Indian and Northern Affairs Canada
Affaires indiennes et du Nord Canada

Environment & Conservation
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July 2, 2010

MVEIRB File Number: EA0809-002
Chuck Hubert
Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
P.O. BOX 938
YELLOWKNIFE NT X1A 2N7

BY EMAIL: chubert@reviewboard.ca

Re: Canadian Zinc Prairie Creek Environmental Assessment First Round Information Requests

Dear Mr. Hubert:

Indian and Northern Affairs Canada (INAC) is providing the following information requests (IR) for the Canadian Zinc Prairie Creek Mine Environmental Assessment with regard to water and water management. Where there was an opportunity to cross-reference INAC information requests with information requests from other government agencies we have noted this in the body of the IR.

Thank you for the opportunity to provide information requests for the Canadian Zinc Prairie Creek Mine Environmental Assessment. If you have any questions about this request, please contact Krystal Thompson at 669-2595 or via email at krystal.thompson@inac-ainc.gc.ca.

Yours sincerely,

Helene Harper
A/Director, Renewable Resources and Environment

cc. INAC EA Working Group

IR: INAC01

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited

Subject: Water – Hydrology – Groundwater

Preamble: The issue of ground water interaction between the Main Quartz Vein (MQV), Harrison Creek Alluvial Aquifer (HCAA) and the Prairie Creek Alluvial Aquifer (PCAA) essentially affects every aspect of the water management of the site, specifically, storage capacity of the Water Storage Pond (WSP), metal and ion loads (water quality), water level of the surface creeks, and the calculation of the water quality parameters. As such, it is critically important to understand the potential variability in the predicted volume of mine water. Unfortunately, it is not realistic to determine the actual flow rate of the mine until it has been mined. In order to deal with this situation the hydrogeology report (Appendix 1) provides 'low flow scenarios' and 'high flow scenarios'. These different scenarios are models that are generally meant to give an idea of the range of flows that can be expected. The hydrogeology report states that 'Significant uncertainty remains about the effective transmissivity of the vein fault (MQV)' (p- e-2) and 'No current information on the hydraulic properties of the vein fault extending beyond immediate limits of the MQV'. Using the different flow rate scenarios (low and high) the predicted flow rates from the mine towards the end of mine life were calculated to range from 2,500 m3/ day (29 L/s) for low flow to 18,000 m3/day (200 L/s) for the high flow scenario (hydrogeology report p-34).

Request:

1. Since Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited provided low and high flow rates, what is the most likely average annual flow rate?
2. What is the level of certainty surrounding the low, high and average annual flow rate (ie. percentage above or below expected)?

IR: INAC02

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited

Subject: Water – Hydrology – Groundwater

Preamble: Section 6.16.2 (DAR p-211) states that 'They [Robertson Geotechnical Consulting] conclude that inflows of up to 100 L/sec as an annual average (8,640 m^3/day) are possible. Therefore, CZN has developed a water management plan for this flow, with contingencies should a greater flow occur.' However, the water balance model (DAR Figure 6-18) indicates a mine flow of 50L/s (annual average flow).

The use of annual average flow when determining water balance does not account for periods of high flow. Certain times of the year are likely to have much higher flows. The capacity of the Water Storage Pond is 220,000 m^3 (pers. Comm. David Harpley). Using the flows provided in the hydrogeology report (see preamble INAC01) of 200 L/s (18,000 m3/day) to represent higher flows, the Water Storage Pond would have capacity for just over 12 days, assuming the Water Storage Pond is empty. The fact that the highest flows will likely come in the spring when the Water Storage Pond is not empty is a reason for concern. (See Parks_Canada_40 and Parks_Canada_41, as well.)

Request:

1. Demonstrate that the Water Storage Pond has the capacity to deal with periods of high flow.
2. Alternatively, demonstrate that the Water Treatment Plant capacity would be sufficient to effectively treat the high flow scenario, including providing calculations that demonstrate plant capacity to accommodate high flow scenarios.

IR: INAC03

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited

Subject: Water – Hydrology – Groundwater

Preamble: The hydrogeology report highlights the hydrological connection between the MQV, Harrison Creek Alluvial Aquifer (HCAA) and the Prairie Creek Alluvial Aquifer (PCAA). Although there is some uncertainty about the volumes concerned, it is clear that dewatering of the mine working (particularly at depth) will create a drawdown cone of influence around the mine workings. This cone of influence will draw down the water in the HCAA. The hydrogeology report also points out that the HCAA recharges the PCAA in the mine area.

Site water quality objectives consider the seasonal variation in flow rates to determine the in stream flow concentrations within Prairie Creek.

Request:

1. What will be the predicted effect of mine dewatering on the HCAA and the PCAA?
2. Provide calculations to demonstrate if there is the possibility of reduced flows in Harrison Creek and Prairie Creek?
3. Provide details for the calculation of the in stream flow concentrations should flows be reduced?
4. Demonstrate that flow rates would not be reduced from the dewatering of the HCAA such that it affects the ability of Prairie creek to handle effluent discharge?

IR: INAC04

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Groundwater/water quality

Preamble: One of the potential sources of contaminants to the aquifers is loss or seepage through the mine and ditch system itself. In order to reduce this input CanZinc should use insulated heat trace piping along the existing ditch system to minimize seepage/leakage of the ditch system.

Request:

1. Provide details for how leakage from the mine and ditch system into the groundwater will be minimized?

IR: INAC05

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Hydrology – Groundwater

Preamble: The mine footprint is on the Prairie Creek Alluvial Aquifer (PCAA). The aquifer in this area is very shallow. The Water Storage Pond (WSP) and catchment pond have been dug into the aquifer thereby connecting them hydrologically to Prairie Creek. It is critical that water does not seep through the proposed liner into the ground water and ultimately enter Prairie Creek. As a solution to this problem CanZinc has proposed to place liners in both the WSP and the catchment pond. The liners should be built in a way that will allow for them to be monitored should a leak(s) develop (potentially an instrumented double liner with sand between the layers).

Request

1. If a leak was to develop, the pond would presumably have to be drained. How would this be done?
2. What is the estimated time to order replacement parts and make the repair?
3. How would the mine and process water be managed during this time?

IR: INAC06

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Water Quality – Water Quality Objectives

Preamble: Section 8.6.1 (DAR p-272) states that 'It is clear from the modelling that a simple list of parameter concentrations that site discharge should not exceed will not be practical because of the seasonally large range of fluctuation in creek flows. To provide the greatest capacity for site discharge, and still minimize receiving water parameter concentrations, a different regulatory approach will be required.'

The purpose of water quality criteria is to be protective of the environment. Therefore a water quality objective is calculated to determine the concentration at which the aquatic environment will not be significantly impacted. That concentration is then back calculated to provide the water quality criteria which must be met at the end of pipe (last point of control). This is the concentration which has been determined to be acceptable to not cause significant impacts to the environment. If levels exceed the Water Quality Objectives then it is considered to cause significant impact and cannot be released into the environment.

The capacity of Prairie Creek to meet these levels may change seasonally. Prairie Creek may be able to accept more treated effluent in the spring and summer and still meet the Water Quality Objectives. The volume of discharge will change seasonally, but the concentration of the effluent at the end of pipe will remain the same. If the concentration of the effluent at the end of pipe cannot be met then it is either a capacity or a treatment issue.

Request:

1. Provide greater detail on the discharge plan.
2. Outline in detail the type of changes to the regulatory approach Canadian Zinc sees being required.

IR: INAC07

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited

Subject: Water – Water Quality – Surface Water

Preamble: Appendix 1 Hydrogeology Report (p-21); 'Water samples collected from the flooded decline indicate that ground water contains no detectable levels of dissolved Zinc, but higher concentrations of Fe, SO_4, alkalinity and major cations than ground water from other sections of the bedrock aquifer.'

Appendix 3 p ii; 'Elevated metals may result as indicated by laboratory results described herein. Parameters of particular note include SO_4, As, Sb, Cd, Pb and Zn, and to a lesser extent also Cu, Se, Hg and Ag.'

The site specific water quality guideline report does a good job defining the water quality guidelines (WQG) for the presumed metals of concern in the mine water. There are a number of additional parameters, including some non-metals that will likely increase due to mining practices such as blasting and processing. The concentrations of Fe, As, Sb, Ag, SO_4, alkalinity, phosphorous, ammonia (nitrates) have the potential to increase. The proponent has not provided site specific WQGs for the additional constituents. (See also Parks_Canada_45.)

Request:

1. Site specific guidelines should be calculated for parameters such as but not limited to; Fe, As, Sb, Ag, SO_4, ammonia, nitrate, nitrite, and phosphorous. This should include a calculation of their expected in stream concentrations.
2. Describe how each of these parameters will be addressed/mitigated should they rise above guideline levels?

IR: INAC08

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Water Quality – In stream

Preamble: The Development of Site Specific Water Quality Guidelines for Prairie Creek Report (SSWQGR) Table 4 lists the expected in stream concentrations of metals. The concentrations are based on the mean monthly average over a 16 year period. The values listed in the table are below the calculated site specific guidelines, however there is little margin for error as the numbers are very close. Long term minor changes in flow, such as draught or draw down of the aquifer(s) could potentially effect the in stream concentrations. The 16 year average is unlikely to represent the actual flows throughout the mine life. Selecting the lower flow years would better represent a more conservative approach. The flow rates should not be calculated with the mean values.

Request:

1. Provide information for the in stream concentrations of metals using an accepted estimate of probable low flow? (Also see Parks_Canada_46(1).)

IR: INAC09

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Water Quality – Water Treatment

Preamble: Section 8.3 Table 8-5 (DAR) lists the predicted water quality parameters for both treated mine and process water. Many of the parameters of interest are above CCME guidelines after treatment.

Parameter	Treated Mine Water	Treated Process Water	CCME
Arsenic	0.0028	0.0018	0.005
Cadmium	0.00001	0.0262	0.000017
Lead	<0.0002	0.0932	0.007
Phosphorous	0.17	0.721	0.004
Zinc	0.017	0.039	0.030

*Units were not mentioned in Table 8.5 but appear to be in mg/l.

Cadmium, lead and zinc are addressed in the Site-Specific Guidelines Report. Curiously, mercury and nitrate are missing from Table 8.5. The treated concentration of mercury is not listed in Table 8.5, but an in stream concentration is listed for mercury in Appendix 7 Table 4. Appendix 2 Table 6-7 lists tailings water quality from metallurgical testing. The table lists total mercury at 0.069-0.183 mg/l and dissolved mercury at 0.47-0.62 mg/l. These numbers are very high. The CCME guideline for inorganic mercury is 0.000026 mg/l and methyl mercury is 0.000004 mg/l. (See also Parks_Canada_33.)

Request:

1. How was the estimated in stream concentration for mercury calculated if there is no value for treated concentration?
2. What will the mercury concentration after treatment be for both mine and process water?
3. Provide assurances that mercury will not pose a long term water quality issue?

IR: INAC10

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated

Subject: Water – Water Quality – Nutrification

Preamble: Nitrogen (ammonia, nitrate, and nitrite) is a major by product of blasting residues. It is also a nutrient in aquatic systems. At higher concentrations, and in certain forms, it can be toxic. Phosphorous, another major nutrient, will be present in the process and mine water (DAR Table 8.5). Prairie Creek has been defined as a pristine low nutrient system. As such, the addition of nutrients is of concern. When discussing nutrient additions into an aquatic system it is important to consider nitrogen's relationship with Dissolved Oxygen (DO). Generally, as nutrient levels increase biological activity increases, this growth and decomposition consumes oxygen (O_2). Low DO conditions can impact fish and other aquatic organisms. (See also Parks_Canada_34.)

Request:

1. What will the in stream concentrations of nitrogen and phosphorous be entering the system?
2. What impact will the nutrient concentrations have on the aquatic system from both a nutrient and toxin perspective? Provide these calculations using expected worst case conditions of low flow and low DO.

IR: INAC11

Source: Indian and Northern Affairs – Water Resources Division

To: Canadian Zinc Incorporated/Robertson Geotechnical Consulting Limited

Subject: Water – Hydrology – Groundwater

Preamble: The Environmental Assessment is in place to determine the potential significance of a Project. The DAR in general and Section 8 in particular, does not really address significance in a systematic way. As the EA moves forward a framework for significance should be discussed.

Request: Provide a framework outlining how the different levels of significance will be determined (ie. negligible, low, medium, and high). The outline should include Magnitude, Duration and Geographic extent.