

PRAIRIE CREEK MINE ALL SEASON ROAD TYPE A WATER LICENCE APPLICATION

PROJECT DESCRIPTION JUNE 2023

Files: MV2023L8-0002, MV2023L8-0003, PC2023L8-0002



IMPORTANT NOTE TO READER

An Environmental Assessment (<u>EA 1415-01</u>) was completed for CZN's Prairie Creek Mine All Season Road (ASR or the Project). Subsequently, two Type A Land Use Permits (<u>MV2014F0013</u>, <u>PC2014F0013</u>) and three Type B Water Licences were issued to CZN for the Project (<u>MV2019L8-0002</u>, <u>MV2014L8-0006</u>, and <u>PC2014L8-0006</u>).

The following provides a brief current overview of the Prairie Creek Mine All Season Road (ASR or the Project). This document is meant to be a companion to the existing information and materials for the various authorizations as submitted in these "initial authorization issuance processes" and the issued Type A Land Use Permits and Type B water licences, and/or the approved Phase 1 management plans for the ASR, and/or the materials submitted to date for the Type A Water Licence applications MV2023L8-0002, MV2023L8-0003, and PC2023L8-0002. The majority of these materials can be found on the Mackenzie Valley Land and Water Board online public registry under the respective authorization numbers.

CZN is seeking to change the daily water use limits for the water licences on Territorial Lands and within the Nahanni National Park Reserve only. No changes to the previously defined water sources are proposed. No changes are being requested to the Land Use Permits and no additional activities are being added. Additionally, Phase 1 of the ASR (a Winter Road to support geotechnical investigations) was completed in January-March 2023. CZN is proceeding to move forward with planning and design work for Phase 2, ASR construction. Thus, CZN will be submitting the required designs and environmental management plans to the regulators for approval for the Phase 2 ASR in the coming months. These will provide more detailed information on project components and environmental management practices for Phase 2 of the ASR as stipulated by the existing authorizations for the Project.

As such, this Type A Water Licence Application Project Description focuses on information relevant to the Type A water licence applications and not on land-based activities that are already authorized by the existing land use permits. Limited details are provided on Phase 1 and more details on the Project will come as the Phase 2 management plans and designs are developed.



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1.0 Introduction

The Prairie Creek Mine (the Mine) site is located in the southern Mackenzie Mountains in the south-west corner of the Northwest Territories (See Appendix 1). The Mine is 100% owned by Canadian Zinc Corporation (CZN), a wholly owned subsidiary of NorZinc Ltd.

CZN has obtained the permits to construct and operate an all season road (ASR) connecting the Mine to the Liard Highway via a 10 km section of the already established Nahanni Butte access road. The ASR alignment runs 170km from Liard Highway 7 to the Prairie Creek Mine and will ultimately consist of a 5 metre wide single lane road to support the resupply of the Prairie Creek Mine and for concentrate transportation out to Liard Highway 7. The route will cross the Liard River near Nahanni Butte and will utilize conventional barge during non-winter operations and an ice bridge during winter operations. The ASR will allow the transport of mineral concentrates from the Mine to market, and the delivery of operating supplies to the Mine, year-round.

The ASR route spans three land tenure jurisdictions. This means there are different authorizations administered by separate regulators for the Project. Requesting a change to the water use daily limit requires that CZN apply for 3 Type A WLs; an application for the Territorial (non-Federal) lands; an application for the federal Indian Affairs Brach (IAB) Lands¹, and an application to Parks Canada for the portion of the ASR located in the Nahanni National Park Reserve.

The following existing ASR related authorizations are available on the Mackenzie Valley Land and Water Board (MVLWB) online public registry:

- Type A Land Use Permit MV2014F0013
- Type A Land Use Permit PC2014F0013
- Type B Water Licence MV2014L8-0006
- Type B Water Licence MV2019L8-0002
- Type B Water Licence PC2014L8-0006

These authorizations provide for a phased approach to the development of the ASR and the phases are defined in the aforementioned authorizations as the following:

¹ Note there are no defined water sources on the IAB Lands.



Phase 1 – activities to support the Construction of the All Season Road in Phase 2, including the Construction and operation of the Winter Road to conduct Geotechnical Investigation and transport equipment and materials to Prairie Creek Mine.

Phase 2 – activities to support the Construction of the All Season Road including the Construction and operation of the Winter Road and of All Season Road Construction.

Phase 3 – activities to support the operation of the All Season Road including transportation of loaded Concentrate, consumable materials and supplies to support mine operations, and road maintenance.

For more details on the regulatory related history of this project, please see the document titled "<u>POST-EA INFORMATION PACKAGE INCLUDING AN UPDATED PROJECT DESCRIPTION ALL SEASON</u> <u>ROAD TO PRAIRIE CREEK MINE</u>" dated February 2019 (Post EA Information Package) specifically section 1.1, under any of the above listed authorizations.

Since the Post EA Information Package was submitted in 2019, there came the COVID-19 pandemic and other impacts to the schedule that had been originally proposed in the Post EA Information Package document. As well, the passage of time has seen the Project and the process move ahead and many of the management plans for Phase 1 (the winter road) of the ASR have been approved by the MVLWB or Parks Canada, details for the Independent Technical Review Panel have been determined, engagement is ongoing and more information and data continues to be collected as the project moves forward and preparations shift to Phase 2 (construction). An updated project schedule is presented in section 2.0.

2.0 Overall Development Approach and Schedule

CZN will construct the ASR in a 2 step process; Phase 1 being the winter access road and Phase 2 being construction of a fully operational ASR. CZN proposes to build the ASR in 3 years which would see construction occur during 3 winter and 2 summer seasons, operate the ASR for 15 years (to coincide with the projected mine life), followed by 2 to 3 years of reclamation.

The current project schedule is reflective of what was presented in the Post EA information package. To bring this information up to the present day, CZN began Phase 1 (Winter Road) of the ASR in October 2022. Work on Phase 1 is ongoing at the time of this application submission but soon due to wrap up (e.g. completion of geotechnical drilling program, then post construction monitoring). The ASR Phase 1 has been deactivated.

Following this, the projected transition to Phase 2 of the ASR is expected to occur between December 2023 to April 2024. The exact start of Phase 2 is not known as it will be dependent



upon having all the required regulatory approvals in place as well as project funding and resourcing determined. Further details on scheduling will be known once the feasibility study has been updated and reviewed (anticipated to occur in July-August 2023). The exact end to Phase 2 is not known either as it depends on the start date of the construction. However, a reasonable expectation would be that Phase 2 is occurring during the calendar years of 2024-2027. Phase 3 (operations) will occur following construction.

There are currently no expectations that there will be temporary closure of the ASR other than potentially at spring break up and freeze up. This type of seasonal temporary shutdown is dependent on a number of factors including for example ice conditions which may prevent a barge from safely operating upon deactivation of the ice bridge at the Liard River.

As the project schedule develops, CZN commits that schedules, decisions, and timelines related to the phases of the ASR will be further communicated to Regulators as the project moves forward.

3.0 Project Components Overview

3.1 Land Based Infrastructure

Land based infrastructure for the ASR is not the focus of this document. There are already land use permits issued for the Project and no changes are being proposed. The Type A Land Use Permits MV2014F0013 and PC2014F0013 remain as is. That said, the following is a summary listing of the anticipated land-based activities or infrastructure.

- Camps are currently anticipated to be required at the following approximate kilometre post (KP) marks: 42, 65, 87, 102, 120 and near the Liard Highway (178).
- Waste Areas There is an approved Phase 1 Waste Management Plan and waste for the Project will be disposed of based on the current approved Waste Management Plan. The intent will be to temporarily store wastes at the road camps. Domestic waste will be collected regularly and transported off-site. Hazardous waste (e.g. oil filters) will be trucked out to a Fort Nelson hazardous waste receiver under manifest. As with the approved Phase 1 Waste Management Plan, CZN would arrange for waste to be delivered to an approved facility through a contract to be in place prior to the start of Phase 2 activities and that would be included in the updated Waste Management Plan for Phase 2 (with links to Spill Contingency Plan).
- Fuel storage Fuel will be stored in suitable tanks with containments proximal to construction locations. Double-walled tanks on skids may be used to transport fuel. CZN will comply with the existing permits and related conditions for fuel storage.
- Borrow Supply Borrow supply will include all borrow material types required to construct the ASR for all construction applications, including subgrade, surfacing aggregate supply, and rock quarry supply. As required by the existing Land Use Permits, a Borrow Pit Management Plan will be submitted to the regulators for approval and all related permit conditions will be abided by.



3.2 Waste (Greywater, Blackwater, Drilling Waste)

There is an approved Phase 1 Waste Management Plan and conditions in the existing authorizations that govern this type of waste management. The following provides a summary for each type of waste for Phase 1. Note that a Phase 2 Management Plan is to be prepared and submitted for approval in the coming months.

Blackwater (Sewage)

• Blackwater is either to be avoided with the use of incinerating toilets, and/or hauled to commercial disposal outside of the NWT.

Greywater

- Grey water disposal will be via sumps on territorial land. For locations on territorial land where grey water is to be disposed of via sumps, the wastewater will initially be filtered through conventional metal sink and drain strainers prior to being temporarily stored in holding tanks. Subsequently the filtered grey water will be decanted from the holding tanks and discharged to the sumps.
- Camps in the Nahanni National Park Reserve (NNPR) will temporarily store greywater in tanks for later removal by septic truck. There will be no greywater disposal to sumps inside the NNPR. For Phase 2, CZN may design and propose a septic field(s).

Drilling Waste

• Drilling wastes from the geotechnical program will be inert and can therefore be directed to a suitable natural depression (drill sump) for disposal to ensure that the drilling waste will be contained and not spread to the surrounding lands or watercourses. Any sumps or natural depressions used to deposit drilling waste will be located at least 100 metres from the Ordinary High Water Mark of any Watercourse, unless otherwise authorized in writing by the Inspector or within the NNPR by the Superintendent. The sumps are to be backfilled and restored or as otherwise authorized in writing by the Inspector or the Superintendent.

3.3 Water Sources

Project water sources are shown in Figure 2-2 (see Appendix 1).

For the Project, all lakes and/or streams are assumed to be potentially fish-bearing, therefore CZN has adopted DFO's 10% of lake volume winter abstraction protocol and <10% instantaneous flow for streams at any time. Lakes are headwater features with low potential for fish. Prairie, Tetcela, Grainger and Liard are confirmed to be fish-bearing.



A bathymetry report defining the capacity of available water from specific lakes was submitted as part of "Response to Canadian Zinc Corporation – Prairie Creek Mine All-Season Road – Water Licences – New Applications – Incomplete – Miscellaneous – Prairie Creek, NT" dated April 20, 2023. For easy reference, the report is included in Appendix B.

3.3.1 Territorial Lands

CZN is applying for a Type A WL to raise the daily water use limit to 2,000 m³/day on Territorial Lands. This is the only requested change; there are no changes being requested to the volume of water by source or the purpose of the water use and all other activities remain the same as is currently authorized by the existing Type B WL MV2014L8-0006 for the All-Season Road (ASR), see Figure 1.

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FIGURE I - EXISTI	ng i voe B vvater L	ICENCE IVIVZU14L8-UUU	Part D Condition	z Authorized Water Sources.

ID	Water Source Name	Coordinates	Type of Watercourse	Purpose of Water Use	Maximum Quantity (m ³ per year)	Maximum Quantity in Any Single Ice- Covered Seasor (m ³)
a.	Prairie Creek (i);	-124.8262197, 61.575705	River	Duct Suppression	<10%	NA
b.	Prairie Creek (ii);	-124.833076, 61.601861	River	Dust suppression	flow	NA
c.	Grainger River;	-123.389019, 61.329630	River	Dust Suppression	<10% instantaneous flow	NA
d.	Liard River (i);	-123.290589, 61.064190			<10% instantaneous flow	NA
e.	Liard River (ii);	-123.267813, 61.069920	River	Road Construction, Dust Suppression		
f.	Liard River (iii);	-123.269335, 60.972031				
g.	Lake at Km 100-OR4;	-123.555714, 61.474093	Lake		2,448	2,448
h.	Lake at Km 115;	-123.480299, 61.344995	Lake	Camp Potable Use; Culvert Installation:	15,293	5,773
i.	Gap Lake at Km 121;	-123.422634, 61.324323	Lake	ke Dust Suppression; Winter Road Construction ke ke	18,670	4,090
j.	Lake at Km 139; and	-123.246916, 61.213290	Lake		12,806	5,382
k.	Lake at Km 141.	-123.254218, 61.193202	Lake		26,523	16,803



3.3.2 Nahanni National Park Reserve

CZN is requesting to be able to use 1,000 m³ per day of water for the Parks Canada authorization in the Nahanni National Park Reserve.

Part D of the Type B licence PC2014L8-0006 has a list of specific streams and lakes from which water can be withdrawn (see Figure 2). For the streams, CZN is allowed to draw less than 10% of the instantaneous flow. For the lakes, CZN is allowed to draw up to a total volume specific to each lake per winter season. CZN is <u>not</u> proposing to change any of the quantities of each water source. The only requested change is to add a water use to the Tetcela River location to include winter road construction (see Part D, Condition 2, item h). On February 1, 2019 the flow in the Tetcela River at the Water Survey of Canada (WSC) road station was recorded at 0.232 m3/sec. Assuming 10% of this, the daily volume would be 2,004 m³. This shows that the river could easily sustain the proposed limit. Environmental protection of the streams and lakes will be maintained as described in the relevant management plans for and permitted by PC2014L8-0006.



Figure 2 - Existing Type B Water Licence PC2014L8-0006 authorized water sources.

- Location and Type of Purpose of ID Water Source Maximum Maximum Quantity (m³ Name Coordinates Water Water Use Quantity in Any course per year) Single Ice-Covered Season (m³) KM 63.5 Lake Winter road 33,528 a) Mosquito Lake 44,448 446703 E. 6825712 N b) Lake 70 KM 70.5 Lake Winter road 64,995 52,475 448577 E. 6819566 N Sundog Creek KM 23.1 River Camp; Culvert <10% NA c) Installation, instantaneous 415639 E, 6829210 N Dust flow Suppression Camp; Culvert <10% d) Sundog Creek KM 29.0 River NA Ш 420657 E. Installation. instantaneous 6826795 N Dust flow Suppression e) Sundog Creek KM 37.5 River Camp; Culvert <10% NA 427063 E, Installation, Ш instantaneous 6829318 N Dust flow Suppression f) Polje Creek KM 53.2 River Camp; Culvert <10% NA Installation, 440692 E. instantaneous 6830793 N Dust flow Suppression g) Fishtrap Creek KM 94.6 River Camp; Culvert <10% NA 465061 E, Installation, instantaneous 6813845 N Dust flow Suppression Tetcela River KM 89.4 River Camp; Culvert <10% NA h) Installation, instantaneous 461383 E, 6815676 N Dust flow Suppression Ground 5750 i) Cat camp pit KM 39.4 Winter road NA 428523 E. water 6830490 N
- 2. The Licensee shall only obtain Water for the Project from the following sources:



3.3.3 Federal IAB Lands

There are no defined water sources on the federal lands. CZN is not proposing a daily water use limit increase for a Type A WL for the IAB Lands.

4.0 Project Phases

4.1 Phase 1

During the winter season of 2022/23, Phase 1 winter road construction occurred. It included a mulched trail followed by typical and non-typical winter road construction. Phase 1 allowed access to the Phase 2 ASR alignment in order to complete various geotechnical studies to gather information on permafrost and ground conditions among other objectives.

Further details can be found in documents related to Phase 1 on the MVLWB online public registry under the existing authorizations for the Project. For easy reference, a listing of the approved Phase 1 Management Plans is available in Appendix 3.

4.2 Phase 2

The proposed 170 km ASR comprises an all-season, single-lane road with pullouts to support a relatively low frequency (approximately 25 trucks/day) of heavy commercial loads; maximum gross vehicle weight of 63,500 kg. The Phase 1 Winter Road alignment was selected to generally follow the Phase 2 ASR alignment, except where Phase 1 investigations were not necessary.

The road geometry is intended to support a haul speed of 40 km/h where terrain conditions permit. This haul speed should be achievable for more than 90% of the road. Where the terrain restricts the ability to adjust the alignment to increase road lengths and reduce road grades, haul speeds may be restricted to meet the constraints of the terrain. These restrictions will primarily be located within the mountainous section from KP 0 to 29 and some sections from KP 96 to 101.

The route traverses a variety of terrain from low-lying floodplains, mountain foothills, river valleys, plateaus, mountainous stream valleys, and mountain passes.

Soils vary along the ASR alignment from limestone-based gravels and talus rock deposits to silty sand, gravels, shale, and silt and clay mixtures.



Key road details include:

- Kilometre points (KPs) start at KP 0 at the Mine and end at KP 170 where the ASR intersects with the Nahanni Butte Access Road.
- From the south bank of the Liard River the ASR runs from KP 155.5 to KP 170 where it joins the Nahanni Butte Access Road.
- The Nahanni Butte Access Road connects the ASR to Highway 7.
- The Liard River crossing will be via a barge in summer/fall and an ice bridge during the winter.
- The ASR passes through the Nahanni National Park Reserve, from KP 17 to KP 101.
- Elevations vary from 180 m above mean sea level at the Liard River at the south of the ASR, to over 1,500 m at the mountain pass at KP 17.
- The ASR primarily follows an existing all season road bed from KP 0 to 24.
- A total of 17 major watercourse crossings have been identified as part of the ASR design, including bridges up to a maximum length of 70 m.
- Major stream crossings may require large span, potentially multi-span, structures with piers and earthworks construction for approaches.
- General 5 m wide running surface, wider at curves and turns. A variable 15 to 30 m wide cleared right-of-way, wider in places where design and construction requires.
- A minimum of three turnouts provided per kilometre where practicable. When local terrain does not allow for this, a minimum of one turnout per kilometre of road will be provided.
- The ASR is expected to be constructed in stages using materials sourced from several borrow areas along the alignment.

In addition to major stream crossings, there are many minor stream crossings. Table 1-13 in the <u>Post EA Information Package</u> provides a preliminary list of crossings by KP.

Crossing structures will require abutments (major) and culverts (minor). Barge ramps are also required for the Liard River crossing. As such, there is expected to be a limited amount of habitat loss and alteration, which is presently being quantified. In addition, it is expected that the road bed along the lower section of Sundog Creek (KP 33-39) will occupy fish habitat. Accordingly, CZN expects to submit a Fisheries Authorization request to DFO to address the habitat loss/alteration.



Following completion of the Feasibility Study (expected in August 2023) at 30% engineering, design of the ASR will be advanced via sections:

- Section A = km 156 to 170 and KM 0 to 17
- Section B = km 102-156
- Section C = km 17 102 (this may need to be further split up but that will be determined at a later date)

There will be one Phase 2 Design and Construction Plan (DCP) that is partitioned to align with sections A through C. There will also be ASR section specific borrow pit management plans (BPMP), and for Section C, a borrow pit optimization report. These plans are required as per existing licences and approvals but also for borrow/quarry permits from GNWT. The DCP and Borrow Pit Management Plan are expected to be submitted to regulators starting with section A in Q4 of 2023.

For more details on the Geology, geochemistry, stability of this project, please see the document titled "<u>POST-EA INFORMATION PACKAGE INCLUDING AN UPDATED PROJECT DESCRIPTION ALL</u> <u>SEASON ROAD TO PRAIRIE CREEK MINE</u>" dated February 2019 (Post EA Information Package) specifically section 1.3, under any of the existing Project authorizations. Also refer to the Phase 1 Winter Road Design and Construction Plan.

4.3 Phase 3

This phase is for operation and maintenance of the ASR. As per the existing authorizations, this phase will require a set of Management Plans that will require regulator approval(s). The ASR is anticipated to be in operation for approximately 15 years to coincide with the projected mine life for Prairie Creek.

Although termed as 'all-season' it is understood that there may be a reduction of traffic or shutdown periods during adverse weather or road conditions, or as per the Wildlife Management and Monitoring Plan.



5.0 Summary of Requested Water Licence Change(s)

CZN has learned from the 2022-2023 winter road construction that the daily water withdrawal limit of 299 m³ has been an impediment to the construction of an ice bridge over the Liard River and to winter road construction progress in general². CZN must be able to use more than 299 m³ of water daily in order to rectify this situation for any future winter roads, which will need to be suitable to carry supplies into the Prairie Creek Mine site, and for ice bridge construction at the Liard River which will be required during the Mine's operational life (currently anticipated to be 15 years).

A Type B Water Licence authorizes the use of water up to 299 m³ per day. Recent interpretations of water use³ see that daily water use from all water sources is restricted to a maximum of 299m³. Also, as per the *Waters Regulations* Schedule H⁴, water use of 300 m³/day triggers the requirement for a Type A WL.

Thus, CZN is applying for a Type A WLs along the ASR to raise the daily water use. The general description of the project and associated design information have not changed materially since CZN presented an Updated Project Description in February 2019 (Part of the <u>Post EA Information</u> <u>Package</u>) in relation to the existing Type B licences.

It is important to note that CZN is not requesting any changes to Land Use Permits MV2014F0013 and PC2014F0013.

5.1 Type B Water Licence MV2014L8-0006 Territorial Lands

Issued in 2019 and valid until 2039, Type B Water Licence (WL), MV2014L8-0006 (for Territorial or non-federal Lands) authorizes the use of water up to 299 m³ per day from KP 0 to 17.14 and KP 101.3 to 169.3 of the ASR (excluding the IAB Lands) connecting Prairie Creek Mine to the Nahanni Butte access road. CZN is applying for a Type A WL to raise the daily water use limit to 2,000 m³/day on Territorial Lands (see the MVLWB online public registry for MV2023L8-0002).

² Phase 1 winter road construction in the 2022-2023 season has also been challenged by a lack of snow in the area. It is possible to overcome the lack of snow, but it means more water is then required to construct the winter road and the 299 m³ daily limit is not sufficient.

³ Based in part on the Land and Water Boards of the Mackenzie Valley *Reference Bulletin Water Use* (dated June 11, 2020).

⁴ As per the <u>Waters Regulations</u>, Schedule VIII.



This is the only requested change; all other activities remain the same as is currently authorized by the existing Type B WL MV2014L8-0006 for the All-Season Road (ASR).

5.2 Type B Water Licence MV2019L8-0002 Federal Lands

CZN also holds Type B WL MV2019L8-0002 for federal IAB lands. This WL was issued in 2019 and expires in 2039.

As there are no defined water sources on the federal lands, CZN is not proposing a daily water use limit increase for a Type A WL for the IAB Lands. However, it is understood that a Type A WL is still required for the IAB Lands portion of the ASR. A Type A WL application (<u>MV2023L8-0003</u>) has been prepared and is submitted for the federal lands portion of the ASR. Activities and scope remain the same as is currently authorized by MV2019L8-0002.

5.3 Type B Water Licence PC2014L8-0006 Nahanni National Park Reserve

CZN holds a Type B WL, PC2014L8-0006, which authorizes the use of water up to 299m³ per day within the Nahanni National Park Reserve KP 17.14 to 101.3 of ASR connecting Prairie Creek Mine to the Liard Highway. This WL was issued in 2019 and expires in 2029.

CZN is applying for a Type A licence application (PC2023L8-0002) to Parks Canada for the portion of the ASR located in the Nahanni National Park Reserve. The requested increase to the daily water use limit is from 299 m³/day to 1,000 m³/day. CZN also requests to add a water use to the Tetcela River location to include winter road construction (see Part D Condition 2 (h) in WL PC2014L8-0006). These are the only requested changes; all other activities and scope remain the same as is currently authorized by the existing Type B WL PC2014L8-0006 for the ASR.



Appendix 1 – Figures







Appendix 2 - Water Use Calculations and Bathymetry Report



In the application for Type A Water Licence in the NNPR, CZN is applying to raise the daily water use limit and to add a water use to the Tetcela River location to include winter road construction. CZN is requesting to be able to use 1000m³ per day of water for the Parks Canada authorization.

- Calculations made to demonstrate ability of defined water sources to support winter road construction at the defined daily withdrawal rate.
- The 10% winter withdrawal limit by source is based on the computed under ice volume.
- Non-winter water demands and uses would be additional. The volumes contemplated in the Type B's were assumed for littoral zone protection, and took no account of seasonal recharge. We propose adding language in the Type A to allow greater withdrawal from lakes based on supporting lake water level data (proving lack of water level reduction).
- Abstraction from rivers will be based on flow data and will be <10% of the instantaneous flow. Available data indicate that the rivers indicated can support the selected abstraction rate.
- Use of the Tetcela River as a source for winter road construction will be important because the main road construction front will progress from the east, and the river will be the first source encountered inside the NNPR.

Type B WL Part D Condition 2 ID	Water Source Name	Type of Watercourse	Lake Volume (m ³)	Under Ice Volume (m³)	Ice Volume (m³)	10% Winter Withdrawal (m³)	Days of winter use @1,000 m ³ /day
	Mosquito Lake Km						
a)	63	Lake	1,092,000	670,567	421,433	67,057	67.1
b)	Lake 70	Lake	1,248,000	1,049,490	198,510	104,949	104.9
	Tetcela River Km						
h)	90	River	-	-	-	-	60
Total							232.0



In the applications for Type A Water Licences, CZN is applying to raise the daily limit only for the Territorial Lands authorization. Please see the table below.

- Calculations are made to demonstrate ability of defined water sources to support winter road construction at the defined daily withdrawal rate.
- The 10% winter withdrawal limit by source is based on the computed under ice volume.
- Non-winter water demands and uses would be additional. The volumes contemplated in the Type B's were assumed for littoral zone protection, and took no account of seasonal recharge. CZN proposes adding language in the Type A to allow greater withdrawal from lakes based on supporting lake water level data (proving lack of water level reduction).
- Abstraction from rivers will be based on flow data and will be <10% of the instantaneous flow. Available data indicate that the rivers indicated can support the selected abstraction rate.

Territorial Lands

- Winter road construction will progress west from the Liard River. The river is an important water source. A Type A licence daily withdrawal limit of 2,000m3 was selected because water from the river will be needed initially simultaneously for ice bridge and winter road construction. Also, there may be days early in the ice bridge construction period when ice bridge flooding may require up to the daily limit for rapid construction. On those days, less water would be available for winter road construction.
- CZN does not anticipate drawing more than 1,000 m3/day from sources other than the Liard River, hence this rate was used for calculations.
- The water sources west of the Liard River are much smaller by comparison, but are nevertheless important to minimize water haul from the river. While the number of days available for these sources to sustain the selected withdrawal rate are limited, they are still significant in terms of the winter road construction window. The main part of that window is considered to be Jan-Feb, or 60 days. The table shows that sources other than the Liard River can sustain the demand, and provide for winter road construction progression west.

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Type B WL			Lake			10% Winter	
Part D	Water Source	Type of	Volume	Under Ice	Ice Volume	Withdrawal	Days of winter use
Condition 2 ID	Name	Watercourse	(m³)	Volume (m ³)	(m³)	(m³)	@1,000 m ³ /day
d.	Liard River I	River	-	-	-	-	120
	Lake at Km 100-						
g.	OR4	Lake	145,300	48,965	96,335	4,897	4.9
h.	Lake at Km 115	Lake	190,400	115,466	74,934	11,547	11.5
	Gap Lake at Km						
i.	121	Lake	291,600	81,809	209,791	8,181	8.2
ј.	Lake at Km 139	Lake	371,200	107,642	263,558	10,764	10.8
k	Lake at Km 141	Lake	486,000	336,061	149,939	33,606	33.6
Total							189.0

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 Date: November 19, 2012
 HCP Ref No.: CZN1856

 From: John Wilcockson and Martin Davies
 To: David Harpley, CZN

 Subject: Prairie Creek Mine – Bathymetry of lakes possibly suitable for winter water withdrawal.

1.0 BACKGROUND/RATIONALE

The purpose of this memo is to present the results of bathymetric data collected from nine lakes located along or in close proximity to the Prairie Creek Mine access road right-of-way (Figure 1). The lakes assessed are located approximately 63 to 141 km from the mine site along the road. The purpose of the bathymetry data is (1) to identify lakes that are suitable for winter water withdrawal, and (2) calculate the volume of water that can be withdrawn with minimal impacts on aquatic biota.

The water withdrawn will be used for road construction and maintenance seasonally. Based on an estimated requirement of 250 m³/km from Km 39 (Cat Camp) to Km 140, the estimated total water requirement is 25,250 m³. Water is not expected to be required for road bed construction from the Mine to Km 39 because the bed is of all season quality, and the road bed to Km 140 will be built from the east using water from the Liard River.

Water withdrawal from lakes in the NWT is governed by the DFO guideline *Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut* (the "Protocol"; DFO 2010). A key factor is the depth of the lake relative to the predicted thickness of ice. The Protocol does not apply to lakes that are anticipated to have less than 1.5 m of water under ice in winter. The intent is to provide sufficient water such that overwintering fish will have sufficient oxygen to sustain them through winter. The Protocol indicates that an ice thickness of 1 m should be assumed for the Dehcho Region, therefore candidate lakes would need to have a maximum depth greater than 2.5 m.

The Protocol also provides guidance on collecting and calculating lake volumes. The maximum volume of water that can be withdrawn from any given waterbody is 10% of the available (under ice) water volume.

Based on the DFO Protocol, lake volumes were calculated for each of the nine prospective lakes, and maximum allowable volumes of withdrawal computed. In addition, bathymetric maps of each lake are provided, as well as maps showing lake hydraulic connectivity.

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2.0 METHODOLOGY

Bathymetric mapping was conducted from July 5 to July 8, 2012 on nine lakes proposed for winter water withdrawal. The DFO Protocol also provides guidance on mapping methods and was used as the basis for completing the assessment.

Bathymetry data were collected using a Lowrance HDS-7 generation two (Tulsa, Oklahoma). This equipment consists of:

- A Lowrance HDS sonar with a split beam 83/200 KHz transducer (a 200KHz frequency was used for all bathymetric mapping);
- A computer to control the sounder and record data; and
- An internal Lowrance 16-channel GPS+WAAS differential GPS to geo-code data as they were collected.

Bathymetry data were collected continuously along transects. These followed longitudinal and zig-zag patterns on each of the lakes and provided greater resolution (and improved lake volume estimates) than the minimum three transect model outlined in the DFO Protocol.

The shoreline of each lake was characterized and mapped using either 5 to 10 m SPOT (Système Pour l'Observation de la Terre, Toulouse, France) or Google Earth satellite imagery (Mountain View, California). Lake shoreline polygons were collected from either pre-traced 1:50,000 NTDB polygons or hand-traced geo-referenced Google Earth imagery. Shoreline files were imported into the bathymetric mapping software and converted to 0 m depth contour shoreline files. Thus, the shoreline was incorporated in the estimate of volume for each lake.

Digital data files obtained during the fieldwork were processed with DrDepth software (Perlin 2012) to create echograms, ".dxf" files and shape files containing contours of depth, latitude, and longitude for each sounding. In order to produce a fully rendered contour map, DrDepth requires extensive data collection along multiple transects, which is beyond the scope of this investigation (as well as beyond the requirements of the Protocol; DFO 2010). To overcome this, data gaps were "filled-in" using extrapolated-transects, calculated as average latitude, longitude and depth between surveyed transects. A conservative approach was taken, such that extrapolation uncertainty was addressed by assuming water was slightly shallower than the average depth of the adjacent transects.

ArcGIS 9.3 software was then used to post-process each map, convert the files to NAD 83 and interpolate the depth scale into a regular colour pattern scale (i.e., "depth contours"). Lake volume estimates and average depth were also calculated using DrDepth.

3.0 RESULTS

Table 1 provides the results of the bathymetry study. Figures 2 to 10 provide bathymetric maps for each of the waterbodies. Satellite images showing hydraulic connectivity of each lake are provided in Attachement 1.

Of the nine lakes, only one did not satisfy the requirements of the Protocol. The lake at Km 95 had a maximum recorded depth of 1.7 m. Assuming a maximum expected ice thickness of 1.0 m (as per the Protocol), only 0.7 m of water is available below the ice in winter. Consequently, according to the Protocol, lake Km 95 is not suitable for water withdrawal. However, the protocol is intended to protect aquatic biota, and assumes such biota are present. As this was suspected not to be the case at lake Km 95, an ecological assessment was performed by Hatfield (2012) on July 6 and 7th. This indicated that the lake may be suitable for winter water withdrawal because the lake:

- 1. Does not provide good habitat for fish and no surface connectivity to other waterbodies was found;
- 2. Rendered no fish after use of several fishing methods (i.e., electro-fishing, gill netting, minnow trapping and angling). Furthermore, there was no surface disruption of the lake indicative of feeding fish, nor were fish seen in underwater video footage.
- 3. Is not unique in the area;
- 4. Does not appear to provide habitat for beaver, muskrat or nesting migratory waterfowl; and,
- 5. Ecological impacts of water withdrawal on resident amphibians and invertebrates should not be significant.

Therefore, we propose that the minimum 1.5 m water depth under ice and 10% withdrawal limit in the Protocol be waived for lake Km 95.

Please refer to the Hatfield memo attached in Attachment 2 for more information on the Ecological Reconnaissance performed at lake Km 95.

Lake Name	Location (UTM)	Imagery	Surface Area (m ²)	Total Lake Volume (m ³)	Under Ice Volume (m ³)	Calculated 10% Withdrawal Volume
Mosquito Lake	445750E/6825750N	2006 SPOT	450,500	1,092,000	670,567	33,528
Km 70	448500/E6819000N	2006 SPOT	217,700	1,248,000	1,049,490	52,475
Km 95	465100E/6812850N	2006 SPOT	15,230	13,999	2,333	NA
Km 100-OR2	470570E/6813770N	2007 SPOT	19,260	18,830	3,000	256
Km 100-OR4	470450E/6815900N	2007 SPOT	107,800	145,300	48,965	2,448
Km 115	474200E/6801200N	2007 SPOT	95,720	190,400	115,466	5,773
Km 121	477000E/6799400N	2007 SPOT	252,400	291,600	81,809	4,090
Km 139	487250E/6787500N	2006 SPOT	393,900	371,200	107,642	5,382
Km 141	486250E/6784500N	2006 SPOT	186,200	486,000	336,061	16,803
Total						120,755

Table 1Summary of Bathymetric information for each of the lakes potentially
suitable for winter water withdrawal.

4.0 **REFERENCES**

[DFO] Department of Fisheries and Oceans. 2010. DFO Protocol for Winter Water Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut. Document current as of June 21, 2010.

ESRI. 2008. ArcGIS 9.3, Redlands, California

- [Hatfield] Hatfield Consultants. 2012. Prairie Creek Mine Ecological Reconnaissance of the Lake at km 95. Memo written by John Wilcockson (Hatfield) for David Harpley (CZN), November 9, 2012.
- Pelin, P. 2012. DrDepth, Sea bottom mapping software, Goteborg Sweden. http://www.drdepth.se/index.php?l=gb

FIGURES





Figure 2 Bathymetry of Mosquito Lake, July 2012

Mapped Area = $450,500m^2$ Mapped Volume = $1,092,000 m^3$ Average Depth = 2.4 m

Maximum Depth = 6.6 m Contour intervals in meters. N.W.T. YUKON Map Extent B.C. 0 65 130 260 m Scale: 1:8,500 Projection: NAD 1983 UTM Zone 10N Data Sources: Bathymetry information created using Dr. Depth software.

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Mapped Area = $217,700m^2$ Mapped Volume = $1,248,000 \text{ m}^3$ Average Depth = 5.7 mMaximum Depth = 21.0 m Contour intervals in meters.





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Bathymetry of lake at 70 km, July 2012 Figure 3



Figure 4 Bathymetry of lake at 95 km, July 2012.

Statistics

Mapped Area = $15,230m^2$ Mapped Volume = $13,990 m^3$ Average Depth = 0.9 mMaximum Depth = 1.7 mContour intervals in meters.





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Figure 5 Bathymetry of lake at 100 km (2km north of road), July 2012.

Statistics

Mapped Area =19,260 m^2 Mapped Volume = 18,830 m^3 Average Depth = 1.0 m Maximum Depth = 2.3 m Contour intervals in meters.

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Mapped Area = $107,800 \text{ m}^2$ Mapped Volume = $145,300 \text{ m}^3$ Average Depth = 1.3 mMaximum Depth = 3.7 mContour intervals in meters.

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Figure 7 Bathymetry of lake at 115 km, July 2012.

Mapped Area = $95,720m^2$ Mapped Volume = $190,400 \text{ m}^3$ Average Depth = 2.0 mMaximum Depth = 4.1 mContour intervals in meters.

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Statistics

Mapped Area = $252,400m^2$ Mapped Volume = $291,600 m^3$ Average Depth = 1.2 mMaximum Depth = 4.3 mContour intervals in meters.

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Hatfield

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Figure 9 Bathymetry of lake at 139 km, July 2012.

Figure 10 Bathymetry of lake at 141 km, July 2012.

Statistics

Mapped Area = $186,200m^2$ Mapped Volume = $486,000 \text{ m}^3$ Average Depth = 2.6 mMaximum Depth = 6.0 mContour intervals in meters.

ATTACHMENTS

Attachment 1

Satellite Images Showing Lake Connectivity

Map showing hydraulic connectivity of lakes at km 139 and km 141. Attachment 1-1

Legend 5 Waterbody Watercourse ~

- Flow Direction
- Contour

Map showing hydraulic connectivity of lakes at km 115 and km 121. Attachment 1-2

Legend

- 5 Waterbody
- Watercourse
- Flow Direction
- Contour

Data Sources: Base Features from 1:50,000 NTDB. SPOT-5 10 m Panchromatic Imagery (August, July, and September 2006).

Map showing hydraulic connectivity of lakes at km 100 (OR2) and km 100 Attachment 1-3 (OR4).

6,812,000

Legend

- 5 Waterbody
- Watercourse
- Flow Direction
- Contour

Projection: NAD 1983 UTM Zone 10N N Data Sources: Base Features from 1:50,000 NTDB. SPOT-5 10 m Panchromatic Imagery (August, July, and September 2006).

0

0.2 0.4

Scale: 1:30,000

0.8 km

Map showing hydraulic connectivity of lakes at km 95. Attachment 1-4

6,814,000

Legend

- 5 Waterbody
- Watercourse
- Flow Direction
- Contour

0.6 km 0 0.15 0.3 Scale: 1:20,000 Projection: NAD 1983 UTM Zone 10N N Data Sources: Base Features from 1:50,000 NTDB. SPOT-5 10 m Panchromatic Imagery (August, July, and September 2006). \wedge

Map showing hydraulic connectivity of lakes at km 70. Attachment 1-5

6,818,000

N

Legend

- 5 Waterbody
- Watercourse
- Flow Direction
- Contour

0.6 km 0 0.15 0.3 Scale: 1:25,000

Data Sources: Base Features from 1:50,000 NTDB. SPOT-5 10 m Panchromatic Imagery (August, July, and September 2006).

Projection: NAD 1983 UTM Zone 10N

Map showing hydraulic connectivity of lakes at Mosquito Lake. Attachment 1-6

6,824,000

N

Legend 5 Waterbody

- Watercourse ~
- Flow Direction
- Contour

0.8 km 0 0.2 0.4

Scale: 1:30,000 Projection: NAD 1983 UTM Zone 10N

Data Sources: Base Features from 1:50,000 NTDB. SPOT-5 10 m Panchromatic Imagery (August, July, and September 2006).

Appendix 3 - Approved Phase 1 Management Plan Table with Links

	Non-Federal: MV2014L8-0006 (Type B) MV2023L8-0002 (new Type A WL application)	Federal: MV2019L8-0002 (Type B) MV2023L8-0003 (new Type A WL application)	Parks Canada: PC2014L8-0006 (Type B) PC2023L8-0002 (new Type A WL application)
i. Wildlife Management and Monitoring Plan	Approval Letter from GNWT (note this same info is also under LUP MV2014F0013): <u>MV2014L8-0006/CZN-ASR-</u> <u>Wildlife Management and</u> <u>Monitoring Program-GNWT</u> <u>Conditions Met-Oct14_22.pdf</u>	Approval Letter from GNWT (note this same info is also under LUP PC2014F0013): <u>MV2019L8-0002 Approval of the</u> <u>Wildlife Management and</u> <u>Monitoring Plan for Phase 1 of the</u> <u>Prairie Creek All-season Road</u> <u>Project Oct14_22.pdf</u>	PC2014L8-0006/CZN Phase 1 Wildlife Plan-Oct28 22.pdf
ii. Design and Construction Plan	MV2014L8-0006/CZN-ASR- Phase1 DCP V2.1-Dec9 22.pdf	MV2019L8-0002/CZN-ASR-Phase 1 DCP V2.1-Dec9 22.pdf	PC2014L8-0006/CZN DCP Phase 1 - Updated-Oct28 22.pdf
iii. Sediment and Erosion Control Plan	<u>MV2014L8-0006/CZN-ASR-SECP</u> <u>V3.3-Sept13_22.pdf</u>	MV2019L8-0002/Sediment and Erosion Control Plan V3.3 Sept13 22	<u>PC2014L8-0006/CZN-ASR-SECP</u> <u>V3.3-Sept13_22.pdf</u>
iv. Permafrost Management Plan	MV2014L8-0006/CZN-ASR- Permafrost MP V2.1- March2 22.pdf	MV2019L8-0002/CZN-ASR- Permafrost MP V2.1- March2 22.pdf	PC2014L8-0006/CZN-All Season Road-Permafrost Management Plan-Revision 7-Feb 18 22.pdf

	Non-Federal: MV2014L8-0006 (Type B) MV2023L8-0002 (new Type A WL application)	Federal: MV2019L8-0002 (Type B) MV2023L8-0003 (new Type A WL application)	Parks Canada: PC2014L8-0006 (Type B) PC2023L8-0002 (new Type A WL application)
v. Geochemical Verification Program	MV2014L8-0006/CZN-ASR- GeochemicalVerificationProgram-V2.2 -Sep222.pdf	MV2019L8-0002/Geochemical Verification Program-V2.2 Sep2 22	PC2014L8-0006/CZN-All Season Road-Geochemical Verification Program-Revision 7-Sept 1 22.pdf
vi. Borrow Pit Management Plan	A Borrow Pit Management Plan was not required for Phase 1.	A Borrow Pit Management Plan was not required for Phase 1.	A Borrow Pit Management Plan was not required for Phase 1.
vii. Explosives Management Plan	MV2014L8-0006/CZN-ASR- Explosives Management Plan- V2.2 - Sep13 22.pdf	MV2019L8-0002/Explosives Management Plan-V2.2 Sep13 22	PC2014L8-0006/CZN-All Season Road-Explosives Management Plan-Revision 14-Sep13 22.pdf
Spill Contingency Plan	MV2014L8-0006/CZN-ASR-SCP V2-Dec12 21.pdf	MV2019L8-0002/CZN-ASR-SCP V2- Dec12 21.pdf	PC2014F0013/CZN Phase 1 Spill Contingency Plan- Oct28 22.pdf
Water Monitoring Plan	MV2014L8-0006/CZN-ASR- Water Monitoring Plan-V3.3- Oct5 22.pdf	MV2019L8-0002/CZN-ASR-Water Monitoring Plan -V3.3 - Oct5 22.pdf	MV2014L8-0006/CZN-ASR-Water Monitoring Plan-V3.3-Oct5 22.pdf
Engagement Plan	MV2014L8-0006/CZN-ASR-EP V2.1-Oct12 21.pdf	MV2019L8-0002/CZN-ASR-EP V2.1-Oct12 21.pdf	PC2014L8-0006/CZN-All Season Road-Engagement Plan-Version 2.1-Oct 12 21.pdf
Waste Management Plan	MV2014L8-0006/CZN-Prairie Creek ASR-Waste MP V2.1- Dec15 21.pdf	MV2019L8-0002/Waste Management Plan V2.1 Dec15 21	PC2014L8-0006/CZN-All Season Road-Waste Management Plan- Revision 7-Mar 1 22.pdf

	Non-Federal:	Federal:	Parks Canada:
	MV2014L8-0006 (Type B)	MV2019L8-0002 (Type B)	PC2014L8-0006 (Type B)
	MV2023L8-0002 (new Type A	MV2023L8-0003 (new Type A WL	PC2023L8-0002 (new Type A WL
	WL application)	application)	application)
Closure and	CRP for Phase1 ASR is currently	CRP for Phase1 ASR is currently	CRP for Phase1 ASR is currently
Reclamation	awaiting a Board decision (see	awaiting a Board decision (see	awaiting an approval decision (see
Plan	above)	above)	above)
	https://new.onlinereviewsystem	https://new.onlinereviewsystem.c	https://new.onlinereviewsystem.c
	.ca/review/6E54FA84-1598-	a/review/6E54FA84-1598-ED11-	a/review/65C26E04-0A5A-ED11-
	ED11-AC20-DC984082315A	AC20-DC984082315A	ADE6-CC60C843C6BF