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via email: DJohnson@Tahera.com

Attention: Dan Johnson

Subject: Jericho Diamond Mine
Reply to NWB
Review Comments to West Dam Construction Specifications

EBA Engineering Consultants Ltd.'s (EBA's) responses to questions and comments in NWB Letter dated September 12, 2006 regarding the Jericho Diamond Mine West Dam Construction Specifications are presented below. The original NWB comments are in italics. EBA's reply follows each comment.

a. Throughout the construction specifications there have been commitments made to have the engineer on site judge/evaluate/approve certain provisions. The engineering body responsible for supervision should produce construction and engineering records that detail how each of these commitments were carried through. The Board requests a detailed report (partnered with as-built construction and engineering records) discussing how each of the following provisions within the listed specifications was carried through:

- *General (Item 3.2)*
- *Water Control (Item 2.2)*
- *Foundation Preparation (Items 2.1, 2.2, 3.1, 3.2, 3.4, 4.6, 4.7, 4.8, 5.0)*
- *Fill Materials (Items 2.8, 2.9, 3.3c)*
- *Fill Placement (Items 1.3, 2.1, 2.4, 2.7, 2.9)*
- *Geosynthetic Clay Liner (Items 4.2, 4.3, 6.7, 6.8, 7.1, 7.2)*
- *Instrumentation (Items 1.2, 1.3, 3.2, 4.1)*
- *Quality Assurance (Items 2.1c, 2.3c)*
- *Adfreeze Piles (Item 2.4)*

The as-built construction drawings and construction summary report will document the construction and quality assurance testing. All of the topics listed above are normally described in our as-built reports. The as-built reports will be submitted upon final construction completion.

*b. (**Foundation Preparation Items 3.1, 3.3, and 3.4**) TDC stated that the base of the key trench excavation must have no natural or excavation related open voids or joints. The Board requests additional information and detail on measures used to establish the quality of rock upon which "the Engineer may limit the*

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excavation". Does TDC intend to include this information in the construction records they are to submit to the NWB as per ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

The base of the key trench is placed in competent rock or ice saturated frozen ground. The required depth of the key trench is determined prior to construction using perculation tests (falling head tests) along the key trench location. Drill holes are filled with water to determine the level that water stabilizes at after 24 hours. It is assumed that the rock or frozen ground is ice saturated below this level. The key trench elevation is set below this level.

c. ***(Foundation Preparation Item 4.0)*** *TDC stated that the contractor must use excavation methods that minimize fracturing beyond excavation limits. The Board request additional documentation on how fracturing will be monitored. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

The key trench is excavated with mechanical equipment where possible. Blasting is used in areas where mechanical excavation is not effective. The key trench is blasted using a tight blast pattern (approximately 2 m spacing), such that a small charge is required to remove the rock and frozen soil. Blasted and fractured rock is removed from the excavation. Dental excavation is used to remove loose rock from the base of the key trench. The base of the key trench is then cleaned using a mechanical sweeper attached to a bobcat, and/or high pressure air. The base is inspected for signs of loose rock and open fractures, snow and ice. A description of the key trench condition will be included in the construction summary report.

d. ***(Foundation Preparation Item 5.0)*** *TDC stated that the foundation must be inspected and approved by the Engineer before fill is placed. The Board requests additional documentation outlining inspection details. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

The base of the key trench is visually inspected for any signs of voids and fractures, and snow and ice as described above.

e. ***(Fill Materials Item 1.4)*** *A record of damage by rain, snow, or any other cause should be provided with remedial measures during construction to the Board. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

Portions of the embankment that do not meet specifications, as interpreted by the Site Engineer, will be removed and reconstructed. These conditions, should they occur, will be documented with explanation and mitigation undertaken in the construction summary report

f. ***(Fill Materials Item 2.3, 2.8)*** *TDC stated that placement of the key trench requires construction in temperatures below -15°C for freezing to occur in a soil lift within a 24 hour period. Freezeback was defined as a maximum temperature of -2°C. The Board requests additional information and details on how soil freezing will be monitored and the frequency of testing, additionally, a statement of where temperature within the soil lift is monitored should be provided.*

The freezeback of individual lifts is monitored using single bead thermistors. The thermistors are installed at a depth equal to 2/3 of the lift thickness. A minimum of one thermistor cable is installed per lift. Additional cables may be installed depending on the construction sequencing (i.e. if a lift construction extends over several days, several thermistor beads may be installed).

*g. (**Fill Materials Item 2.4**) TDC stated that the 20 mm minus material requires mixing with heated water prior to placement in the trench so that it does not contain interstitial ice. The Board request additional detail and discussion on how the temperature of the heated water will be selected to achieve the specification.*

Water added to the 20 mm crush must be warm enough that the 20 mm crush mixture is above zero when it is being placed at the dam. Typically, the temperature is between 5 and 10°C when placed at the dam. The water added to the 20 mm crush at the plant must be warm enough to melt the ice in the stockpiled 20 mm crush and to maintain above zero temperatures during transport. It has been found that the water added to the crush must be between 70 and 90°C.

*h. (**Fill Materials Item 2.12**) A record of damage to the GCL liner or thermosyphons should be provided with remedial measures during construction to the Board. Does TDC intend to include this information in the construction records they are to submit to the NWB as per **Part D, Item 19** of water licence **2AM-JER0410** (formerly NWB1JER0410)?*

A record of damage to the GCL liner or thermosyphons will be included in the construction summary report.

*i. (**Fill Materials Item 3.4**) TDC has provided no specifications regarding the mining of the till in the borrow area. Since the till may be in a frozen state when it is excavated from the open pit area, some processing may be required. The specifications for till do not address the quality of the till that should come from the pit except for maximum particle size and that particles must be "hard, durable and angular". The Board request additional detail and discussion on processing till to ensure an effective barrier for water flow.*

The till is placed in the upstream shell of the dam. It is not the primary barrier for water flow. The primary barrier for water flow is the frozen core, which is supplemented by the GCL liner. The upstream dam shell of frozen core dams is usually constructed with run of mine. The till is generally well graded such that there will be no convective heat flow within it (as opposed to run of mine rock) and thus the thermal performance of the dam is improved.

A portion of the till comes from the key trench excavation. This material is predominately from the active layer; therefore, it contains little or no excess ice content. The remainder of the till will come from the till from the open pit operation. The till is variable in the open pit. The till is generally well graded with varying proportions of boulders, cobbles, gravel and sand. Much of the till on site has between 5 to 10% fines, whereas some of the tills from the pit have 15 to 20% fines. The till material will be placed as specified in 0.3 m lifts or less. Larger particles will be pushed to the outside of the lift. Care must be taken in the winter months to break up the frozen chunks and compact the material. Winter placed material may settle if it thaws. The settlement of the material is not anticipated to effect dam performance and will not affect the dam freeboard.

j. (***Fill Materials Item 6.0***) *TDC stated compaction methods for the placement of till material; however, there is no specification on density to be achieved. The Board request additional detail to address this issue and how compaction specification of the till material will be monitored and reported.*

A method specification is used to define the compaction of the till. There is no minimum density specified for till; therefore, its density will not be tested. The dam performance is not dependent on the density of the till zone.

k. (***Geosynthetic Clay Liner Item 2.2***) *The Board requests commercial specifications for the GCL with as-built construction records. The Board requests signed manufacturing certifications to be referenced, annexed and provided with as-built construction and engineering records.*

The commercial specifications and manufacturing certificates for the GCL will be included in the construction summary report.

l. (***Geosynthetic Clay Liner Item 3.3***) *TDC stated that it is essential to protect the GCL rolls from exposure to water. The Board requests additional detail and discussion on how the GCL will be protected from solar degradation during storage.*

The GCL liner is wrapped in plastic for transportation and storage from the manufacture. The plastic will be maintained on the GCL rolls until the material is to be placed.

m. (***Geosynthetic Clay Liner Item 6.0***) *TDC stated that the cover material must be compacted in excess of 90% maximum dry density or as specified by the Geotechnical Engineer to prevent damage to the GCL. The Board request additional detail and discussion on how and frequency the dry density will measured. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

The most important aspect of the cover on the GCL is to protect the GCL from the coarser materials above it. The 90% maximum dry density specification is relatively low; minimum compactive effort is applied to the layer to minimize damage to the GCL. The density of the cover on the GCL shall not be tested or reported.

n. (***Geosynthetic Clay Liner Item 6.6***) *TDC stated that damage of the GCL during placement of the cover material should avoid damage to the liner. The Board requests additional detail and discussion on what measures and specifications will be completed to assess the potential for GCL damage during cover placement. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

The fill placement over the GCL will be monitored visually. Damage to the liner will be recorded, repaired, and reported in the construction summary report.

o. (***Geosynthetic Clay Liner Item 7.1 and 7.2***) *A record of any damage to the liner should be submitted to the Board along with a note indicating that the proposed remedial measures were implemented. Does TDC intend to include this information in the construction records they are to submit to the NWB as per* ***Part D, Item 19*** *of water licence* ***2AM-JER0410*** *(formerly NWB1JER0410)?*

Damage to the liner will be recorded, repaired, and reported in the construction summary report.

*p. (**Quality Assurance**) The material contained within this section suggests that a monitoring program will be installed in evaluating the QA. The Board requests a thorough report embodying all elements of this program that evaluate all components after construction. This shall be submitted to the Board with the final construction and engineering records. Does TDC intend to include this information in the construction records they are to submit to the NWB as per **Part D, Item 19** of water licence **2AM-JER0410** (formerly NWB1JER0410)?*

The quality assurance testing will be included in construction summary report. This report will be submitted the water board as per the license.

*q. (**Quality Assurance Item 2.3c**) TDC stated that cored samples from the key trench will be examined and photographed by the Engineer and that the bonding between layers, ice-saturation, and ice bonding will be evaluated. The Board requests additional detail and discussion on the evaluation criteria and what characteristics of the core represent an acceptable evaluation. Does TDC intend to include this information in the construction records they are to submit to the NWB as per **Part D, Item 19** of water licence **2AM-JER0410** (formerly NWB1JER0410)?*

The cores will be physically and visually inspected for voids and poor ice bonding. Poor ice bonding is evidenced by friable cores. The density of the cores will be measured, as well, their moisture content such that the degree of ice saturation can be calculated. The voids and ice bonding are qualitative assessments, whereas the degree of saturation is a quantitative assessment. It is generally found that the cores that have voids or poor ice bonding will not meet the specified degree of saturation.

We trust this addresses the NWB questions and comments. We welcome the opportunity to discuss them further at the scheduled meeting between NWB, EBA and Tahera.

Regards,
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