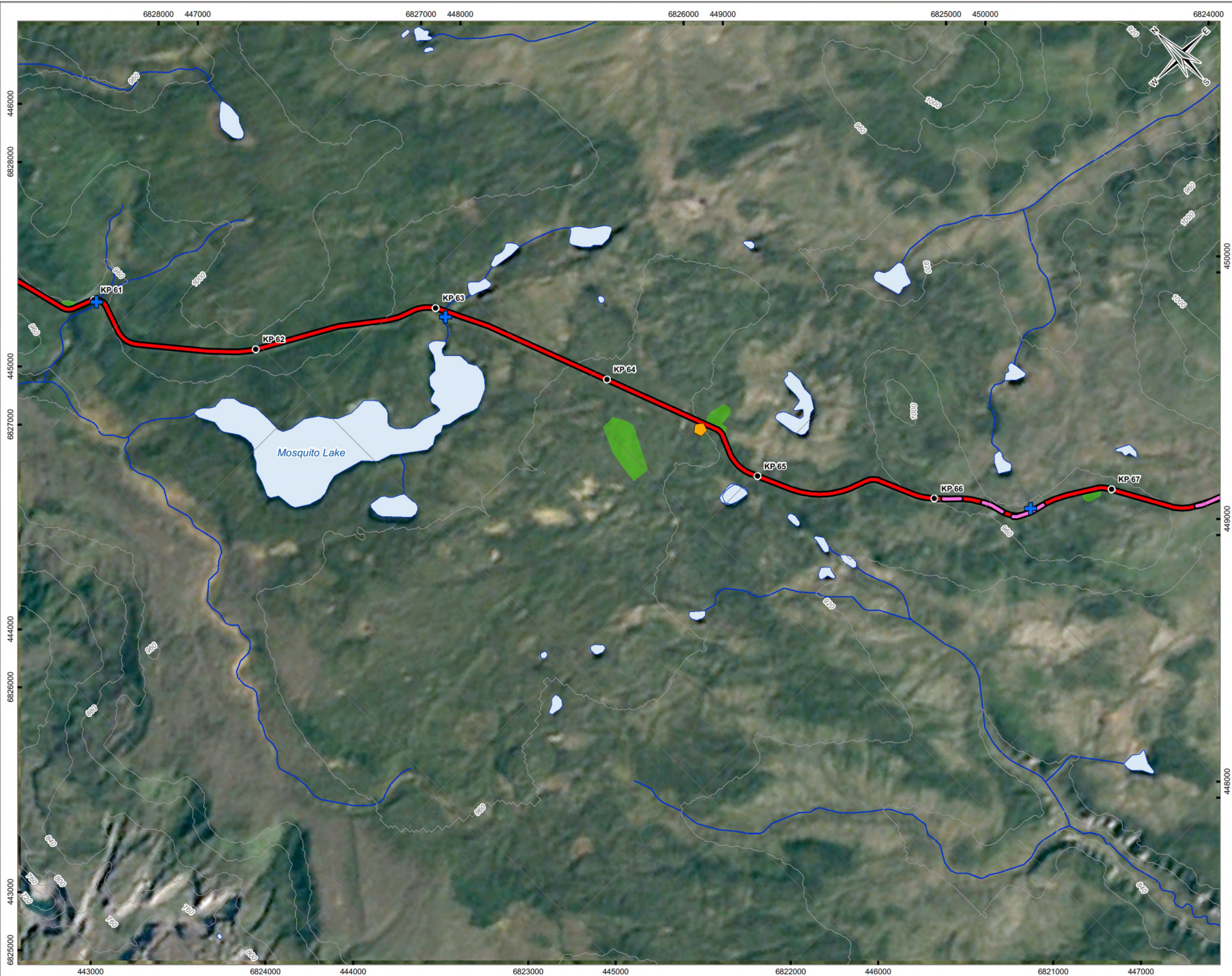
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION
Scale: 1:20,000 400 200 0 400 Metres		FILE NO. EARC03145-01_FigureA.mxd
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A9

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- ~ Contour (40 m)
- 🌊 Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd					
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				A10

Q:\Vancouver\GIS\ENGINEERING\EARC\03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2016

STATUS

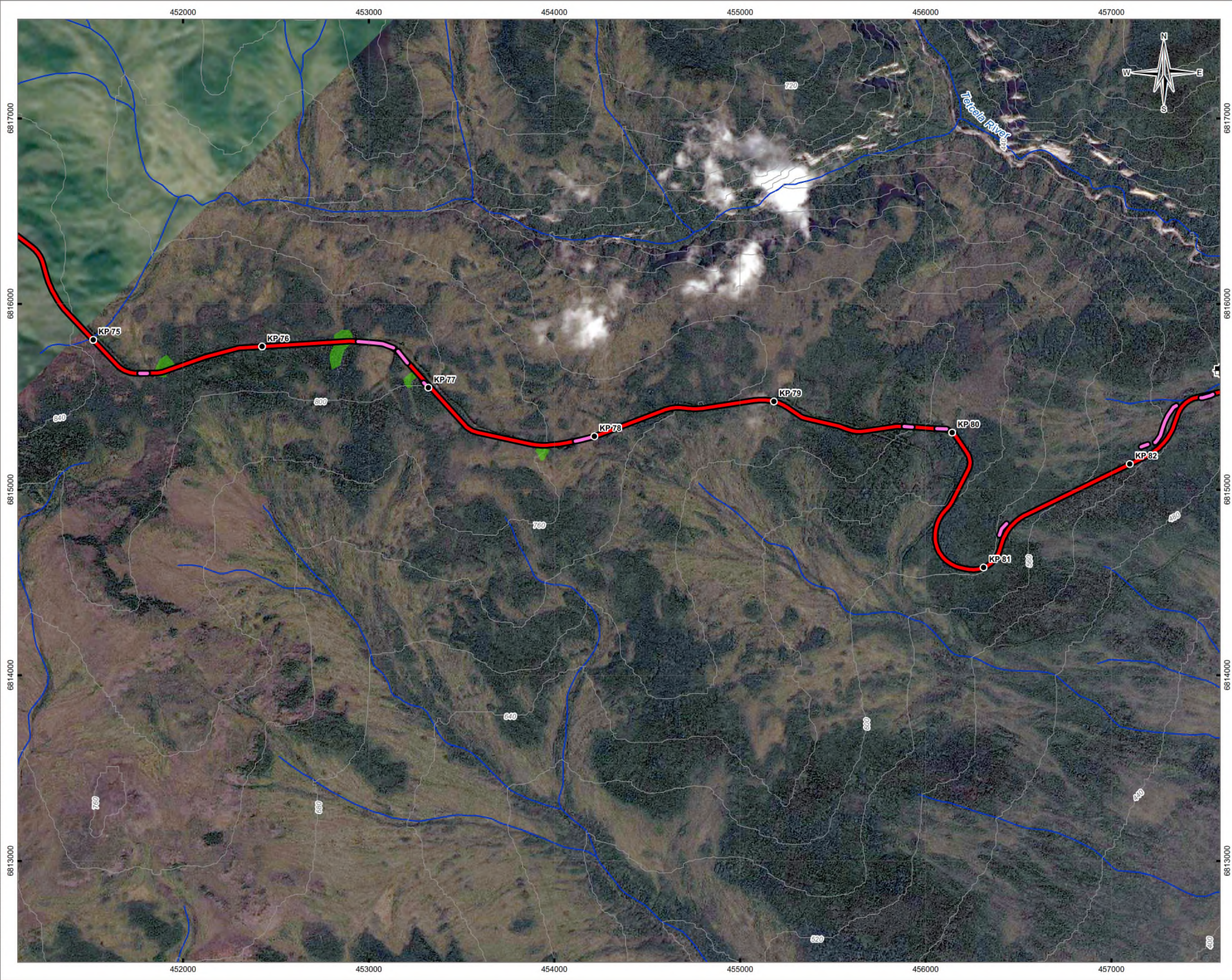
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		FILE NO. EARC03145-01_FigureA.mxd
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A11

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

NOTES
 Base data source: CanVec; GeoBase.
 Base imagery source: Bing Maps Aerial

STATUS
 ISSUED FOR REVIEW

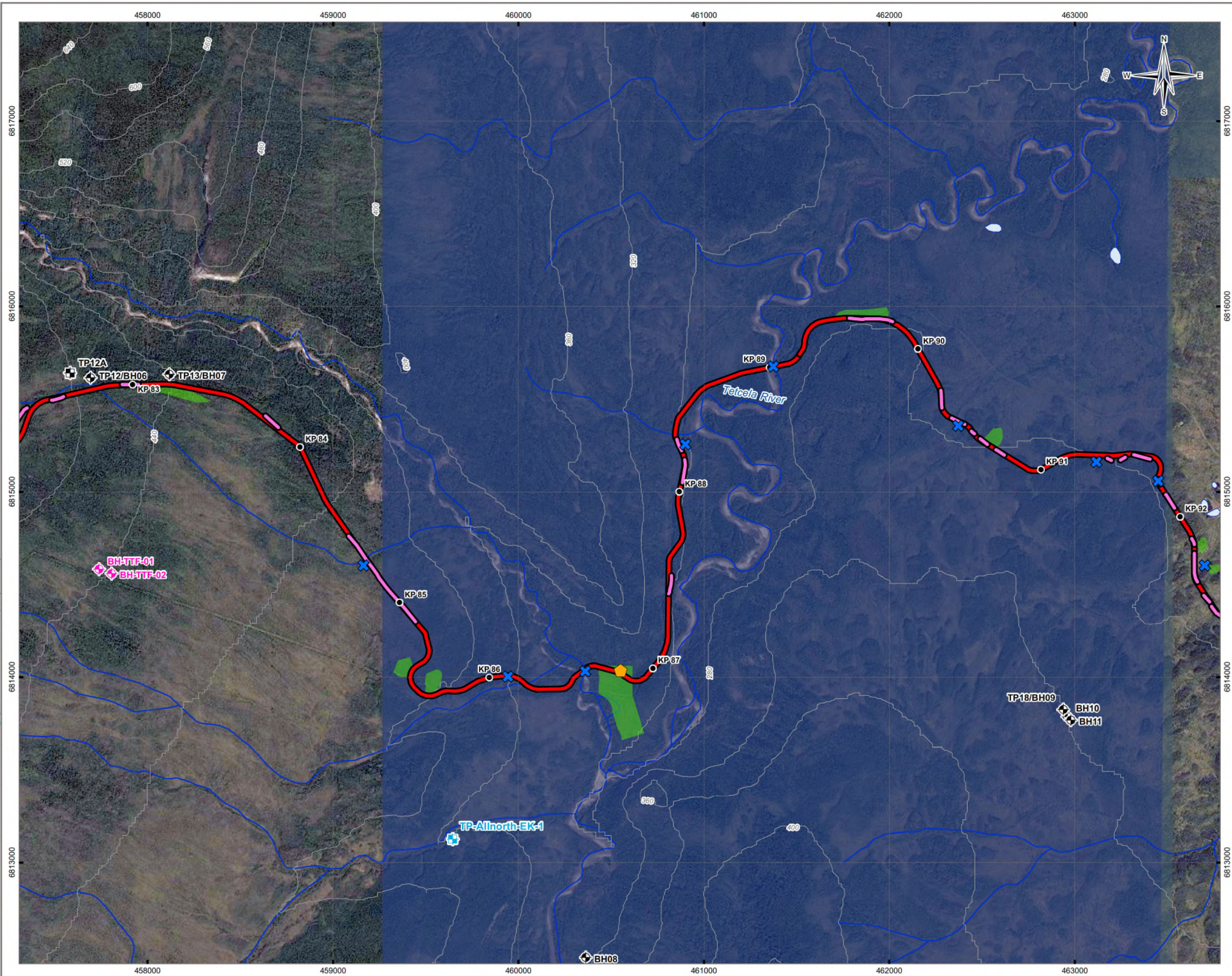
PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10		DATUM NAD83		CLIENT
Scale: 1:20,000 				
FILE NO. EARC03145-01_FigureA.mxd				
OFFICE TI-VANC	DWN MRV	CKD SL	APVD TB	REV 4
DATE January 16, 2019		PROJECT NO. ENG.EARC03145-01		

A12

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ✦ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ✦ 2014 Testpit (Tetra Tech EBA, 2014)
- ✦ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- 🔴 Prairie Creek Access Road (December 2018)
- 🟡 Potential Permafrost Section
- 🟢 Nahanni National Park Reserve Boundary
- 🟢 Potential Borrow Source
- ⋯ Contour (40 m)
- 🌊 Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

STATUS

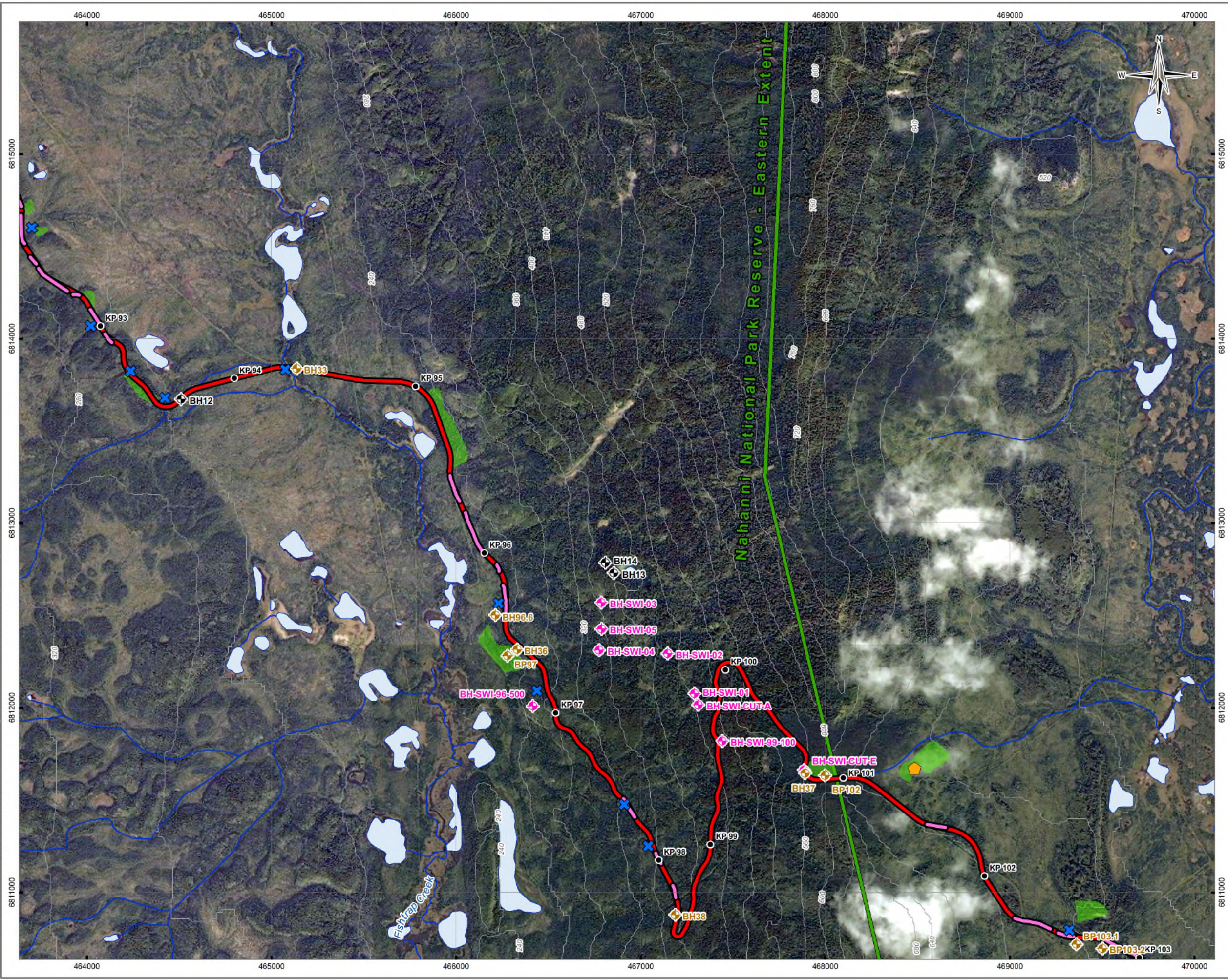
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A13

Q:\Vancouver\GIS\ENGINEERING\EARC\03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

STATUS

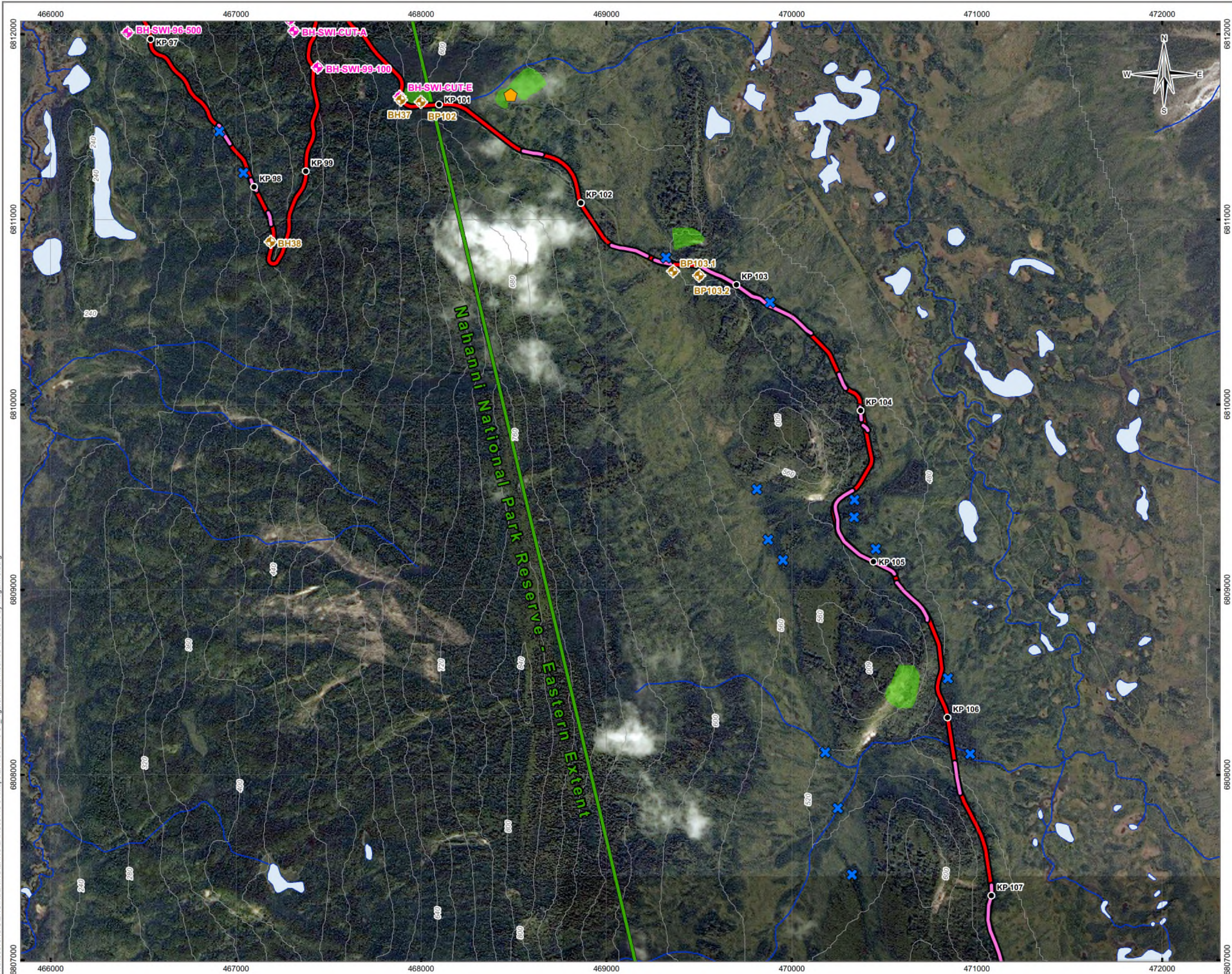
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

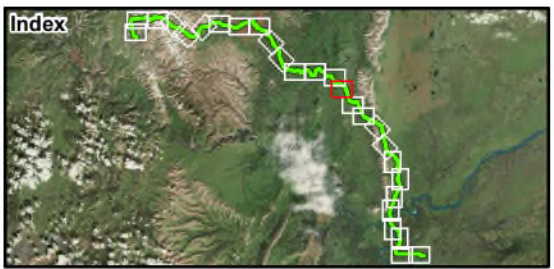
PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION			
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH			
FILE NO. EARC03145-01_FigureA.mxd		A14			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody






NOTES
Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

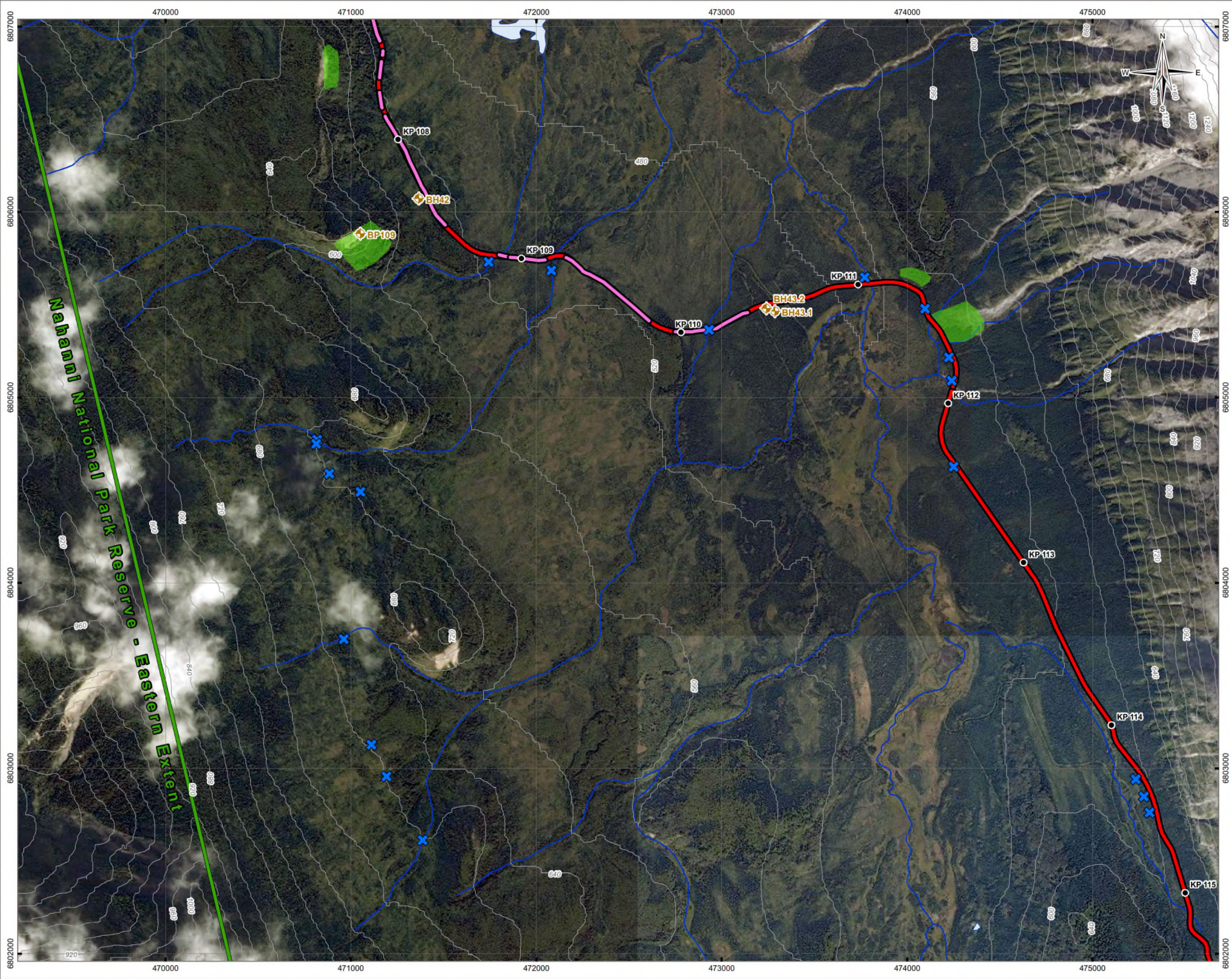
STATUS
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10		DATUM NAD83		CLIENT  CANADIAN ZINC CORPORATION	
Scale: 1:20,000  Metres				 TETRA TECH	
FILE NO. EARC03145-01_FigureA.mxd					
OFFICE TI-VANC	DWN MRV	CKD SL	APVD TB	REV 4	A15
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

STATUS

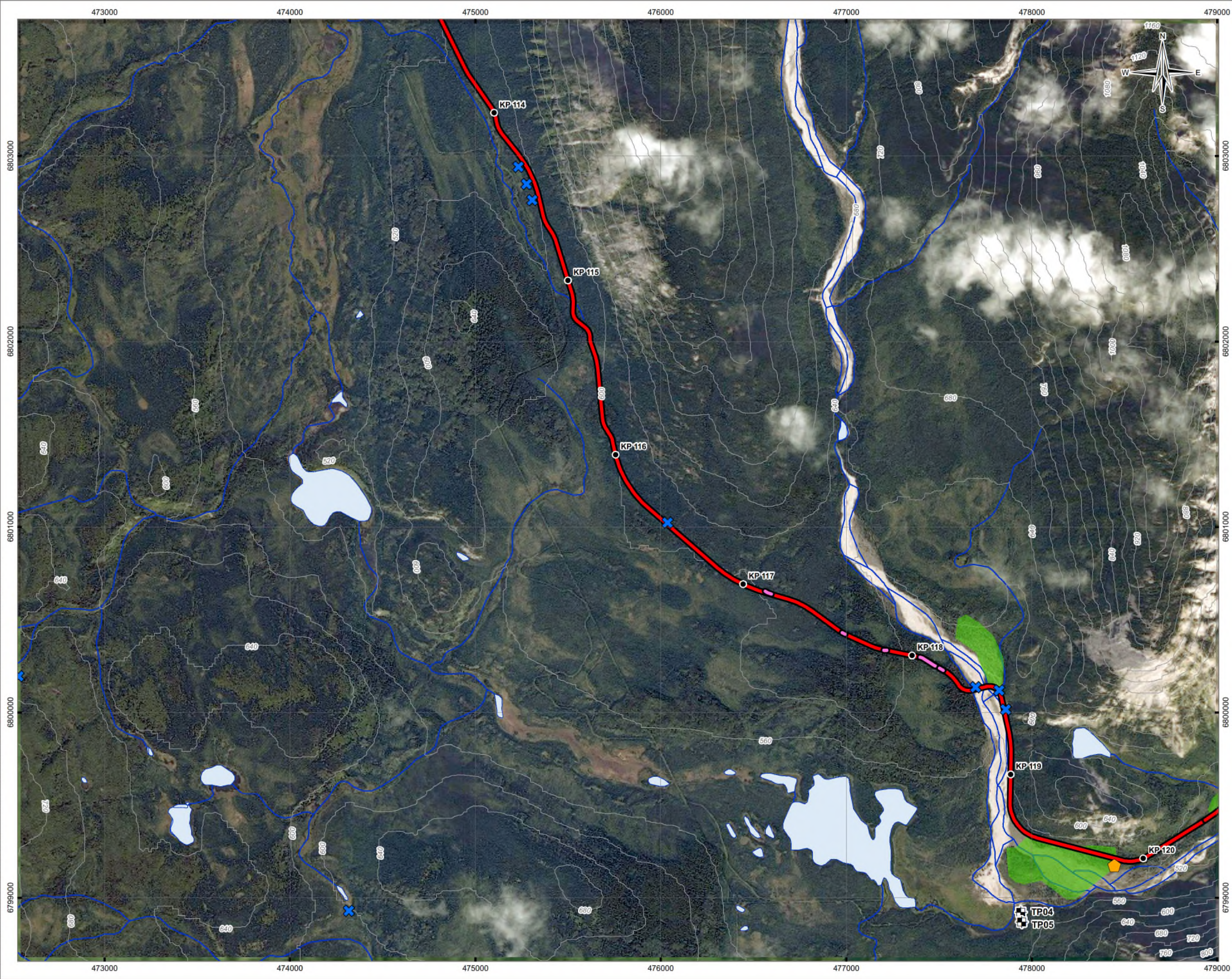
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		FILE NO. EARC03145-01_FigureA.mxd
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A16

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

Access Road Kilometre Marker

2018 Borehole (Tetra Tech, 2018)

2014 Borehole (Tetra Tech EBA, 2014)

2012 Borehole (SNC-Lavalin, 2012)

2014 Testpit (Tetra Tech EBA, 2014)

2014 Testpit (Allnorth, 2014)

Camp/Laydown

Watercourse Crossing

Prairie Creek Access Road (December 2018)

Potential Permafrost Section

Nahanni National Park Reserve Boundary

Potential Borrow Source

Contour (40 m)

Watercourse

Waterbody

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

STATUS

ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION

UTM Zone 10

DATUM

NAD83

CLIENT

CANADIAN ZINC CORPORATION

FILE NO.

EARC03145-01_FigureA.mxd

OFFICE

TL-VANC

DWN

MRV

CKD

SL

APVD

TB

REV

4

DATE

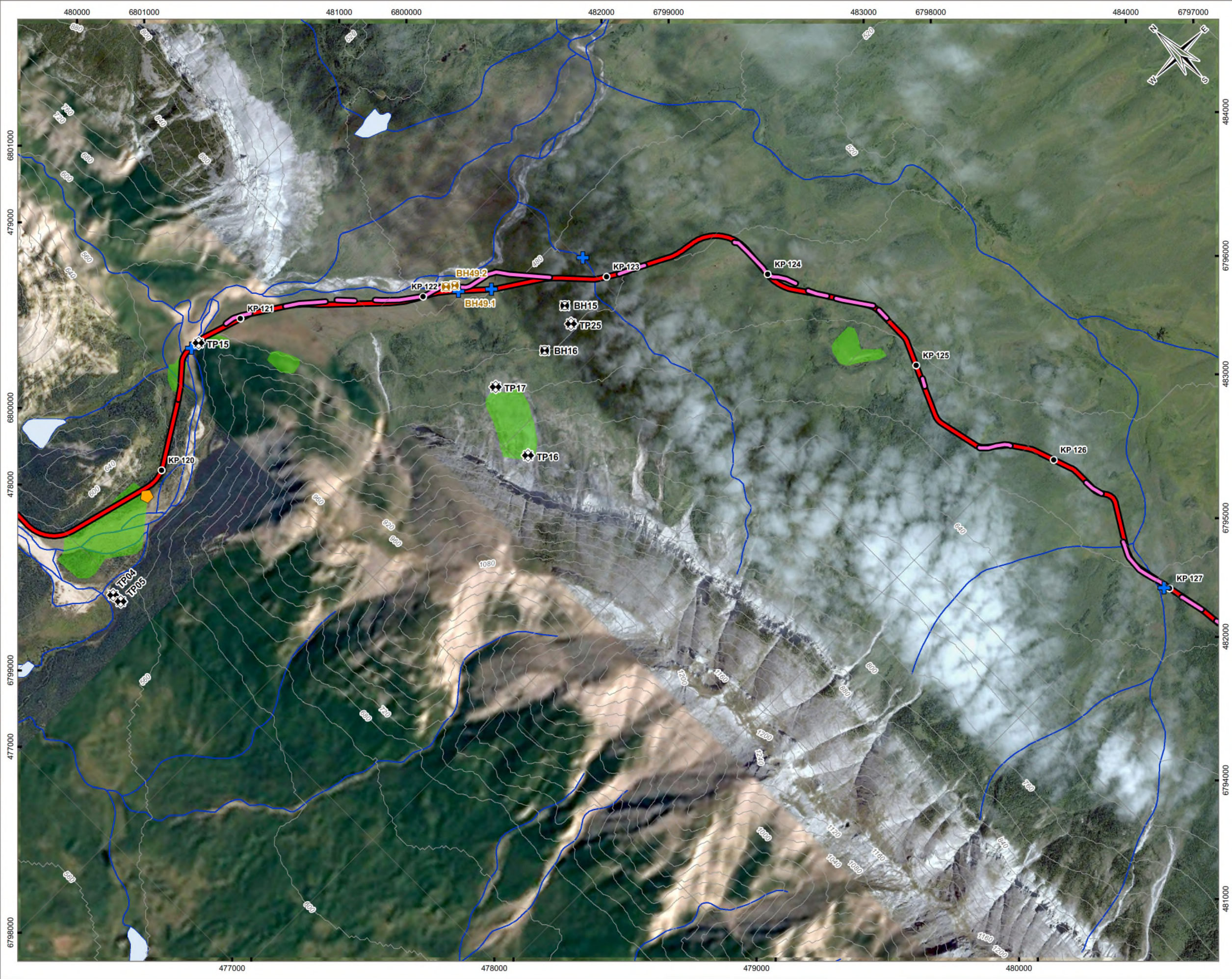
January 16, 2019

PROJECT NO.

ENG.EARC03145-01

A17

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ✦ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ✦ 2014 Testpit (Tetra Tech EBA, 2014)
- ✦ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- 🔴 Prairie Creek Access Road (December 2018)
- 🟡 Potential Permafrost Section
- 🟢 Nahanni National Park Reserve Boundary
- 🟢 Potential Borrow Source
- Contour (40 m)
- 🌊 Watercourse
- 💧 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007

STATUS

ISSUED FOR REVIEW

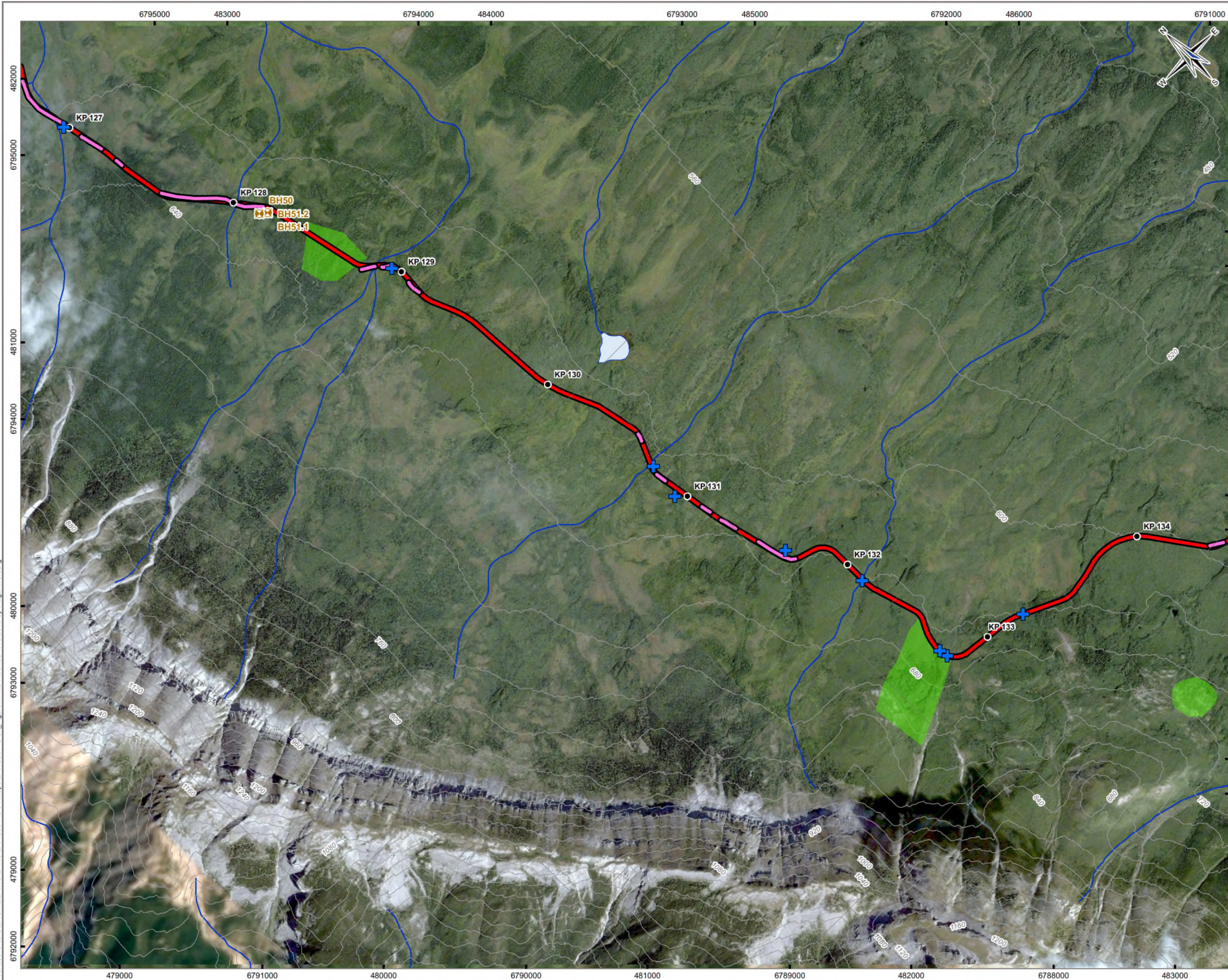
PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd		TETRA TECH			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

A18

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\MapA.mxd modified 1/16/2019 by megan.vanburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- Prairie Creek Access Road (December 2018)
- Potential Permafrost Section
- Nahanni National Park Reserve Boundary
- Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody





NOTES
Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007

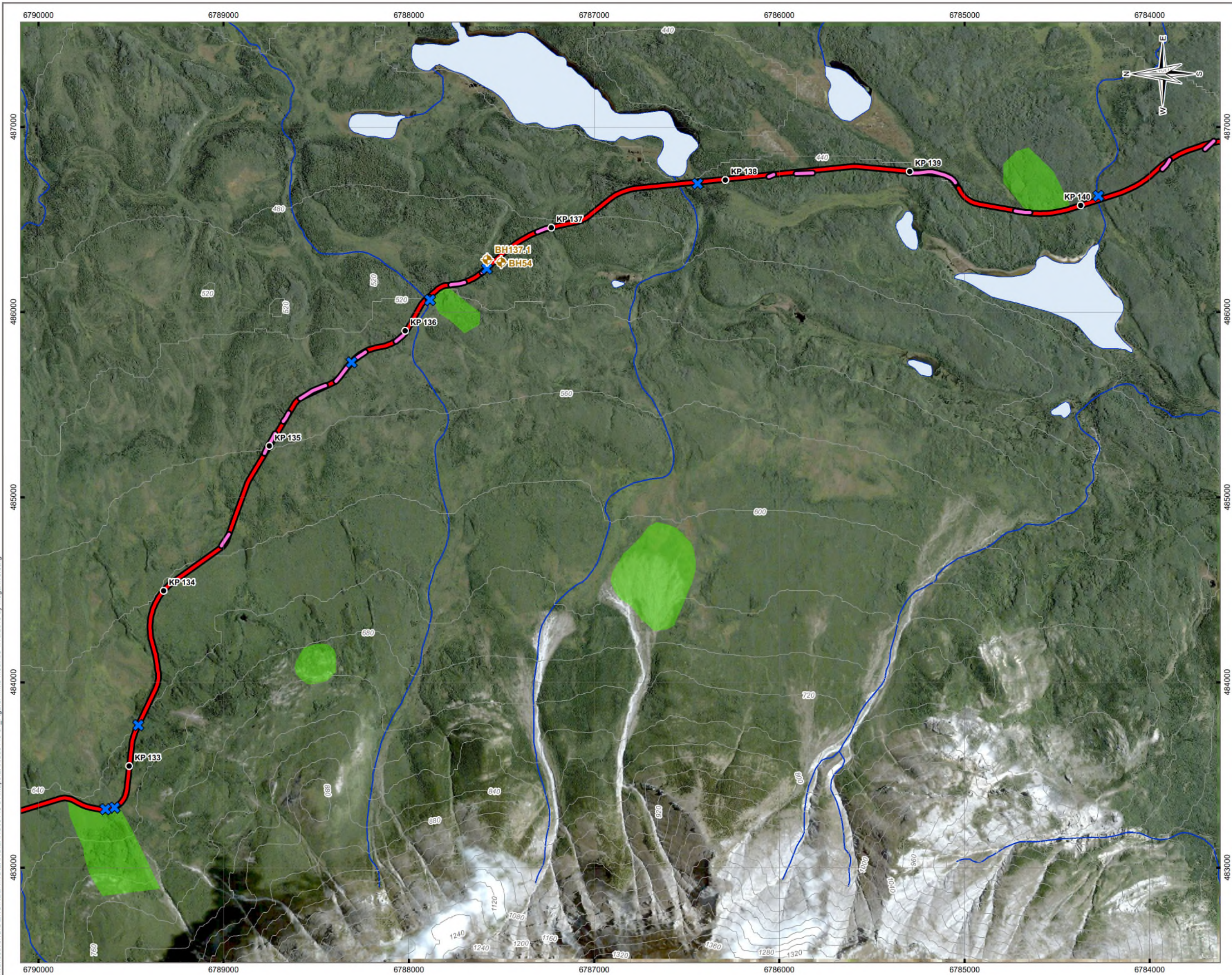
STATUS
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10		DATUM NAD83		CLIENT  CANADIAN ZINC CORPORATION	
Scale: 1:20,000		400 200 0 400		 TETRA TECH	
FILE NO. EARC03145-01_FigureA.mxd		DATE January 16, 2019		PROJECT NO. ENG.EARC03145-01	
OFFICE TL-VANC		DWN MRV	CKD SL	APVD TB	REV 4
					A19

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.vorburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ⊕ Watercourse Crossing
- Prairie Creek Access Road (December 2018)
- Potential Permafrost Section
- Nahanni National Park Reserve Boundary
- Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007

STATUS

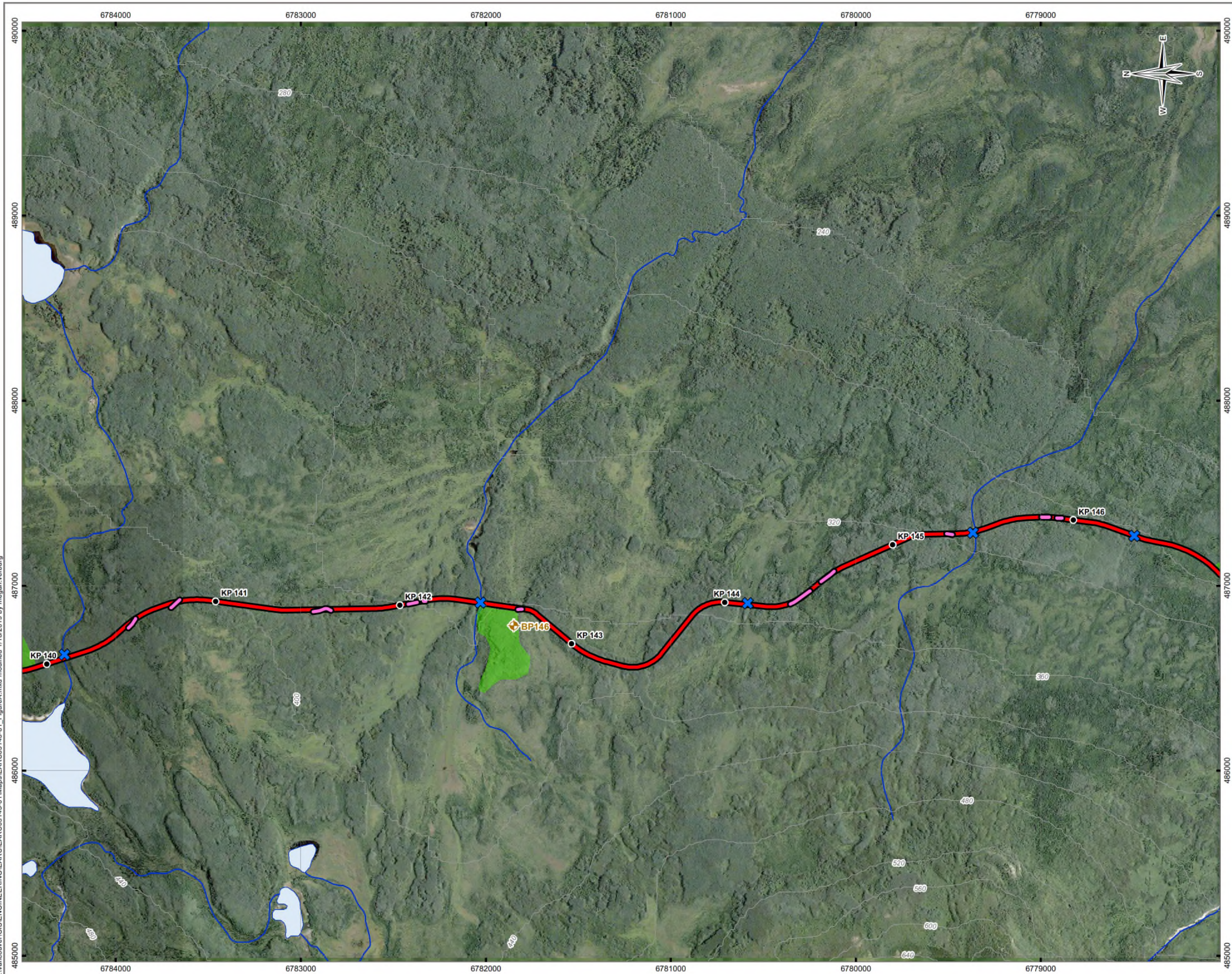
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A20

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- ~ Contour (40 m)
- ~ Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007

STATUS

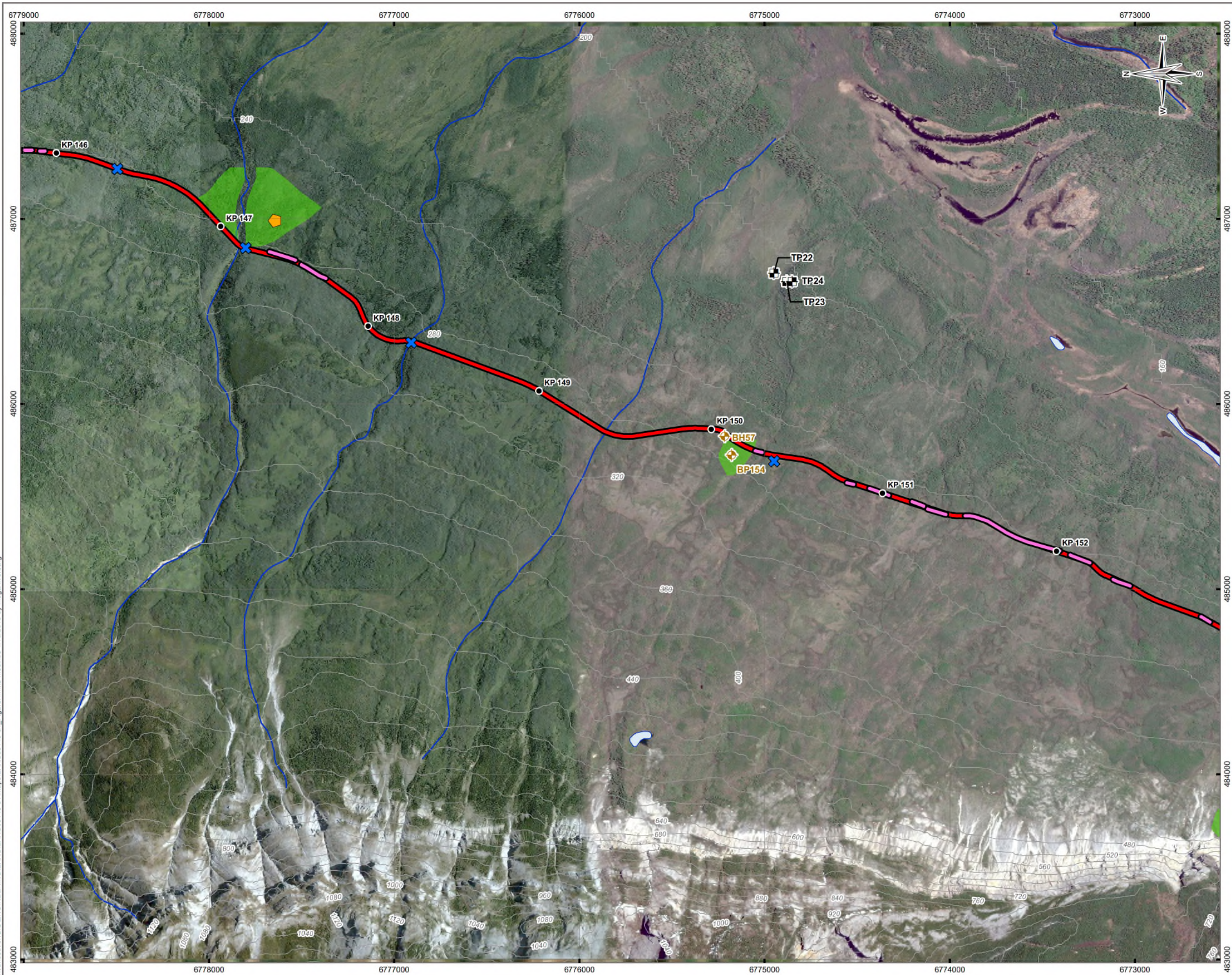
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION
Scale: 1:20,000 400 200 0 400 Metres		
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TI-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A21

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ◆ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ◆ 2014 Testpit (Tetra Tech EBA, 2014)
- ◆ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007-2015

STATUS

ISSUED FOR REVIEW

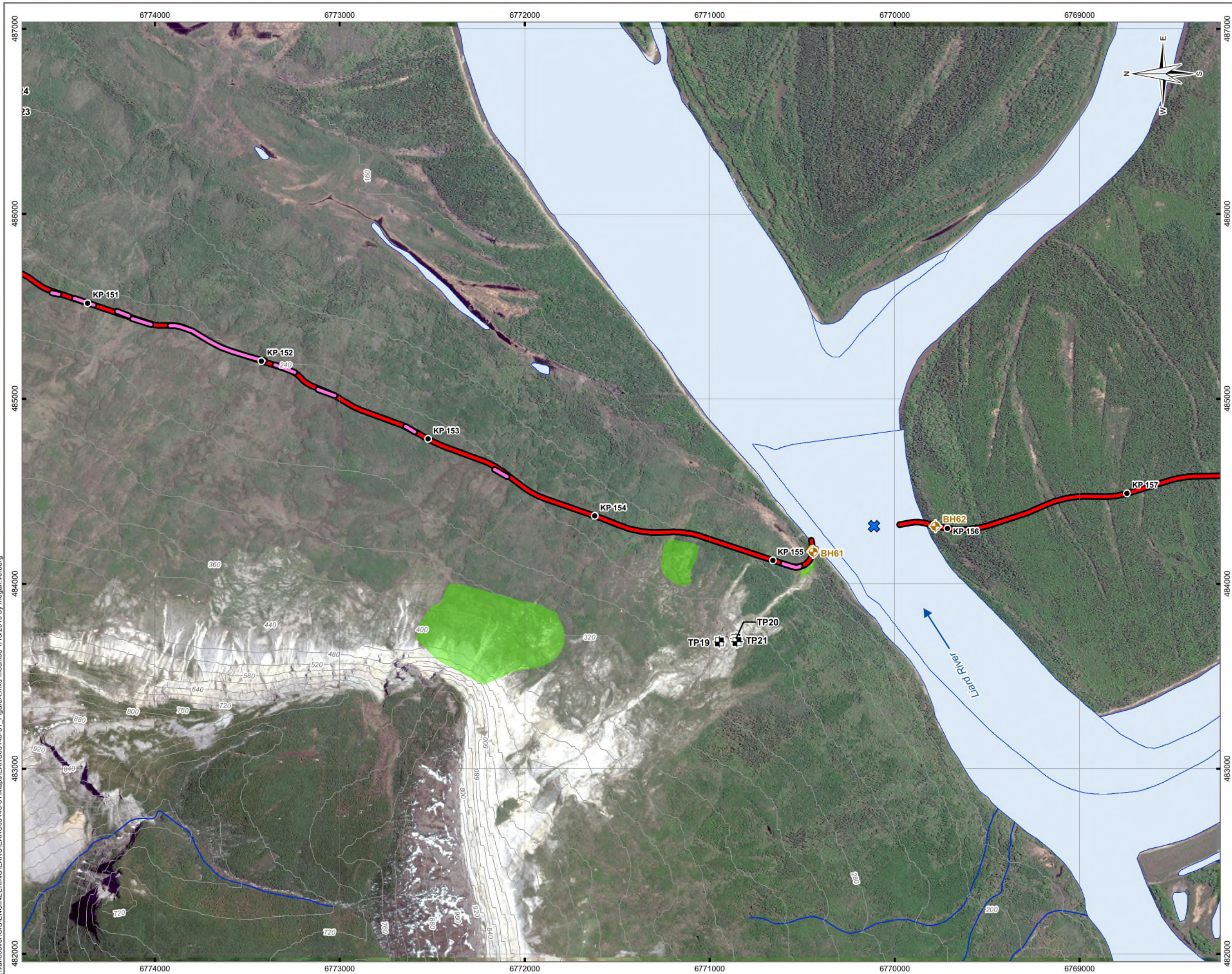
PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10		DATUM NAD83		CLIENT CANADIAN ZINC CORPORATION	
Scale: 1:20,000		TETRA TECH			
400 200 0 400					
Metres					
FILE NO. EARC03145-01_FigureA.mxd					
OFFICE TL-VANC		DWN MRV	CKD SL	APVD TB	REV 4
DATE January 16, 2019		PROJECT NO. ENG.EARC03145-01			

A22

Q:\Vancouver\GIS\ENGINEERING\EARC\EARC03145-01\Maps\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2015

STATUS

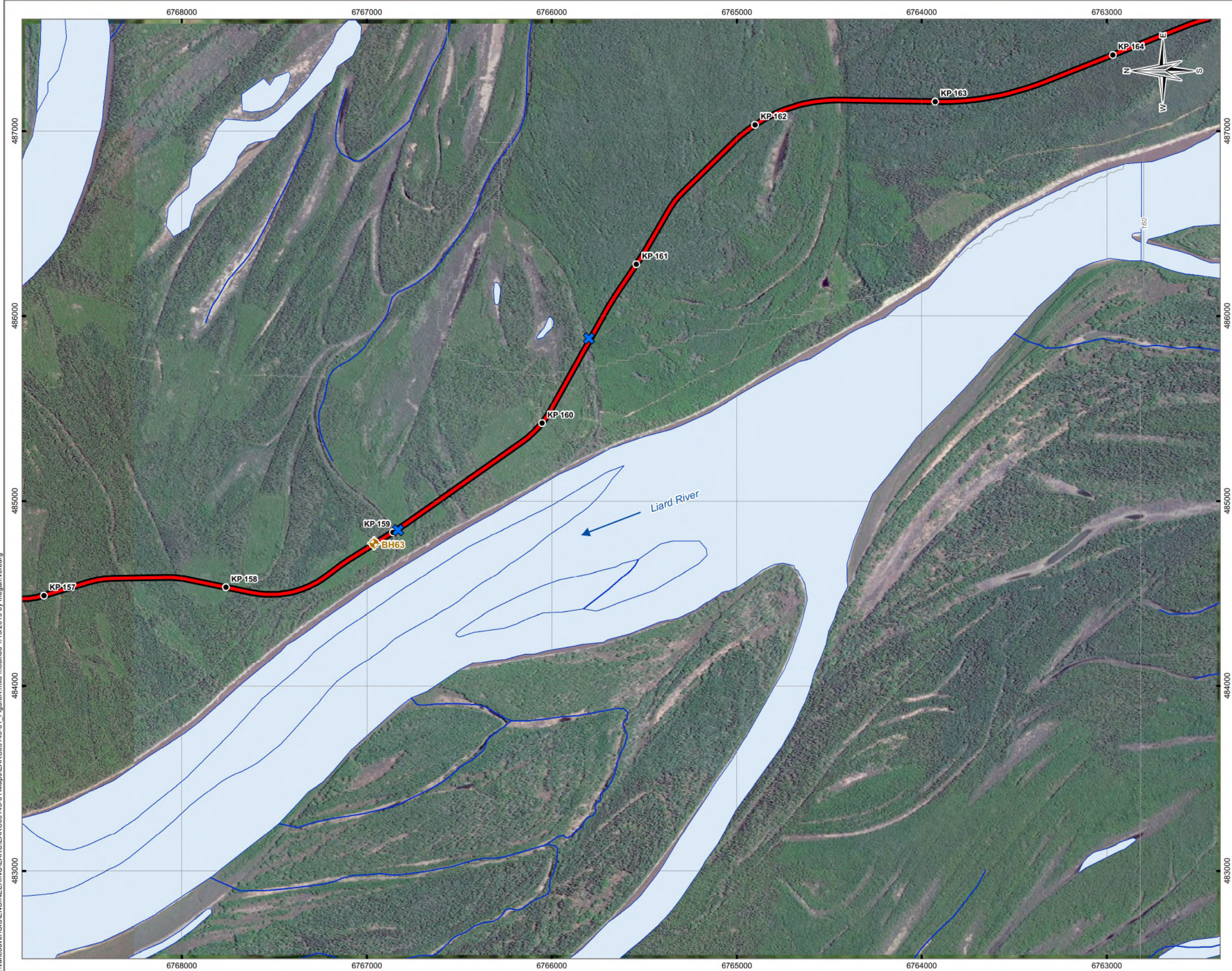
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A23

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- ◆ Camp/Laydown
- ⊗ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2015

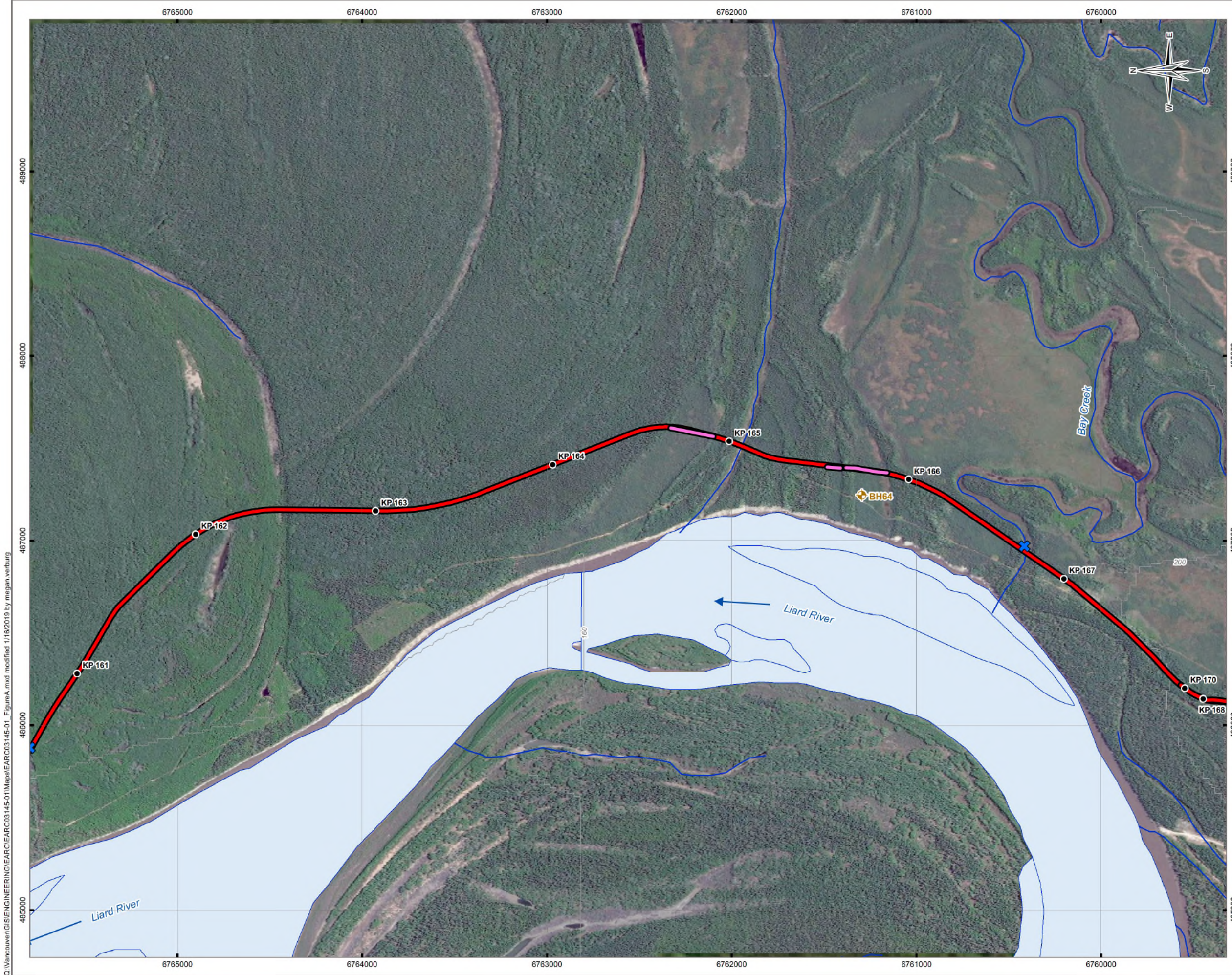
STATUS

ISSUED FOR REVIEW

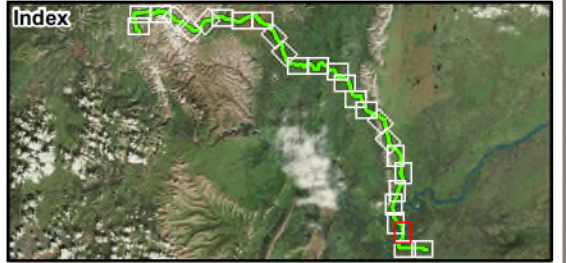
PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH
FILE NO. EARC03145-01_FigureA.mxd		
OFFICE TL-VANC	DWN MRV	CKD SL
DATE January 16, 2019	APVD TB	REV 4
PROJECT NO. ENG.EARC03145-01		A24



- LEGEND**
- Access Road Kilometre Marker
 - ✦ 2018 Borehole (Tetra Tech, 2018)
 - ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
 - ✦ 2012 Borehole (SNC-Lavalin, 2012)
 - ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
 - ⊕ 2014 Testpit (Allnorth, 2014)
 - 🏠 Camp/Laydown
 - ✕ Watercourse Crossing
 - ▬ Prairie Creek Access Road (December 2018)
 - ▬ Potential Permafrost Section
 - ▬ Nahanni National Park Reserve Boundary
 - ▬ Potential Borrow Source
 - ~ Contour (40 m)
 - ~ Watercourse
 - ~ Waterbody



NOTES
Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2015

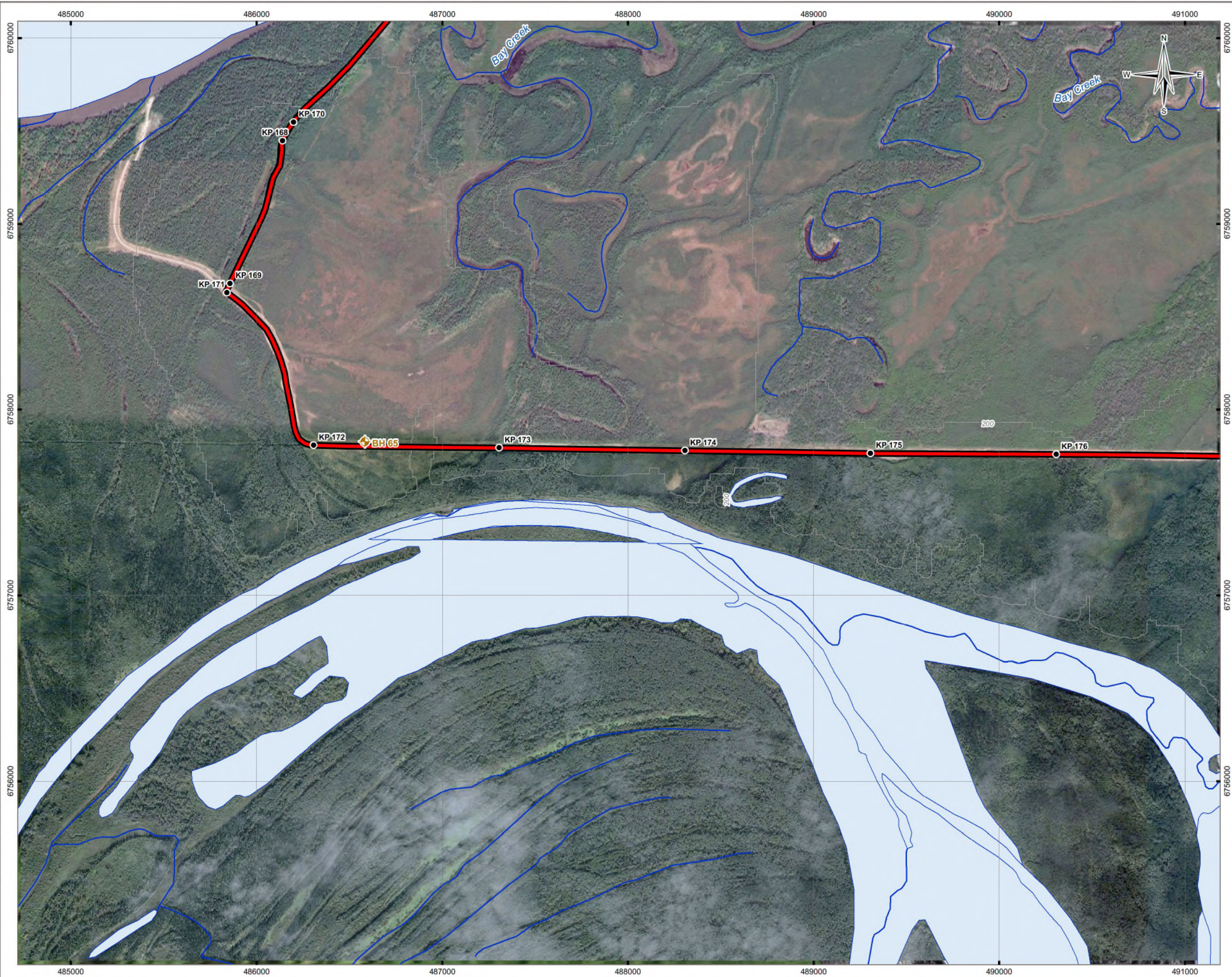
STATUS
ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT CANADIAN ZINC CORPORATION			
Scale: 1:20,000 400 200 0 400 Metres		TETRA TECH			
FILE NO. EARC03145-01_FigureA.mxd		A25			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ◆ 2018 Borehole (Tetra Tech, 2018)
- ⊕ 2014 Borehole (Tetra Tech EBA, 2014)
- ◆ 2012 Borehole (SNC-Lavalin, 2012)
- ⊕ 2014 Testpit (Tetra Tech EBA, 2014)
- ⊕ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▬ Nahanni National Park Reserve Boundary
- ▬ Potential Borrow Source
- Contour (40 m)
- Watercourse
- Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Google Earth, 2007-2015

STATUS

ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd		A26			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

Q:\Vancouver\GIS\ENGINEERING\EARC03145-01\Mapa\EARC03145-01_FigureA.mxd modified 1/16/2019 by megan.verburg



LEGEND

- Access Road Kilometre Marker
- ✦ 2018 Borehole (Tetra Tech, 2018)
- ⬢ 2014 Borehole (Tetra Tech EBA, 2014)
- ✦ 2012 Borehole (SNC-Lavalin, 2012)
- ⬢ 2014 Testpit (Tetra Tech EBA, 2014)
- ⬢ 2014 Testpit (Allnorth, 2014)
- 📍 Camp/Laydown
- ✕ Watercourse Crossing
- ▬ Prairie Creek Access Road (December 2018)
- ▬ Potential Permafrost Section
- ▭ Nahanni National Park Reserve Boundary
- ▭ Potential Borrow Source
- ~ Contour (40 m)
- ~ Watercourse
- 🌊 Waterbody

Index

NOTES

Base data source: CanVec; GeoBase.
Base imagery source: Bing Maps Aerial

STATUS

ISSUED FOR REVIEW

PRAIRIE CREEK ACCESS ROAD

Map Book

PROJECTION UTM Zone 10	DATUM NAD83	CLIENT 			
Scale: 1:20,000 400 200 0 400 Metres					
FILE NO. EARC03145-01_FigureA.mxd		A27			
OFFICE TL-VANC	DWN MRV		CKD SL	APVD TB	REV 4
DATE January 16, 2019	PROJECT NO. ENG.EARC03145-01				

APPENDIX E

SPILL RESPONSE TRAILER TENTATIVE EQUIPMENT LIST

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
30-Nov-18				
Locations				
Mine	Km 0			
Cc = Cat Camp	Km 39			
Km 87 Maintenance Camp	Km 87			
Gg = Grainger Gap	Km 123			
Inventory Categories				
Anchor Pins				
Anchor Pins	Drive- in , 4'	6	6	6
	Drive-in, Delta wing	3	3	3
	Screw- in 5'	3	3	3
Booms, Bridles, Connector Pins				
Booms, River	6" x 6" River Boom in 25' sections with fixed ASTM connectors			
	Boom Repair Kit			
Bridles	Shoreline, c/w snaps for" boom.			
	Tow, Single, ASTM Connector for boom			
Connector Pins, Astm	Spares for 6" x 6" Boom			
Electrical Equipment & Generators				
Extension Cords	20'	2	2	2
	50'	2	2	2
	100'	1	1	1
Generator (Gasoline)	Wheeled	1	1	1
Light Stand	Portable, c/w light	2	2	2
	Spare 500W Halogen bulbs	2	2	2
Fuel, Gas, Oil, Lubes & Additives				
Anti - Freeze	Gas Line 150 ml	1	1	1
Diesel	5 gall. Jerry Can	1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Engine Oil	TBD			
Engine Starting Fluid	Aerosol	1	1	1
Gasoline	5 gall. Jerry Can	1	1	1
Gasoline (5l)/Chain Oil (1.5l) Combi Container		1	1	1
Hydraulic Oil				
Helicopter Equipment				
Hoses & Related Equipment				
See Also Tanks & Related Equipment	Terra Tank fittings not included here			
Adapter	1 1/2" M x 2" M			
Discharge Hose	2" x 25' c/w Kamlocks	2	2	2
	2" x 50' c/w Kamlocks	2	2	2
Fire Nozzle	c/w 1 1/2" to 2" Swage and Kamlock	1	1	1
Foot Valves	2" c/w Kamlock	1	1	1
Hose Caps	1.5"			
	2"			
	3"			
	4"			
Hose Plugs	1.5"			
	2"			
	3"			
	4"			
Kamlock Locking Pins (Spare)		6	6	6
KAMLOCKS, NIPPLES & ADAPTERS Etc.		Y	Y	Y
Kamlock Seals	2" Rubber, Spares	6	6	6
Suction Hoses	2" x 15' c/w Kamlocks	6	6	6
Suction Screen	2" c/w Kamlocks	1	1	1
Swages (Adapters)	2" - 3" c/w Kamlocks	1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
	2" - 4" c/w Kamlocks	1	1	1
Three Way Manifold	2" c/w Ball Valves	1	1	1
Valves	2" Ball, c/w Kamlocks	1	1	1
Ice Equipment				
For Clothing (Chain Saw Chaps, Winter Boots Etc See "Safety Equipment, Personnel." Or "Miscellaneous"				
Auger - Ice	Gasoline Powered, c/w ??" bit and 2' extension			
Auger Bit - Ice	6" Bit			
Auger/Chain Saw Tool Kit	Includes chain file etc.			
Chain Saw	Gasoline Powered c/w ??" bar & chain. C/W manual.			
Chain Saw Air Filter				
Chain Saw Bar	48" Spare			
Chain Saw Chain	48" Spare			
Ice Block Lifter T Bar	c/w 1 "T" Bar c/w chain			
Ladles				
Shovels, Scoop				
Water Velocity Meter	Stream Speed Meter			
Miscellaneous				
Allen Key	Set	1	1	1
AXE C/W Safety Cover	Fire, Long Handled	1	1	1
Batteries, C Cell	For Megaphone	6	6	6
Booster Cables	Pr.	1	1	1
Brush	Floor, Long Handled	1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Carabiners	See Quicklinks			
Chainsaw		1	1	1
See Also Chain Saws In Ice Equipment				
Chain Saw Chaps	Pr.	1	1	1
Chisel, Steel		1	1	1
Clipboard		1	1	1
Come Along 3/4 Ton	C/W chain and lever	1	1	1
Cones, Traffic		12	12	12
Container, Rubbermaid		3	3	3
Cord	Sash on reel	1	1	1
Decon	Brushes, Long Handled	3	3	3
	Trays	3	3	3
DECON KIT	Large			
Bag, Duffle, Marked "Decon Kit"				
3 Bags, Waste Disposal				
3 Berms, Mini 36" x 36" x 6"				
1 Bottle, Spray				
3 Brush, Boot, Long Handled, Stiff Bristle				
2 Scissors, Rounded Ends				
1 Gall Solvent	c/w MSDS			
1 Sorbent, Granular, 10 Lb bag				
25 Pads, Sorbent, Hydrocarbon				
25 Pads, Sorbent, Universal				
1 Roll Tape, Caution/Do Not Enter (yellow)				
1 Tarpaulin, 12' x 12'				
Detergent	20L pail decon etc	1	1	1
Drum, 45 gall, steel	45 Gall. c/w removeable lid & quick release locking ring	3	3	3
Drum, 45 gall, plastic	45 Gall. c/w removeable lid & quick release locking ring	3	3	3

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Emergency Response Guide 2012		1	1	1
Fence	Snow, Orange, Roll	1	1	1
Files	Flat	1	1	1
	Round	1	1	1
Flashlights	c/w Orange Wand Ends & "D" Cell batteries	2	2	2
Funnels	Large	1	1	1
	Small	1	1	1
Garbage Bags	Box, domestic type	1	1	1
Garbage Bags, Industrial Waste	6mm 50 per box	1	1	1
Geo Tech Bags	Solid Waste, Heli Transportable c/w slings attached	3	3	3
Hacksaw	c/w spare blades	1	1	1
Hammer	Ball Peen	1	1	1
	Claw	1	1	1
	Sledge 8 lb.	1	1	1
Hatchet c/w safety cover		1	1	1
Heater	"Reddy", Electric powered, Diesel fuel	1	1	1
Kit, Grounding & Bonding	Rubbermaid Tub c/w Lid	1	1	1
	Steel Spikes			
	15' Yellow Coated Cable c/w BLACK clamp each end			
	25' Yellow Coated Cable c/w RED clamp on each end			
	Instruction Card for use of			
Knife	Utility, c/w spare blades	1	1	1
Lab Spill Kit (in 20L Pail c/w Lid)		1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Labels	Identifying equipt fuel dates, bag content etc (box) c/w plastic ties	Y	Y	Y
Lanterns	Hand	6	6	6
Lantern 6v Batteries		9	9	9
Log Book		1	1	1
Mallet, Rubber		1	1	1
Markers, Permanent	Black	1	1	1
	Red	1	1	1
Megaphone	c/w Siren c/w C cell batteries	1	1	1
Nails	Assorted, In One Gallon Paint can	Y	Y	Y
Nuts, Bolts, Washers	Assorted	Y	Y	Y
Padlocks	Installed on trailers. Combination type, Programmable, Master Locks on doors and on spare tire mount brackets.	Y	Y	Y
Pails	Galv. 2.5 gall, aluminium	1	1	1
	Plastic, 20L c/w lid	1	1	1
Paint	Aerosol Orange	1	1	1
	Aerosol Blue	1	1	1
Paper Towels		1	1	1
Pick		1	1	1
Pitch Forks	"D" Grip	2	2	2
	Long Handled	2	2	2
Plastic, Sheeting	20ft x 100ft 6mm Roll	1	1	1
Pliers	Regular	1	1	1
	Needlenose	1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Plywood	3/4" x 4'x 6'			
	3/4 x 4' x 8'			
	4' x 4'			
	5' x 3'			
Propane Bottles	20lb			
Propane Torch Kit	c/w storage case, flame spreader, 2 utility flame tips.	1	1	1
Pry Bar	5'	1	1	1
QUICK LINKS, Spares		6	6	6
Rags (Box)		1	1	1
Rakes	Long Handled	2	2	2
Scissors	Rounded end	1	1	1
Scraper	Ice, Long Handled	2	2	2
Screwdriver	Multi Tip	1	1	1
Shackles		6	6	6
Shovels	Long Handled	2	2	2
	Scoop, Aluminum, "D" grip	2	2	2
	Snow	2	2	2
Soda Ash	See Sorbents			
Squeegee	Long Handled	2	2	2
Tape	CAUTION	1	1	1
	DANGER	1	1	1
	DUCT	1	1	1
	ELECTRICAL (ROLLS)	1	1	1
	FLAGGING (ROLLS) Not White	1	1	1
	TEFLON (ROLLS) - pipe tape	1	1	1
Tape Measure	25'	1	1	1
	100'	1	1	1
Tarpaulins		2	2	2

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Ties, Wire, Nylon	Assorted sizes	Y	Y	Y
Tie-Downs	For interior of trailer	Y	Y	Y
Tin Snips	Set of 3	1	1	1
Tool Box	Portable	1	1	1
Tiger Torch	c/w regulator and hoses - Propane			
Trays, Drip	36" x 36" x 4" Collapsible	3	3	3
Wd - 40	Lubricant, aerosol	1	1	1
Wire	Mechanics (roll)	1	1	1
Wire Brush		1	1	1
Wire Cutters		1	1	1
Wire Mesh	Roll, Large mesh	1	1	1
Wire Flags	Bundles. 100 per bundle. Not White	1	1	1
Wrench	Crescent 6" Adjustable	1	1	1
	12" Adjustable	1	1	1
	PIPE - 12"	1	1	1
	18"	1	1	1
	Combination Open End Set 11, imperial	1	1	1
	Combination Open End Set 11, metric	1	1	1
	Sparkplug	1	1	1
Wringer c/w bracket to fit 45 gall drum	For sorbent pads	1	1	1
PUMPS				
ALL PUMPS ARE KAMLOCKED				
Diesel	See also "Skimmers"			
Gasoline	2"	1	1	1

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
ROPES & ROPE REELS				
Rope	1/2" x 25', floating, loop & hook	8	8	8
	1/2" x 50', floating, loop & hook	4	4	4
	1/2" x 100', floating, loop & hook	2	2	2
Reel		3	3	3
SAFETY EQUIPMENT				
GENERAL				
Air Horn		1	1	1
Eye Wash Station	c/w liquid	1	1	1
First Aid Kit	10 man	2	2	2
Fire Extinguisher	20lb ABC N2 Refillable	2	2	2
N2 Fire Extinguisher Bracket	N2 Type	2	2	2
Nitrogen Cartridges	Fire Extinguishers Spares			
Powder, Fire Extinguisher	Purple K - 50lb Pails			
Windsock				
SAFETY EQUIPMENT				
PERSONNEL				
Blankets		1	1	1
Booties	Tyvec boot covers, Pr	12	12	12
Boots. Pr.	Rubber, c/w steel toe & shank Size 10	2	2	2
	Rubber, c/w steel toe & shank Size 11	2	2	2
	Rubber, c/w steel toe & shank Size 12	2	2	2
Chin Straps	For Hardhats	6	6	6

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Coveralls, Disposable, Tyvec	Size XL	6	6	6
	Size XXL	6	6	6
Earplugs	Box	1	1	1
Glasses	Safety	6	6	6
Goggles	Chemical. Splash	6	6	6
Gloves	Monkey Grip	12	12	12
	Neoprene	12	12	12
	Nitrile, Disposable (Box of 100)	1	1	1
Hardhats		3	3	3
Ice Sandals	"Korkeez", pr	6	6	6
Lifevests	Large	6	6	6
	Extra Large	6	6	6
Rainwear, Jacket And Pants Set	Large	4	4	4
	Extra Large	4	4	4
	Extra Extra Large	2	2	2
Respirators	Half Mask	4	4	4
	Full Face	4	4	4
Respirator Cartridges	Acid. Fits both of above type respirators	12	12	12
	Organic Vapour. Fits both of above type respirators	12	12	12
	Particulates. Fits both of above type respirators	12	12	12
Safety Harness	Parachute Type c/w 6' shock absorber safety lines	4	4	4
Vests	Road, c/w reflective tape	8	8	8
Waders, Chest C/W Suspenders	c/w steel toes and shanks			
	Size 10	2	2	2
	Size 11	2	2	2

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
	Size 12	2	2	2
SAMPLING EQUIPMENT				
Cooler, 102 quart, white				
Cooler, 60 quart, red/white				
Packing tape, roll				
Ice Packs				
Pen				
Pencil				
Rite in Rain Notebook, small				
Rite in Rain Notebook, large				
Permanent marker pens				
Trowel, Aluminum				
Spoon, Stainless steel				
Scrub Brush				
Distilled Water				
Bucket, steel 9L				
Liquid detergent, bottle				
Paper towels, roll				
Amber Glass Bottles 1L				
Amber Bottles 250 ml				
Plastic Bottles 250 ml				
Purge and Trap Vials				
Soil Sample Jars 250 ml				
Mason Jars 1L				
Ziploc Storage Bags, in box				
Bottle & Jar Labels				
Sample Preservatives, nitric acid vials				
Chain of Custody Forms				
Tape Measure				
Latex Gloves				
Summary of Typical Parameters, Hold Times & Bottle Requirements				
Sampling Kit Inventory				
SKIMMERS				
SORBENTS				
Booms, Oil Only (White)	Sorbent, Bags of 4 (5" x 10')	2	2	2
Booms, Universal, Incl. Acids (Gray)	Sorbent, Bags of 4 (5" x 10')	2	2	2
Granular	Bags	6	6	6

ITEM	DESCRIPTION	Cat Camp	KM 87 Maintenance Camp	Grainger Gap
Oil Snares, Loose	Pom Poms 30 per bag	1	1	1
Oil Snares On Rope	Pom Poms 1 rope per bag	1	1	1
Pads	100 Bale. Oil Only (White)	6	6	6
	100 Bale, Universal (Gray)	6	6	6
Putty, Spill	Jar, for drum and tank leaks	1	1	1
Rolls	Sorbent, Oil Only	1	1	1
	Sorbent, Universal, incl. acids	1	1	1
Socks, Oil Only	Bags	1	1	1
SOCKS, Universal, Incl. Acids	Bags	1	1	1
Soda Ash	Bags, 25 kg.	10	10	10
TANKS & RELATED EQUIPMENT				
Terra-Tank	Pillow type			
Terra Tank Fittings	Bag			
Terra Tank Repair Kit				
TOTES c/w Lids & Drain Assemblies				
Tote, Insulated, FORKLIFTABLE c/w LID	42" x 48" x 35"			
Tote Tank Drain Assemblies	c/w 1.5" drain plug adapter, "O" Ring, 2" DC Kamlock, 2" ball valve, 2" x 1.5" reducer nipple			
Vehicles				
Trailer		1	1	1
Inventory Completion Dates				

APPENDIX F

LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

Where TETRA TECH has expressly authorized the use of the Professional Document by a third party (an "Authorized Party"), consideration for such authorization is the Authorized Party's acceptance of these Limitations on Use of this Document as well as any limitations on liability contained in the Contract with the Client (all of which is collectively termed the "Limitations on Liability"). The Authorized Party should carefully review both these Limitations on Use of this Document and the Contract prior to making any use of the Professional Document. Any use made of the Professional Document by an Authorized Party constitutes the Authorized Party's express acceptance of, and agreement to, the Limitations on Liability.

The Professional Document and any other form or type of data or documents generated by TETRA TECH during the performance of the work are TETRA TECH's professional work product and shall remain the copyright property of TETRA TECH.

The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner

consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

PRAIRIE CREEK ACCESS ROAD

