Parent Company of Canadian Zinc

Memorandum

To: MVLWB **Pages:** 4

Date: August 21, 2021

Re: Water Storage and Discharge Adaptive Management, MV2021L2-0004

In their comments on the application, the GNWT requested a decision tree with triggers and adaptive management in relation to the sources of water to Cells A and B of the Water Storage Pond (WSP), and to discharge to the environment (GNWT comment #'s 45, 54 and 55). The text below provides the rationale and details for a decision tree.

OPERATIONS

The sources to Cells A and B of the WSP do not need triggers or adaptation individually as it is the overall water balance of the cells that matter. The flows and water quality of the sources do need to be monitored. The exception re adaptation is if Cell A is accumulating water such that the maximum water level will be exceeded.

Cell A

A water quality trigger isn't necessary because the Mill is not sensitive to the quality of reclaim water.

The minimum operating water level is 876 m for stability (pond base 870 m), maximum 881 m. For residence time, a minimum operating level of 877 m has been assumed.

The first trigger is if the cell water level drops to 877 m, more waste water will need to be directed to the cell. Assuming sewage treatment effluent, contact mine water and WRP seepage is already being directed to the cell, a portion or all of Camp Ditch water can be directed to the cell to maintain level. If this is insufficient, a portion of non-contact mine water can be redirected.

The optimum operating water level for residence time and to maintain contingency storage capacity is 880 m. If the water level reaches 880.3 m, this will trigger a review of Mill feed (reclaim) and Mill effluent volumes. The Mill balance assumes a rate of Cell A reclaim for gland water. If Mill staff are substituting this with Cell B water, then cell outflows will be less than estimated and the water level will rise. If the water level reaches 880.5 m, then waste water input must be reduced. This will be done by redirecting a portion or all of one or more waste water streams to Cell B. Which stream is redirected will depend on the water quality of the stream. At present, the most likely and preferred candidate is WRP seepage. This is because metal concentrations are expected to be low relative to contact mine water (and in any event could be corrected for discharge by water treatment), and blasting residues should also be low.

Cell B

Cell Capacity

The minimum water level will be 874 m. The cell will accumulate water in winter when flows in the creek limit discharge, and lose water in summer when creek flows are higher. The high creek flow months are May-September, and thus these are also the main cell outflow months. Starting in May, discharge will be maximized in order to lower the cell water level to the minimum (note, there is excess discharge capacity in most summer months). Once this level is attained, discharge will continue to maintain the water level at the minimum level until creek flows are such that discharge has to be limited to what the creek can absorb. Based on the most conservative projections (65 L/s annual average non-contact mine water flows, driest winter on record), the cell water level will never approach the 881 m maximum. As a contingency, in the unlikely event that the pond level reaches the 881 m maximum, non-contact mine water can be temporarily diverted to Cell A. Note that the cells will have a crest elevation of 882 m to provide a 1 m freeboard. In an extreme situation, part of the freeboard of both cells could be used temporarily. Ultimately, in the highly unlikely event of all water storage capacity being utilized, the groundwater interception pumps underground can be temporarily turned off, stopping the production of non-contact mine water.

Cell Discharge

The final effluent will consist of Cell B reclaim, with and without water treatment, plus seasonally, Mill Ditch water flowing through the Catchment Pond. The volume of final effluent that can be discharged, the allowable discharge volume (ADV), will be computed based on the flow in the creek (as determined by the real-time flow estimation protocol) and the creek to effluent flow ratio listed in the Water Licence. The volume of final effluent, effluent discharge volume (EDV), will be measured by summing the flow measurements on the individual streams using calibrated flow meters, with the assumed flows accounting for flow measurement error. EDV will be set at less than or equal to 95% of ADV. The volume of effluent discharged will be controlled by adjusting the release from Cell B.

The quality of final effluent will also be computed using the volume and quality of the individual streams. The parameter aggregates from the computations will be compared to EQC. The comparisons will dictate what proportion of Cell B water is sent to the water treatment plant (WTP) in order for the final effluent to meet EQC. Acceptable parameter aggregate values will be set at less than or equal to 95% of the EQC maximum average concentrations.

Calculation and Control

It is anticipated that the above noted calculations will be automated by use of a Supervisory Control and Data Acquisition (SCADA) system, with flow data input automatically and effluent stream water quality data input based on sample results.

Effluent flows will be measured continuously using electromagnetic flow meters. Continuous instantaneous flow readings will be measured and transmitted to a programmable logic controller (PLC) system and then displayed and recorded at the operator's SCADA system. From the operator station, the operator will have access to the instantaneous flow measurements. The SCADA system will also calculate and record the cumulative daily flow treated and a running total on the cumulative flow treated for the month and for the year. From the SCADA system, the operator will also be able to generate graphs showing the trends of flows over time, as well as cumulative daily, monthly and yearly volumes of water discharged to the environment.

Water level measurement of Prairie Creek will be measured continuously upstream at the WSC station. The measurement will be sent to the SCADA system for monitoring and recording, and the system will convert the water level into a flow volume based on the flow protocol. The instantaneous flow will be displayed on the operator screen. The system will calculate and record the cumulative daily flow and a running total on the cumulative flow for the month and for the year. The SCADA system will also be used to calculate the daily effluent quality discharging to the environment. The assessment will be based on analytical results.

The function of a SCADA system is to monitor, operate and control the WTP remotely from the Operator control station and also from other remote locations. Modern SCADA systems can send an alarm signal to a pager or even send SMS text to a cell phone that the operator will have on him/her at all times. Once an alarm level is activated, the operator can review the operating condition and decide if the flow should be reduced. The operation and monitoring of the WTP will be fully automated. The WTP control system will also be programmed with alarms to warn the operator when a parameter in effluent is outside of the normal range.

CLOSURE

Data collection and reassessment of post-closure water quality will be completed during operations. It is expected that metal release from the backfilled mine will be less than pre-mine. This is based on the removal of mineralized source material, and reduction of the hydraulic conductivity of the flow path since the majority of the mineralized fracture zone, which is the primary flow conduit, will be removed and replaced with backfill with a low hydraulic conductivity.

Data on seepage from the WRP during operations will greatly inform closure requirements. We expect that monitoring data will confirm that pre-mine source term predictions are conservative. Monitoring data will assist in the design of a suitable soil cover to limit infiltration post-closure. We anticipate that the waste rock will continue to weather and break-down, further limiting infiltration. We observe that the waste rock piles below the 930 and 970 level portals appear to have weathered and self-sealed, with no evidence of runoff channels or seepage, and no indications of significant contaminant release to Harrison Creek.

Post-closure water quality in Prairie Creek is expected to meet all WQO. As a contingency for the initial post-closure period when the risk of significant metal release is at its highest, a pump-and-treat scheme has been proposed for the backfilled mine, and seepage collection from the WRP can be included. Depending on the results of updated predictions during operations, the pump and treat scheme will be installed prior to closure, or not, and will continue until such time as sufficient confidence exists that WQO will be met without intervention.