Natural Resources Canada | Ressources naturelles Canada

September 29, 2016

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Re: Natural Resources Canada Review: September 29 Response to the August 9 Request – Technical Review of the BURNCO Aggregate Mine Project Environmental Impact Statement

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On August 9, 2016, Natural Resources Canada (NRCan) received a request from the Canadian Environmental Assessment Agency (CEA Agency) with regards to the technical review of the Environmental Impact Statement (EIS) for the **BURNCO Aggregate Mine Project, BC**.

NRCan is a Federal Authority under the former *Canadian Environmental Assessment Act* (the former Act) and as such, NRCan is participating in the transitional comprehensive Environmental Assessment for this project.

NRCan has provided expertise to support the review of the project and its predicted environmental effects focusing on the following areas:

- Hydrogeology
- Geohazards
- Seismicity

In the attached submission, NRCan has requested some important information and clarifications related to seismicity, and provided recommendations to the proponent related to hydrogeology and terrain hazards.

We look forward to continued collaboration on this review.

Regards,

Original signed by:

Angeles Albornoz
A/Environmental Assessment Officer

Canada

Attachment 1: NRCan's advice to the Agency
Attachment 2: NRCan's information requests directed to the proponent
Attachment 3: NRCan's advice to the proponent

Documents reviewed:

BURNCO Rock Products Ltd. July 2016. Proposed BURNCO Aggregate Project. Environmental Impact Statement. Environmental Impact Statement to satisfy the requirements of the former *Canadian Environmental Assessment Act*.

Ground water resources:
Relevant information from Vols. 1-4. Sections 2.2-2.5, 2.7-2.8, 3.1, 5.6.
Appendices: 5.4 D, 5.6 A, 5.6 D, 5.6 E, 5.6F

Seismicity:
Vol 1: Executive Summary (p. 70-83 – seismic related sections)
Vol 2: 5.4 Geotechnical and Natural Hazards
Vol 3: Part D – Federal Information Requirements
15.0 Requirements for Federal Environmental Assessments
15.1.3 Effects of the Environment on the Project
15.1.3.2 Seismic Hazards

Terrain hazards:
Vol 1: Executive Summary, section 2.2 – 2.5; 2.7, 2.8, 3.1, 5.4, 15.1.3, 15.1.3.5, Parts D, E and F.
Vol 2: Part D, E, F 5.4 Geotechnical and Natural Hazards
Vol 3: Part D – Federal Information Requirements, 15, 16.3, 17 and conclusions.
Vol 4: Part G, section 22 appendices 5.4 B, G, H, K, K, L. O, P, Q.

ANNEX 1: Advice to the Agency

Table 1: NRCan's advice for the Agency's consideration in its recommendation to the Minister of Environment and Climate Change

Questions	Responses/Comments
• Has the proponent described all project components and activities in sufficient detail to understand all relevant project-environment interactions? If not, identify what additional information is needed.	Yes, the proponent has detailed all the activities during the construction, operations and closure phases that may affect the valued components (VCs), which are groundwater quantity and quality.
• Were the study areas sufficient to predict potential effects from all relevant project-environment interactions, and to consider the effects within a local and regional context? • Is the baseline information sufficient to characterize the existing environment, predict potential effects and obtain monitoring objectives? If not, identify what additional information is needed.	Yes, the hydrogeological modelling results show that the area impacted by the activities is rather small with respect to the local study area (LSA). In addition, the baseline information on groundwater quantity and quality is sufficient to develop a credible hydrogeological conceptual model as a basis for the development for both, the hydrogeological model and the monitoring network.
Alternatives Assessment	
• Has the proponent adequately described the criteria it used to determine the technically and economically feasible alternative means? • Has the proponent listed the potential effects to valued components (VCs) within your mandate that could be affected by the technically and economically feasible alternative means? • Has the proponent adequately described why it chose each preferred alternative means? • Are there other alternative means that could have been presented? If so, please describe.	NRCan was not able to locate any alternative solutions; however, the project describes the use of wet extraction of aggregate and that appears to have limited impact on the VCs.
Environmental Effects Assessment	
• Has the proponent clearly described all relevant pathways of effects to be taken into account under section 16 of the former Act? • Has the proponent identified all potential effects to VCs, including relevant species at risk, within your mandate? • Were all potential receptors considered?	Yes, the proponent clearly described the main groundwater flow paths related to mining activities, which are the hydraulic connection between the valley-fill aquifer and McNabb Creek, and the pathway between the pit lake and the downgradient potential receptors (minor surface water creeks). In addition, the potential effects on VCs (groundwater quantity and quality) are correctly identified.

Questions	Responses/Comments
• Were the methodologies used by the proponent appropriate to collect baseline data and predict effects, why or why not? • Describe your level of certainty in the predictions based on the methods used. If there is uncertainty, what are the options for increasing certainty in the predictions presented by the proponent in the EIS?	Yes, field and modelling works were generally done according to the state-of-the-art practices in hydrogeology. As far as a numerical model can be used to predict the likelihood of predictions for complex hydrogeological settings, NRCan considers that the predictions are reasonably well grounded.
• Are the predicted effects described in objective and reasonable terms (e.g., beneficial or adverse, temporary or permanent, reversible or irreversible)?	Yes, the predicted effects are objectively reported.
• Has the proponent adequately assessed the potential cumulative environmental effects, including using an appropriate study area and proposing mitigation and follow-up program requirements? Provide rationale.	N/A
• Has the proponent adequately described the potential for environmental effects caused by accidents and malfunctions, including the types of accidents and malfunctions, their likelihood and severity and the associated potential environmental effects? If not, identify what additional information is needed.	Yes, the proponent identified the risk of malfunction of the overflow structure used to regulate the pit lake level and has adequately quantified the effects on groundwater flow (e.g., an important baseflow reduction for downgradient creeks). However, the proponent did not present how they plan to check the integrity of the structure to ensure its functioning at post-closure. The proponent also carefully assessed the case for an inadequate reclamation of the fines that may impact water quality.
• Are you satisfied with the proponent's assessment of effects of the environment on the Project? • Has the proponent characterized the likelihood and severity appropriately? Provide rationale.	Yes, NRCan is satisfied with the proponent's assessment as they rely on sound analyses and professional judgment. However, NRCan has requested additional information in Annex 2 with regards to seismicity and liquefaction.
• Has the proponent sufficiently described and characterized the project activities and components as they relate to federal decisions within your mandate? If not, identify what additional information is needed. • Are changes to the environment, as they relate to federal decisions within your mandate, sufficiently described? If not, identify what additional information is needed.	Yes, the proponent sufficiently describes the project activities and changes to the environment.

Questions	Responses/Comments
Mitigation	
• Are the proposed mitigation measures described in sufficient detail to have certainty in their effectiveness? If not, identify what information is needed. • Is it clear how each proposed mitigation measure links to each potential pathway of effect?	see below
• Would you propose different or additional mitigation measures? If so, provide a description of the mitigation measure(s), with rationale.	see below
• Which of the proposed mitigation measures and/or project design elements do you consider to be necessary to reduce the likelihood of significant adverse environmental effects? Provide rationale.	The most significant mitigation measure is by far to rely on wet aggregate mining through the construction of a pit lake. While this measure will modify the actual groundwater flow pattern, the proposed wet extraction method will allow to keep the overall water balance relatively intact and to recover the natural groundwater flow pattern (which was modified by the previous construction of the French drain-WC2). Given the current project design, the proponent will have to ensure that no contamination is introduced in the pit lake (during operations and at closure) as it will impact the water quality of downgradient creeks. Particularly, the progressive reclamation of fines will have to be carefully monitored to avoid excessive chemical dissolution, and thus alter the quality of the pit lake and recharging groundwater. For that reason, NRCan suggests that the water quality of both, the pit lake and the downgradient creeks (as well as McNabb Creek) be monitored for the duration of the project and at closure. This was not proposed in the actual monitoring protocol (Volume 2, Section 5.6 Groundwater Resources).
Residual Adverse Environmental Effects	
• Are the identification and documentation of residual environmental effects described by the proponent adequate? If not, what are the aspects for which there is uncertainty and, where possible, indicate how these residual effects can be best described. If there is uncertainty, what are the	Yes, the description of the residual effects is well documented and reveals that the VCs are resilient and the effects fully reversible.

Questions	Responses/Comments
options for increasing certainty?	
• Did the proponent provide a sufficiently precise, ideally quantitative, description of the residual environmental effects related to your mandate? Identify any areas that are insufficient.	see above
Determination of Significance	
• Are the conclusions on significance in the EIS supported by the analysis that is provided? • Are the proponent's proposed criteria (magnitude, geographic extent, duration, frequency, reversibility, and social/ecological context) for assessing significance appropriate? This includes how they were characterized, ranked, and weighted. Provide rationale.	N/A
• Were appropriate methodologies used in developing the conclusions on significance?	
• Do you agree with the proponent's analysis and conclusions on significance? Provide rationale.	

Monitoring and Follow-up	
• Does the proposed monitoring and follow-up program verify the predictions of the environmental assessment? Please explain additional monitoring or follow-up needed to address uncertainty in the effects assessment.	NRCan suggests that the proponent should monitor surface water quality (e.g., pit lake, minor creeks and McNabb Creek). With regards to terrain stability, as stated in Annex 3, NRCan has emphasized the importance of the completion of the proposed monitoring and the implementation of the mitigation measures given that potential landslide hazards are quite evident especially in the regional study area.
• Does the proposed monitoring and follow-up program verify the effectiveness of proposed mitigations? Please explain additional monitoring or follow-up needed to address uncertainty in the proposed mitigation.	Same as above.
• Is the objective of the follow-up program clear and measurable? • Does the follow-up program include sufficient detail, and technical merit, for the Agency to achieve the stated objective (e.g., sufficient baseline dataset, monitoring	Yes, the objective is clear, and the proponent mentions that actions will be taken if the monitoring program shows degradation of the VCs without providing specific description of the

plans, acceptable thresholds of change, contingency procedures)?	actions that will be taken.
• Are you aware of any federal or provincial authorizations or regulations that will achieve the same follow-up program objective(s)? If so, how do these achieve the objective(s)?	N/A
Additional comments, views, advice	

ANNEX 2: Information requests directed to the proponent

Table 2: NRCan's comments and suggestions for information requests to be directed to the proponent

IR Number (e.g. HC-IR-01)	Valued Component	Reference to EIS guidelines	Reference to EIS	Context and Rationale	Specific Question/ Request for Information
NRCan IR-01	Seismicity	15. Requirements for Federal Environmental Assessments	Proposed mitigation measures (Vol. 3, 15.1.3.2 Seismic Hazards, p. 9)	This project falls within a region of high to moderate seismic hazard in the Howe Sound region located northwest of Vancouver, BC. The project duration is short (operations for 16 years). The proposed mitigation measures indicate: "Mitigative measures to prevent damage as a result of earthquake or tsunami events include: • Proposed Project facilities will be built to the BC Building Code 1 in 2,475 year earthquake design criteria; • Detailed, site-specific geotechnical investigations will be conducted to determine: o The need for ground improvement (e.g., soil densification); o Selection of suitable building locations to prevent excessive loadings or ground movement; • Mitigation measures will be designed by qualified and experienced professionals; and • Proposed Project facilities will be designed and constructed to achieve life safety and performance criteria of the National and BC Building Codes, or as otherwise required for the Proposed Project." are appropriate.	NRCan requests that the proponent include clarification by providing additional details on the following statement in section 15.0 Requirements for Federal Environmental Assessments: "The likelihood of seismic hazards (liquefaction induced loss of strength, settlements and lateral spreading) would likely only be associated with a large earthquake event, such as a BC Building Code 1 in 2,475 year event."

NRCan IR-02	Seismicity	15. Requirements for Federal Environmental Assessments	Proposed mitigation measures (Vol. 3, 15.1.3.2 Seismic Hazards, p. 9)	NRCan notes that the Building Code provides a shaking "level" at the 2% in 50-year probability.	Given the materials at the site, NRCan requests the proponent to confirm the following: • What is the shaking level (and period of shaking) that might be expected to induce liquefaction? • Has a seismic hazard de-aggregation been conducted to examine distance/magnitude (and hence period of shaking and amplitudes) that dominate the hazard here? NRCan agrees that the probability of a large earthquake during the 16-19 year-window is very low (but not zero). The de-aggregated seismic hazard results (2nd bullet above) would allow for examination of possible contributions from smaller, closer events.
NRCan IR-03	Seismicity	15. Requirements for Federal Environmental Assessments	Proposed mitigation measures (Vol. 3, 15.1.3.2 Seismic Hazards, p. 9)	Since liquefaction is a potential factor and one of the mitigation measures of the proponents is: • " Detailed, site-specific geotechnical investigations will be conducted to determine: o The need for ground improvement (e.g., soil densification); o Selection of suitable building locations to prevent excessive loadings or ground movement"	NRCan requests to review the detailed report when it becomes available.

ANNEX 3: ***Advice to the proponent***

Table 3: NRCan's additional advice to the proponent

Departmental number (e.g. HC-01)	Reference to EIS	Context and Rationale	Advice to the Proponent
NRCan-01	Ground Water. Relevant information from Vols. 1-4. Sections 2.2-2.5, 2.7-2.8, 3.1, 5.6. App. 5.4 D, 5.6 A, 5.6 D, 5.6 E, 5.6F	The hydrogeological study clearly shows that the quality of surface water is directly related to groundwater quality. Particularly, for the minor creeks located downgradient from the pit lake, where water in the pit lake transits first through the aquifer before emerging in the creeks. On this premise, NRCan suggests to monitor the quality of surface water in addition to groundwater quality as already proposed by the proponent.	NRCan suggests that the proponent should mention the measures that will be undertaken if the monitoring program shows degradation of surface water quality. NRCan also suggests that the proponent monitor the quality of the surface water features (pit lake, minor creeks, McNabb Creek). This was not initially proposed by the proponent.
NRCan-02	Terrain Hazards. Vol 1: Executive Summary, section 2.2 – 2.5; 2.7, 2.8, 3.1, 5.4, 15.1.3, 15.1.3.5, Parts D, E and F. Vol 2: Part D, E, F 5.4 Geotechnical and Natural Hazards Vol 3: Part D – Federal Information Requirements, 15, 16.3, 17 and conclusions. Vol 4: Part G, section 22 appendices 5.4 B, G, H, K, K, L. O, P, Q.	In terms of the terrain stability, in the local study area and the regional study area, the proponent outlines the potential hazards and has discussed monitoring and mitigation measures.	NRCan has no concerns. However, it is essential that the proponent complete the proposed monitoring and implement the mitigation measures related to the potential landslide hazards as they are quite evident, especially in the regional study area, i.e., upstream from the local study area.