Preliminary Technical Review
Completed by: Joe Murdock
Licence: NWB1JER0410 Part H, Item 3 Waste Rock Management Plan Pt. 1

PART H: CONDITIONS APPLYING TO WASTE MANAGEMENT PLANS

3. The Licensee shall submit to the Board for approval within four (4) months of the effective date of this license a Waste Rock Management Plan, to address the management of all rock this is disturbed, moved, stored, or otherwise affected by mining-related activity on the property over the term of the project. This Plan shall be developed in accordance with Schedule H, Item 2.

Schedule H - Conditions Applying to Waste Management Plans

---

2. The detailed Waste Rock Management Plan referred to in Part H, Item 3 of the Licence, shall include but not necessarily limited to the following:

a. the Plan shall be developed in accordance with the Department of Indian Affairs and Northern Development's (DIAND) "Guidelines for Acid Rock Drainage Prediction in the North, September 1993" or subsequent editions.

The Board requests that Tahera briefly outlines how the *Guidelines for Acid Rock Drainage Prediction in the North* (Sept 1993) were consulted in preparation of the Waste Rock Management Plan. The Board requests well developed statements within the body of the text that clearly references where the *Guideline* was used. These references set within the WRMP should point the reader to the appropriate section within the *Guideline* where the *Guideline* was consulted.

b. this Plan shall describe decision criteria and operating procedures of how all rock will be placed and managed during construction, mining and post closure.

In **Section 4.3.1** (Page 17) the Proponent outlines that that dump lift thickness will depend on the projected height of the structure and number of benches. At the final stages of design should not there be a firm understanding on how the lift piles will be specified?

In **Section 4.3.1** (Page 17) the Proponent states that the slopes between benches will transform and correspond to the angle of repose of the dump material. This is further complimented in *Drawing WRMP-P1-3 Detail 1* yet the Proponent does not provide detail into how this will be achieved. Furthermore in Section 4.4.5 (Page 19) the Proponent indicates that a post-closure downstream slope of 3H:1V would exist as assumed. The Proponent is advised to build further on this assumption and how this will be achieved (i.e. what methods?).

As per **Section 4.4.5** (Page 19) the Proponent details that the dump height was taken as 40 m yet there is conflict in the report. The waste rock dump height has yet to be fully defined (**Section 4.3.1** Page 17). Does the Proponent feel that the analysis presented represents actuality if uncertainty still remains in design specifications? The Proponent is to build further, with engineering judgment and discussion, on the appropriateness of each Geometry and Input Parameter assumption made in **Section 4.4.5**. The Proponent is to also clearly state the level of confidence in the assumptions stated with respect to actuality. The Board would like to also understand why analysis was not presented for Waste Rock Dump #2.

The Board would like further detail pertaining what provisions are in place if frozen berms are developed at the toes of waste rock piles to promote in-freezing of water within the dump of each dump stage as suggested by the Proponent (**Section 5.3.1** Page 23)

The Proponent is to provide additional detailed information on how the surface of the dump will be inclined to direct runoff water off the dump toward the open pit or collection ponds (**Section 5.3.1** Page 23)

c. an annual schedule for ore stockpiling, processed kimberlite generation and waste rock production by rock type, tonnage, and destination over the term of the project including sources and volumes of each rock type;

The Board requests the Proponent to clearly reference within the WRMP how this provision was entirely satisfied in the submission. This should be done through properly referencing and cross referencing within text (materials where the Proponent believes the WRMP addresses all aspects of this provision) to ensure this provision has been addressed adequately in the WRMP.

As per **Table 3.1** (Page 13) the Board requests further information into how approximate quantities and estimated density were determined. What characteristics were assumed? Further more the Proponent states within **Section 3.2.2** that the density range is 1.6-1.9t/m^3 whereas its estimated density in **Table 3.1** is 1.7t/m^3. Additional information must be provided.

d. a description of operational procedures that will be used to segregate and manage the rock that is identified for construction;

Under the **Control Measures during Construction and Operation Section** (Page iii) the Proponent states "*The contact between the overburden till waste rock and the rock is easily discernable to operations personnel and samples will be taken regularly during the construction phase to verify the waste rock characteristics*". The Board requires the Proponent to define what procedures are in place to differentiate rock type and define sample frequency and issues pertaining to how sampling location is selected. The Proponent is advised to review **Section 5.2** (Page 22) and fully delineate how rock will be placed (for construction and not for construction purposes). The Proponent is also advised to clear up ambiguity with the statement "*If visible sulphides or mixed kimberlite and granitic rock are observed, the rock will be placed in a designated area in the centre of the waste rock pile…*"

Within **Section 5.2** (Page 22) the Proponent states that geochemical testing indicates that the waste rock is non-acid generating. The Board advises the Proponent to provide or properly reference the analysis and qualified statements indicating that this is the case. This point should be partnered with the second point in part f., brought up by the Board, in this document (see below). The Proponent should also provide proper reference to what the physical specifications are that the Proponent is planning to abide by.

e. a description of the sampling design and analytical methods that will be used to

support the operational classification of all rock types;

As per **Section 3.2** (Page 13), physical characterization of waste dump materials has been determined through other materials not referenced or provided within the document. The Board requests the materials stated be referenced or provided. Also the Proponent states that incremental information will be provided as time progresses. The Board requests further information into how this additional information will be provided to the Board.

Within **Section 3.2.1** and **Section 3.2.2** (Page 13) the Proponent references "*Available data*". The Proponent is requested to provide proper referencing to this material.

In **Section 3.3.1** (Page 14) the Proponent states that materials were part of the EIS. The Board advises the Proponent to properly reference the EIS (Document title, Section, Page) where these materials may be found.

The Board requests the Proponent to provide clarity to the following issues contained within **Section 7.2** (page 25):

i. The term 'minimal variability' must be built upon
ii. How will sampling amounts be determined for each rock type?
iii. How will **all** the information presented in Section 7.2 be presented to the Board including the reporting of the pit wall evaluation?

How does the Proponent plan to report the information to be gathered as part of **Section 7.3** (Page 26)? The Board requests the Proponent to provide further detail and discussion into how daily inspections and reporting of these inspections to the Board will take place (**Section 7.4** Page 26).

f. a description of the methods that will be used to construct till storage, ore stockpiling, Processed Kimberlite, and waste rock facilities such that generation of acidic drainage and/or metal leaching is limited;

Page ii in the WRMP report lists that "*Geochemical testing indicated there are minimal concerns with respect to ARD and metal leaching from the waste rock.*". This claim must be backed up. Is this material from another document or is it supported in this document? If so the Proponent should elaborate.

The Board would like to better understand the condition of the waste rock to be stockpiled. Is it in the opinion of SRK and the environmental geochemist that the waste rock to be piled will not be at acid generating risk? (**Section 3.3.2**). Could the Proponent/Consultant evaluate the level of confidence with respect to the sampling program used in determining these conclusions?

In **Section 3.3.2** (Page 14) the Proponents reports that "*ABA testing on eighteen granite and granodiorite samples including one sample that was altered and iron stained and total sulphur tests on thirty samples indicated that these samples were non-acid generating with low neutralization potential (NP's from 2 to 21 mg $CaCO_3$/t) and negligible levels of sulphides (average <0.01%S)*". The Proponent is advised to assess this conclusion with respect to determining how samples taken (with respect to frequency

per spatial dimensioning) best represent waste rock conditions for the entire site. The Proponent/Consultant is to state the limitations of the quoted assessment with respect to this project.

Could the Proponent define, in quantifiable terms, the term '*generally low*' with respect to dissolved metal concentrations in **Section 3.3.2** (Page 14)? The Proponent references periodic samples with respect to the "*development waste pile*". The Board advises in annexing the material or properly referencing where sampling results may be found.

In **Section 3.3.2** (Page 15) the Proponent states that "*Extraction tests indicate that enhanced leaching of uranium from the granitic rocks was due to mixing of the granatic rocks with kimberlite. Therefore, any waste rock that is inadvertently mixed with kimberlite should be segregated and placed into a designated area in the centre of the waste dump to promote freezing*". The Board seeks detailed documentation clearly indicating how this will be achieved. Furthermore the statement references extraction tests. The Proponent is to include these results and analysis to back up the conclusions and claims submitted. If the material is found within another submitted document to the NWB, the Board advises the Proponent to properly reference where these materials can be found. Also the Board would like full detail into how the Proponent plans segregate materials.

The Proponent makes claim that sampling will take place on a weekly basis to confirm rock geochemistry expectations (**Section 5.2** Page 22). The Board would like further information into how this information is to be presented to the Board and what testing requirements and protocols are in place.

On Page 15 (**Section 3.3.2**) the Proponent pledges that "*the waste rock solids will be monitored during mining to ensure that any isolated materials that could require special handling are appropriately identified and managed during mining*". This statement is regarded as ambiguous. The Proponent is advised to provide sufficient detail into the particulars within this statement.

In **Section 3.3.3** (Page 15) the Proponent lists the fact that three (3) samples were collected for settling tests. The Board requests further information qualifying the protocol in place to adequately represent site conditions. How were overburden sample locations selected? Is the number and location of samples taken adequate with respect to the size, location, and content of the site? The Board also requests the results and analysis of all tests on these samples. This will quantify the Proponent statement "*The results indicated generally low dissolved metal concentrations*".

In **Section 4.1** (Page 16) there is discussion about the construction of Pond A and Pond B if significant quantities of seepage is encountered. Additional information and specifics are required to be presented. The Proponent is advised to define the limits in where these Pond facilities are needed with respect to quantities and other flow characteristics. Also, the Proponent is required to detail the mechanisms, functions, and designs associated with these facilities.

The Proponent is required to clear up uncertainty within "*There is flexibility to increase the height and/or merge the dumps to provide additional capacity should mine plans be altered during the first year of operation.*" (**Section 4.1** Page 16) What is meant by 'flexibility' and 'altered' with respect to engineering judgment? The Board advises in

providing detailed scientific documentation to assist in clearing the ambiguity.

The Proponent outlines in **Section 4.3.1** (Page 17) that the dump designs are based on the properties of dump materials and the foundation conditions yet further detail is needed. The Proponent also states that dump capacity can be increased through design modifications? What modifications are proposed?

As described in **Section 4.3.3** (Page 18) "*Some portion of the overburden stockpile may thaw during the summer months and may require confinement at the dump perimeter*". As a result the Proponent is proposing a waste rock buttress for the downstream slope of Waste Dump Site 2. The Board requests detailed discussion and design of the proposed waste rock buttress.

In **Section 4.3.3** (Page 18) the Proponent states "*The performance of the overburden will be evaluated following the first summer of operations, and if conditions warrant, the slopes on the upstream side may be optimized*". This statement is ambiguous. The Proponent is to provide detail and clarity with the particulars stated in this statement. What entails '*performance*'? What is meant by '*evaluated*'? What '*conditions*' would open the '*optimization*' of the upstream side? The Proponent is also asked to scientifically define what the term 'optimize' means as stated in the last paragraph of **Section 4.4.7**.

The Proponent states in **Section 7.6** (Page 27) that thermal monitoring is not critical to the performance of the waste dumps yet throughout the report the Proponent outlines the need to place a waste rock-kimberlite conglomerate in the center of the waste rock dump to promote freezing. Furthermore, as identified in **Section 4.3.3** (Page 18), there may be a requirement for a waste rock buttress at the downstream slope of Waste Dump #2. There is also detailing indicating that thaw may require the waste rock buttress. The Proponent is advised to refine Section 7.6 to reflect these provisions and indicate, with detail, what is in place with respect to spatial and temporal dimensions of a thermal sampling program.

General Comments

The Board would like to acknowledge that the requirements of the *Waste Rock Management Plan* set forth in Water Licence NWB1JER0410 include kimberlite, coarse processed kimberlite, and fine processed kimberlite. As identified by the Proponent on page *i*, a Part 2 is to be issued sub sequential to this Plan whereas detailed management plans for the fine PK will be provided in the PKCA Management Plan. In essence this report will not fully satisfy the requirements of Part H Item 3 and Schedule H2 without this submission. As per the issued licence the PCKA Management Plan would also then have to be submitted four months after issuance of the licence (Part H, Item 3). THIS HAS BEEN SATISFIED THROUGH THE JANUARY 18TH, 2006 SUBMISSION OF PART II.

Operating procedures and the general conditions of the WRMP are dependent on mine economics. Could the proponent please provide detailed discussion on this relationship to how operating procedures will be affected under the differing potential operating regimes? Operating under these dynamics would call for the Proponent to outline conditions under the differing scenarios? How will further information be presented to the Board once a scenario is adopted? How does the proponent suggest on reporting changes in operation? As indicated in **Section 2.4** (Page 11) "*Should further analysis dictate that underground mining is the preferable method for*

later years of the mine life the OP/UG transition would start at the level determined by the economic trade-off studies and actual mining costs experienced during the first years of operations". Surely waste is a function of these decisions. Further specifics are needed. Due to the dynamic of the waste rock-overburden generated volumes it is essential to employ calculations that embody all potential scenarios with respect to waste rock. This will communicate to the Board that contingency is set in place. Has the OP/UG Plan been addressed to the Board in another document? If so the Proponent is advised to provide a clear proper reference. If the material is not contained within another document the Proponent is advised to annex materials to this document as dump designs are based on the OP/UG quantities.

Access to the OP/UG mine plan? The Proponent refers the Board to this document yet it has not been submitted.

Page iii under the Waste Dump Design Section indicates "*The layout of the two waste dumps has been optimized in order to minimize the number of catchments affected by the facilities, control seepage…*" Does the Proponent discuss how this is optimized in the document? In **Section 4.1** (Page 16) the layout of the waste dumps minimizes the number of catchments potentially affected by drainage from waste dumps and facilitates the design and operation of seepage control structures related to the waste dumps. Is there evidence presented that outlines Tahera understanding in how this is achieved?

Within **Section 4.1** (page 16) the Proponent reports that runoff will flow to the mine open pit. The Boards would like further detail to be presented into the understanding of drainage course from the waste piles to the open pit.

Page iii briefly describes that the initial haul road will act as a waste rock containment buttress yet within the submitted drawings there is no reference. The Proponent is required to provide additional information pertaining to the initial haul road's role as a waste rock containment buttress.

Within the **Control Measures during Construction and Operation Section** (Page iii) the Proponent states "*Further controls are in place in order to minimize the loss of nitrogen to waste rock*". The Proponent is to detail further on how this is achieved.

Under the **Verification and Monitoring Plans Section** (Page iv) the Proponent details that "*Results of these programs will be reported in an annual seepage and waste rock monitoring report*". The Proponent is required to provide further information on when this report is to be submitted to the Board.

Section 2.2 (Page 10) identifies foundation conditions at the waste dump sites to be of bedrock with isolated soil deposits. The Board advises the Proponent to include materials to support the conclusions presented in an annex or to properly reference (document title, section, page) an already submitted document.

Section 2.4 (Page 10) references a Mine Plan. The Board requests the Proponent to once again cross reference documents within the body of the WRMP.

Section 3.3.2 (Page 14) details that, from seepage results, there is an indication that copper exceeds CCME guidelines. The Proponent would like further detail pertaining on how seepage will be controled and treated.

In **Section 4.2.1** (Page 16) the Proponent lists that a series of ephemeral streams flow across the dump site to Carat Lake. The Board requests further information focusing on how these streams can contribute to the migration of waste from the waste rock pile footprint and what is in place to mitigate this migration.

Under **Section 4.4.2** (Page 18) the Proponent has stated that "*Given the size, design, failure mechanisms, and settling of the proposed waste dumps at Jericho, the consequence category is likely to be low*". The Board would like further scientific information, discussion and analysis on the aspects listed in determining Jericho to be within the low consequence category. Also the Board would like the Proponent to scientifically quantify the term '*low*' and scientifically evaluate the term '*likely*'.

Table 4.2 (Page 19) provides *Case A* and *Case B* scenarios to determine the FOS. The Board requires further engineering detail into each point listed. Also as per **Section 4.4.3** (Page 19) the Proponent quotes an 'analysis'. The Proponent is advised to provide the conducted analysis (2-D DIM limit equilibrium analysis, SLOPE/W, any other geotechnical analysis for ultimate or serviceable failure and slope stability).

In **Section 4.4.6** (Page 20) the Board believes that the Proponent has not provided sufficient evidence to back up the bulleted claims. The Board would like to reiterate that further information is to be provided as aforementioned in this document.

Within the bulleted conclusions listed in **Section 4.4.7** (Page 21) the Proponent states that in the case where the FOS for Waste Rock Dump #1 is close to Minimum FOS that "*In the case when the water table is very high. In reality, this would correspond to a transient condition that may or may not actually occur in the field. Observations during the first year of operations should provide a better indication of what the high water table might actually be during freshet*." The phrasing of the statement, and the statement itself, suggests that there is a lack of confidence in understanding actuality and anticipated behaviour. The Proponent is to outline what contingency is in place for a worse case scenario. What impact to water, with respect to waste, will this scenario pose? Furthermore what program is in place to provide observation during operations?

RECOMMENDATION:

To pass along comments to Tahera to respond along with intervener comments.