ENVIRONMENT CANADA'S

SUBMISSION TO THE

MACKENZIE VALLEY ENVIRONMENTAL IMPACT REVIEW BOARD

FOR THE PUBLIC HEARINGS ON THE

PRAIRIE CREEK MINE PROJECT

DEVELOPERS ASSESSMENT REPORT

SUBMITTED BY CANADIAN ZINC CORP. APRIL 2010

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NON-TECHNICAL EXECUTIVE SUMMARY

Environment Canada (EC) is a science-based Department whose business is to help Canadians live and prosper in an environment that needs to be conserved and protected. Contributing to making sustainable development a reality in Canada's North is a priority for EC. The Department focuses on provision of scientific expertise for use in decisions on developments, so that all parties working together can ensure there is minimal impact on the natural environment, and ecosystem integrity is maintained and protected.

Environment Canada staff have reviewed Canadian Zinc Corporation's (CZN) project and documentation submitted for the environmental assessment. EC's submission focuses on issues that fall within our mandated responsibilities for aquatic quality and water management, contaminants management, air quality, migratory birds, and species at risk. Comments and recommendations have been provided on the following topics:

Water and Effluent:
There have been discussions of appropriate receiving environment objectives, and the Proponent has proposed Site Specific Water Quality Objectives (SSWQO). Further thought is needed on the degree of change that is acceptable, and recommendations have been made around monitoring and analytical work required.
Effluent quality has been modeled by CZN, based on estimated process water quality, minewater quality and various flow levels, with contributions from runoff and camp wastewater. Careful management of discharges is proposed to maintain receiving environment SSWQO, and would involve real-time measurement of flows as well as effluent and creek water quality.
Nutrient releases have the potential to cause further enrichment of Prairie Creek. Phosphorus and nitrogen releases should be minimized and monitored, with early management response linked to changes in the environment.
Toxicity testing has identified that there should be no acute toxicity associated with effluent if the appropriate ratio of minewater to treated process water is maintained. There will be chronic toxicity in the mixing zone, and monitoring should be done to ensure that it does not extend outside this area, during operations.
The aquatic effects monitoring program has not been sufficiently developed, and should be designed in accordance with the INAC Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT. Results will need to be tied in to an adaptive management plan.

Contaminants Management
EC recommends that CZN develop a contaminant loading management plan in consultation with EC and the GNWT. This would include elements of identifying sources, mitigating, monitoring and reporting. In addition, EC recommends secondary containment be used for concentrate shipment, as a mitigation measure against spillage or escape.
CZN will be using approved incineration technology, and EC recommends that an incineration management plan be developed which is based on current technical guidance.

Air Quality
Air quality issues are addressed in the Proponent's commitments, specifically to develop the Monitoring Program and Mitigation and Adaptive Strategies (MPMAS). To ensure

that this commitment is realized, EC requests that the Board include the development and implementation of the MPMAS as a Board measure.

Migratory Birds and Species at Risk

CZN has identified that the Water Storage Pond (WSP) will contain concentrations of arsenic, lead and mercury that may exceed CCME water quality guidelines for livestock. Waterfowl are known to use the WSP in the spring and summer. To minimize the risk of bird exposure to contaminants, EC recommends that CZN implement measures to deter waterfowl and other waterbirds from using the WSP, and to monitor the efficacy of deterrent measures.

Eleven (11) Species at Risk may be encountered in the project area. EC recommends that avoidance of contact with or disturbance of each species should be the primary mitigation measure. CZN should work with Parks Canada and the GNWT-ENR to identify appropriate mitigation and monitoring to minimize impacts to species at risk under their management.

Vegetation clearing for the access road and the waste rock storage area has the potential to damage, destroy or disturb the nests and eggs of migratory birds. EC recommends that any vegetation clearing required for the project be conducted outside of the migratory bird breeding period, either before May 7 or after August 10. CZN should verify for the presence of nests before commencing summer maintenance on upper portions of the access road. If active nests are found, the area should be avoided until nesting is complete.

CZN has identified waste management procedures to reduce the attraction of predators and scavengers to project facilities and measures to deter wildlife from denning under buildings and stairs. EC recommends that these measures be implemented to prevent wildlife from gaining access to liquid and solid wastes, and petroleum products. Additionally, all structures should be designed to preclude nesting and roosting sites for avian predators (including ravens). Orientation for project personnel on appropriate waste management practices and regular monitoring of project facilities for signs of wildlife presence should be also implemented.

SECTION 1.0: INTRODUCTION

Contributing to the realization of sustainable development in Canada's North is a priority for Environment Canada (EC). The Department focuses on the provision of scientific expertise for incorporation into decisions on developments, such that all parties working together can ensure that there is minimal impact on the natural environment, and that ecosystem integrity is maintained and preserved. Toward these goals, the Department has reviewed the Canadian Zinc Corp. (CZN) Developer's Assessment Report (DAR) and supporting documents for the proposed Prairie Creek Mine Project that have been provided to the Mackenzie Valley Environmental Impact Review Board (MVEIRB).

Environment Canada's review focused on aspects that fall within EC's mandated responsibilities in the following areas: environmental effects on or related to aquatic quality and water management, migratory birds, species at risk, contaminants management, and emergency response planning.

Environment Canada would like to thank the MVEIRB for the opportunity to comment on the Prairie Creek Mine Project, and we hope that these technical comments and recommendations are useful to the Board in their decision-making process. Should there be any new information brought forward at the hearings, Environment Canada respectfully requests the opportunity to submit additional written comments after the public hearings.

The document is divided into four main sections. Section One provides an overview of EC's mandate and regulatory responsibilities. Section Two provides an overview of the Project and the environmental assessment process to date. Section Three provides EC's technical comments and recommendations to the proponent in response to the DAR and supporting documents. Finally, a summary of the submission's recommendations is provided in Section Four.

1.1 Mandate of Environment Canada

The general mandate of EC is defined by the *Department of the Environment Act* and the legislation assigned to it by Parliament through the Minister. In delivering this mandate, the Department is also responsible for the development and implementation of policies, guidelines, codes of practice, federal, territorial, and international agreements, and related programs. The overall objective is to foster harmony between society and the environment for the economic, social and cultural benefit of present and future generations of Canadians. The Department shares this goal with other federal agencies, provinces, territories and First Nations. Environment Canada is also responsible for providing specialist or expert information and knowledge to federal government agencies and Boards and for the preservation and enhancement of environmental quality.

1.2 Regulatory Responsibilities

Environment Canada is participating in the review of the proposed Prairie Creek Mine Project in order to provide specialist expertise, information and knowledge to the MVEIRB. Environment Canada will not be issuing permits or authorizations for the

proposed Project, but has regulatory duties and responsibilities under the legislation outlined below.

1.3 Relevant Legislation, Regulations, Policies and Guidelines

The following relevant legislation administered or adhered to by EC influenced the content of this submission: *Department of the Environment Act*, *Canadian Environmental Assessment Act*, *Canadian Environmental Protection Act, 1999*, *Fisheries Act* – Pollution Prevention Provisions, *Migratory Birds Convention Act* and *Migratory Bird Regulations*, and the *Species at Risk Act*. Various regulations, policies and guidelines stem from these legislations. Details regarding the legislation, regulations, policies and guidelines are provided in Appendix A.

SECTION 2.0: BACKGROUND

Canadian Zinc Corporation (CZN) is proposing to commission and operate the Prairie Creek Mine located in the Nahanni National Park region of the NWT. The proposed project involves underground mining of base metal deposits at a rate of 600 to 1200 tonnes of ore per day. Lead and zinc will be concentrated in the mill, and shipped out via winter road. Tailings will be stored on surface until underground capacity is available, then will be disposed of as paste backfill in mined-out areas. Waste rock will be disposed of in a small valley west of Harrison Creek, with a portion going underground. Water management will entail storage and treatment of mine water and process water, as well as site runoff and camp wastewater. Approximately 110 people will be on site during operations.

This submission takes into consideration all of the documents submitted with the DAR, as well as the IR responses up until May 22nd. Should new or additional relevant information be brought forward by the proponent or be identified during the final public hearings, this submission will be re-examined. Within the context of the additional information, any changes in EC's recommendations and position will be brought to the attention of the MVEIRB and the proponent.

SECTION 3.0: TECHNICAL COMMENTS

Preface:
While several of EC's concerns regarding the project have been addressed during the technical meetings, ensuing discussions, and information requests leading up to the hearings, a number of outstanding issues remain. We note that the proponent was very responsive with providing information throughout the process, but that our review has been hampered by the lack of time to review recent information and to consider all the ramifications of changes to the project on previously assessed aspects. Environment Canada will continue to review the underlying data and assumptions and may find these alter the contents of this submission.

Environment Canada's overarching concern is with the complexity of the project, and the need for activities to go as planned in order for the management activities and proposed mitigation to be effective and protective. The proponent has provided contingency plans

(Table 1, May 6th, 2011) which cover potential situations arising with respect to water quality, discharge issues, treatment plant malfunctions, and water storage limitations. Canadian Zinc Corporation has committed to stopping the Mill as a bottom-line contingency against having water storage capacity issues. EC has flagged the lack of water storage capacity redundancy as a vulnerability in the project plans, and feels that there are elements of uncertainty in predictions and assumptions used to quantify potential effects. Cumulatively, these may be significant. The proponent has taken steps to address these uncertainties by building in conservatism with the use of assumptions and worst-case scenarios. CZN also acknowledges that modeling overstates process water contributions in extreme mine water simulations, and overstates concentrations of contaminants. Other project aspects may not have this degree of "erring on the side of caution" built in. EC has concerns with the disposal of tailings, and the capacity for paste backfill disposal for the full mine life.

With any project, there is the tendency for the unpredicted to arise, and this is where we see potential for impacts. EC respectfully turns to the Board to assess robustness of the project and to determine significance of potential impacts.

Section 3.1: Water and Effluent

Issue 3.1.1: Receiving Environment Objectives

Reference(s):
DAR Appendix 5
Round 2 IRs Appendix D
May 6th Progress Report - Commitments from Apr. 12 Technical Meeting:

- Appendix C, Water Balance, Water Quality and Regulatory Proposals;
- Appendix D, Table 1;
- Appendix F Predictions of Prairie Creek Water Quality (Memo 3) Table 4

Bowman, M,. Spencer, P, Dube, M, and D. West. 2009. Regional reference variation provides ecologically meaningful protection criteria for Northern world heritage site. Int. Env. Assess. Mgmt. 6:12-27.

Halliwell, D and S. Catto. 2003. How and why is aquatic quality changing at Nahanni National Park Reserve, NWT, Canada? Env. Mon. Assess. 88:243-281.

Parker, B.R., Levesque, L.M., Gue, A., Perry, L., Dessouki, T., Halliwell, D., and Haggarty, D.R. Nahanni National Park Reserve Water Quality Status and Trends. Environment Canada and Parks Canada, March 2010.

Proponent's Conclusion:

Site-specific water quality objectives (SSWQO) for Prairie Creek have been identified by a combined approach of using Canadian Council of Ministers for the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life (or comparable toxicity-based guidelines from other jurisdictions) or use of Reference Condition Approach (RCA) concentrations derived by taking the mean +2 Standard Deviations (SD) or the 90th percentile of baseline concentrations.

CZN proposes to meet receiving environment objectives at a point 100 m downstream of the discharge, to allow sampling at a point where the creek narrows. The Initial Dilution

Zone (IDZ) for vertical mixing would range from 1.6 to 30.6 m downstream of the discharge, depending on input flows. Effluent is substantially fully mixed at the point of vertical mixing, with approximately 2% further mixing occurring as transverse mixing. Appendix C (page 9) notes that vertically mixed concentrations are only marginally higher than totally mixed concentrations, and the difference may be within the range of analytical variability. Therefore, the initial dilution zone (IDZ) for effluent discharge is considered to be effectively defined by the distance range of vertical mixing. Table 3 of Appendix F provides estimated percentages of effluent in the stream at complete vertical mixing, and these range from 0.37% to 7.3% for the Best Mine-water Estimate scenario under different stream flow conditions.

Table 4 of Appendix F presents concentrations of parameters of concern in the stream just outside the IDZ, under each of the four mine water flow conditions, and compares the predicted concentrations to the SSWQOs. Objectives were exceeded in the extreme mine water flow situation, and CZN feels this is an artifact of the modeling inputs whereby extreme mine flow is based on poorer quality of water than would be expected.

In a follow-up letter to the Board dated May 22nd, CZN proposes the use of a load-based approach to effluent discharge during periods of low flow. Table 63 (May 22, 2011) presents the highest concentrations of parameters in blended discharge, for the scenario where there is reduced treated process water discharged during low flows (December to April). Table 68 of the May 22nd Addendum to Appendix C shows what allowable loads would be if edge-of-IDZ objectives were to be met at varying flow levels.

Tables comparing water quality at Harrison Creek to that at the Park boundary show marginal decreases in concentrations of analytes of concern between the two locations, so the objectives would be anticipated to be the same downstream to the Park boundary.

It is also noted that because of issues with mercury measurements being below detection limits, water sampling and low level mercury analysis is planned to verify the assumed upstream mercury value.

Environment Canada's Conclusions

Setting appropriate SSWQOs is of key importance, as these will be used to set effluent quality criteria which will maintain water quality at the objectives deemed to be protective of the ecosystem.

The Proponent took an iterative approach to selecting SSWQOs which started with the RCA values, then took a second tier assessment of effects for parameters which were modeled to exceed the RCA values, or for which appropriate reference data were not available (e.g. mercury and silver were consistently below detection limits). CZN proposed use of CCME guidelines for many of the parameters, and reviewed available toxicity data for each of the analytes.

Consideration of the CCME guidelines when setting water quality objectives provides some assurance against the likelihood that there will be chronic toxicity associated with the receiving environment water quality. Limitations to this approach include relevance of the species used to set the guideline, and that the evaluation is for a single parameter

only, and does not consider chemical interactions or modifying factors. CZN sought to address the species relevance question in the May 6th 2011 Appendix D review of literature toxicity data for relevant taxonomic groups and northern species.

Toxicity testing is routinely used in the regulatory stage to integrate whole effluent quality and evaluate effects of the mixture (e.g. the Metal Mining Effluent Regulations requirements). The toxicity testing done by CZN gave some indications where there would be toxicity expected, and raised questions which would need to be examined when effluent is available for testing (discussed further in Section 3.1.4). Acute and chronic toxicity would need to be tracked through toxicity testing during the operation of the mine.

Using the Reference Condition Approach (RCA) allows comparisons to be made to a dataset that encompasses the range of natural variability, and is site-specific with respect to the conditions which the local ecosystem is adapted to (e.g. mineralized areas). It would be reasonable to expect no changes to the ecosystem at the point in the stream where such ambient conditions are maintained. Other publications have proposed water quality objectives for the Prairie Creek system which are based on the RCA. Halliwell and Catto (2003) set out long term and short term objectives for Prairie Creek at the mouth, and Parker et al (2010) set objectives for dissolved metals for the entire stream, based on upstream background concentrations. RCA concentrations in these two publications are considerably lower than the water quality objectives set for the edge of the IDZ (100 m downstream of the discharge point) and it would be anticipated that they would be met at some point between the discharge and the mouth of the creek. Bowman et al (2009) also provide limited reference condition data for this area, but the two relevant parameters are considerably higher, reflecting regional variability in the dataset. If the RCA is to be utilized for refining SSWQOs in Prairie Creek, it would be appropriate to better characterize seasonal data.

The objectives proposed by CZN, if met at the edge of the IDZ, would be expected to avoid or minimize the potential for chronic toxicity effects in the receiving environment, with some possible exceptions (e.g. bull trout data, Appendix D indicate toxicity at levels just above the proposed objectives in lower hardness test solutions). There is the potential for synergistic interactions between the effluent parameters to cause an increased potential for sublethal effects. Whole-effluent testing may be used to monitor this; however environmental monitoring may not pick up shifts or changes in the ecosystem due to the higher hardness levels in Prairie Creek acting protectively, and the confounding effects of nutrient addition on productivity.

There is some confusion with respect to the RCA for nitrite; Table 6 of the May 6th Appendix C shows a value of 1.03 mg/L for NO2-N while the 90th percentile value shown in Table 1 of Appendix D is 0.01 mg/L

Environment Canada's Recommendations

1. Any change from background water quality will potentially result in changes to the ecosystem. Setting objectives for Prairie Creek downstream of the proposed mine will require a value judgment be made as to the degree of change which is acceptable, and determining how far down the receiving environment stream change is acceptable. Environment Canada is available for further discussions

on appropriate SSWQOs, but will defer to Parks Canada and the Board on making this determination.

2. EC notes that low detection limits will be needed for the onsite analytical instruments, if they are to be used for aquatic effects monitoring, and thus to evaluate whether the mine is meeting water quality objectives.

3. Winter baseline water quality data for Prairie Creek should be augmented to strengthen the dataset, and CZN should subsequently review the SSWQOs.

4. Low level mercury analysis should be done for upstream samples, both in summer and under ice, and results used to re-evaluate the SSWQO for mercury.

5. The nitrite SSWQO discrepancy should be clarified, with the lower value deemed more appropriate.

Issue 3.1.2: Effluent quality

Reference(s)*:*
DAR Section 8, Appendices 2, 6;
May 6th Progress Report - Commitments from Apr. 12 Technical Meeting: Appendix B Table 3; Appendix C;
Appendix F Predictions of Prairie Creek Water Quality (Memo 3)
May 22nd CZN Letter to Board Commitments from Technical Meeting – Addendum to Appendix C

Proponent's Conclusions:

CZN has estimated effluent quality based on potential inflow quantities for minewater and fixed rates of process water generation. Modeling of the discharge was done for four scenarios involving different rates of minewater inflow: low flows, best estimate flows, high flows, and extreme flows. Model inputs used concentrations of parameters measured in the process water synthesized in 2010 and 2011 (whichever was highest), as well as measured mine water and ditch water parameter concentrations. Treated process water quality was estimated based on mineral samples from multiple exposures underground; process water samples were generated using bench scale locked-cycle metallurgical testing, then subsequently stored and used for testing. Treated batches were made, and used for chemical analysis as well as bioassay testing.

The worst case situation was deemed to occur during ice cover when flows were lowest. In March, the predicted proportion of effluent in the stream after full vertical mixing ranged from 5% for the low mine water flow scenario, to 67% for the extreme flow scenario. Estimates of receiving water concentrations at the edge of the mixing zone included several exceedences of SSWQOs during winter low flows, and for mercury and phosphorus during best estimate summer flows. Estimates were based on proposed licence Effluent Quality Criteria (EQC) and maintaining the creek to process water ratio of 500:1 (Addendum to Appendix C).

CZN's follow-up letter to the Board dated May 22nd proposes to manage predicted

exceedences with the use of a load-based approach to effluent discharge during periods of low flow. Table 63 (May 22, 2011) presents the highest concentrations of parameters in blended discharge, for the scenario where there is reduced treated process water discharged during low flows (December to April). CZN has presented this as the most realistic scenario, in contrast with previous estimates being based on the proposed water licence limits shown in Table 47 of Appendix C of the May 6th submission.

The proposed revised approach to managing effluent quality involves varying the proportion of treated process water in the discharge to maintain receiving environment water quality objectives at the edge of the IDZ. Management would require:

- Real time continuous measurement of creek flow volumes, which could be done by re-establishing the WSC flow station, and relaying creek water levels to the WTP control room in real-time using telemetry. The data would be converted to flows using an established relationship;
- Sampling and analysis of upstream water quality to identify background contributions of a given parameter;
- Knowledge of the concentrations of analytes of concern in the effluent;
- Calculation of volumes which could be released without exceeding downstream water quality objectives.

The main response to avoid exceeding allowable load limits would be to reduce process water treatment and store more process water. The proposed management scheme would maintain the creek to process water ratio at 600:1, and involve storage of approximately 8,800 m^3 of process water.

Contingencies to manage water while ensuring limits are met include increasing the proportion of process water that is recycled from the normal rate of 65% to up to 100%, the last resort of stopping the mill, and repeating stability analyses to assess whether additional storage capacity is possible via a lower minimum pond level. Cell A might be made up to 60% larger to increase storage capacity and reduce risk.

CZN proposes that in addition to regulating loads, the water licence conditions also include the requirement for a minimum minewater to treated process water ratio of 4:1, and that the rate of creek flow volume to treated process water discharge must be at least 500:1 to minimize the risk of objectives being exceeded, or of chronic toxicity.

Because of issues with mercury measurements being below detection limits, water sampling and low level mercury analysis is planned to verify the assumed upstream mercury value.

Environment Canada's Conclusions:

The Proponent has taken reasonable steps to characterize effluent and predict concentrations of analytes of concern in the receiving environment. CZN has attempted to build in conservatism by using the worst water quality estimates for model inputs, and basing predictions on the assumption that concentrations would be at maximum average licence limits when predicting environmental concentrations.

Use of the load-based approach to managing process water concentrations adds another layer of complexity to a water management regime that does not have a lot of

excess storage capacity in the event of system upsets and other events that limit the ability to discharge.

This approach could substantially manage the predicted exceedences of water quality objectives during periods of low flow, but would be difficult to implement. Upstream flow levels can likely be monitored on a real time basis, but Prairie Creek would have to be measured to determine winter flows as an established relationship wouldn't exist during the winter as ice amounts change from year to year and throughout the season.

An additional factor is the lack of baseline data for under-ice water quality. This means samples would need to be taken over the next winter to characterize winter water quality, and ongoing confirmatory sampling would need to be done when operations were started. Effluent quality would need to be analysed on an ongoing basis, as it is expected that there will be variation in quality with aging as well as with minewater quality. Water quality results are not available in real time, so there would be a lag time of days to a week to obtain the data to adjust blending to manage loadings. If this approach is to be implemented, it should be after commissioning of the processing and treatment systems during a period of higher flows, such that loads would not need to be managed until a good understanding of effluent quality is gained.

The idea of increasing the Water Storage Pond capacity by 60% was brought out for the first time in the May 22nd letter. It is not clear whether this is a feasible option, and if so, what the implications would be associated with construction and operation.

Environment Canada's Recommendations:

6. Alteration of the water quality in Prairie Creek will need to be minimized through achieving the best possible effluent quality, and careful management of discharges. Further details should be developed to determine if the use of a load-based approach would be feasible.

7. Maintaining the 500:1 ratio of creek water to process water would also rely on real-time flow data; this option should be further developed.

8. Increasing storage capacity of the WSP should be evaluated for feasibility and implications on water balance and management.

Issue 3.1.3: Nutrients

*Reference(s)***:**
DAR Section 6.16.6; 8.7.1
Round 1 IRs Parks-32, EC-16
May 6th Progress Report - Commitments from Apr. 12 Technical Meeting: Appendix C; Appendix F Predictions of Prairie Creek Water Quality (Memo 3); Appendix I Potential Enrichment Effects.
May 22nd CZN Letter to Board Commitments from Technical Meeting – Addendum to Appendix C
Chambers, P.A., M. Guy, E.S. Roberts, M.N. Charleton, R. Kent, C. Gagnon, G. Grove, and N. Foster. 2001. Nutrients and their impact on the Canadian environment.

Agriculture and Agri-Food Canada, Environment Canada, Fisheries and Oceans Canada, Health Canada and Natural Resources Canada. 241 p.
Spencer, P., Bowman, MF, Dube, MD. 2008. A multi-trophic level approach to monitoring the effects of metal mining in otherwise pristine and ecologically sensitive rivers in Northern Canada. Interg. Environ. Assess. Manag. 4:327-343.

Proponent's Conclusions:

CZN predicts that phosphorus will be below the CCME-based SSWQO of 0.004 mg/L total phosphorus at the edge of the IDZ, but that there could be exceedences under conditions of minimum creek flows for all scenarios. Table 46 shows the highest predicted concentration in blended discharge as 0.047 mg/L, occurring in May. CZN proposes to have water licence limits for phosphorus of 0.1 maximum average and 0.2 maximum grab.

CZN states that, if necessary, alum will be used to precipitate phosphorus.

Appendix I reviews conditions in Prairie Creek, and evaluates the effects of the predicted increases in nutrient concentrations. The conclusion is that "…even if mild enrichment occurs in Prairie Creek downstream of the mine discharge, resident invertebrate and fish species should not be negatively affected."

Environment Canada's Conclusions:

Nutrients cycle differently in riverine systems than in lakes, but still have a cycle of uptake, release by decomposition, and subsequent uptake within the stream channel. The distance involved is dependent on the limiting factors for plant growth; rapid uptake and short transport distances are expected in oligotrophic systems which are phosphorus limited, such as Prairie Creek. We would expect to see further enrichment of the reaches of Prairie Creek below the mine site, even using the RCA value for total phosphorus (based on the 90th percentile) of 0.0034 mg/L or the CCME-based objective of 0.004 mg/L which was selected as the SSWQO. These objectives represent ultra-oligotrophic (TP <4 ug/L) to oligotrophic (TP 4-10 ug/L) status (CCME Phosphorus fact sheet, 2004). Sustained inputs of nutrients can result in habitat alteration and changes in abundance and composition of algal and invertebrate communities, and may increase fish production (Chambers et al, 2001). Growth saturation for periphyton can occur at concentrations of as low as 1 to 5 ug/L soluble reactive phosphorus and 10 to 15 ug/L N.

The original water quality modeling did not take camp wastewater contributions into account, despite the observation of mild enrichment already occurring downstream of the mine. Nutrient outputs to Prairie Creek have not been monitored, as it has not been a requirement of CZN's current water licence. Spencer et al., (2008) found increased richness in benthic invertebrate species, and increased condition and egg size in slimy sculpin, consistent with mild enrichment. A decrease in algal richness (the number of different species within an area), and diversity (the number of different species within an area, and the frequency with which they are present) was found at the exposure sites downstream from the Prairie Creek mine site (Spencer 2008).

Subsequent modeling iterations incorporated phosphorus source concentrations based on the Diavik system performance. IR Round 2 Response Appendix G, pg. 4, indicates that there may be increases in bioavailable phosphorous that may result in minor nutrient enrichment. The bioavailable phosphorus would remain below 2ug/L, limited to periphyton growth. Mitigation measures provided included the use of alum in the treatment of the waste water to reduce phosphorus and the use of specialized explosives to reduce the quantity of nitrogen (Appendix G, pg. 5). In ultra-oligotrophic systems, phosphorous can be a limiting nutrient, and increases in phosphorous inputs to these systems can have pronounced effects on algal growth (Appendix D, pg. 28). Primary and secondary productivity will increase as a result of moderate enrichment. If nutrient inputs continue, species richness may be reduced, followed by an increase in algae production which ultimately, can reduce dissolved oxygen levels, increase pH (Appendix D, pg. 28). CZN predicts that the highest nutrient concentrations would occur under ice, when periphyton growth will be limited by low temperatures and light (Appendix D, pg. 29). Modeling has indicated that dissolved inorganic nitrogen will increase in all scenarios, but particularly during low flows, and that ortho-phosphate concentrations during low flows and high effluent discharge scenario, are increased above background, however, remaining below 1.5 ug/L (Appendix D, pg. 30).
It is expected that commissioning the sewage treatment system will take some time, and be subject to fluctuations in output quality. The proposed use of alum to treat for phosphorus is generally most effective at lower pH levels (optimum at 5.5 to 6.5), but can be used in systems ranging from 6-9, so may provide some reduction in phosphorus. CZN is assuming that concentrations of both ortho-phosphate and dissolved inorganic nitrogen will be reduced while in the Water Storage Pond (Appendix D, pg. 30).

Environment Canada's Recommendations:

9. Nutrient releases should be minimized through the use of mitigation measures to prevent releases of nitrogen compounds, and to reduce phosphorus releases through optimizing wastewater treatment.
10. Monitoring of nutrient concentrations in discharges and the receiving environment should be done on an ongoing basis, with results linked to observations of biota under the AEMP.
11. The proposed licence limit of 0.2 mg/L maximum average for phosphorus is supported by EC. It is recommended that this be revisited if the AEMP identifies changes that may become ecologically significant impacts.

Issue 3.1.4: Toxicity

Reference(s): DAR Appendix 2, Tables 18 and 19;
May 6th Progress Report - Commitments from Apr. 12 Technical Meeting - Appendix J
May 6th Progress Report - Commitments from Apr. 12 Technical Meeting - Appendix E, Table 3
May 22nd Letter to MVIERB regarding Commitments to Provide Information; Table 1

Proponent's Conclusions

Initial toxicity testing was conducted in 2009 on mine water and process water. Mine water was treated with lime and then pH-adjusted. Bioassay testing results showed no mortality for trout, fathead minnow, and daphnia. Chronic tests indicated some effects on *Ceriodaphnia dubia* reproduction, with an IC25 of 68.1. Process water was tested and found to be acutely toxic to rainbow trout (LC50 of 70.71%) and daphnia (LC50 of <10%).

Further toxicity testing was completed in 2011 using blends of simulated effluents at concentrations of 4:1 and 8:1 minewater to process water.

The January 2011 testing indicated no mortality to rainbow trout for either test solutions using lab water or Prairie Creek water for dilution. *Daphnia magna* showed an acutely toxic response to the 4:1 mixture for the test using moderately hard water for dilution, with an LC50 of 89%, and 60% mortality in the full strength effluent. This was inconsistent with the 100% survival observed in the full strength effluent used in the side-by-side test using Prairie Creek water for dilution. Minewater was tested for acute toxicity with Daphnia, and 100% survival was observed.

Lemna minor were tested for both mixtures, and showed stimulatory responses.

Chronic testing for *Ceriodaphnia* testing gave the greatest cause for concern; while there was no mortality in the 100% strength mixtures, the IC25 for the reproduction endpoint was <5%, indicating high chronic toxicity.

A toxicity identification evaluation (TIE) was conducted to investigate the *Ceriodaphnia* effects, and focused on a 10% dilution of mill water. The TIE ruled out divalent metals, organic contaminants, strong anions (excluding sulphate, carbonate and chloride) and particulate-bound contaminants. Magnafloc 10, a settling agent, was also tested. None of the treatments identified the source of the chronic toxicity to reproduction. A 5% solution of mill water was tested, and did not exhibit toxicity. Possible explanations for the chronic toxicity to *Ceriodaphnia* included attributing toxicity to sulphate and/or major ions, or contributions by or interaction with constituents of mine water, or lab processes. Aging of the sample may have accounted for the absence of toxicity in the 5% mill water sample.

To follow up on the uncertainty for daphnia test results, further testing was done in April 2011, using 4:1 and 8:1 mixtures of mine water to process water. *Daphnia magna* showed no mortality for either mixture. *Ceriodaphnia* were tested for both mixtures as well as mine water. As with the January 2011 test, the survival endpoint had an LC50 of >100% for all test solutions. For the reproduction endpoint, minewater showed no inhibition (IC25 >100%) while the 4:1 mixture had an IC25 of 23.8% and the 8:1 mixture an IC25 of 44.5%.

Water chemistry was provided for the ditch water, process and mine water, and mixtures.

Table 3 of Appendix E (May 6th) provides predicted concentrations of effluent under various discharge scenarios. At complete vertical mixing, at distances ranging from 1.6 to 30.6 m (Table 3, Appendix B, May 6th), effluent concentrations would range from less than 1: to 7.3% in the Best Mine-Water Estimate case. The Extreme Mine-Water Estimate could range from 1.35% to 66.7%, noting that the effluent would be comprised

of better-quality mine and aquifer water in that case.

The Proponent's conclusion: Treated effluent will not result in any acute mortality within the IDZ and no sublethal effects outside the IDZ. Given rapid vertical mixing, there would likely be an absence of sub-lethal effect within much of the IDZ.

Environment Canada's Conclusions:

Toxicity testing indicates that acute toxicity of the proposed effluent should not occur.

Chronic toxicity was observed in the first tests, for low concentrations of both the 4:1 and 8:1 mixtures, with an IC25 of <5% indicating chronic toxicity would be expected to occur in the receiving environment. Subsequent testing did not replicate this result, showing higher IC25 values, but some uncertainty remains as to the degree of chronic toxicity which could occur. The IC25 values of 23.8% (4:1 mixture) and 44.5% (8:1 mixture) should be well above concentrations expected beyond the vertical mixing zone for all flow conditions except the extreme minewater estimate during minimum monthly flow conditions (March).

While there were differences in test water chemistry between the bioassay testing events, there were no evident reasons for the difference in results. CZN has suggested that aging of the effluent may have been a factor in the improved toxicity results.

Acute and sublethal toxicity testing will be required under the *Metal Mining Effluent Regulations* (MMER) and will include testing with *Ceriodaphnia* for survival and reproduction endpoints. If the effluent exhibits chronic toxicity, the Proponent will be required to delineate the extent of such toxicity in the receiving environment. CZN proposes that the Initial Dilution Zone (IDZ) be 100 m, and states that effluent will be 98% mixed by the end of the vertical mixing distance, which ranges from 1.6 to 30.6 m. If higher concentrations of minewater are seen, following on the 2009 results, there is the potential for some chronic toxicity associated with the minewater fraction as well as the (proportionately lower) process water contributions.

Environment Canada's Recommendation

12. Predictions for mixing and receiving environment concentrations should be validated at the commencement of operations, and conditions monitored on an ongoing basis to ensure chronic toxicity does not extend beyond the 100m IDZ.

Issue 3.1.5: Aquatic Effects Monitoring

Reference(s):
Aquatic Effects Monitoring Final Plan, June 2010, M. Dube;
Appendix O, February 2011 Proposed Aquatic Monitoring Framework for CZN's Prairie Creek Mine Draft.
May 6th Table 2 Commitments Table, page 13.

Proponent's Conclusions:

CZN provided two memos which outlined the approach to aquatic effects monitoring.

The AEM Final Plan, June 2, 2010, prepared by M. Dubé was submitted following the DAR and appeared to use trigger levels for initiating further monitoring. It stated:

> "The experimental design for the AEMP should be equivalent to that used in the Spencer et al (2008) study as it is consistent with the EEM program and has been effectively implemented at this site." (p.11)

During the 1st round IR responses (Sept 2010) in response to DFO-10 it was stated that "the EEM will include annual sampling" and that "The EEM will form part of a broader AEMP."

Within Appendix O the term AEMP is used in a manner synonymous to EEM and it is indirectly stated that sampling would only take place every 3 years, with the exception of the first two years.

In the Commitments Table provided May 6th, it is stated that:

> " An AEMP will be designed and implementd for the project in accordance with INAC's "Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT – 2007."

Environment Canada's Conclusions:

Environment Canada has concerns with the two monitoring program proposals which have been presented to date, notably around extent and timing for monitoring, use of the data in a timely fashion for adaptive management, and concern with the proposed triggers for action.

As stated at the technical session, EC feels that it is important to have good confidence in the proponent's ability to detect change and act upon it in the environmental assessment stage. This entails having a solid understanding of the baseline conditions, and a robust sampling design that will fulfill the various regulatory requirements without duplication or overlap, and that will provide timely information on receiving environment conditions for management response.

An effective AEMP must be designed, which will enable the proponent to detect change to the downstream environment, and provide clarity about how this information will inform of adaptive management.

Environment Canada's Recommendations:

13. EC recommends that further work be done to develop an aquatic monitoring plan that will enable the proponent to detect change to the downstream environment and act upon it before changes become impacts. The monitoring plan should have the elements of other requirements (SNP, EEM, Water licence) harmonized with respect to sampling sites and reporting, acknowledging that there will be different timing cycles for different monitoring requirements. EC supports use of

the INAC Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT – 2007.

14. An adaptive management plan should be drafted that does not incorporate multiples of exceedances of objectives before action is triggered.

15. EC supports the input of the stakeholders committee mentioned in the commitments table, line 2, into design of monitoring programs.

Section 3.2: Contaminants Management

Issue 3.2.1: Contaminant loading from mine operations and transport of lead and zinc concentrate.

Reference(s):
DAR Prairie Creek Mine - Section: 6.10.3; 6.23
DAR Prairie Creek Mine Air Quality - Section: 5.2
CZN Prairie Creek Mine Response to Information Requests (September 2010)- Section: 4.0 IR Number: EC-1

Proponent's Conclusions:

Lead/zinc concentrate will be loaded into bags at the Prairie Creek Mine site. The bags will be transported on flat deck trailers via winter road to the Tetcela Transfer Facility (TTF) and stored until transported to the Liard Transfer Facility (LTF). The concentrate is then transported across the Liard Bridge and onto Fort Nelson. Due to multiple storage locations, the Proponent has concluded that mechanically sealed truck boxes used at other mines, such as the Red Dog mine and Minto Mine, are impractical for this project.

The Proponent has provided an outline for the Best Management Practices Plan to Control Fugitive Dust and Metals Emissions (BMPPCFDME) in Section 5.2 of the Air Quality Assessment.

Environment Canada's Conclusions:

There is potential for the release of contaminants to the environment through mine operations, and the handling and transport of lead/zinc concentrate. The Proponent should develop and implement a Contaminate Loading Management Plan (CLMP) which includes the topics proposed in the BMPPCFDME plus surveillance monitoring and contingency plans. To ensure that contaminants are not being released to the environment the surveillance monitoring should include baseline monitoring and monitoring during operational life of the mine of dustfall and soils around the mine site and concentrate handling and storage facilities, along the haul road, and near sensitive receptors. Contingency plans should include additional mitigation options and adaptive management action trigger levels. The CLMP should be developed in consultation with EC and GNWT.

During the transport of concentrate, the Proponent should employ secondary

containment on the flat deck trailers to mitigate spillage or escapement due to bag malfunctions or accidents.

Rationale:
Fugitive dust from mine operations and transport of concentrate can result in contaminant loading to land and water. The following describes the most common sources of the fugitive dust:

Mine Operations:

- **Dust generated by mining activities—**Dust can be generated from drilling, blasting, material handling, and truck haulage activities.
- **Dust emissions from materials handling—**Dust can be generated from materials handling activities, including truck haulage activities, placement of waste rock on waste rock stockpiles, and the stockpiling of ore.
- **Dust emissions from mill and concentrate storage facilities—**Dust can be generated from the ore crushers, the coarse ore stockpile building, and from concentrate storage and loading operations.
- **Mechanical or wind-generated dust from surfaces—**Windblown dust can be generated from surfaces around the mine, including the access roads and yards, and other mineralized surfaces.

Transportation:

- **Tracking along roads —**Ore concentrate can be tracked out of loading and unloading facilities on haul truck tires and other truck surfaces and subsequently deposited onto the road.
- **Concentrate spillage and escapement from haul trucks—**This includes leakage from bags of concentrate, blowing of dust collected on the outside of the bags of concentrate on the trucks, or spillage from overturned trailers following accidents.

The Red Dog lead and zinc mine in Alaska provides an example how mine activities and transportation of lead/zinc concentrate can lead to the contamination of soil, vegetation and water bodies. Although the Red Dog Mine is larger than the proposed Prairie Creek Mine, both mines will have similar activities: both are lead and zinc mines that include on-site processing of ore and transportation of lead/zinc concentrate by trucks through a national park. Therefore, there is potential that the Prairie Creek Mine will have similar environmental issues as the Red Dog Mine.

The Red Dog Mine transports lead/zinc concentrate along an all season road 24 miles from the mine site to the sea port. Studies have linked the transport of concentrate from the Red Dog Mine to elevated levels of lead, zinc and other metals in the environment. Ford and Hasselbach (2001) found a strong road-related gradient in heavy metal deposition along the all season road. They found lichens (*Hylocomium splendens*) “to be highly enriched in lead (Pb > 400 mg/kg), zinc (Zn > 1800 mg/kg) and cadmium (Cd > 12 mg/kg) near the haul road. Concentrations decreased rapidly with distance from the road, but remained elevated at the transect endpoints 1000 m – 1600 m from the road (Pb > 30 mg/kg, Zn > 165 mg/kg, Cd > 0.6 mg/kg)”. In a follow-up study, Hasselbach, et al. (2004) found that elevated levels of heavy metals extend up to 25 km from the haul

road. Elevated levels of lead and zinc were also found in streams and streambed sediments along the haul road (Brabets, 2004). In streams near the mine, cadmium and lead concentrations in tissue of juvenile Dolly Varden were significantly higher in fish downstream from the haul road compared with upstream fish (Ott and Morris, 2004).

Another example of contaminant loading is found at the original Pine Point mine, NWT. Lead/zinc concentrate was transported from the mine to Hay River along an old CNR railway. Indian and Northern Affairs Canada have tested soil samples from the railway bed and found that lead and zinc concentrations exceed the Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines for these metals. The pathway of this contamination was likely linked to the transportation of the mine concentrate. Further details on the INAC soil testing can be found on the MVLWB public registry, file number MV2004Q0019.

These two examples demonstrate links between mining activities and contaminant loading to the environment. Through mitigation and monitoring, the risk of contaminant loading and negative impacts to the environment can be reduced.

The Red Dog Mine is managing the contaminant loading by implementing mitigation strategies to reduce fugitive dust from the mine site and transport of concentrate. For example, the Red Dog Mine replaced the concentrate haulage fleet with trailers that have hydraulically operated steel covers to minimize spills, solid sides to eliminate potential for concentrate leakage and more stability, thereby reducing the risk of accidents. The mine also implemented a number of mitigation strategies to control dust at transfer points including negative pressure and bag houses in the concentrate loading building, enclosed conveyors, and truck washing bays to minimize tracking issues. A complete list of mitigations strategies can be found in DMTS Fugitive Dust Risk Assessment Report Appendix L (Tech Cominco, 2007). To ensure that the mitigation is effective the Red Dog Mine has an intensive monitoring program (Teck Cominco, 2005).

The approved Tamerlane Ventures Incorporated Pine Point Pilot Project, NWT, has been directed to develop a Contaminant Loading Management Plan through a condition of its water licence (MV2006L2-0003). EC is recommending a similar approach for the Prairie Creek Mine.

***Environment Canada's Recommendations*:**

16. EC recommends that the Proponent develop and implement a Contaminant Loading Management Plan (CLMP). The CLMP should be developed in consultation with EC and the GNWT and should include but not be limited to the following:
    - Identification of potential sources of contaminant loading;
    - Description of all potential mitigation approaches available, including all of the mitigation strategies used at other mines;
    - Identification of mitigation approaches to be employed at the Prairie Creek mine;
    - Description of the monitoring program, including both baseline monitoring and monitoring during mining operations;

- Description of trigger levels or action levels above which adaptive management and contingency plans need to be implemented;
- Description of adaptive management and contingency plans to be employed if trigger levels are exceeded;
- Annual reports presenting the following information:
  - Results from the dustfall and soil monitoring program;
  - Assessment of the effectiveness of current mitigation; and
  - Description of any adaptive management or contingency employed
- Monthly data reports within thirty days following the reporting month for at least the first year after mine operations and the transport of concentrate begins.

17. EC recommends that the Proponent employ secondary containment on the flat deck trailers during the transport of lead/zinc concentrate to mitigate spillage or escapement due to bag malfunctions or accidents.

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Issue 3.2.2: Incineration Management Plan

Reference(s):
DAR Prairie Creek Mine Air Quality - Section: 5.3
CZN Prairie Creek Mine Response to Information Requests (September 2010)- Section: 4.0 IR Number: EC-2

Proponent's Conclusions:

In the DAR Air Quality Assessment, Section 5.3, the Proponent has provided an outline for an Incineration Management Plan (IMP). The Proponent proposed incinerating camp waste and sewage in the DAR. In response to an EC information request (EC-2), the Proponent has reversed its decision to incinerate sewage: "neither sewage nor sewage sludge will be incinerated".

Environment Canada's Conclusions:

The Proponent should develop and implement an IMP prior to waste incineration at the mine site. The IMP should be developed in consultation with EC and GNWT.

Rationale:

Environment Canada recognizes that timely disposal of camp waste - specifically food waste is of critical importance to minimize safety risks associated with wildlife attraction. Timely disposal is usually achieved through incineration. However, there are some important potential environmental concerns associated with waste incineration that can be addressed through proper equipment selection, operation, maintenance and record keeping. These include potential releases of polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans, commonly known as dioxins and furans, to the environment. Dioxins and furans are toxic, persistent, bioaccumulate, and result predominantly from human activity (CEPA, 1990).

Canada has participated in initiatives to reduce dioxins and furans in the environment. Canada is a Party to the Stockholm Convention on Persistent Organic Pollutants (POPs). Incineration was identified as a potential source of the POPs listed in Article 5 of the Stockholm Convention. Article 5 of the Convention requires Parties to take measures to reduce, and where feasible, eliminate releases of unintentionally produced POPs, including dioxins, furans, hexachlorobenzene (HCB) and dioxin-like polychlorinated biphenyls (PCBs) which are "*unintentionally formed and released from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions*". Article 5 also requires that Best Available Techniques (BAT) and

Best Environmental Practices (BEP) be applied for both new and substantially modified sources.

Dixons and furans were designated as Track 1 substances and scheduled for virtual elimination from the Canadian environment under the 1995 federal *Toxic Substances Management Policy* and the 1998 CCME *Policy from the Management of Toxic Substances*. Dioxins and furans are on the List of Toxic Substances in Schedule 1 of the *Canadian Environmental Protection Act (CEPA), 1999*.

The Canadian Council of Ministers of the Environment (CCME) examined the incidental release of dioxins and furans in emissions from various combustion systems. This led to the development of the *Canada-wide Standards (CWS) for Dioxins and Furans*, which were adopted by the CCME in 2001. The standards identify incineration for action to reduce emissions, and include specific air emission standards.

Canada's efforts to improve the environment have also led to new measures under the Chemicals Management Plan (CMP), which was first brought forward in 2006. The CMP develops measures to better protect human health and the environment from the risks posed by chemical substances. The Waste Sector has been identified as a sector under the CMP due to potential releases to the environment from incinerators and landfills.

The *Technical Document for Batch Waste Incineration* was developed by EC under the CMP to provide guidance for owners and operators of batch waste incinerators regarding appropriate incineration technology, operation, maintenance and record keeping, with the goals of assisting them in achieving the intent of the Canada-wide Standards (CWS) for dioxins/furans and mercury, and reducing releases of other toxic substances. This technical document focuses on batch waste incinerators; the type of incinerators which are typically used in the north.

Although incineration contaminants are released to the atmosphere the dominant exposure pathways for wildlife are through vegetation, water column and sediments. Deposition onto vegetation and subsequent ingestion of that plant material by animals is the primary mechanism by which dioxins and furans enter the terrestrial food chain (McLachlan and Hutzinger 1990). Deposition onto soil with subsequent erosion and runoff into water bodies with subsequent uptake by benthic organisms is the primary mechanism by which dioxins and furans enter the aquatic food chain (Muir et al. 1992). Therefore incineration is a land and water issue. Air is simply a pathway from the incinerator to the other media.

The type of incineration technology and the management practices can greatly affect the amount of dioxins and furans released to the environment. Incinerators capable of meeting the Canada-wide Standards for Dioxins and Furans (controlled incineration) will release about 9.5 µg TEQ of dioxins and furan per tonne of waste combusted (Chandler 2006, Lanfranco 2006). Poor incineration equipment (uncontrolled burning) can release much greater amount of dioxins and furans, 3500 µg TEQ per tonne of waste combusted (UNEP, 2005). EC commissioned a study (Webster and Mackay, 2007) to investigate potential environmental impacts from waste incineration at a typical northern remote work camp. The study used an environmental fate model to predict contaminant concentrations in air, soil, water, sediment, aquatic and terrestrial wildlife (including fish, birds and terrestrial herbivores and carnivores) resulting from the emission rates listed above. The conclusions from the study are quoted below.

It is concluded that uncontrolled burning of waste could result in substantial accumulations of dioxins and furans in the local ecosystem, some of which will persist for some 8.5-years with exposure levels approaching those considered to be of toxicological concern. The use of controlled incineration will substantially reduce the expected contamination levels and correspondingly reduce the likely exposure and effects.

In 2008, EC collected sediment samples from an impacted lake near the Ekati Diamond Mine camp incinerator and from a reference lake, 15 km from the incinerator. The concentration of dioxins and furans in the sediments from the impacted lake were of the order of 5 to 10 times greater than the concentration of dioxins and furans in sediments from the reference lake. The concentrations in the impacted lake exceed the CCME Interim Freshwater Sediment Quality Guidelines for dioxins and furans. Analyzing various depths within the sediments indicates that the concentration of dioxins and furans in the sediments were greater during the period the mine was in operation compared to predevelopment levels (Wilson, 2011).

Incineration can be an environmentally sound method of disposing of camp waste. However, if appropriate incineration technologies and operating practices are not used, there is potential for the formation and release of contaminants which can adversely impact water, sediments, fish and wildlife. To minimize the release of contaminants and thereby minimize the risk of potential impacts, EC recommends that the proponent develop and implement an IMP that is consistent with the advice provided in the *Technical Document for Batch Waste Incineration*.

The IMP should include, but not be limited to, the following:

- Waste audit -- quantities and types of waste incinerated
- Selection of incineration technology
- Operational and maintenance records
- Operator training
- Incinerator ash disposal
- Annual Report

Environment Canada's Recommendations:

18. EC recommends that the Proponent develop and implement an Incineration Management Plan that is consistent with the advice provided in the *Technical Document for Batch Waste Incineration.* The incineration management plan should be developed in consultation with EC and the GNWT.

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Section 3.3 Air Quality

Issue 3.3.1: Air Quality and Emissions Monitoring Plan

Reference(s):
DAR Prairie Creek Mine Air Quality - Section: 5.1

Proponent's Conclusions:

In the DAR Prairie Creek Mine Air Quality assessment, Section 5.1, the Proponent has provided an outline for Monitoring Program and Mitigation and Adaptive Strategies (MPMAS). This management plan contains several components including the following: Air Quality Monitoring Program (Section 5.1.2); Emissions Monitoring Program (Section 5.1.3); Fuel Use Summary (Section 5.1.4); Mitigation and Adaptive Strategies (Section 5.1.5); Response Planning (5.1.6); and an Annual Report (Section 5.1.7).

Environment Canada's Conclusions:

EC supports the approach provided in the MPMAS outline. The MPMAS should be developed in consultation with EC and the GNWT.

Links should be made to Contaminants Loading Management Plan (CLMP). Specifically, TSP ambient samples, proposed in the Air Quality Monitoring Program, should be analysed for metals and used in the CLMP assessment. The dustfall, soil and ice monitoring should also be used in the CLMP assessment.

Rationale:

The Proponent has committed to develop the MPMAS. To ensure that this commitment is realized, EC requests that the Board include the development and implementation of the MPMAS as a Board measure.

Environment Canada's Recommendation:

19. EC recommends that Proponent develop and implement the Monitoring Program and Mitigation and Adaptive Strategies management plan in consultation with EC and GNWT.

Section 3.4: Wildlife

Preface:

The Canadian Wildlife Service (CWS) of EC administers and enforces the *Migratory Birds Convention Act* (MBCA) and *Migratory Bird Regulations* (MBR). Paragraph 6(a) of the MBR states that no one shall destroy or disturb the nests or eggs of migratory birds and Section 5.1 of the MBCA prohibits persons from depositing substances harmful to migratory birds in waters or areas frequented by migratory birds or in a place from which the substance may enter such waters or such an area. Environment Canada also administers and enforces the *Species at Risk Act* (SARA). Section 32 (1) of SARA states that no person shall kill, harm, or harass an individual of a species listed as endangered or threatened, and Section 33 states that no person shall damage or destroy the residence of one or more individuals of a wildlife species listed as a endangered or threatened (a "residence" being defined as a dwelling-place such as a den, nest or other similar area or place that is occupied during all or part of the species life-cycle).

CWS provides expert advice in environmental assessment review processes focusing primarily on identifying potential adverse effects to migratory bird populations, habitats, and species at risk, and appropriate measures to mitigate those effects. The advice provided in an environmental assessment process does not constitute an authorization for incidental take under the MBR or SARA, nor does it assure that the project will not result in the killing or taking of a migratory bird or its nest or a species at risk. Furthermore, the advice does not absolve project proponents from their obligation to comply with all provisions of the MBCA, MBR and SARA.

Issue 3.4.1 Migratory Birds - Waterfowl use of the Water Storage Pond at the mine site

Reference(s):

DAR Section 10.3.1; Page 312;
DAR – Appendix 17 – Vegetation and Wildlife Assessment Report; Section: 4.2.1.5.2; Page 54.
Response to Environment Canada Information (Round 1) Request 9; Appendix C; Pages 1-2.
CZN Responses to 2nd Round Information Requests; Appendix K Draft Wildlife Management Plan; Pages 13, 23, 30.
Prairie Creek Mine Updated Commitments Table (March 22, 2011); Wildlife; Page 2.

Proponent's Conclusions:

The Developer's Assessment Report and the Vegetation and Wildlife Assessment Report (DAR – Appendix 17) identified that waterfowl have been known to use the large water impoundment pond on the mine site during the spring and summer. CZN intends to re-engineer the water impoundment pond into a Water Storage Pond ("WSP") that will initially be filled with mine drainage water during the start-up of the Mine, and will subsequently receive both mine water and Mill process water during Mine operations. During the 1st round of Information Requests (IR number EC-9), EC identified concerns about the level of contaminants that might be present in the WSP and the potential exposure of waterfowl using the pond to those contaminants. In their response, CZN

identified that concentrations of arsenic, lead and mercury would exceed CCME water quality guidelines for livestock. In their updated Wildlife Management Plan (Feb. 2011) and Commitments Table (Mar. 2011), CZN proposes to implement measures aimed at reducing the number of birds that use the WSP. These measures include the use of scare tactics such as fake raptors, streamers, and flags. Noise deterrents would be used as a last resort. CZN also proposes to monitor the use of the WSP by birds by recording information on species, number, age, activity and success of scare tactics and to submit monitoring reports to appropriate regulatory agencies.

Environment Canada's Conclusions:

The potential for concentrations of arsenic, lead and mercury in the WSP to exceed levels recommended by the CCME water quality guidelines for livestock suggest that waterfowl and other waterbirds that use the WSP could be exposed to levels of contaminants that are sufficient to cause adverse impacts to their health. EC is of the opinion that measures must be implemented to minimize the risk that birds would be exposed to contaminants contained in the WSP. The use of scare tactics as proposed by CZN should help to reduce the use of the WSP by waterfowl and waterbirds and thus help to minimize their risk of exposure to dangerous levels of arsenic, lead and mercury. The efficacy of the scare tactics used to deter birds from the WSP should be monitored, and the results of monitoring should be reported to the CWS of EC.

Environment Canada's Recommendations:

20. CZN should follow-up on their commitment to implement scare tactics to prevent waterfowl and waterbirds from using the WSP and should monitor the use of the WSP by birds and the efficacy of the scare tactics employed to deter them.
21. Monitoring reports should be sent to EC, and the reports should also include the results of water quality monitoring in the WSP from the SNP program.
22. If CZN finds that scare tactics are not effective in deterring birds from using the WSP, CZN should work with EC-CWS to identify alternative deterrents.

Issue 3.4.2 Identification of Adverse Effects, Mitigation, and Monitoring for Species at Risk

Reference(s):

DAR; Sections 4.9, 6.16.3, Table 6-10, 6.21 6.23, 10.3.1, 10.3.2 ; Pages 113-116, 211, 222, 231, 308, 313
DAR - Appendix 17; Sections 4.2.1.1, 4.2.1.2, 4.2.1.3; Pages 41-42
CZN IR2 Report Main Text; IR EC 2-4; Page 28
CZN Responses to 2nd Round Information Requests; Appendix K Draft Wildlife Management Plan; Pages 8-30

Proponent's Conclusions:

CZN noted that the following Species at Risk could occur within the Project Area: Woodland Caribou (Boreal and Mountain populations), Grizzly Bear, Wolverine, Peregrine Falcon (*anatum* subspecies), Wood Bison, Short-eared Owl, Rusty Blackbird, Common Nighthawk, Olive-sided Flycatcher, and Horned Grebe. CZN has identified potential effects, mitigation and monitoring for Woodland Caribou (Boreal and Mountain populations), Grizzly Bear, Wolverine, and Bison (DAR – Appendix 17 – Section 4.3; Appendix K - Updated Wildlife Management Plan). CZN concluded that the significance of impacts to these species through the different pathways identified in the DAR will all be low to moderate (DAR – Appendix 17 – Section 4.3).

CZN states that Peregrine Falcon and Short-eared Owl were not observed in any baseline surveys, and that although habitat is available for both species within the Project area, operation of the access road is not likely to impact either species as their breeding seasons are both well outside of the hauling period for the road (DAR – Appendix 17 – Section 4.3). In their updated wildlife management plan, CZN states that any raptor nesting activity observed within 1.5 km of the Project will be reported to GNWT ENR.

Horned Grebe, Rusty Blackbird, Common Nighthawk, and Olive-sided Flycatcher were also identified as species that had suitable breeding habitat along the existing and proposed sections of the winter access road corridor (DAR – Appendix 17 – Section 4.3). Several observations of Common Nighthawk were made at ponds along the access road during surveys conducted in 1980, however none of the remaining bird species at risk listed above were observed during baseline surveys. The DAR also identified that suitable habitat for Common Nighthawk occurs in the Prairie Creek valley in open gravel along the road to the airstrip and at the airstrip. CZN concluded that conflicts with the access road were not likely as the breeding season for these species is well outside of the hauling period.

Environment Canada's Conclusions:

Section 79 (2) of the *Species at Risk Act* (SARA), states that during an assessment of environmental effects of a project, the adverse effects of the project on listed wildlife species and its critical habitat must be identified, that measures are taken to avoid or lessen those effects, and that the effects need to be monitored. This section applies to all species listed on Schedule 1 of SARA. However, as a matter of best practice, EC recommends that species listed on other Schedules of SARA and under consideration for listing should also be given this type of assessment.

The species listed in Table 1 below are those that have been designated at risk by COSEWIC and are either on a Schedule of SARA or are being considered for addition to Schedule 1 of SARA.

Table 1. Species at risk that could be impacted by the Prairie Creek Mine project.

Terrestrial Species at Risk	COSEWIC Designation	Schedule of SARA	Government Organization with Lead Management Responsibility
Woodland Caribou (Boreal population)	Threatened	Schedule 1	GNWT

Woodland Caribou (Northern Mountain population)	Special Concern	Schedule 1	GNWT
Grizzly Bear	Special Concern	Pending	GNWT
Wolverine (Western population)	Special Concern	Pending	GNWT
Peregrine Falcon	Special Concern (*anatum-tundrius* complex)	Schedule 1 – Threatened (*anatum*)	GNWT
Wood Bison	Threatened	Schedule 1	GNWT
Short-eared Owl	Special Concern	Schedule 3	GNWT
Rusty Blackbird	Special Concern	Schedule 1	GNWT
Common Nighthawk	Threatened	Schedule 1	EC
Olive-sided Flycatcher	Threatened	Schedule 1	EC
Horned Grebe (Western population)	Special Concern	Pending	EC

Although the status of certain Species at Risk was outdated in the DAR, the list of species at risk provided in the most recent version of CZN's Draft Wildlife Management Plan (Feb. 23, 2011) reflects the most recent species designations and listing by COSEWIC and SARA.

Environment Canada anticipates that Parks Canada and the Government of Northwest Territories – Environment and Natural Resources will provide expertise as to the adequacy of the information provided, and the mitigation and monitoring measures proposed for Woodland Caribou (Boreal and Mountain populations), Grizzly Bear, Wolverine, Wood Bison, Peregrine Falcon, and Short-eared Owl.

Environment Canada's concerns and conclusions regarding Common Nighthawk, Olive-sided Flycatcher and Horned Grebe are addressed in the next section "*Impacts on migratory birds from vegetation clearing and maintenance along the mine access road and vegetation clearing for the waste rock storage area"*.

Environment Canada's Recommendations:

23. The primary mitigation measure for each species should be avoidance. The proponent should avoid contact with or disturbance to each species.

24. The proponent should consult with Parks Canada and the Government of the Northwest Territories (GNWT-ENR) and appropriate status reports, recovery strategies, action plans, and management plans to identify other appropriate mitigation measures to minimize impacts on Woodland Caribou (Boreal and

Mountain populations), Grizzly Bear, Wolverine, Peregrine Falcon, Wood Bison, Short-eared Owl, Rusty Blackbird from the project.

25. The proponent should develop monitoring plans for each species in accordance with any applicable status reports, recovery strategies, action plans, and management plans and in consultation with Parks Canada, the GNWT and EC.

Issue 3.4.3 Impacts on migratory birds from vegetation clearing and maintenance along the mine access road and vegetation clearing for the waste rock storage area

Reference(s):

DAR; Sections**:** 4.9, 6.16.3, Table 6-10, 6.21 6.23, 10.3.1, 10.3.2; Pages**:** 113-116, 211, 222, 231, 308, 313
DAR - Appendix 17; Section**s:** 4.2.1.1, 4.2.1.2, 4.2.1.3; Pages**:** 41-42
Oct. 7 Technical Meeting Transcripts; Wildlife and Vegetation; Pages**:** 255-256
CZN IR2 Report Main Text; IR Number: EC 2-4; Page**:** 28
Prairie Creek Mine Updated Commitments Table (March 22, 2011); Wildlife; Page 3
CZN Responses to 2nd Round Information Requests; Appendix K Draft Wildlife Management Plan; Page 8.

Proponent's Conclusions:

The DAR did not specifically discuss potential impacts to migratory birds, but did assess potential impacts on migratory birds assessed or listed as Species at Risk by COSEWIC and SARA (Common Nighthawk, Olive-sided Flycatcher and Horned Grebe). As a general mitigation measure, CZN states that if a bird nest is found on site and eggs are present, monitoring will be conducted and efforts will be made to avoid the area (Updated Commitments Table – March 22, 2011 – page 2; Appendix K – Draft Wildlife Management Plan).

CZN concluded that impacts from the access road on avian Species at Risk were not likely as their breeding seasons are well outside of the hauling period.

The DAR did not specifically discuss potential impacts to migratory birds or avian Species at Risk from vegetation clearing and maintenance associated with the access road or from vegetation clearing at the waste rock storage area. CZN proposes to upgrade existing sections of the winter access road from the Liard Highway to the Mine site as well as construct 63 km of road re-alignment. The total footprint of the access road is estimated at 173.4 ha, plus 2.0 ha for the Tetcela Transfer Facility (TTF) and 2.8 ha for the Liard Transfer Facility. Sections of the existing road to be used need to be cleared of trees and brush, and new sections of the road re-alignment will require vegetation clearing and cut and fill where necessary to reduce slope. The DAR states that construction of the access road from the Mine site to the TTF would occur between November 1 and December 14, whereas the section from the TTF to the Liard Ice Bridge would be completed by January 15 (DAR – Section 6.32 – pg. 232). An additional 6 ha of Spruce-Lichen habitat will also need to be cleared adjacent to the mine site for the

waste rock storage area. No dates were identified in the DAR for the timing of vegetation clearing for the waste rock storage area.

During the Technical Meetings (Oct. 7, 2010), EC requested that CZN clarify whether any vegetation would be cleared during the spring or summer. CZN stated that any vegetation clearing would have to occur outside of the migratory bird nesting season, and thus vegetation clearing would have to occur during winter. It was revealed, however, that summertime road maintenance will take place along the upper portions of the access road from the Mine site towards Sundog Creek. EC requested (IR round 2 Number EC 2-4) that CZN specify the maintenance activities that would take place along this section of the road and what measures would be taken to reduce potential impacts on migratory birds given that these activities would take place during the nesting season. CZN clarified that maintenance activities are related to runoff management control and structures, repairing eroded or potentially erodible areas, slope stability improvement, and in Sundog Creek, removing talus from the road bed where it crosses several talus slopes. Work would be confined to the immediate area of the road alignment which has been previously disturbed. CZN stated that Olive-sided Flycatcher and Common Nighthawk have not been observed near the Mine nor on the upper portions of the access road and therefore no impacts from summer road maintenance activities are expected. CZN committed (Updated Commitments Table – March 22, 2011 – page 3) to sending out a wildlife monitor to check for bird nests along the sections of the road undergoing summer maintenance before work commences.

Environment Canada's Conclusions:

EC agrees with the proponent's conclusion that construction, maintenance and operation of the access road is unlikely to have significant impacts on avian Species at Risk or on other migratory birds so long as these activities are conducted outside of the migratory bird breeding season. Clearing vegetation for the waste rock storage area outside of the migratory bird breeding season will also help to reduce the likelihood of damaging or destroying nests.

In the boreal region of the Northwest Territories, migratory birds may be found incubating eggs from May 7 until July 21, and young birds can be present in the nest until August 10. Crossbills (medium-sized finch-like birds) may nest at any time of year if there are sufficient numbers of seeds from conifer cones for food. For the upper portion of the access road that will undergo maintenance during the breeding season, EC supports the proponent's commitment to undertake nest surveys prior to carrying out work and to contact the CWS to discuss the need for and form of adaptive management in the event that a nest is found. EC reminds CZN that the prohibitions against destroying or disturbing nests or eggs of migratory birds under paragraph 6(a) of the *Migratory Bird Regulations* (MBR) apply to all migratory bird species wherever they occur, not just to those that have been designated at risk by COSEWIC and SARA.

Environment Canada's Recommendations:

26. Vegetation clearing and roadbed preparation for existing and proposed sections of the mine access road should be conducted either before May 7 or after August 10, to avoid the migratory bird breeding season.

27. Vegetation clearing for the waste rock storage area should also take place outside of the migratory bird breeding season.

28. For upper sections of the access road undergoing summer maintenance, CZN should conduct nest surveys before work commences. If an active nest is found, the area should be avoided until nesting is completed (i.e. the young have left the vicinity of the nest).

Issue 3.4.4 Predator/scavenger attraction to project development and potential increases in predation on migratory birds

Reference(s):

DAR; Section 10.3.1, 10.3.2; Pages 311-312, 315
DAR – Appendix 17; Sections 4.3.1.3.4, 4.3.1.5.3, and 4.3.2.5; Pages 50, 54-55, 65-66
Draft Wildlife Management Plan (Feb. 23, 2011); Sections 5.3.2, 5.3.3; Pages 10-11.
Prairie Creek Mine Updated Commitments Table (March 22, 2011); Wildlife; Pages 2-3.

Proponent's Conclusions:

CZN has proposed several measures both in the DAR and their updated Wildlife Management Plan to limit the attraction of predators and scavengers to wastes generated by the project and to limit wildlife denning under project infrastructure. These measures include:

- Skirting all buildings and stairs to discourage their use by small wildlife
- Surrounding the sewage sludge cell with a non-electrified chain-link fence with a minimum height of 6 feet
- Collecting and incinerating food on a daily basis
- Keeping limited food supplies at the transfer facilities
- Storing all food and garbage in bear-proof areas or bear-proof containers
- A no littering policy
- Separation of food waste and non-food waste at the source
- Not permitting food and beverages and their containers in any outdoor areas
- Storing all grease, oils, fuels, or antifreeze in bear-proof areas or containers

For most species in the area, CZN concluded that habituation to the mine site is not likely to occur. It was noted that Dall's sheep are already habituated to the mine site, and regularly enter the site to lick for soda ash stored in the equipment storage yard, but that measures would be taken to prevent this in the future. CZN concluded that the impacts from wildlife habituation at the mine site and operations on significant VCs would be low to moderate.

Environment Canada's Conclusions:

EC agrees that the implementation of the proposed waste management procedures and the skirting of stairs and buildings will help to reduce the attraction of predators and scavengers to the mine site and transfer facilities along the access road. The DAR does

not, however, recognize the potential for the development to provide additional nesting and roosting sites for avian predators and scavengers (e.g. Ravens), thus increasing their local populations and putting pressure on local bird populations.

Environment Canada's Recommendations:

29. Environment Canada recommends that the Proponent undertake the following predator control measures:
    - All wildlife should be prevented from gaining access to liquid and solid waste and other wildlife attractants such as petroleum products;
    - All structures should be designed to preclude nesting and roosting sites for avian predators (including ravens) or den sites for mammalian predators. The proponent may consult with EC-CWS staff regarding design measures that could be taken;
    - Orientation for project personnel should include best practices with regard to waste management and avoiding wildlife; and,
    - Regular surveillance of facilities and project waste sites for the presence of wildlife to ensure that the predator control measures are effective.

SECTION 4.0: SUMMARY OF RECOMMENDATIONS

The following recommendations have been made by Environment Canada:

1. Any change from background water quality will potentially result in changes to the ecosystem. Setting objectives for Prairie Creek downstream of the proposed mine will require a value judgment be made as to the degree of change which is acceptable, and determining how far down the receiving environment stream change is acceptable. Environment Canada will defer to Parks Canada, other stakeholders, and the Board, on making this determination.
2. EC notes that low detection limits will be needed for the onsite analytical instruments, if they are to be used for aquatic effects monitoring, and thus to evaluate whether the mine is meeting water quality objectives.
3. Winter baseline water quality data for Prairie Creek should be augmented to strengthen the dataset, and CZN should subsequently review the SSWQOs.
4. Low level mercury analysis should be done for upstream samples, both in summer and under ice, and results used to re-evaluate the SSWQO for mercury.
5. The nitrite SSWQO discrepancy should be clarified, with the lower value deemed more appropriate.
6. Alteration of the water quality in Prairie Creek will need to be minimized through achieving the best possible effluent quality, and careful management of discharges. Further details should be developed to determine if the use of a load-based approach would be feasible.
7. Maintaining the 500:1 ratio of creek water to process water would also rely on real-time flow data; this option should be further developed.
8. Increasing storage capacity of the WSP should be evaluated for feasibility and implications on water balance and management.
9. Nutrient releases should be minimized through the use of mitigation measures to prevent releases of nitrogen compounds, and to reduce phosphorus releases through optimizing wastewater treatment.
10. Monitoring of nutrient concentrations in discharges and the receiving environment should be done on an ongoing basis, with results linked to observations of biota under the AEMP.
11. The proposed licence limit of 0.2 mg/L maximum average for phosphorus is supported by EC. It is recommended that this be revisited if the AEMP identifies changes that may become ecologically significant impacts.
12. Predictions for mixing and receiving environment concentrations should be validated at the commencement of operations, and conditions monitored on an ongoing basis to ensure chronic toxicity does not extend beyond the 100m IDZ.
13. EC recommends that further work be done to develop an aquatic monitoring plan that will enable the proponent to detect change to the downstream environment and act upon it before changes become impacts. The monitoring plan should have the elements of other requirements (SNP, EEM, Water licence) harmonized with respect to sampling sites and reporting, acknowledging that there will be different timing cycles for different monitoring requirements. EC supports use of the INAC Guidelines for Designing and Implementing Aquatic Effects Monitoring Programs for Development Projects in the NWT – 2007.
14. An adaptive management plan should be drafted that does not incorporate multiples of exceedances of objectives before action is triggered.
15. EC supports the input of the stakeholders committee mentioned in the commitments table, line 2, into design of monitoring programs.

16. EC recommends that the Proponent develop and implement a Contaminant Loading Management Plan (CLMP). The CLMP should be developed in consultation with EC and the GNWT and should include but be limited to the following:
    - Identification of potential sources of contaminant loading;
    - Description of all potential mitigation approaches available, including all of the mitigation strategies used at other mines;
    - Identification of mitigation approaches to be employed at the Prairie Creek mine;
    - Description of the monitoring program, including both baseline monitoring and monitoring during mining operations;
    - Description of trigger levels or action levels above which adaptive management and contingency plans need to be implemented;
    - Description of adaptive management and contingency plans to be employed if trigger levels are exceeded;
    - Annual reports presenting the following information:
        - Results from the dustfall and soil monitoring program;
        - Assessment of the effectiveness of current mitigation; and
        - Description of any adaptive management or contingency employed
    - Monthly data reports within thirty days following the reported for at least the first year after mine operations and the transport of concentrate begins.
17. EC recommends that the Proponent employ secondary containment on the flat deck trailers during the transport of lead/zinc concentrate to mitigate spillage or escapement due to bag malfunctions or accidents.
18. EC recommends that the Proponent develop and implement an Incineration Management Plan that is consistent with the advice provided in the *Technical Document for Batch Waste Incineration.* The incineration management plan should be developed in consultation with EC and the GNWT.
19. EC recommends that Proponent develop and implement the air Monitoring Program and Mitigation and Adaptive Strategies management plan in consultation with EC and GNWT.
20. CZN should follow-up on their commitment to implement scare tactics to prevent waterfowl and waterbirds from using the WSP and should monitor the use of the WSP by birds and the efficacy of the scare tactics employed to deter them.
21. Monitoring reports should be sent to EC, and the reports should also include the results of water quality monitoring in the WSP from the SNP program.
22. If CZN finds that scare tactics are not effective in deterring birds from using the WSP, CZN should work with EC-CWS to identify alternative deterrents.
23. The primary mitigation measure for each species should be avoidance. The proponent should avoid contact with or disturbance to each species.
24. The proponent should consult with Parks Canada and the Government of the Northwest Territories (GNWT-ENR) and appropriate status reports, recovery strategies, action plans, and management plans to identify other appropriate mitigation measures to minimize impacts on Woodland Caribou (Boreal and Mountain populations), Grizzly Bear, Wolverine, Peregrine Falcon, Wood Bison, Short-eared Owl, Rusty Blackbird from the project.

25. The proponents should develop monitoring plans for each species in accordance with any applicable status reports, recovery strategies, action plans, and management plans and in consultation with Parks Canada, the GNWT and EC.
26. Vegetation clearing and roadbed preparation for existing and proposed sections of the mine access road should be conducted either before May 7 or after August 10, to avoid the migratory bird breeding season
27. Vegetation clearing for the waste rock storage area should also take place outside of the migratory bird breeding season
28. For upper sections of the access road undergoing summer maintenance, CZN should conduct nest surveys before work commences. If an active nest is found, the area should be avoided until nesting is completed (i.e. the young have left the vicinity of the nest).
29. Environment Canada recommends that the Proponent undertake the following predator control measures:
    - All wildlife should be prevented from gaining access to liquid and solid waste and other wildlife attractants such as petroleum products;
    - All structures should be designed to preclude nesting and roosting sites for avian predators (including ravens) or den sites for mammalian predators. The proponent may consult with EC-CWS staff regarding design measures that could be taken;
    - Orientation for project personnel should include best practices with regard to waste management and avoiding wildlife; and,
    - Regular surveillance of facilities and project waste sites for the presence of wildlife to ensure that the predator control measures are effective.

Environment Canada would like to thank the MVEIRB for the opportunity to comment on the, and we hope that these technical comments and recommendations are useful to the MVEIRB in their decision making process. Environment Canada respectfully requests the opportunity to submit additional written comments after the public hearings to address any new information brought forward at the hearings.

APPENDIX 1: RELEVENT LEGISLATION, POLICIES AND GUIDELINES

Department of the Environment Act

The *Department of the Environment Act* (*DOE Act*) provides EC with general responsibility for environmental management and protection. Its obligations extend to and include all matters over which Parliament has jurisdiction, and have not by law been assigned to any other department, board, or agency of the Government of Canada as related to:

- Preservation and enhancement of the quality of the natural environment (e.g. water, air, soil)
- Renewable resources including migratory birds and other non-domestic flora and fauna
- Water
- Meteorology
- Coordination of policies and programs respecting preservation and enhancement of the quality of the natural environment.

The *DOE Act* states that EC has a mandated responsibility to advise heads of federal departments, boards and agencies on matters pertaining to the preservation and enhancement of the quality of the natural environment. As such, this mandate is extremely broad.

Canadian Environmental Assessment Act

The *Canadian Environmental Assessment Act* (*CEAA*) came into force in January 1995. *CEAA*'s primary purpose is to ensure that the environmental effects of projects are considered as early as possible in a project's planning stages. Section 16 of *CEAA* describes the factors which must be considered in order to assess the environmental effects. Environment Canada attempts to incorporate these factors (e.g. consideration of cumulative effects) into all expert advice and information it provides to environmental assessments.

Canadian Environmental Protection Act, 1999

Proclaimed on March 31, 2000, the new *Canadian Environmental Protection Act, 1999* (CEPA 1999, referred to hereinafter as *CEPA*) is an Act respecting pollution prevention and the protection of the environment and human health in order to contribute to sustainable development. *CEPA* shifts the focus away from managing pollution after it has been created to preventing pollution. The Act provides the federal government with new tools to protect the environment and human health, establishes strict deadlines for controlling certain toxic substances, and requires the virtual elimination of toxic substances which are bioaccumulative, persistent and result primarily from human activity.

For substances that are declared "toxic" under *CEPA* and are added to the List of Toxic Substances in Schedule 1 of the Act, instruments will be proposed to establish preventive or control actions for managing the substance and thereby reduce or eliminate its release into the environment. These tools may be used to control any

aspect of the substance's life cycle, from the design and development stage to its manufacture, use, storage, transport and ultimate disposal.

Examples of preventive and control instruments include:

- regulations;
- pollution prevention plans;
- environmental emergency plans;
- environmental codes of practice;
- environmental release guidelines; and
- pre-notification and assessment of new substances (chemicals, biochemicals, polymers, biopolymers, and animate products of biotechnology).

Authority to require emergency plans for toxic or other hazardous substances is provided in Part 8 of *CEPA*. Environmental emergency plans for such a substance(s) must cover prevention, preparedness, response and recovery.

Fisheries Act - Pollution Prevention Provisions

The Minister of Fisheries and Oceans is legally responsible to Parliament for administration and enforcement of all sections of the *Fisheries Act*. However, under a Prime Ministerial Instruction (1978) and a Memorandum of Understanding (1985), EC administers and enforces those aspects of the Act dealing with the prevention and control of pollutants affecting fish. In this context, EC works to:

- advance pollution prevention technologies;
- promote the development of preventative solutions; and
- work with the provinces, territories, industry, other government departments and the public on issues relating to the pollution provisions of the *Fisheries Act*.

The main pollution prevention provision is found in subsection 36(3) of the Act, and is commonly referred to as the "general prohibition". This subsection prohibits the deposit, into fish-bearing waters, of substances that are deleterious to fish. The legal definition of "deleterious substance" provided in subsection 34(1) of the Act, in conjunction with court rulings, provides a very broad interpretation of deleterious and includes any substance with a potentially harmful chemical, physical or biological effect on fish or fish habitat. One measure of a deleterious substance (such as a liquid discharge) is acute lethality as measured by the standard 96 hour fish bioassay test.

Pertinent regulations under the *Fisheries Act* include the Metal Mining Effluent Regulations (MMER's). The MMER's were registered and become national law on June 6, 2002. The regulations apply to all metal mines in Canada, including gold mines. The MMER's take a three tiered approach to monitoring, including end of pipe physical/chemical quality, end of pipe biological quality (through biological testing of lethality), and downstream environmental effect monitoring. The MMER's also have a requirement for comprehensive Environmental Effects Monitoring (EEM). An EEM program is a scientific assessment to evaluate the effects of mine effluent on the aquatic environment, specifically fish, fish habitat and the use of fisheries resources as defined in the *Fisheries Act*. An "effect" is defined in the MMER's as a statistically significant

difference between fish or benthic invertebrate community measurements taken from exposure and reference areas (or along a gradient of effluent exposure). Environment Canada staff are available to assist in the development of EEM programs and to answer questions relating to the MMER's.

Migratory Birds Convention Act

The purpose of the *Migratory Birds Convention* (1916, amended by Protocol in 1999) is to ensure the conservation of migratory birds, as defined in the *Act*, and prohibit the take of migratory birds except for scientific, educational, avicultural, or other specific purposes consistent with the principles of the Convention. The *Migratory Birds Convention Act* (*MBCA*), based upon the Convention, provides the authority for the *Migratory Bird Regulations* (*MBR*), which establishes specific prohibitions and defines activities which may be permitted, and the circumstances under which such permitted activities may take place.

The Canadian Wildlife Service (CWS) of Environment Canada administers and enforces the *MBCA* and *MBR*. CWS provides expert advice in environmental assessment review processes. CWS focuses primarily on identifying potential adverse effects to migratory bird populations and habitats, and appropriate measures to mitigate those effects. The advice provided in an environmental assessment process does not constitute an authorization for incidental take under the MBR's, nor does it assure that the project will not result in the killing or taking of a migratory bird or its nest. Furthermore, the advice does not absolve project proponents from their obligation to comply with all provisions of the MBCA and MBR.

Species at Risk Act

The *Species at Risk Act* (*SARA*) provides a framework for actions across Canada to ensure the survival of wildlife species and the protection of our natural heritage. It sets out how to decide which species are a priority for action and what to do to protect a species. Three federal Ministers have responsibilities under *SARA*; the Minister of Fisheries and Oceans is responsible for aquatic species at risk, the Minister of Heritage (through Parks Canada Agency) is responsible for species at risk found in national parks, national historic sites or other protected heritage areas, and the Minister of the Environment is responsible for all other species at risk, and is also responsible for the administration of the *Act.*

The *Species at Risk Act* is being brought into force through a phased approach. Phase 1 came into force March 24, 2003 and set out amendments to other related federal laws including the *Canada Wildlife Act*, *Migratory Birds Convention Act* (1994), and the *Wild Animal and Plant Regulation of International and Inter-provincial Trade Act*. As of June 5, 2003, Phase 2 of the Act emphasizing consultation, stewardship, cooperation and information about the law came into effect. The remaining sections of SARA (Phase 3), the SARA prohibitions, critical habitat protection, and enforcement of the law, came into effect on June 1, 2004.

SARA applies on all federal lands, and on those territorial lands where the territorial government does not have its own specific legislation to protect species at risk (the "safety net" clause). All species included on the List of Wildlife Species at Risk (i.e. endangered, threatened, extirpated and special concern) will require the development of either recovery strategies or management plans. Further, projects that require an

environmental assessment under an Act of Parliament will have to take into account the project's effects on listed wildlife species and their critical habitat. The assessment must include recommendations for measures to avoid or reduce adverse effects and plans to monitor the impact of the project, if it goes ahead. The project plan must respect recovery strategies and action plans. All other SARA prohibitions will still apply.

The Canadian Biodiversity Strategy

In 1992, more than 160 countries, including Canada, signed the United Nations Convention on Biological Diversity (the Convention) at the United Nations Conference on Environment and Development (the Earth Summit), held in Rio de Janeiro. The goals of the Convention are to conserve the ecosystem, species and genetic diversity, to ensure that the Earth's biological resources are used wisely and to ensure that the economic benefits from using these resources are shared fairly and equitably. Conservation of biodiversity and sustainable use of biological resources are necessary to ensure that the economic, societal and environmental benefits can be available to current and future generations.

One of the key obligations for parties that ratified the Convention was to prepare a national biodiversity strategy. The Canadian Biodiversity Strategy (the Strategy) was prepared as a response to this obligation and has been developed as a guide to the implementation of the Biodiversity Convention in Canada. According to the Strategy, federal, provincial and territorial governments, in cooperation with stakeholders and members of the public, will pursue implementation of the directions contained in the Strategy according to their policies, priorities and fiscal capabilities.

Environment Canada in collaboration with other federal agencies, provincial and territorial environmental and resource management agencies, industry and a range of non-governmental organizations completed the Strategy in 1995, based in part on the principles of the *Canada Wildlife Act* and "A Wildlife Policy for Canada". The Strategy supports wildlife biodiversity and conservation and increases the focus on integrated and ecosystem-based approaches to conservation based on Canada's existing legislation.

While the Strategy does not deal with the mining sector specifically, it does provide a framework for jurisdictions to consider biodiversity when addressing environmental issues. The goals of the Strategy are to:

- Conserve biological biodiversity and sustainable use of biological resources.
- Improve our understanding of ecosystems and increase our resource management capacity.
- Promote an understanding of the need to conserve biodiversity and sustainably use biological resources.
- Maintain or develop incentives and legislation that support biodiversity conservation and sustainable use.
- Work with other countries to meet the objectives of the Convention.