srk consulting

SRK Vancouver
Suite 2200 - 1066 West Hastings Street
Vancouver, BC V6E 3X2

T: +1.604.681.4196
F: +1.604.687.5532

vancouver@srk.com
www.srk.com

Memo

To:	Chris Hanks	**Date:**	November 4, 2011
Company:	Hope Bay Mining Ltd.	**From:**	Lois Boxill, Maritz Rykaart
Copy to:	Lea-Marie Bowles-Lyon	**Project #:**	1CH008.048
Subject:	Reclamation and Security Brief for Amendment No. 3 to Doris North Type A Water Licence No. 2AM-DOH0713		

Reclamation and Security Brief for Amendment No. 3 to Doris North Type A Water Licence No. 2AM-DOH0713 – Summary

This memo describes changes in closure planning components associated with additional site improvements to be included in the proposed Amendment for the Doris North Project. This memo summarizes material changes from the 2007 Mine Closure and Reclamation Plan impacting the associated estimate of closure liability. Where new or expanded facilities have been proposed, the applicable closure methodology is cited and an estimate of closure liability provided. Changes in reclamation security for each infrastructure change or expansion is presented in this memo.

Halumaqtiqnia Nautiumanilu Unniqtut Ihuaqhautmut Nappaa 3 taphumunga Doris North Qanugittunia A Imaqmut Laisa Nappaa 2AM-DOH0713 – Nainaqhimayuq

Una tuhaqhit uniqtuiyuq ahianguqniqnik umiknianut upalungaiyainiqmik ilagiyainik piqatauyut tapkununga ilaliutiyat havakviup ihuaqhautai ilaliutiyukhat tapkunani uuktugutauyut Ihuaqhigiagutit taphumunga Doris North Havanga. Una tuhaqhit nainaqhimayai hunat ahianguqni talvanga 2007 Uyagakhiuqvik Umiknia Halumaqhaqnialu Upalungaiyautit aktuanit tapkuat piqatai mikhauhimayut umiknianut atugait. Tapkunani nutani ilagiaqhimayuniluniit havagutini uuktugutauyut, tapkuat atuqnilgit umiknianut pityuhiit taihimayut mikhautauyutlu umiknianut atugait piqaqtitauyut. Ahianguqni halumaqhainiqmut nautiumatit tapkununga atuni havagutit ahianguqni ilagiaqnitluniit hatqiqtihimayut uumani tuhaqhitmi.

ᓴᓗᒻᒪᖅᓴᐃᒍᑎᒃᓴᑦ ᐊᒻᒪᓗ ᐃᓕᓯᒍᑎᒃᓴᑦ ᓇᓪᓕᐅᒃᑯᒫᓂᒃ ᑮᓇᐅᔭᓂᒃ ᑐᓴᒐᑦᓴᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ ᐋᖅᑭᒋᐊᕈᑎᒃᓴᑦ ᐅᕗᖓᖓᔪᑦ No. 3 ᐅᕙᓂ Doris North ᐃᒪᖅᑲᕈᑎᒃᓴᑦ ᐃᒪᐃᑦᑐᒥᒃ A–ᒥᒃ ᓚᐃᓴᖅᑲᕈᑎᒃᓴᒥᒃ No. 2AM-DOH0713 – ᑐᓴᒐᒃᓴᑦ ᓇᐃᓈᖅᓯᒪᔪᑦ

ᐅᑯᐊ ᑎᑎᖅᑲᑦ ᐱᑕᖅᑲᒻᒪᑕ ᐅᓂᒃᑳᓕᐊᕆᓯᒪᑎᓪᓗᒋᑦ ᐱᔾᔪᑎᓕᖕᓂᒃ ᖃᓄᐃᑦᑐᓂᒃ ᐊᓯᐅᖅᑎᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᒪᑐᓯᒍᑎᒃᓴᒫᓅᖓᔪᑦ ᐃᓚᒋᔭᐅᓛᖅᒪᑕ ᑕᒡᕙᓂ ᓄᓇᒥ ᐋᖅᑭᒋᐊᕈᑎᒃᓴᑦ ᑐᒃᓯᕌᖑᖅᑲᑕᐅᒻᒪᑕ ᑕᒡᕗᖓᖓᔪᑦ Doris North–ᒥ ᐱᓕᕆᕝᕕᖕᒥ. ᐅᑯᑎᒎᓇ ᑎᑎᖅᑲᑎᒍᑦ ᑐᓴᒐᒃᓴᐅᒻᒪᑕ ᓇᐃᓈᖅᓯᒪᑎᓪᓗᒋᑦ ᐊᓯᕈᓛᖅᑐᑦ ᐱᒋᐊᖅᓂᖅᑲᓪᓗᑎᒃ ᐅᕙᖕᖒᖅᓯᒪᔪᓂᒃ 2007–ᒥ ᐅᔭᕋᓐᓂᐊᖅᕕᖕᒥ ᒪᑐᓯᒍᑎᒃᓴᐅᔪᔪᑦ ᐊᒻᒪᓗ ᓴᓗᒻᒪᖅᓴᐃᒍᑎᒃᓴᑦ ᐊᒃᑐᐊᓂᓛᑦ ᒥᒃᓴᐅᓴᒃᑐᓂᒃ ᒪᑐᓯᒍᑎᒃᓴᒫᓅᖓᔪᓄᑦ ᓇᓪᓕᐅᒃᑯᒫᓄᑦ. ᓄᑖᑦ ᐅᕝᕙᓗᑭᐊᖅ ᐊᖏᓪᓕᒋᐊᖅᑕᐅᒐᔭᖅᑐᑦ ᑐᒃᓯᕌᖑᓯᒪᖕᒪᑕ, ᐊᑑᑎᓂᖅᑲᕈᓐᓇᖅᑐᑦ ᐱᓕᕆᔾᔭᑎᑎᒍᑦ ᐅᔾᔨᖅᑑᑕᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᐅᔾᔨᖅᑑᑎᑦ ᒥᒃᓴᐅᓴᒃᑐᑦ ᒪᑐᓯᒍᑎᒃᓵᑦ ᐃᓚᒋᓕᐅᔾᔭᐅᓂᐊᕐᒪᑕ. ᐊᓯᕈᖅᑎᑕᐅᓂᐊᖅᑐᑦ ᓄᓇᒥᒃ ᓴᓗᒻᒪᖅᓴᐃᒍᑎᒃᓴᓅᖓᔪᑦ ᕿᓇᐅᔭᑦ ᐃᓕᔭᐅᒐᔭᖅᑐᑦ ᓇᓪᓕᐊᒃᑯᒫᑎᒍᑦ ᐃᓘᓐᓇᖏᓐᓅᖓᔪᓂᒃ ᐱᔾᔭᑎᓖᑦ ᓴᓇᔭᐅᓯᒪᔪᑕᒫᓄᑦ ᐊᓯᕈᐃᒍᑎᒃᓴᓅᖓᔪᑦ ᐅᕝᕙᓗᑭᐊᖅ ᐊᖏᑦᑕᒋᐊᕈᑎᒃᓴᑦ ᒫᓐᓇ ᐅᑯᓇᓃᑦᑐᑦ ᑎᑎᖅᑲᑎᒍᑦ.

1 General

This memo describes changes in closure planning components associated with additional site improvements to be included in the proposed Amendment to Type A Water Licence No. 2AM-DOH0713 for the Doris North Project. This memo describes detailed changes in design criteria or planning for the following infrastructure or project components:

- Doris Central Vent Raise Pad and Access Road;
- Pad U Waste Rock Expansion Area;
- Pad T Ore Storage Expansion Area;
- Roberts Bay Laydown Expansions; and
- Post operations water management at the Doris North site.

Where facilities are described in the 2007 Mine Closure and Reclamation Plan (hereafter 2007 RCP) that was submitted in support of the existing Water Licence, this brief summarizes the material changes impacting the associated estimate of closure liability.[1] Closure methods for new site development or infrastructure that were not included in the 2007 RCP are described in this memo. However, in cases where infrastructure or site development at the Doris North Project site are consistent with descriptions provided in the 2007 RCP, reclamation criteria for these sites are consistent with the requirements specified in Table 1.1 of the 2007 RCP included as an attachment to this document. Where new or expanded facilities have been proposed, the applicable closure methodology is cited and an estimate of closure liability provided.

Table 1 summarizes changes in reclamation security for each infrastructure change or expansion included in this memo. The following sections of this report describe these changes in greater detail. However, it should be noted that all drawings referenced in this memo are presented with the design briefs that have been prepared by SRK in which design details for each facility or component are provided (SRK 2011a, 2011b,2011c,2011d, Gomm 2011).

[1] Miramar Hope Bay Ltd. 2007. Mine Closure and Reclamation Plan, Doris North Project, Nunavut.

Table 1: Summary of Reclamation Security variances for Amendment No. 3

Area Description	Change from 2007 RCP	Change in Closure Methodology / Management Strategy	Estimated Increase in Closure Liability Estimate (2011 CDN$)
Doris Central Vent Raise Pad and Access Road	New vent raise pad, access road and overburden storage area	No	$138,000
Pad U – Waste Rock Expansion Area	Stockpiled waste rock will remain on pad surface at closure	Yes	$25,000
Pad T – Ore Storage Expansion Area	Expanded camp pad footprint to create a general laydown facility and ore storage area	No	$20,000
Roberts Bay Laydown Expansions	Creation of additional laydown areas adjacent to the beach laydown area and adjacent to the northern segment of the existing Primary Road	No	$22,000
Post operations water management at the Doris North Site	Active pumping and treatment of run off from above ground stored waste rock and flushing of TIA	Yes	$965,000

2 Doris Central Vent Raise Pad and Access Road

The 2007 RCP envisioned closure of ventilation raises associated with the Doris North adit but did not make any explicit allocation for closure of the vent raise pad and associated infrastructure located at the Doris Central site. Under the proposed Type A Water Licence Amendment, a vent raise pad will be constructed east of the Doris-Windy All-Weather Road (Doris-Windy AWR), south of Doris Camp and north of Windy Camp. The Doris Central Access Road will be constructed to provide access to the Doris Central Vent Raise Pad from the Doris-Windy AWR as indicated on Drawing DC-01, Rev. B (SRK 2011a).

The new Vent Raise Pad will cover an approximate total area of 13,252m^2 and will house a fuel transfer station, diesel generator, vent raise infrastructure and an emergency shelter. Rock blasted during development of the pad footprint will be used to construct the pad and will subsequently be covered with a 0.15m thick layer of surfacing material. The pad will be constructed to be free draining away from Doris Lake and the surfacing material specified will be a 1 ¼ inch crushed rock. The design criteria for the vent raise pad are as follows:

- The Vent Raise Pad will be constructed on a drilled and blasted bedrock surface.
- The proposed drilling and blasting zone should not be breached and will be housed entirely within the proposed Quarry I limits.
- A surfacing layer will be required for infrastructure placed on the pad as a levelling course.

The Doris Central Access Road is an extension of the existing Doris Windy AWR and provides access to the Doris Central Vent Raise. The 675m access road will not be paved and will have one turn out location. The road will also connect to a sedimentation control berm (approximately 240m long) that will be located east of the overburden storage area as shown on Drawing DC-01, Rev. B (SRK 2011a). This road is not designed to meet the requirements of a mine haul road or a public road. Dual lane traffic is only allowed for vehicles with an overall outside width of 2.3m and smaller.

Except for reduced-speed zones, the maximum design speed for any vehicle is 50km/hr. The road design requirements are similar to those used for the Doris-Windy AWR. The Doris Central Access Road will also provide access to a designated Overburden Storage Area that will be located approximately 100m west of the Doris Central Vent Raise Pad.

Descriptions of the design criteria for the Doris Central Vent Raise Pad and Access Road, in addition to the associated detail design drawings are provided in the associated design brief prepared by SRK (2011a).[2] It should also be noted that the footprint of the proposed expansion will be entirely located within the existing Commercial Lease boundary.

As the Doris Central Vent raise and the associated Doris Central Access Road were not explicitly envisioned under the 2007 project plan, closure cost allocations for these facilities were not included in the 2007 RCP. However, the 2007 RCP provided closure prescriptions and associated unit costs for adit closure, removal of site infrastructure, and for closure and reclamation of pads, and roads. Unit costs for closure activities consistent with those included in the 2007 RCP provided the basis for developing updated closure and reclamation costs for the Doris Central Vent Raise Pad and Doris Central Access Road as follows:

- Closure of the Doris Central Adit ($75,000 allowance).
- Removal, decontamination, and disposal of 75,000L EnviroTank ($5,000 allowance).
- Removal of Emergency Shelter ($20,000 allowance).
- Removal of diesel Gen Set to Roberts Bay ($20,000 allowance).
- Removal of ventilation raise housing and fan ($5,500 allowance).
- Grading and contouring of Vent Raise Pad ($7,500 allowance).
- Grading and contouring surface of Doris Central Access Road ($4,000 allowance).
- Breaching and contouring of Doris Central Sedimentation Control berm ($1,000 allowance).

  In cases where closure cost estimates for activities like building removal and surface reclamation were included in the 2007 RCP, original unit rates (quoted in 2007 CDN dollars) were escalated at a rate of 5% to account for cost inflation to estimate the indicated cost allowances in 2011 CDN dollars.

Closure and reclamation costs for the Vent Raise Pad including removal of the associated infrastructure are estimated at $133,000 (in 2011 CDN), while closure costs for the Doris Central Access Road are estimated at $5,000 (in 2011 CDN).

3 Pad U – Waste Rock Expansion Area

The 2007 RCP envisioned return of waste rock obtained from underground mining activities (especially all rock with potential for acid generation) back to the underground mine for use as backfill during the operating life of the mine. The original Waste Rock Pile Storage Area was therefore envisioned to provide temporary storage for waste rock brought to the surface. The pad was to be surrounded by berms and runoff from this area directed to a designated Temporary Waste Rock Pile Pollution Control Pond. According to original project plans, the designated storage area would accommodate storage of 137,041 tonnes of waste rock, the estimated maximum quantity of waste rock that would be stored on the temporary waste rock pile storage area at any given time during operating mine life. The original pad provided a pad footprint of approximately 1.5 Ha for waste rock storage.

Under the proposed Amendment No. 3 to the Type A Water Licence, construction of Pad U, consists of three pads (Pad U_1, Pad U_2, and Pad U_3 as seen on Drawing DN-WRE-01, Rev. A (SRK 2011b)) and allows for permanent, above-ground storage of up to 375,000 tonnes of waste rock. It is currently anticipated that waste rock placed on these pads would not be characterized as having potential for generating acid rock drainage and would therefore not necessitate installation of a cover

[2] SRK Consulting. 2011a. Doris North Project - Doris Central Vent Raise Pad and Access Road - DRAFT. Technical Memo, June 13.

system or long-term collection and treatment of runoff or seepage from the pile. When completed the combined U pads would provide approximately 1.2 Ha of pad storage area. The expanded waste rock storage area is located approximately 100m east of the original waste rock storage facility location indicated in the 2007 RCP. Consistent with the original design intent, runoff from the Waste Rock Pile Storage Area will be directed towards a designed pollution control pond located south of the expanded pad.

Descriptions of the design criteria for the expanded Waste Rock Pile Storage Area in addition to the associated detail design drawings are provided in the design brief prepared by SRK (2011b)[3]. It should also be noted that the footprint of the proposed expansion is entirely located within the existing Commercial Lease boundary. Descriptions of the geochemical characterization of representative waste rock materials and of the water quality monitoring program are described elsewhere (SRK 2011e[4], SRK[5], Gomm 2011[6]).

The 2007 RCP explicitly indicated that no allowance had been provided for permanent above-ground waste rock storage. Under the 2007 RCP, waste rock storage areas were expected to be used on a temporary basis with stockpiled waste rock to be returned underground during operating mine life. Initial estimates indicate that the dump could have a waste rock surface area of approximately 3 Ha at closure. Using the unit costs for waste rock regarding at closure included in the 2007 RCP, an allowance of approximately $20,000 (in 2011 CDN dollars) is recommended to complete grading and final contouring of the surface of the permanent waste rock storage area.

The 2007 RCP did not make any allowances for final clean up or breaching of the associated Pollution Control Pond to be constructed down-gradient of the originally planned waste rock storage area. Assuming that final decommissioning of the Pollution Control Pond can be completed within a 10-hr period by a large equipment fleet with an estimated 2011 rate of $500/hr, an allowance of $20,000 (in 2011 CDN dollars) has been provided. In addition, to account for the need to provide adequate long-term drainage on the final dump surface, $5,000 (in 2011 CDN dollars) is also provided for final closure of this facility.

- These amounts combine to provide a total allowance of $25,000 (in 2011 CDN dollars) to cover closure costs associated with closure of the Pad U Waste Rock Storage Area and decommissioning of the associated Pollution Control Pond. In cases where closure cost estimates for activities like dump surface contouring and drainage construction were included in the 2007 RCP, original unit rates (quoted in 2007 CDN dollars) were escalated at a rate of 5% to account for cost inflation to estimate the indicated cost allowances in 2011 CDN dollars. The indicated closure allowance assumes that geochemical characterization of waste rock to be permanently stored on Pad U confirms suitability of permanent above-ground storage of this material, and further that water quality in the Pollution Control Pond would be suitable for discharge to the environment prior to breaching of this facility.

4 Pad T – Ore Storage Expansion Area

The 2007 RCP that was submitted in support of the existing Type A Water Licence envisaged temporary surface storage of a 10,000 tonne ore stock pile on a 5,000m^2 pad. Runoff from the pad would be directed to a Pollution Control Pond and the quality of water collecting in this pond monitored. It was also anticipated that water with quality preventing direct discharge to the environment would be pumped to the Tailings Impoundment Area. During the operations phase, ore would be end dumped on to the pad by underground haul trucks and then fed to the primary jaw crusher by a front end loader. It was also envisioned that all stockpiled ore materials would be processed prior to mine closure.

Under the proposed Type A Water Licence Amendment, a new general laydown facility and ore storage area would be developed adjacent to Pad R, Pad D, and Pad Q as seen on Drawing DN-

[3] SRK Consulting. 2011b. Design Brief: Doris North Project Expanded Waste Rock Storage Pad (Pad U). . August 4.
[4] SRK Consulting. 2011e. Kinetic Testing of Waste Rock and Ore from the Doris Deposits, Hope Bay. July.
[5] SRK Consulting. 2011f. Geochemical Characterization Report for Waste Rock and Ore from the Doris Deposits, Hope Bay. June.
[6] Gomm, Leslie. 2011. "Updated Predicted Water Quality and Summary of Predicted TIA Closure Concentrations." Technical Memorandum. July 6.

DMC-T1, Rev. A (SRK 2011c). The new area, designated as Pad T (which consists of three pads, Pad T_1, Pad T_2, and Pad T_3), would have a storage surface area of approximately 3.6 Ha and accommodate both temporary storage of additional ore, or use as a general laydown area during operations. The component pads would be constructed from Run-of- Quarry (ROQ) fill overlain by surfacing material. The surface of Pad T will be graded to direct surface runoff and infiltration towards the infrastructure pads adjacent to the south perimeter of Pad T which ultimately report to the Pollution Control Pond located down-gradient of these infrastructure pads.

Descriptions of the design criteria for Pad T, in addition to the associated detail design drawings, are provided in the design brief prepared by SRK (2011c).[7] It should also be noted that the footprint of the proposed expansion is entirely located within the existing Commercial Lease boundary.

The 2007 RCP included costs for reclamation of the temporary ore storage area with the grading and berm removal activities associated with reclamation of the plant site. Using the Ore Stockpile footprint and unit costs included in the 2007 RCP, an allowance of approximately $2,250 (in 2007 CDN dollars) was made for grading and final contouring of the surface of the temporary ore storage area. Accounting for the increased footprint area of Pad T, and cost inflation since 2007, an allowance of $20,000 (in 2011 CDN dollars) is estimated to cover closure costs associated with this facility. The allowance includes the following:

- Scarification and grading of pad T surfaces – allowance of $20,000.

As previously indicated, where closure cost estimates for activities like surface scarification and surface grading were included in the 2007 RCP, original unit rates (quoted in 2007 CDN dollars) were escalated at a rate of 5% to account for cost inflation to estimate the indicated cost allowances in 2011 CDN dollars.

5 Roberts Bay Laydown Expansions

The 2007 RCP envisioned reclamation of a 0.6 Ha laydown area adjacent to Robert Bay. Under the proposed Type A Water Licence Amendment, three new laydown areas will be constructed at Roberts Bay. The three laydown areas (designated as Roberts Bay Expanded Laydown Areas West, Southwest, and Southeast) will provide an additional 4 Ha of general laydown area. Drawing RM-LE-01, Rev. A (SRK 2011d) provides the general arrangement of these facilities. The West Laydown Area will be located adjacent to the south perimeter of the existing Beach Laydown Area. The Southwest and Southeast Laydown Area will be located adjacent to the Primary Road, south and east of the Roberts Bay Tank Farm.

Descriptions of the design criteria for the Roberts Bay Laydown Expansions, in addition to the associated detail design drawings are provided in the design brief prepared by SRK (2011d).[8] It should also be noted that the footprint of the proposed expansion laydown areas are entirely located within the existing Commercial Lease boundary.

The 2007 RCP provided an allowance of $2,700 (in 2007 CDN dollars) for grading and contouring of the beach laydown area. However, accounting for the increased surface area provided by the new laydown expansions, an allowance of $22,000 (in 2011 CDN dollars) has been provided for final reclamation of these new areas. The closure liability estimate for the Roberts Bay Laydown Expansions accounts for the following:

- Scarification and grading of laydown area surfaces – allowance of $22,000

Where closure cost estimates for activities like surface scarification and surface grading were included in the 2007 RCP, original unit rates (quoted in 2007 CDN dollars) were escalated at a rate of 5% to account for cost inflation and to estimate the indicated cost allowances in 2011 CDN dollars.

[7] SRK Consulting. 2011c. Design Brief: Doris North Project Expanded Ore Storage Pad (Pad T). August 4.
[8] SRK Consulting. 2010d. Design Brief: Doris North Project, Roberts Bay Expanded Laydown Pads. June.

6 Post Operations Water Management at the Doris North Site

Water management is required during the post closure period at the Doris North site to enable water quality in the Tailings Impoundment Area (TIA) to meet target closure criteria as set out in Clause 28 of the existing water licence.[9] This water management will involve the annual flushing of the contents of the TIA with water extracted from Doris Lake over a seven year period. The 2007 RCP did not anticipate a requirement for active management of water in the TIA prior to breaching the North Dam. The 2007 RCP only envisioned the pumping of supernatant from Tail Lake during the open water season for seven years after active mining during which time water outflows were expected to have reached equilibrium with water inflows.[10] The 2007 RCP did anticipate final breaching of the North Dam and the Pollution Pond at the end of the active mining period.

Post closure water management at the Doris North site is currently anticipated to entail the following:

- Pumping of groundwater from the underground mine workings to the TIA for the first 6 months of the post operations period.
- Routing of accumulated runoff from the Pad U Pollution Pond into Doris Creek. Results from the current water balance indicated that the predicted change in Doris Creek water quality associated with flow contributions from the Pollution Pond are negligible.[11] It is anticipated that this routing would remain until required target closure criteria for the TIA has been achieved at which point the Pollution Pond will be breached to allow natural return of runoff from this area into Doris Lake.
- Annual pumping of approximately 480,000m^3 of water from Doris Lake into the TIA during the winter period (November – April). Current water balance modelling predictions suggest that target water quality closure criteria can be met after 7 years of flushing the TIA with annual water inflows of the indicated volume from Doris Lake.[12]
- Pumping of water from the TIA via a pipeline to a diffuser discharge located on the Beaufort Sea. It is anticipated that water will be pumped for the duration of the post closure period (approximately 9 years) at a rate of 120L/sec during the annual open- water season (June to October). Once target water quality closure criteria for the TIA has been achieved, the North Dam of the TIA will be breached to allow natural outflow of water from the impoundment area into the Doris Creek catchment.

Table 2 summarizes water management components for the Post Closure period at the Doris North site that have been used to develop the closure cost estimate for post closure water management. All water transfer assumes the use of fused HDPE pipe and any pumps or booster stations needed to overcome elevation and drag effects.

[9] Gomm, Leslie. 2011. "Updated Predicted Water Quality and Summary of Predicted TIA Closure Concentrations." Technical Memorandum. July 6.
[10] Mirimar Hope Bay Ltd. 2007. Mine Closure and Reclamation Plan Doris North Project, Nunavut.
[11] Gomm, Leslie. 2011. "Updated Predicted Water Quality and Summary of Predicated TIA Closure Concentrations." Technical Memorandum. July 6.
[12] *Ibid*.

Table 2: Post Closure Water Management Components

Source	Destination	Distance	Rate of Flow	Duration	Pumping Season
GW from UG Mine Workings	TIA	1 km	12 L/sec	6 months	Q1 7 Q2 of Year 8
Pad U Pollutions Pond	Doris Creek	1.4 km	0.1 L/sec	9 years	June-October
Doris Lake	TIA	1.3 km	37 L/sec	6 mo/year for 7 years	November - April
TIA	Beaufort Sea	6.5 km	120 L/sec	5 mo/year for 9 years	June - October

The 2007 RCP included an estimate of $2.6 M (in 2006 CDN dollars) for closure and reclamation of the Tailings Impoundment Area (formerly called the Tail Lake Tailings Impoundment).[13] This estimate included:

- Removal of tailings pipe equipment and infrastructure;
- Discharge of supernatant into Doris Creek;
- Breaching of the North Dam; and
- Shoreline stabilization and armouring for Tail Lake.

A total allowance of approximately $1 M (in 2011 CDN dollars) is provided to cover costs associated with post closure water management at the Doris North site. The indicated allowance accounts for the following:

- Pumping and piping of groundwater from the underground mine workings to the TIA - $2,500.
- Pumping and piping of runoff from Pad U Pollution Pond to Doris Creek – $62,500.
- Pumping and piping of water from Doris Lake to the TIA – $100,000.
- Pumping water from the TIA to the Beaufort Sea – $50,000.
- Removal of additional piping - $25,000.
- Breaching of the Pad U Pollution Pond – $25,000.
- Escalation of 2006 CDN dollars to 2011 CDN dollars at a rate of 5% to account for cost inflation - $700,000.

The indicated closure allowance accounts for: pipe installation costs of approximately $50, 000/km for 0.3m diameter insulated, fused HDPE pipe and $40,000/km for 0.15 m diameter insulated, fused HDPE pipe; pump power costs of $0.01/kwHr; and pipeline removal costs of $2.50/m.

[13] Mirimar Hope Bay Ltd. 2007. Mine Closure and Reclamation Plan Doris North Project, Nunavut.

7 Closure

This memo, “Reclamation and Security Brief for Proposed Amendment No. 3 to Doris North Type A Water Licence No. 2AM-DOH0713”, has been prepared by SRK Consulting (Canada) Inc. All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Prepared by

Lois Boxill, P.Eng. (BC)
Senior Geotechnical Engineer

Reviewed by

Maritz Rykaart, Ph.D., P.Eng. (NU)
Principal

Attachment 1
Proposed Site Specific Reclamation Criteria for the Doris North Project
(Table 1.1) as excerpted from the 2007 Closure and Reclamation Plan

Table 1.1: Proposed Site Specific Reclamation Criteria for the Doris North Project

Land Reclamation Unit	Proposed Site Specific Reclamation Criteria			
	Physical Stability Requirements	**Chemical Stability Requirements**	**Ecological Sustainability Requirements**	**Climatic and Geographic Stability Requirements**
Underground Mine Workings	1) Salvageable equipment removed. All other equipment cleaned of hydrocarbons and other hazardous contaminants. 2) All mine entries sealed to prevent any future inadvertent access by humans or large wildlife using a combination of engineered concrete caps and/or backfill for raises and a backfilled rock plug in the adit portal.	1) All potentially hazardous materials removed from the UG mine; prior to waste rock deposition. 2) All chemical/hydrocarbon spills and contaminants remediated or removed; prior to waste rock deposition. 3) Placement of all potentially acid generating waste rock into the underground mine where it will remain in a frozen state due to the presence of permafrost. 4) Should future global warming trends cause permanent thawing of the permafrost, allow subsequent natural flooding of the closed mine workings to minimize ARD generation.	1) Wildlife unable to enter or come into contact with UG mine workings to protect wildlife health and safety.	1) Permafrost is not required to be sustained within the closed out underground mine workings. 2) Dry underground mine conditions are not required in the event of global warming.

Table 1.1: Continued

	Proposed Site Specific Reclamation Criteria			
Land Reclamation Unit	**Physical Stability Requirements**	**Chemical Stability Requirements**	**Ecological Sustainability Requirements**	**Climatic and Geographic Stability Requirements**
Tail Lake tailings containment area and site water management facilities	1) Stable dam side slopes with adequate geotechnical factor of safety for closure. 2) No significant wind or water erosion. 3) Dams in the water management pond breached to re-establish hydrologic flow. 4) Site drainage systems on the reclaimed site set to direct precipitation into the surrounding water courses under all precipitation events including extreme events without causing significant erosion or damage to the drainage structures left behind. 5) All non-required catch basins, sedimentation ponds and drainage structures removed or in filled so that no significant erosion occurs under all precipitation events including extreme events.	1) No significant level of contaminants in outflow from the reclaimed Tail Lake. 2) Water license discharge requirements are being met without ongoing active water treatment of seepage and drainage. 3) Site drainage consistently meets water discharge criteria and results in no significant adverse impact on water quality in the surrounding water courses and water bodies	1) Separation of wildlife and humans from contact with the underlying tailings deposited within Tail Lake. 2) No opportunity for significant transfer of contaminants to wildlife through water. 3) Water quality draining from the reclaimed site remains protective of aquatic life in the surrounding water bodies and presents no significant adverse risk to the health of wildlife.	1) Ability to shed all precipitation including extreme events without causing significant erosion or pickup of contaminants. 2) Hydrologic flow re-established under all precipitation conditions including extreme events without resulting in significant erosion.

Table 1.1: Continued

	Proposed Site Specific Reclamation Criteria			
Land Reclamation Unit	**Physical Stability Requirements**	**Chemical Stability Requirements**	**Ecological Sustainability Requirements**	**Climatic and Geographic Stability Requirements**
Buildings and Equipment	1) All potentially hazardous materials removed from the mine site and shipped south for re-cycling or proper disposal. 2) Buildings and equipment cleaned prior to demolition and all hazardous materials recovered, packaged and removed prior to demolition. 3) All equipment and buildings demolished and the demolition debris encapsulated within an appropriate landfill within Quarry 2. 4) Site clean of all equipment, steel, containers, debris and concrete. All removed and buried within the landfill. 5) All concrete foundations and slabs broken up and buried within the landfill or used as UG backfill. 6) All fuel storage facilities cleaned of hydrocarbons then demolished and removed for encapsulation within the landfill. 7) No significant erosion of rockfill building pads after removal of buildings.	1) All hazardous materials removed. 2) All chemical/hydrocarbon spills remediated or removed. 3) No significant adverse water quality in drainage across former building pads and areas. 4) All liners and berms from within fuel tank farms removed and buried within landfill. 5) All identified contaminated soils will be excavated and dependant on their level of contamination they will be either remediated on site, removed from site for off-site disposal in a licensed facility or disposed of in the underground mine or landfill so that no significant contaminant release occurs with future site drainage from these sources.	1) No contact of wildlife or humans with contaminated soils due to removal and/or placement of separation barriers. 2) No significant health risks to wildlife or humans from the reclaimed building areas. It may be desirable to leave the residual building pads in an un-vegetated state so that they do not attract wildlife for browsing for many years even centuries.	1) Site drainage restored across the remaining building pads through creation of permanent no maintenance swales or drainage channels to meet all precipitation events including extreme events without causing ponding or significant erosion in these areas.

Table 1.1: Continued

	Proposed Site Specific Reclamation Criteria			
Land Reclamation Unit	**Physical Stability Requirements**	**Chemical Stability Requirements**	**Ecological Sustainability Requirements**	**Climatic and Geographic Stability Requirements**
Infrastructure (airstrip, roads and laydown areas)	1) All culverts and bridges removed and new drainage swales or channels created that are maintenance free and will not result in significant erosion. 2) All side berms removed and shoulder slopes regraded to prevent erosion and allow safe wildlife passage.	1) No ARD or significant contaminant release from the rock fill left in place within the roads, airstrip and laydown areas. 2) All chemical spills and contaminants remediated or removed.	1) No contact of wildlife or humans with contaminated soils due to removal and/or placement of separation barriers. 2) No significant health risks to wildlife or humans from the reclaimed roads, airstrip and laydown areas.	1) Site drainage restored across the remaining roads, airstrip and laydown rock fill areas through creation of permanent no maintenance swales or drainage channels to meet all precipitation events including extreme events without causing ponding or significant erosion in these areas
Non-Hazardous Landfill Area and Quarries	1) Non-hazardous landfill site fully buried within Quarry 2. A separation barrier of quarried rock placed on top of the landfill to separate contact with the surrounding environment. 2) No significant wind or water erosion of the reclaimed landfill area. 3) Stable wall slopes within the reclaimed quarries.	1) No adverse drainage from the landfill area and quarries into the surrounding water courses.	1) No contact of wildlife or humans with the contents of the reclaimed landfill area due to the placement of a suitable stable separation barrier (cover). 2) No significant health or safety risks to wildlife or humans from the reclaimed landfill area and quarries.	1) Permafrost development and maintenance within the reclaimed landfill. 2) Ability to shed all precipitation including extreme events without causing significant erosion or pickup of contaminants.