Mackenzie Valley Review Board

July 23, 2010

Our file: EA0809-002

To: Distribution list

EA0809-002
Prairie Creek Mine, Canadian Zinc Corporation

Re: Instructions to the developer and parties on information requests

Information requests from parties to the developer

Canadian Zinc Corporation is asked to provide written responses to the information requests submitted by the following parties:

- Parks Canada
- Fisheries and Oceans Canada
- Environment Canada
- Indian and Northern Affairs Canada
- Natural Resources Canada
- Government of Northwest Territories
- Canadian Parks and Wilderness Society
- Transport Canada

The information requests submitted by the parties noted above are posted on the public registry.

Information requests from the Review Board to the developer

Canadian Zinc Corporation is asked to provide written responses to the attached information requests issued by the Review Board.

Developer responses to information requests

Developer responses to the information requests submitted by parties and issued by the Review Board respectively will be prepared and sent by Canadian Zinc Corporation to the Review Board. Canadian Zinc Corporation is asked to provide rational in the event that it cannot respond to a specific information request. Responses to information requests submitted by parties as well as responses to those issued by the Review Board will be placed on the public registry.

Information request to all parties including the developer:

The Review Board is aware that there may be agreements between the developer and parties, or between parties, on important issues that are not regulatory in nature and are outside the conditions of a permit or license. These agreements serve an important role in reducing adverse impacts of the development on valued environmental, social, economic and cultural components.

The Board is interested in gaining a better understanding of the nature and scope of these non-regulatory agreements. Information provided by parties on these agreements will assist the Board in determining whether all adverse impacts of the development on the environment, including social, economic and cultural values, have been addressed. While some agreements may be at a preliminary stage at this time, the Board will be better able to make a determination of the significance of adverse impacts if more is known about non-regulatory agreements.

The information request to all parties is as follows:

> Parties are asked to submit a brief description of the type and scope of any non-regulatory agreements between parties and the developer, or between parties, related to this environmental assessment.

The developer and parties are advised that the next scheduled meeting of the Review Board is during the week of August 16th, 2010.

Please forward your responses to the information requests to the Review Board by email to chubert@reviewboared.ca or by fax at (867) 766-7074.

Sincerely,

Chuck Hubert
Environmental Assessment Officer

IR Number: MVRB 1

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Waste Rock Pile - Stability Analyses
Appendix 11: Section 6.3 Discussion.
Appendix 11: Appendix D Slope Stability Analysis.

Preamble

Appendix 11 provided a preliminary design for the Waste Rock Pile, including the stability analyses for the rock pile. Figure 3 shows a typical section of the rock pile, and containment berm at the toe of the rock pile. Slope stability runs utilizing Slide software are presented in Appendix D of the Appendix 11 report.

Request

1 Did the stability analyses include cases for the end of the mine life, in which there will be additional surcharge load for cover materials to be placed on top of the rock pile? What thickness of cover material is assumed?

2 Did the stability analyses include cases for snow loads on top of the rock pile?

3 Was sensitivity analysis carried out to account for variation of water table within the rock stockpile, particularly for cases during the spring freshet where some of the water at the toe of the stock pile may still be frozen and create some back-up of water level behind the pile?

IR Number: MVRB 2

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Waste Rock Pile - Drainage and Seepage Collection Pond
Addendum Report: Figure 3.
Appendix 11: Section 6.5 Water Management.
Appendix A – Golder's 2008 Report (Conceptual Design).

Preamble

Figure 3 of Appendix 11, as well as the cross sections shown for the slope stability analyses in Appendix D of Appendix 11, showed that in the lower portion of the rock pile, the rock pile will be placed directly on top of the bedrock. It is assumed that this was intended to increase the stability of the rock pile. A liner will be placed for the containment berm, with no details on the upslope extent of this liner.

Request

1 It has been assumed that metal leaching may occur through the Waste Rock Pile. The lower portion of the Waste Rock Pile will be founded directly on bedrock (as shown in cross-section and in stability analyses). How tight is the bedrock in this area? Is water infiltration into the bedrock a concern as it will bypass the seepage collection pond? What volume of water is assumed to go into the seepage pond?

2 At the top of the Waste Rock Pile, the crest was sloped 1% to the north or upstream. Where does the drainage water eventually go from the north end of the rock pile?

3 The 2008 Conceptual Design Report (page 5) mentioned the design flows associated with spring snow melt/freshet. However, there is no follow-up provided in the Appendix 11 of the main Report (2010). These flows need to be determined to evaluate the impact if diversion ditches fail in the long term after the mine closure, and upstream runoff flows through rather than around the Waste Rock Pile.

4 Please provide further detail on how the capacity volume of the collection pond (6500 m3) is calculated, and what assumptions such as rainfall events, snowmelt, etc were used? Will the pond generally be empty most of the time during the mine operation?

IR Number: MVRB 3

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Dyke - Selection of Design Flood Level
Addendum Report: Appendix C.

Preamble

The Appendix C of the Addendum Report provides the historical background of the discussion related to the selection of the Design Flood Level. It contained some information from reports by Hay & Co, as well as excerpts taken from Ker Priestman and Associates' report (1980).

Appendix C of the Addendum report indicated that MVLWB approved the use of the Probable Maximum Flood (PMF) estimate presented by the Hay & Co. report in March 2004. In this report, it was assumed that the PMF value would be the same magnitude as the 1:10000 year flood. Past studies have shown, however, that the PMF is typically larger than the 1:10000 year flood by a certain margin. Judge and Zhou [Ref. 1] indicate that depending on the characteristics of the statistical distribution used, the PMF can be anywhere from 1.2 times to well over 2 times the 10,000 year flood estimate.

We agree that the development of a first principles PMF estimate can be quite involved. However, it is our opinion that it could be done if absolutely necessary – data availability would not preclude such an analysis. Such estimates have been prepared for other nearby areas in the Yukon, northern Alberta and northern BC.

Request

1 To follow along the discussion on the PMF estimate, other independent estimates of PMF potential could be considered for comparison with the current PMF estimate of 500 m3/s. For example, the Creagar diagram [Ref. 2] could be used, in combination with existing PMF estimates for other northern locations, to provide another estimate of this extreme flood potential. This would provide a better understanding between the magnitude of PMF value and the value obtained from the 1:10000 year flood. Were these additional estimates completed?

2 We note that while the approximate PMF value of 500 m3/s was accepted by MVLWB, there is still no decision on exactly what design flood to use for these dykes. The same Hay & Co. reports (dated March and July 2004) recommend that the dyke design crest elevations be based on a 1:200 year flood event with a minimum 0.5 m freeboard. It is our opinion that the Inflow Design Flood (IDF) for this dyke should be selected based on recommendations made within the 2007 Canadian Dam Association (CDA) guidelines.

These guidelines recommend selection of an IDF based on the overall hazard posed by the structure to the surrounding environment. The hazard is assessed based on overall potential for loss of life to occur in the event of overtopping and failure of the dyke, and also on the extent or magnitude of environmental damage/economic loss that might occur. Given that a portion of this dyke acts as a

containment barrier for the tailings (temporary) and process water storage pond and to contain the mine plants, it is expected that a review of the potential environmental damages would be important in selecting the hazard classification for this structure. Depending on the magnitude and nature of these damages, the IDF for the dyke design could range from 1:100 years up to PMF. We request additional information on the nature of the environmental damage that might occur in the event that the dyke is overtopped or alternatively breached, and then an appropriate IDF can be selected for this structure based on the 2007 CDA guidelines.

1. Zhou, R. D., C. R. Donnelly and D. G. Judge, 2008. "On the Relationship Between the 10,000 Year Flood and Probable Maximum Flood", Hatch Ltd., Paper presented at the HydroVision 2008 Conference, Sacramento, California.

2. Watt, W.E, Lathem, K.W., Neill, C.R., Richards, T.L. and J. Rousselle, "Hydrology of Floods in Canada: A Guide to Planning and Design", Natural Resources Canada (NRCAN), Ottawa, 1989.

IR Number: MVRB 4

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Dyke - Slope Protection
Main Report, Appendix 18A: Northwest Hydraulic Consultants (NHC) Memorandum (August 14, 2009). Main Report, Appendix 18B: Canadian Zinc Corporation Report on Repairs to Flood Protections (September, 2009).
Main Report, Appendix 18C: Golder's Report on Berm Repairs (March 2009).

Preamble

The reports by NHC (Appendix 18A), Golder (Appendix 18B and 18D), and CZN (Appendix 18C) provided detailed discussion and information regarding the riprap conditions along the flood dyke and adjacent to the Prairie Creek. Repairs work on the riprap materials along the slope was reported by Golder and CZN, following recommendations provided by NHC.

Request

1 For periodic monitoring and observations, it is important that the existing conditions along the slope of the flood protection dykes be defined, clarified, and properly documented. The annual reports and status report on the repair work in 2009 should include a site plan and stationing along the flood dyke (both the western portion which is part of the Water Storage Pond, and the eastern portion which is adjacent to the Mine Plant). Survey cross section along the dyke, extent and size of riprap placed along the slope should also be established along the specified Monitoring Stations. This information can be provided in a spreadsheet table, which can then be updated at the time a new inspection is carried out.

2 NHC Report (Appendix 18A) provided some information about the size of riprap for the slope protection (approximately 0.5 m). However, no information was provided regarding the design velocities in the creek that would dictate the rip rap size. The creek appears to be relatively steep and therefore will exhibit relatively high velocities and high shear stresses along the channel. Have the riprap sizes been calculated or determined to ensure that they are adequate for the design flood along the creek?

3 The NHC report indicates that it is suspected some rip rap damage occurred during passage of a flood event in 2005. It is noted that no estimate of the magnitude of the flood event was available. However, we understand that a video file exists that documents this event, as observed from the upstream part of the pond embankment berm. It may be possible to roughly determine peak water levels on the dyke at this location from the video file. Using these peak water levels, and comparing them to those determined using the backwater model which has been set up, it may be possible to roughly estimate the flow associated with this event, and the peak velocities to which the rip rap has been exposed (and failed). Please confirm that the above approach using the video file has been explored in order to gain a better understanding on the flood magnitude, and riprap issues along the Prairie Creek based on the historical flood event in 2005. If so, what was the maximum back-calculated velocity the riprap was exposed to in 2005?

IR Number: MVRB 5

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Dyke - Stability Analyses
Appendix 12: Appendix D Slope Stability Analysis Results.
Appendix 18A: Draft Report by NHC.

Preamble

Slope stability analyses, including the analyses utilizing a pseudo-static seismic coefficient were completed and reported for the portion of the dyke located on the western area of the flood dyke line (part of the Water Storage Pond, Appendix 12). The eastern portion of the flood protection dyke, which is adjacent to the mine plant was reported to have lower crest elevation in the NHC report (Appendix 18A, page 1, 2nd and 3rd paragraph).

Request

1 It appears that no analyses or discussion about the stability were provided for the portion of the dyke adjacent to the Mill Plant on the eastern area. Were these analyses carried out and reported in previous or different reports? If this is the case, reference needs to be made with respect to the stability analyses of the dyke along the Mine Plant.

2 What materials were used to build the dyke adjacent to the Mine plant? It is understood that the crest of this portion of the dyke is lower than the crest at the Water Storage Pond. Is the cross section similar to the one of the perimeter dyke for the Water Storage Pond?

IR Number: MVRB 6

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Tailings Paste Backfill – Scheduling and Utilization
Main Report: Section 6.12.1. Appendix 15A: Table 11

Preamble

If development waste is stored underground, Dense Media Separation Aggregates/Coarse Reject (DMSA) and Flotation Processed Tailings (FPT) usage for backfill will decrease. Table 11 shows backfill requirement according to the mine production, but it assumes that no development waste is stored underground. In the Main Report, Section 6.12.1 Waste Rock and DMS Rock, it was mentioned that some of the development waste rock may be left underground to avoid haulage to surface.

Request

1 The report says all flotation tailings and partially DMSA will be used for underground filling system, but mine production and paste backfill scheduling during all mine life and availability of the underground stopes for filling will be very critical to achieve this goal. Typical mining operations can use 50% to 60% of their mill tailings. Please elaborate on how to achieve the implementation of the Tailings Paste Backfill as proposed (i.e. all tailings will be used as paste backfill underground)

2 DMSA would typically decrease the flotation tailings amount required for placing the backfill mix underground. However, if development waste rock will remain underground, there is likely more DMSA to be left for surface deposition. Please confirm and provide details of whether the development waste rock will remain underground and whether this will affect the amount of paste backfill that can be stored underground.

3 Mine and paste backfill scheduling is critical throughout the entire mine life. Is mine storage capacity enough to eliminate future bottlenecks, as some development waste rock may be left underground? According to the mine development waste usage, what is the plan and how will this affect the backfilling operation and utilization of all tailings for paste backfill, if excessive tailings remain?

IR Number: MVRB 7

Source: Mackenzie Valley Review Board

To: Canadian Zinc Corporation

Subject: Tailings Paste Backfill - Water Bleed
Appendix 15A: Figures 2, 3 and 8.

Preamble

There are differences in moisture content for the slump between 2005 and 2009 samples (Golder Report, Figure 3). Slump vs. solids content is important to determine the water separation. The moisture retention test shows high water release (Figure 8).

Request

1 No discussion was provided with regards to the effect of groundwater quality if there is water bleed into the groundwater. What are the allowances or acceptance criteria for the water bleed from the backfilling into the mine groundwater?

2 The water bleed is approximately 15% for 7 in. slump and 20% for 10 in. slump (FTP 2005). However, for FTP 2009 samples, the water bleed is approximately 6% for 7 in. slump and 9% for 10 in. slump compared to FTP 2009 samples (Figure 2). Please explain and clarify the differences.

3 The concentrations of As, Cd, Pb, Hg analyses in tailings are of concern. Leach tests on mixtures of paste + cement show concentrations in leachate of Cd, Hg, Pb close to, or exceeding, Water Quality limits. For this reason, high bleed rates would result in an environmental risk of groundwater contamination. Risk would be higher above the water table where groundwater may be moving and thus promote more dispersal of bleed water. Please provide clarification on the bleed rates, and how it may affect the ground water quality.