



April 16, 2014

MV2014L8-0006

MV2014F0013

Julian Morse  
Regulatory Officer  
Mackenzie Valley Land and Water Board  
7<sup>th</sup> Floor-4910 50<sup>th</sup> Avenue,  
Yellowknife, NT  
X1A 2P6

Dear Mr. Morse

**RE: Applications for a Class A Land Use Permit and a Class B Water Licence  
All Season Access Road, Prairie Creek Mine**

Please find attached documents and information, including a Project Description Report (PDR), in support of Canadian Zinc Corporation's (CZN's) application for permits to construct, operate and maintain an all season access road to the Prairie Creek Mine. We propose to use the already permitted winter access road to initiate mine operations and to support at least the early years of mine operations, but we wish to obtain permits to allow us to upgrade the road for all season use at a time of our choosing.

The proposed all season road will follow essentially the same alignment as the winter road authorized by Land Use Permit (LUP) MV2012F0007 and Water Licence (WL) MV2012L1-0005, although some minor re-alignments might be made. Therefore, many of the required plans and procedures will be common to the two types of road. We understand that you will undertake a preliminary screening of the applications according to Part 5 of the *Mackenzie Valley Resource Management Act (MVRMA)*. However, since we are proposing a land use (all season road access to the Liard Highway) that has not been the subject of environmental assessment (EA) or a permit previously, it is our expectation that you will conclude that s. 157.1 of the *MVRMA* does not apply, and that you will refer the applications to the Mackenzie Valley Environmental Impact Review Board (MVEIRB) for EA. In order to expedite this process, we have asked Parks Canada to review the project to EA. A copy of our submission to Parks Canada is attached, and in it we apply for similar all season road permits for that portion of the road inside the Nahanni National Park Reserve.

Documents and advice regarding each application are described below.

## LUP

- A completed application form for a Class A Land Use Permit (LUP) is attached;

- Proof of company registration is not included since you already have this in connection with MV2008L2-0002;
- Maps are provided in the enclosed PDR;
- A cheque in the amount of \$150.00 for the LUP application is provided. We have not included a fee for land use as we assume this is covered by the fee in your possession for MV2012F0007;
- Engagement records and our engagement plan are discussed below;
- A draft Waste Management Plan is in your possession for MV2012F0007, which we assume will be considered further during the EA and permitting. We assume this will suffice for this application;
- A draft Spill Contingency Plan is in your possession for MV2012F0007, which we assume will be considered further during the EA and permitting. We assume this will suffice for this application;
- GIS data for the proposed all season road is currently the same as that in your possession for MV2012F0007.

### **Water Licence**

- A completed application form for a Class A WL is attached;
- A site plan to scale is included in the enclosed PDR;
- A cheque in the amount of \$30.00 for the WL application fee is provided;
- Engagement records and our engagement plan are discussed below.

### **Engagement**

CZN has held meetings with the aboriginal groups in the immediate vicinity of the Project over the last few months to inform them of our plans to make these applications, and our rationale. Copies of engagement records are provided in Attachment A.

CZN has developed a comprehensive Engagement Plan to fulfill Part B, Item 15 of MV2008L2-002, and this was submitted to you recently. An engagement plan specific to these applications is provided in the attached document.

We trust the above is in order. If you have any questions or requests, please contact us.

Yours truly,  
CANADIAN ZINC CORPORATION



David P. Harpley, P. Geo.  
VP, Environment and Permitting Affairs



**Mackenzie Valley Land and Water Board**  
**7th Floor - 4910 50th Avenue**  
**P.O. Box 2130**  
**YELLOWKNIFE NT X1A 2P6**  
**Phone (867) 669-0506**  
**FAX (867) 873-6610**

**Application for: TYPE A**

**New Land Use Permit**

**Amendment**

1. Applicant's name and mailing address: Canadian Zinc Corporation 1710 – 650 W. Georgia St. Vancouver, BC, V6B 4N9	Fax number: 604-688-2043
2. Head office address: As above Field supervisor: To Be Determined Site Satellite telephone: 1-600-700-2454 Site Satellite fax: 1-600-700-9209 Site VOIP telephone: 778-724-2512	Telephone number: 604-688-2001  Fax number: As above  Telephone number: As above
3. Other personnel (subcontractor, contractors, company staff etc.)  With all weather road from the Mine to the Tetcela Transfer Facility (TTF), part of road construction, maintenance and road haul to be completed by Mine staff or contracted staff, and part to be completed by contractors – companies yet to be determined, estimates only. With all weather road from the Mine to the Liard Highway, part of road construction to be completed by Mine staff or contracted staff, and part by contractors, road maintenance and road haul mostly by Mine staff or contracted staff.  Road construction: see attached sheet Annual Road Maintenance: see attached sheet Annual Road Haul: 20* people x 120 days = 2400 person days (* on average, can be up to 30) TOTAL: Up to 45 people working at one time. See attached sheet for total.	
4. Eligibility: (Refer to section 18 of the <i>Mackenzie Valley Land Use Regulations</i> )  a)(i) X    a)(ii)    a)(iii)    b)(i)    b)(ii)	
5. a) Summary of operation (Describe purpose, nature and location of all activities.) **See attached Project Description**  Construction, maintenance and use of an all weather road approximately 170 km long connecting the Prairie Creek Mine to the Tetcela Transfer Facility (TTF, Phase 1), and from the TTF to the Nahanni Butte access road which in turn joins the Liard Highway (Phase 2) to allow haulage of mineral concentrates out, and operating supplies in. Cleared normal right-of-way to be up to 20 m wide but may be up to 35 m when there are steep side-slopes, road surface width 5-8 m. Road crosses the Nahanni National Park Reserve from approximately Km 17-100 where the jurisdiction is Parks Canada. Barge landing/set-down areas both sides of Liard River.  b) Please indicate if a camp is to be set up. (Please provide details on a separate page, if necessary.)  The land use operation will be serviced from the existing facilities at the Prairie Creek Mine, and by Contractors travelling from the Liard Highway. During road construction, a temporary industrial camp is required on the east side of the Liard River, and an annual seasonal camp for road maintenance on the east side of the Silent Hills.	

6. Summary of potential environmental and resource impacts (describe the effects of the proposed land-use operation on land, water, flora & fauna and related socio-economic impacts). Use separate page if necessary.)

Potential environmental and resource impacts were assessed in Environmental Assessment EA0809-002 for winter road use. Assessment contained in CZN's Developers Assessment Report dated March 2010. Decision of the Review Board in their Report of EA dated December 8, 2011 is that "the proposed developed is not likely to have significant adverse impacts on the environment or to be a cause of significant public concern", subject to the commitments made by CZN during the EA process.

7. Proposed restoration plan (please use a separate page if necessary).

Bridges will be removed from stream crossings, abutments will be removed or pushed-back. Material will be pulled-back to recontour side-hill cuts. Erosion control measures will be installed as necessary. Restoration of disturbed areas will be promoted by stabilization measures and vegetation by natural invasion.

8. Other rights, licences or permits related to this permit application (mineral rights, timber permits, water licences, etc.)

Mining Leases ML 2854, ML 2931, ML 2932, ML 2933, ML 3313, ML 3314, ML 3315, ML 3338, ML 5113, ML5114, ML5115, ML 5116; Mineral Claims K01369; Surface Leases 95F/10-5-5, 95F/10-7-4; and, Land Use Permit MV20012F0007 and Water Licence MV2012L1-0005.

Roads: Is this to be a pioneered road? No

Has the route been laid out or ground truthed? The route is the same as that in LUP MV2012F0007. Most of the route exists, but there are new re-alignments, as shown in drawings provided previously for LUP MV2012F0007. The precise location of the re-alignments has yet to be ground truthed. Minor re-alignments may be considered for the all weather route.

9. Proposed disposal methods.

- a) Garbage: Combustible refuse to be incinerated at Mine Site or temporary camp. Non-combustible refuse to be disposed of at Mine Site or other approved facility.
- b) Sewage (Sanitary & Grey Water): Will be taken to the Mine site Sewage Treatment Plant.
- c) Brush & trees: Alignment will already be cleared. For any new re-alignments, brush and debris from clearing the right of way will be windrowed adjacent to the right of way, with breaks every 100 m. Trees felled will be bucked.
- d) Overburden (Organic soils, waste material, etc.): Overburden disturbance will be minimized. Cut organic soil will be stockpiled. Cut mineral soil will be used to create a level bed, and potentially to insulate areas of permafrost.

10. Equipment (includes drills, pumps, etc.) (Please use separate page if necessary.)

This list is not intended to be exhaustive nor definitive, but rather an indication of the types of equipment necessary to support the proposed development.

See attached page.

11. Fuels	( )	Number of containers	Capacity of containers	Location
Diesel		15 11 2 3	10,000 litres 400 – 1,500 litres 35,000 litres 2,000 litres	Trailers on backhaul Mobile equipment Camp Enviro tanks: Fuel Trucks
Gasoline		2	10,000 litres	Camp
Aviation fuel		?	205 litre	Airstrips, landing pads
Propane		2	1,000 gallon	Camp
Other				
<p>12. Containment fuel spill contingency plans. (Please attach separate contingency plan if necessary).</p> <p>A draft spill contingency plan was provided for LUP MV2012F0007. The plan will be revised and approved prior to issue of this LUP.</p>				
<p>13. Methods of fuel transfer (to other tanks, vehicles, etc.)</p> <p>Electric pump. Enviro tanks in trucks will be used to top up heavy equipment. Fuel tanker will be used to fill camp storage tanks.</p>				
<p>14. Period of operation (includes time to cover all phases of project work applied for, including restoration)</p> <p>During all season use to the TTF only, that road section will be used year-round. Construction of the eastern section would occur as soon as ground conditions permit, but expected to be in December. Use of the eastern road section would continue until ground no longer firm or ice bridge over the Liard River not available, expected to be late March-early April. For all season use to the Liard Highway, the road will be used year-round with a barge operating to cross the Liard River during the ice-free period.</p>				
<p>15. Period of permit (up to five years, with maximum of two years of extension).</p> <p>A land use permit with a term of 5 years is requested.</p>				
<p>16. Location of activities by map co-ordinates (attached maps and sketches) See Project Description Report</p>				
Minimum latitude (degree, minute) 61° 06' N		Maximum latitude (degree, minute) 61° 37' N		
Minimum longitude (degree, minute) 122° 50' W		Maximum longitude (degree, minute) 124° 48' W		
Map Sheet no. 95F/95G				
<p>17. Applicant Canadian Zinc Corporation  Print name in full David Harpley</p> <p style="text-align: center;"></p> <p style="text-align: center;">Signature <span style="float: right;">Date April 16, 2014</span></p>				
<p>18. Fees Type A - \$150.00 ** Type B - \$150.00 ** (**Application Fees are Non-Refundable**)</p> <p>Land use fee: <u>Land already in use for winter road</u> _____ hectares @ \$50.00/hectare \$ _____</p> <p style="text-align: right;">Total application and land use fees \$ <u>150.00</u></p> <p style="text-align: center;"><b><i>Please make all cheques payable to "Receiver General of Canada"</i></b></p>				



**Mackenzie Valley Land and Water Board**  
**7th Floor - 4910 50th Avenue**  
**P.O. Box 2130**  
**YELLOWKNIFE NT X1A 2P6**  
**Phone (867) 669-0506**  
**FAX (867) 873-6610**

**APPLICATION FOR A NEW WATER LICENCE**

**Application/Licence No:**  
 (amendment or renewal only)

<p><b>1. Name and Mailing Address of Applicant</b>  <u>Canadian Zinc Corporation</u>    <u>Suite 1710, 650 West Georgia Street</u>    <u>Vancouver B.C. V6B 4N9</u>            Telephone: <u>604 688 2001</u>            Fax: <u>604 688 2043</u></p>	<p><b>2. Address of Head Office in Canada if Incorporate</b>  <u>Canadian Zinc Corporation</u>    <u>Suite 1710, 650 West Georgia Street</u>    <u>Vancouver B.C. V6B 4N9</u>            Telephone: <u>604 688 2001</u>            Fax: <u>604 688 2043</u></p>
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**3. Location of Undertaking (describe and attach a map, indicating watercourses and location of any proposed waste deposits).**

Prairie Creek Mine Access Road, Southern Mackenzie Mountains, South-West NWT (see Project Description Report and maps provided in application for LUP MV2012F0007).

Location	Latitude (N)			Longitude (W)		
	Deg	Min	Sec	Deg	Min	Sec
Mine	61	33	14	124	47	51
W Park Boundary	61	36	36	124	41	4
E Park Boundary	61	25	43	123	34	30
E road terminus	60	57	46	123	15	40

**4. Description of Undertaking (describe and attach plans)**

Construction and use of an all weather road, with creek crossing structures exceeding 5 m in width.



**12. Studies undertaken to date. Attach a list if necessary.**

See Environmental Assessment EA0809-002 and the attached Project Description Report.

**13. Proposed time schedule.**

To be determined. Licence to allow for all weather use from the Mine to the Tetcela Transfer Facility (TTF) as Phase 1, then from the TTF to the Nahanni Butte access road connecting to the Liard Highway as Phase 2.

Name (print): David Harpley

Signature:



Title (print): Vice President, Environment and Permitting Affairs Date: April 16, 2014

***Please make all cheques payable to "Receiver General of Canada"***

***FOR OFFICE USE ONLY***

**Application Fee Amount:**            \$ \_\_\_\_\_            **Receipt No:**            \_\_\_\_\_

**Water Use Deposit Amount:**        \$ \_\_\_\_\_            **Receipt No:**            \_\_\_\_\_

# **Prairie Creek Mine All Season Access Road Engagement Plan**

## **Background**

CZN has had a regional presence in Fort Simpson for over a decade. CZN hired Wilbert Antoine as its Manager of Northern Development, based in Fort Simpson, in the summer of 2008. Mr. Antoine assumed the main community interaction function on behalf of CZN.

Also in 2008, CZN signed a Memorandum of Understanding (MOU) with Parks Canada relating to the expansion of the Nahanni National Park Reserve and the future operation of the Prairie Creek Mine. The parties agreed to make every reasonable effort to address issues of common interest and build a strong working relationship, including convening a Technical Committee to better identify, define and consider issues of common interest. The Committee met every 3-4 months, and in 2009, representatives of the Dehcho First Nation were invited and did attend.

CZN signed MOU's with the Naha Dehe Dene Band (NDDDB) and the Liidlii Kue First Nation (LKFN) in 2008. These were a precursor to Impact Benefit Agreements (IBA).

CZN and the NDDDB concluded an IBA in January 2011. This was followed by an IBA with the LKFN in June 2011, and a socio-economic agreement (SEA) with the GNWT in August 2011.

As a means of including all neighbouring communities in the Dehcho in the economic development of the Mine, CZN formed the Nahendeh Aboriginal Economic Council (NAEC) in 2010. The intent of the NAEC is to provide a vehicle for the potential involvement of local community development corporations in economic opportunities that cannot be addressed by the IBA communities.

CZN maintains a visible presence in the region as a result of the regional Fort Simpson office, by sponsoring and attending the annual Canadian Zinc Open in Fort Simpson since 2003, and by sponsoring and attending an annual Winterfest in Nahanni Butte since 2010.

## **Future Engagement**

At this pre-construction stage, CZN will be continuing engagement with local aboriginal groups on many fronts, as follows:

- Wilbert Antoine will continue with his regular informal and formal meetings (at least monthly) with LKFN, DFN and the Fort Simpson Metis in Fort Simpson, and his informal meetings with the Chiefs of neighbouring communities during their visits into Fort Simpson, during which he will provide updates on all issues relating to CZN;
- Wilbert Antoine will continue with his visits approximately every 6 months to the community of Nahanni Butte, during which he will update Band members on all issues relating to CZN;
- regular telephone calls, teleconferences and meetings will take place with NAEC members regarding current and potential future contracts;

- Senior CZN management will meet with the LKFN Band council in mid-summer, and if requested, the NDDDB council and DFN also. These meetings are usually open to the community to participate, at least in Nahanni Butte;
- Senior CZN management will meet with the NDDDB council during Winterfest in January 2015, and the LKFN Band council and DFN also;
- Senior CZN management will be in contact with at least the NDDDB and LKFN during the course of the expected EA and permitting processes.

In addition to the above, CZN's engagement personnel (numbering 3) receive telephone calls from Band members and/or their representatives on a weekly basis. As a result, there is an almost constant process of on-going discussion, feedback and issue resolution.

## **Attachment A**



## ENGAGEMENT RECORD

**Party Engaged:** Naha Dehe Dene Band (NDDDB)

**Date/Time:** January 15, 2014 / 11:45 am to 12:30 pm

**Location:** Nahanni Butte Gym, NT

**NDDB Attendees:** Acting Chief Peter Marcellais, James Betsaka, Jane Konisenta, Joan Ekotla, Tammy Matou, Tom Betsaka, Helen Ekotla, Lorraine Vital, Voilet Tesou, Leon Konisenta

**CZN Attendees:** Alan Taylor, David Harpley, Chris Reeves, Wilbert Antoine

### Issues Discussed:

1. Corporate Status
2. Security Payment Status
3. All Weather Access Road Application

### Issues Resolved:

1. Alan Taylor gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including trainingship (general trades), diamond driller, and road construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN getting wage subsidies. A summary of the overall success of the Silver Lining training programs was provided.
  - Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction.

Therefore, CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist. The program seeks to reduce costs where possible, and more accurately estimate the total cost of construction. To obtain more detailed costs and engineering designs, CZN will be sending in a group of engineers (from Tetra Tech) to the Mine site next week, and the company will subsequently be issuing tender packages for the main components required to complete construction. If all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The earliest possible commercial production at the project would be late 2015.

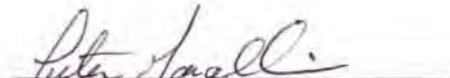
2. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
3. David Harpley informed NDDDB that CZN intends to apply to use the access road in all seasons. The attached document was provided which explains CZN's rationale for the planned application. James Betsaka indicated that the Band will support the proposed application and road use.

**Issues Unresolved:**

None.

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

PETER MARCELLAIS  
Name

  
Signature

Photos:



## **NOTES FOR ENGAGEMENT MEETINGS**

**January 14<sup>th</sup>, 2014 – LKFN, ADK**  
**January 15<sup>th</sup>, 2014 – NDDB**

### **OPERATING PERMITS**

#### **Letter of Dec. 9, 2013 to MVLWB re FMEA**

The Water Licence (WL) requires a Failure Modes and Effects Analysis, mostly related to mine water management. CZN has requested that this be deferred until after CZN has done some dewatering of the Mine this summer, which will generate important data.

#### **Letter of Dec. 22, 2013 to MVLWB re Security and Length of Permits**

The WL and Land Use Permit (LUP) require CZN to post a total of \$17.7 million to cover reclamation security. \$9 million of is to cover all existing site liabilities. The permits require CZN to post \$6 million immediately, and \$3 million at the start of operations. The Water Board erred because CZN is not liable for all existing liabilities as a result of a Release issued by the Crown. CZN is only currently liable for those liabilities related to its Surface Lease, estimated at \$2 million. CZN has proposed to post security of \$2 million immediately, and the remaining \$7 million over the first 2 years of operations.

Time will be required to complete final engineering, raise capital and construct the Mine. This will eat significantly into the term of the permits, and is not helpful for raising capital. CZN has asked the Board to either extend the period of the permits, or defer their start dates.

## ACCESS ROAD

Access Road permits currently allow winter use of the road only. CZN's operating plans include early winter opening of the road from the Mine to a mid-way point. Concerns were raised in the environmental assessment (EA) process regarding early winter ground conditions, and this may be an operational constraint. In addition, winter access only means that all supplies must be brought in over a few months, and mineral concentrates are stranded at the Mine until the next winter, negatively affecting cash flow. However, the cost to upgrade the road to all season status is significant.

CZN proposes to apply to have the road permits amended to allow all season use at a time of its choosing. Initial road use would be winter only. The next step would be to upgrade the western portion for all season use to allow all mineral concentrates to be transported to the mid-way point. A second airstrip would also be built to improve air access in bad weather. After that, CZN would consider upgrading the eastern portion for all season use, which would be the most expensive.

In CZN's opinion, all season road access presents a significant economic opportunity for all parties in the region. The Ram Plateau is a unique area and the karst landscape is a great tourist and cultural attraction. There is an opportunity to promote greater use of, and access to, the Nahanni National Park Reserve, and with greater aboriginal involvement. This could include greater day and air access, and perhaps overnight accommodation for tourists and researchers. A multi-party collaborative approach is required to realize these benefits, and to finance the upgrade of the eastern portion of the road.



## ENGAGEMENT RECORD

**Party Engaged:** LiidliiKue First Nation(LKFN)

**Date/Time:** January 14, 2014 / 1:00 pm to 2:50 pm

**Location:** LKFN Boardroom, Fort Simpson, NT

**LKFN Attendees:** Chief Minnie Letcher, Jim Antoine, Betty Hardisty, Emma Amundson, Liza McPherson, Dan Hillman

**LKFN Guest:** Chief Harry Deneron (Acho Dene Koe First Nation)

**CZN Attendees:** Alan Taylor, David Harpley, Chris Reeves, Wilbert Antoine  
\*Joseph Lanzon (Call-in)

### Issues Discussed:

1. IBA Commitment Presentation
2. Review the IBA Status
3. Corporate Status
4. Security Payment Status
5. All Weather Access Road Application
6. Procurement Contracts\*
7. Nahendeh Aboriginal Economic Development Update\*

### Issues Resolved:

1. A cheque was provided by CZN to satisfy an IBA commitment.
2. A discussion was held regarding IBA Status. The Chief and Council will act as LKFN's IBA Representatives until further notice. Chief Minnie suggested having these IBA meetings scheduled to coincide with the first Tuesday of each month when they typically have their meeting. IBA meetings should be arranged with Alesha (LKFN).
3. Alan Taylor gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including training ship (general trades), diamond driller, and road

construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN getting wage subsidies. A summary of the overall success of the Silver Lining training programs was provided.

- Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction. Therefore, CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist. The program seeks to reduce costs where possible, and more accurately estimate the total cost of construction. To obtain more detailed costs and engineering designs, CZN will be sending in a group of engineers (from Tetra Tech) to the Mine site next week, and the company will subsequently be issuing tender packages for the main components required to complete construction. If all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The earliest possible commercial production at the project would be late 2015.
4. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
  5. David Harpley informed LKFN that CZN intends to apply to use the access road in all seasons. Chief Minnie suggested that in the application, the road should be referred to as all-weather and not all-season. The attached document was provided which explains CZN's rationale for the planned application.
  6. A discussion was held regarding the process for tendering on future contracts. While IBA holders would have priority on opportunities to secure contracts, CZN expressed concern that the Nahendeh Aboriginal Economic Committee (NAEC) could also provide involvement for surrounding communities and could help CZN further its commitment to GNWT to reduce economic seepage to southern contractors. CZN gave a brief history of the company's involvement going back to the Fort Liard meeting in 2010.

**Issues Unresolved:**

- 6. Chief Minnie advised that LKFN council is currently not in favour of NAEC participation as similar past collaborations have not been productive. However, the Band is amenable to further discussion and consideration.

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

MINNIE LEUTER

Name

  
 Signature CHIEF, LKFN

**Photos:**





## ENGAGEMENT RECORD

**Party Engaged:** Acho Dene Koe First Nation (ADK)

**Date/Time:** January 14, 2014 / 11:00 am to 12:00 pm

**Location:** CZN Regional Office, Fort Simpson, NT

**ADK Attendees:** Chief Harry Deneron

**CZN Attendees:** Alan Taylor, David Harpley, Chris Reeves, Wilbert Antoine

### Issues Discussed:

1. Corporate Status
2. Security Payment Status
3. All Weather Access Road Application

### Issues Resolved:

1. Alan Taylor gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including trainingship (general trades), diamond driller, and road construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN giving wage subsidies as all site trainee were CZN employees. A summary of the overall success of the Silver Lining training programs was provided.
  - Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction. Therefore, CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist. The program seeks to reduce costs where possible, and more accurately estimate the total cost of construction. To obtain more detailed costs and engineering designs, CZN will be sending in a group of engineers (from Tetra Tech) to the Mine site next week, and the company will subsequently be issuing tender packages for the main components required to complete construction. If

all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The earliest possible production of the first mineral concentrates at the project would be late 2015.

2. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
3. David Harpley informed the Chief that CZN intends to apply to use the access road in all seasons. The attached document was provided which explains CZN's rationale for the planned application.

The Chief indicated his support for the Prairie Creek Mine because the project will help other things in the region. The project could help get funding to improve the highway near Fort Liard. The Chief was careful not to speak for others who are more directly impacted by the project, but he generally supports industry and wonders if the upcoming Devolution (Bill C-15) will help Prairie Creek. He mentioned he was on his way to Yellowknife shortly to speak on Devolution in front of the legislative standing committee.

**Issues Unresolved:**

None.

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

Harry Deneron  
Name

[Signature]  
Signature

Photos:

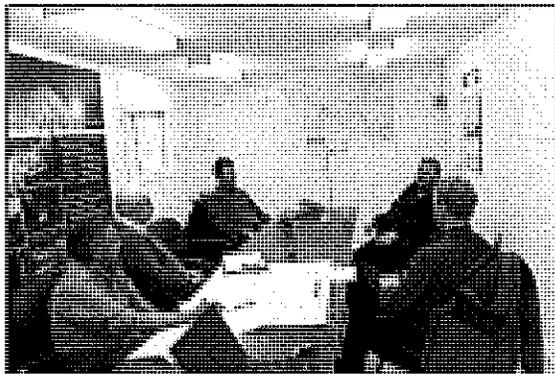


Photo 1: CZN Meeting with Chief Harry Deneron,



**JEAN MARIE RIVER FIRST NATION**  
GENERAL DELIVERY  
JEAN MARIE RIVER, NT  
X0E 0N0

Ph: 867-809-2000 Fax: 867-809-2002  
Email: [chief@jmrfn.com](mailto:chief@jmrfn.com)

April 9, 2014

Julian Morse  
Regulatory Officer  
Mackenzie Valley Land and Water Board  
7<sup>th</sup> Floor-4910 50<sup>th</sup> Avenue,  
Yellowknife, NT X1A 2P6

**Re: CZN's Proposed All Weather Road Application for the Prairie Creek Mine**

Dear Mr. Morse,

On February 14, 2014 I had an opportunity to meet with Wilbert Antoine, Manager of Northern Development with Canadian Zinc Corporation in Fort Simpson. Mr. Antoine provided me with an update on CZN's activities and their intent to apply in the very near future to upgrade the winter road into the Prairie Creek Mine for all weather use. The intent of the application is to allow the mine to transport minerals to market, and bring in supplies year round.

This letter is to notify you that, as the designated representative of the Jean Marie River First Nation, we support CZN's application.

Yours truly,

for  
Chief Stanley Sanguéz  
Jean Marie River First Nation  
Jean Marie River, NT



## ENGAGEMENT RECORD

**Date of Engagement:** February 19<sup>th</sup>, 2014

**Party Engaged:** Sambaa Ke Dene Band

**Location:** SKDB Office, Trout Lake, NT

**Party Attendees:** Chief Dolphus Jumbo and Ruby Jumbo

**CZN Attendees:** Wilbert Antoine

### Issues Discussed:

1. Corporate Status
2. Security Payment Status
3. All Weather Access Road Application

### Issues Resolved:

1. Wilbert Antoine gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including trainingship (general trades), diamond driller, and road construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN getting wage subsidies. Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction. CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist, early January the mine was temporary open for the Tetra Tech firm to do some estimates. The program seeks to reduce costs where possible, and more accurately estimate the total cost of

construction. If all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The

2. David Harpley intends to apply to use the access road in all seasons. The attached document was provided which explains CZN's rationale for the planned application.
3. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
4. A discussion was held regarding the process for tendering on future contracts. While IBA holders would have priority on opportunities to secure contracts, CZN expressed concern that the Nahendeh Aboriginal Economic Committee (NAEC) could also provide involvement for surrounding communities and could help CZN further its commitment to GNWT to reduce economic seepage to southern contractors. CZN gave a brief history of the company's involvement going back to the Fort Liard meeting in 2010.

**Issues Unresolved:**

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature



## ENGAGEMENT RECORD

**Party Engaged:** Dehcho First Nation (DCFN)

**Date/Time:** January 14, 2014 / 4:00 pm to 4:30 pm

**Location:** DCFN Fort Simpson office, NT

**DCFN Attendees:** Grand Chief Herb Norwegian

**CZN Attendees:** Alan Taylor, David Harpley, Wilbert Antoine

**Issues Discussed:**

1. Corporate Status
2. Security Payment Status
3. All Weather Access Road Application

**Issues Resolved:**

1. Alan Taylor gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including trainingship (general trades), diamond driller, and road construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN getting wage subsidies. A summary of the overall success of the Silver Lining training programs was provided.
  - Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction. Therefore, CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist. The program seeks to reduce costs

where possible, and more accurately estimate the total cost of construction. To obtain more detailed costs and engineering designs, CZN will be sending in a group of engineers (from Tetra Tech) to the Mine site next week, and the company will subsequently be issuing tender packages for the main components required to complete construction. If all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The earliest possible commercial production at the project would be late 2015.

2. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
3. David Harpley informed the Grand Chief that CZN intends to apply to use the access road in all seasons. The attached document was provided which explains CZN's rationale for the planned application.

**Issues Unresolved:**

None.

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

\_\_\_\_\_  
Name

\_\_\_\_\_  
Signature

Photos:



## ENGAGEMENT RECORD

**Date of Engagement:** February 18<sup>th</sup>, 2014

**Party Engaged:** Fort Simpson Metis Nation (FSMN)

**Location:** FSMN Office, Fort Simpson, NT

**Party Attendees:** President Marie Lafferty

**CZN Attendees:** Wilbert Antoine

### Issues Discussed:

1. Corporate Status
2. Security Payment Status
3. All Weather Access Road Application

### Issues Resolved:

1. Wilbert Antoine gave an overview of 2013 programs and plans for 2014:
  - There were many training programs at the Mine during the summer, including trainingship (general trades), diamond driller, and road construction and slashing on the access road. All programs were successful and much appreciated, and trainees were employed with CZN getting wage subsidies. Surface exploration drilling was completed near the Mine site spanning 2 months. This included the diamond driller training program.
  - Baseline aquatic surveys were carried out in the South Nahanni basin in preparation for operations.
  - While CZN has all the necessary operating permits, the financial markets are not conducive to raising the money required for construction. CZN will embark on an optimization program, and has hired Tetra Tech Engineering to assist, early January the mine was temporary open for the Tetra Tech firm to do some estimates. The program seeks to reduce costs where possible, and more accurately estimate the total cost of

construction. If all of the plans and financing falls into place this year, the winter road would be opened in early 2015 so that construction materials can be taken to site and to enable construction to begin in 2015. The

2. CZN intends to apply to use the access road in all seasons. The attached document was provided which explains CZN's rationale for the planned application.
3. CZN submitted letters to the Water Board in December regarding deferral of a Failure Modes and Effects Analysis, and alteration of security payment terms in connection with the operations Land Use Permit and Water Licence. A summary of CZN's positions was explained by providing the attached document.
4. A discussion was held regarding the process for tendering on future contracts. While IBA holders would have priority on opportunities to secure contracts, CZN believes that the Nahendeh Aboriginal Economic Committee (NAEC) could also provide involvement for surrounding communities and could help CZN further it's commitment to GNWT to reduce economic seepage to southern contractors.

**Issues Unresolved:**

None.

**Signature of Party Representative Confirming Accuracy of Engagement Record:**

MARIE LAFFERTY  
Name

Marie Lafferty  
Signature



April 16, 2014

Jonathan Tsetso  
Resource Conservation Manager  
Nahanni National Park Reserve  
Parks Canada  
Box 348  
Fort Simpson, NT  
X0E 0N0

Dear Mr. Tsetso:

**Re: Prairie Creek Mine – Applications for Land Use Permit and Water Licence  
All Season Access Road**

We refer to applications of the above noted date submitted by Canadian Zinc Corporation (CZN) to the Mackenzie Valley Land and Water Board (MVLWB) for a Type A Land Use Permit (LUP) and a Class B Water Licence to authorize construction, maintenance and use of an all season road. For your information, copies of the applications to the MVLWB are attached, and are for the portion of the access road that connects the Prairie Creek Mine to the Liard Highway that is NOT within the boundaries of the Nahanni National Park Reserve (NNPR). The application included a Project Description Report (PDR).

This letter is in support of similar applications to Parks Canada for that portion of the access road WITHIN the boundaries of the NNPR. Attached are applications for a LUP and a Water Licence, as well as three copies of the PDR. Also, a cheque in the amount of \$150.00 for the LUP application is provided. We have not included a fee for land use as we assume this is covered by the fee in your possession for Parks2012-001. A cheque in the amount of \$30.00 for the Water Licence is also included.

As per paragraph 126.(2)(a) and subsection 126.(4) of the MVRMA, we expect the project (an all season road) would proceed to environmental assessment (EA) immediately upon receipt by the MVLWB of a referral from a department or agency of the federal or territorial government. Until such time that a referral is received, the MVLWB would proceed with their regulatory process (deem the application complete/incomplete, send for review, conduct a Preliminary Screening). To expedite matters, we ask that Parks Canada collaborate with the MVLWB to refer the project to EA without delay.

We look forward to our continued cooperative relationship and await your further direction. If you have any questions please do not hesitate to contact us.

April 16, 2014  
Parks Canada

Yours truly,

A handwritten signature in blue ink, appearing to read "D. Harpley".

David P. Harpley, P. Geo.  
VP Environment and Permitting Affairs

Attachment



## APPLICATION FOR OPERATION OF A MINE ACCESS ROAD IN NAHANNI NATIONAL PARK RESERVE OF CANADA: LANDS

**New Authorization    X                      Amendment**

**as per the *Canada National Parks Act and Regulations***

<p>1. Applicant's name and mailing address: Canadian Zinc Corporation 1710 – 650 W. Georgia St. Vancouver, BC, V6B 4N9</p>	<p>Fax number: 604-688-2043</p> <hr/> <p>Telephone number: 604-688-2001</p>
<p>2. Head office address: As above Field supervisor: To Be Determined Site Satellite telephone: 1-600-700-2454 Site Satellite fax: 1-600-700-9209 Site VOIP telephone: 778-724-2512</p>	<p>Fax number: As above</p> <hr/> <p>Telephone number: As above</p>
<p>3. Other personnel (subcontractor, contractors, company staff etc.)</p> <p>With all weather road from the Mine to the Tetcela Transfer Facility (TTF), part of road construction, maintenance and road haul to be completed by Mine staff or contracted staff, and part to be completed by contractors – companies yet to be determined, estimates only. With all weather road from the Mine to the Liard Highway, part of road construction to be completed by Mine staff or contracted staff, and part by contractors, road maintenance and road haul mostly by Mine staff or contracted staff.</p> <p>Road construction: see attached sheet Annual Road Maintenance: see attached sheet Annual Road Haul: 20* people x 120 days = 2400 person days (* on average, can be up to 30) TOTAL: Up to 45 people working at one time. See attached sheet for total.</p>	
<p>4. a) Summary of operation (Describe purpose, nature and location of all activities.) *See attached Project Description*</p> <p>Construction, maintenance and use of an all weather road approximately 170 km long connecting the Prairie Creek Mine to the Tetcela Transfer Facility (TTF, Phase 1), and from the TTF to the Nahanni Butte access road which in turn joins the Liard Highway (Phase 2) to allow haulage of mineral concentrates out, and operating supplies in. Cleared normal right-of-way to be up to 20 m wide but may be up to 35 m when there are steep side-slopes, road surface width 5-8 m. Road crosses the Nahanni National Park Reserve from approximately Km 17-100 where the jurisdiction is Parks Canada. Barge landing/set-down areas both sides of Liard River.</p> <p>b) Please indicate if a camp is to be set up. (Please provide details on a separate page, if necessary.)</p> <p>The land use operation will be serviced from the existing facilities at the Prairie Creek Mine, and by Contractors travelling from the Liard Highway. During road construction, a temporary industrial camp is required on the east side of the Liard River, and an annual seasonal camp for road maintenance on the east side of the Silent Hills.</p>	



6. Summary of potential environmental and resource impacts (describe the effects of the proposed land-use operation on land, water, flora & fauna and related socio-economic impacts). Use separate page if necessary.)

Potential environmental and resource impacts were assessed in Environmental Assessment EA0809-002. Assessment contained in CZN's Developers Assessment Report dated March 2010. Decision of the Review Board in their Report of EA dated December 8, 2011 is that "the proposed developed is not likely to have significant adverse impacts on the environment or to be a cause of significant public concern", subject to the commitments made by CZN during the EA process.

7. Proposed restoration plan (please use a separate page if necessary).

Bridges will be removed from stream crossings, abutments will be removed or pushed-back. Material will be pulled-back to recontour side-hill cuts. Erosion control measures will be installed as necessary. Restoration of disturbed areas will be promoted by stabilization measures and vegetation by natural invasion.

8. Other rights, licences or permits related to this permit application (mineral rights, timber permits, water licences, etc.)

Mining Leases ML 2854, ML 2931, ML 2932, ML 2933, ML 3313, ML 3314, ML 3315, ML 3338, ML 5113, ML5114, ML5115, ML 5116; Mineral Claims K01369; Surface Leases 95F/10-5-5, 95F/10-7-4; and, Land Use Permit Parks2012-L001 and Water Licence Parks2012\_W001.

Roads:            Is this to be a pioneered road?    No  
 Has the route been laid out or ground truthed?    The route is the same as that in LUP Parks2012-L001. Most of the route exists, but there are new re-alignments, as shown in drawings provided previously for LUP Parks2012-L001. The precise location of the re-alignments has yet to be ground truthed. Minor re-alignments may be considered for the all weather route.

9. Proposed disposal methods.

- a) Garbage: Combustible refuse to be incinerated at Mine Site or temporary camp. Non-combustible refuse to be disposed of at Mine Site or other approved facility.
- b) Sewage (Sanitary & Grey Water): Will be taken to the Mine site Sewage Treatment Plant.
- c) Brush & trees: Alignment will already be cleared. For any new re-alignments, brush and debris from clearing the right of way will be windrowed adjacent to the right of way, with breaks every 100 m. Trees felled will be bucked.
- d) Overburden (Organic soils, waste material, etc.): Overburden disturbance will be minimized. Cut organic soil will be stockpiled. Cut mineral soil will be used to create a level bed, and potentially to insulate areas of permafrost.

10. Equipment (includes drills, pumps, etc.) (Please use separate page if necessary.)

This list is not intended to be exhaustive nor definitive, but rather an indication of the types of equipment necessary to support the proposed development.

See attached page.



11. Fuels not in transport	Yes/No	Number of containers	Capacity of containers	Location
Diesel		15	10,000 litres	Trailers on backhaul
		11	400 – 1,500 litres	Mobile equipment
		2	35,000 litres	Camp
		3	2,000 litres	Enviro tanks: Fuel Trucks
Gasoline		2	10,000 litres	Camp
Aviation fuel		?	205 litre	Airstrips, landing pads
Propane		2	1,000 gallon	Camp
Other (please indicate)				
<p>12. Containment fuel spill contingency plans. (Please attach separate contingency plan if necessary).</p> <p>A draft spill contingency plan was provided for LUP MV2012F0007. The plan will be revised and approved prior to issue of this LUP.</p>				
<p>13. Methods of fuel transfer (to other tanks, vehicles, etc.)</p> <p>Electric pump. Enviro tanks in trucks will be used to top up heavy equipment. Fuel tanker will be used to fill camp storage tanks.</p>				
<p>14. If fuel or flammable liquids are to be transported through the park, indicate how they will be transported.</p> <p>Tidy or enviro tanks in pick-up trucks will be used to transport fuel for heavy equipment use. Fuel transfer to the mine will be via 10,000 litre tanks. Fuel tankers providing camp supplies would be dedicated contractors.</p>				
<p>15. Do you intend to use, remove, damage, or destroy natural objects (e.g., soil, sand, gravel, rock, mineral, fossil, snow) from their natural location? If so, please indicate the intended use and how the activity will not: have significant adverse impacts on the park and its natural resources; jeopardize cultural, historical and archaeological resources; and pose a danger to public health or public safety.</p> <p>Winter road construction will have created a level roadbed. Removal of organic soil will have been avoided as much as possible, but mineral fill may have been placed to insulate permafrost in places. To construct an all season road, considerably more fill will be placed over the already disturbed area. During the winter road EA, surveys of the road alignment did not identify rare plants or other unique vegetation, and an archaeological assessment with field surveys at locations thought to represent the highest potential for presence of cultural resources did not find any. The construction work will be remote and will pose no danger to public health or safety.</p>				
<p>16. Please specify the kind, amount, and location of natural objects and/or flora to be used, removed, defaced, damaged or destroyed.</p> <p>Since the all season road will use the permitted winter road alignment, apart from some potential small re-alignments, there will be very little to no additional removal or destruction of natural objects/flora. Some small flora loss may occur where additional bridge abutments are built, and for expansion of the TTF.</p>				
<p>17. Will your activities include the willful removal, relocation, or destruction of wildlife?</p> <p>No.</p>				



18. Period of operation (includes time to cover all phases of project work applied for, including restoration)	
During all season use to the TTF only, that road section will be used year-round. Construction of the eastern section would occur as soon as ground conditions permit, but expected to be in December. Use of the eastern road section would continue until ground no longer firm or ice bridge over the Liard River not available, expected to be late March-early April. For all season use to the Liard Highway, the road will be used year-round with a barge operating to cross the Liard River during the ice-free period.	
19. Period of permit (up to five years, with maximum of two years of extension).	
Initially 5 years.	
20. Location of activities by map co-ordinates (attached maps and sketches) <b>**See Project Description**</b>	
The Prairie Creek Mine access road enters the park from the west at latitude 61 deg 36 min 36 sec N, longitude 124 deg 41 min 4 sec W, and leaves the park in the east at the Wolverine (Silent Hills) Pass at latitude 61 deg 25 min 43 sec N, longitude 123 deg 34 min 30 sec W.	
Map Sheet no. 1:50,000 NTS Sheet 95 F/10	
17. Applicant Print name in full	Canadian Zinc Corporation David Harpley
	
Signature	Date: April 16, 2014

**FOR OFFICE USE ONLY**

**Application Fee (\$150)** Receipt No: \_\_\_\_\_

**Land Use Fee (\$50/hectare)** Receipt No: \_\_\_\_\_

**Assignment Fee (\$50)** Receipt No: \_\_\_\_\_

**Please make all cheques payable to the "Receiver General of Canada"**

**Date Application Received:** \_\_\_\_\_



APPLICATION FOR CREEK CROSSINGS ALONG MINING ROAD ACCESS IN NAHANNI NATIONAL PARK RESERVE OF CANADA: WATER

New Authorization X Amendment

as per the Canada National Parks Act and Regulations

Table with 2 columns: 1. Name and Mailing Address of Applicant, 2. Address of Head Office in Canada if Incorporate. Includes contact info for Canadian Zinc Corporation.

3. Identify the type of undertaking.

Industrial \_\_\_\_\_ Mining and milling \_\_\_\_\_
Municipal \_\_\_\_\_ Construction \_\_\_\_\_
Recreation \_\_\_\_\_ Miscellaneous X

4. Indicate which of the following activities are proposed.

To obtain water \_\_\_\_\_ Flood control \_\_\_\_\_
To cross a watercourse X \_\_\_\_\_ To divert water \_\_\_\_\_
To modify the bed or bank of a watercourse \_\_\_\_\_ To alter the flow of, or store water \_\_\_\_\_

Other (describe): \_\_\_\_\_

5. For each activity you have identified above, please attach a document describing the below criteria where applicable: See attached Project Description.

- a. Specify the purpose of the above activities and/or why the water is required. Describe all activities and attach plans.
b. Describe all equipment to be used, methods to be employed, and indicate all watercourses that may be affected along with the location of any proposed waste deposits. Provide a statement specifying the location of any equipment to be installed in taking water. In addition,



please include a map that plots the above with recognizable landmarks and latitude/longitude indicated.

- c. If this water is to be potable, is a water quality test attached? Provide documentation that the water quality is suitable for the purpose for which it is required.
- d. Quantity of water involved (litres per second, litres per day or cubic meter per year), including both quantity to be used and quality to be returned to source.
- e. Waste deposited (quantity, quality, treatment and disposal).
- f. Other persons or properties affected by this Undertaking (give name, mailing address and location). Include a list if necessary.
- g. Predicted environmental impacts of Undertaking and proposed mitigation.
- h. Studies undertaken to date.

**6. Contractors and sub-contractors (names, addresses and functions). Attach a list if necessary and identify the activity or activities they will be responsible for.**

Contractors responsible for installing bridges currently not known.

**7. Proposed time schedule.**

Start date: Fall 2014 Completion date: Indefinite

Name (print): David Harpley

Signature: \_\_\_\_\_

Title (print): VP, Environment

Date: April 16, 2014

***For Office Use Only***

**Application fee (\$30)** Receipt No: \_\_\_\_\_

**Water use deposit** Receipt No: \_\_\_\_\_

***Please make all cheques payable to the "Receiver General of Canada"***

**Date Application Received:** \_\_\_\_\_



**PRAIRIE CREEK MINE**

**ALL SEASON ROAD APPLICATION**

**PROJECT DESCRIPTION REPORT**



**April 2014**

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Appendix A	Caribou Occupancy Survey Details and Results
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## LIST OF ACRONYMS

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ADK	Acho Dene Koe Band
AMSL	above mean sea level
BC	British Columbia
Cadillac	Cadillac Explorations Ltd.
CBH4	Navigation Canada Designation for the Prairie Creek Airstrip
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CZN	Canadian Zinc Corporation
DAR	Developer's Assessment Report
DFN	Dehcho First Nations
EA	Environmental Assessment
EC	Environment Canada
ENR	Environment and Natural Resources
GNWT	Government of the Northwest Territories
Ha	hectare (area 100 m by 100 m)
Km 83	Kilometre marker along access road, Km 0 is Prairie Creek Site
km	Kilometre
IBA	Impact and Benefits Agreement
JMRFN	Jean Marie River First Nation
LKFN	Liidlii Kue First Nation
LTF	Liard Transfer Facility
LUP	Land Use Permit
m	metre
m <sup>2</sup>	1 metre by 1 metre (area)
MOU	Memorandum of Understanding
MVLWB	Mackenzie Valley Land and Water Board
MVRMA	Mackenzie Valley Resource Management Act
MVEIRB	Mackenzie Valley Environmental Impact Review Board
NDDB	Naha Dehe Dene Band
NT or NWT	Northwest Territories
PDR	Project Description Report
PC	Parks Canada
PKFN	Pehdzeh Ki First Nation
SARA	Species at Risk Act
SARC	San Andreas Resources Corporation
SCP	Spill Contingency Plan
STP	Sewage Treatment Plant
t/d, tpd	Tonnes per day
TK	Traditional Knowledge
TOR	Terms of Reference
TTF	Tetcela Transfer Facility
WMMP	Wildlife Mitigation and Monitoring Plan

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# 1.0 INTRODUCTION

## 1.1 Background

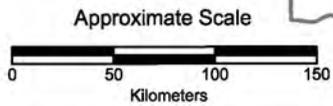
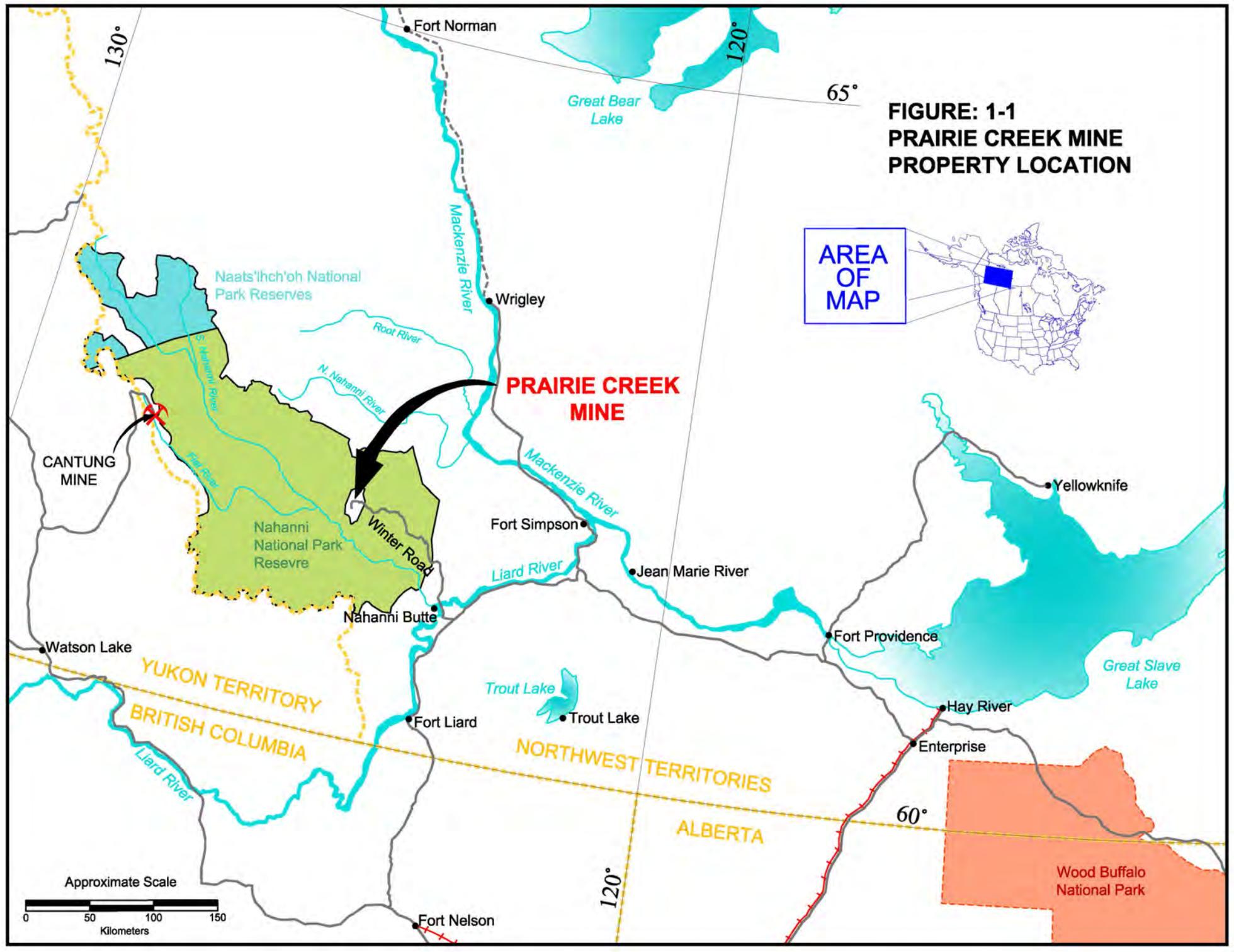
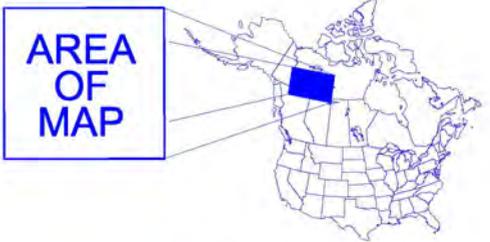
The Prairie Creek Mine site is located in the southern Mackenzie Mountains in the south-west corner of the Northwest Territories (Figure 1-1). The Mine is 100% owned by Canadian Zinc Corporation (CZN), and consists of significant mine infrastructure and facilities constructed in the early 1980's. The Mine received an operating Water Licence in 1982 and Land Use Permits (LUP) in 1980 to allow production of concentrates of lead and zinc and a silver-bearing copper concentrate and use of an access road from the Mine to the Liard Highway. The Mine was three months from production when it was placed into receivership due to market conditions.

CZN, formerly named San Andreas Resources Corporation (SARC) acquired the property in 1991, and has since expanded and developed the mineral resource. After completing numerous engineering, environmental and economic studies, CZN applied to the Mackenzie Valley Land and Water Board (MVLWB) for a Type "A" Water Licence and a Type "A" LUP to support reactivation of the Mine for production, and two Type "A" LUP's for transfer facilities approximately half-way along the access road and at the junction of the road with the Liard Highway. CZN already held LUP MV2003F0028 for operation of a winter road. The applications were referred to environmental assessment (EA). In the terms of reference (TOR) for EA0809-002, issued by the Mackenzie Valley Review Board (MVRB), construction and operation of the access road in support of mine operations was included in the scope of development.

The MVRB issued their Report of EA (REA) on December 8, 2011. The MVRB concluded that the proposed development, as described in the REA and including CZN's commitments, is not likely to have any significant adverse impacts on the environment or to be a cause for significant public concern. The file was returned to the MVLWB for the permitting phase, and mine operations permits were subsequently issued, including Water Licence MV2008L2-0002 issued on September 24, 2013. As changes were made to the access road alignment during the EA, CZN applied for and received new access road LUP's and Water Licences from both the MVLWB and Parks Canada.

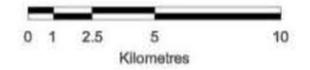
CZN's current access road operating plans include early winter opening of the road from the Mine to the Tetcela Transfer Facility (TTF) at Km 84 (see Figure 1-2), roughly mid-way along the road to the Liard Highway, in order to start the haulage of concentrates to the TTF. This is imperative because of the volume of material to be moved in a limited and unpredictable time period. Concerns were raised in the EA process by Parks Canada and others regarding the ground being sufficiently frozen to support the weight of vehicles in early winter. Sufficient snow availability at this time of year for road bed construction was also a concern. If conditions are not favourable, road construction and opening could be delayed. CZN has considered these risks, and the data available indicate that road construction should be possible as planned most years. However, the risk of seasonal delay remains, and this risk could change negatively in the longer term with the effects of climate change. Concern was also expressed during the EA regarding the road conditions through the mountains in winter, and the potential for spills and effective spill response.

**FIGURE: 1-1  
PRAIRIE CREEK MINE  
PROPERTY LOCATION**



**Figure 1-2:  
Prairie Creek Mine  
Access Road**

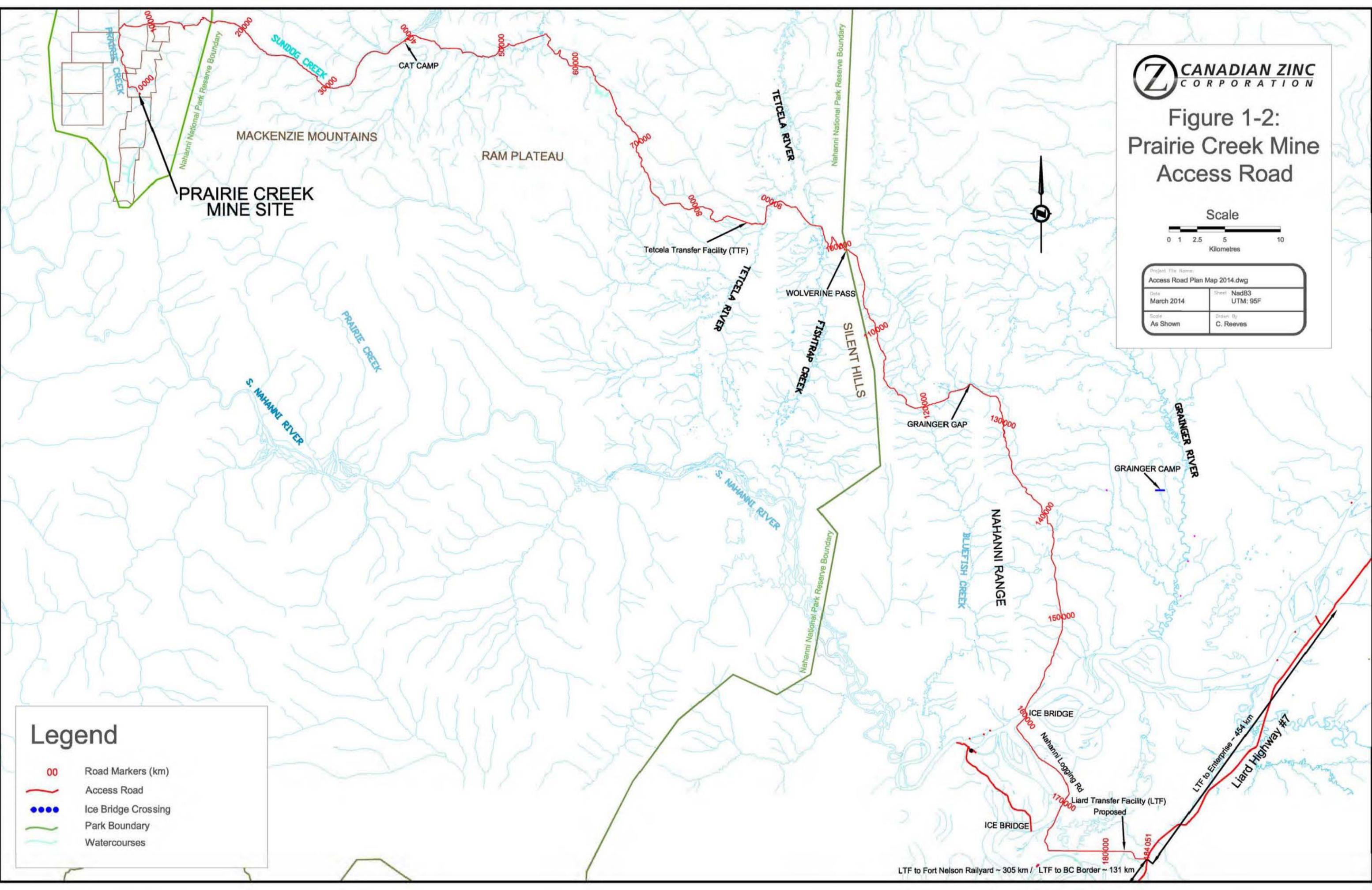
Scale



Project File Name: Access Road Plan Map 2014.dwg	
Date: March 2014	Sheet: Nad83 UTM: 95F
Scale: As Shown	Drawn By: C. Reeves

**Legend**

- 00 Road Markers (km)
- Access Road
- Ice Bridge Crossing
- Park Boundary
- Watercourses



LTF to Fort Nelson Railyard ~ 305 km / LTF to BC Border ~ 131 km

Nahanni Logging Rd  
LTF to Enterprise - 454 km  
Liard Highway #7

Liard Transfer Facility (LTF) Proposed

ICE BRIDGE

170000

160000

150000

140000

130000

120000

110000

100000

90000

80000

70000

60000

50000

40000

30000

20000

10000

00000

For these reasons, CZN is now applying for permits to use the road in all seasons to the TTF. This will enable the year-round transport of concentrates to the TTF, and alleviate the concerns described above.

From an economic perspective, the operation will be penalized by only seasonal road access because significant working capital is required upfront to finance annual operating activities before any revenue from the concentrates produced in that year is available. All season access would remove this penalty, but is counter-balanced by the anticipated significant cost to upgrade the portion of the access road from the TTF to the Liard Highway. However, all season access could promote other activities, such as increased tourism, and greater involvement of local aboriginal groups may occur. Also, with all season access, CZN could consider alternate, cheaper and more environmentally-friendly fuels to power the operation, such as propane or liquefied natural gas (LNG). Therefore, in addition to applying for all season road use from the Mine to the TTF, CZN is now applying for all season road use from the TTF to the Liard Highway also, which when combined includes the entire road.

The road bed from the Mine (Km 0) to Km 39 (Cat Camp) is already of all season quality. In addition, Cadillac's road LUP provided for all season use of that section. The majority of the remainder of the road to the TTF location is on solid ground with very little muskeg terrain. While initial road use for early mine operations would be winter only using existing permits, CZN wishes to obtain new permits to allow all season use in phases. Phase 1 would see the western portion of the road upgraded for all season use to allow all mineral concentrates to be transported to the TTF. A second airstrip would also be built at this time on the Ram Plateau near the road to facilitate air access to the Mine in bad weather, since the existing CBH4 Prairie Creek Airstrip has a limited approach and is frequently closed due to poor weather. Phase 2 would see the eastern portion of the road upgraded. This phase will also provide an opportunity for multi-party collaboration for financing and use.

## **1.2 Access Road Regulatory History**

Between 1970 and 1980, extensive underground development of the Mine took place. A winter tote road from Camsell Bend into the Mine was established in 1974/75 in order to bring supplies and heavy equipment in. An engineering feasibility study was completed by Kilborn Engineering (B.C.) Ltd. in 1980 for Cadillac, with environmental assessments directed by Ker Priestman, culminating in Preliminary Environmental Evaluation reports, one on the Mine, Mill and Camp, and one on the Winter Access Road, both dated May 1980. The latter study was the basis for a successful application for Land Use Permit N80F249.

A new access road was constructed from the recently built Liard Highway (Northwest Territories Highway 7) into Prairie Creek, beginning in the summer of 1980. The road intersected the Highway 3 km north of Lindberg Landing, approximately 7 km north of the Blackstone River. At that time, the Highway south to Fort Liard was not completed. The access road was used extensively over the period from late January to the end of March in both 1981 and 1982. In excess of 800 loads were hauled into the Mine over these two years.

CZN applied for a LUP to use the existing access road alignment to re-supply the Mine in May, 2003. The MVLWB referred the application to EA, however CZN requested a judicial review of the referral decision, and the Supreme Court of the Northwest Territories ruled that the road was 'grandfathered' according to Section 157.1 of the Mackenzie Valley Resource Management Act, because the undertaking was previously assessed in the 1980's and LUP N80F249 was issued. LUP MV2003F0028 for use of the road was subsequently issued by the MVLWB on April 7, 2007. Subsequent to receiving the road permit, an evaluation of the road determined that washed-out sections of the road required repair, and further permits were needed. A quarry permit and Water Licence were issued in relation to the repairs, as well as an authorization from Fisheries and Oceans Canada following several fisheries studies.

As noted above, in the terms of reference (TOR) for EA0809-002, construction and operation of the access road in support of mine operations was included in the scope of development. However, the MVRB indicated that it would not be assessing structures already in existence in connection with the access road, as explained in the following statement contained in the MVRB ruling:

“The Review Board accepts the argument made by Canadian Zinc and others that conducting an impact assessment of the construction of facilities, including the road, which have been present on the land for over 25 years is not likely to generate any useful information even if it is possible. The Review Board will not be assessing construction impacts of already built structures.”

The Board also indicated that it would consider proposed changes to the access road. CZN did indeed propose changes, and these were assessed. Changes were made to the access road alignment during the EA to address concerns from the Naha Dehe Dene Band about wetland/wildlife issues, and from Parks Canada regarding re-routing around the unique Polje-karst features.

As a result, after the EA, CZN applied for and received new access road LUP's and Water Licences from both the MVLWB and Parks Canada. The MVLWB issued LUP MV2012F0007 and Water Licence MV2012L1-0005 on January 10, 2013 and Parks Canada issued LUP Parks2012-L001 and Water Licence Parks2012\_W001 on August 26, 2013.

## **2.0 DEVELOPMENT DESCRIPTION**

### **2.1 General**

#### **2.1.1 Road Alignment**

The original winter access road was from Lindberg Landing to the Prairie Creek Mine, and was constructed in 1980 and operated for 2 winter seasons carrying over 800 loads into the Mine site. During EA0809-002, the route was optimized to reduce environmental and logistical risks. Four re-alignments were included in the revised route, as follows:

- Polje By-Pass, within the expanded NNPR;
- Silent Hills re-alignment, within the expanded NNPR;
- Wolverine-Grainger Gap re-alignment; and,
- Nahanni Front Range re-alignment.

The result is that the currently permitted winter route links the Mine to the Liard Highway via the Nahanni Butte Access Road. The four re-alignments were studied in detail by Golder Associates (terrain assessment) and by Dillon Consulting (stream crossing fish and fish habitat). The proposed all season road alignment will generally follow the new winter route. Minor re-alignments may be considered for reasons explained below.

#### **2.1.2 Road Bed Design and Construction**

The proposed width of the all season road surface will be 5 m for a single lane and 8 m for a double lane. For 5 m width road sections, 8 m wide turnouts for passing will be built at a suitable spacing for the section, which might be as short as approximately 1 km.

The road bed will preferably be built with free-draining gravel fill and with a slight camber. Side slopes will be a minimum two horizontal to one vertical units. For crossing soft ground, the bed thickness will be increased, and/or a geotextile will be laid first.

To facilitate road construction and minimize travel, a temporary camp will be established near the location of construction. As construction progresses, the camp would be moved closer. The camp would likely consist of a number of accommodation trailers, a kitchen/diner, a diesel-fed generator with a storage tank up to 1,000 gallons, a double-chamber garbage incinerator plus an ash bin, and a sewage lagoon or pit. Some of the possible locations for such camps include Cat Camp, the TTF, the eastern slope of the Silent Hills, and the eastern side of the Front Range near Grainger Gap. Fuel storage and sewage disposal sites will need to be suitably designed and sufficiently distant from water bodies. An airstrip was previously approved and built in the lowland area just east of Wolverine Pass. We propose to re-establish the strip to facilitate construction crew changes and supplies delivery. Some temporary camp locations could be retained in a smaller form during road operations to support road maintenance.

Gravel for road bed construction will be sought from multiple local sources. As many sources as possible will be used to minimize travel. An investigation will be undertaken to locate additional,

suitable sources. A portable crusher may also be utilized to produce gravel size material for use as road bed.

Significant watercourses will be crossed by span crossing structures. Many of these have already been proposed for the winter road. Less significant watercourses, and areas where runoff would pond upslope of the road, would be addressed by closed or open-bottom culverts on a case-by-case basis, as required.

## **2.2 Phase 1 Development (Km 0 to Km 84, TTF)**

### **2.2.1 Road**

The road from the Mine (Km 0) to the TTF would be upgraded for all season use. The section from Km 0 to Cat Camp (Km 39) was previously permitted for all season use in 1980. However, there are potentially fish-bearing creek crossings from Km 26.5 to Km 39 that would currently require crossing structures in order to be crossed outside of the winter period.

Upgrading the road will require little to no work from Km 0 to Km 23 over and above the work that will already have been completed for winter use. From Km 23 to Km 28.5, an all season road bed exists and there are 5 creek crossings. If bridges have not already been installed at these locations for winter use, they will need to be.

From Km 28.5 to Cat Camp (Km 39), the road traverses the Sundog Creek alluvial floodplain. The old winter road alignment currently crosses the creek channel approximately six times. However, the road alignment can be shifted slightly south in some places to reduce the number of crossings to two. These crossings occur at Km 34 where the road changes from the south bank to the north bank, and at Km 36 where the road changes from the north bank to the south bank. To eliminate these crossings, we propose to realign the road so that it remains on the south bank all the way to Cat Camp. In two locations (approximately Km 35 and 38), the creek channel may need to be moved to the north. Because of the braided nature of the channel, and the fact that the channel changes location significantly from year to year, no net loss in habitat value is expected to occur from the realignment. The creek-side edge of the road will need to be armoured in several places to avoid erosion.

A significant tributary to Sundog Creek at Km 39 will require a crossing structure, and a bridge is already planned for another crossing at Km 43. A gravel road bed will need to be placed between Km 40 and at least Km 55 because the underlying soils are too soft to support vehicles. There are significant gravel sources in the Cat Camp area in the form of talus slopes immediately adjacent to the road alignment. Additional borrow sources are also present from Km 49 to Km 54. A bridge crossing of Polje Creek at Km 54 is already planned.

From Km 55 to the TTF, the road traverses mostly upland karst terrain with thin or no soil cover. Gravel fill requirements are expected to be much less, except in a few locations, such as Km 62 and Km 64 where the road crosses drainage in proximity to Mosquito Lake, and from Km 83 to the TTF where there is muskeg.

### **2.2.2 TTF**

The TTF would be enlarged to accommodate storage of all of the concentrates between the closure of the last winter road to the Highway, to the opening of the next winter road. Either additional storage sheds would be added, or the existing sheds would be removed and replaced with a larger structure. The TTF would become the main concentrate storage location, as opposed to the Mine. Therefore, the concentrate storage shed at the Mine could be moved to the TTF.

A dry storage shed may also be provided to store incoming materials. These would be brought in during the winter and mostly hauled directly into the Mine, however there might be a need to have some storage at the TTF to allow hauling to the Mine over the course of the following spring and summer. During the winter period, fuel will be back-hauled into the Mine directly and there will be no need for temporary storage at the TTF. However, a truck fueling station with a 10,000 litre storage tank in a bermed and lined enclosure may be provided so that the mine fleet can fuel up at the TTF instead of at the Mine, thus avoiding the haul of that fuel into the Mine.

Because the facility would be in operation all season, fire-fighting equipment and protocols will be put in place.

### **2.2.3 Additional Airstrip**

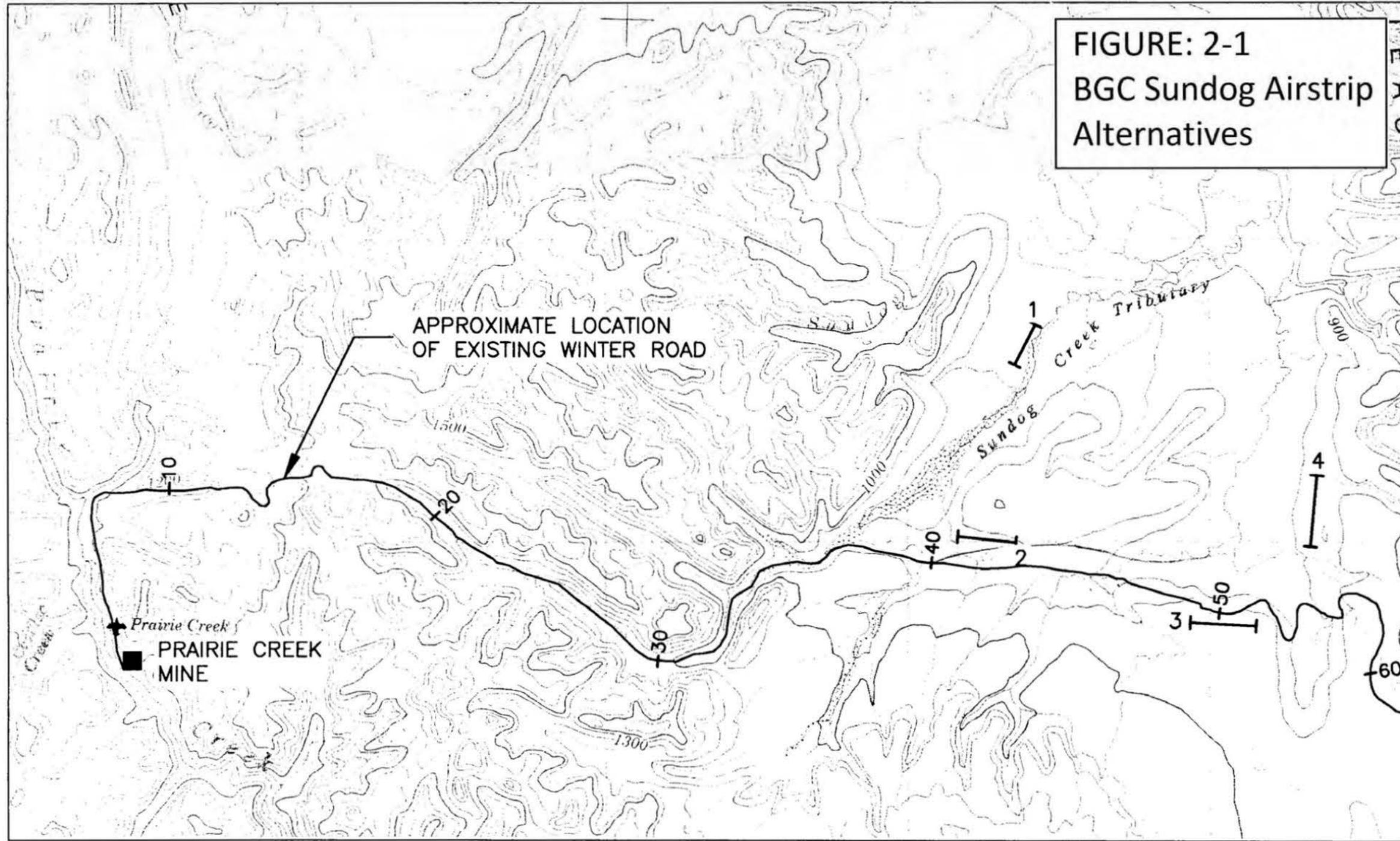
CZN proposes to build a second airstrip in the Sundog-Ram Plateau area to facilitate air access to the Mine when the Mine strip is inaccessible due to poor weather. Some potential locations were studied previously by BGC Engineering in 2001. Figure 2-1 is a reproduction of one BGC produced, and shows four potential locations. Location 1 is not preferred because it is on the west bank of Sundog Creek and distant from the access road. Location 3 is not preferred because it is not proximal to the new road alignment, and is in an area close to the Poljes that CZN intended to avoid by using the Polje Realignment. Locations 2 and 4 are proximal to the access road and will be considered further, along with others that might be identified.

While the intention of the second airstrip is to be a back-up for the Mine, it would also be available to Parks Canada to support NNPR activities, and to all aircraft for emergency landings.

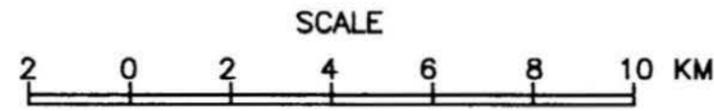
### **2.2.4 Concentrate/Supplies Haul**

The Mine will produce ~120,000 tonnes of concentrate per annum when the Mine is producing at maximum capacity. Therefore, approximately 330 tonnes will be produced daily and will need to be transported to the TTF. For a truck capacity of 30 tonnes, this means 11 trips. Travel time to the TTF and back at 25 km/hour would be approximately 7 hours, with 1 hour added for unloading, rest and turnaround. As a result, it is likely that there would be a mine fleet of ~6 trucks which would make 2 trips per day in convoys, with a day shift and a night shift. The trucks would return empty, unless they carry some supplies that were left in storage at the TTF.

**FIGURE: 2-1  
BGC Sundog Airstrip  
Alternatives**



SOURCE  
NTS MAP SHEET 95F (VIRGINIA FALLS)



NOTE:  
LOCATION OF FOUR ALTERNATIVE AIR STRIPS ARE APPROXIMATE. SEE TABLE 1 FOR SITE DESCRIPTIONS.

SCALE: 1:200 000    DATE: JAN 2001    DRAWN: KB    DESIGNED: KWS    CHECKED: KWS    APPROVED: *[Signature]*

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**BGC ENGINEERING INC.**  
AN APPLIED EARTH SCIENCES COMPANY  
Vancouver, B.C. Phone: (604) 684 5900

CLIENT:  
CANADIAN ZINC CORPORATION

PROJECT	PRAIRIE CREEK MINE		
TITLE	ALTERNATIVE AIR STRIP LOCATIONS		
PROJECT No.	0059-002-04	DWG. No.	01
REV.			

When the winter road is open to the Highway, all of the annual Mine fuel requirement and most of the annual supplies required will be brought in to the Mine directly on the back-haul of taking concentrates out. This will be accomplished by using 10,000 litre fuel tanks incorporated into the trailers used for the concentrate haul, the same approach that will be used when the whole road is used in winter only. Traffic over the winter period on the western portion of the road will be much less than before, but the same as before on the eastern portion of the road. Special deliveries will be required as before, such as explosives and sulphuric acid.

## **2.3 Phase 2 Development (Km 84 to Km 183 LTF)**

### **2.3.1 Road**

The road from the TTF to approximately Km 96 at the toe of the Silent Hills crosses some of the softest ground on the whole route. There are two crossings of the Tetcela River, each of which will require a bridge, followed by a muskeg area and then the Fishtrap Creek wetlands. There may be borrow sources in intervening areas, and at the lower slopes of the Silent Hills. The road then ascends the Silent Hills to Wolverine Pass via switch-backs, and after the Pass heads south along the eastern slope of the range before turning east towards Grainger Gap at Km 121. This section of the road should not require significant fill because the upland terrain is well drained.

From Km 121 to Km 126, the road crosses the headwater wetlands of the Grainger River. After that, Km 126 to Km 130 is the Grainger Gap area and the eastern bank of the Grainger River where the ground is firmer below the slopes of the Front Range. There are significant gravel sources in the Gap area.

The road section from Km 130 to the Liard River (Km 160) has varied ground conditions. The first 10 km is well drained, but the remainder has increasing muskeg as the road crosses the historical Liard floodplain. There is significant borrow material available along the toe of the Front Range. East of the Liard River, the road continues across the Liard floodplain to the Nahanni Butte Access Road at Km 174.5.

A private barge would operate on the Liard River crossing during the ice-free period, with an ice bridge in the winter. As the preferred barge landing locations may not coincide exactly with the ice bridge, there may be two road approaches each side of the river. Small staging areas will be required adjacent to the barge landing sites on both sides of the river. Equipment will likely be stationed at these sites to maintain the barge landing areas.

### **2.3.2 Concentrate/Supplies Haul**

Concentrates would be hauled out of the mine daily to travel the 184 km to the Liard Transfer Facility (LTF) near the Liard Highway. Travel will not occur during periods when crossings of the Liard River are not possible. At the Liard River crossing near Fort Simpson, the 10 year average (1998-2008) dates for ferry operation are May 13 to November 4, and for ice bridge operation November 28 to April 21. However, 60 tonne ice bridge crossings are only possible from January 15, and likely have to end sooner than April 21. Therefore, we can assume that only 250 days would be available for hauling in an average year. So, to move 120,000 tonnes of concentrate using trucks with 30 tonne loads, 16 trips per day would be required.

Travel time to the LTF at 25km/hour with a brief stop would be approximately 8 hours in winter. In summer, the trip would be approximately 9 hours to allow for the barge crossing of the Liard River, which could be a bottle-neck.

In winter, sixteen trucks in convoy might transport concentrates to the LTF during the day shift, with the trucks returned with supplies during the night shift. There are at least two possible summer transportation scenarios, as follows:

- Sixteen trucks leave the Mine in convoy to the west bank of the Liard River. Trailers loaded with supplies are delivered to the west bank before the convoy arrives. When the convoy arrives, the rigs will unhitch from the concentrate trailers and hitch the supplies trailers. A second truck crew will then take the supplies trailers into the Mine, again in convoy. This avoids a bottle-neck at the ferry crossing as there would be nearly a full day to transfer the concentrate trailers to the LTF, unload and load, and return them to the west bank. However, this option will require a trailer transfer area on the west bank of the river; and,
- Sixteen trucks leave the Mine in one hour intervals and travel all the way to the LTF. After unloading and loading, a second crew driver immediately returns the truck to the Mine. Ferry crossings are synchronised so that few crossings are made without a loaded truck.

The most efficient transportation plan will need to be determined. As for the Phase 1 road, there will be special delivery trips in addition to the concentrate trips.

## 3.0 EXISTING BIOPHYSICAL ENVIRONMENT

### 3.1 Development Location and Ecoregions

The Prairie Creek Mine site is located at 61° 33' North latitude and 124° 48' West longitude. Mine site facilities are situated on the eastern side of and adjacent to Prairie Creek, about 43 km upstream from its confluence with the South Nahanni River, and approximately 7 km upstream of the point where Prairie Creek crosses the boundary of the recently expanded Nahanni National Park Reserve (NNPR, Figure 3-1). The South Nahanni River flows into the Liard River near Nahanni Butte, 100 km downstream from Prairie Creek. The Liard River merges with the Mackenzie River at Fort Simpson, a further 175 km downstream.

The Mine site is at an elevation of 850 m above mean sea level (AMSL), and is situated in topography characterized by low mountains and narrow valleys with an average relief of 300 m. The Mine site is located within the Alpine Forest-Tundra section of the Boreal Forest, characterized by stunted fir with limited undergrowth and open areas dominated by lichen.

The Mine is connected to the Liard Highway via an access road (see Figure 3-1), most of which already exists from the old alignment used in 1981-82. The road leaves the Mine site heading north along the Prairie Creek valley for about 7 km before turning east to cross the Mackenzie Mountains. As the Access Road climbs out of the Prairie Creek valley it enters Sub-Alpine Shrub and Alpine Tundra from an elevation of approximately 1000 m AMSL at Km 10. The road continues to climb through the Alpine to the summit of 1530 m at Km 17, then dropping down and leaving the Sub-Alpine again at the 1000 m elevation around Km 25. As the road drops from the 1000 m elevation to the 900 m elevation, it passes through a spruce-lichen Alpine forest zone similar to that found at the Mine site and then into Riparian Alluvial habitat in the Sundog tributary valley bottom.

As the road crosses the Ram Plateau, it passes through an open forest Black Spruce/Pine Parkland setting between the 830 to 930 m elevations, before dropping down into the Tetcela River valley. The valley consists of a mixed coniferous/deciduous closed forest. The road then passes through a short distance of muskeg open shrub/sedge wetland at the headwaters of Fishtrap Creek, and climbs up and over the Silent Hills, again a closed mixed coniferous/deciduous forest. The road then crosses an area of black spruce muskeg and wetlands before passing through mixed coniferous deciduous pine parkland prior to entering the Grainger River headwaters at Grainger Gap (Second Gap).

Once through the Grainger Gap, the road heads south along the foothills of the Front Range through mixed deciduous coniferous forest towards Nahanni Butte, thus avoiding the Grainger Tillplain. The road crosses the Liard River near the community and continues through forest to the Liard Highway.

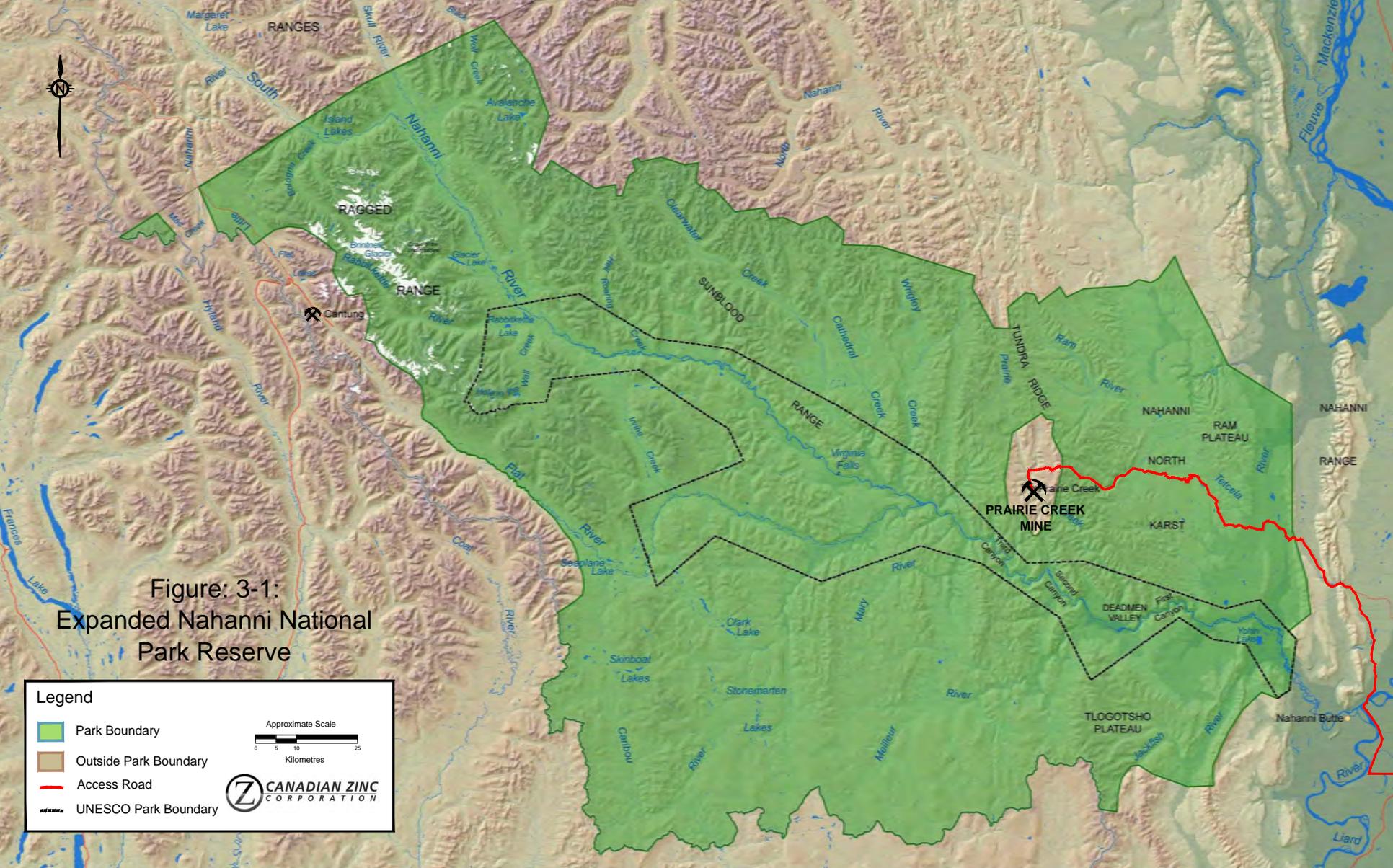


Figure: 3-1:  
Expanded Nahanni National  
Park Reserve

**Legend**

- Park Boundary
- Outside Park Boundary
- Access Road
- UNESCO Park Boundary

Approximate Scale  
  
 Kilometres

CANADIAN ZINC CORPORATION

The TTF is located at approximately Km 84 of the access road, as measured from the Mine site, at 61°27'38" North latitude, 123°46'30" West longitude. The location is on the eastern edge of the Ram Plateau in Black Spruce/Pine open forest approximately 2 km north-west of the Tetcela River. The area is a broad spur of land approximately 392 m AMSL in elevation.

The LTF will be located on the Nahanni Butte access road, approximately 1 km west of the Liard Highway at an elevation of 200 m AMSL.

### **3.2 Climate**

A climate station was installed at Prairie Creek in 1994. The station was equipped with temperature, relative humidity and wind strength and direction sensors, together with an independent tipping-bucket rain gauge. All instruments sent readings to a data-logger powered by a battery whose charge was maintained by a solar panel. A period of site inactivity followed station installation, with the result that data was not downloaded and the stored data was lost. CZN refurbished and restarted the station in late May 2005. Data has been collected and downloaded regularly since that time, although a data logging malfunction occurred over the period August 2008 to September 2009. Relevant recent data has been summarized in Table 3-1 together with historical data. Figure 3-2 shows recorded temperatures from May 2005 to August 2008.

Data for the site in 1980 (Cadillac) was estimated from stations in the region. Rainfall for the site was estimated at approximately 300 mm/year, and precipitation 508 mm/year. These are both roughly 50% greater than Fort Simpson (1980). However, the average mean daily temperatures for the year were comparable at around -5°C. The site was predicted to be slightly more temperate than Fort Simpson, cooler in the summer but warmer in the winter.

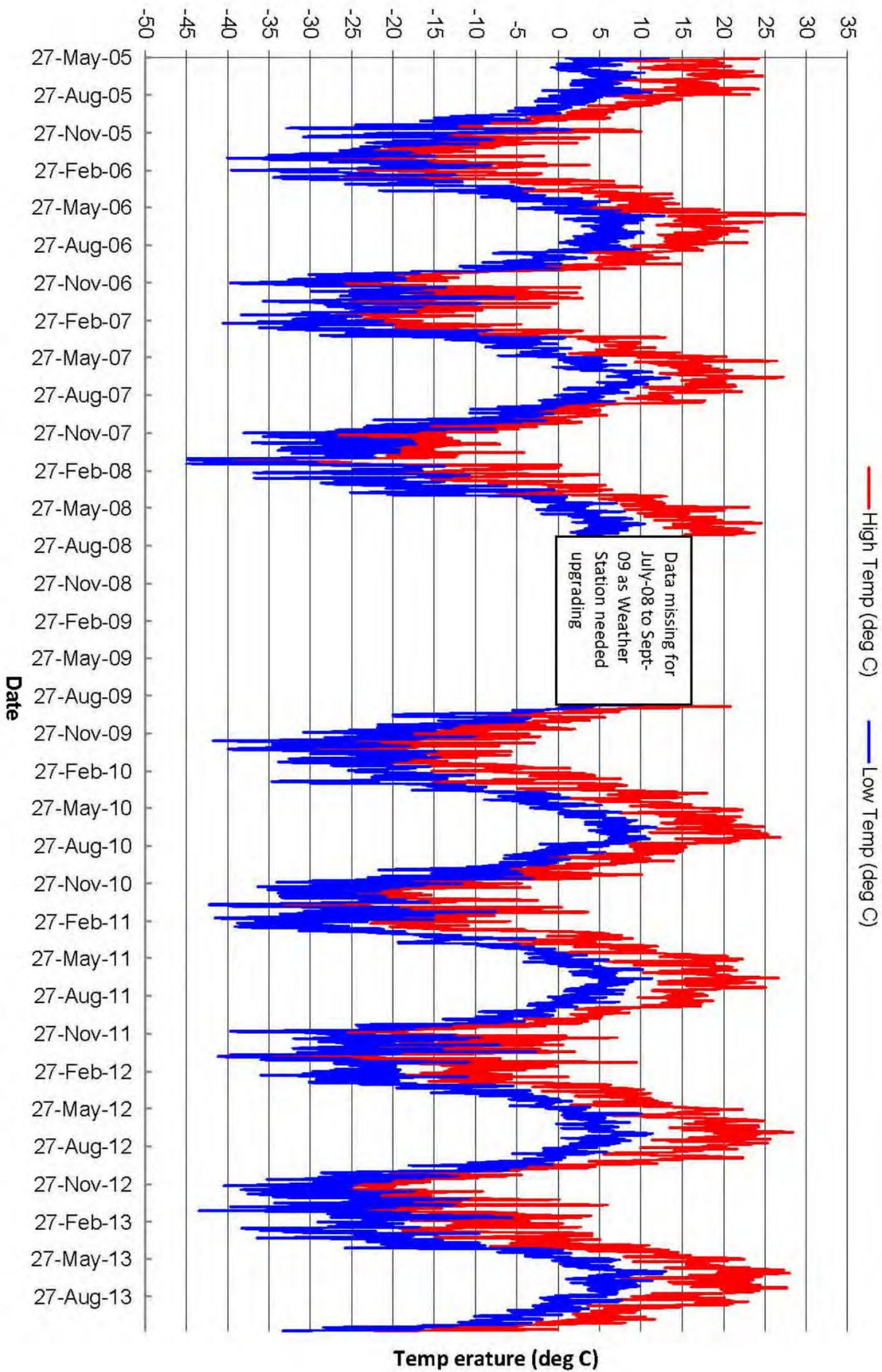
Data from the Prairie Creek station for 2005-2007 is consistent with recent Fort Simpson data. Annual mean daily temperature, wind speed and direction are comparable. Monthly mean daily temperatures are similar to the estimated data in 1980, and are more moderate than Fort Simpson, cooler in summer but warmer in winter. The annual rainfall total of 414 mm in 2006 is 38% higher than the 1980 estimate. 2006 appears to have been abnormally wet in May and June compared to 1980, 2005 and 2007. Snowfall depth is not available to make a comparison of total precipitation.

### **3.3 Wildlife**

The access road traverses a number of habitat (vegetation) units. From the Prairie Creek Mine site, the access road traverses Spruce-Lichen, Sub-alpine Shrub, Alpine Tundra, Black Spruce-Parkland, Riparian Alluvial, Pine Parkland, Mixed Coniferous-Deciduous, Black Spruce Muskeg, Grainger Tillplain, Floodplain/Tillplain, and finally Aspen-Liard Floodplain at the Liard River.

Significant wildlife species that could be encountered along the access road corridor include Dall's sheep, grizzly bear, mountain caribou and wolverine. Wood bison occur in the Liard River floodplain.

**Figure 3-2: Temperatures Recorded at Prairie Creek from May 27, 2005 - November 18, 2013**



**Table 3-1: Climate Data**

Station/Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
<b>Cadillac 1980</b>													
Mean Daily Temp °C	-25.6	-19.4	-13.3	-3.9	4.4	10.6	12.8	11.1	5.0	-4.4	-16.7	-20.6	-5.0
Rainfall mm	0.0	0.0	0.0	2.5	25.4	58.4	86.4	71.1	48.3	7.6	0.0	0.0	299.7
Precipitation mm	22.9	22.9	20.3	25.4	40.6	58.4	86.4	71.1	58.4	48.3	30.5	22.9	508.0
Evaporation mm	-	-	-	-	<25	76.2	101.6	76.2	50.8	<25	-	-	330.2
<b>Fort Simpson 1980</b>													
Mean Daily Temp °C	-29.4	-23.3	-15.0	-1.7	8.3	14.4	16.7	14.4	7.2	-2.2	-16.1	-24.4	-4.4
Rainfall mm	0.0	0.0	0.0	2.5	22.9	40.6	45.7	53.3	25.4	7.6	0.0	0.0	299.7
Precipitation mm	20.3	17.8	17.8	15.2	30.5	40.6	45.7	53.3	30.5	27.9	25.4	20.3	345.4
<b>Fort Simpson 2000</b>													
Mean Daily Temp °C	-25.4	-21.1	-13.2	-0.5	9.0	15.2	17.2	14.7	8.0	-2.3	-16.2	-23.5	-3.2
Rainfall mm	0.2	0	0.1	3.0	21.5	47.8	59.2	56.7	23.6	11.6	0.2	0	224.0
Snowfall cm	24.0	21.2	18.8	14.4	6.2	0	0	0.5	5.3	29.4	27.3	23.2	170.3
Precipitation mm	18.5	17.5	15.9	16.0	28.2	47.8	59.2	57.2	28.6	38.9	22.7	18.6	369.0
Wind Speed (km/h)	7.8	8.9	9.8	10.6	10.7	9.8	8.9	9	9.1	9.6	8.4	7.4	9.2
Most Frequent Wind Direction	NW	NW	NW	E	E	E	NW	NW	E	E	NW	NW	NW
<b>Prairie Creek Mine 2006</b>													
Mean Daily Temp °C	-22.3	-17.1	-16.3	-1.7	5.4	12.3	12.8	10.2	5.4	-2.8	-23.1	-15.7	-4.4
Rainfall mm	0	0	24	18.8	80.1	139	59.8	56.8	32.4	3.2	0	0	414.3
Wind Speed (km/h)	2.2	2.4	5.9	6.1	6.3	5.7	6.3	4.9	4.9	3.7	3.1	2.5	4.5
Most Frequent Wind Direction	W	W	W	E	W	W	W	W	W	W	W	W	W
<b>Prairie Creek Mine 2012</b>													
Mean Daily Temp °C	-22.6	-15.5	-15.5	-2.0	5.3	10.4	13.6	11.6	7.1	-6.3	-21.4	-25.0	-5.0
Rainfall mm	0.0	0.5	0.6	0.6	1.2	4.0	1.5	2.7	0.8	0.2	0.0	0.0	1.0
Wind Speed (km/h)	2.0	1.9	3.5	3.5	4.5	3.4	3.3	2.4	2.9	3.5	2.1	2.0	2.9



The location of seasonal wildlife ranges in the Prairie Creek Mine area and along the access road is summarized on Figure 3-3. Boreal caribou may be encountered in winter nearer to the eastern terminus of the road. Woodland caribou, moose, wolves and wolverines could be encountered any time along the entire road, although moose are more commonly found from Km 60 eastwards.

### **Dall's Sheep**

Dall's sheep inhabit the Prairie Creek Mine site area and surroundings and are regularly observed during the spring and summer around the Mine site. Dall's sheep ranges occur in the Mackenzie Mountains of the Northwest Territory and the Yukon, other mountain ranges of the Yukon and Alaska, and the north-western part of British Columbia. Sheep are known to exhibit fidelity to home ranges, and may inhabit a particular mountain for their life cycle, including winter range, birthing areas and summer range.

Dall's sheep occur in the Prairie Creek Mine site area primarily in spring and summer, moving to fall range (including rutting) and winter range in the Mackenzie Mountains to the east of Prairie Creek. Sheep are common on the east side of the valley above the Mine and Mill site in the spring, primarily ewes, yearlings and lambs. Rams appear to be more widely dispersed, including the west side of the Prairie Creek valley.

Sheep occur in smaller numbers along the access road through the Mackenzie Mountains, along Funeral Creek and the pass to Sundog Creek, and in the Nahanni Range through which the access road passes (Grainger Gap). In general, the density of sheep habitat use along the access road route may be highest in the Nahanni Range, where the greatest concentration of Dall's sheep sign was found.

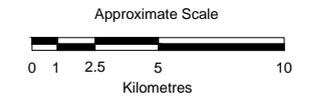
### **Woodland Caribou**

Woodland caribou occur as several separate ecotypes, of which two occur in the region of the Prairie Creek Project:

- Northern Mountain type which occupies the Mackenzie Mountains in the Yukon and NWT; and
- Boreal type which occurs east of the Mackenzie Mountains and into northeastern BC and northern Alberta.

Five populations of northern mountain woodland caribou overlap the Mackenzie Mountains of the NWT and are shared with the Yukon.

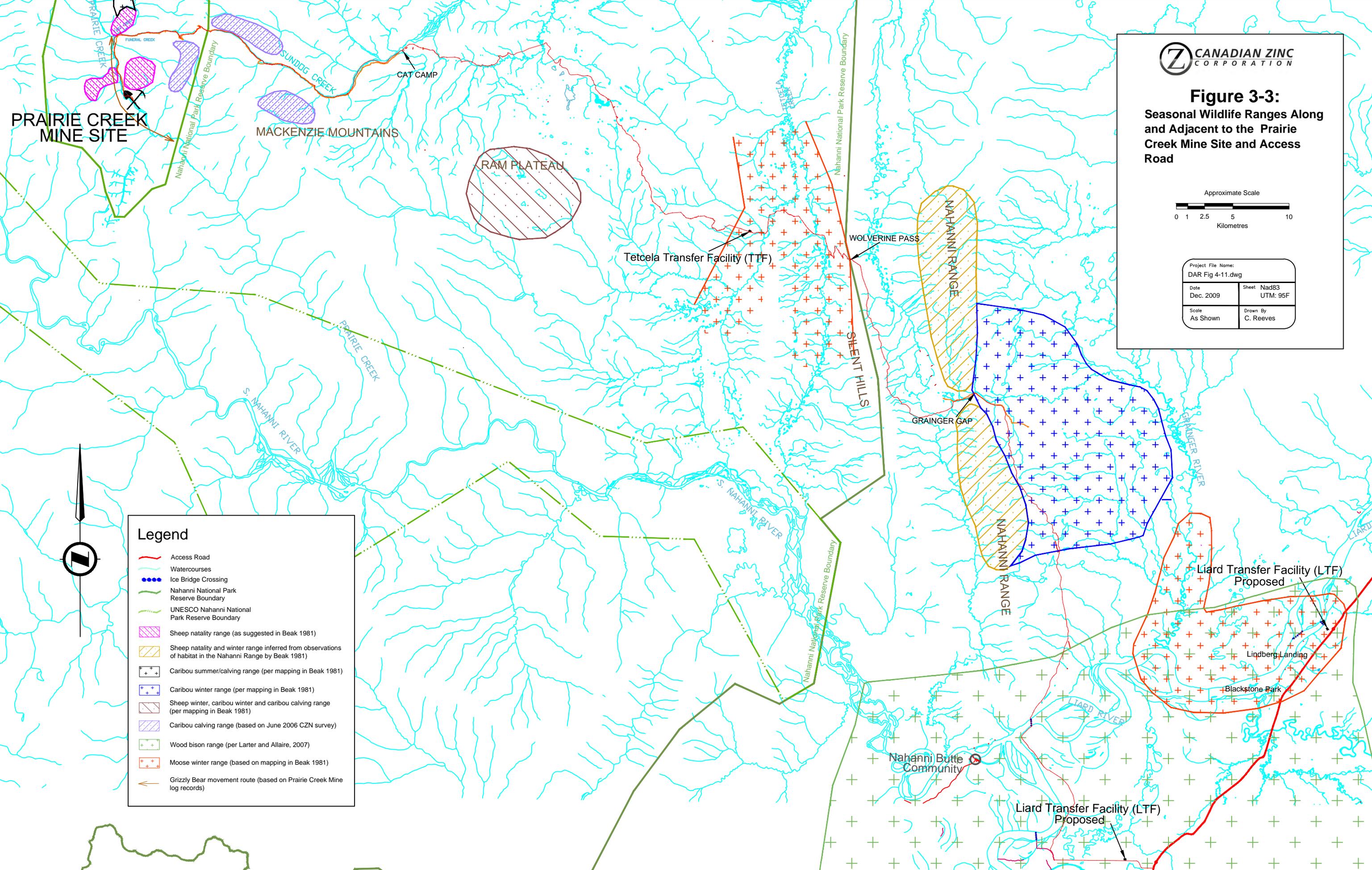
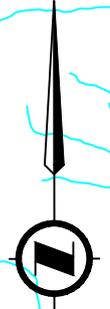
**Figure 3-3:**  
**Seasonal Wildlife Ranges Along and Adjacent to the Prairie Creek Mine Site and Access Road**



Project File Name: DAR Fig 4-11.dwg	
Date: Dec. 2009	Sheet: Nad83 UTM: 95F
Scale: As Shown	Drawn By: C. Reeves

**Legend**

- Access Road
- Watercourses
- Ice Bridge Crossing
- Nahanni National Park Reserve Boundary
- UNESCO Nahanni National Park Reserve Boundary
- Sheep natality range (as suggested in Beak 1981)
- Sheep natality and winter range inferred from observations of habitat in the Nahanni Range by Beak 1981)
- Caribou summer/calving range (per mapping in Beak 1981)
- Caribou winter range (per mapping in Beak 1981)
- Sheep winter, caribou winter and caribou calving range (per mapping in Beak 1981)
- Caribou calving range (based on June 2006 CZN survey)
- Wood bison range (per Larter and Allaire, 2007)
- Moose winter range (based on mapping in Beak 1981)
- Grizzly Bear movement route (based on Prairie Creek Mine log records)



Caribou that belong to the Mackenzie Mountain populations have an annual distribution that straddles the Northwest Territories and Yukon; the Nahanni and Redstone populations are closest to the Prairie Creek Project site. Satellite data from collared caribou indicate that the Nahanni population generally occupies high alpine meadows in the south-east Yukon in the summer and fall, and migrate east into the Northwest Territories following the rut. In the winter, the majority of the herd occupies much of the NNPR, south and west of the Prairie Creek Mine site. Caribou that occupy the Prairie Creek Mine site area and vicinity in the Mackenzie Mountains may not be part of the Nahanni population and may be part of the Redstone population, which generally occupies range further to the north.

Wintering caribou along the access road may be part of the Redstone population, or a part of a boreal population that generally occupies the region east of the Nahanni Range but ventures west through Grainger Gap and into the Tetcela River and Fishtrap Creek areas. Boreal populations of woodland caribou occur as small populations outside of the Mackenzie Mountains in the NWT, in north-eastern B.C. and northern Alberta. These are likely small, dispersed bands throughout the year, rather than being part of the larger discrete populations.

The information available suggests that woodland caribou of the Prairie Creek area are of the Northern Mountain ecotype, and may be part of the Lower Nahanni or the Redstone population. Winter Mine site and access road surveys found only one group of 5 caribou to the west of the Mine site and one group of 13 caribou east of Grainger Gap. This is a relatively small number suggesting the area is not part of the “core” winter range. The caribou observed east of Grainger Gap may be part of a boreal population that resides east and south-east of the Nahanni Range, often in small groups.

Caribou were relatively widely dispersed in the uplands of the Prairie Creek area during a June 1981 aerial survey but appeared to have moved by July since there were few observations. The June 1981 survey included observations of cows with calves, confirming that the uplands are used for calving. It is possible that caribou in the Prairie Creek area move westward and south-westward as part of the Lower Nahanni herd or move northward as part of the Redstone population. Caribou may also remain in the Prairie Creek area as part of a local population. The Prairie Creek area (and entire drainage basin) is not considered part of key woodland caribou range by some researchers.

Caribou occupancy surveys of the access road region were carried out in December 2010 and February 2011. Approximately 2,200 km of line was flown over 4 days each time. Caribou sign was mostly found in the upper Prairie Creek watershed and in Vera Creek to the west. Tracks were also noted in the boreal lowlands north of Cat Camp. Few sightings were recorded in proximity to the road itself. Survey details and results are provided in Appendix A.

## **Moose**

Moose are an important component of the ecosystem of the region, having value as a First Nations food source in the north, and are of economic, cultural and ecological significance.

Moose have been seen in the Prairie Creek valley in spring and summer, with occasional sightings near the Mine, but are scarce in the winter. The Prairie Creek valley and adjacent

lower mountain slopes do not generally provide suitable moose habitat, limited by sparse browse in little cover, especially in winter. Moose sign is common but not plentiful along the access road section between the east side of the Mackenzie Mountains and the Nahanni Range, and east and south-east of the Nahanni Range to the Liard River where they are more common. Both areas were suggested during previous studies as representing moose winter range.

### **Wood Bison**

The Wood bison Nahanni population was started in 1980 by the introduction of 28 head from Elk Island National Park. The population grew and was augmented by supplemental introductions from Elk Island National Park to its present numbers of approximately 400 head. This population inhabits both sides of the Liard River from the Blackstone River southward into northern British Columbia. Apart from natural mortality (including drowning), collision with vehicles along the Liard Highway has been a mortality factor.

A June 2006 aerial survey recorded four bison at the airstrip of the community of Nahanni Butte. Given the present distribution of the Nahanni population, bison may be found along the proposed new southern portion of the access road as it approaches the Liard River floodplain, and along the Liard Highway into British Columbia.

### **Grizzly Bears**

Grizzly bears are an integral component of the Mackenzie Mountains and the Nahanni Region. Grizzlies occur throughout much of northern and mountainous regions of the NWT, Yukon and BC and are expected to roam widely in the Mackenzie Mountains and the region along the access road. Grizzlies occur in the Prairie Creek drainage and are active from mid-spring (approximately April) to late fall (October) when they head to their winter dens.

Anecdotal information from the Mine wildlife log suggests that a number of lone grizzly bears move through the Prairie Creek valley each spring and summer, along with occasional family groups (sow and cubs). Observations were mostly in the immediate Mine site area, the airstrip and the road in between. A minimum number of individual grizzlies is estimated at four plus a family group of three (sow and two yearling cubs).

The location of grizzly den sites has not been documented, but it is likely that several bears den in the Prairie Creek drainage north of the Mine site, and that these bears move from the upper drainage southward through the Mine site and to the adjacent uplands in the late spring and summer, returning in the fall.

### **Wolverine**

Wolverine occur in the Mackenzie Mountains and range widely, with large home ranges of up to 405 km<sup>2</sup> and 1366 km<sup>2</sup> for females and males, respectively in northern British Columbia. Sub-adults range even more widely, with home ranges of up to 4600 km<sup>2</sup>.

Several sightings of wolverine have been recorded in the Prairie Creek Mine site area, including one in July 1980 in alpine tundra habitat. Mine site personnel identified wolverine among species seen infrequently during the 1968 to 1980 period.

There were no observations of wolverines or tracks during recent aerial and ground surveys. However, one or more wolverines may use the Mine site and vicinity as part of their home range.

## **Wolves**

Sightings of wolves have been infrequent near the Mine site, but they are assumed to be a persistent element of the area's wildlife. In 1980, camp personnel identified Caribou Flats and the exploration camp area as sites where wolves had been observed, including mention of wolves preying on caribou. No sightings were made during 1981 surveys.

In September 1994, a solitary wolf was observed crossing the access road approximately 1 km east of Folded Mountain. A pack of five wolves was observed along the access road in September 1994. Their abundance along the access road is unknown, but they are suspected of being important predators of woodland caribou and moose, and possibly Dall's sheep.

Observations recorded in the Mine camp log suggest that wolves travel through the Prairie Creek Mine area and valley on an occasional basis, with observations from spring to fall. Since wildlife observations were not compiled during the late fall to winter period, the occurrence of wolves through the Mine area and valley between the end of September and early April is speculative; however, there is no reason to not expect wolves to be year-round travelers through the Prairie Creek valley and Mine area. Since wolves travel widely, they are expected all along the access road at all times of the year.

## **Other Wildlife**

Other wildlife species in the Prairie Creek Mine area or along the access road include beaver, muskrat, marten, black bear, varying hare, coyote, red fox, grouse and ptarmigan, and various waterfowl (ducks and geese). These wildlife forms provide a subsistence food source or are trapped/hunted by regional residents. Apart from a limited amount of survey information, there is little information on local or regional populations of these species, the status of those populations, or disease factors.

### **3.4 Vegetation and Plant Communities**

This section is a summary extracted from a report by Golder Associates dated March 2010. CZN also commissioned a study of rare and invasive plants along the access road by EBA Engineering Consultants Ltd. (EBA) in July 2009, the results of which are also summarized here.

Vegetation along the access road consists of 12 vegetation units: aspen-Liard floodplain, floodplain/tillplain, Grainger tillplain, burn, black spruce muskeg, pine parkland, subalpine shrub, alpine tundra, mixed coniferous deciduous, black spruce parkland, riparian alluvial, and spruce lichen.

The original 180 km long access road is broken down as follows by length and approximate area of vegetation units (based on a total length of 181.1 km and road corridor width of 10 m):

**Table 3-2 Vegetation Units Along Access Road**

<b>Vegetation Unit</b>	<b>Road Length (km)</b>	<b>Area (ha)</b>
1 Spruce-Lichen	13.8	13.8
2 Subalpine Shrub	10.3	10.3
3 Alpine Tundra	8.4	8.4
4 Pine Parkland	17.6	17.6
5 Black Spruce Parkland	19.2	19.2
6 Riparian alluvial	7.0	7.0
7 Mixed Coniferous/Deciduous	25.4	25.4
8 Black Spruce Muskeg	19.5	19.5
9 Grainger Tillplain	8.9	8.9
10 Floodplain/Tillplain	32.3	32.3
11 Aspen Liard Floodplain	18.7	18.7
<b>TOTAL</b>	<b>181.1</b>	<b>181.1</b>

### **Spruce/Lichen**

Along the access route east of the Prairie Creek/Ram River system divide, spruce lichen is distributed in limited areas in the valley floors of 4 of the Ram River tributaries. A description of this vegetation unit is given above, and is the best woodland caribou habitat in the combined study area. A ground survey along the access road in this habitat found almost continuous caribou tracks.

### **Black Spruce Parkland**

This unit extends from the eastern base of the Mackenzie Mountain eastward to the eastern edge of the Ram Plateau. In terms of the access road, it starts at Km 32 and extends more or less continuously to Km 64. The elevation range of this vegetation unit is 793 to 915 m.

Tree cover varies from 5% to 30% and is comprised mostly of black spruce, with patches of white spruce on well drained south aspect slopes. Trees support a rich lichen cover. The shrub layer (20 to 45% cover) is primarily composed of dwarf birch and willow. Cover of the herb layer is also moderate (10 to 45%). Major species are kinnikinnik along with Labrador tea and blueberry. Ground cover is 100%, and is composed primarily of lichen and feathermoss.

Habitat studies indicated only limited recent browsing. Three moose pellet groups were recorded. This unit should represent an important habitat for woodland caribou at certain times of year.

### **Riparian Alluvial**

The riparian alluvial unit is essentially sparsely vegetated alluvial streams and rivers of the Ram River system. The braided streams in this unit are relatively wide in places, and on some of the in-stream islands which survive for several years, there may be colonization by willow and various grasses and sedges. This vegetation unit is likely to represent an occasional wildlife corridor, and winter range for moose.

## **Pine Parkland**

The pine parkland vegetation unit also occurs in both the Prairie Creek Mine site and access road study areas and was described above. Along the access road, this unit occurs on the lower slopes of the Nahanni Range between 549 and 763 m, and on the Ram Plateau from Km 53 to 63 within a limited elevation range (915 to 975 m). Tree cover is dominated by jack pine on 10% slope and southwest aspect, and by black spruce in poorly drained depressions. Like many of the lowland units, the ground cover is 100% and in jack pine stands comprises primarily feathermoss and lichen.

Habitat studies indicated limited browsing in this habitat type with 9 moose pellet groups found.

## **Mixed Coniferous/Deciduous**

The mixed coniferous/deciduous vegetation unit covers the low elevations of the Tetcela and Fishtrap Creek drainages from Km 64 to 110 where the access road approaches Grainger Gap. This is a post-fire successional forest, estimated to have resulted from a burn that occurred between 1940 and 1950.

The western slopes of the Silent Hills are well drained and tree cover is estimated at 78%. Of this, 80% was deciduous, primarily trembling aspen and paper birch, with the remainder (20%) white spruce.

The Tetcela Valley transect was variable and included elements of black spruce parkland mixed with a dense mixed coniferous/deciduous forest. The vegetation succession appeared to be returning to black spruce parkland. In 1981, the forest cover at the tree level varied from 60 to 100%, and comprised birch, alder and willow with lesser amounts of black spruce and jack pine. Cover of the lower strata (shrub, herb, and moss layers) was considerably less than the tree cover.

Habitat studies indicate that the main browse species being used were alder and willow. Nine moose pellet groups were recorded.

## **Black Spruce Muskeg**

This vegetation unit is distributed in lowland, waterlogged drainages which grade into open wetlands. It occurs in three areas: Fishtrap Creek, west of the Silent Hills within an elevation range of 244 to 305 m; an eastern tributary of the Tetcela/Ram River system in the valley between the Silent Hills and the Nahanni Range at an elevation of approximately 490 m; and a lowland area west of the Grainger River near its mouth.

The Tetcela drainage had predominantly shrubs (cover of 35 to 60%) comprised of black spruce and blueberry willow, Labrador tea and dwarf birch. Cover in the herb layer was 25 to 50% and comprised mostly of bearberry, grass and Labrador tea. Moss and lichens provided a thick ground cover.

Habitat surveys indicate some browsing on dwarf birch and willow. A total of 3 moose pellet groups were found. The wetlands within this habitat unit represent productive waterfowl habitat, particularly for trumpeter swans.

### **Forest Fire Burn Areas**

Since 1982, there have been at least three forest fire burns along the access road. The earliest was situated within black spruce parkland near Km 66. The second burn took place in 1994 and covered an enormous area immediately east of the Nahanni Range. A smaller burn occurred just east of Mosquito Lake in 2008.

### **Sub-Alpine Shrub**

This vegetation unit occurs along the access road on the eastern slopes of the Mackenzie Mountains, and in the Nahanni Range. In the former, the elevation range extends from 1325 m down-slope to 1070 m, whereas in the Nahanni Range the elevation range is considerably lower, from approximately 1220 m down to 700 m. The vegetation description for this unit is provided in Section 4.10.2.

### **Alpine Tundra**

Alpine tundra occurs along the access road as a large area on the eastern slope of the Mackenzie Mountains, and a much smaller component in the Nahanni Range.

This habitat type is important as it represents key year-round range and lambing areas for Dall's sheep, and calving areas for woodland caribou. Pellet groups are relatively common.

### **Grainger Tillplain**

The Grainger Tillplain unit is a rolling plain with little elevation range (approximately 460 m to 670 m) and an absence of forest cover. The basic site types include depressions and drier meadows. The former are wet sedge meadows. The drier meadows are composed of a shrub layer (80% cover) including dwarf birch and Labrador tea. The herb layer is mostly comprised of sedges, bearberry and horsetail, while the ground cover is moss. In other areas, there is a taller shrub community of alder, dwarf birch, and willow, or coniferous thickets of black spruce. As of 1994, over 40% of this habitat type occurring along the access road had recently burned. Habitat studies showed considerable availability of browse, with utilization greatest on willow. Four caribou and 3 moose pellet groups were found.

### **Floodplain/Tillplain**

This is a heterogeneous unit comprising Grainger Tillplain and lowland marsh, shrub, and mixed forest. Major tree species in this mosaic include trembling aspen, white spruce, black spruce, paper birch, jack pine and alder. The densest of the mixed forest communities, comprising more than 50% cover, is distributed along parts of the Grainger River and provides thermal cover for wildlife.

## **Aspen Liard Floodplain**

This vegetation type borders the Liard River from Km 151 to Km 164 (existing alignment), excluding the Liard River crossing itself. The climax tree species is white spruce, but frequent fires have led to trembling aspen introduction. Within the aspen subunit, the canopy was estimated to reach a height of 20 m, with other understory trees between 12 m and 16 m. The shrub layer was predominantly alder and prickly rose. There was limited ground cover (5%) owing to a thick layer of deciduous litter.

Habitat studies showed moderate browsing of high-bush-cranberry and light browsing of trembling aspen.

## **Rare Plants**

EBA completed a rare plant survey along the Prairie Creek Mine access road. No rare plant species defined by the COSEWIC and the federal Species at Risk Act (“SARA”) were observed in the surveyed area. However, one plant species, Few Flower Meadow Rue listed as being rare in McJannet et al. (1995) was documented along the access road and an adjacent wetland. Since 1995, this plant species has been documented in many locations and will likely be de-listed in the near future.

Two ENR ranked ‘May Be at-Risk’ species identified along the access road (Hornemann willowherb and linear-leaved willowherb) have restricted distribution in the NWT with limited known occurrences, but are globally secure. Six ENR ranked Sensitive plant species identified adjacent to the access road have small regional distributions in the NWT with a small number of known occurrences, but are globally secure.

## **Non-Native Plant Species**

Non-native or invasive plants can enter a site in a number of ways, primarily being inadvertently transported by road vehicles. Invasive plants are usually brought into a site (or along an access road) in seed form via dirty vehicles/equipment operating during the non-winter period. During the winter period, there is limited exposure of vehicles/equipment to seed sources, and therefore a much lower risk of seed introduction. Invasive plant species were not found during a 2009 survey for rare plants along the access road by EBA Engineering Consultants Ltd. (S. Moore, pers. comm.).

## **3.4 Terrain**

Golder Associates completed a terrain assessment in 2009. Below is a summary of the terrain relating to landforms, stability and granular deposits.

### **Karst Development on the Ram Plateau**

The Ram Plateau is defined as the broad geographic area between the Silent Hills Range (east) and the Mackenzie Mountains (west), over 30 km east-west and greater than 100 km north-south. Topography throughout the Ram Plateau is subdued compared to the adjacent mountain ranges,

however, many areas within the plateau contain incised, rugged steep-sided canyons, which are especially well developed in the Ram River area.

The steep-sided canyons generally formed as a result of the exposure of thick beds of the competent Nahanni Formation limestones. The Nahanni Formation is susceptible to dissolution or karstification due to its calcium carbonate composition.

Structurally, the Ram Plateau is underlain by a series of gently alternating folded anticlines and synclines. The Nahanni Formation is overlain by shales of the Horn River/Fort Simpson Formation which, by virtue of their very fine grained nature, are quite impervious to water infiltration.

Numerous studies have been completed of the karst landforms and processes within the Ram Plateau. The focus of these studies is the area generally to the south of the access road where the Nahanni Formation is well exposed and incised. Many karst features were identified and documented and include, but are not limited to, the Poljes, sinkholes (dolines), suffosion terraces, caves, labyrinth karst, and tower karst.

The Polje area occurs along the access road near Km 50 where the Nahanni Formation is exposed. At Km 55 to Km 57, the old access road alignment crosses the trend of the Poljes which are referred to as the First, Second and Third Poljes.

A Polje is defined as a flat floored, steep sided enclosed basin which is fed by groundwater. A Polje does not have any apparent surface water source, such as a creek or river, water entering or leaving via subterranean means. Depending on groundwater flow, water levels within a polje can vary considerably and the feature can either be full of water or empty. Ford et al determined that the poljes are connected hydrologically through subterranean conduits or aquifers.

In addition to the Polje area, the old access road crosses what Ford terms the Southwest Suffosion Terrace (Km 48 to 54), which is an elevated plateau above the Polje system. A number of suffosional sinkholes are developed in this area due to dissolution of the Nahanni Formation underneath the shale cap. Due to the elevation difference, groundwater drains to the Poljes and to the Bubbling Springs area which feeds Polje Creek. The new Polje Re-alignment will avoid the Southwest Suffosion Terrace and the Polje system completely. The new road section will cross Polje Creek more than 1 km downstream from the Bubbling Springs area.

The hazard related to the suffosion sink hole features is that renewed subsidence (associated with existing closed depressions) could take place during the life of the road, leading to partial loss of the road grade. During a reconnaissance, no evidence of subsidence at any location along the old access road route was noted. The presence of the road provides a specific means to date any movements that may have occurred, however, none were noted to have affected the existing road bed within the 30 year timeframe that the road has existed. It was recommended that the area of the Poljes be avoided by re-aligning the road route to the north, and this was adopted.

## **Ground Stability**

Based on a review of available aerial photos, historic, large scale rock slope failures are not evident along the access route within the Funeral Creek and Sundog Creek valleys. Local areas

are prone to active, small scale rock falls. These areas occur in the mountainous terrain from Km 0 to 39 (Cat Camp area). Infrastructure at Cat Camp is constrained by topography and is proximal to these local falls.

Rocky debris flows with essentially no organics and derived from adjacent talus have accumulated on the slopes. Flow events are believed to be related to high runoff conditions, possibly due to intense precipitation events and/or to periods of rapid thaw. Evidence of past debris flow activity can be seen at the locations of many small lateral drainages along Prairie, Funeral and Sundog Creeks.

Large scale, historic soil slope instabilities were documented by Golder in the Km 39 and Km 60 areas of the access road. Generally, the instabilities do not appear to be active. A number of recent, small-scale soil slope failures were noted along the road. These appear to be located near the interface between the surficial glacial soils and the underlying Horn River Shale Formation.

Mud flows are defined as slope failures that involve generally fine-grained soils that move in liquid fashion normally with only ten's of metres of displacement. A relatively large recent mudflow was noted at the Second Polje and the western slope of the Silent Hills. These failures appear to be related to degradation of ice-rich ground in the area of the failures, possibly along with increased seepage or surface runoff into the failed areas.

A number of recent small scale soil slope failures were noted in relatively steep terrain near the crests of the valley slopes adjacent to the intense karst land. Some had failed, exposing glacial soils and/or shale while others had moved only of the order of 1 m forming local tension cracks on the hillside. At one location near Km 54.5 on the access road, a slide scarp several tens of meters long with vertical displacement of approximately 1.5 metres was noted. These appear to be related to groundwater seepage. The increased seepage may be due to extended periods of wet weather and/or to extended periods of warm weather. It is possible that ice rich ground exists in the vicinity of some of these failures and melting weakens the ground locally and adds extra water to the soil. Some of the failures may also be adversely affected by surface drainage flowing into the unstable area. It is believed that this type of failure presented the most significant risk to the old access road through the karst valley near Km 56, hence the recommendation that the route be re-aligned in order to avoid this terrain.

## **Permafrost**

Ice rich ground may be encountered along the existing and proposed re-aligned sections of the access road. While no specific investigation for ice rich ground was carried out as part of this assessment, it may be found to exist: within the re-alignment between Km 48 and Km 59; in the Tetcela valley between Km 89 to Km 92; possibly along the re-alignment on the western flank of the Silent Hills between Km 92 and Km 99 and along the re-alignment east of the Front Range between Km 125 and Km 155. Maintenance of the organic layer in a viable and uncompacted state helps to maintain the thermal status of the ground along the route. The existing road appears to have generally performed well in this regard and has very few examples of thaw settlement.

## Landslides

Landslides are considered to be slope failures, and some comments are already provided above. Past seismic activity does not appear to have caused failures of the slopes along Prairie Creek, Funeral Creek and Sundog Creek, at the scale of the valley slope. Smaller rock fall failures may have been triggered by past seismic shaking, however, these events are not readily distinguished from other forms of small scale rock fall. Future performance of the subject slopes during earthquake events cannot be determined with certainty, but the current evidence indicates that the likelihood of large rock slope failures occurring due to seismic activity is very remote.

## 3.5 Aquatic Resources

Beak Consultants Ltd. conducted aquatic studies along the winter road in 1981. In addition, Dillon Consultants investigated creek crossings of the existing and new alignments in 2006 and 2009. Golder Associates also conducted a limited study in upper Sundog Creek in 2008. Detailed information was provided during EA0809-002. This section presents a summary of findings.

**Prairie Creek watershed upstream:** Both bull trout (*Salvelinus confluentus*) and mountain whitefish (*Prosopium williamsoni*) spawn in good numbers in Prairie Creek upstream of the Mine site, particularly bull trout in Funeral Creek. Spawning bull trout were found in Funeral Creek on August 15, 2005 (ref. DFO). Slimy sculpin (*Cottus cognatus*) are common, particularly in the main channel of Prairie Creek. The fish are thought to be resident species, over-wintering in the area.

**Remainder of Access Road:** Arctic grayling were found to use the Grainger River, Tetcela River and Sundog Creek and its tributaries. Sundog Creek upstream of Km 24 is not fish-bearing because a large waterfall is a migration barrier. Northern pike appear to be using the Grainger River (Beak, 1981). Mosquito Lake (just east of the Poljes) contains fish, but specific data are not available (Ker Priestman, May 1981). The Tetcela and Grainger Rivers are considered to have over-wintering habitat. The creek draining north from the Poljes, a tributary of Sundog Creek, may have over-wintering potential. Smaller creeks in this area, the Fishtrap Creek headwaters, and the headwater creeks along the eastern side of the Nahanni Range have low utilization potential and are likely not fish-bearing (Dillon, 2009).

## **4.0 HUMAN ENVIRONMENT**

### **4.1 Heritage Resources**

CZN initiated archaeological database searches previously in support of EA's following permit applications. The first was conducted on August 18, 2000 through the Canadian Museum of Civilization in support of Land Use Permit Application MV2000C0030. The search area encompassed the Mine site area, as well as the entire access road corridor from the Prairie Creek Mine to the Liard River. To accomplish this, the search parameters were defined by geographical coordinates to cover a block extending from 61° 00' to 61°45' N. latitude and from 122°45' to 125°00' W. longitude. No recorded archaeological sites were identified for the area of interest. The closest identified sites are south of the South Nahanni River near the mouth of the Meilleur River, 35-40 m south of the Mine site.

A second database search was undertaken on December 16, 2004 covering the area of a proposed drilling program. The search parameters were defined by coordinates 61°27' to 61°40' N latitude and 124°44' to 124°56' W longitude. No recorded archaeological sites were noted within at least 150 m of the area of interest.

CZN held meetings with the NDDDB to discuss the project and their concerns as part of a Traditional Knowledge (TK) addendum. Meetings were held in July and August 2009. One area of concern was as follows: "Given that the ancestors of the Nahanni people are known to have travelled overland to a greater extent than via waterways, the mountain passes that provide easy access into and between valleys are potential areas for pre-historic and historic artifacts. For this reason, it would be useful to carry out archaeological work". It was agreed that an archaeological impact assessment (AIA) should be undertaken in key areas of the Prairie Creek access road, primarily at the Second Gap area in the Nahanni Range, but also at Wolverine Pass in the Silent Hills, and at the crossings of the Tetcela River. CZN engaged Points West Heritage Consulting Ltd. to undertake an AIA of the noted key areas. Surveys were undertaken on September 23-24, 2009. The survey party also included representatives from the NBDB. All shovel tests were negative and visual inspection revealed no archaeological remains in any of the areas examined. Camp remains were found in Second Gap, but the site probably dates no earlier than the cut-line, that is, the 1980's. Therefore, it was not recorded as an archaeological site. No other cultural evidence was observed within or in close proximity to the specific portions of the project footprint assessed during this investigation.

A follow-up AIA was completed by Golder Associates of the Front Range re-alignment from the Liard River to Grainger Gap. Surveys were undertaken in September 2012 and included aboriginal involvement. Low and slow helicopter traverses were made, as well as pedestrian surveys. No historic resource sites were recorded.

### **4.2 Traditional Knowledge**

During EA0809-002, a detailed TK study was undertaken for the NDDDB by Crosscurrents Associates Ltd (2008). A study report was produced but is confidential. A TK Addendum report was produced which included TK information from the 2008 study relevant to the Prairie Creek

Mine project. The MVRB has a copy of the addendum report, which has non-confidential and confidential portions. CZN received a full copy after signing a confidentiality agreement with the NDDB. Table 3-3 below indicates how the TK obtained relating to the access road was used.

CZN also contacted the Liidlii Kue First Nation (LKFN) and the Acho Dene Koe First Nation (ADK) in connection with their TK for the project area. CZN was informed by Allan Bouvier of LKFN that the Band had no concerns with the project, and did not offer relevant TK information. The ADK advised that they were in the process of compiling traditional knowledge data for the area, but this was not available at the time of completion of the Developer’s Assessment Report (DAR).

**Table 4-1: Use of Traditional Knowledge**

Traditional Knowledge Item	DAR Section	
	Used In	How Used
High traditional use of the wetland valleys running north from S Nahanni, Tetcela River, and on both sides of the Nahanni Range, areas particularly sensitive to industrial development	9.3, 9.4, 10.2, 10.3, 10.6, 11.4	Road re-alignments have been proposed to move the alignment away from wetlands, as much as possible
Increased access to this area by outside people using the haul road for winter hunting activities may affect wildlife populations.	9.4, 10.3, 11.4	CZN has proposed access control, and is encouraging the NDDB to take an active role
Wildlife over-wintering in the area may be disturbed by winter hauling and transfer activities (particularly sensory disturbances), and winter and spring habitat may be damaged by haul road construction and possible contaminant spills.	9.2, 9.4, 10.3, 10.7, 11.4	Wildlife impact assessment notes a low potential for significant sensory disturbance. Habitat damage will not be significant because of the small area, and intent to move the road out of wetlands. Spill response planning is noted above.
The mountain passes that provide easy access into and between valleys are potential areas for pre-historic and historic artifacts. It would be useful to carry out archaeological work prior to any redevelopment of the winter haul road.	11.4	An archaeological impact assessment was completed at the locations identified of concern by the NDDB.
The mine haul road runs directly through the lowland area between Second Gap and the Liard River. It is important to fully assess the current alignment of the road to ensure that it is not affecting important wildlife habitat.	9.4, 10.3, 11.4	With the NDDB's assistance regarding a new alignment, a re-alignment has been proposed taking the road south towards Nahanni Butte and avoiding the Grainger lowlands.



## **APPENDIX A**

**DATE** January 18, 2011**PROJECT No.** 09-1422-5007/1000/1040**TO** David Harpley, P.Geo.  
Canadian Zinc Corporation**CC** Alan Taylor, Doug Tate, Nic Larter**FROM** Daniel Guertin, Chris Schmidt**EMAIL** dguertin@golder.com, cschmidt@golder.com**CANADIAN ZINC CORPORATION – PRAIRIE CREEK MINE AND ACCESS ROAD DECEMBER 2010  
WILDLIFE SURVEY**

This technical memorandum briefly summarizes the results of the first of three aerial surveys to be conducted on behalf of Canadian Zinc Corporation (CZN) in the vicinity of the Prairie Creek Mine site and access road during the time period from December 2010 to March 2011. This survey was conducted under Parks Canada Agency (PCA) research and collection permit NAH-2010-7252 and under Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR) wildlife research permit WL005033 (addressed to David Harpley of CZN). A complete description of survey methods and results will be provided in a report following completion of all three aerial surveys in the study area.

## 1.0 BACKGROUND

Canadian Zinc Corporation, based in Vancouver, British Columbia, has proposed to reopen the Prairie Creek Mine for production (the Project). The mine is located in the Dehcho region of the Northwest Territories (NT). The mine site is situated at approximately 61° 33' north latitude and 124° 48' west longitude adjacent to Prairie Creek, a tributary of the South Nahanni River. The Prairie Creek Mine site is located on land surrounded by the Nahanni National Park Reserve (NNPR). Approximately 80 km of the 174 km access road crosses the NNPR.

Golder Associates Ltd. (Golder) conducted an assessment of the potential effects on vegetation and wildlife of reopening the access route and bringing the mine into production, which was incorporated by CZN into its Developer's Assessment Report (DAR). Subsequent to submission of the DAR to the Mackenzie Valley Environmental Impact Review Board (MVEIRB), the DAR was reviewed by GNWT ENR and departments of the Government of Canada. During the review process, Parks Canada Agency (PCA) noted that, in their opinion, there were deficiencies with respect to wildlife survey data for the mine access road, specifically for the winter period. Of primary interest to PCA is the status of woodland caribou (*Rangifer tarandus*) along and adjacent to the mine access road, and the potential for impact to woodland caribou from use of the mine access road, specifically with respect to NNPR.



Golder Associates Ltd.

500 - 4260 Still Creek Drive, Burnaby, British Columbia, Canada V5C 6C6  
Tel: +1 (604) 298 4200 Fax: +1 (604) 298 5253 www.golder.com

Golder Associates; Operations in Africa, Asia, Australasia, Europe, North America and South America

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## 2.0 OBJECTIVES

Parks Canada Agency has indicated that current knowledge of the winter distribution of caribou in the Project area is lacking from the perspective of impact assessment/mitigation. In fulfilment of its obligations under the SARA, PCA has requested that an occupancy survey be conducted to provide baseline information on the occurrence of caribou in proximity to the mine development and access road during winter. Therefore, the objectives of this winter survey are to:

- Identify areas of caribou winter use, including possible movement corridors in proximity to the mine development and access road alignment; and
- Provide information on the presence and distribution of caribou in the wider Project area during winter.

## 3.0 METHODS

A 9,261 km<sup>2</sup> study area surrounding the Prairie Creek Mine site and access road was delineated in consultation with GNWT ENR and PCA (Figure 1). The survey area was divided into a tessellation of 100 km<sup>2</sup> hexagons, and flight lines were established through the centre of hexagonal survey units according to the occupancy survey method described in Magoun *et al.* (2007) and Bowman *et al.* (2010) (Figure 1). Flight routes following the pre-determined flight lines were completed on December 10, 11, and 17, 2010 (Figure 2).

The survey was conducted using a Cessna 185 aircraft from Wolverine Air equipped with wheel-skis. All flights originated from Fort Simpson, NT. The survey crew consisted of a pilot (Garry Murtsell or Richard Taylor) and navigator/observer/recorder (Daniel Guertin [Golder] or Nic Larter [GNWT ENR]) in the front seats, and two local observers in the rear seats (Wilbert Antoine [CZN], Darrell Betsaka [Nahanni Butte Dene Band], or Peter Corneille [Liidlii Kue First Nation]). Data recorded during survey flights included the location of animal tracks, animal feeding sites, and observed animals. Observed animals were subdivided into calf and non-calf age classes with sex being recorded if possible. Photographs of observed animals were also obtained when possible.

Following the completion of the sub-regional survey on December 17, a reconnaissance level fly-over of the access road alignment was conducted by the same fixed-wing aircraft. The road alignment was flown from the south-eastern terminus to the mine site.

## 4.0 RESULTS

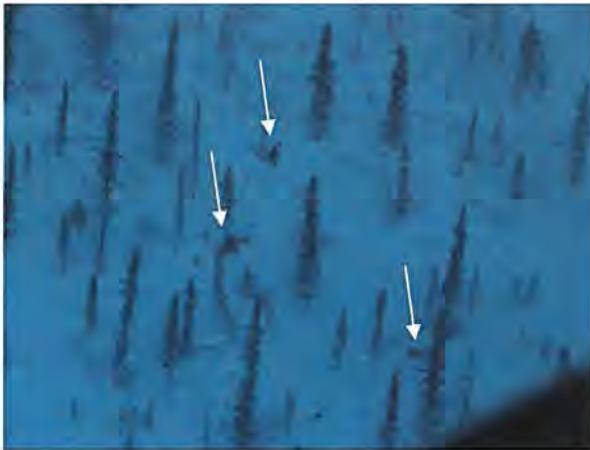
Approximately 8 cm of fresh snowfall on December 6 (Environment Canada's Canadian Daily Climate Data database; [www.climate.weatheroffice.ec.gc.ca](http://www.climate.weatheroffice.ec.gc.ca)) prior to the survey provided ideal survey conditions. Flying conditions on December 10 and 11 were ideal for making observations throughout the entire study area (Table 1). Visibility was acceptable, but hindered by frosting on windows, a result of very low temperatures. A low pressure weather system moved into the region on December 12 and contributed to approximately 13 cm of snowfall in the study area until December 16 (Environment Canada's Canadian Daily Climate Data database; [www.climate.weatheroffice.ec.gc.ca](http://www.climate.weatheroffice.ec.gc.ca)), resulting in poor flying conditions. Flying conditions were good on December 17 except for the formation of some minor ice crystals along some portions of the flight route, which partially obstructed clear visibility from the aircraft. Although these were not ideal conditions, they did not preclude observations of 1 km from the aircraft in any direction.

**Table 1: Detailed Description of the 3 Flight Routes of the December 2010 Aerial Survey**

Date	Departure Time	Flight Time (hr)	Weather at Departure	Snow Conditions	Total Flight Distance (km)
10 Dec 2010	10:48	4.6	-34°C, calm wind, scattered cloud (10%), good visibility (24 km)	100% cover, 15-30 cm, 4 days since last snow	640
11 Dec 2010	10:00	4.9	-29°C, SE wind (11 km/hr), broken clouds (80%), good visibility (24 km)	100% cover, 15-30 cm, 5 days since last snow	576
17 Dec 2010	10:00	4.4	-24°C, calm wind, scattered clouds (10%), good visibility (24 km)	100% cover, 15-30 cm, 1 day since last snow	630

Approximately 1,546 km of survey lines were flown over three days (Figure 2). A total of 62 caribou, 48 moose (*Alces alces*), 13 bison (*Bos bison athabascaë*), and 7 Dall's sheep (*Ovis dalli dalli*) were observed during flights (Figures 3 to 5). Tracks of caribou ( $n=13$ ), moose ( $n=6$ ), grey wolf (*Canus lupis*; [ $n=3$ ]), wolverine (*Gulo gulo*; [ $n=2$ ]), red fox (*Vulpes vulpes*; [ $n=1$ ]), and river otter (*Lontra Canadensis*; [ $n=1$ ]) were also observed during survey flights. Caribou and caribou sign were detected in 10 of the hexagon survey units. Observed caribou were usually in groups (range 4 to 15 animals) with few lone individuals observed. No wildlife or wildlife sign was observed during the December 17, 2010 access road reconnaissance level fly-over.

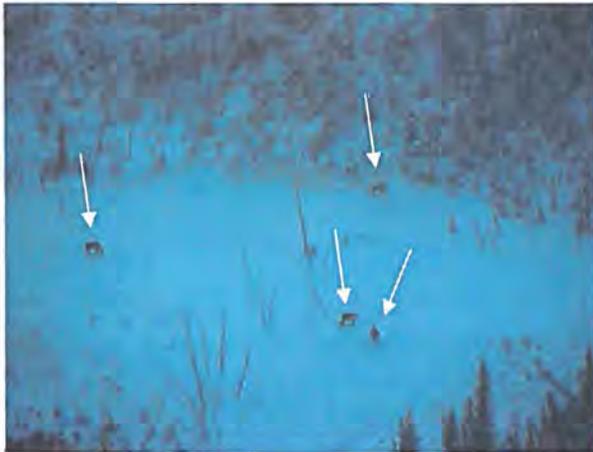
Representative photographs of wildlife observations recorded during the December 2010 surveys are included below:



Photograph 1: Group of caribou on mountain side (approximately 0.3 km from access road alignment).



Photograph 2: Group of caribou in Prairie Creek drainage (approximately 8 km from access road alignment).



Photograph 3: Group of caribou in boreal lowlands (approximately 5 km from access road alignment).



Photograph 4: Two male moose on mountain side.

## 5.0 SUMMARY AND CONCLUSIONS

Sunshine, calm winds, complete snow coverage, and recent snowfall provided good to excellent flying and observing conditions during this survey. In general, caribou and caribou sign was present among the hills and higher elevations of the survey area, with moose and moose sign primarily occurring in lower elevations. Plotting of location data obtained for caribou show that most caribou and caribou sign was observed in the western portion of the study area, in particular the Prairie Creek drainage and surrounding areas in the Mackenzie Mountains. One group of four caribou was observed in boreal lowland habitat east of the Mackenzie Mountains.

No wildlife or wildlife sign was observed during the access road reconnaissance level fly-over conducted on December 17, 2010. While some animals were observed in the larger study area on the same day, fresh snowfall from December 12 to 16 may have covered recent tracks.

This survey, in conjunction with two additional surveys to be completed by March 31, 2011, will be used to estimate the probability of occurrence of caribou in the study area.

## 6.0 CLOSURE

We trust that the preliminary findings presented in this technical memorandum are sufficient for your requirements. If you have any questions, please do not hesitate to contact the undersigned.

**GOLDER ASSOCIATES LTD.**

**ORIGINAL SIGNED**

Daniel Guertin, M.Sc.  
Wildlife Biologist

DAG/CHS/asd

**ORIGINAL SIGNED**

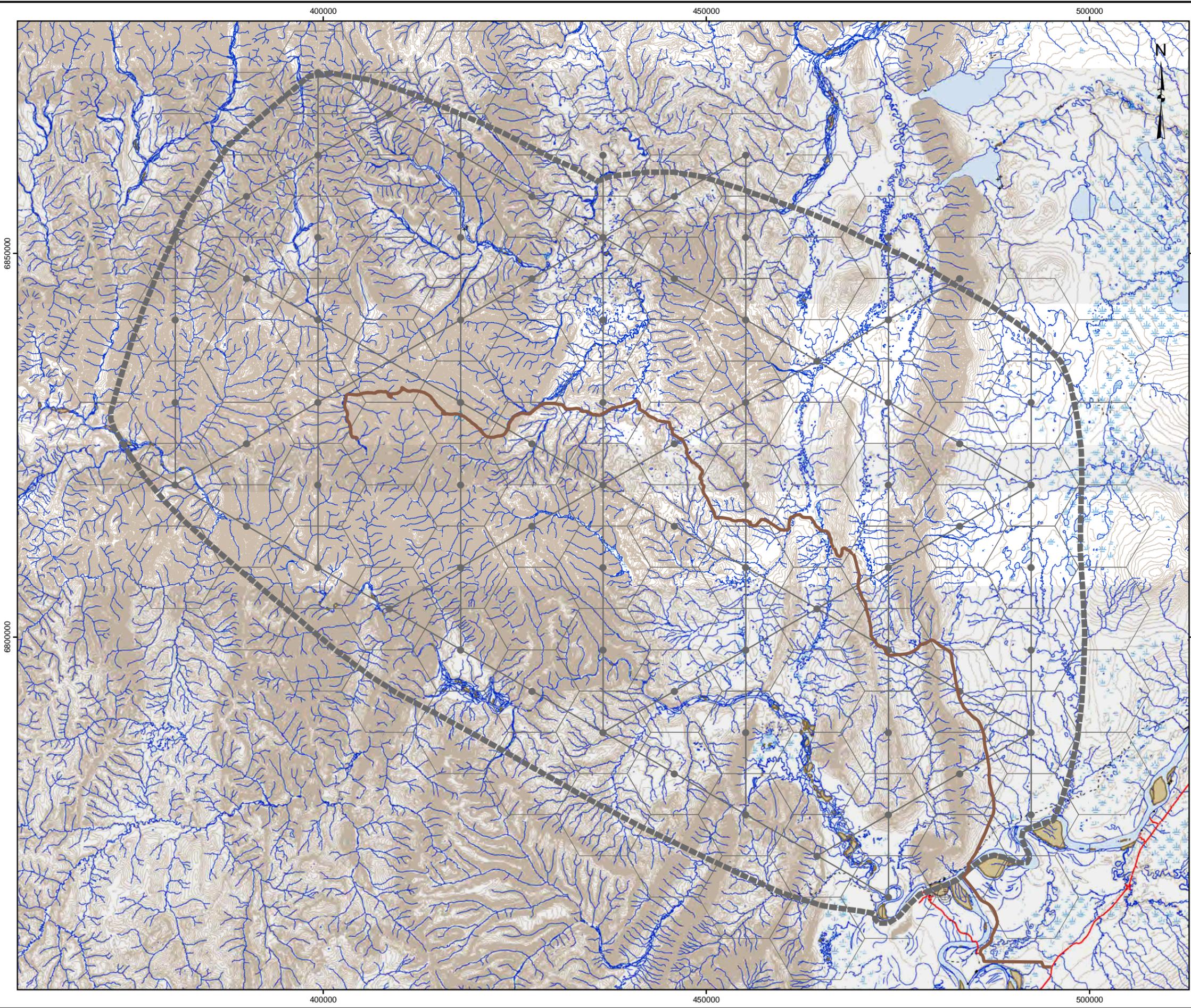
Chris Schmidt, B.Sc., R.P.Bio.  
Associate, Senior Wildlife Biologist

\\Bur1-s-filesrv2\final\2009\1422\09-1422-5007\TM 0118\_11 Survey 1 Results\_FINAL.docx

## 7.0 REFERENCES

- Bowman, J., Ray, J.C., Magoun, A.J., Johnson, D.S., and F.N. Dawson. 2010. Roads, logging, and the large-mammal community of an eastern Canadian boreal forest. *Canadian Journal of Zoology* 88:454-467.
- Magoun, A.J., Ray, J.C., Johnson, D.S., Valkenburg, P., Dawson, F.N., and J. Bowman. 2007. Modeling Wolverine Occurrence Using Aerial Surveys of Tracks in Snow. *Journal of Wildlife Management* 71:2221-2229.

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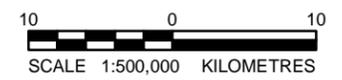


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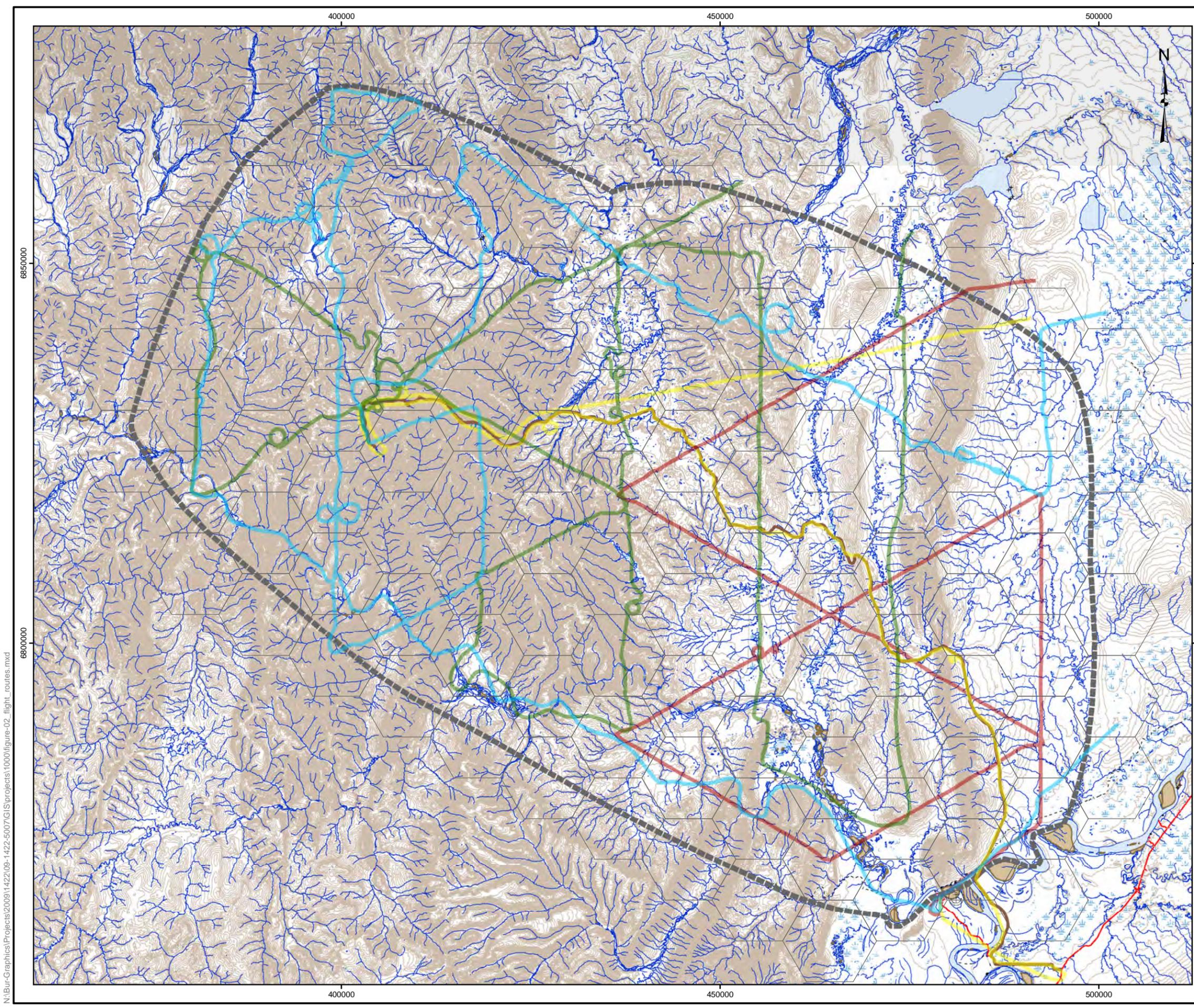
- Hexagon Centroid
- Planned Flight Lines
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- ▣ Study Area

**DRAFT**

**REFERENCE**  
 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geograsis.  
 Projection: UTM Zone 10 Datum: NAD 83



<b>PROJECT</b>	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
<b>TITLE</b>	DECEMBER 2010 WILDLIFE SURVEY FLIGHT LINES		
 Greater Vancouver Office, B.C.	PROJECT NO. 09-1422-5007	PHASE No. 1000/1040	
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	GIS JW 11 Jan. 2011		
	CHECK CHS 11 Jan. 2011		
REVIEW			
			FIGURE 1



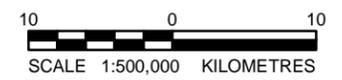
**LEGEND**

- Flight Route - Day 1 (Dec. 10, 2010)
- Flight Route - Day 2 (Dec. 11, 2010)
- Flight Route - Day 3 (Dec. 17, 2010)
- Flight Route - Day 3 Road (Dec. 17, 2010)
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- Study Area

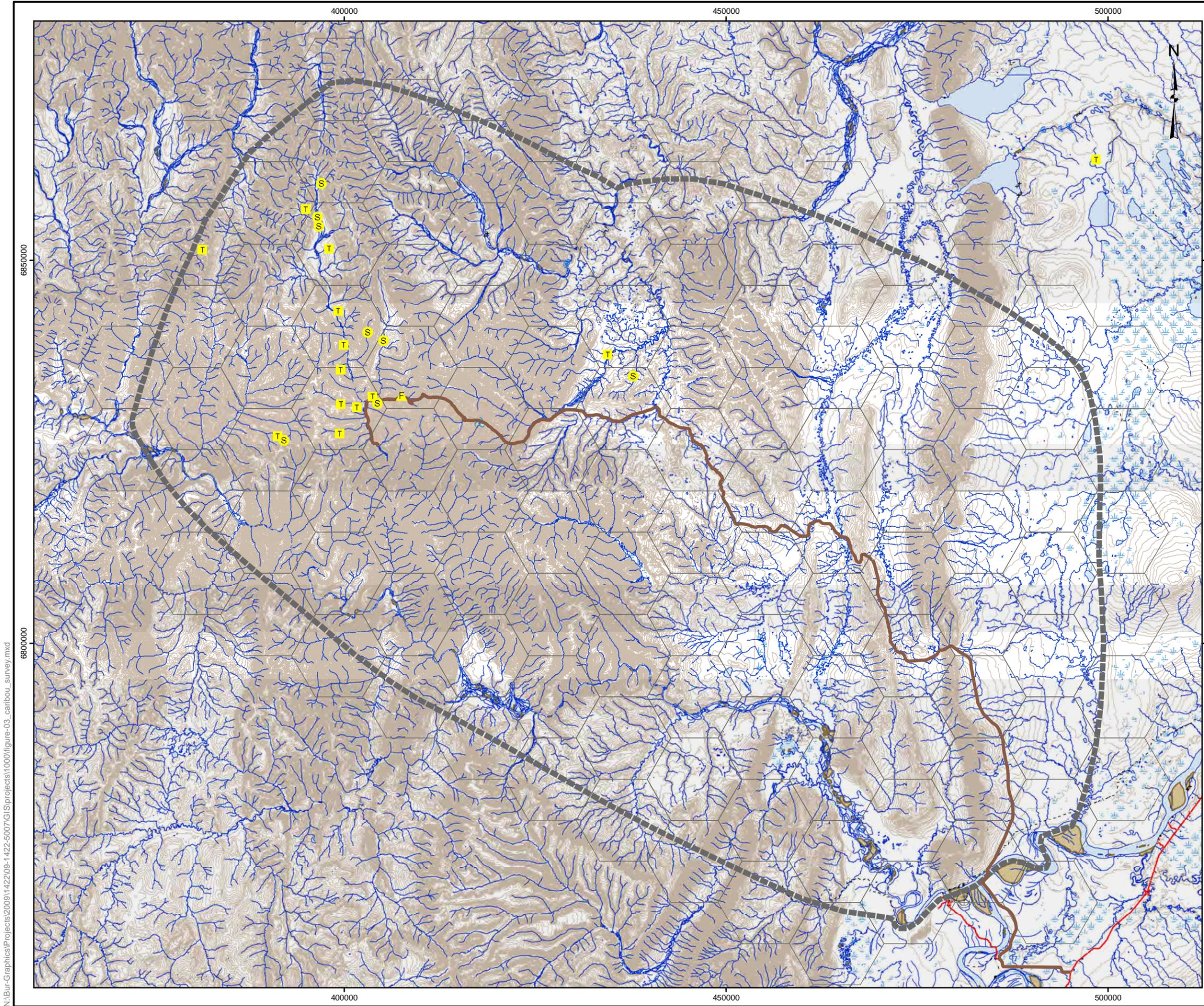
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**REFERENCE**  
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 Projection: UTM Zone 10 Datum: NAD 83



<b>PROJECT</b>	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
<b>TITLE</b>	DECEMBER 2010 WILDLIFE SURVEY FLIGHT ROUTES		
 Greater Vancouver Office, B.C.	PROJECT NO. 09-1422-5007	PHASE No. 1000/1040	
	DESIGN DG 21 Dec. 2010	SCALE AS SHOWN REV. 0	
	GIS JW 11 Jan. 2011		
	CHECK CHS 11 Jan. 2011		
REVIEW			FIGURE 2



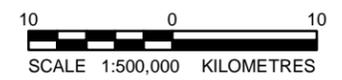
**LEGEND**

- Caribou - Feeding Location
- Caribou - Sighting
- Caribou - Track
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- Study Area

**REFERENCE**

Project features obtained from Canadian Zinc Corporation. Base features obtained from Geogritis.  
 Projection: UTM Zone 10 Datum: NAD 83

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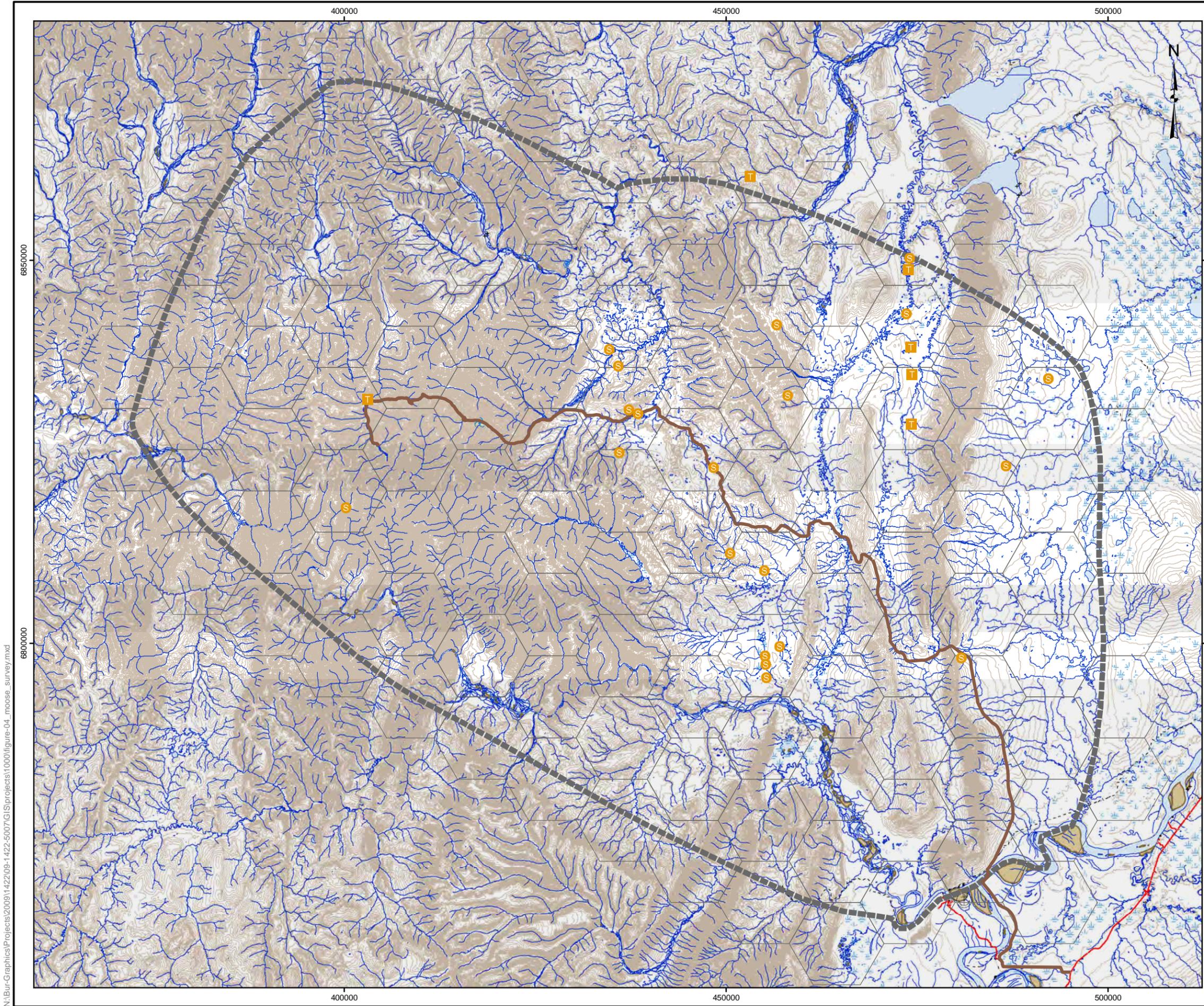


PROJECT	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
TITLE	THE OBSERVED DISTRIBUTION OF CARIBOU AND CARIBOU SIGN IN THE STUDY AREA DURING THE DECEMBER 2010 SURVEY		
	PROJECT NO. 09-1422-5007	PHASE No. 1000/1040	
	DESIGN DG 21 Dec. 2010	SCALE AS SHOWN	REV. 0
	GIS JW 11 Jan. 2011		
	CHECK CHS 11 Jan. 2011		
	REVIEW		



**FIGURE 3**

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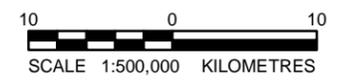
**LEGEND**

- S Moose - Sighting
- T Moose - Track
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- Study Area

**REFERENCE**

Project features obtained from Canadian Zinc Corporation. Base features obtained from Geograsis.  
 Projection: UTM Zone 10 Datum: NAD 83

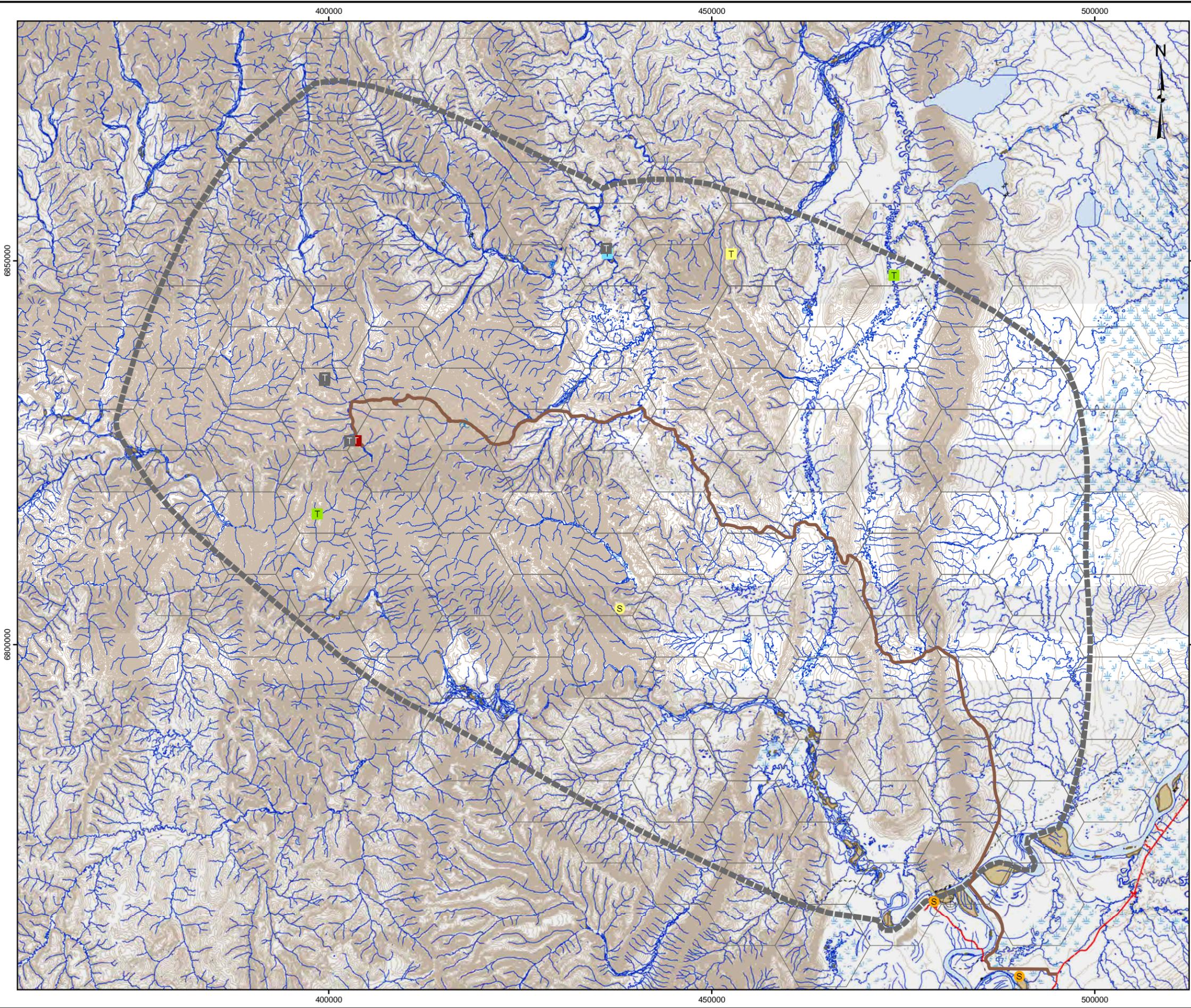
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<b>PROJECT</b>	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
<b>TITLE</b>	THE OBSERVED DISTRIBUTION OF MOOSE AND MOOSE SIGN IN THE STUDY AREA DURING THE DECEMBER 2010 SURVEY		
	PROJECT NO. 09-1422-5007	PHASE No. 1000/1040	
	DESIGN DG 21 Dec. 2010	SCALE AS SHOWN	REV. 0
	GIS JW 11 Jan. 2011		
	CHECK CDB 11 Jan. 2011		
	REVIEW		
<b>Golder Associates</b> <small>Greater Vancouver Office, B.C.</small>		FIGURE 4	

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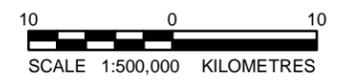
- S Bison - Sighting
- T Dall's Sheep - Track
- S Dall's Sheep - Sighting
- T Red Fox - Track
- T River Otter - Track
- T Wolf - Track
- T Wolverine - Track
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- Study Area

**REFERENCE**

Project features obtained from Canadian Zinc Corporation. Base features obtained from Geogratia.

Projection: UTM Zone 10 Datum: NAD 83

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PROJECT	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
TITLE	OTHER WILDLIFE AND WILDLIFE SIGN OBSERVED IN THE STUDY AREA DURING THE DECEMBER 2010 SURVEY		
	PROJECT NO. 09-1422-5007	PHASE No. 1000/1040	
	DESIGN DG 21 Dec. 2010	SCALE AS SHOWN	REV. 0
	GIS JW 11 Jan. 2011		
	CHECK CHS 11 Jan. 2011		
	REVIEW		



**FIGURE 5**

**DATE** March 11, 2011

**PROJECT No.** 09-1422-5007

**TO** David Harpley, P.Geo., Vice President - Environment and Permitting Affairs  
Canadian Zinc Corporation

Alan Taylor, Canadian Zinc Corporation

**CC** Doug Tate, Parks Canada Agency

Mike Sutor, Parks Canada Agency

Nic Larter, ENR/NWT

**FROM** Daniel Guertin and Chris Schmidt

**EMAIL** dguertin@golder.com

**CANADIAN ZINC CORPORATION – PRAIRIE CREEK MINE AND ACCESS ROAD  
FEBRUARY 2011 WILDLIFE SURVEY**

---

## **1.0 INTRODUCTION**

This technical memorandum briefly summarizes the results of the second of three aerial wildlife surveys to be conducted on behalf of Canadian Zinc Corporation (CZN) in the vicinity of the Prairie Creek Mine site and access road during the time period from December 2010 to March 2011. This survey was conducted under Parks Canada Agency (PCA) research and collection permits NAH-2010-7252 and under Government of Northwest Territories Department of Environment and Natural Resources (GNWT ENR) wildlife research permit WL005033 (addressed to David Harpley of CZN).

## **2.0 METHODS**

Methods for the February 2011 wildlife survey were analogous to those described in the technical memorandum produced by Golder Associates Ltd. (Golder) following the December 2010 wildlife survey. Survey flights following predetermined flight lines (Figure 1) were completed on February 8, 9, 19, and 24, 2011 (Figure 2).

Approximately 7 cm of fresh snowfall on February 4 provided ideal survey conditions beginning on February 8 (4 days following fresh snowfall). Flying conditions on February 8 were ideal for making observations throughout the study area, except for an area of low cloud cover in the western portion of the survey area. A low pressure weather system moved into the region on February 9, bringing overcast skies and strong W/SW winds over higher terrain. Flying conditions were adequate over low terrain on February 9; however the survey was suspended mid-day due to strong winds and heavy mechanical turbulence at higher elevations. Strong winds continued in the study area on February 10, grounding the airplane.

Approximately 25 cm of snow fell in the study area between February 11 and February 16. Flying conditions were good for making observations on February 19 (3 days following fresh snowfall) except strong winds continued in the Mackenzie Mountains, precluding any survey of that area. Strong winds and intermittent snowfall continued in the study area until February 23, again grounding the airplane. Flying conditions were generally good on February 24 although several tracks in the mountains were obscured due to high winds from previous days.

The survey crew consisted of a pilot (Dan Slattery or Garry Murtsell) and navigator/observer/recorder (Daniel Guertin [Golder] or Mike Sutor [PCA]) in the front seats, and two observers in the rear seats (Wilbert Antoine [CZN], Mike Sutor [PCA], or Jon Tsetso [PCA]).

### 3.0 RESULTS

- Approximately 2,200 km of survey lines were flown over four days in February 2011 (Figure 2).
- A total of 89 caribou (*Rangifer tarandus*), 31 moose (*Alces alces*), and 3 bison (*Bos bison athabascaae*) were observed during flights (Figures 3 to 5).
- Tracks of caribou ( $n=73$ ), moose ( $n=222$ ), grey wolf (*Canus lupis*; [ $n=21$ ]), bison ( $n=6$ ), Canada lynx (*Lynx canadensis*; [ $n=3$ ]), and wolverine (*Gulo gulo*; [ $n=1$ ]) were observed during survey flights (Figures 3 to 5).
- Caribou and caribou sign were detected in 20 of the hexagon survey units (Figure 3).
- Wildlife tracks observed on or immediately adjacent to the access road alignment during the reconnaissance level fly-over consisted of caribou, moose, and wolf (Figure 3 to 5).
- Snowmobile tracks ( $n=4$ ) were observed in the south-eastern portion of the study area (Figure 5).

### 4.0 SUMMARY AND CONCLUSIONS

Inconsistent weather, heavy snowfall, and strong winds limited the number of days with adequate survey conditions for flying and observing wildlife sign in February 2011. The survey of the study area began on February 8 and flight lines were not completed until February 24. Nonetheless, survey results obtained in February 2011 are similar to the results obtained in December 2010. Most caribou and caribou sign observed during the February 2011 survey was located in the western portion of the study area, in particular the upper Prairie Creek drainage and the Vera Creek drainage. Several caribou tracks were also observed in the boreal lowlands north of Cat Camp. The majority of moose and moose sign observed during survey flights occurred in lower elevations east of the Mackenzie Mountains.

The results from this survey, in conjunction with the December 2010 survey results and one additional survey to be completed by March 31, 2011, will be used to estimate the probability of occurrence of caribou in the study area. A complete description of survey methods and results will be provided in a report following completion of all three aerial surveys in the study area.

## 5.0 CLOSURE

We trust that the preliminary findings presented in this technical memorandum are sufficient for your requirements. If you have any questions, please do not hesitate to contact the undersigned at 604-296-4200.

**GOLDER ASSOCIATES LTD.**

### **ORIGINAL SIGNED**

Daniel Guertin, M.Sc.  
Wildlife Biologist

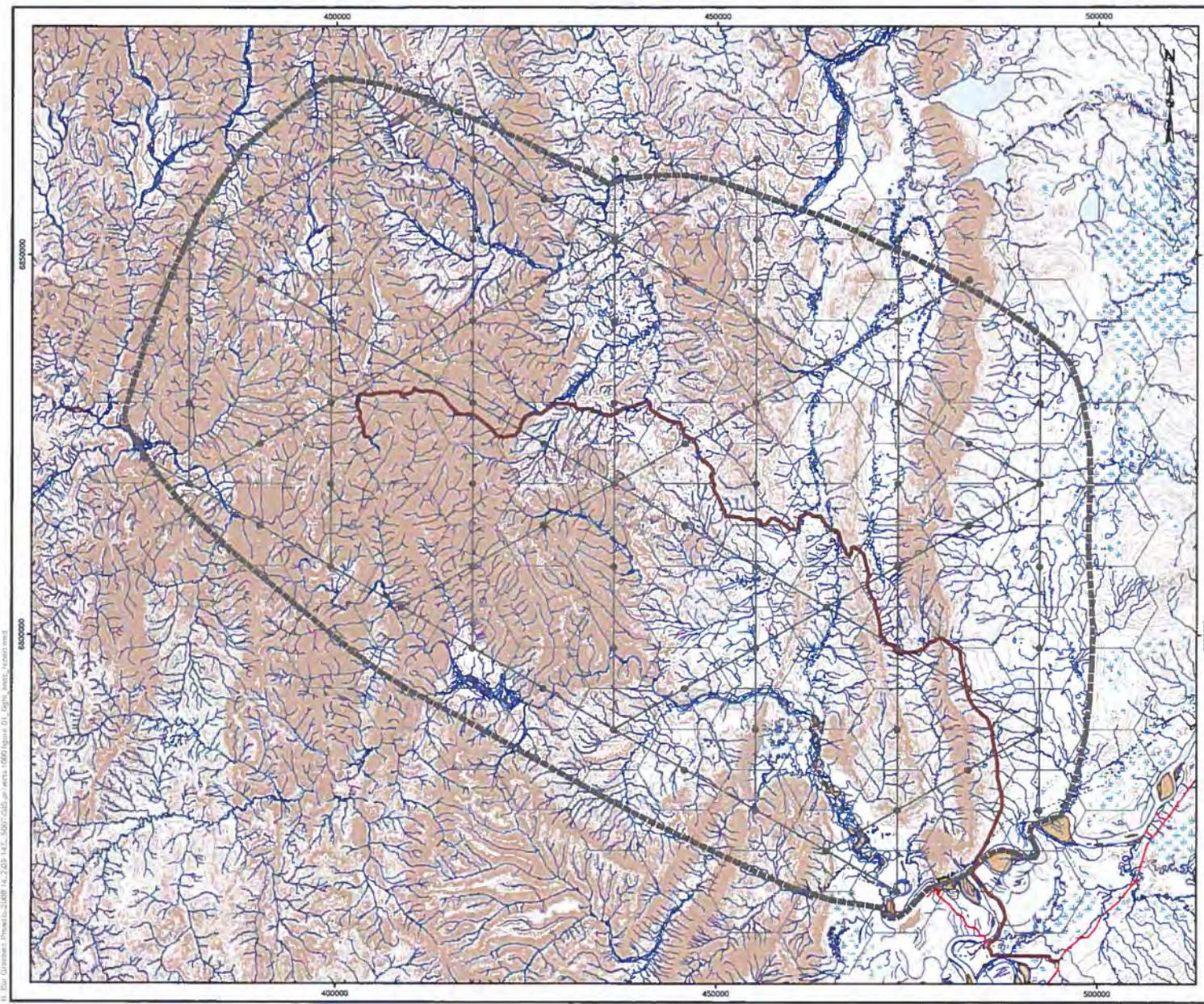
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Attachment: Figures 1 - 5

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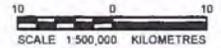
### **ORIGINAL SIGNED**

Chris Schmidt, B.Sc., R.P.Bio.  
Associate, Senior Wildlife Biologist



- LEGEND**
- Hexagon Centroid
  - Planned Flight Lines
  - Access Road Alignment
  - ▭ Hexagon (100 km<sup>2</sup>)
  - ▨ Study Area

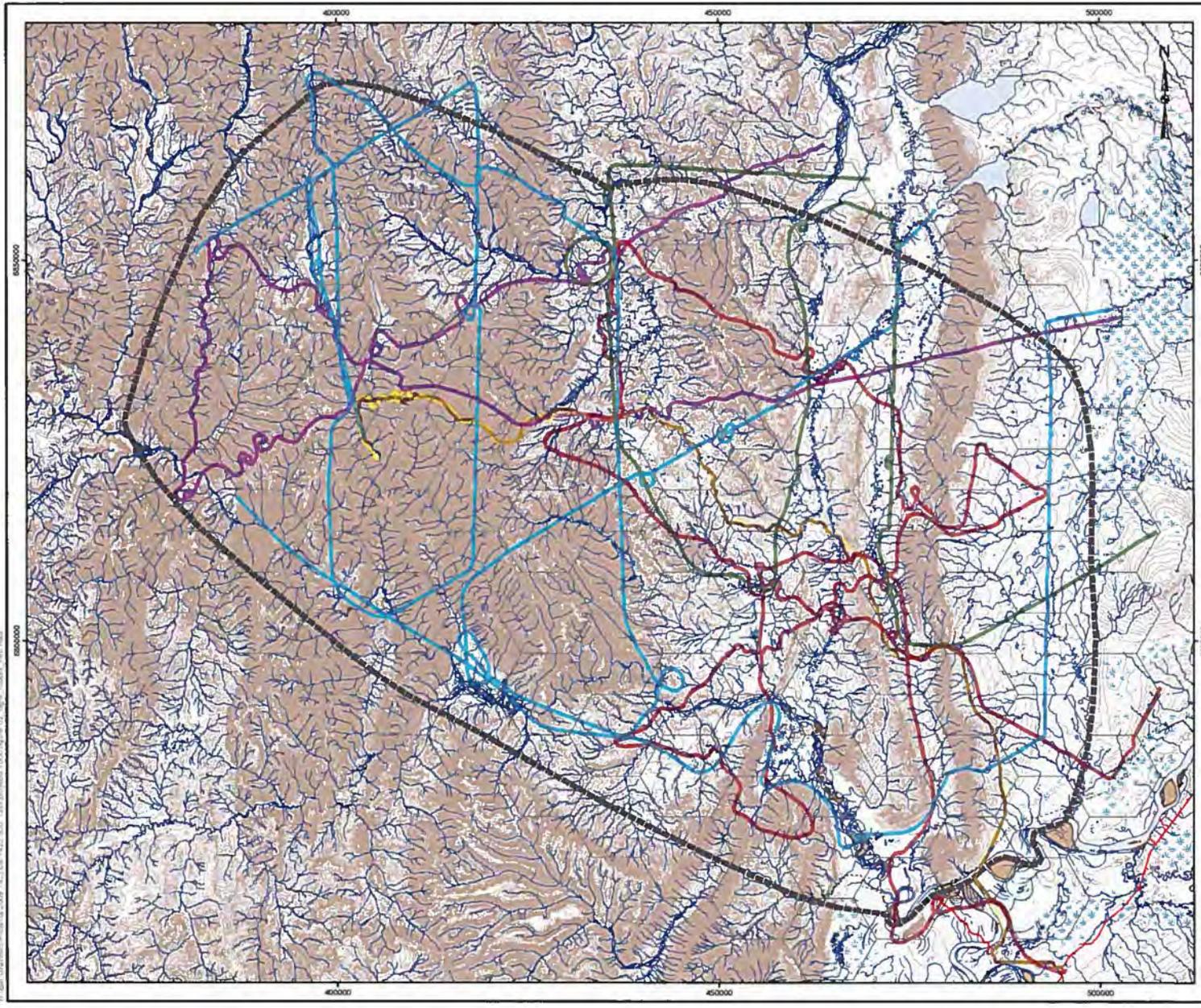
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 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geogratis.  
 Projection: UTM Zone 10 Datum: NAD 83



PROJECT		CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES	
TITLE		2010-11 WINTER WILDLIFE SURVEY FLIGHT LINES	
 Greater Vancouver Office, B.C.	PROJECT NO	09-1422-5287	PHASE No 10001040
	DESIGN	DG 21 Dec 2010	SCALE AS SHOWN
	QIS	JW 11 Jan 2011	REV 0
	CHECK	CHS 11 Jan 2011	
	REVIEW	CHS 10 Mar 2011	

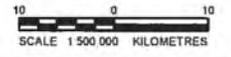
**FIGURE 1**

U:\Data\GIS\Projects\2009\1422\09-1422-5287\005-ar-rects-10001040.dwg, 11/11/2011 10:00:00 AM

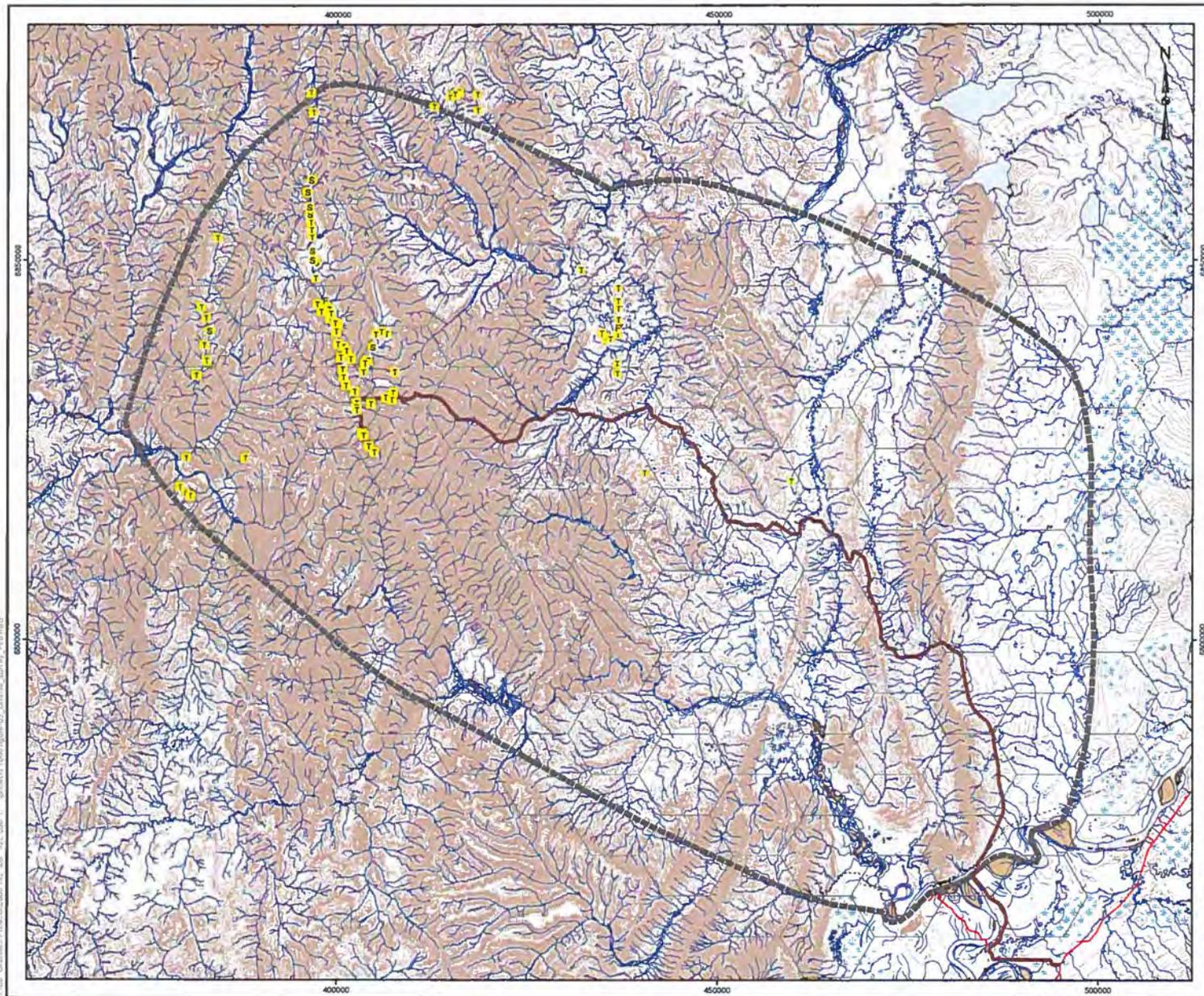


- LEGEND**
- Flight Route - Day 1 (Feb. 08, 2011)
  - Flight Route - Day 2 (Feb. 09, 2011)
  - Flight Route - Day 3 (Feb. 18, 2011)
  - Flight Route - Day 4 (Feb. 24, 2011)
  - Flight Route Road - Day 3 & 4 (Feb. 18 & 24, 2011)
  - Access Road Alignment
  - Hexagon (100 km<sup>2</sup>)
  - Study Area

**REFERENCE**  
 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geographics.  
 Projection: UTM Zone 10 Datum: NAD 83



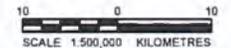
<b>PROJECT</b>	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES			
<b>TITLE</b>	FEBRUARY 2011 WILDLIFE SURVEY FLIGHT ROUTES			
 <b>Golder Associates</b> <small>Golder Vancouver Office, B.C.</small>	PROJECT NO	DD 1427 5207	PHASE No	10221940
	DESIGN	DG 21 Dec. 2010	SCALE AS SHOWN	REV. 0
	GIS	JW 25 Feb. 2011		
	CHECK	CHS 10 Mar. 2011		
	REVIEW	CHS 10 Mar. 2011	FIGURE 2	



**LEGEND**

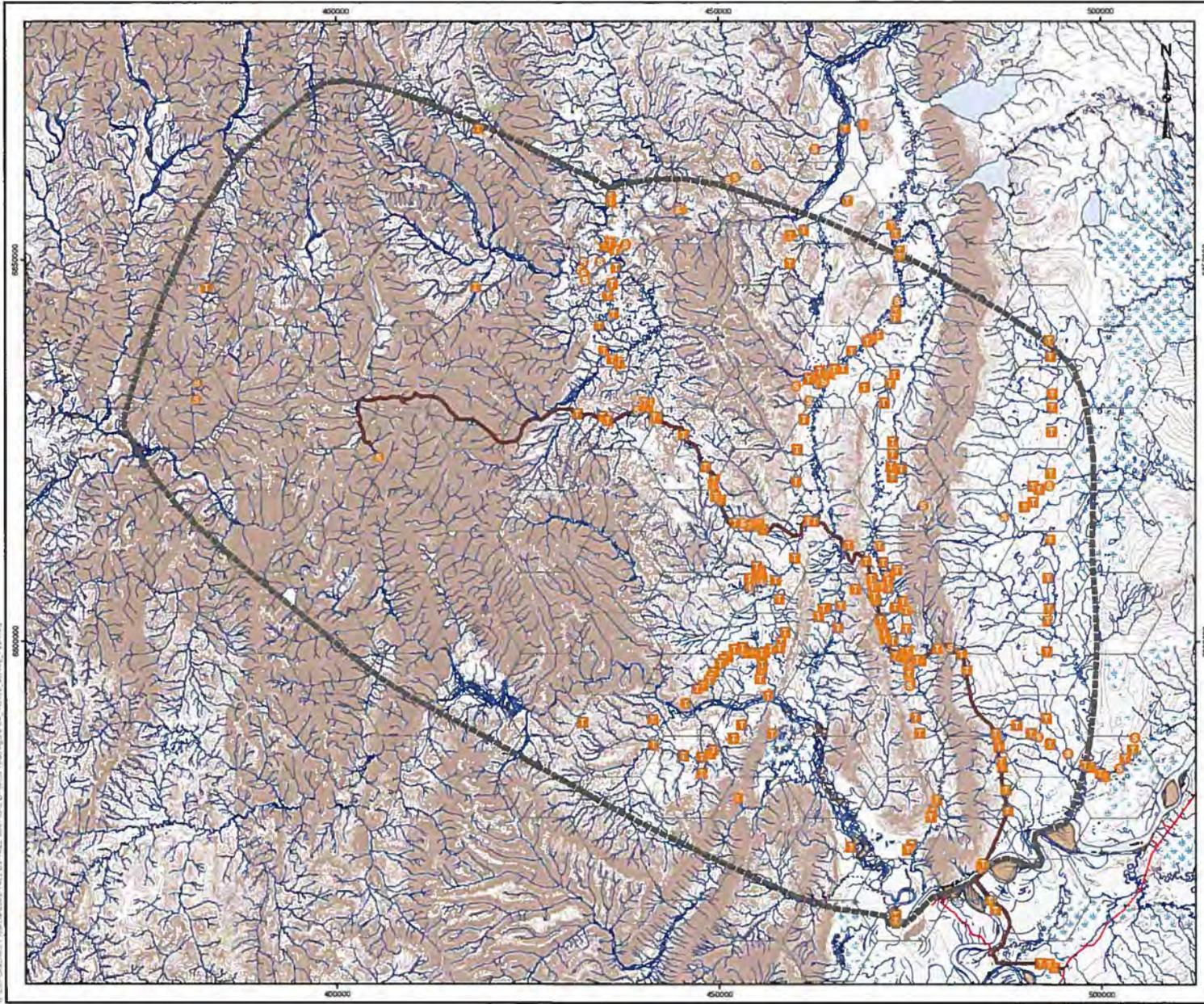
- F Caribou - Feeding Location
- S Caribou - Sighting
- T Caribou - Track
- Access Road Alignment
- Hexagon (100 km<sup>2</sup>)
- Study Area

**REFERENCE**  
 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geogratis.  
 Projection: UTM Zone 10 Datum: NAD 83



PROJECT	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
TITLE	THE OBSERVED DISTRIBUTION OF CARIBOU AND CARIBOU SIGN IN THE STUDY AREA DURING THE FEBRUARY 2011 SURVEY		
 Greater Vancouver Office, B.C.	PROJECT ID	05-1427-5607	PHASE No: 10001540
	DESIGN	DG 21 Dec 2010	SCALE AS SHOWN
	QS	JW 29 Feb 2011	REV. 0
	CHECK	CHS 10 Mar 2011	
	REVIEW	CHS 10 Mar 2011	

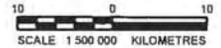
**FIGURE 3**



**LEGEND**

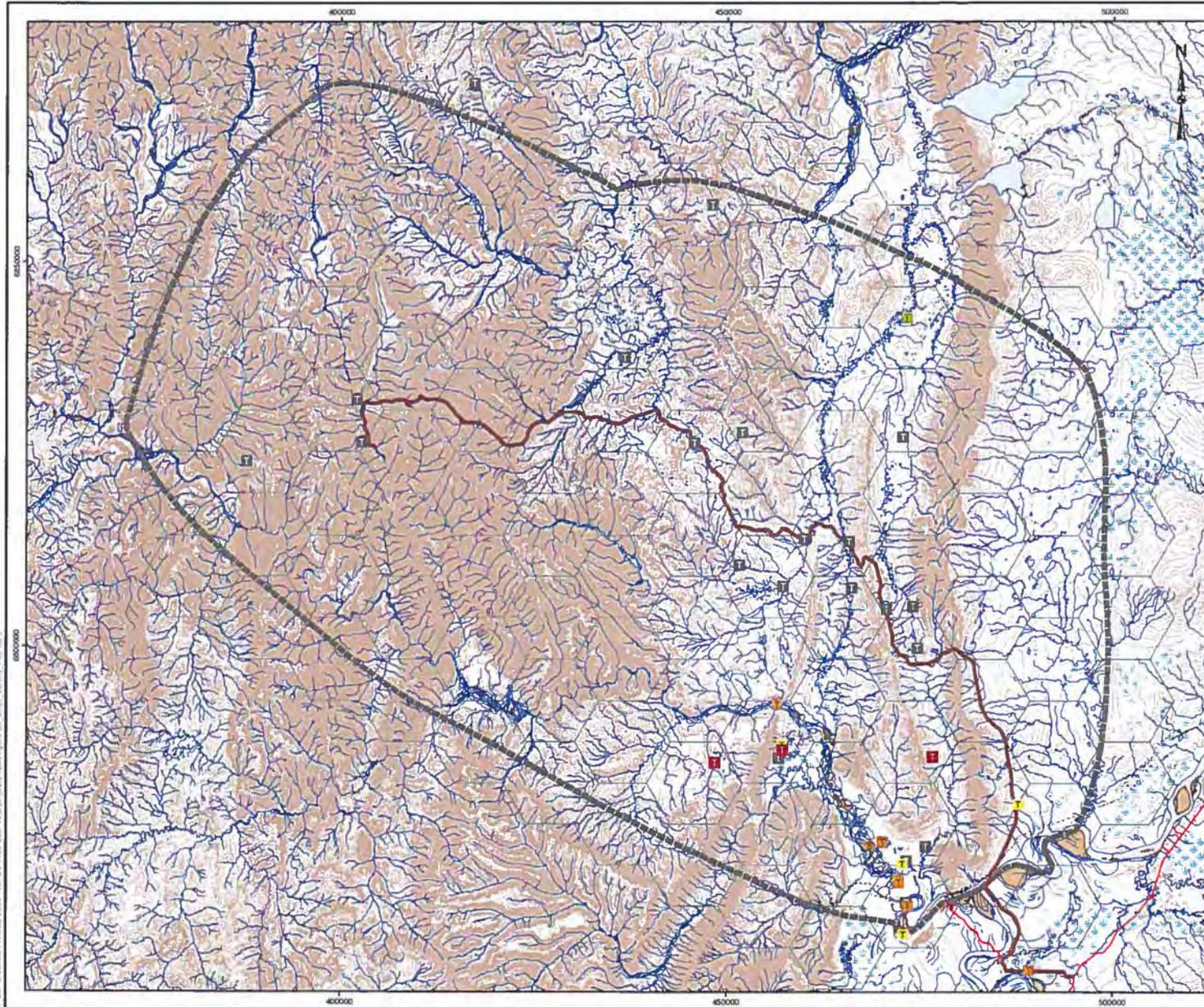
-  Moose Sighting
-  Moose - Track
-  Access Road Alignment
-  Hexagon (100 km<sup>2</sup>)
-  Study Area

**REFERENCE**  
 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geographics.  
 Projection: UTM Zone 10 Datum NAD 83



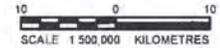
PROJECT	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES				
TITLE	THE OBSERVED DISTRIBUTION OF MOOSE AND MOOSE SIGN IN THE STUDY AREA DURING THE FEBRUARY 2011 SURVEY				
 Greater Vancouver Office, B.C.	PROJECT NO	25-1423-5607	PROJECT IN	10001940	
	DESIGN	DG	21 Dec 2010	SCALE AS SHOWN	REV 0
	QS	JW	25 Feb 2011		
	CHECK	CHS	19 Mar 2011		
	REVIEW	CHS	10 Mar 2011		

**FIGURE 4**



- LEGEND**
- Bison - Sighting
  - Bison - Track
  - Human - Track
  - Lynx - Track
  - Wolf - Track
  - Wolverine - Track
  - Access Road Alignment
  - Hexagon (100 km<sup>2</sup>)
  - Study Area

**REFERENCE**  
 Project features obtained from Canadian Zinc Corporation. Base features obtained from Geogratis.  
 Projection UTM Zone 10 Datum: NAD 83



PROJECT	CANADIAN ZINC CORPORATION PRAIRIE CREEK MINE NORTHWEST TERRITORIES		
TITLE	OTHER WILDLIFE AND WILDLIFE SIGN OBSERVED IN THE STUDY AREA DURING THE FEBRUARY 2011 SURVEY		
	PROJECT NO: 09-1422-0007	PHASE NO: 10001040	
	DESIGN: DG 21 Dec 2010	SCALE AS SHOWN	REV 0
	GIS: JW 25 Feb 2011		
	CHECK: CHS 16 Mar 2011		
	REVIEW: CHS 16 Mar 2011		



**FIGURE 5**

I:\Data\Geographic Information Systems\GIS\Projects\2010\09-1422-0007\2011\02\Fig 5 - Other Wildlife and Wildlife Sign - Feb 2011.mxd