



Parent Company of Canadian Zinc

October 15, 2019

Julian Morse
Regulatory Officer
Mackenzie Valley Land and Water Board
7th Floor, 4922 48th St.
PO Box 2130
Yellowknife, NT
X1A 2P6

Jonathan Tsetso
Nahanni National Park Reserve
Parks Canada
PO Box 348
Fort Simpson NT
X0E 0N0

Dear Mr. Morse and Mr. Tsetso:

Re: **Information Request, Waste Management Plan**
Prairie Creek Mine All Season Road
MV/PC2014F0013, MV/PC2014L8-0006

We refer to the information request (IR) dated October 7, 2019. With this letter, Canadian Zinc Corporation (CZN) is pleased to provide a revised Waste Management Plan (WMP) for the Phase 1 Winter Road.

We trust the WMP contains the pertinent information requested in the IR. For greater clarity, we have recapped this information below, and also commented on transport of waste to the Prairie Creek Mine for treatment or storage.

The IR refers to reviewer comments made on the ORS dated May 15, 2019, and to guidelines. Concordance is discussed below.

ENR 121

ENR recommends the Board not approve the Waste Management Plan until the method of sewage disposal has been determined and sufficient detail as to effluent quality has been provided for each camp including distance to the nearest surface water bodies.

The revised WMP describes black water being taken off-site for disposal in Fort Nelson, and grey water disposal in sumps on territorial land >31 m from the nearest water body.

ENR 122

ENR recommends that should sewage be disposed of at any of the camp sites, the Board establish SNP stations and appropriate Effluent Quality Criteria (EQC).

Black water will not be disposed of at any of the camp sites.

MVLWB 18

Please clarify how CZN will address the sewage and greywater management plans.

CZN was unable to confirm the black water management plan prior to engaging a road contractor. Having now done that, we are able to confirm off-site black water disposal. Grey water disposal is described in the revised WMP consistent with the Northern Land Use Guidelines – Camp and Support Facilities (NLUG) and the Board’s Guidelines for Developing a Waste Management Plan (Board Guidelines).

Parks Canada 128

1. *On-site disposal of grey water within NNPR will be conducted as per the Guidelines for Grey water Disposal at Remote Camps - Yukon Environmental Health Services, 2012, Option #2 Grey Water Septic System. Option #1 would require a barrel system for each person, which is not practical, and would only apply to systems that are not pressurized.*
 2. *CZN shall provide a grey water management plan for the development, management and decommissioning of all grey water septic systems within NNPR. This plan must be approved by Parks Canada and will include:*
 - a. *a design of the grey water septic system being proposed,*
 - b. *the soil stratification for all proposed locations,*
 - c. *the depth of the water table,*
 - d. *the distance to nearest water course/ water body and potable water source.*
 3. *All camps of a temporary nature (with a wastewater system that serves a non-permanent population) must have a closure plan submitted as part of preliminary design. As with the design for site facilities, the closure plan must be prepared by a qualified professional and detail how the treatment works will be decommissioned upon camp closure.*
-
1. No grey water disposal is proposed within the NNPR for Phase 1.
 2. See 1.
 3. No treatment works are proposed inside the NNPR during Phase 1 and therefore no closure plan is needed.

Parks Canada 129

1. *Preferentially, CZN shall store all sewage (brown water) within NNPR in holding tanks for removal and treatment off site at an approved location. Details on the storage, removal and transportation must be provided.*
2. *If CZN chooses to manage sewage for larger camps within NNPR rather than at an approved off site location, a sewage management plan must be completed for the development, management and decommissioning of the proposed sewage treatment systems at each site. This plan must be approved by Parks Canada and will include:*
 - a. *a design of the sewage treatment system being proposed in accordance with accepted standards and guidelines,*
 - b. *in the case of a septic system, a soil stratification for all proposed locations,*
 - c. *the depth of the water table,*
 - d. *the distance to nearest water course/ water body and potable water source,*
 - e. *depending on the choice of sewage treatment system, a ground water quality monitoring program may also be required which will include thresholds for active management*
3. *All camps of a temporary nature (with a wastewater system that serves a non-permanent population) must have a closure plan submitted as part of preliminary design. As with the design for site facilities, the closure plan must be prepared by a qualified professional and detail how the treatment works will be decommissioned upon camp closure.*

The plans for onsite sewage disposal will be evaluated on a case by case basis; should the risks be deemed too high, Parks Canada will require that the sewage be removed and treated off site.

1. That is the plan for Phase 1.
2. On-site black water treatment is a possibility for Phase 2, although other options (incinerating toilets and storage/off-site disposal) will be considered.
3. An on-site treatment and disposal system would include a closure plan.

Parks Canada 132

For those camps that will have two separate handling methods for grey water and sewage proponent should indicate what portion will be grey and what portion will be sewage (black).

Volumes for black water and grey water are provided in the revised WMP.

Parks Canada 133

For those that indicate "no" (on-site disposal) in Table 1-18, confirm that all grey water and sewage will be hauled to a treatment plant.

For Phase 1, all grey water and black water will be hauled out of the NNPR.

Parks Canada 134

Please provide clarification (sewage from small and maintenance camps).

As for PC133.

Racher 12

There need to be approved waste management plans in place under the current permit and licence at the mine site to treat, store or dispose of the waste from the road construction that is taken there.

No road waste will need to be taken to the Mine for disposal during Phase 1. The limited road crew working on the western end of the road will be accommodated at the Mine, so no road camp waste will need to be taken to the Mine.

The Board's IR dated October 7 notes that "CZN's mining Licence (MV2008L2-0002) and Permit (MV2008D0014) do not authorize CZN to treat or store waste from this Project". CZN does not understand why this is. We refer to the Developers' Assessment Report for EA0809-002 in connection with the Mine site and winter road. In Section 6.22.1 on p. 230, 2nd paragraph, it is stated:

"Seasonal road construction crews will operate from the Mine, Cat Camp, and the Tetcela and Liard Transfer Facilities.....Sewage from the trailers will be held in temporary tanks which will periodically be pumped out into a sewage truck and taken to the Sewage Treatment Plant at the Mine."

In Section 6.22.2 on the same page, relating to access road operations, it is stated:

"Similar to the construction period, road maintenance crews will operate from the Mine, Cat Camp, and the Tetcela and Liard Transfer Facilities, and will continue to use the trailers equipped with potable water and washrooms....Water supply and sewage disposal will be as for construction."

Also, in Section 6.24.3 on p. 243, 2nd paragraph, operation of a transfer facility on the road is described "with sewage and waste being periodically transported to the Mine for disposal in the appropriate facilities".

Therefore, it seems to us that CZN's mining Licence (MV2008L2-0002) and Permit (MV2008D0014) should authorize CZN to treat or store waste from the road at the Mine site. CZN is not intending to deposit waste in a NWT community Waste Disposal Facility.

Racher 13

The WMP that is approved prior to Phase 1 Construction should contain all of the details (sewage, incineration) necessary for that phase. The WMP will then need to be updated prior to Phase 2 Construction and possibly again prior to operations.

The revised WMP for Phase 1 contains the necessary details. We agree an update will be required for Phase 2.

Board Guidelines

The revised WMP discusses waste storage and disposal and sumps, consistent with Section 3.4 of the Guidelines. Regarding Section 3.4.6, while sewage generation volumes are provided, treatment plant design, operation and maintenance is not since black water is to be transported off-site for disposal. Regarding Appendix A, Section 2, combustible solid waste will be incinerated. Hazardous waste, including incinerator ash, will be hauled to Tervita in Fort Nelson. Section 4 discusses sumps, seemingly in relation to the containment of drilling waste. In our case, we propose to use sumps for grey water disposal. See below re NLUG. Section 7 discusses sewage disposal, specifically black water and grey water. Disposal plans have been described above.

NLUG

Section 4.2 of the NLUG discusses waste management. General principles are presented which are included in the WMP. Section 4.2.1 discusses solid waste, and we have noted our intention to use an incinerator. Section 4.2.2 discusses sewage and grey water, which we have already discussed above. However, the Section also discusses grey water sumps, and we have incorporated the guidance into the WMP, including locating sumps well in excess of 31 m from the nearest water body.

Closing

CZN trusts this letter and the WMP adequately addresses the IR

Sincerely,
NorZinc

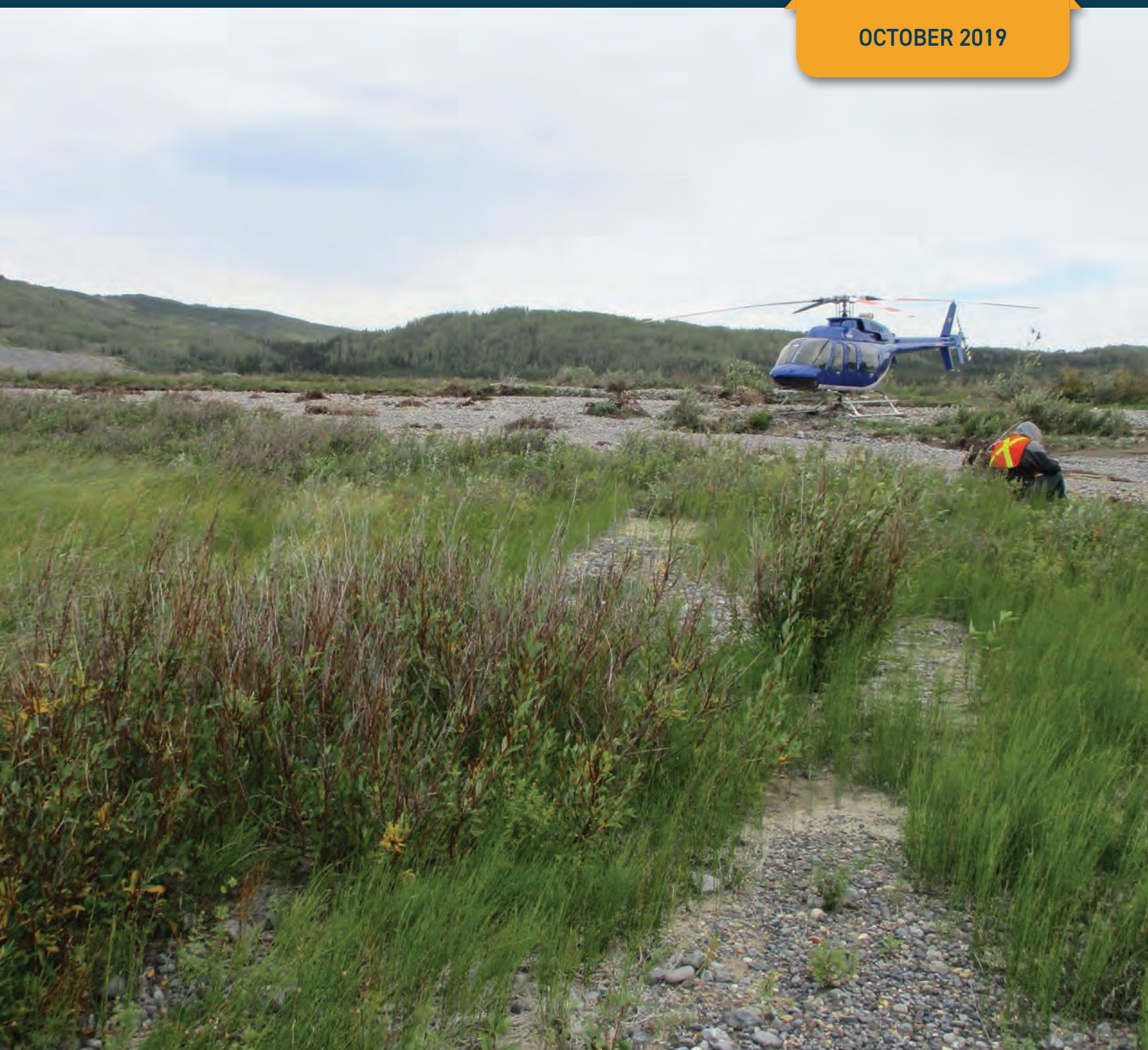


David P. Harpley
VP, Environment and Permitting Affairs

PRAIRIE CREEK WINTER ROAD – PHASE 1 CONSTRUCTION

WASTE MANAGEMENT PLAN

OCTOBER 2019



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Revision History

Revision	Description	Revised By (Initials)	Revision Date
1	Initial Version	Tetra Tech	2019-07-19
2	Updated version to reflect conditions in draft LUP and WL	Tetra Tech	2019-10-16

Conformity Table

Permit Conditions	Section of Plan
Conformance with draft LUP Conditions 78, 79 80 and 81 and draft WL Schedule 4.	
76. The Permittee shall comply with the Waste Management Plan, once approved. The Waste Management Plan shall include but not be limited to: a) A Greywater management plan for the development, management and decommissioning of grey water septic systems within NNPR, in accordance with the Yukon Government's Environmental Health Services Guidelines for Grey Water Disposal at Remote Camps (2012) and/or the direction of the Superintendent, including: i. a design of the grey water septic system being proposed, ii. the soil stratification for all proposed locations, iii. the depth of the water table, iv. the distance to nearest water course/ water body and potable water source. v. A closure plan for each camp with a wastewater system that details how the treatment works will be decommissioned upon camp closure. The closure plan must be prepared by a qualified professional. b) A management plan for Toilet Wastes that shall include but not be limited to: i. Storage of all Toilet Wastes within NNPR in holding tanks for removal and treatment off site at an approved location. Details on the storage, removal and transportation must be provided, OR, ii. A septic system and onsite disposal field at each camp in NNPR. Plans will include but not be limited to: a) Details on the development, management and decommissioning of each system b) a design of the septic treatment system being proposed in accordance with the Yukon Government's Design Specifications for Sewage Disposal Systems (2017) and/or the direction of the Superintendent, c) in the case of a septic system, a soil stratification for all proposed locations, d) the depth of the water table, e) the distance to nearest water course/ water body and potable water source, f) depending on the choice of sewage treatment system, a ground water quality monitoring program may also be required which will include thresholds for active management g) A closure plan for each camp with a wastewater system that details how the treatment works will be decommissioned upon camp closure. The closure plan must be prepared by a qualified professional.	Section 3.5
78. The Permittee shall keep all garbage and debris in a secure container until disposal.	Sections 3.1, 3.2, 3.3
79. The Permittee shall dispose of all garbage, Waste, and debris as described in the approved Waste Management Plan, unless otherwise authorized in writing by an Inspector	Sections 3.1, 3.2, 3.3
80. The Permittee shall dispose of all Sewage and Greywater into a Sump at least 100 m from the Ordinary High-Water Mark of any Watercourse, unless otherwise authorized in writing by an Inspector.	Section 3.5
81. The Permittee shall dispose of all Sewage and Greywater as described in the approved Waste Management Plan.	Section 3.5

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		2019-10-31
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 –

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PLAIN ENGLISH SUMMARY

The purpose of Canadian Zinc Corporation's (CZN) Phase 1 Winter Road (WR) Waste Management Plan (WMP or Plan) is to ensure that all wastes produced by activities associated with the construction and operation of the Prairie Creek Mine Phase 1 WR are handled, transported, stored or disposed of in a safe and responsible manner and comply with all applicable legislation, regulations, authorizations, permits and licenses for the duration of the Project.

Winter Road construction, operations and related infrastructure such as the maintenance camps and trucking operations are expected to produce small volumes of waste on a yearly basis. Road construction crews may use portable day trailers and camps, accumulating modest volumes of domestic waste, sewage (black water) and grey water (wash water). The WR maintenance camps will also generate domestic waste and sewage.

The intent will be to temporarily store wastes at the road camps. Domestic waste will be collected regularly and transported to the main road camp for incineration. If for some reason a suitable incinerator is not available, the waste will be taken to Tervita in Fort Nelson for disposal. Black water will be stored temporarily for later removal by septic truck to Kledo Construction in Fort Nelson. Grey water camps will be disposed into sumps >31 m from the nearest water body and after filtration. This will only occur on territorial land. There will be no grey water disposal to sumps inside the Nahanni National Park Reserve (NNPR). Grey water from camps inside the NNPR will be temporarily stored and then taken out by septic truck. Hazardous waste (e.g. oil filters, incinerator ash) will be trucked out to Tervita in Fort Nelson under manifest.

The Plan identifies the types of wastes that will be produced by the project and the procedures to promote the reduction, reuse, and recycling of the waste materials. It also describes the practices and procedures for waste handling, collection, storage, transport, and disposal. Waste addressed are: domestic wastes (combustible and non-combustible - non-hazardous wastes); hazardous wastes; recyclable waste; domestic sewage and wash water; excavated material; and, waste explosives. Excavated material will consist of organic material and strippings that cannot be used in road construction. More detail is provided in the Road Construction Plan (RCP). Waste explosives are covered in CZN's Explosives Management Plan (EMP).

The Phase 1 WR WMP is a living document that will be updated as necessary 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.

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Appendix B	Blackwater Disposal Agreement
Appendix C	Phase 1 WR Camp Outlines
Appendix D	Window Sampler Logs

LIST OF ACRONYMS

Acronyms/Abbreviations	Definition
AANDC	Aboriginal Affairs and Northern Development Canada
CCME	Canadian Council of Ministers of the Environment
ASR	All Season Road
CZN	Canadian Zinc Corporation
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment (Process)
GNWT	Government of the Northwest Territories
ha	Hectare
km	Kilometre
KP	Kilometre post
m	Metre
m ³	Cubic Metre
M	Million
Mine	Prairie Creek Mine
MVLWB	Mackenzie Valley Land and Water Board
MVRB	Mackenzie Valley Review Board
NNPR	Nahanni National Park Reserve
NWT	Northwest Territories
Phase 1 WR	Phase 1 Winter Road
TDGR	Transportation of Dangerous Goods Regulation
WHMIS	Workplace Hazardous Materials Information System
WMP	Waste Management Plan
WR	Winter Road

GLOSSARY

Combustible Non-Hazardous Waste	Waste that can be incinerated such as kitchen and food waste, cardboard, wood, paper, etc.
Domestic Waste	Domestic waste typically consists of packaging, tins, food scraps and drink containers.
Domestic Sewage	Black and grey waste water
Four Rs of Waste Management	Reduce, Reuse, Recycle, Recover
Non-Combustible Non-Hazardous Waste	Waste that cannot be burned such as scrap metal, Exposed solid rock or rock underlying loose deposits such as soil or alluvium.
Recyclable Waste	Waste that can be recycled such as beverage containers, batteries, electrical equipment, etc.

1.0 INTRODUCTION

This Phase 1 Winter Road (WR) Waste Management Plan (WMP) was prepared for Canadian Zinc Corporation (CZN) by Tetra Tech Canada Inc. (Tetra Tech) in general accordance with the Mackenzie Valley Land and Water Board's (MVLWB 2011) Guidelines for Developing a Waste Management Plan.

The Phase 1 WR WMP addresses the waste management practices to be implemented for the construction and subsequent operation of the Prairie Creek Phase 1 WR and associated infrastructure from the Mine to the Liard Highway.

Canadian Zinc and its contractors are committed to undertaking waste collection, storage, transportation and disposal for the access road in a safe, efficient and environmentally responsible manner, by actively encouraging and implementing the four R's of waste management, namely: waste reduction, recovery, reuse and recycling, as generally summarized in Figure 1.

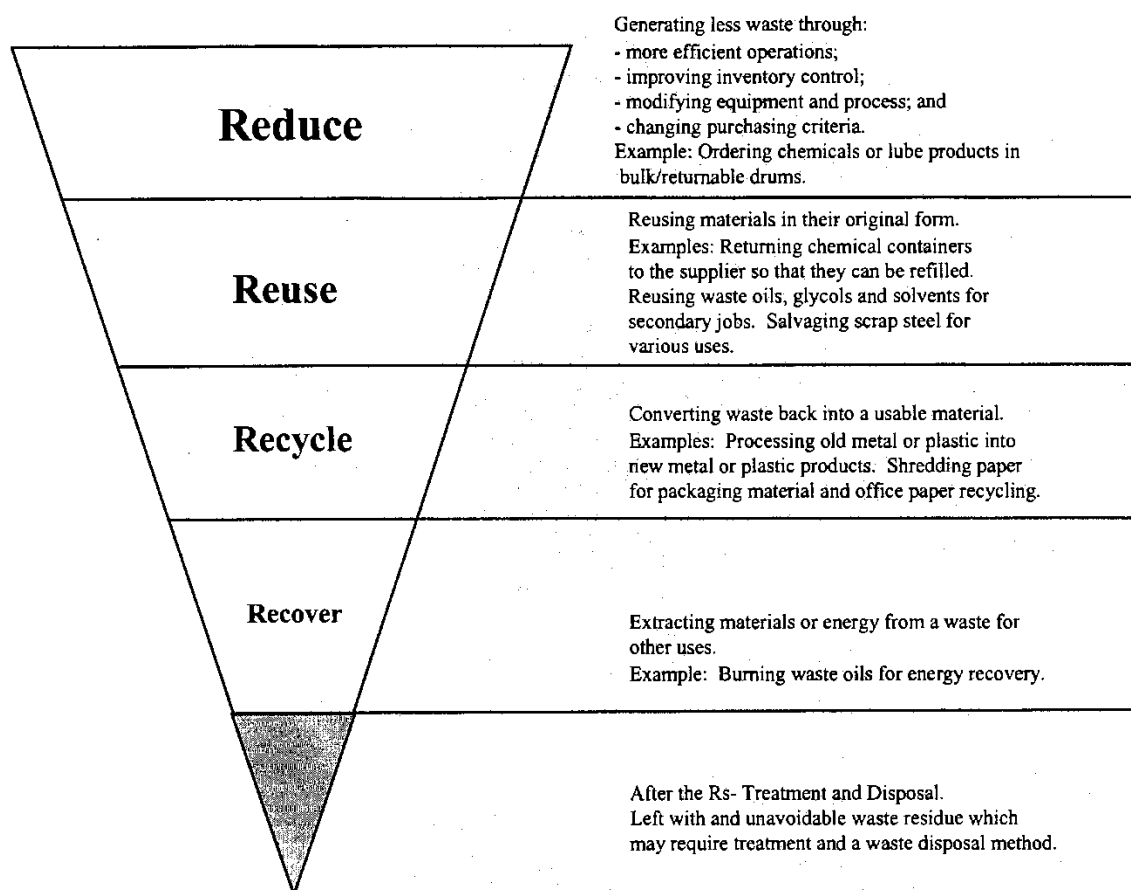


Figure 1: Basic Principles of Waste Management

The effective implementation of these basic principles of waste management will contribute to reducing the environmental footprint of the Phase 1 WR construction program and subsequent operations.

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 and scope of CZN's Phase 1 WR WMP is to ensure that all wastes produced by activities associated with the construction and operation of the Prairie Creek Mine Winter Road are handled, transported, stored or disposed of in a safe and responsible manner and comply with all applicable legislation, regulations, authorizations, permits and licenses for the duration of the Project.

To achieve this, the WMP:

- Identifies waste types potentially generated by the project;
- Identify procedures to promote reduction, reuse, and recycling of waste materials;
- Identify practices and procedures for waste handling, collection, storage, transport, and disposal, and
- Identify waste monitoring and mitigation procedures.

The Phase 1 WR WMP is a living document that will be updated 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.

The WMP is linked to a number of other CZN environmental management plans including:

- Winter Road Design and Construction Plan
- Traffic Control Mitigation and Road Operations and Maintenance Plan
- Avalanche Safety Plan
- Permafrost Management Plan
- Sediment and Erosion Control Plan
- Wildlife Management and Monitoring Plan
- Health, Safety and Emergency Response Plan.

The map book showing the Phase 1 WR alignment can be accessed from the MVLWB Project Registry as PC2014F0013 - CZN - App 1-2 Access Road Maps 1-10,000 Version 2 - Mar13-19.

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 Regulatory Requirements

Specific legislation, regulations and guidelines related to waste management in the Northwest Territories (NWT) include:

1.4.1 Federal Legislation

- Canadian *Environmental Protection Act* (1999)
- *Waters Act* S.N.W.T (2014)
- Canada –Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (CCME 2001)
- *Transportation of Dangerous Goods Act* and Regulations (1992)
- *Work Site Hazardous Materials Information System (WHMIS) Safety Act*
- *Territorial Lands Act* (1985)
- *Explosives Act* (1985)
- Technical Document for Batch Waste Incineration (Environment Canada 2009).

1.4.2 Territorial

- Guidelines for Developing a Waste Management Plan (MVLWB 2011)
- Guideline for Hazardous Waste Management (GNWT 2017)
- Camp Waste & Wildlife Attraction Manual (GNWT 2014)
- Guideline for Waste Antifreeze (GNWT 1998)
- Guideline for Waste Batteries (GNWT 1998)
- Guideline for Waste Solvents (GNWT 1998)
- MVLWB Land Use Permit (to be issued)
- MVLWB Water Licence (to be issued)
- NWT *Environmental Protection Act* (1988)
- NWT *Public Health Act* (1988)
- NWT *Transportation of Dangerous Goods Act* (1990)
- NWT *Waters Act* (last amended April 1, 2014)
- Used Oil and Waste Fuel Management Regulations (GNWT 2003)
- Yukon Territorial Government Design Specifications for Sewage Disposal Systems (June 2016)
- Yukon Territorial Government Environmental Health Services Guidelines for Greywater Disposal at Remote Camps (March 2012).

2.0 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 NWT (Figure 2).

The development of the Phase 1 WR is intended to provide seasonal access for one winter season to enable geotechnical investigation of the proposed ASR alignment and the delivery of equipment and supplies to the Mine site. The Phase 1 WR will be approximately 170 km long and will primarily utilize the proposed ASR alignment, as shown in Figure 3.

Approximately half of the Phase 1 WR (85 km between KP 17-KP 102) is located within the Nahanni National Park Reserve (NNPR). The Phase 1 WR alignment deviations from the proposed ASR alignment can be viewed in detail in the 1:10,000 Allnorth maps referenced in Appendix A, which can be accessed from the MVLWB Project Registry as PC2014F0013 - CZN - App 1-2 Access Road Maps 1-10,000 Version 2 - Mar13-19.

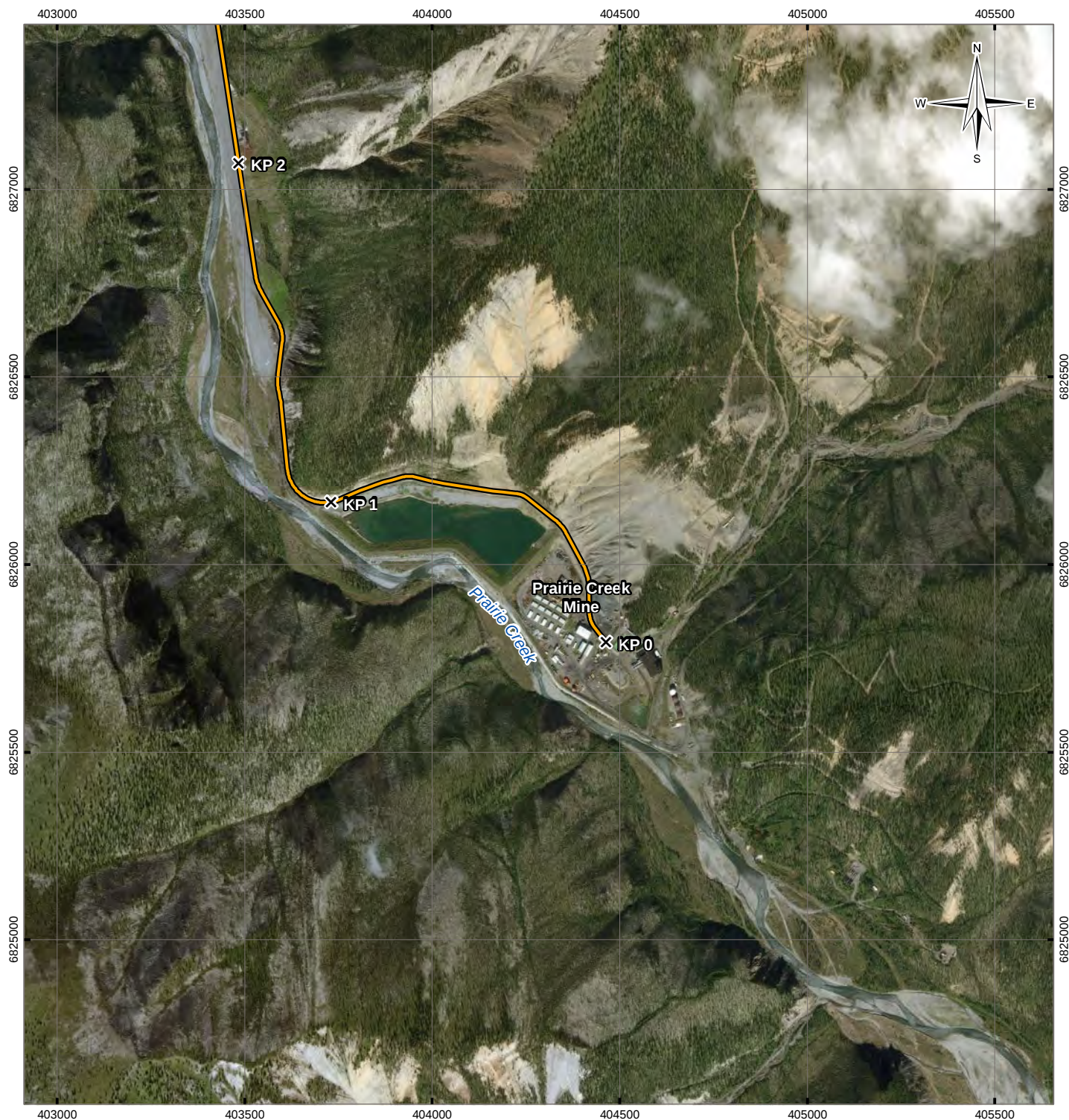
An important goal of the Phase 1 WR construction program will be to minimize mineral soil disturbance and to confine the alignment to the proposed ASR footprint as much as possible. Combining the Phase 1 WR and proposed ASR alignment footprints as much as possible will significantly reduce the total project footprint and in

turn minimize ground/watercourse disturbances. Where side-slopes exist, the construction of the Phase 1 WR is intended to largely occur along the lower side-slope of the proposed ASR alignment.

The WR will cross approximately 18 major streams and 85 minor streams. Construction will be supported by temporary camps as the work progresses. Defined camp locations that may be used include KP 23 (Sundog), KP 42 (Cat Camp), KP 64 (Ram), KP 87 (Tetcela Camp), KP 102, KP 124 (Grainger Gap), KP 159 (Liard R.) and KP 178 (Liard Highway).

Water sources will be utilized in winter road construction. Water sources have been defined at KP 0 (the Mine), KP 42 (Cat Camp), KP 60 (Mosquito Lake), KP 70, KP 100, KP 121 (Gap Lake), KP 139, KP 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.

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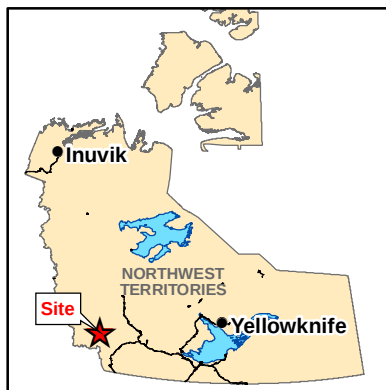


LEGEND

- ✕ Kilometre Marker
- Existing Access Road to be used for Phase 1 Winter Road

NOTES

Base data source:
Kilometre Marker and Winter Road alignment from AllNorth (Dec 2018).
Imagery from ESRI; DigitalGlobe (2016).



STATUS
ISSUED FOR USE

PRAIRIE CREEK PHASE 1 WINTER ROAD

Prairie Creek Mine Area Overview

PROJECTION

UTM Zone 10

DATUM

NAD83

CLIENT



Scale: 1:15,000

200 100 0 200

Metres



FILE NO.

EARC03145-01_Figure01_MineArea.mxd

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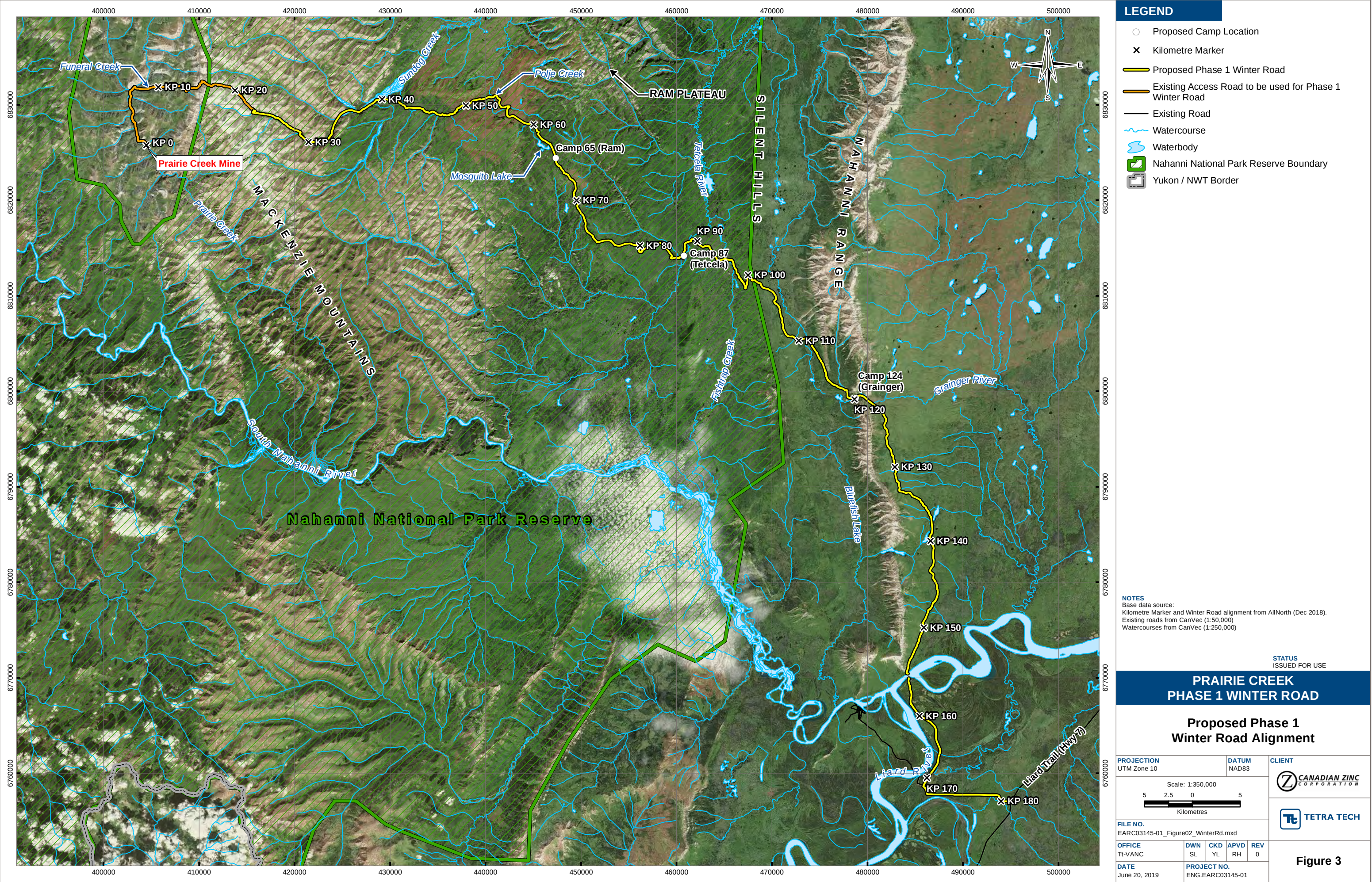
June 12, 2019

PROJECT NO.

ENG.EARC03145-01

Figure 2

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2.1 Phase 1 Winter Road Construction Approach

Construction of the approximately 170 km long Phase 1 WR will follow best standard industry practice and comply with all current safety regulations, and at the same time minimize environmental impacts. The *Northern Land Use Guidelines; Access: Roads and Trails, Winter Access Road*, Table 2.1A (GNWT Lands 2015), defines a typical winter access road.

The Phase 1 WR alignment will need to be cleared of trees and brush. Tree stumps, roots, shrubs and ground cover will typically be left in place as recommended by GNWT Lands (2015). Clearing will be carried out to provide the minimum width necessary. The typical WR clearing width is anticipated to be 10 m to 15 m, approximately half of the future, anticipated ASR clearing width.

Construction of the Phase 1 WR is expected to commence after the ground is frozen (typically after November 1). Existing vegetation in the Phase 1 WR right-of-way (ROW) will typically be cleared with a bulldozer equipped with mushroom shoes or smear blades to avoid cutting the tops of hummocks, tussocks or high spots, which can lead to ground thaw and subsidence during spring. Larger trees will be cut and piled in windrows parallel to the route, with periodic breaks for wildlife access. Windrows can also be used to enhance snow accumulation in certain sections of the route.

For construction of most of the Phase 1 WR, snow and ice will be shaped and compacted to form a solid road prism to support the heavy commercial traffic anticipated to use the Phase 1 WR after opening, tentatively set for March 1, 2020. This standard fits well with the majority of the WR terrain within the NWT.

However, portions of the Prairie Creek Phase 1 WR are located in mountainous and/or rocky terrain, and some locations have greater than 20% side-slopes where snow/ice fills alone are not practical or safe to support a road base. On such terrain, comprising approximately 11 km, a modified or non-typical winter road construction approach will be applied combining the use of organics and some cut material.

The initial construction of the Phase 1 WR is expected to advance on two fronts simultaneously; from the Nahanni Butte Access Road in the east (Spread 1) and from the Mine site in the west (Spread 2). The main advance will be from the Nahanni Butte Access Road, KP 170, working until it meets up with the advance from the Mine site. A small pioneer group may advance a trail ahead of the main group to establish the alignment. The group would likely be supported by a skid-mounted trailer pulled behind the advance. The main crew would be supported by a stationary temporary camp.

Road construction and maintenance crews will mainly operate from the Mine and Phase 1 WR camps to be located at KP 23 (Sundog), KP 42 (Cat), KP 64 (Ram), KP 87 (Tetcela), KP 102, KP 124 (Grainger), KP 159 (Liard River) and KP 178 (Liard Highway) (Figure 2 and Appendix C).

2.2 Phase 1 Winter Road Deactivation

De-activation of the Phase 1 WR in the spring following road closure will involve:

- Notching of snow-fills at stream crossings;
- Pullout/removal of all temporary structures and any log fills at stream crossings;
- Stabilization of fills and disturbed areas at crossings as necessary;
- Possible installation of water bars to ensure natural drainage courses are maintained and potential ponding of water is minimized;

- Stage equipment and basic supplies at key locations along the route to provide support should additional preventative action be required during the spring freshet period; and
- Monitor to preventively identify and stabilize any potential surface water drainage issues

2.3 Project Setting

The Phase 1 WR alignment is shown in Figures 1 and 2. The Phase 1 WR 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 Phase 1 WR will cross 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.

2.4 Terrain Physiography and Vegetation

The proposed route of the Phase 1 WR will pass 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.

2.5 Surface Waters

The main surface water basins crossed by the Phase 1 WR 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 Phase 1 WR 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.

2.6 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 is 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 Phase 1 WR 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 Phase 1 WR 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, particularly during the snow-free period, 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 Phase 1 WR 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 Phase 1 WR alignment during the snow-free period; 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 Phase 1 WR alignment, and documented occurrences include Golden Eagle, Bald Eagle, Peregrine Falcon, American Kestrel, Red-tailed Hawk, Northern Harrier, and Gyrfalcon.

3.0 IDENTIFICATION AND MANAGEMENT OF WASTE TYPES

3.1 Waste Overview

A material is considered to be a waste when it can no longer be used for its original intended purpose. The types of waste anticipated to be generated during the construction and operation of the Phase 1 WR can be classified into the following general categories:

- Domestic Wastes (Combustible and non-combustible – non-hazardous wastes)
- Hazardous Wastes
- Recyclable Waste
- Domestic Sewage
- Excavated Material

Road construction, operations and associated infrastructure activities are expected to produce small volumes of waste on an annual basis. Road construction crews will likely use portable day trailers and accumulate modest volumes of domestic waste and sewage. The Phase 1 WR maintenance camps will also generate limited volumes of domestic waste and sewage. The intent will be to temporarily store these wastes at the road camps for regular collection and transportation either to the Prairie Creek Mine or to a registered waste receiver) for treatment and/or disposal. The same approach will be taken for any hazardous waste generated by the Project, such as lead acid batteries and waste hydrocarbons.

Once the WR camps have been established, the locations of designated waste storage areas will be identified at each camp for the construction and operations phases of the Project.

3.2 Domestic Waste

Domestic waste produced during road construction and operation and similar waste associated with the operation of the camps will consist of packaging, tins, food scraps and drink containers. Production sources will be from trucks and other mobile equipment moved along the road during the road construction and operations phase, and

at the maintenance camps, where some truckers may also stop for a few hours or overnight. Domestic wastes will be temporarily stored in wildlife proof containers (such as Sea Cans) at the WR camps.

Winter Road construction crews of up to 40 personnel will work from the eastern end of the road during the construction phase. Domestic waste is assumed to be produced at a rate of 2.64 kg/person/day (0.011 m³/day, 240 kg/m³). Forty (40) personnel would produce an estimated 105.6 kg/day. The crew working on the western end will number approximately 5 but will produce no road-related domestic waste since they will be based out of the Mine. Road maintenance crews will be smaller, and therefore less domestic waste will be produced.

Road maintenance camps may be used by two to three personnel per shift. Six to nine personnel are expected to produce waste ranging from 15.84 kg/day to 23.76 kg/day.

During the short seasonal WR operations period, Mine and contractor trucks will be travelling daily on the Phase 1 WR. This activity is assumed to be roughly equivalent to 15 personnel being on the road 24 hours/day. Based on these assumptions, an additional 39.6 kg/day of domestic waste may be generated.

3.2.1 Combustible Non-Hazardous Waste

Typical combustible non-hazardous wastes include discarded materials in a solid, or semi-solid form that can be safely incinerated. The incineration of waste can typically reduce the total volume of residual waste by approximately 85%, resulting in 15% of residual ash. Waste ash will be temporarily stored for transportation and disposal off-site. Such wastes do not pose a risk to human or environmental health. The types of waste generated within this category include:

- Kitchen and food waste
- Corrugated cardboard
- Domestic refuse.

Table 1 identifies the typical combustible non-hazardous waste types, sources, potential effects, management hierarchy, and management strategies.

For the WR Project, the selected contractor plans to incinerate domestic waste. The contractor plans to acquire a suitable double-chamber incinerator as part of camp supply. The incinerator will comply with Environment Canada's Technical Document for Batch Waste Incineration, including system selection, operation, maintenance and record keeping. The incinerator will be stationed at the contractor's main camp at any given time, and any waste from smaller, outlying camps would be brought to the main camp. In the unlikely event an incinerator is unable to be sourced, or is deemed unsuitable, the fall-back position will be transport of the waste to Tervita in Fort Nelson for disposal.

Table 1: Combustible Non-Hazardous Waste

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Kitchen and Food Waste	- Food scraps - Kitchen grease - Wrappings contaminated with food - Bagged lunches	- Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers - Potential for litter	- Train kitchen staff on waste reduction - Use bulk food containers whenever possible	- Stored in Designated wildlife-proof food waste containers (e.g. Sea Cans) to be located at all camps - Collected daily - Batch incineration
Corrugated Cardboard	Packaging of supplies/materials	Potential for litter	- Order products in bulk to minimize packaging - Monitor and reduce, where possible, the amount of packaging shipped to the sites - Reuse corrugated cardboard on-site to package materials being sent off-site	- Stored in wildlife-proof containers (e.g. Sea Cans) prior to incineration / landfilling - Regular collection and incineration or transfer to Fort Nelson or the Mine
Domestic Refuse	Refuse from camps (e.g., paper, plastic wrapping, fabrics, etc.)	- Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers - Potential for litter	Domestic waste will be reduced through employee/contractor education programs, including proper separation of waste	- Educate employees about separating recycling and hazardous items from personal waste items - Use clear garbage bags so that cleaning staff can monitor waste sorting habits - Periodically assess domestic refuse to ensure that waste streams are being separated - Regular collection and incineration or transfer to Fort Nelson or the Mine

3.2.2 Non-Combustible, Non-Hazardous Waste

Typical non-combustible non-hazardous waste includes discarded materials in a solid, liquid, or semi-solid form that cannot be burned or recycled. Such wastes do not pose a risk to human or environmental health. The type of waste generated within this category is primarily scrap metal. All scrap metal generated by the Phase 1 WR and associated infrastructure will be consolidated and shipped off-site for recycling/disposal as appropriate as further discussed in Section 3.4.

3.3 Hazardous Waste

A hazardous waste is a contaminant which is a dangerous good that is no longer used for its original purpose and is intended for recycling, treatment, disposal or storage. A hazardous waste does not include a contaminant that is:

- Household in origin;
- Included in class 1, Explosives or class 7, Radioactive materials of the Transportation of Dangerous Goods Regulation (TDGR);
- Exempted as a small quantity;
- An empty container; or
- Intended for disposal in a sewage system or by landfilling that meets the applicable standards set out in schedules I, III or IV of the Guideline for Industrial Waste discharges in the NWT.

A small quantity is "hazardous waste that is generated in an amount that is less than 5 kilograms per month if a solid or 5 litres per month if a liquid; and where the total quantity accumulated at any one time does not exceed 5 kilograms or 5 litres. This does not apply to wastes that are mercury or in classes 2.3, 5.1 or 6.1 of TDGR. These wastes must be generated in an amount less than 1 kilogram per month if a solid or 1 litre per month if a liquid; and where the total quantity accumulated at any one time does not exceed 1 kilogram or 1 litre."

The typical types of waste generated within this category include:

- Used petroleum products (oils/greases)
- Contaminated snow/water/soil (oil/fuel)
- Oil and fuel filters
- Used sorbents and rags
- Incinerator ash
- Hydraulic fluid
- Empty petroleum hydrocarbon containers and drums
- Glycol
- Solvents
- Fluorescent light tubes
- Electronics and electrical waste, and
- Waste equipment batteries.

Table 2 identifies the hazardous waste types, sources, potential effects, management hierarchy, and management.

Table 2: Hazardous Waste

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Used Petroleum Products (oils / greases)	Vehicles and equipment including camp generators/pumps	- Petroleum products released to water bodies can impact aquatic life and waterfowl - Petroleum products can be toxic if ingested by wildlife	When possible, waste oil will be incinerated at the WR camps or Mine	- Waste oil will be collected and stored in empty bulk lubricant cubes. Cubes will be stored in designated hazardous waste storage areas at each WR camp - When possible, waste oil will be incinerated at the WR camps or mine - Waste oil that is not appropriate for incineration may be shipped off-site to a registered hazardous waste receiver
Contaminated Snow/ Water/ Soil (oil/fuel)	Fuel or oil spills on snow or soil	Same as above	- Spill prevention procedures to be employed - Spill Contingency Plan to be implemented to minimize impacts of spills when they occur	- Spill Response Procedures to respond to the spill (safety procedures, initial assessment, spill report, containment, storage, and disposal) - Contaminated snow/water will be stored in clearly-marked, sound, sealed containers at the WR camps and then shipped off-site to an appropriate facility - Bioremediation to be implemented for contaminated soil
Oil and Fuel Filters	Vehicles and equipment	Same as above		- Waste oil and fuel filters will be drained in a heated and ventilated section of the WR camp or Mine. Filters will then be crushed to minimize volume and release any additional oil - The filters will be placed in sealed containers and labelled and stored prior to being shipped off-site to a registered hazardous waste receiver

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Used Sorbents and Rags	Used in maintenance of vehicles and equipment	Same as above	When possible, waste oil will be incinerated at the WR camps or Mine	- Where possible, used rags and sorbents will be incinerated - If incineration is not practical, used sorbents and rags will be stored in clearly-marked, sound, sealed containers in designated hazardous waste storage areas at each WR camp prior to being shipped off-site to a registered hazardous waste receiver
Incinerator ash	Incinerator	Emissions		The ash will be placed in sealed containers and labelled and stored prior to being shipped off-site to a registered hazardous waste receiver
Hydraulic Fluid	Used in vehicles and camp equipment	Hydraulic fluid may enter the environment from spills and leaks from equipment or from improper storage and harm fish or wildlife.	- Biodegradable, low toxicity hydraulic fluids will be used where practical - Equipment will be regularly maintained to prevent spills from ruptured hydraulic fluid lines	- Where possible, used hydraulic fluid will be incinerated - Used hydraulic fluid that cannot be incinerated will be stored in clearly marked, sound, sealed containers prior to being shipped off-site to a registered hazardous waste receiver
Empty Petroleum Hydrocarbon Containers and Drums	Packaging for oils, solvents and penetrating oils	Same as for other petroleum products	CZN and its contractors will purchase these items in bulk to minimize the amount of packaging	Will be backhauled to a recycling facility
Glycol	Used as a coolant and antifreeze in equipment	- Glycol's odour is a known wildlife attractant - Glycol can have toxic effects on aquatic organisms and wildlife	Equipment will be regularly maintained to prevent spills from ruptured glycol lines	- Waste glycol will be stored at each WR camp in clearly marked, sound, sealed containers - These containers will be shipped off-site to a registered hazardous waste receiver
Solvents	Used to degrease machinery in the maintenance shop	- Petroleum products released to water bodies can impact aquatic life and waterfowl - Petroleum products can be toxic if ingested by wildlife	- Low toxicity solvents and physical cleaning will be used where practical - Petroleum-based solvents will not be allowed into the environment and will be subject to the spill response plan	- Waste or excess solvents will be stored in the waste storage facility in clearly marked, sound, sealed containers - These containers will be shipped off-site to a registered hazardous waste receiver

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Fluorescent Light Tubes	Indoor lighting	Fluorescent tubes contain mercury phosphor powder and traces of lead and cadmium	Lights will be equipped with motion sensors to reduce usage where practical	Discarded fluorescent lights will be consolidated and stored at each WR camp prior to being shipped off-site to a registered hazardous waste receiver
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	Electrical waste and devices may or may not contain polluting substances (such as mercury, lead, arsenic, cadmium, and polyvinyl chloride (PVC) that could enter the ecosystem		CZN's environment staff will determine the risk of electronic devices and classify them as hazardous or non-hazardous waste and determine the appropriate method of recycling/ disposal
Equipment Batteries	Equipment batteries	- Lead batteries (i.e., vehicle batteries) contain sulphuric acid and lead - Rechargeable batteries (i.e., industrial, radio and transmitter batteries) usually contain either potassium hydroxide or nickel cadmium	- Protect and service batteries to prevent damage and loss of charge - Test batteries prior to disposal to confirm the battery is spent - Replace non-rechargeable batteries with rechargeable batteries where possible	Equipment batteries will be shipped off-site to a recycling facility or a registered hazardous waste receiver

Hazardous materials will be stored and managed according to the Guideline for the General Management of Hazardous Waste in the NWT (ENR 1998). Where appropriate and in compliance with legislation, used oils will be incinerated. All other types of hazardous waste will be shipped to a registered hazardous waste receiver. The WR contractor plans to ship all hazardous waste to Tervita in Fort Nelson. CZN and its WR Contractor will be registered as generators of hazardous wastes in the NWT and will track the disposal of hazardous wastes from the site activities to the registered hazardous waste receivers.

3.4 Recyclable Waste

Recyclable wastes comprise discarded items that can be made into new products. The typical types of waste generated within this category include:

- Scrap metal
- Beverage containers (plastic, aluminum, glass, tetra packs)
- Tires
- Electronics and electrical wastes
- Dry cell batteries for domestic use (e.g., AAA to D cells, 6- and 9-volt batteries).

Table 3 identifies the recyclable waste types, sources, potential effects, management hierarchy, and management strategies.

Table 3: Recyclable Waste

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Scrap Metal	▪ Camps	▪ Unsightly if left on site (visual impact) ▪ Wire can cause wildlife entanglement	▪ To be consolidated and temporarily stored	▪ Stored at each WR camp prior to shipment off site for recycling
Beverage Containers (plastic, aluminum, glass, tetra packs)	▪ Camp and transport personnel drinking bottled beverages	▪ Improper storage, handling and disposal can lead to the attraction and subsequent habituation of carnivores and scavengers ▪ Potential for litter	▪ The WR camps will limit the use of individually packaged beverages (e.g., cans of pop or juice, bottled water, etc.), and promote the use of bulk beverages available from a beverage dispenser	▪ Basic waste management training, including recycling training, and waste reduction for all personnel on-site ▪ Designated recycling bins for beverage containers ▪ Used beverage containers will be stored in wildlife-proof containers (e.g. Sea Cans) ▪ Stored at each WR camp prior to shipment off site for recycling
Tires	▪ Tires from equipment that can no longer be repaired	▪ Unsightly if left on site (visual impact) ▪ In certain soil and moisture conditions, tires may leach heavy metals and other additives	▪ Tires will be repaired and reused as much as possible	▪ Spent tires will be consolidated and shipped off-site for recycling

Type	Source	Potential Environmental Effects	Waste Management Hierarchy	Waste Management Strategies
Electronics and Electrical Materials	Electrical devices that cannot be repaired and cannot be recycled	May contain mercury, lead, arsenic, cadmium, brominated flame retardants (BFRs), and polyvinyl chloride (PVC) that could enter ecosystem	Electrical devices will be repaired when possible	CZN's environment staff will determine the risk of electronic devices and classify them as recyclables, hazardous or non-hazardous waste and investigate the possibility of recycling the electronics and/or appropriate methods for waste disposal
Dry cell batteries (AAA to D cell, 6- and 9-volt, and watch batteries)	Personal electronics (e.g., flashlights)	New domestic dry cell batteries do not contain mercury. Older batteries may contain small amounts of lead, cadmium, and mercury. Other battery compounds like silver, zinc, and nickel may also be present.	To be collected and temporarily stored in bins	- There will be designated collection bins for dry cell at each WR camp - Dry cell batteries will be shipped off-site for recycling/disposal as appropriate.

Recycling is preferred over disposal as it reduces the potential environmental effects associated with the Project. At the Phase 1 WR maintenance camps recyclables will be stored in labelled, designated waste recycling containers and regularly trucked off-site to an approved recycler.

It should be noted that lead acid batteries greater than 1 kg and rechargeable batteries are considered a contaminant under the NWT *Environmental Protection Act* and are managed as a hazardous waste. There is limited infrastructure for recycling in the Northwest Territories but such facilities do exist in nearby British Columbia.

3.5 Domestic Sewage

3.5.1 Approach

Winter Road construction and operations camps will produce sewage. The WR contractor will temporarily store black water in tanks at camps for later removal by a septic pump-out truck. The black water will be taken to Kledo construction in Fort Nelson for disposal. A draft agreement between our contractor and Kledo for the black water disposal is provided in Appendix B. Camps on territorial land will dispose of grey water on-site via sumps. Sumps would be operated to maintain a water level greater than 1 m from surface. Camps in the NNPR will temporarily store grey water in tanks for later removal by septic truck to a territorial camp. There will be no effluent disposal inside the NNPR during the Phase 1 WR project. This is because Parks Canada has indicated that Yukon Government's Environmental Health Services Guidelines for Grey Water Disposal at Remote Camps (2012) is to be followed, and the guideline does not provide for sumps. A more significant disposal mechanism inside the NNPR (i.e. a designed septic field based on prior field testing) cannot be justified for the WR.

Road construction crews may also use portable day trailers and accumulate modest volumes of black water and grey water for disposal as defined above. The WR maintenance camps will also generate small quantities of black water and grey water for similar disposal.

3.5.2 Sewage Quantities

The contractor will have a total crew of up to 30. CZN will have an additional up to 10, including supervisors, monitors, drill rig operators and technicians.

The 'rule of thumb' used to estimate sewage (black and grey water) production is 270 L/person/day. Using 40 total personnel, sewage volume is estimated as $40 \times 270 = 10,800$ L/day, or approximately 11 m³/day.

The Yukon grey water guidelines indicate average flows of 115 L/day/pp for cooking/dishes/bathe/laundry. 'Hamburg water cycle' indicate black 'waste' at 1.5 L/day/pp, increasing to 25-50 L/day/pp including flush water. The 11 m³/day can be considered peak demand since the contractor will likely have some crew in outlying camps. Sewage from those camps would be treated at the STP during periods of lower demand i.e. outside of the early morning and evening times which are the higher demand periods.

3.5.3 Effluent Disposal

For locations on territorial land where grey water is to be disposed of via sumps, water will be decanted from the holding tanks and subject to suitable filtration before discharge to sumps.

The outline of all camp locations are shown in Appendix C. Also shown are window sampler borehole locations, and proposed sump locations (territorial land only). The camp outline indicates an area within which a camp will be located. It does not necessarily mean the whole area will be developed. Appendix D contains window sampler borehole logs. No permafrost was suspected at the camp locations. There were no indications of frozen ground in any of the window sampler boreholes in the camp locations. None of the boreholes indicated wet conditions shallower than 1 m, suggesting deeper groundwater levels and an ability to maintain a sump water level greater than a 1 m depth. All camp locations where a sump is to be dug were screened for heritage resource potential (Lifeways, report in progress) and given clearance.

Each camp for potential WR effluent disposal is discussed below.

3.5.3.1 Camp 102

Camp 102 is located on the north-eastern slope of the Silent Hills. A large wetland system occupies the valley bottom and flows north-west. The sump location is approximately 125 m from the nearest watercourse, due south-east. However, the direction of groundwater flow would be north-east, and the flow path is approximately 800 m from the wetland system. Window sampler borehole logs indicate a clay layer to a depth of 0.5-1.1 m, below which is sand and gravel. A 3 m deep sump should adequately penetrate the sand and gravel layer and provide for acceptable percolation, and the effluent will readily disperse in the porous material.

3.5.3.2 Camp 124

Camp 124 is on the north side of the Grainger River, in an area of historical floodplain. The sump location is approximately 140 m from the river, however the direction of groundwater flow would be south-east, and the flow path is approximately 250 m to the river. No window sampling was possible at this location due to the cobbly nature of the material. The floodplain material is likely to be highly porous, allowing rapid percolation of effluent in a sump. The high porosity will also mean rapid dispersion.

3.5.3.3 Camp 159

Camp 159 is north-west of the Liard River, on a slope below the Front Range. The sump location is approximately 400 m from the river. Window sampler boreholes indicate sand and gravel below 1 m. A 3 m deep sump will

penetrate the sand and gravel and provide for acceptable percolation, and the effluent will readily disperse in the porous material.

3.5.3.4 Camp 178

Camp 178 is near the Liard highway, and approximately 7 km from the Liard River. Window sampler boreholes indicate fine sand. The camp is located in a former sand borrow pit. The central area contains a depression which is dry. This indicates a deeper water table and adequate percolation.

3.5.3.5 Sumps

All sumps will be located in excess of 31 m from the nearest water body (Northern Land Use Guidelines (NLUG)). Sumps will be constructed using a back hoe to a depth of approximately 3-4 m. The sides of the excavation will be battered for stability. Per the NLUG, structural supports will be used if necessary to prevent slumping. Sump water levels will be monitored at least daily to confirm levels >1 m depth. After sumps are no longer needed, the excavated material will be replaced and the surface smoothed.

3.6 Excavated Material

Construction of the Phase 1 WR will involve some ground levelling to make the road bed, and side-hill cuts. This will generate a limited quantity of excavated material, which is expected to be organic material and mineral (granular) soil. The organic material will be stockpiled local to the excavation source for use in progressive and future closure and reclamation. Most of the mineral soil will likely be consumed in road bed preparation, particularly where permafrost may exist and require insulation. However, some may not be suitable for use. Mineral soil to be excavated or stripped will be characterized for acid rock drainage/metal leaching (ARD/ML) potential prior to disturbance. If the stripping of soil with ARD/ML potential cannot be avoided, a disposal plan will be developed which may include transfer to the Mine to be managed with other material in the Mine's Waste Rock Pile (WRP).

The Polje Re-alignment is approximately 9 km in length and inside the NNPR. The underlying bedrock is either the Fort Simpson or Nahanni Formation, which are predominantly limestone and shale units respectively. Most of the expected side-hill cuts will be where the road overlies the Fort Simpson Formation. Therefore, the excavated material may be clay-rich and unsuitable as fill. If this is the case, the material will be taken stockpiled locally for later use in reclamation.

The road switch-backs on the west side of the Silent Hills (inside the NNPR) are to be revised. The underlying rock is the Upper Devonian unit, consisting of shales, mudstones or siltstones. However, very little excavation is expected to be required. The Wolverine Pass-Grainger Gap Re-alignment is approximately 16 km in length, and the underlying bedrock is either the Upper Devonian unit or Fort Simpson Formation. Again, very little excavation is expected to be required.

The Front Range Re-alignment is approximately 43 km in length, and the underlying bedrock is Mesozoic shales, mudstones or siltstones, although rock exposure is rare. Very little excavation is expected in predominantly soil/muskeg material.

It should be noted that the chances of encountering material with significant ARD/ML potential is considered to be low because no indications of mineralization have been noted in proximity to the Phase 1 WR, and the excavations will be shallow and mostly in highly weathered soil deposits. It is considered more likely that clay-rich soil that is unsuitable as fill will need to be stockpiled.

3.7 Training & Certification

As part of their orientation, all Phase 1 WR construction and operations phase employees and contractor personnel will receive basic environmental and waste management training, including:

- Reducing water use
- Managing food wastes to minimize animal attraction
- Reducing waste, and
- Separating waste (recyclables, dry-cell batteries, food waste, hazardous waste).

In addition, all personnel involved in the handling of hazardous wastes will receive Workplace Hazardous Materials Information System (WHMIS), 'Personal Safety and Protection' and Emergency Response training and retraining in each operational year, including participation in an annual waste management spill drill involving key personnel.

3.8 Monitoring, Inspections and Adaptive Management

Routine monitoring and inspections of the Phase 1 WR camp waste management procedures and facilities, including the waste segregation practices, the effectiveness of the wildlife-proof containers (Sea Cans) and other temporary waste storage containers and waste storage areas will be conducted by trained personnel on a regular (daily or weekly) basis. All monitoring/inspection observations will be recorded and will be assessed and used to inform ongoing adaptive management actions.

3.9 Environmental Mitigation

CZN made a number of commitments during the Environmental Assessment (EA) process pertaining to the implementation of environmental mitigation measures related to waste management associated with the access road and associated infrastructure. These include:

- All waste foods and human garbage will be stored in wildlife proof containers (such as Sea Cans) and incinerated consistent with current industry good management practices to minimize wildlife attraction and potential habituation to the local area.
- Littering will be prohibited.
- Feeding of wildlife will be prohibited.
- Adaptive management, with input from CZN's indigenous groups, will be applied to the Phase 1 WR waste management practices. If wildlife is found to be attracted to a particular site (i.e., problem wildlife) additional management practices as appropriate will be adopted.
- Employees and contractors will receive orientation on the contents of CZN's Phase 1 WR WMP and best practices for waste management.

The diligent application of these and other mitigation measures and best practices outlined in the Phase 1 WR WMP will assist in minimizing potential effects of the waste management program associated with the construction and operation of the Prairie Creek Mine Phase 1 WR on the environmental values of the Project area.

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APPENDIX A

ACCESS ROAD MAP BOOK

Provided on MVLWB Project Registry as PC2014F0013 - CZN - App 1-2 Access Road Maps 1-10,000 Version 2 - Mar13-19.

APPENDIX B

BLACKWATER DISPOSAL AGREEMENT



SEWAGE DUMPING AGREEMENT

between

INFRACON

(Client)

and

KLEDO CONSTRUCTION LTD.

(Kledo)

of Box 508

Fort Nelson, BC V0C 1R0

Tel: 250-774-2501 Fax: 250-774-2504

Kledo will allow Client to dump sewage in the lagoon located at Kledo's 102 Camp located at km 102 SYD Road under the following terms:

- **Only** septic waste will be dumped into the lagoon.
- The Client is **solely responsible for all fluids** dumped into the lagoon.
- All tanks must be clean of **all** contaminated fluid prior to hauling septic waste.
- Kledo is not responsible for trucking costs.
- **Septic Waste Disposal Forms** are available from Kledo office in Fort Nelson. Kledo's tickets (white and pink copies) must be placed in kiosk box at lagoon gate at time of dumping. All void or spoiled tickets must be handed in as well. All completed books must be returned to Kledo with golden rod copies in place.
- Dumping rate is \$50.00 per m³ (subject to change at any time) and is due within 30 days
- It is the right of Kledo to rescind dumping rights at any time, or if any of the above terms are not followed.

We agree and will comply with the above-mentioned conditions

INFRACON

Client Representative (PLEASE PRINT)

Signature

Unut L – 954 Laval Crescent, Kamloops, BC V2C 5P5

Mailing Address

Date

Victor Komori

Kledo Representative

Signature

Date

APPENDIX C

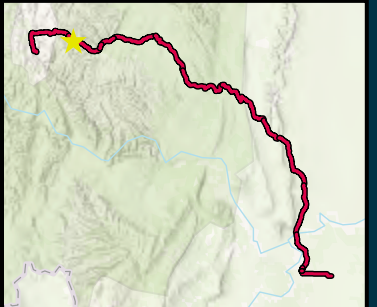
PHASE 1 WR CAMP OUTLINES



- Legend
- Winter Crossing
 - Non Classified Drainage
 - Major Stream Crossing (201907)
 - Designed Station (KM)
 - Proposed Permafrost Monitoring
 - Creek (indefinite)
 - River
 - Winter Alignment (201907)
 - Access Road (20190601)
 - Contours (2012-2017)
 - Camp Footprint
 - Avalanche Path
 - Nahanni National Park Reserve

Date: 10/9/2019
Projection: NAD 1983 UTM Zone 10N
Scale: 1:3,000
Author: ainglis
Last Modified By: ainglis
Checked By:
Revision #:

0 50 100
Metres





Legend

 Window Sampler Soil Test

 Helipad

 Designed Station (KM)

 Creek (indefinite)

 Borrow Pit Access Road

 Winter Alignment (201907)

 Access Road (20190601)

 Contours (2012-2017)

 Camp Footprint

 Borrow Pit

 Nahanni National Park Reserve

Date: 10/9/2019

Projection: NAD 1983 UTM Zone 10N

Scale: 1:3,000

Author: ainglis

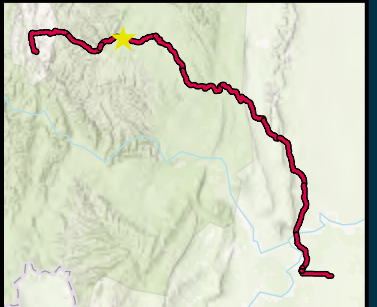
Last Modified By: ainglis

Checked By:

Revision #:

050100

Metres





Legend

 Window Sampler Soil Test

 Helipad

 Designed Station (KM)

 Creek (indefinite)

 Reservoir/Pond

 Borrow Pit Access Road

 Winter Alignment (201907)

 Access Road (20190601)

 Non Typical Winter Alignment

 Contours (2012-2017)

 Camp Footprint

 Borrow Pit

 Nahanni National Park Reserve

Date: 10/9/2019

Projection: NAD 1983 UTM Zone 10N

Scale: 1:3,000

Author: ainglis

Last Modified By: ainglis

Checked By:

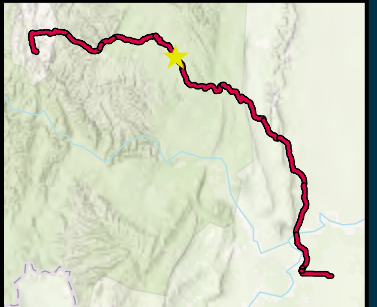
Revision #:

0

50

100

Metres





Legend

 Window Sampler Soil Test

 Winter Crossing

 Helipad

 Major Stream Crossing (201907)

 Minor Stream Crossing (201907)

 Designed Station (KM)

 Potential Permafrost - no ground disturbanc

 Creek (indefinite)

 River

 Winter Alignment (201907)

 Access Road (20190601)

 Stream Line

 Contours (2012-2017)

 Camp Footprint

 Borrow Pit

 Nahanni National Park Reserve

Date: 10/9/2019

Projection: NAD 1983 UTM Zone 10N

Scale: 1:3,000

Author: ainglis

Last Modified By: ainglis

Checked By:

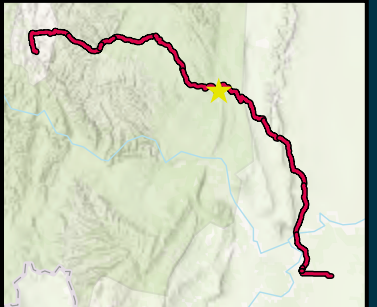
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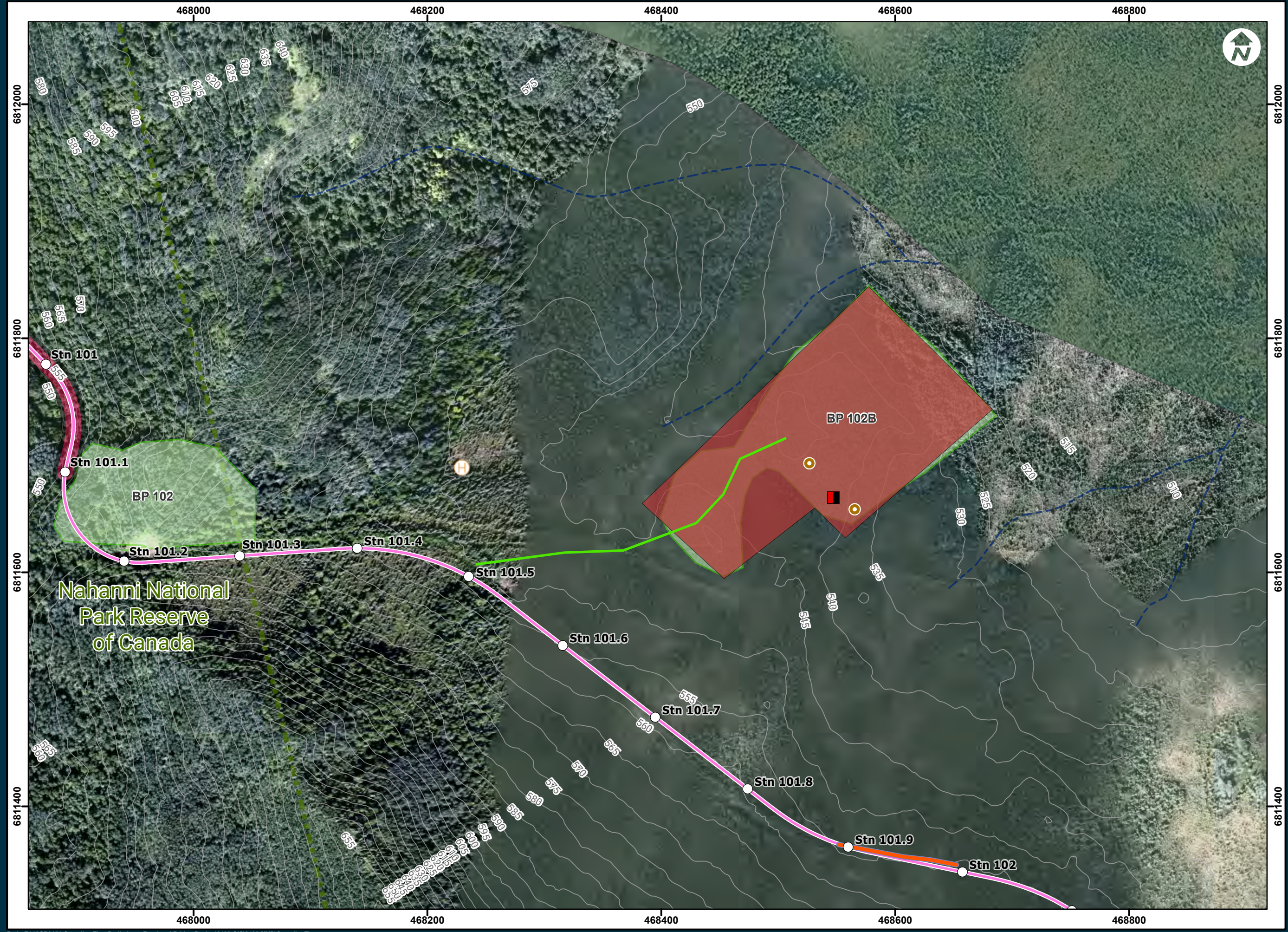
0

50

100

Metres





Legend

 Window Sampler Soil Test

 Sump

 Helipad

 Designed Station (KM)

 Potential Permafrost - no ground disturbanc

 Creek (indefinite)

 Borrow Pit Access Road

 Winter Alignment (201907)

 Access Road (20190601)

 Non Typical Winter Alignment

 Contours (2012-2017)

 Camp Footprint

 Borrow Pit

 Nahanni National Park Reserve

Date: 10/9/2019
Projection: NAD 1983 UTM Zone 10N
Scale: 1:3,000
Author: ainglis
Last Modified By: ainglis
Checked By:
Revision #:

050100

Metres







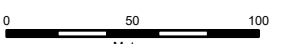
Prairie Creek Mine Road Realignment

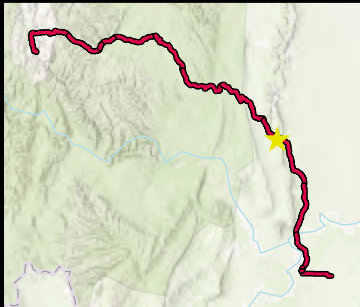
Page 6 of 8
Camp 124 Soil Samples

Legend

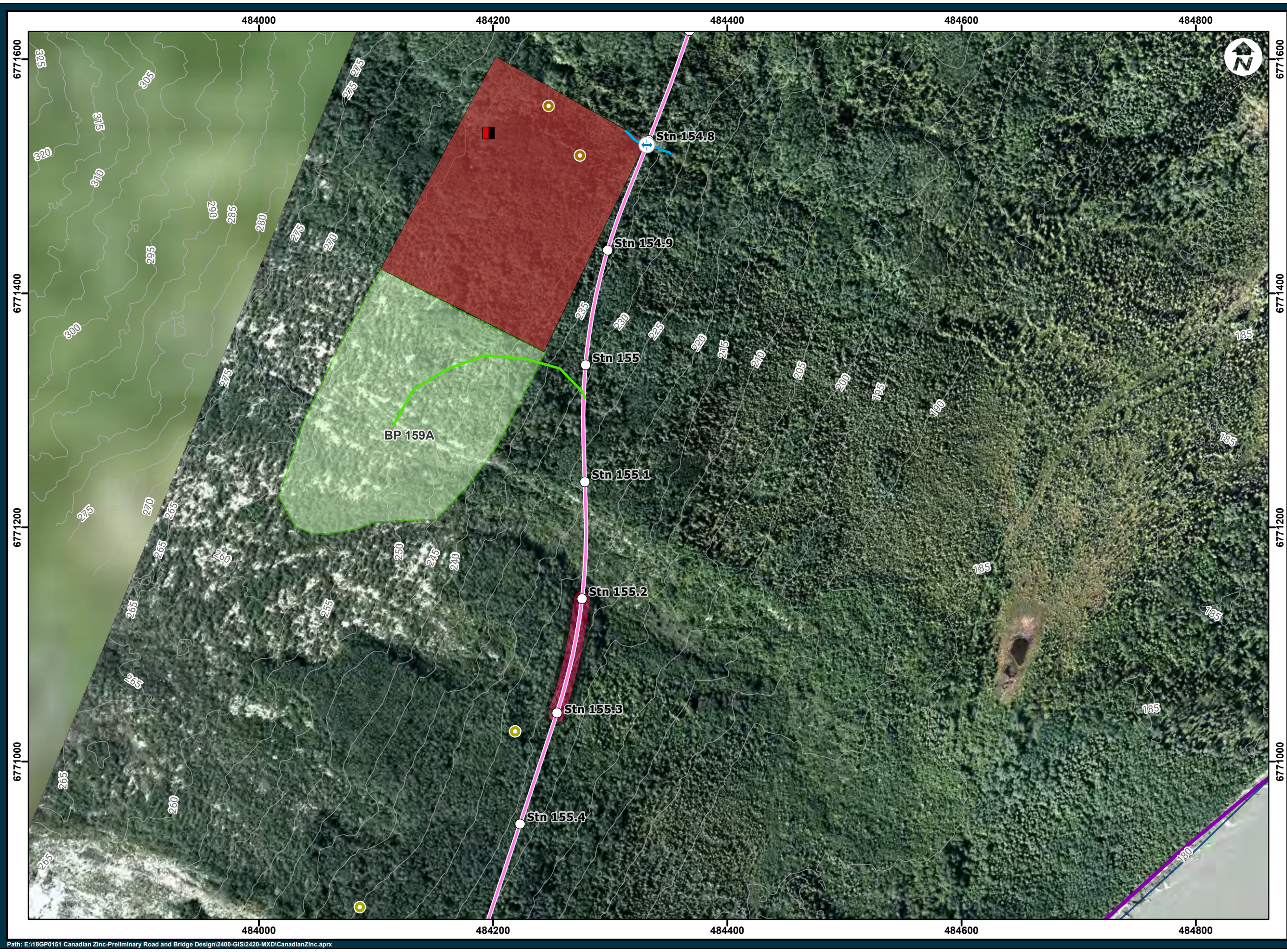
- Window Sampler Soil Test
- Sump
- Minor Stream Crossing (201907)
- Designed Station (KM)
- Creek (indefinite)
- River
- Borrow Pit Access Road
- Winter Alignment (201907)
- Access Road (20190601)
- Contours (2012-2017)
- Camp Footprint
- Borrow Pit

Date: 10/9/2019
Projection: NAD 1983 UTM Zone 10N
Scale: 1:3,000
Author: ainglis
Last Modified By: ainglis
Checked By:
Revision #:











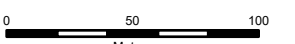
Prairie Creek Mine Road Realignment

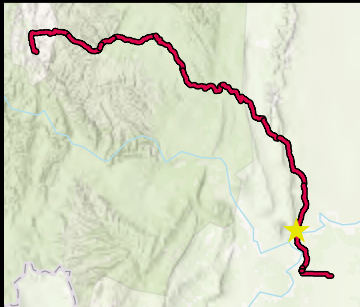
Page 7 of 8
Camp 159 Soil Samples

Legend

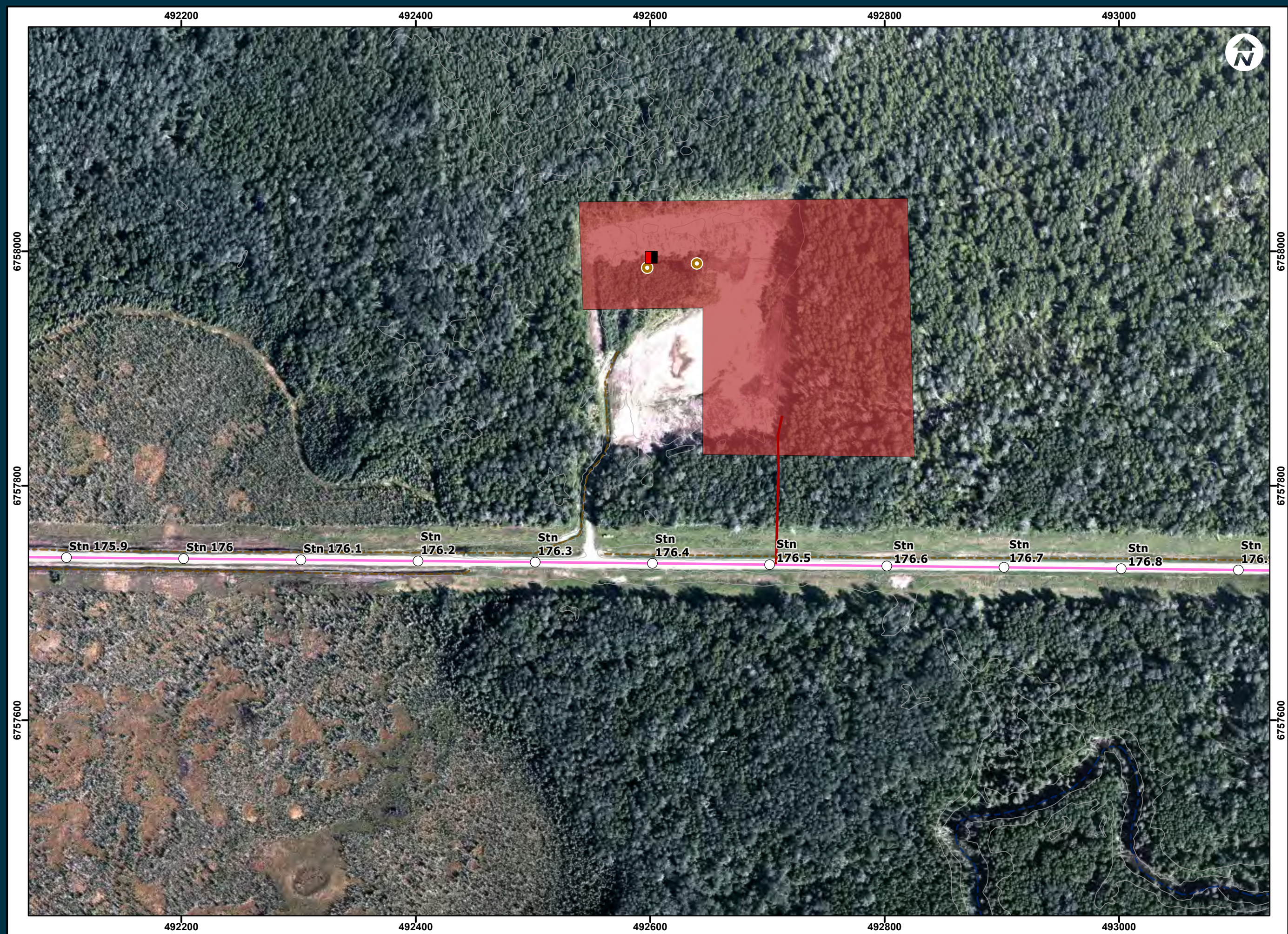
- Hand Soil Test Pit
- Window Sampler Soil Test
- Sump
- Minor Stream Crossing (201907)
- Designed Station (KM)
- River
- Borrow Pit Access Road
- Liard Winter Crossing
- Winter Alignment (201907)
- Access Road (20190601)
- Non Typical Winter Alignment
- Stream Line
- Contours (2012-2017)
- Camp Footprint
- Borrow Pit

Date: 10/9/2019
Projection: NAD 1983 UTM Zone 10N
Scale: 1:3,000
Author: ainglis
Last Modified By: ainglis
Checked By:
Revision #:





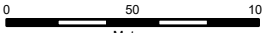


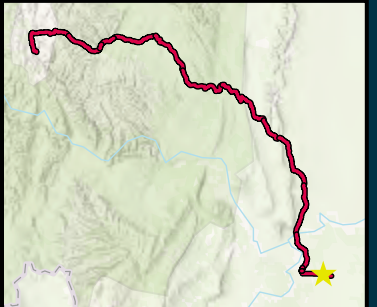


Legend

-  Window Sampler Soil Test
-  Sump
-  Designed Station (KM)
-  Potential Permafrost - no ground disturbanc
-  Creek (indefinite)
-  Ditch
-  Camp Access Road
-  Winter Alignment (201907)
-  Access Road (20190601)
-  Contours (2012-2017)
-  Camp Footprint

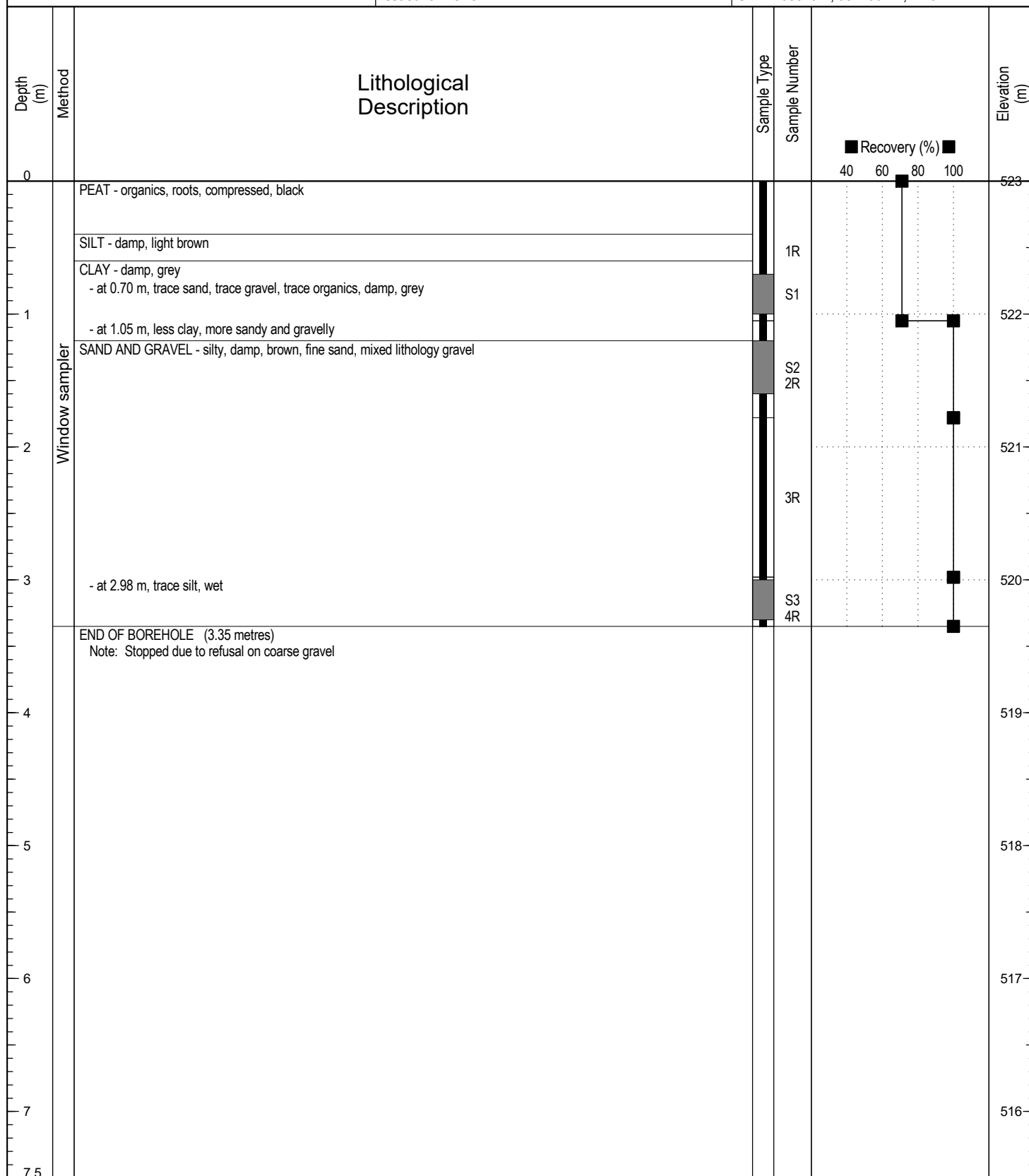
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Projection: NAD 1983 UTM Zone 10N
Scale: 1:3,000
Author: ainglis
Last Modified By: ainglis
Checked By:
Revision #:

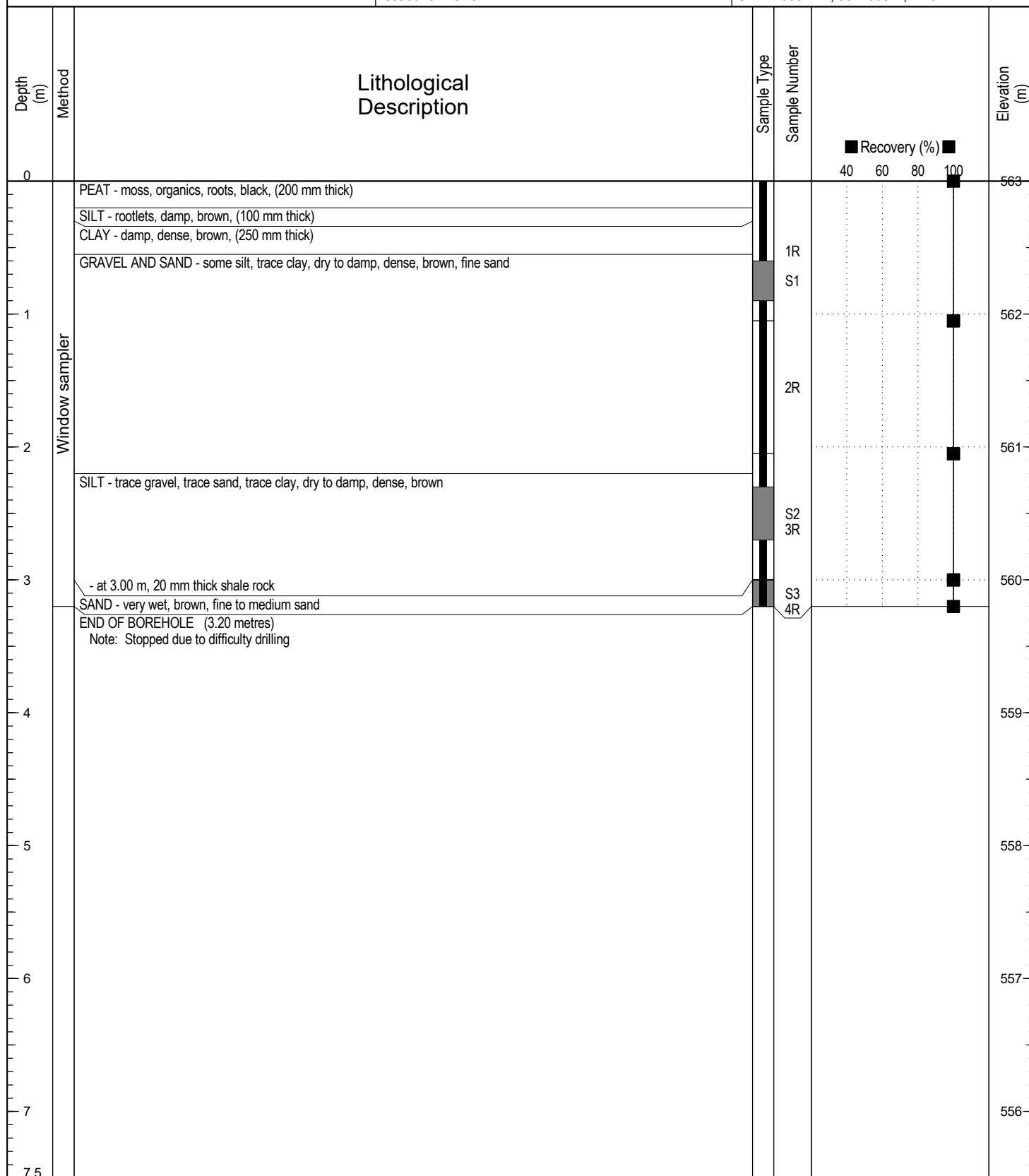




APPENDIX D

WINDOW SAMPLER LOGS





Depth (m)	Method	Lithological Description	Sample Type	Sample Number	Recovery (%)	Elevation (m)
0					40 60 80 100	260
	Window sampler	PeAT - organics, roots, dry, black, (300 mm thick)				
		SILT - some sand, organics, dry, black, (200 mm thick)				
		SAND AND GRAVEL - trace silt, poorly sorted, dry, grey brown, subangular gravel		1R		
1		- at 1.00 m, damp to moist, gravel to 60 mm diameter		S1		259
				2R		
2		- at 2.00 m, some silt, very wet, light grey to dark grey		S2		258
				3R		
3		END OF BOREHOLE (2.60 metres) Note: Stopped due to sloughing				257
4						256
5						255
6						254
7						253
7.5						



Borehole No: CAMP159-2

Project: All-Season Road 2019 Geotechnical Investigation

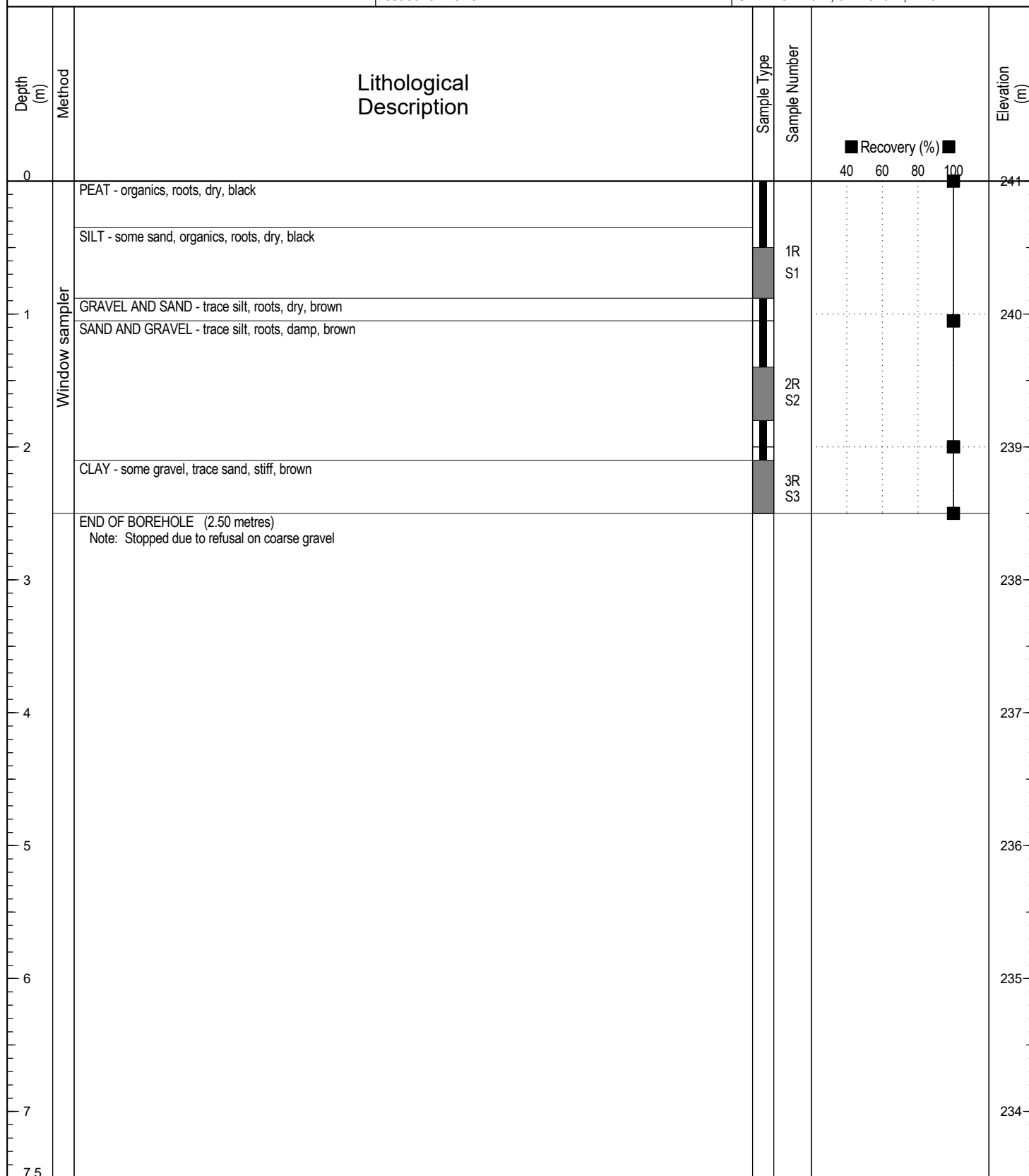
Project No: ENG.EARC03130-02

Location: Prairie Creek Mine, Northwest Territories

Ground Elev: 241 m

Issued for Review

UTM: 484249 E; 6771510 N; Z 10



TETRA TECH

Contractor: Tetra Tech Canada Inc.

Completion Depth: 2.5 m

Drilling Rig Type: Window Sampler

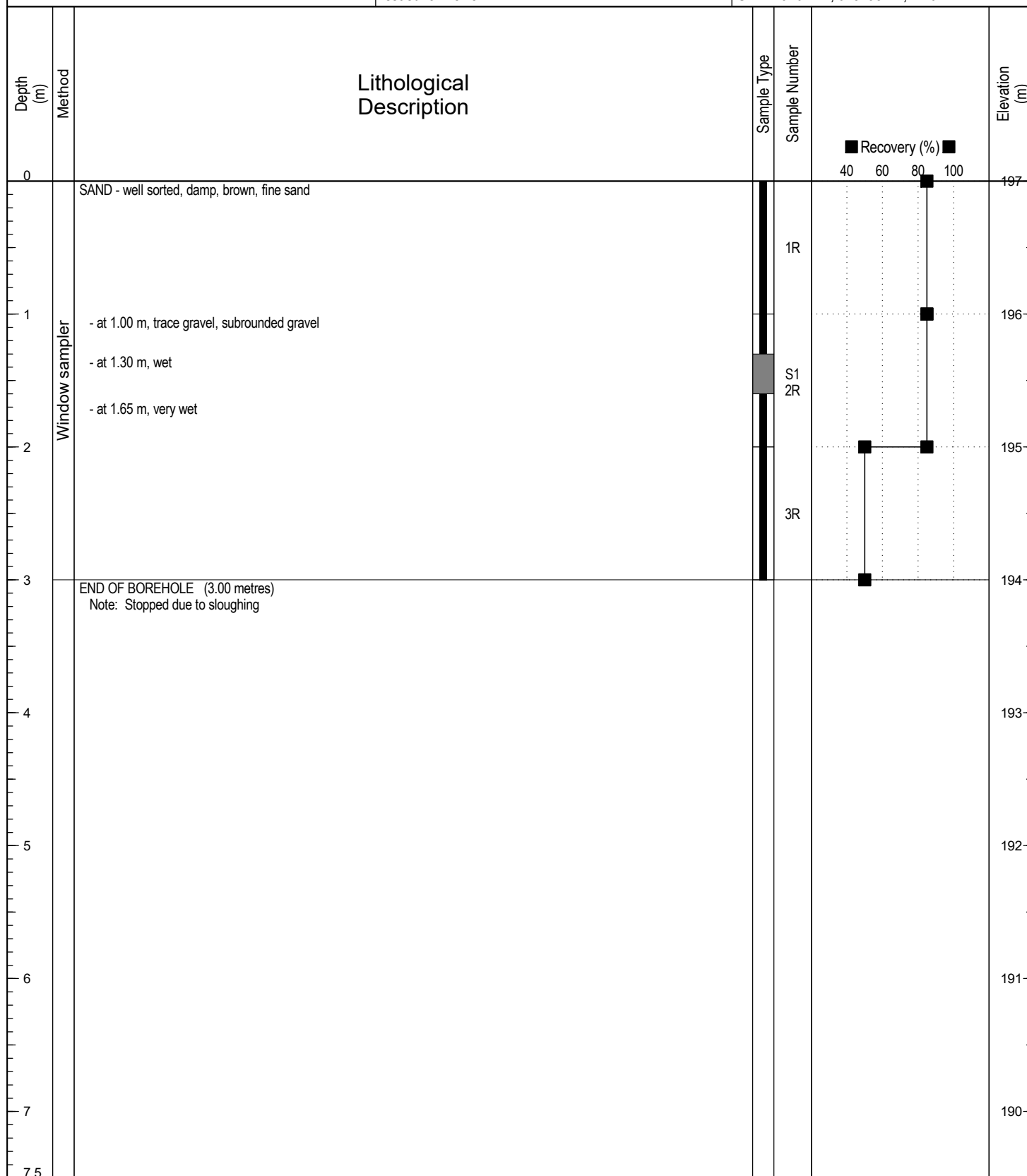
Start Date: 2019 September 11

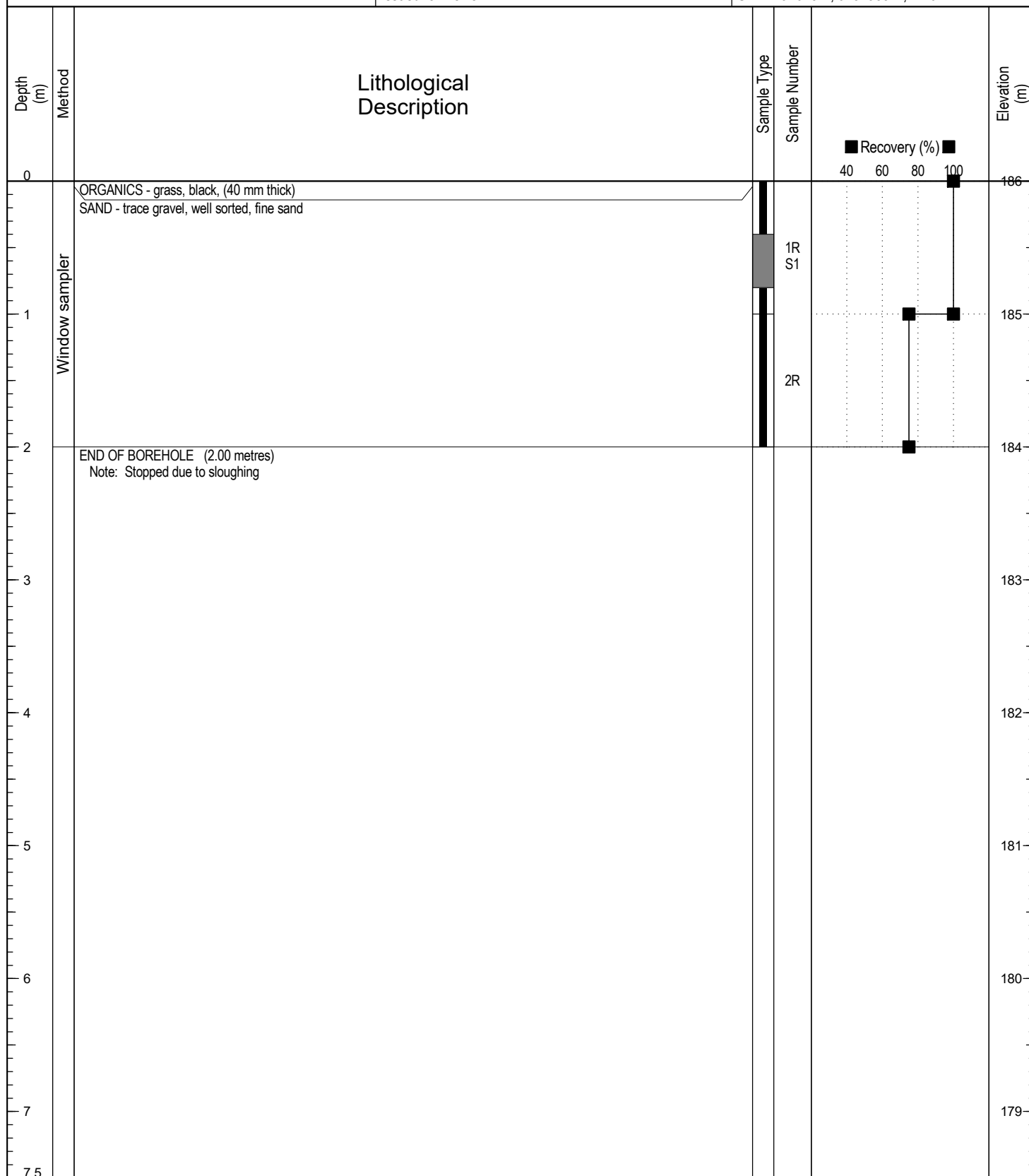
Logged By: EP

Completion Date: 2019 September 11

Reviewed By: TB

Page 1 of 1





PRAIRIE CREEK WINTER ROAD – PHASE 1 CONSTRUCTION

