Diavik Diamond Mines (2012) Inc. (DDMI) is actively preparing for the 2016 in-lake construction season. In this regard we have reviewed regulatory requirements under Water License WL2015L2-0001.

- DDMI filed an application to amend Part H Item 31 on October 20, 2015 and this regulatory process is underway.
- DDMI has committed to resubmit the A21 Construction Environmental Management Plan pending the outcome of the above noted amendment request.
- Please accept this letter as DDMI's notification of intent to re-commence dike construction in early July as soon as ice-conditions allow access to Lac de Gras. Design drawings and reports have been previously submitted in conformance with Part F Item 4. (Submitted to WLWB December 10, 2014 and Approved by WLWB April 29, 2015 link here). These design drawings and reports include the 2016 construction activities.

Engineering design modifications were identified in 2015 that we are planning to implement in 2016 construction. These include:

1. Zone 1/1A Filter Blanket Gradation Specification
2. Secant Pile Cut-Off Wall
3. Toe Buttress Design
4. Shallow Cut-Off Wall Mix Design
5. South Abutment Cut-Off Wall Configuration

Attachment #1 is a Technical Memorandum that addresses Item #1 above prepared by the A21 Engineer of Record. DDMI is submitting this to the Wek’eezhii Land and Water Board (WLWB) as per our understanding of Part G Item 1. This modification is, to the best of our knowledge, not in contravention of the Water License nor the Waters Act (as required under Part G Item 1b). By copy of this letter we are also seeking written confirmation from the Inspector, to the WLWB, that the attached Modification is acceptable (as per Part G, Item 1d).

DDMI will submit specific modification requests under Part G Item 1 for each of Items #2 through #5 as each engineer memorandum is available.

DDMI would also like to highlight to the WLWB a construction method applied during the 2015 dike construction. DDMI placed waste rock as a toe buttress to stabilize the dike.
embankment during construction as shown in yellow in Attachment #2. (The yellow is a DDMI addition to BGC Drawing 14300-41D2-1006.1.) Type III waste rock was used in this toe buttress as the deep water provided a recognized geochemical mitigation alternative to surface disposal (Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories – MVLWB/AANDC 2013). A21 Dike Technical Specifications supporting the A21 Dike Design Drawings allow for use of Type III rock in areas of the dike provided it meets the criteria in the Technical Specifications (see Appendix M – Technical Specifications – Embankment Placement Section 2.1.4 submitted to WLWB December 10, 2014 - link here). The Waste Rock Management Plan however, had not been updated to include geochemical criteria for construction in Lac de Gras (Schedule 6, Item 5,b,ii of WL2015L2-0001).

DDMI confirms that toe buttress construction in 2016 will use only Type I rock.

Please let me know if you require any additional clarification.

Regards,

Gord Macdonald

cc  Sarah Elsasser (WLWB)
Ryan Fequet (WLWB)
Tracy Covey (Inspector)

Attachments:

2. Toe Buttress Drawing.
Attachment #1 – BGC Engineering Technical Memorandum – Zone 1/Zone 1A Material
EXECUTIVE SUMMARY

In view of the difficulty producing Zone 1A material in-spec, BGC Engineering Inc. (BGC) have assessed the alternative of using Zone 1 material to build the A21 Dike’s filter blanket drain.

Based on the results of laboratory tests, the hydraulic conductivity Zone 1 material would be acceptable considering the design criteria ($K \approx 10^{-2}$ cm/s).

In terms of both internal stability and filter criteria, Zone 1 would be generally consistent with the material used in the other dikes and an improvement relative to the as-produced Zone 1A for the A21 Dike.

BGC have concluded that Zone 1 material placed appropriately would be adequate to build a filter blanket that would have a similar performance as observed for the other dikes within a comparable service life (i.e., considering that dewatering of the in-field would be followed by dewatering of the open pit and the associated phreatic surface drawdown).

1.0 INTRODUCTION

The design of the A21 Dike includes a filter blanket under the downstream shell to manage the seepage regime across the dike and to reduce the risk of internal erosion of the foundation material. The design includes Zone 1C material for construction of the filter blanket in areas where the prepared foundation is between El. 410 m and 414 m and Zone 1A material at the locations where the prepared foundation is below El.410 m. The difference between the gradations of these materials is shown in Figure 1.

Zone 1A material was specified to have an average fines content (< 0.075 mm) of no more than 2% in order to achieve a sufficiently high hydraulic conductivity ($K \approx 10^{-2}$ cm/s) to quickly dissipate positive shear induced pore pressures generated due to expected contractant behaviour of the Zone 1A material and thus limit the potential for liquefaction during dike construction. Test work done for the previous dikes provided the basis for this specification (NKSL, 1999).
During the 2015 construction season, the Contractor encountered significant difficulty producing Zone 1A material that met the Technical Specification, despite a number of changes to the screening plant, improvement in feed control and a relaxation of the Technical Specification to allow a fines content up to 5%. The material produced had a relatively high fines content and a gap-graded gradation curve (Figure 2). In addition to the relative poor quality of the gradations produced, there was an adverse impact on productivity given the large number of batches of out-of-spec material that had to be discarded (see Figures 2 and 4).

Production of Zone 1 material in 2015 was generally much better; gradations produced by DDMI’s Backfill Plant are shown in Figures 3 and 5. Given the above, the alternative of using Zone 1 material to build the entirety of the filter blanket was assessed. The results of this assessment are summarized in this technical memorandum.

Figure 1 – A21 Dike Material Gradation Specifications
Figure 2 – As-produced gradations of Zone 1A

Figure 3 – As-produced gradations of Zone 1
For reference, the gradations of the filter blanket material used at the A154 and A418 Dikes are presented in Figures 6 and 7, respectively. The gradation criteria for Zone 1A and the range of material (Zones 1 and 1A) produced for the A21 Dike are also shown on Figures 6 and 7 for comparison.
Figure 6 – A154 Dike in-place filter blanket gradations compared to 2015 produced and approved Zones 1 and 1A gradations for the A21 Dike

Figure 7 – A418 Dike in-place filter blanket gradations compared to 2015 produced and approved Zones 1 and 1A gradations for the A21 Dike
2.0 REQUIREMENTS

An adequate filter blanket material for the A21 Dike needs to comply with the following requirements:

- Meet the filter criteria for the foundation material
- Be internally stable
- Have a hydraulic conductivity in the order of $10^{-2}$ cm/s or higher

3.0 FILTER CRITERIA

For all three dikes (A154, A418 and A21), the filter blanket has been designed to meet the filter criteria for the foundation till, which leads to the Technical Specification requirement of $D_{15} \leq 3$ mm as shown on Figure 1. The $D_{15}$ of the approved gradations of Zone 1A material produced in 2015 were all smaller than 3 mm, ranging from about 0.9 mm to 2.6 mm with a mean of 1.7 mm. The $D_{15}$ of the approved Zone 1 gradations produced in 2015 were also all smaller than 3 mm, ranging from about 0.2 mm to 1.5 mm with a mean of 0.6 mm, which makes it a better filter for the foundation material, especially if one considers that some of the lower, stiffer lakebed sediment may be left in place after dredging (as it was observed for the previous dikes).

4.0 INTERNAL STABILITY

Both Zone 1A and Zone 1 materials produced in 2015 have some unstable gradations according to various criteria used, including Kenney and Lau (1985, 1986), Wan and Fell (2004, 2007) and Li and Fannin (2008). However, the gap-graded gradations common to Zone 1A (“hockey sticks”) (Figure 2) are more prone to instability than the gradations obtained for Zone 1 (Figure 3) based on Kenney and Lau and Li and Fannin criteria. Thus, the Zone 1 material is generally more internally stable than the Zone 1A material.

5.0 HYDRAULIC CONDUCTIVITY

A program of laboratory testing was conducted to evaluate the hydraulic conductivity of the Zone 1 material produced in 2015, to identify factors influencing the hydraulic conductivity, and to compare with results of past hydraulic conductivity testing programs. Two samples of Zone 1 material were collected by DDMI from the finer range of produced Zone 1, since the finer range will have lower hydraulic conductivity. These samples were labelled “Loadout-fine” and “ROM-fine”; their gradation curves are presented in Figure 8 below, along with the Zone 1 and 1A specified gradation limits.
Figure 8 – Zone 1 gradations for hydraulic conductivity testing

Constant head hydraulic conductivity tests were conducted using a large scale rigid wall permeameter (315 mm diameter) and upwards hydraulic gradient. For each material tested, two states of initial density, loose and dense, were evaluated to determine the effect of compaction on the material’s hydraulic conductivity.

The average hydraulic conductivity of the Loadout-fine material was determined to be approximately 5 x 10^{-2} and 2 x 10^{-3} cm/s in a loose and dense state, respectively. The ROM-fine loose and dense samples had average hydraulic conductivities of approximately 6 x 10^{-1} and 6 x 10^{-3} cm/s, respectively. A summary of the test results is presented in Table 1, for further details on the tests procedure and results, please refer to the memo entitled “Zone 1 Permeability Testing” (BGC, 2015).

Table 1: Hydraulic conductivity tests on Zone 1 fine material

<table>
<thead>
<tr>
<th>Test</th>
<th>Material</th>
<th>State</th>
<th>Initial Dry Density ρd [g/cm³]</th>
<th>Hydraulic Gradient, i</th>
<th>Average Hydraulic Conductivity, [cm/s]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Loadout Fine</td>
<td>Loose</td>
<td>1.60</td>
<td>0.56-0.78</td>
<td>5.0 x 10^{-2}</td>
</tr>
<tr>
<td>2</td>
<td>ROM Fine</td>
<td>Loose</td>
<td>1.50</td>
<td>0.08-0.13</td>
<td>6.2 x 10^{-1}</td>
</tr>
<tr>
<td>3</td>
<td>ROM Fine</td>
<td>Dense</td>
<td>2.19</td>
<td>0.19-1.17</td>
<td>6.4 x 10^{-3}</td>
</tr>
<tr>
<td>4</td>
<td>Loadout Fine</td>
<td>Dense</td>
<td>2.03</td>
<td>0.22-1.01</td>
<td>2.1 x 10^{-3}</td>
</tr>
</tbody>
</table>
Both Loadout-fine and ROM-fine samples in the loose state had hydraulic conductivities greater than the required $10^{-2}$ cm/s; while the hydraulic conductivity of dense state samples were slightly below.

The filter material will be placed in a loose state during construction of the filter blanket and then will densify under the loading of the dike. However, field densities as high as the dense samples tested in the laboratory are unlikely and thus the hydraulic conductivities are not expected to be as low as those from the dense laboratory samples. Moreover, the samples tested were within the finer range of the as-produced Zone 1 material and the coarser material would have higher hydraulic conductivity than the samples tested.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The as-produced Zone 1 material complies with the basic requirements for the filter blanket. It appears to provide better filtration of the foundation soils and be more internally stable than the as-produced Zone 1A gradations and it has comparable gradations to previous filter blanket placed for the A154 and A418 Dikes. Based on the results of laboratory tests on Zone 1 samples, the hydraulic conductivity of the Zone 1 material is expected to meet the $10^{-2}$ cm/s criterion. Therefore, appropriately placed Zone 1 material would be adequate to build a filter blanket that would perform similarly to the other dikes within a comparable service life of the blanket considering that dewatering of the in-field would be followed by dewatering of the open pit and an associated phreatic surface drawdown. If, for any reason, the pit dewatering is delayed, appropriate measures would be required to manage the long term hydraulic gradients across the filter blanket.

The Zone 1A material that has already been produced can be used to raise the dike from El.418 m to 421 m. It can also be used as road surfacing material.

7.0 CLOSURE

BGC Engineering Inc. (BGC) prepared this document for the account of DDMI. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is 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 document.

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Yours sincerely,

BGC ENGINEERING INC.

per:

[Signature]

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AO/AK/rm/cr
REFERENCES


Attachment #2 – Toe Buttress Drawing
1. All dimensions are in metres unless otherwise noted.
2. This drawing is to be read in conjunction with accompanying drawings and technical specifications. The contractor shall immediately notify the engineer should uncertainties arise with the drawings, scope, and/or technical specifications.
4. Projection is UTM NAD 83 Zone 12.
5. Toe berm toe is designed to intersect the till layer, however shown is the inferred lakebed surface. Toe is approximate and to be field fit.
6. Unless BGC agrees otherwise in writing, this drawing shall not be modified or used for any purpose other than the purpose for which BGC generated it. BGC shall have no liability for any damages or loss arising in any way from any use or modification of this document not authorized by BGC. Any use of or reliance upon this document or its content by third parties shall be at such third parties' sole risk.