CANADIAN ZINC CORPORATION

May 10, 2017

Mr. Chuck Hubert
Senior Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
5102 50th Avenue,
Yellowknife, NT
X1A 2N7

Dear Mr. Hubert

Re: EA1415-001, Prairie Creek Mine All Season Access Road
Response to Undertakings from Public Hearing

Canadian Zinc Corporation (CZN) is pleased to provide this response to the Undertakings from the Public Hearing in Fort Simpson last month. We address each Undertaking in order below.

Undertaking 1

CZN was to respond to any questions in connection with Tables 7.1 and 7.2 which were used in CZN's presentation at the Hearing. No questions were received.

Undertaking 2

CZN was to calculate the percentage of the proposed all-season road that is in medium to high risk areas from the Mine to the Liard Highway. This Undertaking relates to Table 7-3 from the DAR Addendum. A modified version of Table 7-3 is attached providing percentages for all road sections and risk categories.

Undertaking 3

CZN was to describe whether wide scarps in the west part of the road alignment (e.g. km 8.5, km 16.5 and km 29) represent the back scarps of large historic landslides, and describe whether they have the potential to produce a debris dam on the valley floor and impound water if the landslide were to re-activate. Tetra Tech has provided a response in an attached memo.

Undertaking 4

Based on the species list in the invasive species management framework, CZN was to explain how it would determine which invasive species will be controlled and who will be involved in that decision.

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A relevant excerpt from the Invasive Species Management Framework is as follows:

"Prevention measures should be monitored for effectiveness; this is accomplished through training and regular monitoring as follows:

- Training - train CZN Environmental Monitor to identify, monitor, and control invasive species using appropriate mechanical treatments specific to the plant species (e.g., covering/smothering, cutting, digging);
- Monitor – monitoring should be conducted regularly throughout the growing season (June to August); and
- If an infestation is detected, size, density and location should be recorded and tracked. Other factors to consider include:
  - Potential impacts of the species (e.g., How does it alter ecosystem processes? How competitive is it with native species?);
  - By what means does the species spread;
  - How valuable and/or rare is the habitat with the infestation; and
  - How difficult is control of the infestation and the re-establishment of native species."

Invasive species control is species dependent and will be influenced by the health of the surrounding native vegetation community, the degree and method of dispersal, how competitive the species is, and control measures available. If invasive species are detected, depending on the location, the GNWT Department of Environment and Natural Resources (Fort Simpson office) and Parks Canada will need to be consulted, with input from First Nations.

Undertaking 5

DFO and CZN were to discuss hydrograph modelling for Sundog Creek and submit a written response based on these discussions. Discussions were held at the Hearing and subsequently recorded as a Meeting Record. A partially unsigned copy of the Record is attached.

Undertaking 9

CZN was to provide an explanation of how caribou numbers identified in CZN's April 28 hearing presentation figures were derived. A reply is attached with an explanation.

Undertaking 10

CZN was to provide a list of monitoring and management plans in table format that will be developed or updated, what each plan applies to, what project phase(s) it applies to, and what government agencies will be involved in review and approval. A table providing these details is attached.

If you have any questions, please contact us at 604 688 2001.

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May 10, 2017
MVRB

Yours truly,

CANADIAN ZINC CORPORATION

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

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UNDERTAKING #2

Km from Mine		Likelihood	Consequence	Risk		% of Road Length
From	To					
Prairie/Fast Creek						
0	3.5	Low	Low	Very Low		2.0
3.5	4.2		High	Moderate		0.4
4.2	5.3		Moderate	Low		0.6
5.3	5.5		High	Moderate		0.1
5.5	6.2		Moderate	Low		0.4
6.2	7.4		High	Moderate		0.7
Funeral Creek						
7.4	12.0	Moderate	High	High		2.6
12.0	17.2	High		Very High		3.0
Sundog Creek						
17.2	23.3	Low	Moderate	Low		3.5
23.3	23.5	Moderate		Moderate		0.1
23.5	28.1		High	High		9.6
28.1	40.2					
Sundog Creek tributaries						
40.2	53.6	Low	Low	Very Low		7.7
53.6	59.9	Moderate	Moderate	Moderate		3.6
59.9	64.5	Low		Low		2.6
Tetcela & Fishtrap						
64.5	86.8	Low	Moderate	Low		12.8
86.8	95.8		High	Moderate		5.2
95.8	102.0	High	Moderate	High		3.6
Wolverine Pass to Grainger Gap						
102.0	119.5	Low	Low	Very Low		10.0
119.5	124.5		High	Moderate		2.9
Grainger Gap to Liard						
124.5	127.0	Low	Moderate	Low		1.4
127.0	159.8		Low	Very Low		18.8
Liard Crossing						
159.8	160.4	Low	High	Moderate		0.3
Old Logging Road						
160.4	174.5	Low	Low	Very Low		8.1

% Very Low	% Low	% Moderate	% High	% Very High
46.6	21.4	10.4	18.6	3.0

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	David Harpley	**Date:**	May 5, 2017
c:	Alan Taylor	**Memo No.:**	1
From:	Shirley McCuaig, Rita Kors-Olthof, Kevin Jones	**File:**	YARC03070-01
Subject:	Consideration of Potential Debris Dam Formation Resulting from a Landslide West End of Proposed Alignment (KP 0 to KP 31) EA1415-01 Prairie Creek Mine All-Season Road		

1.0 INTRODUCTION

This technical memo has been prepared for Canadian Zinc Corporation (CZN) by Tetra Tech Canada Inc. (Tetra Tech) to respond to an information request from Knight Piésold Inc. during the hearings of April 27, 2017, for the proposed Prairie Creek Mine all-season road. This information request relates to the possibility of a slope instability resulting in a debris dam and impounded water on the valley floor in narrow valley sections of the route.

2.0 DETAILS OF INFORMATION REQUEST

The information request is as follows:

Comment: *This question relates to the possibility of a large landslide occurring in natural terrain in the steep valley side slopes along portions of the route where the valley floor is very narrow such that the debris from a landslide, if one were to occur, could develop a debris dam and impound water. The west part of the alignment passes through such terrain, locally (for example in the vicinity of KP 8.5, KP 16.5 and KP 29), and in these areas the terrain stability maps show wide 'landslide head scarps' on the upper slopes.*

Recommendation: *Please can you comment on whether any of these wide scarps represent the back scarps of large historic landslides that have the potential to produce a debris dam on the valley floor if the landslide were to re-activate?*

3.0 SCOPE OF WORK AND METHOD

Tetra Tech has reviewed the terrain stability mapping along the west end of the proposed road alignment, and has reviewed the recommendations provided to date for this road section (KP 0 through KP 31). Tetra Tech has considered the potential implications of a landslide in producing a debris dam on the valley floor. The results of this review are presented in this memo. The previous studies are listed in the references at the end of this memo.

4.0 CHARACTERISTICS OF POSSIBLE SLOPE FAILURES (KP 0 TO KP 31)

In narrow valley locations at KP 3, from KP 8 to 12.5, at KP 16.5, and from KP 17.5 to 31, the wide landslide headscarps mapped are not those of deep-seated bedrock slides, but rather a conglomeration of a series of smaller headscarps of narrow rock fall and rock slide failures that feed small colluvial fans, veneers and blankets where the landslide scars meet the river valleys and on the valley slopes.

Regarding the potential for blocking of the rivers or creeks in these locations, there is no evidence that the rock fall/slide material forms anything more than a veneer or thin blanket of material on most of the above-mentioned slope sections. Therefore, possible future rock fall/slide events would not be expected to result in large volumes of debris. Some sections of the road might well form catchment areas for much of the debris from small upslope

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events, thereby preventing it from reaching the streams. In locations where small amounts of debris could still potentially reach the streams, for example, where the debris originates from the opposite valley slope, much of the finer-grained debris would likely be easily carried away by the stream, while coarser-grained debris would allow water to drain through. Where larger colluvial fans are present, such as at KP 28.5, there is no historical evidence on the air photos and LiDAR image of debris dam-related events having occurred in the past.

In the vicinity of KP 16.5, there is a drainage divide and very little water flow, so a significant damming event is considered extremely unlikely here. Rather, the small amount of water present would likely pass through the bouldery debris.

The possible effects of road design and construction on the overall slope stability above and below the road have been previously considered and discussed by Tetra Tech (2016a, 2016b). As noted previously, the detailed design will need to take into consideration the overall slope conditions along the road to determine the most suitable cut/fill slope configuration to accommodate each location. For example, limiting the extent of cut slopes in specific sections of out-dipping bedrock could serve to protect or enhance stability along the road. Some of these same mitigations may also result in enhanced protection for the stream below. As noted above, the presence of the road could also reduce the volume of debris potentially reaching the stream in some locations, requiring only cleanup of debris from the road itself.

Finally, since daily traffic is anticipated along the road, there will be considerable opportunity for observation and monitoring of local slope or stream conditions. Should a slope event occur, the road would allow timely access and the ability to remedy the situation. That capability would thus allow CZN to mitigate the effects of a rock fall/slide on the natural surroundings, as well as on the road itself or the slopes supporting the road.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Canadian Zinc Corporation and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Canadian Zinc Corporation and their agents, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech Canada Inc.'s Services Agreement. Tetra Tech's General Conditions are attached to this memo.

6.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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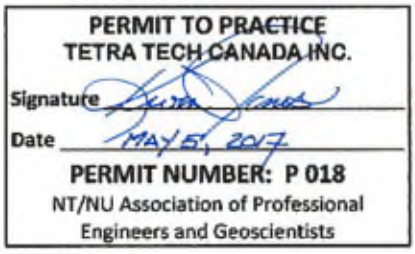

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/kla

Attachment General Conditions

REFERENCES

Tetra Tech EBA Inc. (Tetra Tech), 2016a. Technical Memo No. 1, MVEIRB #11 – Terrain Instability (Related to Undertaking #40), Response to Second Round Information Request, EA1415-01 Prairie Creek Mine All-Season Road. Prepared for Canadian Zinc Corporation. October 2016. Tetra Tech File: YARC03070-01.001.

Tetra Tech, 2016b. Technical Memo No. 6, Discussion for Undertakings #36, 37, 40 and 44, Questions Arising from the Technical Sessions on June 13-16, 2016, EA1415-01 Proposed Prairie Creek Mine All-Season Road, NT. Prepared for Canadian Zinc Corporation. July 2016. Tetra Tech File: Y14103320.01-008.

Meeting Summary

Date/Time: April 27, 2017 / 5 pm MST

Fisheries and Oceans Canada: Jessica Taylor, Véronique D'Amours-Gauthier

Tetra Tech (for CZN): Bill Rozeboom

Hatfield Consultants (for CZN): John Wilcockson

Issues Discussed: Undertaking #5, EA1415-01 Final Hearings

Undertaking #5: DFO and CanZinc to discuss hydrograph modelling use for Sundog Creek and submit a written response based on these discussions

Context: DFO's Recommendations 4 and 12 from their Technical Report, as follows:(4) DFO-FPP recommends that hydrographs, modelling, and detailed designs for the existing channel and the proposed channel are submitted to DFO-FPP during the regulatory phase, and (12) DFO-FPP recommends the Developer consider the possibility of a channel readjustment phase and develop a plan to mitigate these potential adverse effects.

Summary notes taken by Jessica Taylor.

- DFO understands that Sundog Creek runs dry. To gain a further understanding of the fish and fish habitat in Sundog Creek, DFO asked for how long Sundog Creek is usually dry (at what times of year, and what portions of the Creek). As per Recommendation #4, DFO asked for hydrographs to demonstrate Sundog's flow regime.
- Tetra Tech discussed expectations with DFO. Information for Sundog Creek includes 4 or 5 sets of historical air photos beginning in the late 1940s and first hand observations from Canadian Zinc field programs. This information can be provided.
- Tetra Tech showed DFO the Prairie Creek at Cadillac Mine (Station 10EC002) hydrographs on the Water Survey of Canada website. Data are available for 1974-1990 and 2013-2015. Tetra Tech will process Prairie Creek information to assist DFO's understanding of Sundog Creek hydrology. The information and method will be written out in a Memo, and provided to DFO during the regulatory phase with Canadian Zinc's application for a *Fisheries Act* authorization.
- Tetra Tech (Canadian Zinc) committed that this information would be provided, together with any adjustments to the already provided flow modelling, to DFO in support of further review during the regulatory phase.

Signature of Parties Confirming Accuracy of Record:

Jessica Taylor

_____ _____

Name Signature - DFO

David Harpley

_____ _____

Name Signature - CZN

Undertaking 9

CanZinc to provide an explanation of how caribou numbers identified in CanZinc's April 28 hearing presentation figures were derived.

The CanZinc mountain caribou kernel maps were derived using the collar and group size data provided by Parks Canada to Canadian Zinc on March 27, 2017 (attached). Each collar location in the kernel density analysis was weighted based on the group size indicated at the time of collaring in winter. For example, a collar representing a group of 16 animals was ranked higher than a collar representing 2 animals. While the collar data to group size correlation may not be a precise indicator of density of habitat use in all seasons, because it may vary across seasons, we believe it serves to indicate the general location of animals seasonally.

For search radius, we used the default search radius as calculated by the ArcGIS Kernel Density tool. The calculation is complex but the method of default search radius calculation can be found here:

http://pro.arcgis.com/en/pro-app/tool-reference/spatial-analyst/how-kernel-density-works.htm#ESRI_SECTION1_B6405A4584AA4250BE7CB071928B60F1

We used a numbered scale for caribou densities, and a more local scale to show that caribou concentrations are in discrete areas to the north and west of the proposed access road.

Undertaking 10

Management or Monitoring Plan	Purpose	Project Phase	Review Agencies
Spill Contingency and Emergency Response	Preparation for/response to spills and emergencies	All	PC, EC, GNWT
Borrow Pits	Development and reclamation for each pit	Construction and operations	PC, EC, GNWT
Sediment and Erosion Control	Limit sediment production and protect water quality, including pre-construction, construction, operations and closure monitoring.	All	PC, EC, GNWT
Road Construction and Maintenance	How the road will be built and maintained, including crossing structures, terrain hazards and dust	Construction and operations	PC, EC, DFO, GNWT
Blasting	Handling and use of explosives	Construction	PC, NRCan, DFO
Invasive Species	Control and monitoring	All	PC, GNWT
Road Operations	How the road will be used and use controlled and monitored	Operations	PC, GNWT
Waste	Collection and disposal of solid waste	All	PC, EC, GNWT
Wildlife Mitigation*	Operating procedures, monitoring and adaptation, including access and harvest tracking	All	PC, EC, GNWT
Contaminant Loading	Monitoring of particulates, soil and vegetation	Operations	PC, EC, GNWT
Aquatic Effects	Assess water quality (sediment) and/or occupancy (Funeral Creek) following significant release or spill	Construction and operations	PC, DFO
Road Closure and Reclamation	Temporary and permanent closure/reclamation	Operations and closure	PC, EC, GNWT

* Current name. Name may be changed and content modified (added to) to be consistent with the NWT Wildlife Act

PC = Parks Canada, EC = Environment and Climate Change Canada, DFO = Fisheries and Oceans Canada, NRCan = Natural Resources Canada, GNWT = Government of the NWT