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BGC Project Memorandum

To:	Kitikmeot Inuit Association	Doc. no:	
Attention:	Luigi Torretti	cc:	Heather Bears
From:	Holger Hartmaier	Date:	November 21, 2011
Subject:	Doris North- Proposed Modification Airport Expansion and Bypass Road Design- Comments		
Project no:	0454-002-11	No. Pages:	5

1.0 INTRODUCTION

As requested, BGC Engineering Inc. (BGC) has reviewed the above noted submission by Hope Bay Mining Ltd., (HBML) to the Nunavut Water Board, dated October 5, 2011. This review was carried out for the Kitikmeot Inuit Association (KIA) as part of their response to the NWB letter dated October 24, 2011. This letter invited comments from parties and confirmation that the proposed modifications will not raise any issues of compensation under Article 20 of the Nunavut Land Claims Agreement (NLCA).

2.0 COMMENTS

HBML is proposing to revise the design of the airstrip expansion at the existing airstrip location. The original design included a separate bypass road constructed on the east side of the expanded airstrip. HBML has decided to remove the separate bypass road and include an 8-m wide attached bypass road that is constructed along the east edge of the expanded airstrip. The re-designed airstrip expansion was illustrated in the drawings attached to HBML's submission.

BGC is generally satisfied with the proposed modifications, as presented. However, based on a review of the drawings included within the submittal, we had some questions regarding some of the details presented. BGC reviewed the design basis presented in Supporting Document S2, Design of Infrastructure Components, Doris North Project, Hope Bay, Nunavut, Canada, by SRK Consulting, dated March 2007 (SRK, 2007) to try to resolve some of these questions. As such, we request that HBML address the following issues.

2.1. Culvert Locations

It was not clear if the culvert locations indicated represent existing locations or new locations. In general, BGC expects that the actual culvert locations will have to be determined in the field based on local topographical conditions and drainage requirements. Nevertheless, BGC would like HBML to review the following areas of concern:

2.1.1. Culvert Near Station 0+220

On Sheets 2 and 3 of 15, there is only one culvert shown under the entire airstrip/bypass road at about Station 0+220. Based on the longitudinal cross section shown in Sheet 3 of 15, this culvert appears to be located within a local topographic low in the existing ground surface. Based on the cross section in Sheet 4 of 15 labeled "Cross Section of Airport Expansion at Culvert Crossing", the culvert is sloped to drain to the east (i.e. towards the bypass road side of the airstrip). The topographic contours shown on Sheets 2 and 3 of 15 are not labeled with elevations, so it is difficult to tell which way drainage will flow in this area. BGC checked regional site topography and drainage presented in SRK, 2007, Figure 1, which indicated that drainage was to the west in this area. We request that HBML confirm the drainage direction to ensure that construction does not result in ponding of water in this area.

2.1.2. Near Station 0+680

There is a stream crossing shown on Sheets 2 and 3 of 15 under the proposed facility at approximately Station 0+680, however there is no culvert shown at this location. This creek appears to drain to the west. A lake is partially indicated on Sheet 2 of 15 on the higher ground to the east of the airstrip, however the drawing does not show any stream connecting to the stream shown at Station 0+680. We request that HBML confirm if a culvert will be installed to carry the flow in the stream channel at Station 0+680.

2.1.3. Between Station 0+680 and Station 1+916 (South End of Airstrip)

The ground surface contours indicate that drainage flows to the north, parallel to the airstrip, towards the stream drainage shown near Station 0+680. The airstrip/road will divert all runoff from the high ground on the east and west sides towards the north, parallel to the airstrip. This would result in potentially blocking drainage of all runoff from the east side of the airstrip. Additional culverts under the airstrip to permit drainage to the west side may be required along this section. It is requested that HBML provide confirmation of additional culverts in this area.

2.2. Culvert Design

2.2.1. Design Criteria

SRK (2007) noted that hydraulic design confirmed that 600 mm diameter culverts are adequate (for an assumed 1:100 year storm event of 48.6 mm, zero attenuation, 100% runoff and a 12 ha catchment area). However, to allow easy access for the installation of steam pipes, SRK recommended that the culvert sizes be increased to 900 mm. HBML should explain the rationale for the reduction in culvert diameter to 600 mm. HBML should also confirm that each culvert location satisfies the above design criteria, particularly with respect to the catchment area.

2.2.2. Design Details

The following details shown on the drawings are in conflict with the design criteria presented in Supporting Document S2, Design of Infrastructure Components, Doris North Project, Hope Bay, Nunavut, Canada, by SRK Consulting, dated March 2007:

- Steam will be used to thaw out the culverts in the spring. To facilitate this, a 51 mm outside diameter steel pipe will be laid along the longitudinal axis of the culvert. The steel pipe will have a 1.5 m stick-up vertically from the upstream end of the culvert for steam delivery. This detail is not shown on the set of drawings submitted. HBML should confirm if this detail is included with respect to the overall rationale regarding culvert diameter specifications.
- There shall be a minimum of 0.5 m of fill cover over the culvert. The drawings show a total of 1.0 m minimum fill thickness on the bypass road side at the culvert crossing (Sheet 4 of 15), resulting in only 0.4 m of fill cover over the culvert. HBML should confirm if they intend to locally raise the road surface to accommodate the increased fill thickness requirement over each culvert.
- Minimum pad thicknesses were based on thermal calculations presented by SRK in Appendix D of Supporting Document S2, Design of Infrastructure Components, dated March 2007. SRK noted that the minimum thickness for the airstrip was 2 m and for roads, it was 1 m. SRK noted that the 1 m thickness was not sufficiently thick that the active layer remained completely within the fill material. Therefore some thaw and possible settlement of the road fill is expected. BGC requests that HBML confirm if site experience has shown that the minimum pad thickness for the airstrip and roads predicted from the 2007 thermal calculations is adequate, given that the drawings are based on these minimum thicknesses of fill for each structure.

3.0 CONCLUSIONS AND RECOMMENDATIONS

The modifications proposed by HBML may impact local drainage conditions, contrary to what HBML has indicated in Item 2 of their submission. In addition, some of the design details contradict the original design criteria, as presented in SRK, 2007. BGC recommends that HBML review the above concerns and provide further clarification to the KIA regarding these matters.

The use of culverts in northern regions tends to be problematic. Snow and ice blockages may lead to local flooding and overtopping. HBML must commit to the use of steam and the clearing of these culverts from any plugging.

4.0 CLOSURE

BGC Engineering Inc. (BGC) prepared this report for the account of the Kitikmeot Inuit Association. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of report preparation. Any use which a third party makes of this report, or any reliance on decisions to be based on it are the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

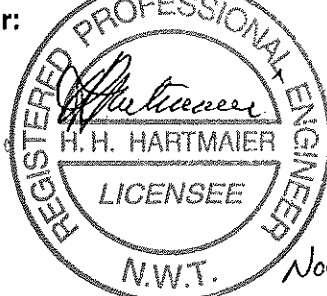
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We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

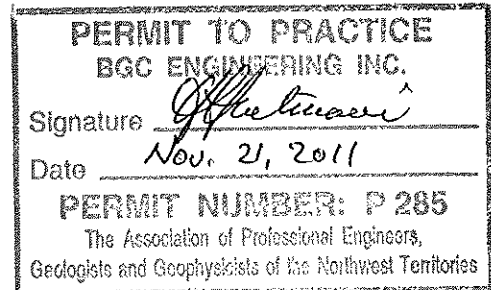
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per:



Nov. 21, 2011

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