APPENDIX B

TETRA TECH EBA

July 23, 2015

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FILE: ENVMIN03009-01
Via Email: david@canadianzinc.com

Canadian Zinc Corporation
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Attention: Dave Harpley

Subject: Response to Review Board Section 4.9 Comment on Canadian Zinc Developer's Assessment Report

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) is pleased to provide the following response to Section 4.9 of the Mackenzie Valley Review Board's May 2015 Adequacy Review (AR) comments on Canadian Zinc's Developer's Assessment Report (DAR), as requested.

Section 4.9 is requesting information regarding peak flows and erosion potential. Specifically, "*Additional information should be presented covering the regional data/methods used to generate the Q100 values, in-depth analysis of the 2006 and 2007 flood events and how these were used to inform/validate the Q100 estimates, and a discussion of uncertainty in the peak flow estimates. In addition, the developer will describe the erosion and sedimentation potential and channel stability more explicitly including what specific mitigations can be used*."

The basis for the Q100 estimates is the regional analysis approach described in Tetra Tech EBA's December 18, 2014 letter report, Stream Crossing Design Water Levels for Prairie Creek Mine Access Road. Design discharges were estimated on the basis of a regional hydrology analysis completed for the 2012 design assessment using Water Survey of Canada (WSC) peak flow data for Prairie Creek at Cadillac Mine (drainage area 495 km^2), Flat River near the Mouth (8560 km^2), and South Nahanni River above Virginia Falls (14500 km^2). A best fit trend line of drainage area to 100-year discharge was determined on the basis of these three stations and used to estimate 100-year discharges at the crossing locations. The trend line equation, with discharge (Q) in m^3/s and basin area (A) in km^2, is VQ100 = 1.888 * (A) ^ 0.751.

The methodology relied upon analysis of peak flow data published by the WSC. Peak flow data for 2006 and 2007 were recorded and reported by the WSC for the Flat River and South Nahanni River sites and were used in the analysis. The WSC gauge on Prairie Creek was not operational in these years and peak flow data were not available for use in the analysis.

Additional analysis of the regional streamflow data is presented in an NHC October 25, 2010 letter report which assessed streamflow trends in response to a review board request, and which is available from the Board's website. Figures 1 and 2 from that report are relevant to the discussion of available regional data, and are attached for reference.

Notably, the peak flow record for the Prairie Creek stream gauge includes a major flood in 1977 which is representative of a 100-year flood. Figure 2 of the streamflow trends report, with normalized peak flows for Prairie Creek, Flat River and South Nahanni River, shows that the 1977 normalized peak flow on Prairie Creek was by far the largest normalized flow for any of the three streams for all years of record. It was more than double the next highest peak flow for Prairie Creek and caused a significant upward shift of the high end of the flow frequency curve and raises the possibility that the flow frequency curve might be biased for high estimates.

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The exponent in the flow frequency curve equation, 0.75, is lower than the textbook value of 0.8 for preliminary estimates which is suggested by the National Research Council Canada publication "Hydrology of Floods in Canada; A Guide to Planning and Design" (by W.E. Watt, et al). The 0.75 exponent is sufficiently similar to the recommended preliminary value of 0.8 to serve as a reality check on the reasonableness of the equation. Also, for basins that are smaller than that for Prairie Creek (495 square kilometers), the equation yields flow estimates that are higher than would result from the preliminary value. In additional checks, it was found that the equation yielded 100-year flow estimates that were conservatively high compared to direct estimates for WSC gauges on smaller streams including Lened Creek above Little Nahanni River (34.3 km^2), Flat River at Cantung Camp (155 km^2) and Mac Creek near the Mouth (216 km^2). Overall, we are confident that the 100-year flow estimates are reasonable and may possibly be biased towards flows which are conservatively high for the smaller basins which account for the majority of the stream crossings.

Rivers are dynamic with channel shifting which is most pronounced on an episodic basis during major flood events. One of the best predictors of channel shifting potential is past channel movement which can be assessed by presence and age of woody vegetation, oxbow lakes and meander scars. Mitigation for channel movement includes route selection to avoid hazard areas, and then site specific measures when hazard areas cannot be avoided. Site specific measures can include bridges with armoured abutments and ample freeboard to withstand a major flood event, while accepting that localized roadbed inundation or washouts may occur across floodplain areas where repairs can be more easily completed.

2.0 CLOSURE

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

Respectfully submitted,
Tetra Tech EBA Inc.

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Attachments: Figure 1: Normalized Annual Mean Flow
Figure 2: Normalized Annual Maximum Daily Flow

FIGURES

Note: Figures reproduced from:
http://www.mvlwb.ca/Boards/mv/Registry/2008/MV2008L2-0002/Appendix%20M%20NHC%20analysis%20of%20streamflow%20trends%2025%20Oct%202010.pdf

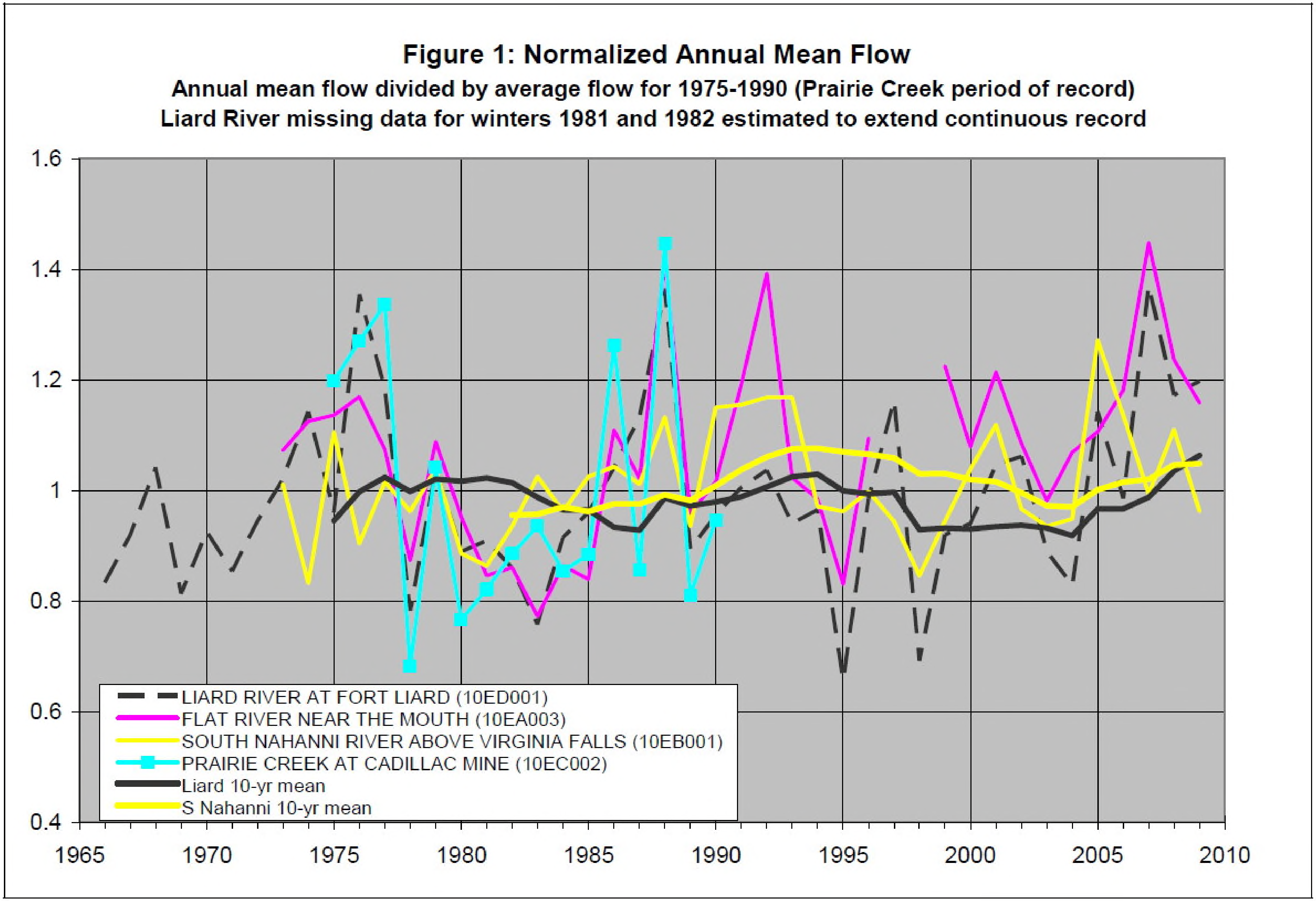
Figure 1: Normalized Annual Mean Flow
Annual mean flow divided by average flow for 1975-1990 (Prairie Creek period of record)
Liard River missing data for winters 1981 and 1982 estimated to extend continuous record
1.6
1.4
1.2
1
0.8
0.6
0.4
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
LIARD RIVER AT FORT LIARD (10ED001)
FLAT RIVER NEAR THE MOUTH (10EA003)
SOUTH NAHANNI RIVER ABOVE VIRGINIA FALLS (10EB001)
PRAIRIE CREEK AT CADILLAC MINE (10EC002)
Liard 10-yr mean
S Nahanni 10-yr mean

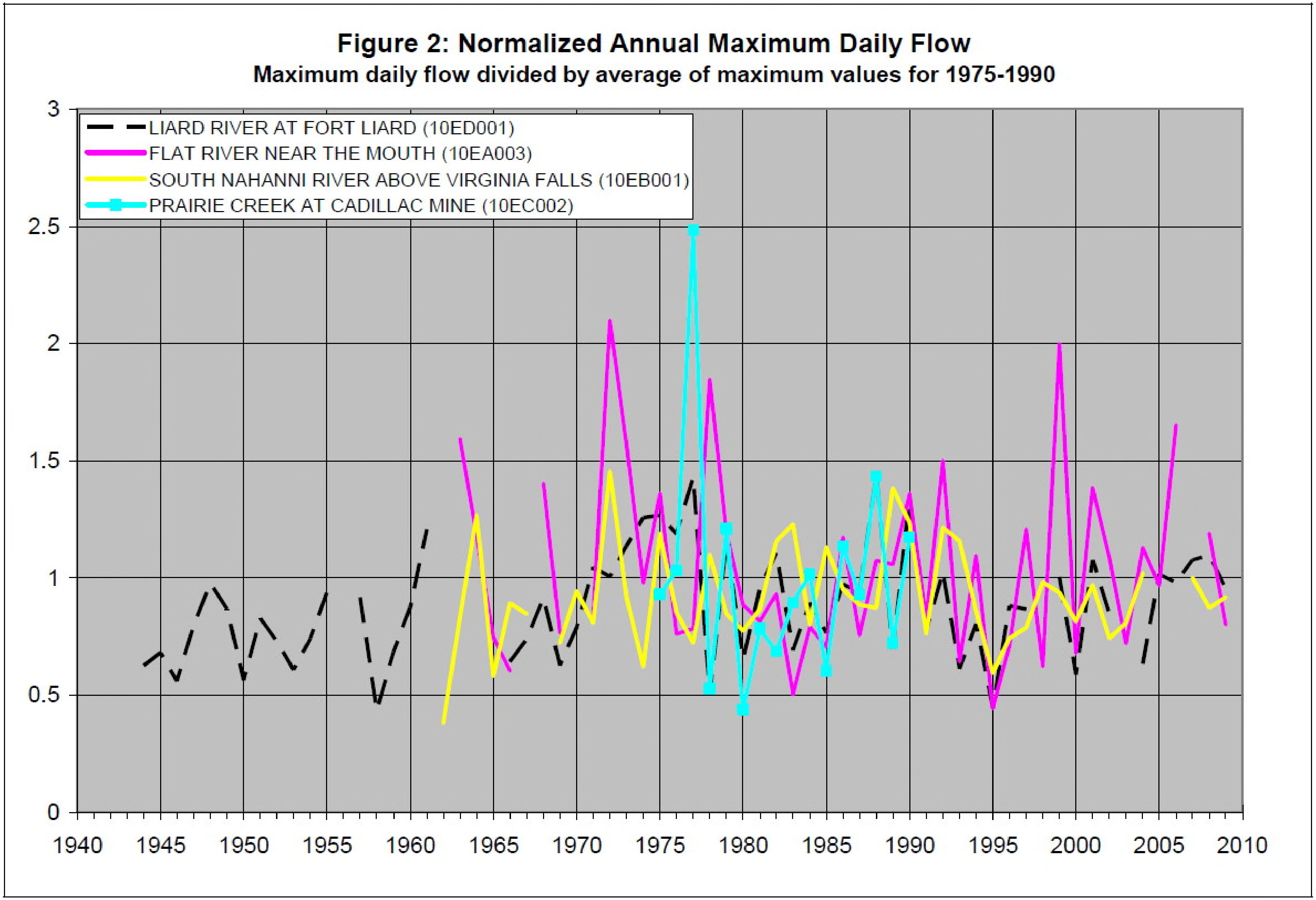
Figure 2: Normalized Annual Maximum Daily Flow
Maximum daily flow divided by average of maximum values for 1975-1990
LIARD RIVER AT FORT LIARD (10ED001)
FLAT RIVER NEAR THE MOUTH (10EA003)
SOUTH NAHANNI RIVER ABOVE VIRGINIA FALLS (10EB001)
PRAIRIE CREEK AT CADILLAC MINE (10EC002)
3
2.5
2
1.5
1
0.5
0
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010