Parks Canada Parcs Canada

September 13, 2011

Mr. Chuck Hubert
Mackenzie Valley Environmental Impact Review Board
#200 Scotia Centre
5102 – 50th Avenue
Yellowknife, NT X1A 2N7

Via email: *chubert@reviewboard.ca*

Re: EA0809-002, Prairie Creek Mine, Canadian Zinc Corporation: Final Submission

Dear Mr. Hubert,

Please find the attached Final Submission from Parks Canada. Our Final Submission has been based on the public record as of September 13, 2011. We are aware that additional information has been circulating among parties, but as this information is not on the public record we have not considered it when drafting our submission. We thank you for the opportunity to participate in this process.

Sincerely,

Eric Betsaka
Associate Superintendent, Nahanni National Park Reserve of Canada

cc Robert Kent, Field Unit Superintendent, Southwest NWT

Canada

Parks Canada Parcs Canada

Final Submission

Canadian Zinc Corporation Prairie Creek Mine Proposal

EA 0809-002

September 13, 2011

Canada

Executive Summary

On behalf of the people of Canada, Parks Canada is responsible for the protection and presentation of nationally significant examples of Canada's natural and cultural heritage and to foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations. The proposed Prairie Creek mine is now surrounded by the expanded Nahanni National Park Reserve of Canada (NNPR) and the proposed winter access road includes 77 km within the park. In May 2011, Parks Canada referred the permits for the road in the park to environmental assessment. Parks Canada is participating in the environmental assessment process as a regulator for a portion of the road and as an expert advisor on the potential impacts of the development on the ecological integrity of the park.

On June 3, 2011 Parks Canada submitted a technical report to the Mackenzie Valley Environmental Impact Review Board in advance of public hearings. This Final Submission is an addition to that report and readers should look to the technical report for more detailed analysis and rationale for recommendations.
This final submission is organized in two sections which address issues associated with the road and the mine site separately.

Approximately 77 km of the winter access road is in NNPR. Parks Canada's analyses of the road focused on the spills, road construction, karst landscape, vegetation, and wildlife in NNPR. As described in our technical report, without mitigation, we believe the impacts to the ecological integrity of NNPR from the road would be significant. To date the mitigation identified by the proponent and other parties is not at the standard we have come to expect in a national park. As a result, where information was missing a reasonable worst case environmental impact was predicted. On that basis we have made recommendations on mitigation measures.

At the mine site, uncertainty remains around potential impacts from mine operations and post-closure on physical processes influencing aquatic ecosystems in Prairie Creek and therefore impacts to aquatic invertebrate and algal communities which contribute to the ecological integrity of NNPR. We have provided additional recommendations on mitigation and monitoring.

Table of Contents

1 Introduction

On behalf of the people of Canada, Parks Canada is responsible for the protection and presentation of nationally significant examples of Canada's natural and cultural heritage and to foster public understanding, appreciation and enjoyment in ways that ensure their ecological and commemorative integrity for present and future generations.

Nahanni National Park Reserve of Canada (NNPR) was established in 1976, consisting of an area of 4,766 square kilometres. Under the *Canada National Parks Act*, NNPR is protected for public benefit, education and enjoyment, while being maintained to leave it unimpaired for future generations.

In 2009, NNPR was expanded to an area of approximately 30 000 square kilometers, making it the third largest national park in Canada (Figure 1). The expansion occurred to protect a significant portion of the South Nahanni River watershed, and the unique features of the Ram plateau, and the globally unique North Nahanni Karst. Portions of the park are also designated a UNESCO World Heritage Site and a Canadian Heritage River.

1.1 Parks Canada Regulatory Role and Environmental Assessment

The proposed Prairie Creek mine is surrounded by NNPR, but is not on national park lands. The expansion occurred in a way that would allow the mine to operate within an area excluded from the park. Approximately half of the proposed access road is contained within the park, traversing 77 km from the eastern boundary of the park, through the karst, and into the mountain valleys toward the mine site. As the mine was pre-existing, its operation was anticipated during the negotiations for the expansion of NNPR. In the *Canada National Parks Act,* the government of Canada specifically allowed for a mining access road (s. 41.1) for this mine. Parks Canada is committed to working with Canadian Zinc Corporation towards our respective goals.

Similar to the Mackenzie Valley Land and Water Board (MVLWB), Canadian Zinc Corporation requires permits to operate the winter road in the park and these permits are subject to Part 5 of the Mackenzie Valley Resource Management Act. While Canadian Zinc Corporation holds a water licence and land use permit for use of the previously operated winter road through the park, they applied on May 12, 2011 for permits to operate the winter road for full mine operation as described in the Developers Assessment Report for EA 0809-002. Parks Canada conducted a preliminary screening of these permits and referred them to environmental assessment on May 31, 2011. We indicated in the letter that based on our interpretation of the terms of reference and the scope of the development for EA 0809-002, our permits/preliminary screening were included in the ongoing environmental assessment (i.e. EA 0809-002) and a subsequent environmental assessment was not warranted. As a result, it was decided that this environmental assessment would meet the requirements of Part 5 of the MVRMA not only for permits issued by the MVLWB, but also for permits issued by Parks Canada. Parks Canada will be implementing the measures recommended by the Review Board and agreed to by the Responsible Ministers in our permits.

We are participating in this environmental assessment process as a regulator for a portion of the road and as an expert advisor on the potential impacts of the development on the ecological integrity of NNPR.

1.2 Report organization and approach

Our analysis of the proposed Prairie Creek Mine is separated into two sections. First the potential impacts from the road on NNPR are examined. Second, the potential impacts of the mine site are examined for potential impacts on the Prairie Creek aquatic ecosystem in NNPR. We consider this report a supplemental report to our technical report in June. All of our recommendations from the June 2011 technical report are still applicable and are summarized in Appendix 1. Therefore, please refer to it for further analysis and details.

2 Winter road

Approximately 77 km of the winter access road is in NNPR. Parks Canada's analyses of the road focused on potential spills, road construction, karst landscape, vegetation, and wildlife in NNPR. As described in our technical report, without adequate mitigation, we believe the impacts to the ecological integrity of NNPR from the road would be significant. Our technical report also identified deficiencies in information about the road. However, following the hearing in a letter to Parks Canada dated July 18, 2011, the Review Board stated:

> With respect to winter access road issues including spills risk analysis, water withdrawal and aggregate sources the Review Board has determined that sufficient information has been received from the developer for the purposes of this environmental assessment. The level of detail requested by Parks Canada will be required from the developer during the detailed design of the winter access road which will take place during the regulatory phase of this project.

It is difficult to understand how adequate mitigation measures will be identified to ensure there will be no significant adverse environmental impacts on the ecological integrity of NNPR without the information highlighted in our Technical Report on page 17. Mitigation proposed to date by the proponent has been limited to:

- Two route alterations, without details on grades, locations and ground condition that would support these alterations as the best routes. Furthermore, there is no information provided to allow us to evaluate if there should be alterations in other locations.
- Commitments to provide information in the permitting phase.
- General statements that would apply for any winter road anywhere in the Mackenzie Mountains.
- Some commitments with regard to spill response mitigations.

This environmental assessment must meet the obligations of Part 5 for the permits issued by Parks Canada (as described above) and in order to provide the appropriate level of care. Environmental assessments in national parks tend to be more detailed than those outside of national parks. To date the mitigation identified by the proponent and other parties is not at the standard we have come to expect in a national park. However, given the Board's direction we have tried to find a way forward that does not involve recommending more information be collected (which doesn't provide an actual mitigation or allow a determination of significance). We have identified the missing information, predicted a worst case environmental impact and provided the following table of recommended mitigations.

Recommendation 9: The following mitigation measures be implemented for the winter road.

Aspect	Missing Project Information	Reasonable Worst Case Impact	Recommended Mitigation
Aggregate source	Size, nature of extraction	Large visual scar in a national park	Materials may only be removed for fill within 2 meters of the road bed and only where materials are unvegetated. After removal of aggregate slopes are to be contoured to accommodate drainage, to ensure stability, and to ensure the removal of materials is not obviously an impairment to aesthetics. Maximum amount of aggregate taken from the park be 8250 m^3 (DAR Addendum (6000 m^3 for TTF) and IR Round 2 PC 2-1 (5 km fill in park x .5m thick x 5m wide) plus 10% buffer = a maximum of 8250 m^3.)
Water source	Water needs, aquatic environment of Mosquito Lake	Anecdotally Mosquito Lake is of variable depth with large portions of the lake being very shallow. The aquatic ecosystem in the lake may be unique because it is in an unglaciated karst area. A large withdrawal could significantly impact this particularly unique aquatic ecosystem.	If the total withdrawal could potentially exceed 7% of the volume of the lake, aquatic surveys must be conducted and a thorough quantitative assessment made to determine potential impacts before permitting.
Spills	Grades of road, locations of road modifications, such as runoffs.	Spills are uncontained in sensitive areas, destroying large portions of ecosystems.	Minimum response time to all locations in the park be 30 minutes. Materials at the location meeting minimum response time would be sufficient to contain an entire truck of all potential spill materials in a variety of environmental conditions. Barriers will be used in appropriate locations.

Aspect	Missing Project Information	Reasonable Worst Case Impact	Recommended Mitigation
Bridges	Design	Wildlife movement is obstructed preventing movements to important or critical habitats. Temporary delays in movement increase stress and reduce nutritional intake resulting in reduced pregnancy rates in ungulates.	Bridges over Funeral Creek and Sundog Creek are required to be designed to ensure wildlife passage beneath.
Avalanches	Risk assessment and mapping	Avalanche control causes Northern Mountain Woodland Caribou or other wildlife species to abandon part of the winter habitat and interrupts movement.	Conduct detailed risk assessments and mapping for avalanche risk. Wildlife sweeps will be required prior to control being initiated. No control will be used when large mammals are within 3 km of the control area.
Karst and permafrost	Geotechnical stability	Collapse of karst area during construction or transport causes death or bodily harm, the release of harmful substances and materials into underground waterways, and permanent alteration to the landscape. Deterioration of ground conditions supporting the road can lead to extensive erosion and sedimentation, changes to land cover and ecosystem components.	Obtrusive probing must occur along the road alignment in areas with near surface karst and suspected permafrost or weak layers. Road design will take into account avoidance of these features as a first measure, and mitigation to reduce risk as a second measure. Also, refer to our recommendation #1

2.1 Modification of Previous Recommendations

In our June technical submission, we recommended the following:

Recommendation 6: Management of traffic when wildlife are on/near the road will be detailed in the wildlife management plan, but will include:

- ***Stopping traffic when wildlife are within 50m to allow them to cross.***
- ***Only hazing when there is a danger to people or wildlife.***
- ***Hazing only carried out by specific trained staff.***

Based on questions at the hearing, Parks Canada is revising recommendation 6. We believe the following revised recommendation addresses the concerns raised in the Government of the Northwest Territories' (GNWT) Final Argument (September 13, 2011). For clarity, we use the following definition of hazing:

> Hazing is the application of aversive agents (e.g., noisemakers, projectiles) to wildlife that is approaching or has approached a conflict situation (e.g., interaction with traffic on a road, aircraft landing sites, or other facilities). The goal is to remove wildlife from the immediate conflict situation and not necessarily modify the wildlife's behaviour. Further application of aversive agents is not implied nor necessarily consistently applied every time.[1]

We have changed our recommendation to limit it to a few species of particular concern that may be encountered during road operation. If the proponent feels hazing is a necessary mitigation and includes it in their wildlife management plan, a permit would be required from Parks Canada, and based on the GNWT's final argument, a permit would likely be required from GNWT as well. Asking traffic to stop on a road is a mitigation measure that has been used in other projects (for example see s. 33 of MVLWB Land Use Permit 2005F0028) and would only be applied if there was no danger to drivers. The road is not a public road in NNPR and therefore the road near the mine site could not be considered public. We have modified the recommendation to apply only to the portion of the road that is not accessible to the public.

Recommendation 6: Management of traffic when wildlife are on/near the road west of Wolverine Pass will be detailed in the wildlife management plan, but will include:

- ***Stopping traffic when caribou, moose, sheep, wolverine and lynx are within 50m to allow them to cross.***
- ***Only hazing when there is a danger to people or wildlife.***
- ***Hazing only carried out by specific trained staff.***

2.2 Recommendations by other parties

The following recommendations were made by other parties to the environmental assessment. Although we support all the recommendations by other parties, we wish to highlight our support for these recommendations as they provide needed mitigation that is appropriate for a national park.

Environment Canada Recommendation 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
  - 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:

[1] Based on "3rd International Bear-People Conflicts Workshop Summary". 2009. November 15-17, Canmore, Alberta. 69pp.

  - 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.

Environment Canada Recommendation 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.

Aboriginal Affairs and Northern Development Canada (AANDC) Recommendations

1. INAC recommends that local ground temperature measurements define the commencement of road construction activities using equipment other than low pressure ground vehicles, in areas where road construction relies on frozen ground.
2. INAC recommends that local ground temperature measurements define the duration of the road operating season, in areas where road operation relies on frozen ground.

3 Mine Site

While the mine site is not in NNPR, water from the mine site will flow into the park approximately 6.7 km downstream of the mine site and remain in the park for the following 115 km.

3.1 Prairie Creek Aquatic Ecosystem

In Parks Canada's scoping submission, we discussed the goal of protecting the ecological integrity of NNPR and provided an operational description of ecological integrity for the Prairie Creek Watershed aquatic ecosystems (Appendix 2 of Parks Canada's Technical Report). The components of this description that have the greatest probability of being impacted by this project are the second and third:

2. **In the park, physical processes that influence aquatic ecosystems will operate within the natural range of variation.**
   Note: Physical processes include water flow, channel morphology, temperature and chemical processes and regimes.
3. **Aquatic invertebrate and algal communities inside the park are characteristic of the natural region.**
   Note: Community structures that are characteristic of the natural region would also provide quality habitat for other species (for example fish).

3.2 Analysis

We have separated our analysis of the impacts to Prairie Creek Aquatic Ecosystem in NNPR into those impacts during the mine operation and in post-closure.

3.2.1 During Mine Operation

As stated above, the ecological integrity of the Prairie Creek aquatic ecosystem would be maintained if, in the park, physical processes that influence aquatic ecosystems remain within the natural range of variation. The Reference Condition Approach (RCA) to monitoring and assessment is consistent with this definition because it compares a site with ecologically comparable sites and the range of values for a parameter that would be found at a site in the absence in the project (i.e., the range of natural states for a particular location). Choosing SSWQOs that are based on the RCA approach will provide objectives consistent with NNPR's ecological integrity goals.

Recommendation 10: Site Specific Water Quality Objectives (SSWQOs) be set based on the Reference Condition Approach to the degree possible.

Based on the evidence presented, without mitigation we expect that the adverse environmental impacts would be significant. Uncertainty remains in a number of areas that make it difficult to predict the impact of the mine on the water quality of Prairie Creek and the ecological integrity of NNPR after mitigation.

- It is likely that the proponent will not be able to meet all RCA objectives and that some SSWQOs will be above RCA values.
- The final water treatment and storage approach have not been selected by Canadian Zinc.
- Risk assessments of elements that cannot meet RCA values with current or alternate water treatment technologies have not been completed to provide information on the impacts on the aquatic ecosystem.
- Bioaccumulation of mercury has been observed in fish downstream of the mine, but there is insufficient data to determine background levels of mercury. Furthermore there has been no quantitative modelling of the impacts of mercury (see Parks Canada's Technical Report pg 22-24).
- Effluent toxicity results raised questions, were inconsistent and were based on water treatment approaches that may not be used in operation.

Given that water quality was the most important issue for this environmental assessment and that we have raised these concerns at every stage of the process, the extent of the uncertainty surrounding the potential impacts to water is concerning. We have provided several recommendations. Recommendations 11, 12 and13 identify mitigation that would reduce potential for significant adverse impacts and risk to the Prairie Creek aquatic ecosystem. We feel these recommendations are important given the value placed on water by all parties and the uncertainties noted above.

Recommendation 11: Additional water storage be required.

Recommendation 12: Additional treatment options and additional water storage be implemented where they enable the water quality to reach RCA SSWQOs. Risk assessments be conducted for parameters that are predicted to exceed RCA SSWQOs even with additional treatment and storage.

Consistent with Parks Canada and Canada Dam Safety Association dam classification standards[2], the important bull trout habitat in Prairie Creek, and the national park reserve downstream we recommend the following thresholds be established.

[2] "The Development of a National Dam Safety Standard for Parks Canada", Donnelly, C.R., Bechai, M., Trias, M., Vaillancourt, J., Roy, A. 2009. CDA 2009 Annual Conference.

Recommendation 13: A new water storage pond or an expansion to the existing water storage pond be constructed for a 1 in 1000 year flood and a 1 in 1000 year earthquake. Back slopes be designed to ensure adequate stability from landslides and earthquakes.

The following recommendation for ecological integrity in NNPR is based on commonly used statistical techniques for interpreting reference condition approach data which are illustrated in Appendix 2.

Recommendation 14: Thresholds of impacts and management action be established as follows:

Level of impairment to algal or invertebrate communities within Nahanni NPR using a statistical distribution reference condition approach	**Action**
Sample falls within the 70% ellipse or less	Ongoing monitoring and assessment.
Sample falls within the 70-95% ellipse	Possible pending impairment to the ecological integrity of the Prairie Creek Aquatic Ecosystem in Nahanni NNPR – additional assessment is required as designed in consultation with Parks Canada and other parties.
Sample falls beyond the 95% ellipse[3]	Significant adverse environmental impact

We also support AANDC's recommendations with respect to mercury.

3.2.2 Post-closure

Parks Canada has relied on the expertise of Aboriginal Affairs and Northern Development Canada and Natural Resources Canada to assist in assessing the potential impacts of the paste backfill. The legacy of the Prairie Creek Mine Site is very important considering it is located in an area of great value to Dehcho First Nations, all Canadians and internationally as a National Park Reserve and World Heritage Site. The most recent information provided by the proponent (September 2, 2011) identifies a change in the management of Dense Media Separation rock. While this change provides some reassurances, there remains a possibility that seepage after closure will have some high metal loadings. As a result, we provide the following recommendations.

Recommendation 15: No paste tailings to be stored on surface other than those contained within the paste plant itself.

Recommendation 16: No paste tailings to be stored within the waste rock pile.

Recommendation 17: DMS be segregated within the waste rock pile.

[3] The 95% RCA ellipse is consistent with the use of two standard deviations and therefore consistent with AANDC's submission.

Recommendation 18: Seepage from the waste rock pile be routed through the mine water circuit and be discharged in accordance with effluent quality criteria back-calculated from downstream site-specific water quality objectives. Installation of a seepage collection system for the Harrison Creek aquifer should be included in the development plan.

Natural Resources Canada has identified that additional testing is needed to provide confidence in the predictions of water quality draining from the mine after closure in their recommendation number 12. Given that once the paste backfill is placed in the mine, there are no mitigative measures that can be taken if predictions prove incorrect, additional testing is warranted. This information should be collected prior to permitting the mine.

3.2.3 Monitoring

As previously recommended, Parks Canada believes that as part of the aquatic monitoring program, sites within the park should be monitored to assess the impacts of the development on the park.

Appendix 1- Parks Canada's Recommendations

This list of recommendations includes those from the Parks Canada Technical Report, with amendments where discussed above, and new recommendations from this final submission.

Recommendation 1: After each spill, the proponent be required to report on the spill including the following information: factors contributing to the cause of the spill, corrective action that will be taken to minimize a similar set of factors occurring again, effectiveness of spill response, actions that will be taken to improve spill response based on this experience.

Recommendation 2: After each spill, adequate monitoring occur to assess the impacts and effectiveness of clean-up. If the spill occurs within the karst area, monitoring should occur for an extent appropriate to the potential of impacts in the karst system.

Recommendation 3: Monitoring of the approximately 10 km of road through the intense karst landscape will include the following:

- ***Initial recording of sinkhole features and other closed depressions would consist of specifically identifying, briefly characterizing and photographing each feature within a zone at least the maximum diameter of karst subsidence features in the area. Each feature would be mapped onto ortho-corrected, high resolution satellite imagery and given a unique identifier. The attributes of each feature, along with associated photos and other related data (date, category of sink hole, etc.) would be handled within a geographic information system. (Response to IR Round 1 Parks_Canada 9.3).***
- ***Monitoring of sinkhole features and other closed depressions be carried out within a zone width that is at least the maximum diameter of karst subsidence features, by re-photographing the corridor and making an image comparison with the original image. (IR Round 1 Parks_Canada 9.3) Monitoring of formation and development of new sinkholes and caves by visual inspection, and monitoring of settlement within the karst area to assess if road operations are impacting the karst. Minimum frequency of visual monitoring should be twice yearly during times of limited to no snow cover.***
- ***Monitoring of surface water flow patterns (and potentially quantity) in the intense karst region adjacent to the road to assess if road operations are altering the natural drainage patterns.***
- ***Monitoring of surface water quality in the intense karst region to assess if road operations are altering the quality of water.***
- ***Monitoring of groundwater originating or passing under the intense karst region to assess if road operations are altering groundwater levels and background groundwater quality.***

Recommendation 4: Monitoring for invasive species should occur along the road corridor and any associated footprint of the development. The extent and design of this monitoring should be based on the biological attributes of potential invading species.

Recommendation 5: Post-closure, abandonment, and reclamation planning should incorporate findings of research on revegetation and reclamation conducted in the project area.

Recommendation 6: Management of traffic when wildlife are on/near the road west of Wolverine Pass will be detailed in the wildlife management plan, but will include:

- ***Stopping traffic when caribou, moose, sheep, wolverine and lynx are within 50m to allow them to cross.***
- ***Only hazing when there is a danger to people or wildlife.***
- ***Hazing only carried out by specific trained staff.***

Recommendation 7: Monitoring of wildlife will include:

- ***Measures of Mountain Woodland Caribou distribution (e.g., site occupancy) and population vital rates (e.g., pregnancy rates) in the Prairie Creek watershed and along the road.***
- ***Wildlife interactions, observations, hazing etc.***
- ***Measures of moose distribution (e.g., site occupancy) along the road corridor east of Cat Camp in Nahanni National Park Reserve.***
- ***Wildlife attractant inspections including all storage facilities.***
- ***Track surveys and incidental observations for predators of caribou along the road and at the mine site.***

Recommendation 8: Locations for monitoring aquatic effects include sites within the park. In addition we recommend a decision response system be established with thresholds

Recommendation 9: The following mitigation measures be implemented for the winter road.

Aspect	Missing Project Information	Reasonable Worst Case Impact	Recommended Mitigation
Aggregate source	Size, nature of extraction	Large visual scar in a national park	Materials may only be removed for fill within 2 meters of the road bed and only where materials are unvegetated. After removal of aggregate slopes are to be contoured to accommodate drainage, to ensure stability, and to ensure the removal of materials is not obviously an impairment to aesthetics. Maximum amount of aggregate taken from the park be 8250 m^3 (DAR Addendum (6000 m^3 for TTF) and IR Round 2 PC 2-1 (5 km fill in park x .5m thick x 5m

Aspect	Missing Project Information	Reasonable Worst Case Impact	Recommended Mitigation
			wide) plus 10% buffer = a maximum of 8250 m³.)
Water source	Water needs, aquatic environment of Mosquito Lake	Anecdotally Mosquito Lake is of variable depth with large portions of the lake being very shallow. The aquatic ecosystem in the lake may be unique because it is in an unglaciated karst area. A large withdrawal could significantly impact this particularly unique aquatic ecosystem.	If the total withdrawal could potentially exceed 7% of the volume of the lake, aquatic surveys must be conducted and a thorough quantitative assessment made to determine potential impacts before permitting.
Spills	Grades of road, locations of road modifications, such as runoffs.	Spills are uncontained in sensitive areas, destroying large portions of ecosystems.	Minimum response time to all locations in the park be 30 minutes. Materials at the location meeting minimum response time would be sufficient to contain an entire truck of all potential spill materials in a variety of environmental conditions. Barriers will be used in appropriate locations.
Bridges	Design	Wildlife movement is obstructed preventing movements to important or critical habitats. Temporary delays in movement increase stress and reduce nutritional intake resulting in reduced pregnancy rates in ungulates.	Bridges over Funeral Creek and Sundog Creek are required to be designed to ensure wildlife passage beneath.
Avalanches	Risk assessment and mapping	Avalanche control causes Northern Mountain Woodland Caribou or other wildlife species to abandon part of the winter habitat and interrupts movement.	Conduct detailed risk assessments and mapping for avalanche risk. Wildlife sweeps will be required prior to control being initiated. No control will be used when large mammals are within 3 km of the control area.
Karst and permafrost	Geotechnical stability	Collapse of karst area during construction or transport causes death or bodily harm, the release of harmful substances and materials into underground waterways, and permanent alteration to the landscape. Deterioration of ground conditions supporting the road	Obtrusive probing must occur along the road alignment in areas with near surface karst and suspected permafrost or weak layers. Road design will take into account avoidance of these features as a first measure, and mitigation to reduce risk as a second measure. Also, refer to our recommendation #1

Aspect	Missing Project Information	Reasonable Worst Case Impact	Recommended Mitigation
		can lead to extensive erosion and sedimentation, changes to land cover and ecosystem components.	

Recommendation 10: Site Specific Water Quality Objectives (SSWQOs) be set based on the Reference Condition Approach to the degree possible.

Recommendation 11: Additional water storage be required.

Recommendation 12: Additional treatment options and additional water storage be implemented where they enable the water quality to reach RCA SSWQOs. Risk assessments be conducted for parameters that are predicted to exceed RCA SSWQOs even with additional treatment and storage.

Recommendation 13: A new water storage pond or an expansion to the existing water storage pond be constructed for a 1 in 1000 year flood and a 1 in 1000 year earthquake. Back slopes be designed to ensure adequate stability from landslides and earthquakes.

Recommendation 14: Thresholds of impacts and management action be established as follows:

Level of impairment to algal or invertebrate communities within Nahanni NPR using a statistical distribution reference condition approach	Action
Sample falls within the 70% ellipse or less	Ongoing monitoring and assessment.
Sample falls within the 70-95% ellipse	Possible pending impairment to the ecological integrity of the Prairie Creek Aquatic Ecosystem in Nahanni NNPR – additional assessment is required as designed in consultation with Parks Canada and other parties.
Sample falls beyond the 95% ellipse[4]	Significant adverse environmental impact

Recommendation 15: No paste tailings to be stored on surface other than those contained within the paste plant itself.

Recommendation 16: No paste tailings to be stored within the waste rock pile.

Recommendation 17: DMS be segregated within the waste rock pile.

[4] This is equivalent to two standard deviations and therefore consistent with AANDC's submission.

Recommendation 18: Seepage from the waste rock pile be routed through the mine water circuit and be discharged in accordance with effluent quality criteria back-calculated from downstream site-specific water quality objectives. Installation of a seepage collection system for the Harrison Creek aquifer should be included in the development plan.

Appendix 2 – Reference Condition Approach Probability Ellipses

Recommendation 11 is based on commonly used statistical techniques for interpreting reference condition approach data which are illustrated below.