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PROJECT MEMORANDUM

To:	**Nunavut Water Board**	**Fax No.:**	**Via e-mail**
Attention:	**Ms. Dionne Filiatrault**	**CC:**	**Carl McLean (DIAND)**
From:	**Holger Hartmaier (Ext. 113)**	**Date:**	**October 27, 2003**
Subject:	**Polaris Mine Decommissioning and Reclamation- Placement of Core Material into Barge Excavation- Comments**		
No. of Pages (including this page):3 Pages		**Project No:**	**0308-001-05**

1.0 INTRODUCTION

As requested in your e-mail of October 15, 2003, this memorandum provides comments regarding the proposal by Teck Cominco to place core material from Garrow Lake Dam into the hole left by the removal of the mill/office/barge complex at the Polaris Mine site.

As outlined in the letter from Teck Cominco, dated October 15, 2003, decommissioning of Garrow Lake Dam will yield about 4,200 m^3 of core material, consisting of frozen, saturated shale rock. After removal of the barge, a hole with an estimated volume of 75,000 m^3 must be filled as part of the reclamation work.

Under the original Polaris Decommissioning and Reclamation Plan (DRP), the core material was to be hauled to the LRD Quarry for disposal. The reason for placing it into the LRD Quarry versus placing it on the surface slopes of the creek banks was to prevent erosion and sedimentation of this material into Garrow Creek when it thaws. By placing all of the material into the barge excavation instead, Teck Cominco hopes to save money, due to the shorter haul distance to the barge, as well as the decreased amount of fill required from other areas to reclaim the barge area.

2.0 CORE MATERIAL PROPERTIES

Details of the core material are provided in the as-built construction report for the Garrow Lake Dam (EBA, June 1990):

- The core material is composed of shale bedrock excavated from the quarry by blasting.
- The material was crushed so that 100 percent passed the 38 mm sieve size, resulting in a well-graded sandy gravel with an average of 5% fines.
- The average moisture content of samples from the crusher and stockpile was 17.8%.
- The core was constructed by pre-mixing the dry crushed shale with water in an open pit. The shale-water mix was slightly over-saturated. The mixture was hauled to the dam by loader and dumped. The dumped mixture was spread into thin lifts varying between 100 –200 mm, depending on ambient temperatures. A minimum of 12 hours was required to completely freeze each lift.
- Samples of the frozen core material indicated an average moisture content of 39.2 % and a density of 1800 kg/m^3.

Given that the shale material was frozen insitu, it is unlikely that any physical changes to the material have resulted.

3.0 PROPERTIES OF BARGE BACKFILL MATERIAL

Teck Cominco have previously indicated that they plan to excavate the frozen dam materials by blasting in the spring, before the ground thaws. As a result, the material hauled to the barge from the dam excavation will not have the same properties as the crushed shale placed in the core. Instead, the core material is expected to come out in frozen pieces. In addition, secondary fines will be generated as a result of drilling, blasting and general disturbance associated with the excavation, hauling and placement process.

The material being placed into the barge excavation will no longer resemble the homogeneous structure of the core and will likely comprise a non-homogeneous mixture of fines, sand, gravel, cobble and boulder sized pieces, as well as crushed ice. The larger pieces will consist of frozen core material or aggregates of frozen core material.

As a backfill material, there is a potential for a high degree of voids to be created.

Note that the barge excavation itself is located within fill that was placed around the barge after it was installed. During barge operations, a zone of thaw developed around the hull within this material. Since decommissioning, some freeze back has occurred, but there is no information presented regarding the properties of this material. It is assumed that at the time of fill placement, all the contaminated soils around the barge will have been removed.

The barge excavation lies within the former beach area and is part of the foreshore remediation area. The main concern with respect to placing this backfill material in this location is the potential for re-exposure due to erosion and consequent sedimentation problems due to the high fines content. In addition, blasting residues may be present in the shale. There is also no information regarding acid rock drainage (ARD) and metals leaching potential of the shale backfill.

4.0 RECOMMENDATIONS

To address the concerns in using the core material from Garrow Lake Dam to backfill the barge excavation, the following minimum conditions should be satisfied:

- Teck Cominco should submit static acid-base accounting (ABA) and metals leaching test results to confirm that the shale backfill is clean.
- Teck Cominco should submit a plan indicating how blasting residues will be minimized in the backfill. Leach extraction tests should be conducted on representative samples of the blasted material to assess the nitrogen content of the blasted backfill material. Test results should determine nitrogen content in terms of nitrate (NO_{3-}), nitrite (NO_{2-}), ammonium (NH_4) and ammonia (NH_3).
- All the backfill material must be placed at the base of the excavation, below the future active zone predicted for the reclaimed site.
- The zone of fill placement shall lie below the projected 17.5 H :1V slope from the reclaimed beach, as shown on Westmar Drawing 02-102 (Revision C), dated May 30, 2003, Section 1400N.
- The foundation area on which the material is being placed shall be cleaned of excess ice and snow and be free of contaminated soils.
- The core backfill shall be free of excess ice and snow and be broken down so that the maximum particle size of the frozen material does not exceed 150 mm.
- The backfill shall be placed and compacted in lifts not exceeding 300 mm in thickness.
- Pieces of core material larger than the maximum size specified, shall be preferentially bladed out of the fill and then further broken down mechanically by several passes of a bulldozer.
- Additional backfill may be required in the spring, following settlement of the frozen fill after thaw, and before permafrost has aggraded into the barge excavation area.

As part of the approval, Teck Cominco should be required to submit a plan and cross-section drawing of the proposed backfill area, that shows the present limits of the barge excavation and the zone of proposed fill placement with respect to final lines and grades of the finished dock and shoreline decommissioning in this area.

5.0 REFERENCES

EBA Engineering Consultants Ltd., 1990, Dam Construction Review, Garrow Lake Dam, Little Cornwallis Island, NWT., submitted to Cominco Ltd., June 1990.

6.0 CLOSURE

We trust that this memorandum satisfies your requirements at this time. If you have any questions or require additional information, please do not hesitate to contact me.

Yours truly,
Per BGC Engineering Inc.

Holger Hartmaier, M.Eng., P.Eng,
Senior Geotechnical Engineer

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