Tahera Diamond Corporation

Addendum

To the

Submission to the Nunavut Water Board

Jericho Diamond Project

October 8, 2004

Section No. 4.1(a)(ii)2.a

NWB Comment: No geotechnical or geothermal conditions provided for area along the diversion channel.
Response: See comments under Section No. 4.1(a)(ii)2.b

Section No. 4.1(a)(ii)2.b
NWB Comment: No ground conditions provided.
Response: Incremental comments on geotechnical or geothermal conditions are provided below.

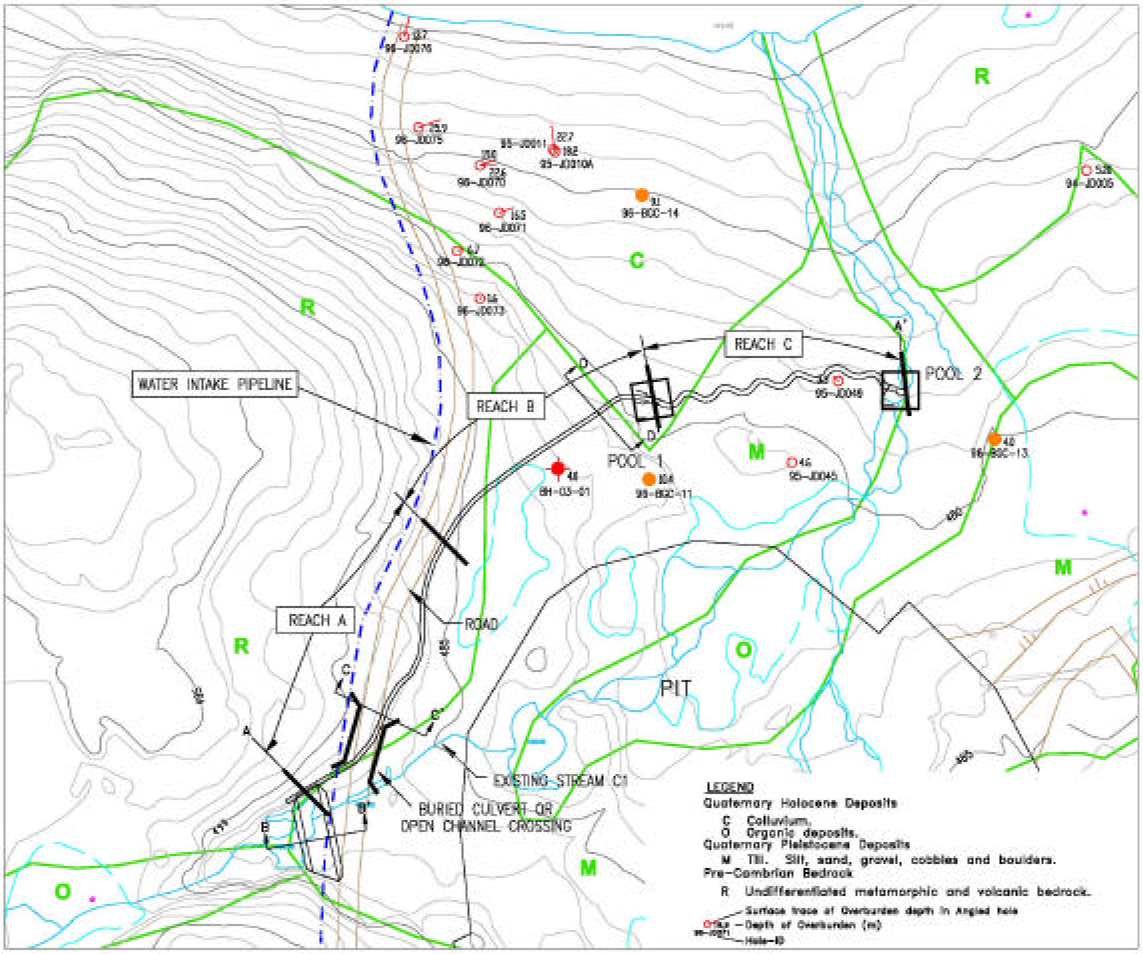
1) Geotechnical Conditions
As noted in the conformance table, Appendix X, Section 2.3.1 and Drawings 1CT004.06-W2 and W3 summarize the geotechnical conditions along the proposed alignment of the C1 Diversion.

Reach A
In particular, approximately the first third of the channel (Reach A) coincides with a glacially smoothed outcrop of granitic bedrock. Section C-C' on Drawing 1CT004.06-W2 illustrates the channel will be excavated into the bedrock along Reach A (see also Appendix CC, Photo 22).

Reach B
The stratigraphy along approximately the next third (Reach B) consists of a layer of granular soil up to several metres thick overlying bedrock. The C1 Diversion will cut through the local soils and be founded on the local bedrock (Section D-D' on Drawing 1CT004.06-W2). However, where the bedrock surface is too deep, the ditch will be constructed in accordance with the design for Reach C.

Reach C
Reach C covers the remaining third of the C1 Diversion. The stratigraphy along Reach C consists mainly of sand and gravel, with some zones of silt and till, overlying bedrock. The thickness of the Along Reach C, the C1 Diversion channel will be excavated into these soils, as shown in Sections F-F', G-G' and H-H' (see also Appendix CC, Photo 23).

Detailed Geotechnical Information
The surficial geology in the vicinity of the diversion ditch is provided on the following figure. This figure also shows the locations of boreholes completed in the general vicinity of the C1 Diversion and the thickness of soils encountered at each of these borehole locations. Detailed geotechnical and ground ice data of relevance to Reaches B and C is provided on the logs for boreholes 96-BGC-11, 96-BGC-13, 96-BGC-14 and BH-03-01, copies of which are provided in Appendix BB (SRK Technical Memorandum A, Attachments A.4 and A.6).



The soils encountered in these boreholes typically ranged from sand to sand and gravel with cobbles and boulders up to about 0.3 m in diameter. The silt content ranged from less than 10% by weight (a trace) to up to about 20% by weight.

The thickness of the unfrozen layer, at the time of test pit excavation (August 1996), varied from about 1 to 2.5 m. The soils below the unfrozen layer were frozen and typically well bonded with either no excess ice or excess ice that varied from ice coatings to, in one borehole, an ice layer 0.3 m thick. In general, however, the excess ice was less than 1 cm thick.

2) Geothermal Conditions

The geothermal conditions are summarized in Appendix W, Section 2.5 which states the following:

> The Jericho Diamond Project lies within a region of continuous permafrost. Permafrost is present everywhere except beneath large lakes and rivers and, at the Jericho pipe, is estimated to extend to a depth of approximately 540m. In the surficial soils, the active layer typically ranges in thickness from less than one meter in organic soil to slightly more than three meters

where well drained granular soils are present. The active layer thickness in exposed rock locally exceeds three meters.

Ground temperature data from the site indicates the average ground temperature is about -5° to -6°C. Further information regarding the permafrost conditions at the Jericho site is available in Technical Memorandum B.

Boreholes 96-BGC-11, 96-BGC-13 and 96-BGC-14 provide detailed information on ice content in the local soils proximal to the C1 Diversion. In addition, site specific geothermal data is provided by the thermistor in borehole BH-03-01. The location of each of these boreholes is provided on the layout plan, above. The logs for boreholes 96-BGC-11, 96-BGC-13, 96-BGC-14 and BH-03-01 are provided in Appendix BB (SRK Technical Memorandum A).

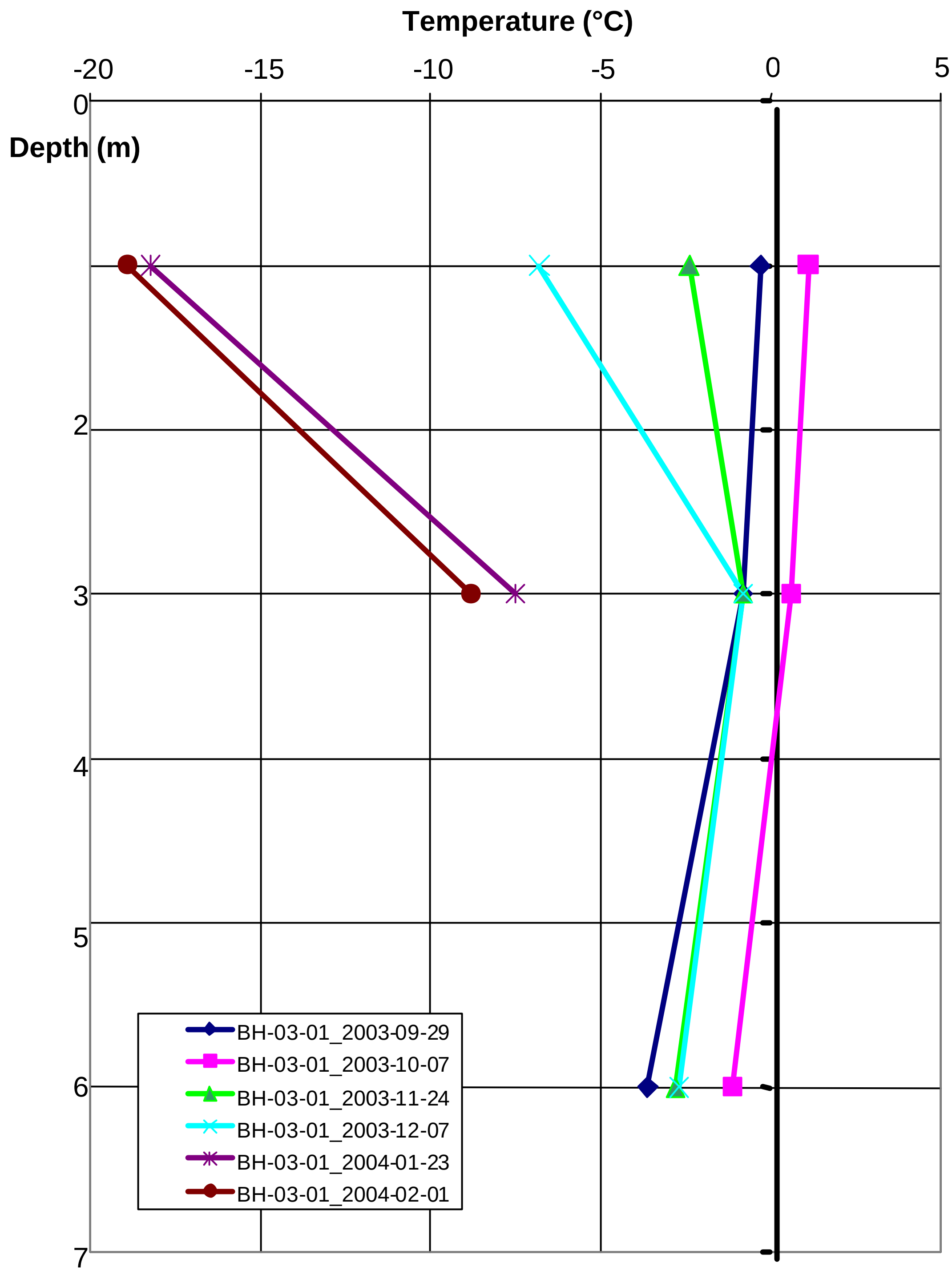
The thickness of the unfrozen zone during early to mid August when the three BGC holes were drilled varied from 1.0 m (96-BGC-13 and 96-BGC-14) to 2.5 m (96-BGC-11). Thermistor data from BH-03-01 is provided in the following table and summarized on the subsequent figure.

Thermistor Data Collected from BH-03-01

Date	Thermistor Depth (m) and Temperature (°C)		
	1 m	3m	6m
Aug. 19, 2003	6.1	-1.3	4.7
Aug. 26, 2003*	5.0	-1.3	-3.0*
Sept. 17, 2003	1.8	-0.9	-3.9
Sept. 29, 2003	-0.2	-0.8	-3.7
Oct. 7, 2003	0.5	-0.8	-3.5
Oct. 14, 2003	0.1	-0.8	-3.4
Nov. 24, 2003	-2.3	-0.8	-2.9
Dec. 7, 2003	-6.7	-0.8	-2.8
Jan. 23, 2004	-18.1	-7.5	malfunction
Feb. 1, 2004	-18.8	-8.8	malfunction

* can’t read the number on the fax.

Graphical Output of Select Temperature Data from Thermistors at BH-03-01



In conclusion, the thickness of the active layer within the soils along Reach B and Reach C is less than 3 m. The ground temperature at a depth of about 6 m is about -3°C but, based on other thermistors in the area, the average ground temperature is about -5°C or colder due to lower temperatures at depth.

Section No. 4.1(c)(iv)
NWB Comment: Confirm potential taliks.
Response: Incremental comments on potential taliks are provided below.

As stated in Appendix W, Section 2.5, the Jericho Diamond Project lies within a region of continuous permafrost. Permafrost is present everywhere except beneath large lakes and rivers.

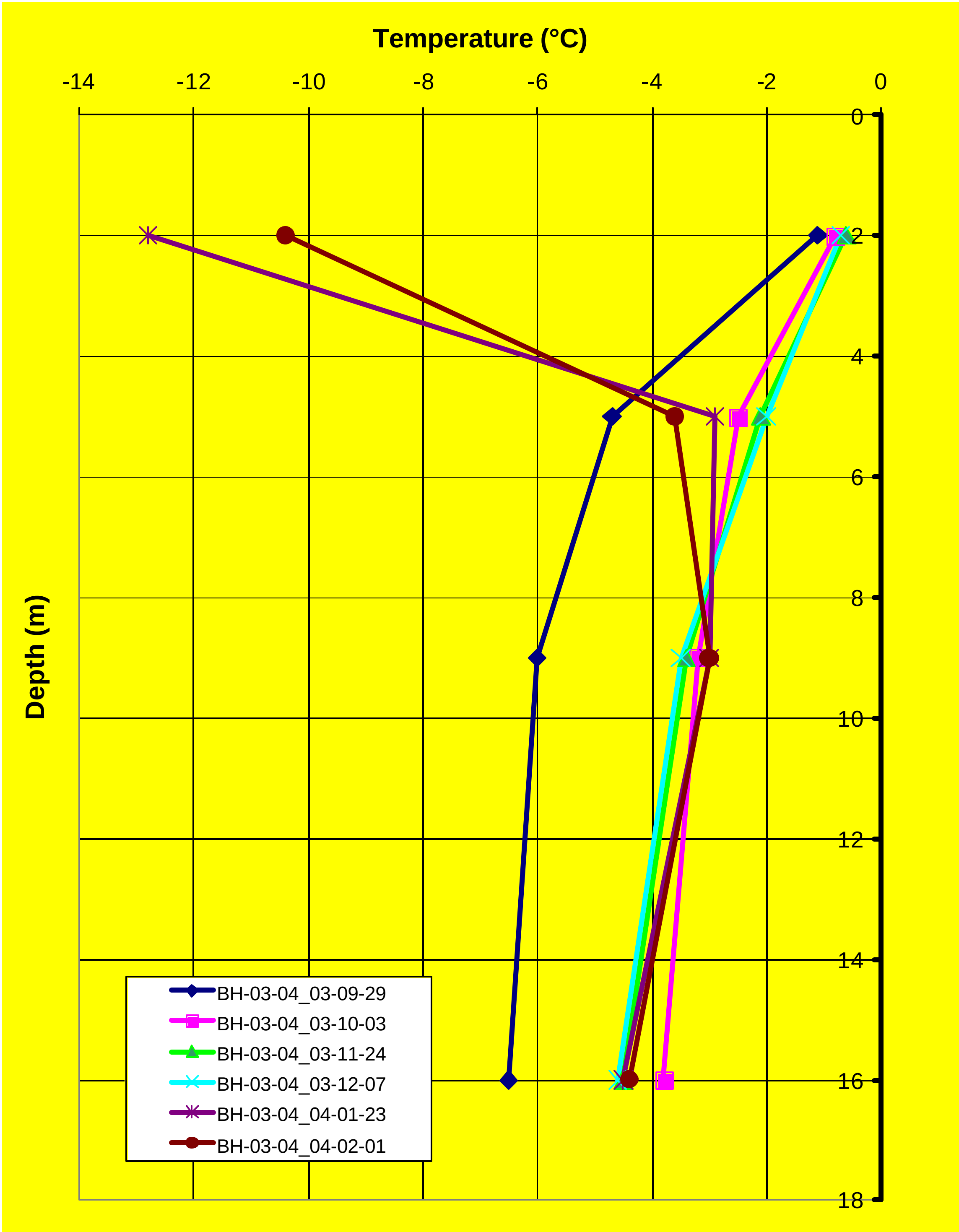
Measurements of ice thickness were collected by Tahera in March 2002. The average ice thickness on Carat Lake, based on 60 measurements, was 1.32 m and the maximum thickness was 1.60 m. Similarly, the average of 2 measurements of ice thickness at Lake C1 was 1.55 m, with a maximum of 1.56 m.

Figure 5.1 from Appendix W provides the bathymetric elevations at Long Lake and a series of cross sections through the lake. Parts of this lake do not freeze to the bottom in winter and there is undoubtedly talik below these parts of Long Lake. Similarly, the small lake approximately 80m west of Long Lake has a maximum depth of approximately 7 m so there is probably talik immediately below the deep part of this lake also.

A segment of Stream C3 connects Long Lake with the small lake noted above and coincides with the location of the West Dam. This stream segment meanders amongst the boulders exposed at the ground surface (see Photos 17 to 19 from Appendix CC). As a result, Stream C3 does not have a defined channel in this area and is very shallow (significantly less that 0.3 m deep except, possibly, for very brief periods during the spring freshet). Based on the ice thickness data provided above, Stream C3 freezes to the bottom each year. Beneath this section of Stream C3, it is possible that the thickness of the active layer is a metre or so deeper than normal, or that a thin layer of talik may be present.

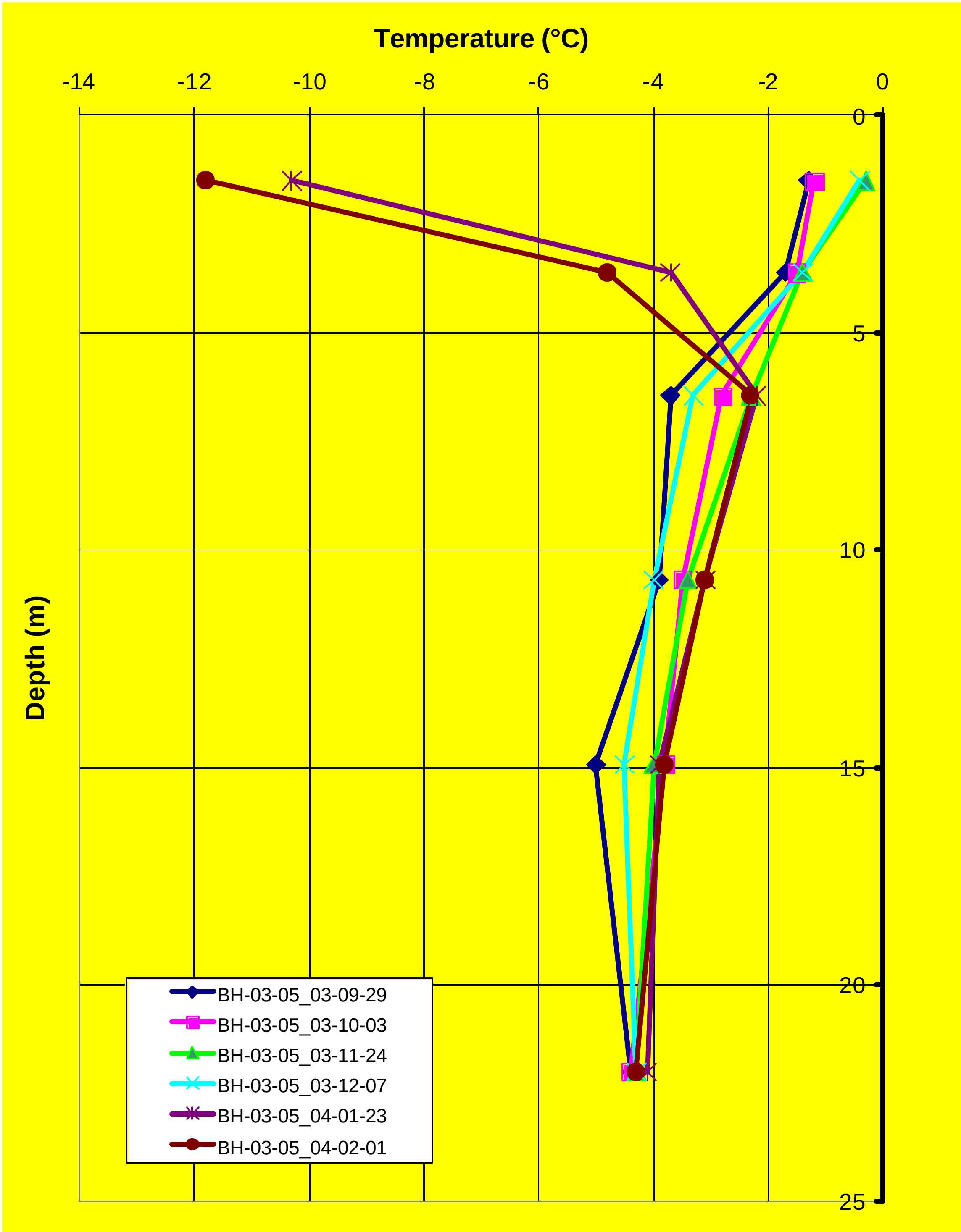
Additional technical data which supports the conclusion that any talik, if present, is thin are the thermistor plots from two boreholes in the valley floor (BH-03-04 and BH-03-05). The locations of these two boreholes are shown on Drawing 1CT004.06-G4 (included in Appendix S of the Tahera Water Permit Submission). The thermistor data from these two boreholes is provided on the following two figures, which indicates that the ground temperature in the valley is similar to the general permafrost temperatures elsewhere at the site.

Graphical Output of Select Temperature Data from Thermistors at BH-03-04



Temperature (°C)
-14
-12
-10
-8
-6
-4
-2
0
0
2
4
6
8
10
12
14
16
18
Depth (m)
BH-03-04_03-09-29
BH-03-04_03-10-03
BH-03-04_03-11-24
BH-03-04_03-12-07
BH-03-04_04-01-23
BH-03-04_04-02-01

Graphical Output of Select Temperature Data from Thermistors at BH-03-05



It is acknowledged that either a thicker active layer or a thin layer of talik could be present in the vicinity of Stream C3. However, as noted in Appendix W, Section 9.1, there is a provision to increase the depth of the key cut in the event that thin localized zones areas of talik are encountered during construction of the key cut at the West Dam. The same contingency would be available for the construction of the Settling Pond Dam in the event it is constructed. In addition, thermosyphons placed at or near the base of the key cut will lead to freezing of any remaining talik that does not get excavated during construction (Appendix W, Section 6.1.1 and Drawing 1CT004.06-P7).

Section No. 4.1(c)(vii)1.d
NWB Comment: No discussion of sedimentation during an extremely high run-off season.
Response: Incremental comments on sedimentation are provided below.

The sedimentation levels at the PKCA are expected to be very low and relatively consistent from year to year, regardless of the runoff, for the following reasons:

- The Stream C3 catchment area above the site of the West Dam is relatively small (see Appendix X, Drawing 1CT004.06-W1 for a plan view of the catchment). There are no creeks or concentrated flow channels leading into the PKCA or over the beached PK;
- Flow velocities through the PKCA pond will be low for all inflow conditions and sediment settling conditions will not vary significantly during higher runoff years;
- Runoff water pumped into the PKCA from other areas will be discharged into the pond and will not flow over erodible material;
- The water that will report directly to the PKCA as local runoff represents about 30% of the total volume of water that will report to the PKCA (Appendix X, Table W4;
- Bedrock dominates much of the catchment (Drawing 1CT004.06-G7 in Appendix S of the Tahera Water Permit Submission) leaving a relatively small portion of the catchment as soil covered and a potential source of sediment; and
- The soil slopes that are present within the catchment are vegetated and not actively eroding, although some slopes are experiencing solifluction due to the periglacial environment (Appendix CC, Photos 1 to 20).

Section No. 4.1(d)(i)
NWB Comment: Information not provided on all stream crossings.
Response: Incremental comments on the steam crossings are provided below.

The development of the Jericho Diamond Project involves two stream crossings, namely Stream C1 and Stream C2 (Stream C2 is the outlet stream that flows from Lake C4 to Carat Lake).

These two defined watercourses will crossed by permanent roads. Other drainages crossed by roads exhibit seasonal flow and poorly or un-defined channels. The Stream C2 road crossing presently exists and is traversed using a culvert. All other drainages traversed by permanent roads are not considered watercourses because the channels cannot be delineated, water flow is ephemeral, and they do not provide fish habitat.

Information has been presented for Stream C1 (see Tahera Diamond Corporation Water Permit Application August 2004).

The Stream C1 crossing will coincide with a segment of the Stream C1 diversion. Further comments related to the Stream C1 diversion and its crossing are provided in conjunction with the responses to Section No. 4.1(d)(ii) and Section No. 4.1(e)(ii), below.

The Stream C2 crossing consists of an existing culvert beneath the existing access road that links the current exploration camp with the mining area. This crossing location will likely be used during mine operation. The crossing may or may not be upgraded depending on the final road design. Stream C2 is an ephemeral watercourse. Discharge data for 2001 are as follows:

June 17:	0.0470 m^3/s
August 2:	0.0002 m^3/s
August 9:	dry

Channel banks exhibit low relief and are dominated by boulder materials (Photo 1). Stream C2 at the crossing is not considered fish habitat as defined by Fisheries and Oceans Canada (DFO 1998) because it does not support fish populations either directly (fish use) or indirectly (food production area) and it is located 430 m upstream of fish habitat (Mainstream 2004).

Photo 1. Existing Stream C2 crossing on 5 June 2001.

Section No. 4.1(d)(ii)
NWB Comment: Information not provided and no written description.
Response: Incremental comments on the existing conditions at the proposed Stream C1 crossing are provided below.

The general arrangement of the C1 Diversion is shown on Drawing 1CT004.06-W2. The diversion will consist of a small diversion dyke located downstream of Lake C1 and a channel which will direct the stream flow around the proposed open pit and into the natural Stream C1 channel at a point more than 200 m south of Carat Lake. The channel is designed to convey a peak 200 year flow of 0.7 m^3/s from a total catchment area of 105 ha.

Photo 21 (Appendix CC) provides a view of the bedrock “draw” in the general area where the diversion dyke will be constructed. The crossing of the C1 Diversion will be located within a few tens of metres of the north side of the diversion dyke. In this general area, the C1 Diversion coincides with a glacially smoothed outcrop of granitic bedrock, as illustrated in Photo 22 of Appendix CC. Section C-C’ on Drawing 1CT004.06-W2 indicates this part of the channel will be drilled and blasted as an unlined channel into the local bedrock with a minimum base width of 2 m, minimum depth of 1 m, and a longitudinal slope of about 1.5%. The channel alignment will be adjusted in the field to allow for local ground conditions and topography. Final channel dimensions will likely be in excess of the design requirements due to practical construction considerations.

The road access across this part of the C1 Diversion will consist of either a swale across the open channel or a culvert.

4.1(e)(i)

NWB Comment: No monitoring of surface drainage patterns as it pertains to roads

Response:

There are only two streams crossed by roads: C1 and C2 (outlet to Lake C4). Stream C1 is discussed in the Application. Stream C2 crosses the existing exploration camp to portal road through an existing culvert which has been in place since 1996 with no problems. The road at the C2 crossing is not currently planned to be disturbed; no mitigation is required based on the past history of culvert operation. Proposed monitoring will be limited to routine inspection by mine environmental staff.

Section No. 4.1(e)(ii)

NWB Comment: No information on culverts.
Response: Incremental comments on the proposed Stream C1 crossing are provided below.

1. Waterbody name and location: Stream C1 (local name) located at 65°59'52" N Latitude and 111°28'28" W Longitude
2. Drawing detailing the location: The general location of the proposed crossing is shown on Drawing 1CT004.06-W1 and a more detailed location is provided on Drawing 1CT004.06-W2.
3. Other Agencies contacted to date: Those involved with the Nunavut Impact Review Assessment and the Water Licence Application.
4. Need for the project and alternatives considered: The crossing is linked to the need to divert the flow from Stream C1 around the proposed open pit.
5. General condition of the site:
    i. Slope of banks: The diversion channel at which the crossing will be developed will be drilled and blasted into bedrock (Section C-C' on Drawing 1CT004.06-W2).
    ii. Description of substrate: Bedrock.
    iii. Vegetation (on banks, in-stream, to be removed): Some moss and/or lichen.
    iv. Expected flow rates during time of construction: Flows expected to be zero during winter construction period
    v. Channel meander pattern: Existing channel and this part of the diversion will be relatively straight.
6. Existing Habitat
    i. Fish Community (species/common names) at and near the site: No fish use of the stream section. See Section 2.1 of NNLP (Mainstream 2004).
    ii. Use of impacted are as spawning, nursery, rearing, food supply or migration route: No fish use of the stream section. See Section 2.1 of NNLP (Mainstream 2004).
    iii. Presence of sensitive habitat: No fish use of the stream section. See Section 2.1 of NNLP (Mainstream 2004).

iv. Assessment of impact to fish and fish habitat: No fish use of the stream section. See Section 2.1 of NNLP (Mainstream 2004).

7. Construction Details
   i. In water work timing restriction for fishery No in water work.
   ii. Proposed start date and completion date: Construction of the C1 Diversion and its crossing will be done in winter.
   iii. Type of crossing: either open channel swale or culvert.
   iv. Method of installation: Conventional earthmoving equipment.
   v. Dimensions of pipe or structure: 900 mm diameter, 16 m long corrugated steel pipe (CSP) culvert
   vi. Machinery to be used: A drill and track-mounted excavator.
   vii. Construction sequence (timing restriction may need to be taken into account): First, the diversion channel will be drilled and blasted. Then the channel at the crossing will be shaped in the case of an open channel crossing; or, in the case of a culvert, crushed rock fill and/or esker sand will be used to bed the channel for culvert placement. Next, for the culvert option, the culvert will be installed and the remainder of the fill will be placed over and adjacent to the culvert.
   viii. Sedimentation and erosion control measures: None required based on no flows during winter construction. Clean rockfill and backfill will be used for all in-stream fill placement to minimize sediment generation potential.
   ix. Monitoring during construction: Photos and periodic water sampling for water quality monitoring upstream and downstream of the construction activities if there is flow during the winter.
   x. Other mitigation measures: None planned.
   xi. Assessment of impact to fish and fish habitat: See Section 2.1 of the NNLP (Mainstream 2004).

xii. Bank stabilization: None needed due to presence of bedrock.

xiii. Cumulative impacts to area: No cumulative impacts since there are no other streams affected by the proposed activity.

xiv. Contingency plan: If water is flowing in the creek during construction, silt screens will be placed to control sediment or construction will be delayed until flow stops.

xv. Revegetation proposed: None due to the local climate and presence of bedrock.

xvi. Proposed post-construction monitoring: Photos will be taken of the site before construction, during construction and after construction; photographs will be taken form the same reference point for easy comparison. Stream C1 is part of the surveillance network program for the mine.

8. Culvert Installation

i. Culvert dimensions (height and width or diameter, length): 900 mm diameter, length approx 16 m to suit road dimensions.

ii. Culvert type/material: CSP

iii. Impact to fisheries ability to migrate through the culvert: No fish migration in area; therefore, not relevant.

iv. Need to realign the channel? This crossing is part of a diversion.

v. Open bottom or natural substrate inside? No

vi. Slope of culvert: 1.5%

vii. Installation of baffles, rock weirs or other structures: None planned.

4.1(e)(iii)1.a

NWB Comment: No information on timing, duration of pumping, monitoring, mitigation, or thresholds for mitigation implementation for winter road water withdrawal.

Response:

Winter road water withdrawal was discussed in AMEC letter to Tahera 4 August 2004 and included in Appendix M of the Nunavut Water Board Water Licence Application (Application). The letter indicates a maximum of 5700 m^3 will be required each time the winter road is constructed (annually). Half the water would be drawn from Contwoyto Lake and half (at most) from Lynne Lake. Pumping would occur from the ice-covered lakes. Withdrawal from Lynne Lake would only constitute 0.27% of the volume of the lake and therefore change in lake level would be undetectable. There would therefore be no impacts on fish or fish habitat. Per DFO requirements, the intake would be screened. The withdrawal would occur when the road was constructed and at a maximum rate of the entire requirement (2850 m^3) in one day. No monitoring is possible and no mitigation is deemed necessary.

4.1 (f)(iii) 1.a. [Open Pit] (provided by SRK)

Provide an estimate of volumes and concentration of Mine water and options for treatment disposal and/or discharge. *NWB conformity review indicated that only volumes were provided.*

Long-term pit lake concentrations are provided in Section 5.5.2 and Appendix B of Appendix A (AMEC Abandonment and Restoration Plan). The estimates provided did not include nutrient predictions. However, a statement indicating that nutrient levels were expected to reach background levels by the time the pit reaches its spill point was included. In addition, the contingency measures proposed for pit lake treatment (Appendix C of Appendix A (AMEC Abandonment and Restoration Plan)) indicated that, based on experience with other pit lake systems, nutrients would need to be added to the system to promote algal growth in the pit lake. Further discussion of nutrient levels is provided in the response to 4.1 (i)(iv)1.a.

Options for discharge are presented in Section 2.8 of Appendix X (SRK Technical Memo W – Site Water Management) and in Section 5.5.2 of Appendix A (AMEC Abandonment and Restoration Plan.

A contingency for In-Pit treatment of water quality is provided in Appendix C of Appendix A (AMEC Abandonment and Restoration Plan.

4.1 (f)(iii)2.b. [Waste Rock Dump/Ore Stockpiles] (provided by SRK)

Estimate volumes and concentration of surface runoff (ponds and ditches) and options for treatment disposal and/or discharge. *NWB conformity review indicated that only volumes were provided.*

Section 3.3.2 and Table W6 of Appendix X (SRK Technical Memo W – Site Water Management) provides estimates of water quality for surface runoff during operations. Appendix B of Appendix A (AMEC Abandonment and Restoration Plan) provides estimates of post-closure water quality for surface runoff and the pit lake.

Options for discharge during operations are provided in Section 2.2 of Appendix X (SRK Technical Memo W – Site Water Management). Options for post-closure discharge are provided in Section 2.8 of the same report.

The preferred contingency for water treatment is described in Appendix K (AMEC Spray Irrigation Design Report). Alternative treatment options are discussed in the response to 4.3(b)(i) 6(d).

4.1(f)(iii)6.b

NWB Comment: re borrow management, no discussion or estimates of ice volumes.

Response:

Discussion of ground ice and management are included in the Borrow Management Plan (Appendix D of the Application), Sections 2.2.2 and 3.2.

4.1(g)(i), (ii), (iii)

NWB Comment: re. SRK technical memoranda on mine waste did not include a discussion of industrial wastes.

Response:

Domestic and industrial wastes are dealt with in the Landfill Management Plan (Appendix H of the Application). Hazardous materials are discussed in the Ammonium Nitrate Management Plan (Appendix C of the Application) and the Hazardous Materials Management Plan (Appendix F of the Application). Hazardous wastes are discussed in the Hazardous Materials Management Plan with respect to recyclable hazardous substances and in the Landfarm Management Plan (Appendix G of the Application) with respect to petroleum contaminated soil and snow. The Spill and Emergency Response Plan (Appendix J of the Application) discusses accidents.

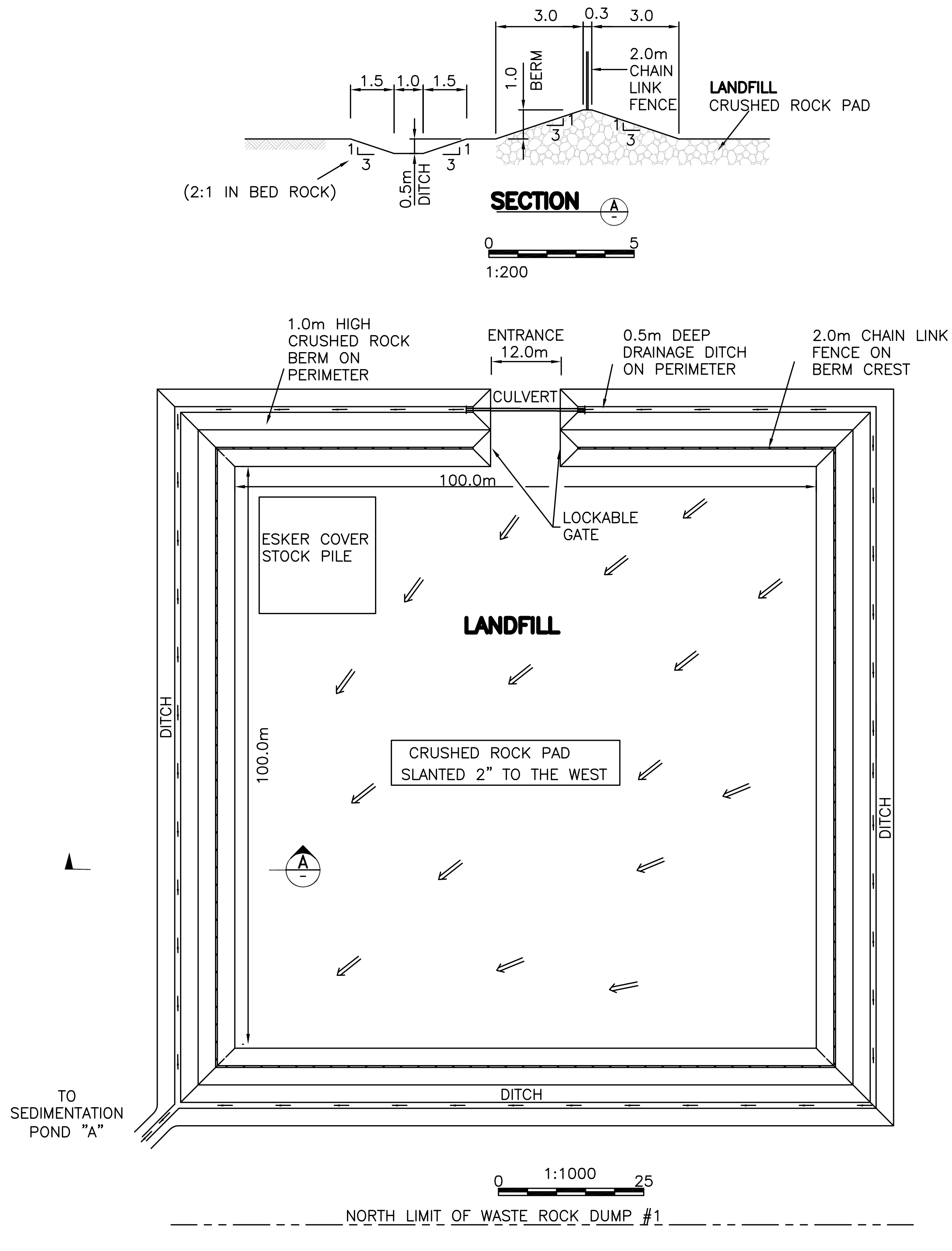
4.1(g)(v)1.b

NWB Comment: re. landfill management, no design plan provided for landfill, no monitoring or details on maintenance.

Response:

Design of the landfill is in Figure 1 of the Landfill Management Plan, P. 3 which may have inadvertently been omitted from the Application and is therefore attached.

Management (and maintenance) of the landfill is discussed in Section 5 of the Plan. General monitoring of site conditions will be on an on-going basis. Any runoff will be directed to a control pond and not discharged to the environment. No groundwater seepage is anticipated as the landfill will be sited on bedrock or close to bedrock. Based on Ekati's experience, the base will freeze back.



amec

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CLIENT

JERICHO DIAMOND PROJECT

LANDFILL LAYOUT DRAWING
FOR WATER LICENCE

DWN BY: YC	CHK'D BY: BO	APP. BO	DATE: MAY 31,2004
PROJECT NO: VE51295-500	REV. NO.: --	SCALE: AS SHOWN	FIGURE No. FIGURE 1

4.1(g)(v)1.c
NWB Comment: re. landfill management, no quantities of wastes given
Response:
Calls to Ekati and Diavik and a canvassing of AMEC's mining group indicated that, as far as we can determine, mines are not required to track this information and there are no data available. This may be due to the fact that quantities of non-hazardous wastes are typically small and the area available for storage is typically large.

4.1(g)(v)1.d

NWB Comment: re. landfill and landfarm management, not discussed in relation to expansion of waste rock dump.

Response:

As explained in the Landfarm Management Plan, the landfarm will be located at the NW side of Waste Rock Dump 2 and will not be moved throughout mine life; refer to Drawing 1CT006.06-G12.

As explained in the Landfill Management Plan, the landfill will initially be set up at the North end of Waste Rock Dump 1 (refer to Drawing 1CT004.06-G10) and when the dump expands the initial location will be covered by the dump. At that time the landfill will be moved to its permanent location at the northern extent of the dump (refer to Drawing 1CT004.06-G13).

4.1(g)(v)1.e

NWB Comment: re. landfarm management, no results presented and basing on Ekati without providing detail is not sufficient.

Response:

Results from remediation are requested, however, the Jericho project has not been built and therefore there are no site data. The Ekati experience was detailed in the Landfarm Management Plan and the Jericho plan was built on their successes. Mackenzie Valley Land and Water Board (and presumably Environment Canada and INAC) are aware of Ekati's plans and they have been approved. Ekati indicated, as detailed in the landfarm management plan, that the mine had had success with light petroleum fraction remediation, but not with heavy petroleum fraction remediation. Therefore Ekati segregates light and heavy fraction contaminated soils and that is the plan outlined for Jericho. Ekati is presently investigating a way to treat the heavy fraction and Jericho Mine will have to do the same.

Details of the Ekati landfarm operation were included in the proposed Jericho landfarm operation. AMEC is not aware of any other relevant recent Arctic experience. If in-situ remediation fails at the Jericho Diamond Mine, the only other option the operator will have will be off-site treatment at a hazardous waste contractor's site. As indicated in the plan, soils will be tested for petroleum hydrocarbon levels before being removed from the landfarm and used for reclamation or other use outside the treatment facility. Soils will have to meet industrial site guidelines to be used.

4.1(g)(v)2.c

NWB Comment: re. waste water treatment plant, detailed design specification was not provided.

Response:

Design specifications for a sewage treatment plant that would serve the Jericho Diamond Mine's purposes were provided in the Waste Water Treatment Plan (Appendix L of the Application, Appendix 1). Technical specification sheets are attached to this document.

Item 1 **< 10 mg/l BOD_5, < 10 mg/l TSS, < 1.0 mg/l Phosphorous, UV Disinfection**

ITEM	QTY	DESCRIPTION	UNIT PRICE
1	1	**P.J. HANNAH BIODISC®** sewage treatment plant model BS9F-BFP. Rated for a daily flow of 22.7 m^3 of camp strength sewage, to produce an effluent quality of < 10 mg/l BOD_5 , <10 mg/l TSS,and less than 1.0 mg/l Phosphorous average. Drive motor 1/2 hp, 110/1/60 TEFC. Media area 1098 m^2. This is a complete corrosion protected steel package plant complete with primary clarifier, rotor treatment zone, final clarifier, filter feed and backwash chambers and effluent pumping chamber. Also includes the following if √ √ Internal flow balancing system. √ 25 mm spray foam insulation on all external walls and bottom. √ 25 mm spray foam insulation on underside of cover. √ UV disinfection system. √ Tertiary filter. √ Control panel. √ Phosphorus removal system. √ Effluent pumps √ Intrinsically safe heaters and lights within treatment plant. √ Flow meter. √ Grating and handrailing within treatment plant. BUDGET PRICE Canadian Funds, F.O.B. Minesite, NWT	**$ 200,000.00**

Item 2 **< 20 mg/l BOD_5, < 20 mg/l TSS, < 1.0 mg/l Phosphorous, UV Disinfection**

ITEM	QTY	DESCRIPTION	UNIT PRICE
2	1	**P.J. HANNAH BIODISC®** sewage treatment plant model BS9F-BFP. Rated for a daily flow of 22.7 m^3 of camp strength sewage, to produce an effluent quality of < 20 mg/l BOD_5 , <20 mg/l TSS,and less than 1.0 mg/l Phosphorous average. Drive motor 1/2 hp, 110/1/60 TEFC. Media area 1098 m^2. This is a complete corrosion protected steel package plant complete with primary clarifier, rotor treatment zone, final clarifier, and effluent pumping chamber. Also includes the following if √ √ Internal flow balancing system. √ 25 mm spray foam insulation on all external walls and bottom. √ 25 mm spray foam insulation on underside of cover. √ UV disinfection system. √ Control panel. √ Phosphorus removal system. √ Effluent pumps √ Intrinsically safe heaters and lights within treatment plant. √ Flow meter. √ Grating and handrailing within treatment plant. BUDGET PRICE Canadian Funds, F.O.B. Minesite, NWT	**$ 175,000.00**

Client Ref#: AMEC Earth and Environmental **P.J. HANNAH REF#: K 17550- ITEM 1**

Job Name **Tahera Corp.** **DATE June 13, 2003**

	DESIGN CRITERIA	SUMMER	WINTER
INFLUENT CONDITIONS	Design Flow m^3/day (avg)	**22.7**	**22.7**
	Design Flow m^3/hr (peak)		
	To be flow balanced to m^3/hr (design)		
	Anticipated Flow m^3/day (avg)		
	Anticipated Flow m^3/ (peak)		
	To be flow balanced to m^3/hr (Anticipated)		
	PH	Assumed 6.5 to 8.5 all year round	
	BOD_5 mg/ℓ (total)	**375**	**375**
	SS mg/ℓ (total)	**450**	**450**
	Fats, oils & grease mg/ℓ	**50 (max)**	**50 (max)**
	NH_3-N mg/ℓ		
	T.K.N. mg/ℓ		
	Phosphorous mg/ℓ	**13**	**13**
	Sewage temperature °C	**>12.5**	**> 9**
EFFLUENT REQUIREMENTS (**All Average Values)**	BOD_5 mg/ℓ (total)	**< 10**	**< 10**
	SS mg/ℓ (total)	**< 10**	**< 10**
Nitrification	NH_3-N mg/ℓ		
	NO_3-N mg/ℓ		
Dentrification	T.K.N. mg/ℓ		
	Total Nitrogen mg/ℓ		
	Phosphorous mg/ℓ	**< 1.0**	**< 1.0**
Disinfection	Fecal Coliform M.P.N./100 mℓ	**< 10 CFU**	**< 10 CFU**
	SOURCE OF WASTEWATER:	**Mine Camp**	

Client Ref#: AMEC Earth and Environmental **P.J. HANNAH REF#: K 17550- ITEM 2**

Job Name **Tahera Corp.** **DATE June 13, 2003**

	DESIGN CRITERIA	SUMMER	WINTER
INFLUENT CONDITIONS	Design Flow m^3/day (avg)	**22.7**	**22.7**
	Design Flow m^3/hr (peak)		
	To be flow balanced to m^3/hr (design)		
	Anticipated Flow m^3/day (avg)		
	Anticipated Flow m^3/ (peak)		
	To be flow balanced to m^3/hr (Anticipated)		
	PH	Assumed 6.5 to 8.5 all year round	
	BOD_5 mg/ℓ (total)	**375**	**375**
	SS mg/ℓ (total)	**450**	**450**
	Fats, oils & grease mg/ℓ	**50 (max)**	**50 (max)**
	NH_3-N mg/ℓ		
	T.K.N. mg/ℓ		
	Phosphorous mg/ℓ	**13**	**13**
	Sewage temperature °C	**>12.5**	**> 9**
EFFLUENT REQUIREMENTS (**All Average Values)**	BOD_5 mg/ℓ (total)	**< 20**	**< 20**
	SS mg/ℓ (total)	**< 20**	**< 20**
Nitrification	NH_3-N mg/ℓ		
Dentrification	NO_3-N mg/ℓ		
	T.K.N. mg/ℓ		
	Total Nitrogen mg/ℓ		
	Phosphorous mg/ℓ	**< 1.0**	**< 1.0**
Disinfection	Fecal Coliform M.P.N./100 mℓ	**< 10 CFU**	**< 10 CFU**
	SOURCE OF WASTEWATER:	**Mine Camp**	

Reference Installations:

North American Palladium – Lac Des Iles, Ontario

Rob Normore – Tel: 807-448-2005, Fax: 807 448 2001, email rnormore@napalladium.com

Darryl Boyd – Environmental Coordinator – Tel: 807-448-2005 ext 16

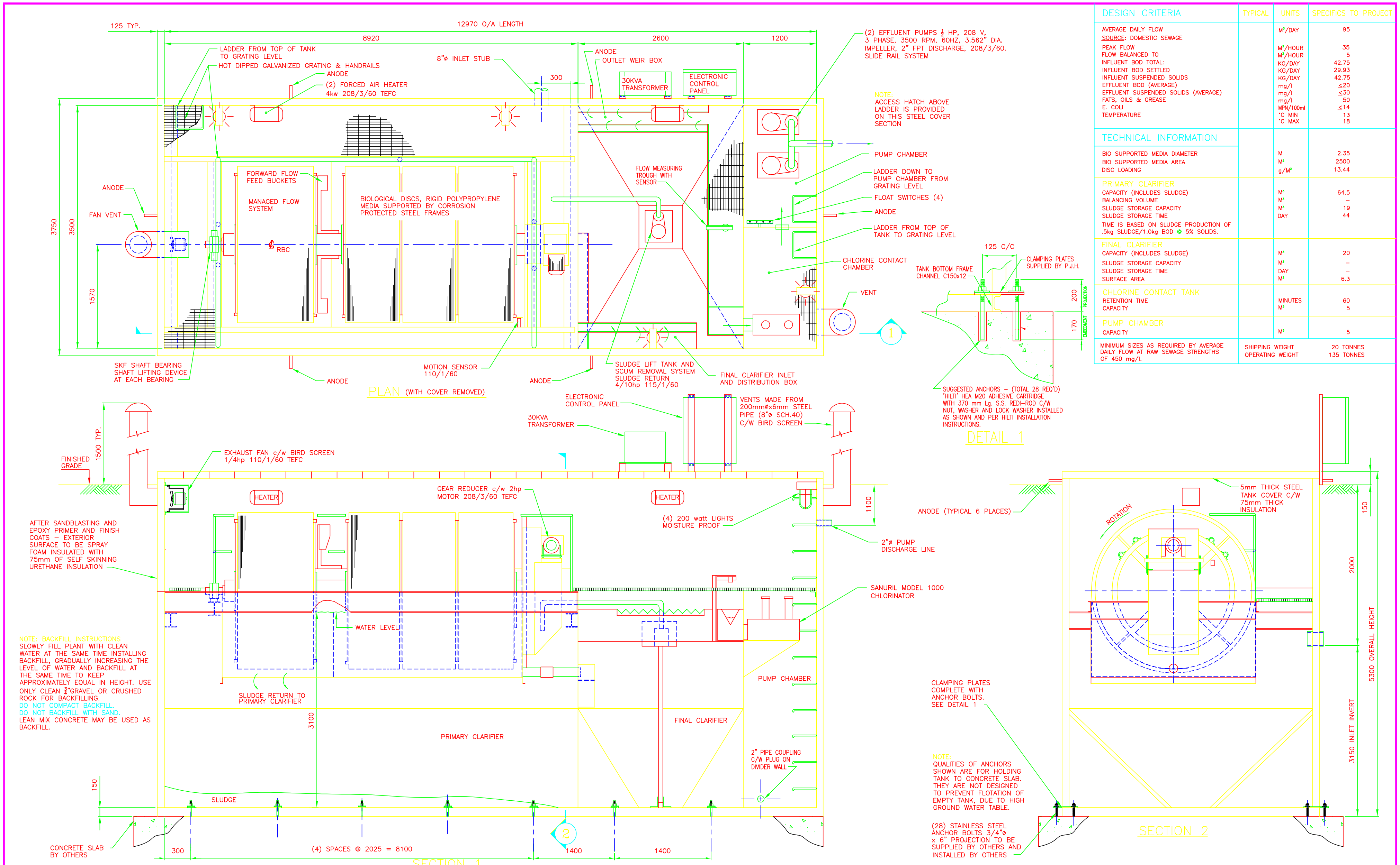
350 man camp - ~ 95 m^3/day

Hydro Quebec – Various sites through-out Northern Quebec

Yves Barabe – Tel: 514-289-6318

AutoCAD Drawings:

The attached AutoCAD drawing shows the treatment plant we supplied for North American Palladium several years back. While this is a good example of our factory-built packaged camp plants, it is considerably larger than your application (350 men vs. 100 men). At your request, we would be pleased to provide a basic lay-out drawing for a system suitable for your application.



DESIGN CRITERIA	TYPICAL	UNITS	SPECIFICS TO PROJECT
AVERAGE DAILY FLOW		M^3/DAY	95
SOURCE: DOMESTIC SEWAGE			
PEAK FLOW		M^3/HOUR	35
FLOW BALANCED TO		M^3/HOUR	5
INFLUENT BOD TOTAL:		KG/DAY	42.75
INFLUENT BOD SETTLED		KG/DAY	29.93
INFLUENT SUSPENDED SOLIDS		KG/DAY	42.75
EFFLUENT BOD (AVERAGE)		mg/l	≤20
EFFLUENT SUSPENDED SOLIDS (AVERAGE)		mg/l	≤30
FATS, OILS & GREASE		mg/l	50
E. COLI		MPN/100ml	≤14
TEMPERATURE		°C MIN	13
		°C MAX	18
TECHNICAL INFORMATION			
BIO SUPPORTED MEDIA DIAMETER		M	2.35
BIO SUPPORTED MEDIA AREA		M^2	2500
DISC LOADING		g/M^2	13.44
PRIMARY CLARIFIER			
CAPACITY (INCLUDES SLUDGE)		M^3	64.5
BALANCING VOLUME		M^3	–
SLUDGE STORAGE CAPACITY		M^3	19
SLUDGE STORAGE TIME		DAY	44
TIME IS BASED ON SLUDGE PRODUCTION OF .5kg SLUDGE/1.0kg BOD @ 5% SOLIDS.			
FINAL CLARIFIER			
CAPACITY (INCLUDES SLUDGE)		M^3	20
SLUDGE STORAGE CAPACITY		M^3	–
SLUDGE STORAGE TIME		DAY	–
SURFACE AREA		M^2	6.3
CHLORINE CONTACT TANK			
RETENTION TIME		MINUTES	60
CAPACITY		M^3	5
PUMP CHAMBER			
CAPACITY		M^3	5
MINIMUM SIZES AS REQUIRED BY AVERAGE DAILY FLOW AT RAW SEWAGE STRENGTHS OF 450 mg/l.	SHIPPING WEIGHT		20 TONNES
	OPERATING WEIGHT		135 TONNES

PROTECTED BY CANADIAN PATENT #2,097,917, U.S. PATENT #5,407,578 AND OTHER NORTH AMERICAN AND WORLD WIDE PATENTS.
PROTEGER PAR UN BREVET CANADIAN N° 2,097,917 ET PAR D'AUTRES BREVETS NORD AMERICAN ET INTERNATIONAUX.

THIS REVISED DRAWING SUPERSEDES ALL PREVIOUS ISSUES

TOUS LES DIMENSIONS EN mm SINON SPÉCIFIER AUTREMONT / ALL DIMENSIONS IN mm UNLESS OTHERWISE NOTED

CONSULTANT

PROJECT / PROJET: NORTH AMERICAN PALLADIUM

OUR REF. # / NOTRE RÉF #: K17296 — YOUR REF. # / VOTRE RÉF #:

GENERAL ARRANGEMENT
KLARGESTER BIODISC MODEL BSF-18-BFP

DRAWN / DESSINÉE	RP/SDW
DATE	00/06/08
SCALE / LÉCHELLE	NTS
CHECKED / VÉRIFIÉ	
APPROVED / APPROVÉE	
PLOT	1:20

DESCRIPTION	REV.	DATE

PJ HANNAH
EQUIPMENT SALES CORP.
VANCOUVER, TORONTO
Specialists in pollution control since 1973

DRAWING NO. / DÉSSIN.: A1-K17296-7868 — REV.: –

4.1(h)(ii)
NWB Comment: re. hazardous materials management plan, consider GN guidelines
Response:
The Jericho Hazardous Materials Management Plan meets or exceeds all GN guidelines

4.1(h)(iv)

NWB Comment: re Spill and Emergency Response Plan, provide clarification on issues raised by GN

Response:

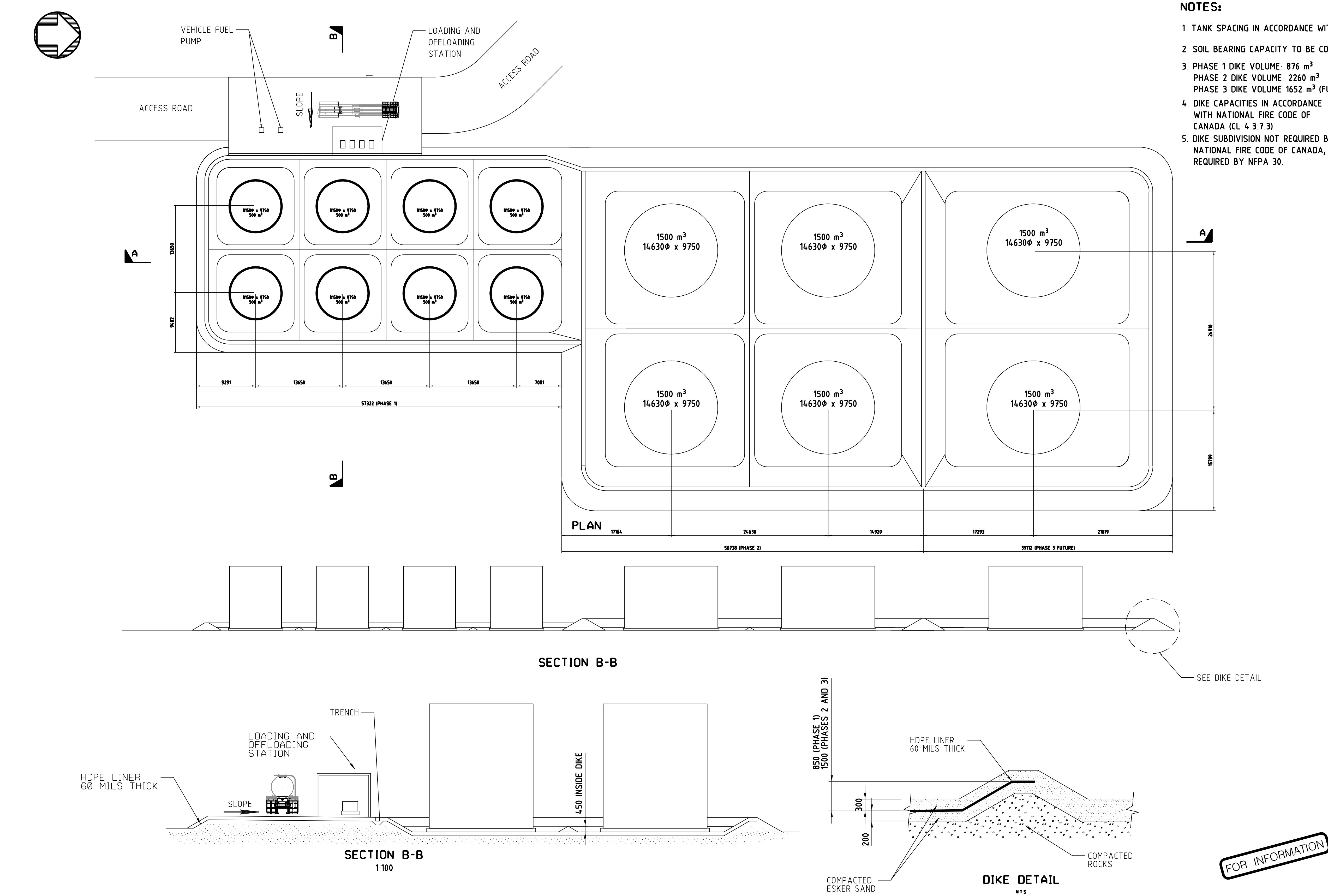
With respect to external reporting, the spill reporting regulation will be followed. The spill plan meets or exceeds all GN guidelines

4.1(h)(v)
NWB Comment: re. Spill and Emergency Response Plan, revisit with consideration for above ground fuel storage.
Response:
All guidelines including CCME, GN and National Fire Code will be met or exceeded

Guideline 4.1(h)(vi)

NWB Comment: Detailed Fuel Storage Plan not provided.

Response: Fuel Storage Plan attached for bulk fuel storage at the Jericho mine site.



NOTES:

1. TANK SPACING IN ACCORDANCE WITH NFPA 30.
2. SOIL BEARING CAPACITY TO BE CONFIRMED.
3. PHASE 1 DIKE VOLUME: 876 m^3
   PHASE 2 DIKE VOLUME: 2260 m^3
   PHASE 3 DIKE VOLUME 1652 m^3 (FUTURE)
4. DIKE CAPACITIES IN ACCORDANCE WITH NATIONAL FIRE CODE OF CANADA (CL 4.3.7.3)
5. DIKE SUBDIVISION NOT REQUIRED BY NATIONAL FIRE CODE OF CANADA, BUT REQUIRED BY NFPA 30.

REV.	ISSUE FOR	AUTH. BY	DATE
P2	FOR INFORMATION	JCP	7.10.04
P1	FOR INFORMATION		

ISSUE AUTHORIZATION

REFERENCE DRAWINGS — DRAWING NO. / DRAWING TITLE

REVISIONS — NO. / DESCRIPTION / CHK. / APPR. / DATE

STAMP

HATCH

DESIGNED BY J. C. PARADIS DATE: 7.10.04
DRAWN BY B. KRICKOVIC DATE:
CHECKED BY DATE:
DISCIPLINE ENG. DATE:
PROJ. DES. COORD. DATE:
PROJECT ENG. DATE:
PROJECT MGR. DATE:

TAHERA DIAMOND CORPORATION

PROJECT TITLE: JERICHO DIAMOND PROJECT

DIESEL FUEL FARM
PRELIMINARY LAYOUT
PERMIT APPLICATION

HA PROJECT NO. 316996

SCALE 1:200 | DWG NO. 150-02-0001 | SHEET NO. | REV. P2

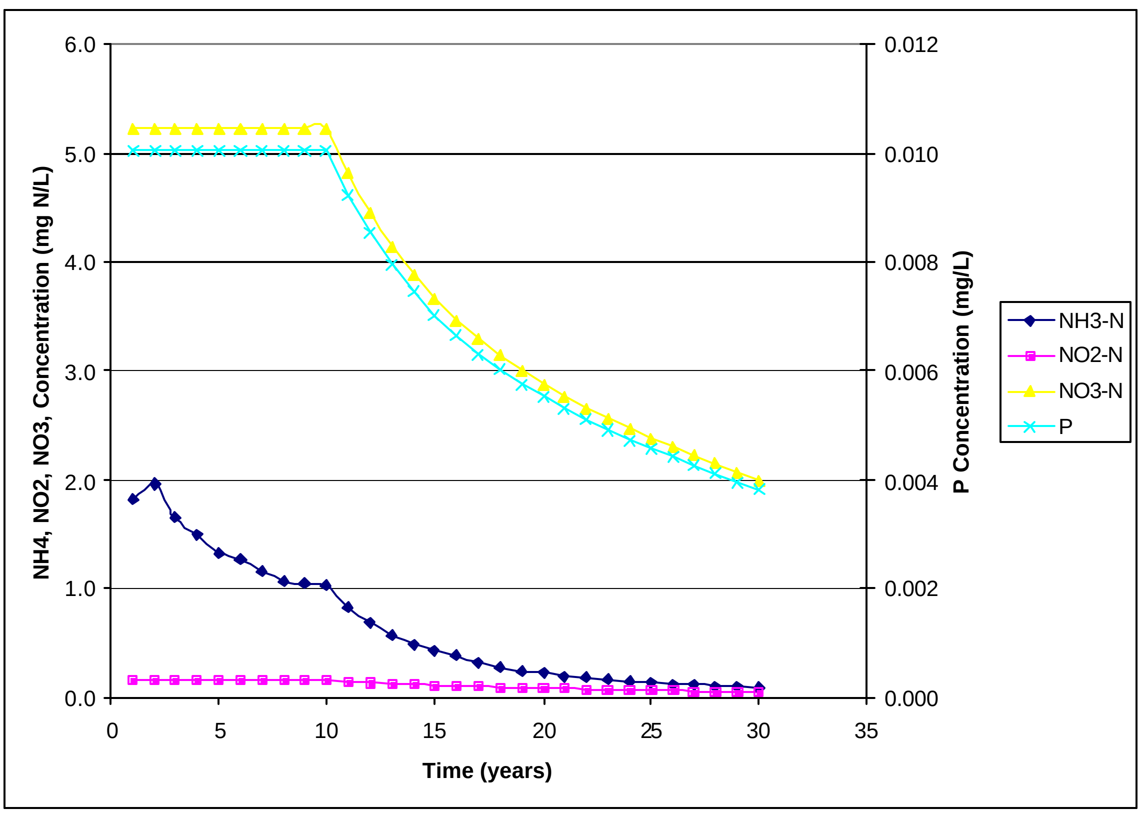
4.1 (i)(iv)1.a. Open Pit Post Closure: Provide an estimate of the expected concentrations of ammonia and metals in the refilled mine pit, provide an estimate of degradation rates for these and any other constituents of concern, and indicate how long water quality in the pit water is likely to have concentrations above receiving water quality levels. *NWB conformity review indicated that there were no estimates or discussion for metals or ammonia.*
Section 5.5.2 and Appendix B of Appendix A (AMEC Abandonment and Restoration Plan) provides estimates of post closure TDS and metal concentrations. Specific estimates of nutrient concentrations were not provided in the above document because the expectation is that nutrients would be unlikely to persist at significant concentrations over the approximately 15 to 20 years required to fill the pit. Calculations to estimate nutrient concentrations in the pit lake have been completed in response to the conformity review, and are presented herein.

As explained in the memo on post closure pit water quality (Appendix B of Appendix A), initial concentrations of all water quality parameters in the open pit will be dominated by the concentrations in seepage and runoff from the waste rock dumps and coarse PK stockpile, which report to collection ponds A B and C. The first consideration in calculating nutrient concentrations in the pit is therefore to determine when nutrients in the waste rock piles will become depleted. Experience at the Ekati Diamond Mine™ indicates that nutrient concentrations tend to decrease rapidly within 3 to 4 years of deposition of the waste rock. As reported in SRK Technical Memorandum H and I of the supplemental EIS, nutrient concentrations in the development waste pile at Jericho persisted at relatively high concentrations for at least 7 years following mining. However, additional seepage collected in August 2004 indicated that ammonia concentrations in the development waste rock pile at Jericho decreased to approximately 3 mg/L in 2004 (as compared to 16 mg/L in 2003), indicating significant depletion after 8 years of mining. The longer flushing period may reflect climatic differences and/or the larger amount of nutrient loss in the underground mine waste. In this assessment, nutrient concentrations in discharges from the collection ponds are conservatively assumed to continue at operational concentrations for 10 years following cessation of mining, and then to decrease rapidly (as a step function) to significantly lower levels (10% of operational estimates) thereafter.

The second consideration is to determine the rate of “decay” of nutrients due to uptake by algae and dilution by clean inflows. The Fuscum Lake Pit at the Colomac mine site in NWT is a reasonable analog to the Jericho pit lake system because it has similar climatic conditions and comparable initial ammonia concentrations. Ammonia losses due to algal uptake in Fuscum Lake are well characterized and are estimated to be on the order of 148 $mg/m^2/day$ (over the open water season). Although the other nutrients are also expected to be taken up by phytoplankton, the rate of loss is for natural conditions has not been well characterized. The enhanced natural removal program at Colomac showed that nitrite will not persist in the water column but will rapidly be oxidized to nitrate. Furthermore, as ammonium is depleted from the water column, nitrate will become the primary nitrogen source and will also be depleted.

In the following assessment for Jericho, only ammonia is allowed to decrease as a result of algal uptake at the rate measured in Fuscum Lake. Thermal stratification expected to occur during the summer months when algal growth will occur will form a 'boundary (thermocline) between the colder deeper water and warmer surface water which will prevent the exchange of ammonia-N between the two layers. Only ammonia-N contained in the surface layer or epilimnion would be available for uptake. Therefore, the seasonal uptake was assumed to be the lesser of the amount that could be taken up by plants and that present in the epilimnion of the pit, which was assumed to comprise the upper 5 metres of the pit lake. A calculation spreadsheet (available to reviewers on request) was set-up to calculate the decrease in nutrients due to ammonia uptake and dilution of all of the nutrients from clean runoff entering the pit. In these calculations, it is assumed that the C1 diversion would be maintained and that clean water from Stream C1 would not be used to more rapidly fill the pit.

The results of the calculations (see figure below), indicated that nutrient concentrations would remain relatively constant during the first 10 years of filling and then would decrease as clean inflows mix with the pit lake water. In the case of ammonia, the rate of decay would be somewhat faster due to uptake by algae. By the time the pit reaches its spill point at approximately year 20, nutrient concentrations are expected to be well below receiving water criteria.



4.1(i)(iv)2.

NWB Comment: re. AMEC Abandonment and Restoration Plan, diversion channel contingency reclamation measures not addressed.

Response:

The final reclamation measures for the diversion channel will depend on the final pit lake water quality. If the pit lake water quality meets CCME criteria, it will be discharged into the mouth of Stream C1, and the Stream C1 Diversion will be breached. If the pit lake water quality does not meet CCME criteria, but is acceptable for discharge into Carat Lake, it will be discharged via a constructed channel to Carat Lake, and the Stream C1 Diversion Channel will be maintained over the long-term.

If left in place, regular inspection and maintenance will occur (annual inspection; repair as needed). If indicated by geotechnical inspection prior to closure, armouring will be increased, and an emergency overflow to the pit will be installed to keep really high flows off the diversion.

Section No. 4.1(i)(iv)3.
NWB Comment: Section 13.6 is missing and information is in 13.5.
Response: As noted in the NWB letter, the comments on PKCA freeze back are provided in Appendix W, Section 13.5.

Section No. 4.1(i)(iv) 4
NWB Comment: However design drawings are absent.
Response: Further comments on the closure of the PKCA are provided below.

As noted in Appendix W, Section 13, the expected final surface of the fine PK is shown as a series of contour lines on Drawing 1CT004.06-G15. The final surface of the fine PK will be covered by a layer of coarse PK to reduce the dusting and erosion potential of the fine PK. The coarse PK will be taken from the stockpile adjacent to the east end of the PKCA.

The proposed cover methodology at this time is based on the following:

- A 0.3 to 0.5 m layer of coarse PK from the coarse PK stockpile will be spread over the surface of the fine PK (geotextile is unlikely to be needed as a separator between the fine PK and the cover material); and
- The coarse kimberlite may be top dressed with up to 0.3 m of overburden from the overburden stockpile or run-of-mine waste rock from one of the waste rock dumps.

Comments related to the cover and potential revegetation are provided in Appendix A, Section 5.5.3.

In order to minimise or eliminate the subsequent water storage capacity of the PKCA, the discharge elevation will be lowered by either breaching the West Dam or deepening the spillway. The final discharge elevation will be determined as part of the preparation of the final closure design based on the expectation that a shallow body of water will remain at the western end of the PKCA. The West Dam will, therefore, no longer perform or be classified as a dam. The discharge elevation will be set so that fine PK present on the floor and sides of the western portion of the PKCA, and any sediment associated with the cover, do not wash downstream. Thereafter, the natural watershed volumes are expected to once again flow into Stream C3.

Once sufficient information is available to advance the various details of the PKCA closure beyond concepts, design drawings will be prepared.

Guideline 4.1(j)(ii)

NWB Comment: No discussion of other security

Response: Tahera currently has in place reclamation security that totals $918,000.00 for the current Jericho site. This security is held in conjunction with NWB Water Permit #NWB1JER0306. Tahera believes that this amount should be considered and applied toward the amount which the NWB considers required security for the Jericho Mine.

Guideline 4.2(a)(ii)1.

NWB: Soil Sampling Related to pre-impact aquatic monitoring

Response: This item is discussed in the response to 4.5(e)(i).

Guideline 4.2(a)(ii)2

NWB: Lack of Information on Dissolved Oxygen

Response: While Tahera committed to obtaining wintertime dissolved oxygen data for lakes, the Company did not receive the required Nunavut Research Institute permit to collect the data in 2004. The Company remains committed to collecting this data and will endeavor to collect this information in 2005.

Guideline
4.2(a)(ii)3. Fisheries: Confirm that baseline data is adequate to monitor effectiveness of No Net Loss Plan.

Conformity Statement
The information is only proposed to be collected and has not been presented.

Response (Provided by Mainstream Aquatics)
Section 5.0 of the NNLP (Mainstream 2004) describes the type of baseline information that will be collected to monitor the effectiveness of the No Net Loss Plan. It is not possible to complete baseline fisheries investigations until DFO has accepted the proposed compensation works and the location of those works. There will be an opportunity in 2005 and 2006 to collect baseline information prior to initiation of compensation.

4.3(b)(i)10.

NWB Comment: re. operational monitoring summary, the long-term effects of sedimentation were not discussed.

Response:

With respect to long-term effects of sedimentation, AMEC understands that what is meant is post closure erosion from disturbed sites causing sedimentation in water bodies. This issue is dealt with in the Abandonment and Restoration Plan (Appendix A of the Application) throughout with a commitment on the part of Tahera to stabilize all disturbed surfaces prior to mine abandonment. Specific mitigation measures are discussed in the Abandonment and Restoration Plan. Additional information on the PKCA closure is provided in SRK Technical Memorandum P, Section 13.

See also response to 4.1(c)(viii)1.d.

Guideline

4.3(b)(i)13. Discuss mitigation measures for the construction, operation, and removal of the Causeway/Water Intake including but not limited to sediment and erosion plans and timing.

Conformity Statement

Causeway mitigation not identified.

Response (provided by Mainstream Aquatics)

See Section 2.2.2 of the NNLP (Mainstream 2004).

Guideline
4.3(b)(i) 14 Present mitigation measures for the construction, operation, and removal of the stream diversion including but not limited to sediment and erosion plans, timing and fisheries enhancement measures.

Conformity Statement
No mitigation identified.

Response (provided by Mainstream Aquatics)
- See Section 2.5 and Section 3.4 of the NNLP (Mainstream 2004).

4.3(b)(i)6 (c).

Metals treatment:

The geochemical testing programs have indicated there is a negligible potential for ARD from this site. Therefore, a contingency for treatment of low pH is highly unlikely. The pH of discharges from the PKCA will be controlled by equilibrium with carbonate minerals in the kimberlite, and is expected to be in the range of 8.0 to 8.5. At this pH, concentrations of most metals are generally low, and in the range of concentrations that best available control technologies are able to achieve. Conservative estimates of metal concentrations indicate most parameters will meet CCME guidelines within a reasonable distance of the discharges in Lake C3. Adequate control of sediments will be important for controlling aluminum concentrations, which are most likely to occur in a particulate form. The current design calls for addition of flocculants in the tailings drop box, which will allow adequate contact time in the facility for settling to occur. The installation of an internal divider dyke will help to ensure that sediments settle in the eastern part of the facility.

Tahera is currently exploring additional contingencies that could be used in the unlikely event that metal concentration exceeds the current estimates of water quality, which should be available in time for discussion at the NWB Technical meeting.

4.3(b)(i)6.d

NWB Comment: re. trade-off matrix, environmental cost benefit not provided for treatment alternatives

Response:

Trade-off Matrix additions are provided in the attached spreadsheet. Treatment options are further discussed in AMEC memorandum (Higgs to Missal, 6 October 2004), attached.

CHO PROJECT SCENARIO MATRIX

Phase	Activity	Alternative	Receiving Waterbody (s)	Env Control Cost	Water Quantity Outcome Positive	Water Quantity Outcome Negative	Water Quality Outcome Positive	Water Quality Outcome Negative	Fish Health Outcome Positive
Construction	PKCA Construction	Drain fully	Long Lake, Str C3, Lake C3	Moderate	Headwater Lake; low contribution to Lake C3. ~150,000 m^3 to pump out in spring/summer of Year 1.	Increased flows in Str C3; erosion not an issue or can be mitigated using controlled pump out and development of a monitoring program.	None	Some potential for elevated sediments in water from lake; est. 50% pump out without settling to remove sediment.	Most fish can be salvaged following DFO Protocols for fish salvage. Low numbers of fish and low species diversity compared to typical fish bearing waterbodies in area.
		Partially drain	Long Lake, Str C3, Lake C3	Moderate	Headwater Lake; low contribution to Lake C3	See 1a	See 1a	Less potential for elevated sediments because water left in lake	See 1a
	Fine PK storage locations	Long Lake	Long Lake, Stream C3	High	Headwater Lake; low contribution to Lake C3; average annual discharge ~150,000 m^3; 0.5% of MAR for Lake C3 @ 250 mm r/o	No dam installation until the end of construction therefore having no impact on stream C3 flows until oeprations.	None	Some sediment export to Str C3 possible from dam construction, but construction in winter will minimize. No stream water flows incur in winter therefore there shouldn't be any quality issues during construction.	Fish populations very limited in number and species to slimy sculpin and burbot
		Rescan alternatives (1997)	Lynne, Key, Pocket, Contwoyto lakes	High	Moderation of spring freshet to a small degree.	Much larger drainage areas affected by construction; additional drainage basin for some runoff; pump out would significantly affect water flow into Contwoyto Lake	None	More drainage basins affected; potential to affect both Carat Lake and Contwoyto Lake basins from sediment, metals, TDS, nutrients	None
		KIA proposal - Holubec	Lake C1, Stream C1	High	Zero discharge suggested but without water balance analysis; storage piles undersized based on chosen design criteria	Completely eliminate drainage from Lake C1 drainage basin; could mean lower Stream C1 dries up in the summer; initial pump out of Lake C1 will increase flows in Str C1	None	Some sediment export to Str C1 and Carat Lake possible	Fish populations in Lake C1limited: lake trout, slimy sculpin
	Water intake	Causeway	Carat Lake	Moderate	None	Not significant; water withdrawal up to ~260,000 m^3/year or <1% of Carat Lake annual discharge @ 250 mm r/o	Less sedimentation than buried pipe because less disturbance of lake bottom during construction. Mine rock will be used.	Zero sedimentation not possible, some construction related sediment; some potential to affect water circulation	None - Causeway forms natural fish screen surrounding intake well.
		Buried pipe	Carat Lake	High	None	See 3a	Water circulation not affected - Lake currents not obstructed however water intake draw point will impact circulation the same for both options.	Even with silt curtain fine lake bottom sediments will increase sediment in surrounding water temporarily - construction of trench for pipeline will cause heavy sediment loads. Silt curtains limited effectiveness The handling and disposal of lake bottom sediments creates additional environmental issues	None
		Floating Intake	Carat lake	Low	None	See 3a	No disturbance to lake bottom	None	None
	Waste rock dump locations	Dumps 1 & 2	Carat Lake	Moderate; winter const	None	None significant if water not diverted Potentially significant if uncontrolled released to Carat Lake.	None	Sediment settled by sed pond; any ammonia should be absorbed by tundra before Carat Lake. Pump to PKCA if does not meet water licence criteria	None
		Dump 3	Carat Lake and Lake C1	Moderate; winter const	None	See 4a	None	See 4a	None
		KIA proposal - Holubec	Str C1 and Carat Lake	Moderate; winter const	None	Reduction in natural flows to Str C1 by ~80%; little significant change to Carat Lake because of very small contribution from Str C1 (~1%)	None	See 4a	None
	Stream C1 Diversion	Naturalize	Str C1 and Carat Lake	High	No change to natural hydrograph; winter construction	None	Clean water around open pit	More sedimentation potential from first flush because longer channel in overburden; potential to destablize due to fish structures	Maintains fish-bearing habitats in lower channel and food production habiats in upper channel. Upper channel available to fish, but will not be used based on findings of pre-development studies
		Conduit	Str C1 and Carat Lake	Moderate	No change to natural hydrograph; winter construction	See 5a	See 5a	Sedimentation from first flush; greater structure stability	Maintains food production habitats
	Fine PK storage	Long Lake	Long Lake; Stream C3; Lake C3; Carat Lake	High	Increased temporary water storage; moderate spring freshet; higher than baseline flows most of the time. Annual total flow for Str. C3 at the mouth approximately 3 times pre-mining flow volume. Releases to follow shape of natural hydrograph	Flows reduced by approx. 50% if no discharge to Stream C3 from PKCA Plans are to maintain water flows with annual discharges	Provides treatment of raw PK and mine water Provides storage capacity for all water effluents not meeting discharge criteria	Increase in TDS, some metals, ammonia and possibly phosphorus over background. CCME criterial met in Lake C3 except for cadmium.	None
		Rescan alternatives (1997)	Lynne, Key, Pocket, Contwoyto lakes	High	Increased temporary water storage; moderate spring freshet	Flows reduced some years	Provides treatment of raw PK and mine water. Not as high in basin, higher catchment area, lower concentration, same loading	Analysis of water quality effects not done; by analogy similar effects to Long Lake PK storage. Volume of water to treat higher.	None
		KIA proposal - Holubec	Lake C1, Str C1; Carat Lake	High	None	Eliminate most of the flow in Str C1 which may dry out in summer	See 6b	Increase in TDS, some metals, ammonia and possibly phosphorus over background in Stream C1 and Carat Lk from seepage	None
	Waste rock dumps	Dumps 1 & 2	Carat Lake	Moderate	None	None significant unless water redirected to PKCA; then 0.6% of Jericho River flow (Ponds A&B, 2 yr return r/o; 250 mm basin r/o) if water is not discharged from the PKCA, e.g. use of spray irrigation.	None	Sediment settled by sed pond; any ammonia should be absorbed by tundra before Carat Lake. If metals, ammonia above Water Licence pump to PKCA	None
		Dump 3	Carat Lake; Lake C1	Moderate	None	None significant	None	See 7a	None
		KIA proposal - Holubec	Lake C1, Str C1, Carat Lake	Moderate	None	Reduction in flows to Str C1; little significant change to Carat Lake (1% maximum reduction)	None	Seepage would affect a smaller water body with less absorptive capacity than the other sites (Str C1)	None
	Stream C1 Diversion	Naturalize	Str C1 and Carat Lk	Moderate	Maintains Stream C1 flow in lower channel	Annual discharge of C1 at the mouth reduced to 53% of pre-mining discharge, 0.8% of flow for Carat Lake at outlet	Clean water diversion from pit area	Sedimentation potential; higher than shorter channel; mitigation through management	Maintains fish food and spawning in lower channel; upper channel unlikely to be used by fish based on baseline studies
		Conduit	Str C1 and Carat Lk	Low	Maintains Stream C1 flow in lower channel	See 8a	See 8a	Sedimentation potential; mitigation through management	Maintains fish food and spawning in lower channel
eration		Base Case: Discharge to Str C3 Base Case Operation	Long Lake; Stream C3; Lake C3; Carat Lake	Moderate	Increase over natural flow; freshet moderated	Increase over natural flow if high enough could cause erosion. Str. C3 has experienced comparable magnitude flows previously.	Reduction in ammonia, metals, phosphorus; CCME met in Lake C3 except for cadmium.	Some potential for chronic effects in Str C3, Lake C3 and Carat Lake; aluminum, cadmium and copper are predicted to slightly exceed CCME guidelines at Stream C3 outlet + 200 m under average source concentrations: Al: 0.10, Cd: 0.00013, Cu: 0.004 mg/L. All but cadmium are predicted to meet CCME just beyond the dilution zone.	CCME met in Lake C3 if discharge concentrations low enough.

CHO PROJECT SCENARIO MATRIX						
Phase	Activity	Alternative	Fish Health Outcome Negative	Fish Habitat Outcome Positive	Fish Habitat Outcome Negative	Mitigation
Construction	PKCA Construction	Drain fully	Fish moved to Lake C3 or Carat may have low survival rate. Fish habitat in Carat Lake or C3 Lake may be nutrient limited therefore incapable of handling additional fish.	Fish habitat has lower productive capacity compared to typical fish bearing lakes in area	Long Lake fish habitat will be lost (10.74 ha)	Fish moved to other lake or harvested.
		Partially drain	See 1a	See 1a	See 1a	See 1a
	Fine PK storage locations	Long Lake	Fish populations in Long Lake eliminated	Fish habitat has low productive capacity and common at site	Fsh habitat in Long Lake eliminated and Stream C3 reduced quality.	See 1a
		Rescan alternatives (1997)	Fish populations in Lynne and Key lakes eliminated with one configuration: arctic char, lake trout, slimy sculpin	Fish habitat common at site.	Fish habitat in Lynne and Key lakes eliminated with one configuration	See 1a
		KIA proposal - Holubec	Fish populations in Lake C1 eliminated: lake trout and slimy sculpin	See 2b	Fish habitat in Lake C1 and potentially Stream C1 eliminated.	See 1a
	Water intake	Causeway	Natural rock berm will not impinge fish. If fish spawn on intake rock berm, there may be the potential for impingement of fish eggs.	Mitigation replaces moderate quality habitat with high quality habitat (1,814 m^2). Important fish habitats not affected.	Loss of 1,800 m^2 moderate quality habitat	Improve causeway sides to create fish habitat
		Buried pipe	None. Screening will meet DFO requirements.	Temporary effects on fish habitat. No permanent habitat loss.	Higher operational risk of submerged pipeline will result in higher likelihood of habitat disturbance during repairs	Silt fence during construction
		Floating Intake	None. Screening will meet DFO requirements.	Minor effects on fish habitat	None	
	Waste rock dump locations	Dumps 1 & 2	Water quality effects (which see)	None	None	Mine water management; monitor and direct discharge to fundra or pump to PKCA . Dump design to drain to pit sumps during initial operation to allow for monitoring of water quality.
		Dump 3	Water quality effects (which see)	None	None	See 4a
		KIA proposal - Holubec	Dam becomes much of waste rock storage; loss of fish populations in Lake C1 (lake trout and slimy sculpins)	None	Loss of Lake C1 and upper part of Str C1	Pump back seepage and runoff to PKCA; mine water management
	Stream C1 Diversion	Naturalize	None.	Maintains fish-bearing habitats in lower channel and food production habiats in upper channel. Upper channel available to fish, but will not be used based on findings of pre-development studies	Sedimentation from first flush may temporarily affect habitat	Minimize sedimentation silt fences; winter construction. Stream C1 kept intact until 3rd year of operation therefore Adaptations of site experience to construction is possible. Run of mine granite available for slope protection and channel enhancements.
		Conduit	None.	Maintains food production habitats.	See 5a	See 5a
eration	Fine PK storage	Long Lake	Fish eliminated include slimy sculpin and burbot.	None	Slimy sculpin and burbot habitat lost: 92,500 m^2	See 1a
		Rescan alternatives (1997)	Fish eliminated include lake trout, arctic char, slimy sculpin and burbot	None	Lake trout, arctic char, slimy sculpin and burbot habitat lost	See 1a
		KIA proposal - Holubec	Fish eliminated include lake trout and slimy sculpin	None	Lake trout and slimy sculpin habitat lost	See 1a
	Waste rock dumps	Dumps 1 & 2	Water quality effects (which see)	None	None significant	See 4a. Ability to construct dumps so that initial flows are directed to pit to allow monitoring of water quality from waste dumps.
		Dump 3	Water quality effects (which see)	None	None significant	See 4a
		KIA proposal - Holubec	Dam becomes much of waste rock storage; therefore part of loss of fish populations in Lake C1	None	Loss of Lake C1	See 4b
	Stream C1 Diversion	Naturalize	Temporay reduction in food production for lower section of Stream C1	Creates more potential fish habitat than conduit	Some potential for sediment.	Minimize sedimentation with washed fill and silt fences; winter construction Defer installation of channel until 3rd year of operations
		Conduit	See 8a	Provides limited fish habitat	Shorter channel eliminates some potential fish habitat compared to natural channel. Some potential for sediment.	See 8a
		Base Case: Discharge to Str C3 Base Case Operation	Some potential for chronic effects on fish in Str C3 and Lake C3	Maintains possibility of use of Stream C3; increased flow would increase habitat quantity and quality	If erosion occurs, may reduce quality of habitat in Stream C3	Compensation plan for fish habitat effects. PKCA storage capacity of water is mitigation

Phase	Activity	Alternative	Receiving Waterbody (s)	Env Control Cost	Water Quantity Outcome	Water Quantity Outcome	Water Quality Outcome	Water Quality Outcome	Fish Health Outcome
					Positive	Negative	Positive	Negative	Positive
Op	PKCA Discharge Scenarios	Scenario B: Hold water for 1 year and discharge to Str C3;	Long Lake; Stream C3; Lake C3; Carat Lake	Moderate	None	Flows in C3 at the mouth reduced by approx. 50% for 1 year and increased thereafter	prevents higher concentrations of ammonia, metals, phosphorus being discharged; CCME met in Lake C3; no direct discharge to receiving water if water quality does not meet discharge criteria	Pilot tests will be controlled so as not to result in negative impacts to Lake C3. Predicted final concentration in groundwater discharge 2.0 mg/L NH_3 as N, 0.02 mg/L Cu, 0.025 mg/L Ni.	CCME met in Lake C3.
		Scenario C: Hold water for 2 years	Long Lake; Stream C3; Lake C3; Carat Lake	Moderate	None	See 9a	No direct discharge to receiving water during 2 year period if water quality does not meet discharge criteria. Allows time for mitigating plan such as spray irrigation to be developed	Same as Scenario B.	No direct discharge to receiving water; limited effects on fish.
		Scenario D: Treat with nutrient addition	Long Lake; Stream C3; Lake C3; Carat Lake	Moderate	None	None	Reduce ammonia levels through phosphate addition	Potential to increase phosphate export which could lead to some eutrophocation in Lake C3 which, if extensive, could lead to winter oxygen deficits.	Reduce ammonia concentrations in receiving waters
		Scenario E: Spray Irrigation	Long Lake; Stream C3; Lake C3; Carat Lake	Moderate	None	Discharge from Stream C3 reduced by 70 - 80% by the withdrawal of Long Lake catchment.	Removal of ammonia, phosphorus and metals through land treatment	None	See water quality outcome.
		Treatment Plant - Biological	Long Lake; Stream C3; Lake C3; Carat Lake	High	None	None	Removal of ammonia and phosphorus through biological treatment	None	See water quality outcome.
		Treatment Plant - Physicochemical	Long Lake; Stream C3; Lake C3; Carat Lake	High	None	None	Removal of ammonia, phosphorus through physicochemical treatment (ion exchange; reverse osmosis; breakpoint chlorination	Breakpoint chlorination results in higher Cl^- and therefore higher TDS which cannot be treated economically. Breakpoint chlorination also generates stable chlorine compounds which are toxic, e.g. trihalomethane. Ion exchange will increase TDS which cannot be treated economically.	See water quality outcome.
Post-closure	Stream C1 Diversion	Re-direct part of Stream C1 to pit	Stream C1	Moderate	Maintain most of Stream C1 flows after closure	None significant. Decrease in peak freshet flows. Long-term maintenance of diversion required.	Upper stream sediment settled in pit lake.	Pit water quality will (may) affect lower Stream C1; quality depends on whether pit used for treatment or not. Water quality won't be known with certainty until after several years of monitoring during operation.	Water quality maintained in Stream C1
		Redirect all of C1 into pit	Stream C1	Moderate	None	No flow in C1 diversion or in Stream C1 until pit fills (~17 years)	None	Pit water quality may affect lower Stream C1; quality depends on whether pit used for treatment or not. Water quality won't be known with certainty until after several years of monitoring during operation.	None
		Maintain diversion	Stream C1	High	Maintain Stream C1 flows after closure	None significant. Long-term maintenance of diversion required.	Pit water quality does not affect lower Stream C1	Potential for sedimentation; mitigation through maintenance	See 10a
	End pit fill	Rapidly fill pit	Stream C1, Carat Lake	Moderate	None	Some reduction on Carat Lake discharge; dependent on rate of filling of pit. Loss of all flow to Stream C1	None	Loss of treatment potentially required for mine runoff resulting in contaminant export or need to treat	None
		Let pit fill over 15 - 20 years	Stream C1, Carat Lake	Low	Temporary reduction of Carat Lake discharge for 15 to 20 years.	Reduce runoff to Stream C1 and Carat Lake (~400,000 m^3/yr--1% of annual discharge) for 17 years.	Pit acts as storage/treatment facility while filling	None	Issue of contaminants entering Carat Lake deferred for several years.
	End pit discharge	Pit overflow to open channel	Carat Lake	High	Reestabish runoff to Carat Lake (~400,000 m^3/yr--1% of annual discharge of Carat Lake @ 250 mm annual r/o)	Flows to Stream C1 reduced permanently by about 47%	Pit will act as settling pond for sediment and provide reservoir to hold water for extended period of time until water quality stabilizes.	Metals may be at chronic levels and would affect Carat Lake	Move potentially lower quality water away from fish egg deposition areas
		Pit overflow to Stream C1	Stream C1, Carat Lake	Low	Reestabish runoff to Carat Lake (~400,000 m^3/yr--1% of annual discharge of Carat Lake @ 250 mm annual r/o)	None significant	See 12a	Metals may be at chronic levels and would affect Stream C1 and Carat lake	Most closely reestablish pre-mining conditions for fish in lower Str C1
		Pit overflow to Carat Lake diffuser	Crat Lake	High	See 12a	See 12a	See 12a; Stream C1 unaffected by any water quality issues associated with the closure pit	See 12a	See 12a
	Stream C1 Flows	Flows maintained at natural levels with diversion until pit fills, then flow returned to pre-mining drainage pattern	Stream C1, Carat Lake	Moderate	None	None	None	None	None
		Flows maintained in perpetuity by diversion	Stream C1, Carat Lake	High	None	None	None	None	None
		Flows cut off until pit filled by redirecting stream to pre-mining drainage pattern on closure; no diversion	Stream C1, Carat Lake	Moderate	Once pit fills flows in Stream C1 will be the same as pre-mining except that spring freshet peaks will be reduced due to the storage effects of the pit. Summer lows will also be less pronounced.	No water flows in lower stream until overflow from pit	None	Water quality may be degraded over pre-mining due to contaminants in the pit	None
	End pit use	End pit lake fish habitat	Pit	Moderate	None	None	Pit water quality would be at CCME guidelines	Pit water quality may be unsuitable for fish use depending on quality of water directed to pit. Under some discharge scearios pit lake water may be unsuitable.	Potential replacement of lake fish populations from Long Lake.
		End pit lake treatment facility	Pit	High	None	None	Improve water quality, particularly metals	Some metals will likely remain above natural background, e.g. copper	Potential replacement of lake fish populations from Long Lake if contaminants above chronic levels without treatment
		End pit lake no treatment	Pit	Low	None	None	Sediment settling	No change of runoff except settling of sediment	None
	PKCA	Dry land	Str C3, Lake C3	Low	None Water Runoff from PKCA should mimic pre-mine Flows	Stream flows will mimic natural hydrograph	None	None significant	Not applicable
		Wetland	Str C3, Lake C3	Low	Flows similar to pre-mining	Stream flows will mimic natural hydrograph. Wetland may be difficult to establish and maintain	None. Residual PKCA lake/pond will act as settling pond for PKCA runoff providing some settling capacity	PKCA pore water quality may affect Str C3 water quality	Not applicable
Costs	Low	Less than $20,000							
	Medium	$20,000 to $100,000							
	High	More than $100,000							

Phase	Activity	Alternative	Fish Health Outcome Negative	Fish Habitat Outcome Positive	Fish Habitat Outcome Negative	Mitigation
Op	PKCA Discharge Scenarios	Scenario B: Hold water for 1 year and discharge to Str C3;	Same as Scenario A	Possibility of use of Stream C3 after Year 2	Reduced quality of habitat in Stream C3 for one year.	See 9a. Containing water in PKCA for 1year would mitigate quality impact.
		Scenario C: Hold water for 2 years	Some potential for chronic effects if seepage exceeds CCME	None	As per 9b but for 2 years.	Compensation plan for fish habitat effects. Containing and storing water in PKCA for 2 years would mitigate water quality impacts
		Scenario D: Treat with nutrient addition	Potentially decrease winter oxygen levels in Lake C3 causing stress or possibly winter fish kills	None	None	Strictly regulate phosphate addition; optimize the N:P ratio under PKCA conditions. Ferric sulphate reactor vessel may be required post treatment to reduce phosphorus.
		Scenario E: Spray Irrigation	None	None	None	Spray irrigation will use tundra plants and soil as a natural removal system. It is a low impact, relatively low technology approach to water treatment
		Treatment Plant - Biological	None	None	None	Biological treatment will remove ammonia and phosphorus but requires heated reactors which will mean increased use of fossil fuel and discharge of exhaust gases
		Treatment Plant - Physicochemical	None	None	None	Physicochemical treatment will remove ammonia and phosphorus but requires heated reactors which will mean increased use of fossil fuel and discharge of exhaust gases
Post-closure	Stream C1 Diversion	Re-direct part of Stream C1 to pit	Pit water quality could potentially negatively affect fish and fish food organisms; suspended sediment caused by diversion failure may affect lower section of Stream C1	Water quality and quantity effects on fish (see water quality)	Water quality and quantity effects on fish (see water quality)	Maintains base flows of Stream C1 downstream of diversion
		Redirect all of C1 into pit	Pit water quality could potentially negatively affect fish and fish food organisms; suspended sediment caused by diversion failure may affect lower section of Stream C1	None	Loss of lower Stream C1 habitat until pit overflows	None for fish habitat or flows
		Maintain diversion	Sedimentation could potentially negatively affect fish and fish food organisms	See 10a	Water quality and quantity effects on fish populations (see water quality)	Maintains near-natural flows of Stream C1 downstream of diversion
	End pit fill	Rapidly fill pit	Potentially contaminated water discharged from pit, particularly ammonia	If water quality adequate potential fish habitat could be created in end pit	Water quality less likely to be suitable for fish habitat in short period	Meter pump rates to minimize effects on Carat Lake drawdown
		Let pit fill over 15 - 20 years	Contaminant potential reduced but chronic metals levels may still be present	Pit water more likely to be suitable for fish use than rapidly filled pit due to less contam runoff from waste dumps	Metals may still be above chronic effects levels making pit unsuitable (aluminum, cadmium, copper and possibly others)	Allows pit to be used as a storage and treatment facility until it fills substantially reducing ammonia and providing reduction of metals from freeze back effects in dumps
	End pit discharge	Pit overflow to open channel	Water exiting the pit may potentially be lower quality than pre-mining	None significant	Reduced flows may decrease available habitat in Stream C1; introduction of contaminants may affect habitat quality along Carat Lake shoreline	Prevents water of lower quality entering Stream C1 and potentially negatively affecting fish
		Pit overflow to Stream C1	See 12a	Most closely reestablish pre-mining conditions for fish in lower Str C1	Introduction of contaminants may affect habitat quality in Stream C1 and along Carat Lake shoreline	Returns lower Stream C1 flows to pre-mining condition
		Pit overflow to Carat Lake diffuser	See 12a	None significant	See 12a	See 12a
	Stream C1 Flows	Flows maintained at natural levels with diversion until pit fills, then flow returned to pre-mining drainage pattern	None	Fish habitat maintained	None	Maintains flows in lower Sream C1; maintains fish habitat and opportunity for use
		Flows maintained in perpetuity by diversion	None	See 13a	None	Maintains flows in lower Sream C1; maintains fish habitat and opportunity for use
		Flows cut off until pit filled by redirecting stream to pre-mining drainage pattern on closure; no diversion	No fish use of the stream until the pit overflows. Degraded water quality could affect fish populations once pit overflows.	Fish habitat eliminated until the pit fills (2-3 years for rapid fill; 15-20 years for natural fill).	Fish habitat eliminated until the pit overflows; then habitat may be somewhat improved if summer low flows are higher than pre-mining due to pit lake storage effects.	None
	End pit use	End pit lake fish habitat	Water quality may be lower than background	Replacement of fish habitat - est 4800 m^2	Fish do not naturally reach the pit area in Stream C1. Configuration of pit would limit the amount and quality of available fish habitat.	If viable (**predicted under some conditions that may not to be due to water quality concerns**) could provide partial compensation for lost fish habitat.
		End pit lake treatment facility	Not applicable	Not applicable	Not applicable	Water quality treatment prior to discharge to Carat Lake
		End pit lake no treatment	Not applicable	Depending on water quality may provide fish habitat	Not applicable	Settle sediments and increase holding time for mine area runoff
	PKCA	Dry land	Not applicable	Not applicable	Not applicable	Rehabilitate and stabilize the PKCA area; provide wildlife habitat
		Wetland	Not applicable	Not applicable	Not applicable	Partial rehabilitation of PKCA; water quality and stability may be concerns
Costs	Low	Less than $20,000				
	Medium	$20,000 to $100,000				
	High	More than $100,000				

JERICHO PROJECT

MEMO

To:	Greg Missal, Vice-President, Government and Regulatory Affairs, Tahera Diamond Corporation	Date	1 October 2004
From:	Tom Higgs, Senior Process Engineer, Water Treatment	File No.	
Tel:	604 664-4542 (fax: 604 664-3057)	Project No.	146361
CC:	Bruce Ott, Senior Environmental Scientist, AMEC Earth & Environmental		
Subject:	**Review of Ammonia Treatment Technology for Mine Effluent at Jericho**		

Background

Estimates of site water balance and concentration loads over the project life were presented in a report prepared by SRK (Technical Memorandum F)[1]. This water balance predicts that there will be sufficient storage in the PKCA to store all site water from August 2005 until June 2008, at which time release of water would become necessary. After this point, water would be released from the PKCA to Stream C3 on an annual basis, over a four-month period at a rate of approximately 10,000 m^3/d. Predicted concentrations for the contaminants in the water in the model were derived from estimates of source concentrations provided in a report prepared by SRK (Technical Memorandum I)[2]. Source concentrations were derived from a combination of sampling programs, laboratory and pilot studies, validation using Ekati data and modeling. The results of the Load Concentration Model indicate that peak concentrations of all contaminants will be less than the Provisional Discharge Criteria[3] indicating that no further treatment would be required for PKCA water, prior to release. With respect to ammonia, the maximum predict ammonia concentration under average precipitation conditions was estimated at 2.9 mg/L N[4] versus the proposed discharge limit of 12 mg/L on a grab sample basis or 6 mg/L on an average basis.[5] While it is not expected that alternative methods of ammonia treatment will be required, there are a number of other treatment methods available for elevated levels. Therefore, this memo has been prepared to present conceptual designs of water treatment alternatives that could be considered for ammonia removal, if it becomes necessary. Two passive treatment alternatives, which rely on natural degradation either through (1) storage in an impoundment or

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[1] SRK Consulting. 2003A. "Technical Memorandum F – Site Water Balance and Load Concentration Model, Jericho Project. October 2003.

[2] SRK Consulting. 2003B. "Technical Memorandum I – Estimates of Source Concentrations, Jericho Project. October 2003.

[3] SRK Consulting 2004. "Technical Memorandum O – Proposed Discharge Limits for the Jericho Project". August 2004.

[4] Table F5 - Ref. 1

[5] Table 4.1 – Ref. 3

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From:	Tom Higgs	File No.	146361

(2) through land disposal, have been described in previous documents[6,7] and will not be discussed in detail in this memorandum. Both of these alternatives are technically feasible, if ammonia concentrations remain at the low concentrations predicted in the Load Concentration Model[2]. However, if ammonia concentrations were to increase significantly above their predicted values, there is a potential that the passive alternatives would not be adequate to meet the proposed discharge limits for ammonia, requiring installation of an active treatment system for ammonia. Current predicted ammonia concentrations are based on an explosive loss percentage of 0.1% of maximum projected annual ANFO usage. To provide a basis for evaluating active treatment alternatives a loss percentage of 1.0% has been used. Therefore, the maximum ammonia concentration on a prorated basis would become 29 mg/L as N. For the purpose of this assessment, it is assumed that treatment will be required for an annual volume of 1,000,000 m^3 resulting in the need to release 10,000 m^3/d over a 100 day period on an annual basis.

Active treatment options that could be considered for removal of ammonia at Jericho would include the following:

- Biological Treatment
- Membrane Processes
- Ion Exchange
- Break-point Chlorination

Biological Treatment

Biological processes can be used to convert ammonia to nitrogen gas, involving two basic steps. First an aerobic step that oxidizes ammonia to nitrate and second, an anaerobic step that reduces nitrate to nitrogen gas. The use of biological nitrification/denitrification processes have been applied in the municipal sewage treatment field where there is need for control of nitrogen. The required processes can be carried out using a number of different biological treatment configurations, including suspended growth (membrane bioreactors, conventional activated sludge, aerated lagoon etc.) or attached growth (rotating biological contactor (RBC), trickling filters, or aerated biofilters). A biological process for ammonia removal in a mining environment was recently piloted at the Colomac site as part of remediation work being carried out by INAC. The results of this work were summarized in a report prepared for INAC by Elbow Creek Engineering and Times Limited[8] (Mudder and Botz, 2003). The Colomac pilot plant used RBC systems for both the aerobic and anaerobic circuits. Factors that need to be considered with a potential biological treatment system using the Colomac system at Jericho are as follows:

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[6] SRK Consulting. 2003C. "Technical Memorandum J – Ammonia Removal, Jericho Project. October 2003.

[7] AMEC Earth & Environment. 2004. "Proposed Design and Operation of a Land Application System as Contingent Treatment of PKCA Waste Water. Jericho Project" July 2004.

[8] Mudder, T. and M.Botz. 2003. "Summary of Water Treatment Pilot Plant Testwork Conducted for the Colomac Mine" Issued March 2003.

- Based on pilot plant studies, the aerobic portion of the treatment plant would require a very large RBC installation. The pilot studies indicated a media area requirement of 1475m^2 per m^3 of flow per hour for each of the aerobic and anaerobic sections of treatment plant. This unit rate must be considered in the context of a design flow of around 10,000 m^3/d.
- A biological system carrying out both nitrification and denitrification would require one clarifiers for each circuit, of approximately 23 m in diameter each, representing a high capital cost.
- The biological processes require phosphate (PO_4) for growth. Based on the Colomac studies a phosphoric acid dosage, equivalent to 3 mg/L as P, would be required. Based on a proposed phosphorous limit for Jericho of 0.2 mg/L an additional chemical such as ferric sulfate would be required prior to final clarification to reduce PO_4 to acceptable levels for discharge.
- The biological process would require heating to over 15 C to support biological activity. The use of heat exchange would help to minimize energy consumption but there are limits to what can be achieved. The fuel consumption required to heat the water prior to biological treatment would be high.
- The aerobic circuit would require alkalinity addition in the form of soda ash ($NaCO_3$) or caustic ash (NaOH) to compensate for the acid produced during ammonia oxidation. Depending on the initial alkalinity of the water and the actual ammonia concentration in the water approximately 500 tonnes/year of $NaCO_3$ could be required under design conditions of 10,000 m^3/d and an ammonia concentration of 29 mg/L to satisfy the alkalinity demand from the nitrification process.
- The anaerobic process step would require a reductant or carbon source, typically methanol, to convert nitrate and nitrite (NO_3 and NO_2) to nitrogen gas (N_2). Based on a ratio of 3.5 g methanol/g of nitrate removed, the quantity of methanol required would be approximately 225 tonne/year. Methanol would have to be trucked to site and stored in bulk prior to use. If the concentration of NO_3 in the feed to the anaerobic circuit is high, the addition of an acid, such as sulphuric acid, may also be required to compensate for the alkalinity produced during denitrification.
- Both biological circuits would produce some excess sludge that would require disposal. Similar to sludge produced from the sewage treatment plant, this material may require incineration to avoid acting as an animal attractant. This would increase fuel requirements for incineration. The sludge would be need to be dewatered prior to incineration to control energy costs, adding to equipment costs.

Membrane Processes

Membranes technology, such as reverse osmosis (RO), can be used to separate soluble material, such as ammonia, from effluent streams to produce relatively clean effluent for

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disposal. Membrane systems produce a clean stream, referred as permeate and a waste stream, referred as retentate. An RO system for ammonia would require a dedicated treatment facility to destroy ammonia in the retentate (reject solution). There are a number of technologies available to treat the ammonia in the retentate. These technologies are the same as would be required for treating the full stream. A treatment system using RO would need a pre-treatment step, to remove all suspended solids prior to the RO unit. Standard 5 micron disposable guard filters, include with RO systems, might be sufficient if the feed TSS is very low i.e. 1 or 2 ppm, however if the TSS feed levels are higher, in the order of 5 to 15 mg/L, a conventional multi-media pre-treatment filter unit would be required ahead of the guard filter. The backwash from multi-media filter would have to be dispose of with the tailings. To achieve both high water recovery and high salt rejection in an RO would require a multi-pass unit with a separate brine concentration unit. This type of unit would be capable of both 90% recovery of clean water and 90% rejection of ammonia assuming that the raw feed water does not contain appreciable concentrations of sparingly soluble salts, such as strontium or barium sulfate. These salts tend to precipitate out at high recovery rates, resulting in membrane fouling issues that have to controlled using acid or anti-scalants. Based on a maximum ammonia concentration in the feed of 29 mg/L, the retentate (or brine reject solution) would have an ammonia concentration of 261 mg/L while the permeate (or clean water) would have an ammonia concentration of 2.9 mg/L. Based on a raw feed flow of 10,000 m3/d, the volume of retentate requiring treatment would be 1000 m^3/d. It important to note that the low water temperatures that would apply here could require a fairly conservative sizing of the RO unit due to the impact of low water temperatures on through-put. Small scale RO systems with low feed temperatures often include supplemental heating to increase through-put rates but this may not be practical in this case. In this particular case, retentate treatment would likely best be provided using a biological treatment system, such as membrane bio-reactors (MBR), rotating biological contactors (RBC) or a more conventional activated sludge type treatment process. Excess sludge and treated effluent from the biological treatment system would likely report to tailings. Since the effluent from the retentate treatment system would contain elevated levels of nitrate and nitrite, a separate denitrification step would be required to convert these nitrogen species to nitrogen gas, in order to comply with final permit limits. The temperature of the feed to retentate treatment system would have to be increased to 12 to 15C in order for the biological process to proceed with reasonable kinetics. However an MBR system could potentially operate at lower temperatures than a more conventional activated sludge system. Additional factors, which should be considered with a potential combined RO/biological treatment system at Jericho, are as follows:

- There may be a need for coagulant and/or flocculant to assist the multi-media filter in achieving low TSS for the RO feed.
- The power requirements for the RO feed pumps will be high (approximately 500 Hp for a system operating at 300 psi).
- There may be need for acid or anti-scalant addition to the RO feed to control scaling in the RO unit.

- There will be a need for RO cleaning and disinfection chemicals such as bisulfite to control bacterial growth and provide clean-in-place capability.
- Caustic or lime could be required for final effluent pH adjustment if acidification is required to control RO scaling.
- Fuel in the form of propane or fuel oil would be required to heat the feed to bio-treatment plant
- Lime or caustic addition may be required for the bio-treatment plant to supply alkalinity for nitrification process.
- Methanol and potentially acid would be required to support the denitrification process.
- There may be a need for on-site pilot testing prior to implementation, due to both the scaling and low temperature issues.
- The complexity of an RO system would require highly skilled operators.
- Capital and operating costs for a system of this type would be high given the high flows and remote location.

Ion Exchange

Zeolite ion-exchange resin (IX) can be used to selectively remove ammonium ion (NH_4^+) from solution in exchange for sodium ion (Na). Once the exchange capacity of the resin is consumed it can be regenerated using sodium hydroxide (NaOH) or sodium chloride (NaCl), which regenerates the resin and produces a regenerant solution containing ammonia and excess NaOH or NaCl. This regenerant solution can be then treated to remove the ammonia by a variety of means, including biological similar to RO, as well as electrochemical methods. A recent innovation in the use of IX to remove ammonia from wastewater is the electrochemical approach developed by Enpar Technologies of Guelph Ontario and marketed as the AmmEl Process[9]. This process involves conventional IX for ammonia removal coupled with an electrochemical method to regenerate the resin, resulting in the release of N_2 to the atmosphere. Additional factors that would need to be considered in an IX system using the AmmEl technology, are as follows

- Similar to the membrane process, an IX system could still require pre-treatment, such as a multi-media filter to remove suspended solids and colloidal material prior to the IX unit to reduce resin-fouling problems.
- An IX system using this process would require IX columns sized on a hydraulic basis. A flow of 10,000 m^3/d would require an IX column bed area of approximately 20 m^2 to provide the required exchange capacity and provide additional capacity to compensate

[9] Seed, L.P., D.D. Yetman and G.S. Shelp. 2003. “The AmmEl Process for Treatment of Ammonia in Waste Water”. Presented at Sudbury 2003, Mining and the Environment Conf. May, 2003.

for IX vessels being off-line for regeneration. Due to its size, the capital cost of the IX vessels and regeneration system would be high.

- Resin regeneration would require significant amounts of caustic (NaOH) or salt (NaCl), equivalent to the amount of ammonia being removed on a stiochiometric basis.
- Any salts used in the process would ultimately report as increased TDS in the final effluent released to the environment.
- The IX resin would lose its exchange capacity over time and eventually require replacement. Typically this is a 3 to 5 year cycle. Resin replacement and disposal could represent a significant operating expense and logistic issue.
- Electrolytic removal of ammonia from the regenerant solution would require a large amount of electrical power, resulting in a need for increased power generation capability and increased fuel consumption and storage and transportation issues.
- Long-term piloting and feasibility level cost estimation work would be required before this technology could advance to the implementation stage.

Breakpoint Chlorination

Chlorine can be used to oxidize ammonia and convert it to nitrogen gas via a process referred to as breakpoint chlorination. This process is an older technology that has been used for removal of ammonia in municipal sewage in the past. The process has largely been replaced by biological processes due its high consumption of chemicals, high cost and the production of chlorinated compounds. The use of breakpoint chlorination was evaluated on pilot scale basis by INAC at Colomac[8]. Factors that would impact the use of breakpoint chlorination at Jericho be as follows:

- Using data generated from the pilot plant studies at Colomac, breakpoint chlorination would consume approximately 1000 tonnes/yr of calcium hypochlorite ($Ca(OCl)_2$ and around 150 tonne/yr of sodium metabisulfite under design conditions of 1,000,000 m^3/yr and ammonia concentration of 29 mg/L. In addition, based on the pilot plant results, the process would require approximately 1000 tonnes of hydrated lime per year as well as substantial amounts of ferric sulfate and organic flocculants.
- The process would add substantial amounts of dissolved salts to the final effluent in the form of chloride, sulfate, sodium and calcium.
- The kinetics of the process are relatively slow requiring long residence times - in the order of 7 to 14 hours. Reactor vessels would be very large. The capital costs for a facility using this process would be high.
- The process generates some trihalomethane (THM), chloroform and other stable chlorinated compounds, especially if the feed contains some organic compounds. Although not addressed in the pilot plant study report, in the Jericho case, the potential

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From:	Tom Higgs	File No.	146361

long-term environmental impacts of these compounds would have to be addressed. Additional treatment may be required to remove these compounds to make the final effluent acceptable for discharge.

Discussion

A key issue in the evaluation of alternative technology for the treatment of ammonia is whether any of the above alternatives can be considered as Best Available Practical Technology (BAPT or BAT) for a northern environment in the diamond industry. BAT in this case was defined in a document prepared by INAC[10]. To be considered as a BAT a given process must be proven, reliable and have a sound technical basis for implementation at a reasonable cost. Based on this definition, none of the above active treatment alternatives would represent best-available practical technology (BAT) for ammonia at Jericho. BAT alternatives for control of ammonia at Jericho must focus on source control and proper selection and handling of ammonia-based explosives to minimize the concentration of ammonia in the untreated mine water. As stated by INAC[10] no ammonia technology could be described as BAT for the diamond industry in the Northwest Territories. The INAC[10] report found that a treatment strategy using natural processes in large ponds to aid volatilization could have application but still may be limited by climate in the NWT. The INAC report also found that land application could be considered but still did not list it as a BAT alternative.

10INAC, 2002. "Applicable Technologies for Management of Mining Effluents in the Northwest Territories" report prepared by Lakefield Research Limited and Senes Consultants Limited for Dept. of Indian and Northern Affairs Canada.

Section No. 4.3(b)(i)8.
NWB Comment: Only presented for the PKCA. It does not discuss the mitigative measures for the long-term degradation of permafrost in all affected areas.
Response: Incremental comments on the mitigative measures for the long-term degradation of permafrost in other affected areas are provided below.

As shown on Drawing 1CT004.06-G7 in Appendix S of the Tahera Water Permit Submission, bedrock dominates the surficial geology of most of the project development areas. Permafrost degradation within the bedrock, should it occur, will have no impact on either the overlying structure(s) or the environment and, therefore, requires no mitigation. Areas where surficial soils are present and which, therefore, warrant further comment are discussed below.

C1 Diversion
The response provided above regarding Section No. 4.1(a)(ii)2.b describes the geotechnical conditions along Reaches A, B and C of the C1 Diversion. Reach A is entirely within bedrock and is, therefore, not an issue with respect to permafrost degradation. Within Reaches B and C, the diversion will intersect soil and, as a result, the active layer will likely re-establish itself below the base and/or along the sides of the C1 Diversion. As noted in Appendix X, Section 2.3.1, all components of the diversion will be monitored and, depending on their performance (including aspects such as slope stability and settlement), repairs will be implemented as and when appropriate. This is likely to consist mainly of the placement of additional clean rock fill at select locations in the base and along the sides of the diversion.

Open Pit
The open pit is covered by a layer of frozen granular soils approximately 10 to 15 m thick. The portion of the pit slopes that expose these frozen soils will be buttressed with waste rock. As discussed in Appendix BB (SRK Technical Memorandum K, Section 4), these soils will be insulated with a waste rock cover, as part of the initial stages of pit development. Post-closure, the slopes may ravel or degrade to a slope as flat as approximately 15°. The bedrock below these soils will also ravel back over the very long term. This is common in all rock slopes, and is the reason why there is no requirement for long-term stabilization of pit slopes in most mine reclamation guidelines. In the very long term, the open pit is expected to fill with water, but the potential impacts are expected to be no different than what was described above.

Borrow Areas
Borrow pits are exclusively on eskers or kame deltas and soils are granular, thus not presenting surfaces easily eroded by wind. However, any steep internal slopes will be subject to water erosion during the summer. In addition, removal of esker surface material will increase the depth affected by freeze-thaw. As well, there is a potential to expose ice-rich soils, which could result in further melting and internal slumping in the short term. The potential for erosion will be mitigated by keeping the limits of the borrow areas well away from steep slopes. Once areas are no longer active, the internal

slopes will be regraded to the angle of repose or 3:1, as appropriate, and revegetated based on the results of reclamation trials.

Some borrow material may be required for final reclamation and thus borrow area may be one of the last areas to be reclaimed and revegetated.

In the long term, there may be some incremental settlements within the footprint of the borrow area as the depth of the active layer adjusts to changes in the local climate. However, this will not impact the stability of the reclaimed borrow area. The Borrow Management Plan (Tahera Water Licence Application, Appendix D, Section 4.0) discusses measures to address borrow area erosion.

Waste Rock Dump and Stockpile Areas

There are portions, albeit very minor in most cases, of the dumps and stockpiles that are underlain by thin layers of soil. It is expected that these soils will be frozen in the long term, because either the initial placement of material will be done in winter or because of the expected ingress of permafrost. If, however, these underlying soils do not freeze for some unexpected reason, there will be no impact on the stability of these dumps and stockpiles.

Airstrip

The airstrip will be scarified or ripped and vegetated when no longer required, pursuant to probable success as shown in reclamation trials. However, the strip will be left for others to use, if requested by government agencies or by a third party willing to assume the airstrip land lease. The airstrip will be kept open until final closure for use by Tahera Diamond Corporation reclamation personnel.

Over the long term, there may be some incremental settlements within the footprint of the airstrip as the depth of the active layer adjusts to changes in the local climate.

Other infrastructure

Other infrastructure that may be underlain, in part, by soils includes:

- the accommodation and mine office;
- the fuel farm;
- the explosives magazines;
- truck shop; and
- the laydown areas.

In the long term, there may be some incremental settlements within the footprint of these pads as the depth of the active layer adjusts to changes in the local climate. However, this will not impact the stability of the reclaimed pads.

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Section No. 4.3(d)(i)
NWB Comment: QA/QC does not adequately consider GMTF and does not specify a definite QA/QC plan for all sampling and analysis.
Response: Further comments on GMTF, Section E, page 9-10, are provided below.

GMTF, Section E, page 9-10 addresses control and monitoring of the PKCA including a QA/QC plan, construction control, dust control, inspection of tailings dams, stability monitoring program plan, water quality plan and tailings deposition plan.

The QA/QC requirements for construction will be developed in conjunction with the final design drawings and technical specifications. Most of the remaining elements have been addressed at some level in Appendix W. For example, the PK deposition concepts are discussed in Section 10.1. Operational water management is discussed in Section 10.2 and the extreme event management is discussed in Section 10.3. Dam safety monitoring (which includes dam inspections) and water quality monitoring are addressed in Sections 10.4.1 and 10.4.2, respectively. Further details of where the requirements for water quality sampling and analysis can be found are provided in the conformance table.

As noted in Section 11, the operations manual will address all of the operational elements listed on page 9-10 of the GMTF. The operations manual that will be prepared prior to the start of the PKCA operations.

4.3(e)(i)
NWB Comment: re. Landfill Management Plan conformance to GN guidelines
Response:
The Landfill Management Plan meets or exceeds GN guidelines.

4.3(e)(iv)
NWB Comment: Incinerator ash volume and composition not provided
Response:
The following information pertains to ash generated by a 100-person camp at the Jericho Diamond Mine site.

JERICHO PROJECT INCINERATOR ASH COMPOSITION AND WEIGHT			
Parameter	**Value**	**Units**	**Info Source**
Kitchen waste from 100 man camp	182	kg/d	Nuna Logistics
Incinerator reduction	92	%	Westland Incinerator
Ash	15	kg/d	Calculated
Composition - ash (carbon)	99	%	Westland Incinerator
Composition - other (glass, metal)	1	%	Westland Incinerator

4.3(e)(v)

NWB Comment: re. landfill ash dust control, consider GN Guideline ‘Dust Suppression’ for further development.

Response:

Tahera Diamond Corporation and AMEC are in receipt of copies of the above-referenced guidelines. Review of the subject guidelines indicates that the intent of said guidelines has been followed in the relevant plans developed for the Application.

4.5(b)(i)
NWB Comment: Section missing from conformity table and discussion.
Response:
Section 4.5(b)(i)2(a) in conformity table references the subject, as does the Monitoring Program Summary Section 4.5.

4.5(c) (ii) 1. (c) (Provided by SRK)

Provide estimates of nutrient loadings and modeling updates which show isopleths of predicted concentrations of ammonia, phosphorus, TDS and metals in downstream waters….*NWB conformity review requests confirmation of information on individual isopleths and loadings.*

Appendix U SRK Technical Memorandum N – Estimates of Receiving Water Quality) provides spatial and temporal patterns of dilution in Lake C3 for a number of discharge scenarios. These plots provide an indication of the available dilution a various locations in the lake. Section 4.1 of Appendix U (provides an explanation of how the isopleths of dilution factors are used to estimate receiving water concentrations. This has been extracted as follows:

> Receiving water concentrations at a number of locations in the receiving environment were estimated by dividing the PKCA discharge concentrations (Section 2.1 and 2.2) by the dilution estimates (Section 3), and adding measured background concentrations in the Jericho River system (*"Jericho Final EIS, Appendix B.1.1, Baseline Summary Report, Section 6.4 and Table 6.3"*, Tahera 2003) to this value, i.e.:
>
> $$C_R = \frac{C_D}{D} + C_B$$
>
> Where:
>
> C_D = Estimated Discharge Concentrations (as summarized in Section 2)
> D = Dilution Factor (from Section 3)
> C_B = Background Concentrations
> C_R = Estimated Receiving Water Concentrations

The reason isopleths of concentrations were not provided in the document is that for each discharge scenario, there are nearly continuous (hourly) estimates of dilution factors, and then over 30 parameters that could be presented. If isopleths were provided for each parameter every two weeks, there would be over 240 plots of isopleths for each scenario. This volume of information would be very onerous to prepare, interpret and review. Therefore, we chose to calculate concentrations based on conservative estimates of dilution at key locations in the system The resulting estimates are presented in Tables 12 through 16 of Appendix U.

Estimates of nutrient loadings were not provided because the estimated concentrations reached acceptable levels within a very short mixing distance from the mouth of Stream C3. However, nutrient loadings can be easily back-calculated from the information provided as follows:

Load (kg/yr) = Concentration (mg/L) x Flow (m3) x .001 (unit correction)

The nutrient loadings for average and maximum concentrations under typical and stored release conditions are provided in the following table:

Parameter	Concentrations		Expected Loading for Typical Release of 510,129 m3/yr		Expected Loading for Stored Release of 959,487 m3/yr	
	Average Discharge (mg/L)	Maximum Discharge (mg/L)	Average (kg/yr)	Maximum (kg/yr)	Average (kg/yr)	Maximum (kg/yr)
Ammonia (total)	1.8	2.9	918	1479	1727	2783
Nitrate	5	7.4	2551	3775	4797	7100
Nitrite	0.16	0.23	82	117	154	221
Phosphorus	0.087	0.087	44	44	83	83

4.5 (c) (ii) 1.(d) (Provided by SRK)

Estimate aquatic ecosystem effects of modeled TDS levels. *NWB conformity review indicates no discussion on modeled TDS in the reference provided.*

Tahera would like to clarify that estimated total dissolved solids (TDS) concentrations are provided in Tables 12 through 16 of Appendix U (SRK Technical Memorandum N: Estimates of Receiving Water Quality), and that there is a discussion of the estimated TDS levels on pages 15, 16 and 17 (Section 4.2) of the above reference. Attachment N5 of Appendix U provides a more general review of potential thresholds for aquatic effects from TDS and its major ionic components.

Guideline
4.5(c)(ii)2.(a) Surveillance Network Program: Provide a table with the proposed sampling locations (UTM/Latitude-Longitude coordinates fixed by GPS with an attached map), sampling frequency, physical and chemical parameters, thresholds (industry/environmental standards or degree above baseline which is considered as a 'significant increase' by statistical methods), and justification/reasoning behind the selection..

Conformity Statement
AEMP missing sampling coordinates and thresholds for parameters.

Response

Coordinates
See attached coordinates table.
Table 1. Jericho Diamond Project AEMP Station Coordinates (NAD 83; Zone 12).

Station	Location	Purpose	Coordinates		Component		
			East	North	Water	Sediment	Biological
SNP-1	PKCA Discharge	Compliance with water license	476100	7318940	*		
SNP-2	Stream C3 above Mouth	Nearfield PKCA discharge	475097	7319305	*		*
SNP-3	Control Lake	Upstream control	473751	7318676	*	*	*
SNP-4	Cigar Lake (2nd Control)	Outside basin control	469707	7320289	*	*	*
SNP-5	Lake C3 South Basin	Nearfield	474603	7319843	*	*	*
SNP-6	Lake C3 Outlet	Nearfield	475100	7320800	*		
SNP-7	Lake C1	Near mine, non-discharge effects	477582	7319411	*	*	
SNP-8	Stream C1 above Mouth	Near mine, non-discharge effects	478200	7320200	*		*
SNP-9	Water Intake	Intake water quality	478100	7320400	*		
SNP-10	Carat Lake Center Basin	Farfield	477476	7320760	*	*	*
SNP-11	Stream C4 above Mouth	Near mine, non-discharge effects	478600	7321000	*		
SNP-12	Carat Lake Outlet	Farfield	478197	7321135	*		*
SNP-13	Jericho Lake North Basin	Downstream control	478543	7323663	*	*	*
SNP-14	Jericho River	Downstream control	478734	7324712	*	*	
SNP-15	Lynne Lake	Near mine, non-discharge effects	479900	7319200	*		
SNP-16	Carat Lake at Stream C1	Nearfield	478194	7320095			*
SNP-17	Lake C3 at Stream C3	Nearfield	475050	7319327			*

Thresholds for aquatic biota

The objective of the AEMP is to answer the following question:

"Is there an effect of mining activities?"

For the aquatic biota component of the AEMP, a threshold for effect is defined as a significant statistical difference between a measured parameter taken in a potentially affected area compared to a control area (spatial); and/or, a significant statistical difference between a measured parameter taken before initiation of mining compared to after mining has commenced (temporal). A statistical significant difference is accepted at $\alpha = 0.1$ and ß = 0.2.

Given the above definition, it is important to recognize that:

1. Not all statistically significant differences represent a negative adverse effect.
2. Inherent variability in the aquatic biological community may preclude identification of a statistical difference.

As such, the findings for a particular parameter will be examined in relation to results for other parameters and for evidence of trends to assist in the interpretation.

Thresholds for Water Chemistry and Sediments

Thresholds for water chemistry are discussed in detail in SRK Technical Memorandum O (Application Appendix V), which see. Table 2.1 from that Memorandum setting out aquatic thresholds is enclosed below for reference. Thresholds not discussed are those where CCME guidelines for freshwater aquatic life are taken to be appropriate for the Jericho site.

The Aquatic Thresholds proposed for this project are summarized in Table 2.1. The table includes all of the parameters specified in recent water licences issued for Ekati, Diavik and Snap Lake, plus additional parameters raised as potential concerns at this site. However, consistent with these other applications, aquatic thresholds for TSS and phosphorus are not applicable. Therefore, as discussed in Section 4, the discharge criteria for these parameters are based on precedents set for other northern water licences that are also considered to be protective of the receiving environment.

No thresholds are proposed for sediments since a number of parameters naturally exceed CCME ISQG and PEL limits and because metals in sediments are largely sequestered and biologically unavailable. Further, there is no unequivocal way to determine biological availability. Tests, such as sediment triads, are designed for highly contaminated sediments and are not appropriate to detect early changes in sediment communities in response to low level pollution.

Table 2.1: Selected Aquatic Thresholds

Parameter	Aquatic Threshold	Derivation
Major Ions		
TDS	400 mg/L	Proposed Site Specific Objective (see Attachment N5 of Technical Memorandum N).
chloride	150 mg/L	B.C. chronic aquatic life guideline (BCMWLAP, 2003)
Nutrients		
ammonia	0.59 mg/L	CCME (1999)**, assumes total ammonia. (Concentrations in N equivalents)
nitrite	0.25 mg/L (at chloride concentrations of >20 mg/L)	Proposed Site Specific Objective – see Attachment O1. The proposed objective is linked to chloride concentrations. Chloride concentrations of 24 to 48 mg/L are predicted for the edge of the mixing zone, assuming 10 to 20 times dilution. (Concentrations in N equivalents)
nitrate	3 mg/L*	CCME (1999), (Concentrations in N equivalents)
Total Metals		
aluminum	0.16 mg/L	Proposed Site Specific Objective – see Attachment O1.
arsenic	0.005 mg/L	CCME (1999)
cadmium	0.00017 (at a hardness of 100 mg/L)	Proposed Site Specific Objective – see Attachment O1. The proposed objective is linked to hardness. A hardness of 100 mg CaCO3 eq/L is predicted for the edge of the mixing zone.
chromium	0.0089 mg/L	CCME (1999)
copper	0.004 mg/L	Proposed Site Specific Objective – see Attachment O1.
lead	0.001 mg/L	CCME (1999)
molybdenum	0.073 mg/L	CCME (1999)
nickel	0.025 mg/L	CCME (1999)
uranium***	0.02 mg/L	CCME (1999)
zinc	0.030 mg/L	CCME (1999)

Notes:

* Ammonia, Nitrite and Nitrate thresholds are presented in units of mg N/L, consistent with standard laboratory protocols

** CCME 1999 guidelines tables were updated in 2002. The 2002 values are used in this summary.

*** The threshold for uranium is for the protection of drinking water supplies that are used on an ongoing and regular basis.

4.5(d)(ii)
NWB Comment: re. Abandonment and Restoration Plan, reveg trials: metals uptake discussion missing.
Response:
Nunavut Water Board (NWB) conformance review of the Jericho Diamond Project (Jericho) Water Licence Application (Application) has identified that no discussion was provided in the Abandonment and Restoration Plan (Appendix A in the Application) under NWB Guide number 4.5(d)(ii) for contaminant uptake. This letter provides a summary of what is known from revegetation work at the Ekati Diamond Mine™ (Ekati). Ekati was chosen because of the length of revegetation trials that have been conducted at the mine (1996 through the present) and because it is a diamond mine and therefore most closely relevant to Jericho.

Firstly, we consider that the term contaminant uptake is misleading, since contaminants are normally understood to be substances that are added to receiving material or artificially concentrated in the material, whereas metals levels in mined kimberlite are naturally occurring and are therefore not contaminants as such under the normal definition of the word. Unlike metal mines, diamond mines do not add chemicals in ore processing other than ferro-silicon when is almost entirely recovered in the process. However, some metals are at higher concentrations in kimberlite than in non-serpentine soils and could potentially be of concern. Serpentine soils tend to have higher concentrations of chromium, nickel, manganese and iron.

Metals concentrations in revegetation at Ekati were reported in 1999[1]. Their results are summarized in Table 1.

Table 1: Mean (n=3) trace metal concentrations in kimberlite and potting soil (control) substrates within three plant cultivation treatments evaluated in the bench-scale plant growth experiment, EKATI™ Diamond Mine, NT, Canada, 1999.

	Kimberlite			
Metals (mg/kg)	***Arctophilia fulva***	**Native-grass Cultivars**	***Salix planifolia***	**Potting Soil**
Aluminum	4186.67	4310.00	4263.33	870.67
Antimony	<0.04	<0.04	<0.04	<0.04
Arsenic	2.37	2.40	2.57	0.63
Barium	427.00	492.33	526.67	36.33
Beryllium	d<0.2	<0.2	<0.2	<0.2
Bismuth	<0.3	<0.3	<0.3	<0.3
Cadmium	0.17	0.18	0.19	<0.08
Chromium	291.67	327.33	264.00	3.21
Cobalt	93.60	81.40	76.73	1.70
Copper	11.97	13.03	13.80	2.14
Iron	43500.00	48000.00	37733.33	1856.67
Lead	3.47	3.47	4.04	2.46
Lithium	6.73	7.87	7.03	0.53
Mercury	<0.01	<0.01	<0.01	<0.01
Molybdenum	0.85	1.19	0.90	0.25
Nickel	1680.00	1853.33	1376.67	2.77
Selenium	<0.2	<0.2	<0.2	<0.2
Silver	0.53	0.26	0.18	<0.08

[1] ABR Environmental Research Services. 1999. EKATI™ Diamond Mine Reclamation Research Program, 1999, NT, Canada.

Metals (mg/kg)	Kimberlite			Potting Soil
	Arctophilia fulva	**Native-grass Cultivars**	***Salix planifolia***	
Strontium	165.33	156.00	206.00	56.47
Thallium	<0.04	<0.04	<0.04	<0.04
Titanium	326.67	412.00	400.67	58.10
Uranium	1.27	1.27	1.60	0.13
Vanadium	18.47	19.27	19.83	1.96
Zinc	40.30	36.60	38.40	18.53

ABR concluded concentrations of most metals were significantly higher in processed kimberlite (PK) but that nickel was the only potentially metal at potentially phyto-toxic concentrations. However elevated nickel concentrations in plant tissues are not considered a cause for concern in the fool chain (CAST 1976, Chang et al. 1982, both quoted in ABR 1999). Plant tissue metals analyses were not discussed.

Metals levels in tissues of seeded annual plants were analysed at Ekati in 2000 by Martens[2]. Results are summarized in Table 2.

Table 2: Nutrient and metal concentration (mg/kg) in tissues of seeded annual plants in Soil Revegetation Study treatment plots, EKATI™ Diamond Mine, NT, 2000

Nutrient/Metal	Low Peat	Low Peat G – Rp	High Peat	High Peat G – Rp	Kimberlite	Kimberlite G – Rp
Silver	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Aluminum	250	537	303	289	821	757
Arsenic	1.8	0.6	2.3	0.4	1.4	2.0
Barium	15.7	29.9	18.3	18.5	42.6	40.3
Beryllium	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	2260	3450	3880	3650	3300	3480
Cadmium	0.54	0.71	0.35	0.47	0.55	0.40
Cobalt	0.79	1.48	0.95	1.12	1.59	1.54
Chromium	5.1	15.3	5.4	8.3	15.2	14.8
Copper	6.33	7.41	7.01	7.57	8.64	6.49
Iron	433	934	465	548	1260	1190
Potassium	38900	36600	45400	44200	29100	22500
Magnesium	4340	5980	4780	5650	6410	6420
Molybdenum	7.23	9.20	4.31	5.97	35.3	35.1
Sodium	71	81	100	86	71	72
Nickel	11.1	23.6	13.2	16.4	25.4	26.3
Phosphorus	1950	2770	2560	3340	2020	992
Lead	0.47	0.52	0.83	<0.04	0.65	0.68
Antimony	0.29	0.05	0.37	0.51	0.23	0.34
Selenium	0.4	<0.2	0.4	0.3	<0.2	0.3
Tin	0.28	0.48	0.34	0.56	0.82	0.40
Strontium	28.9	44.7	45.0	45.8	45.6	46.5
Titanium	18.6	42.8	19.7	21.5	52.1	48.4
Thallium	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Vanadium	1.01	2.14	<0.08	1.06	3.18	3.19
Zinc	17.5	22.7	17.9	16.5	20.7	16.4

G – Gypsum Rp – Rock Phosphate

[2] Harvey Martens & Associates Inc. 2000. EKATI™ Diamond Mine Processed Kimberlite Tailings Reclamation Research Program, 2000, NT. Canada.

Trials were conducted on kimberlite with and without peat addition (low = 4 cm; high = 8 cm) and with and without gypsum and rock phosphate added. Martens found that metal concentrations did not affect plant growth although some phyto-toxicity was apparent in the fall rye (yellowing of leaves). Metals levels reported were considerably below those reported by ABR (Table 1). As well, there is no control comparison because all plots were on kimberlite.

A further analysis of metals uptake was carried out by Martens in 2001[3]. Results are summarized in Table 3.

Table 3:Mean (n=3) nutrient and metal concentration (mg/kg) in Annual ryegrass aboveground biomass in three soil treatments in 2001. Lake Sediment Soil Amendment Study 2001, Ekati Diamond Mine™, NT

Nutrient/Metal	Kimberlite	Kimberlite + Lake Sediment	Kimberlite + Lake Sediment + Peat
Silver	<0.08	<0.08	<0.08
Aluminum	172	174	280
Arsenic	<0.2	<0.2	<0.2
Barium	9.67	7.05	10.3
Beryllium	<0.2	<0.2	<0.2
Calcium	1957	1753	2217
Cadmium	0.22	0.16	0.14
Cobalt	2.48	2.19	2.02
Chromium	6.8	3.6	6.7
Copper	7.49	7.52	7.7
Iron	469	348	439
Potassium	18100	17766	19533
Magnesium	4087	3657	3803
Manganese	159	150	156
Molybdenum	11	12.4	5.22
Sodium	145	173	193
Nickel	45.4	41.3	38.6
Phosphorus	1410	1410	1577
Lead	0.12	0.14	0.62
Antimony	<0.04	<0.04	<0.04
Selenium	0.5	0.5	0.5
Tin	0.12	<0.08	<0.08
Strontium	23.1	22.2	24.6
Titanium	13.7	11	16.6
Thallium	<0.4	<0.4	<0.4
Vanadium	0.61	0.49	0.57
Zinc	9.7	9.1	11.8

Martens' 2001 results are similar to their 2000 results, although most treatments were different. Concentrations of nickel were two to three times greater in annual rye grass (2001) compared to fall rye (2000). Some phyto-toxicity was apparent in the fall rye (yellowing of leaves). Martens concluded that while nickel concentrations on revegetated plots were elevated over normal soil[4], revegetation plants were not hyperaccumulators (Brooks 1987 quoted in Martens).

[3] Harvey Martens & Associates Inc. Ekati Diamond Mine™ Processed Kimberlite Tailings Reclamation Research Program, 2001, NT, Canada.
[4] Nickel concentrations in plants grown on serpentine soils range from 20 to 100 μg/g and can exceed 1000 μg/g.

Martens again measured metals concentrations in natural and revegetation plants at Ekati in 2002[5]. Results are summarized in Tables 4 to 6.

Table 4: Metal concentration (mean ± SD) in shrubs in plant communities near the mine site, Ekati Diamond Mine™, NT, Canada, 2002.

Trace Element (mg/kg)	Dwarf Birch		Blueberry		Willow	
	Mean	SD	Mean	SD	Mean	SD
Aluminum	111	27	285	52	218	42
Magnesium	2460	185	3373	842	2570	98
Barium	51.4	9.4	14.6	6.4	47.6	15.6
Iron	129	41	122	35	21	2
Manganese	707	223	510	261	352	216
Cobalt	1.5	0.5	3.6	0.4	0.3	na
Chromium	1.1	0.4	0.9	0.4	0.3	0.0
Molybdenum	0.1`	0.0	0.2	0.1	0.2	0.1
Nickel	4.9	1.6	5.0	0.3	2.2	1.0
Strontium	22.1	2.8	28.9	12.9	25.7	4.8
Titanium	6.2	2.0	4.6	0.6	7.2	0.6
Vanadium	0.2	0.1	0.2	0.0	<0.08	na

SD Standard Deviation na Not applicable

Table 5: Metal concentrations (Mean ± SD) in wet meadow grasses and sedges near the mine site, Ekati Diamond Mine™, NT, Canada, 2002

Trace Element (mg/kg)	*Carex aquatilis*		Cotton grass		Bluejoint reedgrass	
	Mean	SD	Mean	SD	Mean	SD
Aluminum	220	17	275	16	199	25
Magnesium	1190	111	943	37	1495	474
Barium	25.3	5.4	20.2	4.7	44	27
Iron	138	112	88	43	88	28
Manganese	142	84	114	31	540	435
Cobalt	0.2	na	0.1	na	0.2	0.1
Chromium	1.0	0.4	0.7	0.2	1.4	0.6
Molybdenum	0.8	0.4	1.9	1.6	0.7	0.3
Nickel	4.6	2.0	4.2	4.8	6.6	7.0
Strontium	11.8	4.2	7.4	1.2	13.0	3.9
Titanium	3.7	1.4	4.8	2.0	4.5	0.9
Vanadium	0.2	na	0.1	0.0	0.1	na

Table 6: Comparison of trace element tissue concentrations in two native species growing in the LLCF study plots and native soil, Ekati Diamond Mine™, NT, Canada, 2002.

Trace Element (mg/kg)	Fireweed		Bluejoint Reedgrass	
	LLCF Kimberlite	Native Soil	LLCF Kimberlite	Native Soil
Calcium	4280	11610	1430	2337
Aluminum	252	178	47	206
Magnesium	14400	5290	3550	1620
Barium	20	71	5.6	44
Sodium	956	836	16	972

[5] Harvey Martens & Associates Inc. 2002. Ekati Diamond Mine™ Processed Kimberlite Tailings Reclamation Research Program, 2002, NT, Canada.

Trace Element (mg/kg)	Fireweed		Bluejoint Reedgrass	
	LLCF Kimberlite	Native Soil	LLCF Kimberlite	Native Soil
Iron	294	66	123	82
Manganese	123	355	279	601
Cobalt	0.8	0.7	0.7	0.2
Chromium	2.6	0.4	1.8	1.7
Molybdenum	24	1.1	12	0.7
Nickel	14	3.1	17	6
Strontium	69	69	31	12
Titanium	2.4	4.5	10.3	3
Vanadium	0.5	0.1	<0.08	0.12

Table 7: Guidelines For Some Metals of Concern to Livestock[6]

Trace Element	Target Organism	Effects Level	Guideline (US National Academy of Science)
Aluminum	cattle and sheep	1000 mg/kg	Safe level as dry matter
	rabbits	200 mg/kg	Safe level as dry matter
Chromium	cattle	1000 mg/kg	Safe level as chloride
		3000 mg/kg	Safe level as oxide
Cobalt	cattle, sheep and rabbits	10 mg/kg	Safe level as dry matter
Iron	cattle	1000 mg/kg	Safe level as dry matter
	rabbits	500 mg/kg	Safe level as dry matter
Magnesium	cattle	0.5%	Safe level as dry matter
	rabbits	0.3%	Safe level as dry matter
Manganese	cattle and sheep	1000 mg/kg	Safe level as dry matter
	rabbits	500 mg/kg	Safe level as dry matter
Molybdenum	cattle and sheep	10 mg/kg	Safe level as dry matter
	rabbits	500 mg/kg	Safe level as dry matter
Nickel	cattle	50 mg/kg	Safe level as dry matter
Vanadium	cattle and sheep	50 mg/kg	Safe level as dry matter
	rabbits and poultry	10 mg/kg	Safe level as dry matter

Martens (*op. cit.*), based on their literature review, concluded that concentrations of metals in the Long Lake Containment Facility posed no concern to wildlife.

Specifically, with respect to caribou which migrate over large distances[7], concentrations likely to be found in revegetation on the processed kimberlite containment area are unlikely to be of any concern given that the animals will spend only a very short time at the site. Cumulative effects are likewise unlikely to occur as minesites are widespread in NWT and Nunavut.

[6] Very little information is available for wild animals.
[7] The Bathurst herd travels over 650 km.

4.5(e)(i)

NWB Comment: re Air Quality Management Plan, no soils monitoring plan provided.

Response:

Pursuant to Nunavut Water Board (NWB) conformance review of the Jericho Diamond Project (Jericho) Water Licence Application (Application), issue 4.5(e)(i) – pre-operational soils monitoring, AMEC Earth & Environmental is pleased to provide Tahera Diamond Corporation (Tahera) with the following program for pre-construction soils collection and analysis. The subject program will provide baseline conditions at the Jericho site prior to mine operation.

Overview

It is desirable to have information on all sites that will be disturbed through mine development, operation and closure. The proposed plan provides for at least one soil sample at each of the disturbed sites; more than one sample has been suggested for facilities that have a relatively large aerial extent. Sample locations will have to be field fit and may vary somewhat from those suggested for two principal reasons:

- much of the site is bedrock covered and soil may not be available at the suggested location; and
- till rather than organic soil should be sampled, since the disturbed sites will, in the main, be till covered and the organic layer removed.

Sample Timing, Location and Analyses

Samples should be collected prior to construction of facilities. Soils can be disturbed but if pads are constructed, then the sampling becomes more difficult since a window in the pad would have to be dug to obtain native soil.

The attached drawing indicates 23 sites where sampling is suggested. The intent is for all areas where facilities will constructed be sampled prior to construction.

Analyses suggested are for metals; benzene and toluene, ethylbenzene, xylene (BTEX) and total extractable hydrocarbons (TEH) for petroleum hydrocarbons. Hydrocarbon analyses need only be done at facilities sites which could potentially be contaminated from petroleum during any mining phase; suggestions are provided in the attached table.

Sample No.	Facility	Metals	BTEX/TEH
SS1	Exploration camp east of existing pad	Yes	Yes
SS2	Permanent landfill site	Yes	Yes
SS3	North end of waste rock dump 1	Yes	No
SS4	Centre of waste rock dump 1	Yes	No
SS5	Pond A location	Yes	No
SS6	South end of waste rock dump 1	Yes	No
SS7	Emulsion plant	Yes	Yes
SS8	Ammonium nitrate storage	Yes	No
SS9	East side of waste rock dump 2	Yes	Yes
SS10	Pond B	Yes	Yes
SS11	Landfarm location (W side of dump 2)	Yes	Yes
SS12	East side of low grade ore stockpile	Yes	No
SS13	Pond C	Yes	No
SS14	South side of low grade ore stockpile	Yes	No
SS15	South side of coarse PK stockpile	Yes	Yes
SS16	North side of coarse PK stockpile	Yes	Yes
SS17	Fuel farm	Yes	Yes
SS18	Central lobe ore stockpile	Yes	Yes
SS19	Mining shop	Yes	Yes

Sample No.	Facility	Metals	BTEX/TEH
SS20	Northern lobe ore stockpile	Yes	Yes
SS21	Processing plant	Yes	Yes
SS22	Process laydown	Yes	Yes
SS23	Accommodation	Yes	Yes

Logistics
Petroleum hydrocarbon sample maximum holding time is seven (7) days whereas metals samples can be held much longer. Timing of sampling is therefore important for petroleum.

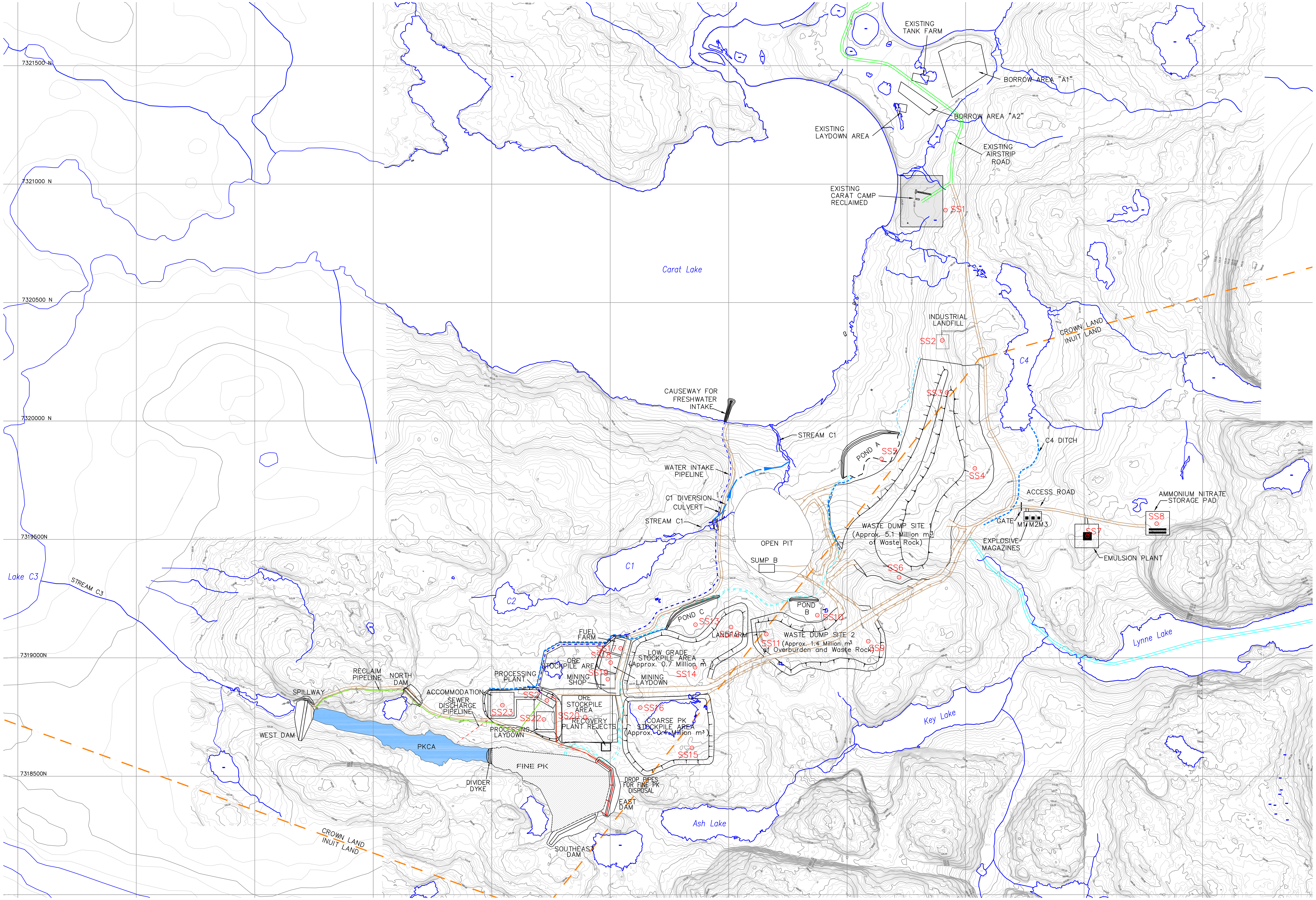
Sampling Protocol
All soil samples are to be taken from the till horizon; avoid organic soils. Record the sample coordinates with a hand held GPS together with the sample number, date and time of collection. Provide the name of the sampler on the field data sheet(s).

BTEX/TEH
Samples must be collected with a stainless steel trowel, or similar device. One sample is required for both analyses. Samples are to be placed in clean wide-mouth 250 mL jars with Teflon lids, filled completely to the top. (Jars are usually supplied by the assay lab.) Label the jars with the sample number and date and time of collection. Place jars in a cooler and keep refrigerated; do not freeze. Clean trowel with distilled water between samples.

Metals
Samples can be collected in wide-mouth jars or plastic bags (preferred due to ease of transport). Use a stainless steel or plastic trowel. Collect at least 1 kg of soil and double bag if using plastic bags. Place a sample label between bags and write the sample number, date and time of collection on the bag. Use a twist tie to close the inner bag (or knot the bag). Use a twist tie to close the outer bag (or knot the bag). Clean trowel with distilled water between samples.

Shipment
Complete chain of custody forms (usually supplied by the assay lab) and include a copy with the soil shipment. Notify the lab when the samples are shipped and indicate BTEX/TEH samples must be processed immediately upon receipt. Request confirmation of receipt from the assay lab.

Reporting
AMEC is available to provide interpretation of the results and a report if desired. Alternately, a cover letter and results could be provided to NWB as proof that samples had been collected. The important evaluation will be a comparison with results upon mine closure. Results should be archived in the mine's environmental database as the assay lab will only keep results for a relatively short period of time. If required, results could be provided in the first annual environmental report to regulatory agencies, in which case interpretation of results would likely be expected.



LEGEND

- EXISTING ROAD
- EXISTING ROAD (APPROXIMATE LOCATION)
- ROAD REQUIRED BY YEAR 3
- WINTER ROAD
- FRESH WATER PIPELINE
- MINE WATER PIPELINE
- FINE PK DISCHARGE PIPELINE
- RECLAIM PIPELINE
- SEWER PIPELINE
- PKCA DISCHARGE PIPELINE
- DITCH
- SS1 SOIL SAMPLE LOCATION

NOTES:

1. LAYOUTS ARE APPROXIMATE AND MAY NOT REFLECT ACTUAL SIZE AND FOOTPRINT LOCATIONS
2. SHOULD THE GRADE OF THE LOW GRADE MATERIAL BE FAVORABLE, THIS MATERIAL MAY GET PROCESSED WHICH WOULD LEAD TO A REDUCTION IN THE SIZE OF THE STOCKPILE
3. THE TIMING OF THE CONSTRUCTION AT THE NORTH DAM, AND THE COMPLETION OF THE EAST AND SOUTHEAST DAMS WILL BE REVIEWED ANNUALLY UNTIL THE DAMS ARE CONSTRUCTED OR OPERATIONS CEASE.
4. THE TIMING OF THE CONSTRUCTION OF POND B WILL BE REVIEWED ANNUALLY.
5. STOCKPILE FOR CENTRAL AND NORTH KIMBERLITE LOBES SHOW MAXIMUM LIMITS. ACTUAL FOOTPRINTS MAY VARY.

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION
Date of Photography: August 5, 1995.
Scale of Photography: 1:10 000
Survey control supplied by: Canamera Geological Ltd.
Survey control based on: UTM Projection, NAD 27, Zone 12
Compiled by The ORTHOSHOP, Calgary, October 1995.
WO 7423

0 100 200 300 400 500 METRES
1:8000

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE
DRAWING G-9	AMMONIUM NITRATE STORAGE LAYOUT		
DRAWING G-8	BORROW AREAS PLAN & SECTION		
DRAWING G-7	TERRAIN EVALUATION MAP		
DRAWING G-6	BEDROCK GEOLOGY MAP		
DRAWING G-5	QUATERNARY GEOLOGY MAP		
DRAWING G-4	EXISTING THERMISTOR INSTALLATION PLAN	DRAWING G-14	CLOSURE CONCEPTS
DRAWING G-3	SITE INVESTIGATION MAP	DRAWING G-13	GENERAL ARRANGEMENT APRIL 2013
DRAWING G-2	SITE VICINITY MAP	DRAWING G-11	GENERAL ARRANGEMENT APRIL 2007
DRAWING G-1	PROJECT LOCATION AND DRAWING INDEX	DRAWING G-10	GENERAL ARRANGEMENT APRIL 2006

REFERENCE DRAWINGS

No.	DESCRIPTION	CHK'D	APP'D	DATE

REVISIONS

REV.	ISSUE PURPOSE	AUTH. BY	DATE
A	WATER LICENSE APPLICATION	CCS	JULY 2004

ISSUE AUTHORIZATION

WATER LICENSE APPLICATION

DESIGNED BY: CCS	DRAWN BY: JM
DATE: JULY 2004	DATE: JULY 2004
CHECKED BY: CCS	DISCIP. ENGR.
DATE: JULY 2004	DATE:
PROJ. MGR:	PROJ. ENGR.
DATE	DATE

SRK PROJECT NUMBER:
1CT004.06

JERICHO PROJECT

GENERAL ARRANGEMENT AT END OF APRIL 2008

DRAWING NUMBER: 1CT004.06 – G12

REV.: A

Guideline 4.7c(i)3

NWB Comment: Guideline not discussed in terms of Cumulative Effects

Response: Tahera addressed the cumulative effects of the Jericho Discharge area and they are presented in Appendix Y of the NWB Submission.