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Ottawa, Canada
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October 7, 2011

Chuck Hubert
Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
Box 938 #200 Scotia Centre 5102-50th Avenue
Yellowknife, NT X1A 2N7

File#: NWT-145
File#: EA0809-004

Sent via e-mail: chubert@reviewboard.ca

Subject: Natural Resources Canada's Information Requests Regarding Environmental Assessment of Fortune Minerals Ltd. NICO Project EA0809-004

Further to the Mackenzie Valley Environmental Impact Review Board's letter of July 18, 2011, Natural Resources Canada (NRCan) is providing the attached Information Requests (IR) to you for Fortune's NICO Project Environmental Assessment.

NRCan reviewed the Developer's Assessment Report (DAR) and appendices with respect to: Mine Waste Management - Metal Leaching and Acid Rock Drainage, Mine Effluents, Sludge, Waste Rock and Tailings; Permafrost and Terrain Conditions; Geotechnics; Surficial Geology; and Hydrogeology. Our proposed information requests are directed to the proponent, to request clarification or additional information to understand the project's potential effects.

Should you have any questions regarding NRCan's information requests, please do not hesitate to contact the undersigned.

Sincerely,

Original signed by

John King
Senior Policy Analyst
Environmental Assessment Division
Natural Resources Canada

John.King@nrcan.gc.ca

Attach: (1)

c.c.: J. Clarke, R. Johnstone, F. Schellekens (NRCan)

Canada

NRCan's Information Requests Regarding Environmental Assessment of the Fortune Minerals Ltd. NICO Project EA0809-004

IR Number: NRCan 1-1

Source: Natural Resources Canada – Mineral and Metals Sector

To: Fortune Minerals Limited

Subject: Mine Waste Management - Metal Leaching and Acid Rock Drainage

References:
Annex A (Geochemical characterization of waste rock, ore, and tailings – Report no: 0811180043(5000), p.22, p.30, Table 5-3, Table 5-4, Appendix IV-1a, Appendix IV-3c, Appendix 3.II Co-Disposal Facility Management Plan (Fortune Minerals Limited Developer's Assessment Report), page 3.II.9

(1) **Preamble:**
The classification of one of the sub-economic mineralized mine rock, FC-3, as having an uncertain potential for acid generation is inaccurate. The reported carbonate carbon value of this sample is 0.087 wt% which indicates that the Neutralization Potential (NP) should be 7 kg $CaCO_3$ eq per ton instead of the measured NP value of 13.9. In this case, the NP Ratio (NPR) value becomes less than 1 (i.e. 0.8) indicating that the sample is likely to be an acid generator. The assessment of another sub-economic mineralized mine rock (i.e. FC-2) as having a low acid generating potential is not very strong either. This sample has an NPR value of 2.3 and should be considered as marginal.

Request
Please review and verify/revise assessments for mineralized mine rock.

(2) **Preamble**:
The ore (FC5) was reported to have 6.5 % arsenopyrite and 2 % pyrite (Annex A, p.22 and Appendix IV-1a). It is not clear what happens to these minerals during the processing, nor where they report to (rougher tailings, cleaner tailings or concentrate). Mineralogical data indicate that neither is present in the tailings and that the bulk chemical analyses of As suggest that arsenopyrite, if present, is a trace mineral in the bulk rougher tails. The bulk cleaner tailings with 2000 ppm As may contain about half a percent arsenopyrite though.

Requests
(i) For the ore (FC5), what happens to arsenopyrite and pyrite during the processing?
(ii) Where do they report to (rougher tailings, cleaner tailings or concentrate)?

(3) **Preamble**

Interpretation of some of the geochemical characterization data is questionable. The report stated that the tailings are unlikely to generate acidity. An examination of the reported geochemical data, however, indicates that the bulk cleaner tailings should be classified as having an uncertain potential for acid rock drainage. As reported in Appendix IV-3c, the bulk cleaner tailings have 0.6 % carbonate carbon. This corresponds to about 1.5 % calcite ($CaCO_3$). Mineralogical NP of this calcite is 15 kg $CaCO_3$ eq per ton which is much lower than the measured NP of 25.8. The NPR in this case becomes 1.5 instead of the reported NPR value of 2.6. It appears that Net Acid Generation (NAG) tests overestimated the neutralization potentials of the tailings.

It is difficult to understand why the humidity cell tests excluded the cleaner tailings. Although the bulk cleaner tailings would make up of a small portion of the bulk tailings (i.e. about 9%) and that they will be blended with the rougher tailings prior to disposal, it is imperative to know their long-term behaviors as a component of the bulk tailings. Without knowing the details of the pilot plant testing and the representativity of the tailings materials tested, the conclusion stating that the tailings are unlikely to generate acidity in the long-term is weak.

Requests

(i) Why did the humidity cell tests exclude the cleaner tailings?

(ii) Does the proponent plan additional testing to determine the longer-term behavior of the cleaner tailings as a component of the bulk tailings, and when?

(4) **Preamble**

It appears that the particle size distribution of the tailings on Figure 3.ii.3-1 is mislabeled. The yellow curve labeled as the rougher tailings should belong to the cleaner tailings and vice versa.

Request

Please review and verify the labeling for Figure 3.ii.3-1.

(5) **Preamble**

Similar questionable acid mine drainage (AMD) assessments for the mine rock exist. It should be kept in mind that the 17 % of the mine rock samples generated acidic drainage during the long-term kinetic tests.

A conservative assessment of the static testing results is always recommended due to uncertainties in the Acid-Base Accounting (ABA) measurements. The report acknowledges that the dissolution of non-carbonate minerals has contributed to the measured NP values (p. 30 of Annex A).

Request
Please review and verify AMD assessments for the mine rock considering the uncertainties.

(6) **Preamble**
The report states that 10% of mine rock has acid generation potential (Appendix 3.II Co-disposal facility management, page 3.II.9). This is contradictory to other data such as those obtained from the kinetic testing results (i.e. 17% of mine rock having the potential for AMD).

Request
Please clarify or revise the statement that 10% of mine rock has acid generation potential (Appendix 3.II Co-disposal facility management, page 3.II.9), which is contradictory to other data such as those obtained from the kinetic testing results

(7) **Preamble**
The NAG-pH values were incorrectly assigned for the feldspar porphyry and rhyolite on Table 5-3 of Annex A. NAG-pH values should be >4.5 for these rock types.

Request
Please review the NAG-pH values assigned for the feldspar porphyry and rhyolite.

(8) **Preamble**

The reported claudetite (As_2O_3) concentrations of the tailings (1.3 to 1.9%) are inconsistent with the bulk chemical assays (p. 23 of Annex A; App IV1b and App IV2c). Claudetite concentrations correspond to As concentrations of about 1 to 1.4 wt% which are grossly greater than the reported As assays of 0.02 to 0.2 wt%. It appears that the reported claudetite concentrations are erroneous.

Request
Please review and revise the reported claudetite ((As_2O_3) concentrations of the tailings and provide an explanation for the discrepancy.

(9) **Preamble**
The report states that the As, Bi and Sb concentrations of the Mine Rock, mineralized rock, ore and tailings are 10 times greater than the average crustal rock abundances. This statement is not consistent with the data reported in the tables and graphs. The graphs show that As concentrations are about 50 to 5000 times the crustal abundance, Sb concentrations are approximately 50 to 250 times

greater and Bi concentrations are about 100 to 100000 times greater than the crustal values.

Request
Please review and revise inconsistent statements regarding the As, Bi and Sb concentrations of the Mine Rock, mineralized rock, ore and tailings.

(10) **Preamble**
The Cd and Se concentration ranges as reported on Table 5-4 of Annex A are identical (i.e. all Cd are 0.0005 mg/L and all Se are 0.005 mg/L).

Request
Do these values represent the detection limits for Cd and Se?

(11) **Preamble**
Although the proponent plans to develop a monitoring program during the operations to ensure the mine rock is effectively and efficiently classified for their intended use as cover materials, dams, dykes and disposal, the mine rock production data (amount mined over the lifetime of the project) could have been provided with the rock classification such as Type 1-3 and sub-economic mine rock. The proponent could also provide a comprehensive sampling and monitoring plan involving the Type-2 rocks ahead of the operations to ensure that there is adequate material for the perimeter dyke.

Requests
(i) Please provide the mine rock production data (amount mined over the lifetime of the project) with the rock classification such as Type 1-3 and sub-economic mine rock.
(ii) Please provide a comprehensive sampling and monitoring plan involving the Type-2 rocks ahead of the operations to ensure that there is adequate material for the perimeter dyke.
(iii) Will the geochemical criteria developed to classify the rocks be reassessed and confirmed prior to their use during the operations?
(iv) Are the numbers of different types of samples analyzed and tested representative of the rock and tailings volumes to be excavated, processed and disposed?

(12) **Preamble**
It was stated that the thickened tailings will not segregate in the Co-Disposal Facility (CDF).

Requests

(i) What detrimental effects would this have on the co-disposal of the tailings with the waste rock?

(ii) Would the void space of the waste rock be effectively filled?

(iii) Would continued settling occur within the CDF following the placement of the cover materials, and would that compromise the cover properties?

IR Number: NRCan 1-2

Source: Natural Resources Canada – Mineral and Metals Sector

To: Fortune Minerals Limited

Subject: Mine Waste Management - Mine Effluents

Preamble

Considering that arsenic and selenium are going to be an important operational and closure issue, it would be useful to understand the operational parameters at existing effluent treatment facilities with similar design proposed for the NICO project. For instance, examples of the effectiveness and efficiency of microfiltration and ion exchange resins in the removal of As and Se to levels comparable to effluent quality objectives for this project could be given.

Request

What are the operational parameters at existing effluent treatment facilities with similar design proposed for the NICO project?

IR Number: NRCan 1-3

Source: Natural Resources Canada – Mineral and Metals Sector

To: Fortune Minerals Limited

Subject: Contingency Plans - Metal Prices

Preamble

Metal prices can affect the pace at which a proponent may wish to develop a resource and operational plans. For example, if commodity prices increase, it may make economic sense to develop a resource project at an accelerated rate. In this case, increasing operational capacity could have implications for waste management plans, metal leaching and acid rock drainage, and mine effluents. On the contrary, if commodity prices decrease, some parts of the "ore" would become waste rock which means increased amounts of waste rock having potentials for AMD and metal leaching.

Request:
Are there contingency plans for potential changes in the metal prices, and if so, how do these affect the project and the environment?

IR Number: NRCan 1-4

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Baseline terrain and geotechnical conditions in the mine site area
Relevant to Key Line of Inquiry, Water Quality; Subject of Note, Terrain and Soils

References:
TOR 3.2.4, App. A, 3.3.8, App. G
DAR sections 3, 13, 19, Annex H, App. 1.III, 3.I, 3II

Preamble:
Stability of engineered structures in the mine site area, in particular the Co-Disposal Facility (CDF), will be dependent on the properties of the underlying foundation materials. Although the Developer has provided a description of terrain and soils (DAR sec. 13, Annex H), this has largely been limited to a description of materials in the upper 1m. There has been no detailed information presented from geotechnical investigations conducted in the mine site area although reference has been made to geotechnical investigations conducted by Golder (2010). This detailed information is required to better understand the physical (grain size, moisture/ice content) and strength properties of the unconsolidated materials as well as their thermal condition. NRCan requires this information to determine whether design of project components, in particular the CDF will ensure they perform as intended and that there will be no impacts on water quality.

Request:
Please provide the following: any additional detailed information on characteristics of subsurface materials in the mine site area including results of geotechnical investigations, borehole logs, ground thermal data and results of laboratory testing to characterize geotechnical conditions.

IR Number: NRCan 1-5

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Baseline terrain and geotechnical conditions and terrain sensitivity along the proposed access road alignment
Relevant to Key Line of Inquiry, Water Quality; Subject of Note, Terrain and Soils

References:
TOR 3.2.4, App. A, 3.2.5, App. B, 3.3.8, App. G
DAR sections 3, 13, 9, 18, 19, Annex H, App. 1.III

Preamble:
Vegetation clearing and disturbance of the ground surface associated with road construction can lead to thawing of frozen ground, ground settlement, changes to drainage and erosion which may have implications for terrestrial and aquatic ecosystems. The proposed NICO Project Access Road (NPAR) traverses terrain with variable material, drainage and permafrost conditions (DAR sec. 19). Information on properties of subsurface materials and terrain sensitivity along the route is required to design the NPAR to minimize the effects of the environment on the road and the effects of the road on the surrounding environment. In particular this information is required to ensure water course crossings are designed to maintain terrain stability and minimize sediment input into streams and impacts on water quality. The Developer has provided a description of terrain and soils for the local study area (DAR sec. 13, Annex H) but this has largely been limited to the description of materials in the upper 1 m. In addition the maps provided are not at a large enough scale to adequately show the terrain type and terrain sensitivity along the proposed alignment for the NPAR. A detailed route alignment map along with any additional information on material properties is required to adequately describe the baseline terrain conditions and the environmental impacts that may be associated with the NPAR. NRCan requires this information to evaluate the Developer's conclusions regarding impacts on the terrain and aquatic systems.

Requests:
Please provide the following:

(i) A detailed large scale route alignment map for the NPAR that shows terrain types and terrain sensitivity conditions as well as potential geohazards.

(ii) Detailed topography along the alignment including location of watercourse crossings.

(iii) Results of any geotechnical investigations conducted along the alignment including: borehole logs, results of laboratory testing, information on ground thermal conditions and ice content

(iv) Plans for additional geotechnical investigations to support final design for NPAR.

IR Number: NRCan 1-6

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Analysis conducted to support design of access road and assessment of environmental impacts
Relevant to Key Line of Inquiry, Water Quality & Closure and Reclamation; Subject of Note, Terrain and Soils

References:
TOR 3.2.4, App. A, 3.2.5, App. B, 3.3, 3.3.8, App. G
DAR sections 3, 13, 19, Annex F, H, App. 1.III

Preamble:
Removal of vegetation and disturbance of the ground surface during access road construction activities can result in warming and thawing of permafrost which can lead to changes in drainage and ground instability and subsidence which can have implications for aquatic and terrestrial ecosystems. In addition these activities can also lead to erosion and stream bank instability which can result in increased sediment loads to streams and impacts on water quality. The Developer has provided some information on design of the NPAR including measures that may be utilized to reduce impacts (DAR sec. 19.2.1.3.3). However, there has been no information presented on any analysis conducted to determine the design parameters for the road and water course crossings to ensure both infrastructure stability and minimal impacts to the surrounding environment during the project life and beyond. For example, thermal analysis can be utilized to determine embankment height to ensure minimal impacts to the ground thermal regime. Slope and bank stability analysis can be conducted to ensure that engineering design is adequate to reduce the potential for instability at water course crossings. The long-term effects of the NPAR on the environment beyond the project life have not been assessed. Changes in the ground thermal regime and drainage conditions may continue beyond the project life under a changing climate and conditions may not return to their pre-development condition. The results of any analysis conducted to support design of NPAR and the assessment of potential environmental effects are required by NRCan to adequately conduct its review of the DAR.

Requests:
Please provide the following:

(i) Documentation providing results of any analysis conducted to support the design of NPAR and the assessment of environmental effects. This may include but is not limited to thermal analysis, slope and bank stability analysis.

(ii) Documentation providing results of any analysis conducted to assess the long-term impacts associated with environmental disturbance resulting from NPAR beyond the project life (post-abandonment period).

IR Number: NRCan 1-7

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Properties of underlying materials at proposed borrow sites
Relevant to Subject of Note, Terrain and Soils

References:
TOR 3.2.4, App. A, 3.2.5 App. B, 3.3, 3.3.8, App. G
DAR sections 3, 13, 19, Annex H, App. 1.III, 3.I, 3II

Preamble:
Granular resources will be required for construction of project components including roads, dams and dykes. The Developer has indicated that potential borrow sites have been identified. However, there is no information provided regarding the characteristics of the materials at these sites. Unconsolidated sediments in this region may be frozen. Although massive ice is not likely in this region, sediments may contain excess ice which needs to be considered in determination of suitable sites, determination of volumes of material to be extracted and assessment of potential environmental effects. Information on investigations conducted to determine material characteristics is therefore required for NRCan to review the EIS and assess the Developer's conclusions regarding potential environmental impacts.

Requests:
Please provide the following:

(i) Information collected from any investigations conducted at potential borrow sites to determine material characteristics.

(ii) Plans for future site investigations to finalize borrow site selection.

IR Number: NRCan 1-8

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Uncertainty in on-site climate and hydrological parameters
Relevant to Key Line of Inquiry, Water Quality & Closure and Reclamation; Subject of Note Water Quantity

References:
TOR 3.2.4, App. A, 3.3.2, App. C, 3.3, 3.3.3, App. D, 3.3.5, App. B, 3.3.8, App. G
DAR sections 3, 9, 11, 19, Annex F, G, App. 1.III, 3.I, 3II

Preamble:
Information on climatic parameters (e.g. temperature and precipitation) and hydrologic parameters (water level, discharge) is required for calculation of the site water balance and design of project components including mine waste and water management facilities and design of water course crossings (including bridges) associated with NPAR. On-site information has been collected for 2005-08 (Annex F). The lack of long-term records at the NICO project site means (as is often the case for mine development sites) that data from surrounding stations must be utilized to develop the project site baseline conditions. The Developer for example, has utilized climate data from the Environment Canada station in Yellowknife and additional stations operated by ENR in the region (Annex F, G). While this is a reasonable approach there can be uncertainties especially with respect to precipitation and snowmelt and also extreme events. Further clarification is required regarding how the Developer has dealt with uncertainty in the design of project components and determination of the water balance. It is also not clear whether any sensitivity analysis has been done with respect to climate variability in determination of the site water balance, project design and impact assessment.

Requests:
Please provide the following:

(i) Documentation describing how uncertainty with respect to determination of on-site climate and hydrological conditions has been dealt with in determination of the water balance, design of project components and impact assessment.

(ii) Documentation on any sensitivity analysis conducted with respect to climate variability in determination of site water balance, project design and impact assessment.

IR Number: NRCan 1-9

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Baseline hydrogeological conditions and groundwater flow in the project area
Relevant to Key Line of Inquiry, Water Quality; Subject of Note, Water Quantity

References:
TOR 3.2.4, App C, 3.2.5, 3.3.2, 3.3.5
DAR sections 3, 7 (App. 7.3), 11 (App. 11.I, 11.III), Annex G

Preamble:
Project operation may, through impacts on groundwater flow, result in changes to water quantity and also water quality. For example mine dewatering during operation may reduce the inflow into surface water bodies and reduce water levels. At closure, the open pit will flood and overflow directed to Peanut Lake will affect its level, and if the water quality is not suitable for release into the environment then treatment will be required prior to drainage (DAR 11.3.3.2). Groundwater flow through seepage may be associated with other project components such as the mine waste management facilities. Characterization of the hydraulic properties of geologic materials and identification of potential groundwater pathways is essential to determine the effects that the project may have on water quantity as well as quality.

The Developer has provided in the DAR (sec. 11) a description of hydrogeological baseline conditions. A conceptual groundwater model has also bee provided in App. 11.1. Additional information relative to groundwater issues including information collected from monitoring wells and testing done to determine hydraulic conductivity is provided in DAR vol. 7 (App 7.III, Attachment 7.III.1). While the information provided is helpful to NRCan in assessing the Developers conclusions regarding the impacts on water quality, additional information would allow NRCan to conduct an adequate review of the DAR. The Developer has provided in Table 11.1.1-1 of App. 11.1 the sources of information utilized in development of the conceptual groundwater model. Some of these are technical memos that were written specifically for the NICO project. The Developer indicates that thermistor data is available for 9 wells along with piezometer data in Golder (2008). This information would be useful in understanding the permafrost conditions at the mine site including the possible configuration of taliks and groundwater flow pathways. Other Technical memos also appear to have the results of geotechnical and hydrogeological investigations associated with open pit and mine workings (e.g. Golder 2005, 2007). This information would facilitate NRCan's review of the Developer's conceptual groundwater model and assessment of the validity of the conclusions regarding impacts. For example, please see the following reports:

- Golder (2005). Factual Report On Geotechnical and Hydrogeological Investigations For The Proposed Open Pit And Underground Mine Workings, NICO Deposit, North West Territories. 03-1117-029. Submitted to Fortune Minerals Limited. February 2005.
- Golder (2007). Final Summary Report On Open Pit, Underground and Mine Waste, Geotechnical Engineering Studies And Environmental Baseline Data Collection For NICO Project, Fortune Minerals, Northwest Territories. 05-1117-032. Submitted to Fortune Minerals Limited. April 2007.
- Golder (2008). Technical Memorandum – Re: Monitoring Update – August 2008, Thermistor Strings and Piezometers NICO Site, North West Territories. 05-1117-032. Submitted to Fortune Minerals. October 17, 2008.

Request:
Please provide additional information regarding hydrogeological investigations conducted in the project area that was utilized to characterize the groundwater flow regime and assessment of associated impacts on water quantity. These include (but are not limited to) the reports and technical memorandum described above by Golder (2005, 2007, 2008) that provide information on geotechnical and hydrogeological investigations in the project area and information collected from thermistors and piezometers at the site.

IR Number: NRCan 1-10

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

Subject: Terrain Mapping
Relevant to Description of the existing environment; Subject of Note - Terrain

References:
TOR sections 3.1.4 and 3.2.4; DAR sections 1, 3, 13, 20, Annex A, Annex H, Annex I

Preamble:
The NICO Project Developer's Assessment Report (DAR) descriptions of the biophysical environment, notably those of terrain units, soils and surficial geochemistry provide a range of adequate to less adequate information.

Although the scales of the following maps included in the DAR are sufficient for page size figures in an overview document, there are more detailed, larger scale versions available:

- terrain unit map of the regional study area (1:325K)
- soil unit map of the regional study area (1:325K)
- terrain unit map of the local study area (1:50K)

- soil unit map of the local study area (1:50K and 1:125K)
- permafrost potential of soils in the local study area (1:50K and 1:125K)

The terrain maps appear to be derived from interpretations of satellite imagery represented by pixels. Without suitable ground verification, this type of remote predictive mapping can over-simplify the surficial geology, and commonly tends to create broad based terrain units which can encompass a range of materials, such as "Fg1-M-O". This unit contains glaciofluvial gravels, glacial till diamictons and organic sediments – all of which may have very different physical properties that should be differentiated.

The nature of the terrain units within and surrounding some of the potential borrow areas indicated on Figure 13.4-1b, has not been identified or described. Mapping of this area would be required to confirm origin, properties and therefore suitability of the surficial sediments as construction material.

The Developer reports the presence of "fine grained lacustrine/glaciolacustrine sediment" (in Annex H NICO SOILS Baseline) in areas of lower elevation (above 200 m a.s.l.) between bedrock outcrops. Some locations are given in Appendix V, Table V-1, but these lacustrine deposits are not identified on the terrain maps.

Requests:

(i) Explain why no suitable ground verification was conducted to confirm the remote predictive terrain mapping, and, if such verification is planned, when it will occur.

(ii) Provide maps of terrain units within and surrounding some of the potential borrow areas indicated on Figure 13.4-1b.

(iii) Provide the locations of fine grained lacustrine/glaciolacustrine sediment on terrain maps. Confirm if the extent of this material may be greater than anticipated between 200-300 m a.s.l.

IR Number: NRCan 1-11

Source: Natural Resources Canada – Earth Sciences Sector

To: Fortune Minerals Ltd.

References:
TOR: 3.3.8, Appendix G, Appendix B item 8, Appendix C item 11
DAR sections 3.II.5.4.4; 3.8

Preamble:
Instability of underground mine workings, open pit slopes and the tailings/waste rock co-disposal facilities (CDF) directly concerns workers' safety and environmental impact. In cold regions, slope stability is complicated by coupled

ground thermal, hydrological and mechanical responses to temperature changes. The complication is further pronounced in discontinuous permafrost regions. For example, a frozen surface along an open pit wall may act as a dam causing pore water pressure build up behind the wall and hence slope instability. The freezing front in tailings attracts moisture causing increased water/ice content. Such highly moist materials may form weak zones when thaws occur due to e.g. extreme weather, construction sequence or climate change. Although some detailed studies can be done only at the detailed design stage, reasonable consideration should be given at the conceptual design stage so that the potential environmental effects of the construction and operation of those main components (underground mine, open pit and the CDF) are assessed.

The Developer's Assessment Report (DAR) indicated that geotechnical and hydrogeological investigations have been done at the open pit and CDF sites. It also presented a conceptual level slope stability analysis result for the CDF. Little information is provided about the stability of the open pit slopes and the underground stopes. In order for NRCan to conduct an adequate review, it would be useful to review the reports containing geotechnical investigations, stability analyses for the open pit, underground mine workings and the CDF.

Request:
Please provide the following information related to geotechnical conceptual design:

(i) Reports/information about structural rock conditions (including material properties, description of faults and fractures, illustrated by maps, cross sections, drilling logs and test results) around the open pit slopes and underground mine stopes collected from drilling programs;
(ii) Ground temperature data from the installed thermistors;
(iii) Reports/information about the in-situ hydraulic conductivity test results;
(iv) Any report/information that addresses expected pit slope thermal, ground water/ice and stability conditions;
(v) Any report/information that addresses expected temperature (freeze-thaw) conditions in the CDF deposit and how extreme weather, construction sequence and long-term climate change will affect the CDF slope stability;
(vi) Please provide also the geotechnical reports referenced in the DAR. In particular, the following reports should provide some of the information listed above:
    - Golder, 2004. Tailings basin site selection study NICO Project Northwest Territories. Submitted to Fortune Minerals Limited. July 2004.
    - Golder, 2005. Factual Report on Geotechnical and Hydrogeological Investigations for the Proposed Open Pit and Underground Mine Workings, NICO Deposit, North West Territories. 03-1117-029. Submitted to Fortune Minerals Limited. February 2005.
    - Golder, 2007a. Final Summary Report on Open Pit, Underground and Mine Waste, Geotechnical Engineering Studies and Environmental

Baseline Data Collection for NICO Project, Fortune Minerals, Northwest Territories. 05-1117-032. Submitted to Fortune Minerals Limited. April 2007.

- Golder, 2007b. Report on NICO tailings dams and process plant facilities 2006 geotechnical site investigation. 05-1117-032 (9100). Submitted to Fortune Minerals Ltd. 16 April 2007.
- Golder, 2008. Technical Memorandum – Re: Monitoring Update – August 2008, Thermistor Strings and Piezometers NICO Site, Northwest Territories. 05-1117-032. Submitted to Fortune Minerals Ltd. 17 October 2008.
- Golder, 2010a. Trade off evaluation of tailings and mine rock alternatives. Submitted to Fortune Minerals Limited. February 2010
- Golder, 2010b. Tailings and Mine Rock Co-disposal Facility FEED Study. Submitted to Fortune Minerals Limited, October, 2010.
- Golder, 2010c. Factual report of the geotechnical investigation for the seepage collection pond and polishing pond dams. Prepared for Fortune Minerals Limited, by Golder Associates Ltd., November 2010.
- Lim, D.H., and B. Dershowitz. 2010. NICO – Derivation of Rock Mass Porosity from Packer Test on Fractured Rock. FracMan Technology Group (Golder Associates). 12 November 2010.
- PasteTech (Golder Paste Technology Ltd.), 2010. FEED study draft report on tailings dewatering, distribution and return water systems for Fortune Minerals NICO Project. Report Number 10-1118-0046(1000), dated August, 2010.