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February 09, 2017

Karen Kharatyan  
Acting Manager of Licensing  
Nunavut Water Board  
P.O. Box 119  
Gjoa Haven, NU, X0B 1J0

**Re: TMAC response to NWB Request for Information on the Madrid Bulk Sample 2BB-MAE Application**

Dear Mr. Kharatyan,

In response to the Nunavut Water Board's (NWB) correspondence provided to TMAC Resources Inc. (TMAC) on January 20, 2017 regarding the Madrid Bulk Sample Application 2BB-MAE, TMAC is pleased to present the following technical memo:

1. SRK. February 7, 2017. Responses to Technical Review Comments pertaining to TMAC's Madrid Bulk Sample (see Attachment A).

The SRK (Feb 7, 2017) technical memo has been prepared to address comments received from the following parties:

- Nunavut Water Board (NWB). 2017. Licence No. 2BB-MAE. *Application by TMAC Resources Inc. for the Madrid Project – Request for Information*. Letter to TMAC Resources. NWB File No. 2BB-MAE---, January 20.
- Kitikmeot Inuit Association (KIA). 2015. *TMAC Resources Inc. Comments on responses to Madrid Advanced Exploration Program*, 150908 2BB-MAE. Letter to Nunavut Impact Review Board, October 3.
- BGC Engineering Inc. (BGC). 2017. *Review of Madrid North Project Revisions, Doris North Project, Nunavut*. Project memorandum submitted to Kitikmeot Inuit Association. Project No. 0454004-09, January 19.

Should you have any further questions please feel free to contact me at [john.roberts@tmacresources.com](mailto:john.roberts@tmacresources.com).

Sincerely,

A handwritten signature in blue ink, appearing to read 'John Roberts', with a stylized flourish at the end.

John Roberts

Vice President, Environmental Affairs  
TMAC Resources Inc.

Cc: Stephanie Autut (NWB)  
Dave Hohnstein (NWB)  
Sonia Aredes (NWB)  
John Roesch (KIA)  
Oliver Curran (TMAC)

# **ATTACHMENT A**

SRK. Responses to Technical Review Comments  
pertaining to TMAC's Madrid Bulk Sample



## Memo

<b>To:</b>	John Roberts, PEng. Vice President, Environmental Affairs	<b>Client:</b>	TMAC Resources Inc.
<b>From:</b>	Iozsef Miskolczi, PEng	<b>Project No:</b>	1CT022.012.200
<b>Reviewed By:</b>	Maritz Rykaart, PhD, PEng	<b>Date:</b>	February 7, 2017
<b>Subject:</b>	Responses to Technical Review Comments pertaining to TMAC's Madrid Bulk Sample		

This Technical Memo provides TMAC's response to select review comments received in the following correspondence:

- Kitikmeot Inuit Association (KIA). 2015. *TMAC Resources Inc. Comments on responses to Madrid Advanced Exploration Program*, 150908 2BB-MAE. Letter to Nunavut Impact Review Board, October 3.
- BGC Engineering Inc. (BGC). 2017. *Review of Madrid North Project Revisions, Doris North Project, Nunavut*. Project memorandum submitted to Kitikmeot Inuit Association. Project No. 0454004-09, January 19.
- Nunavut Water Board (NWB). 2017. Licence No. 2BB-MAE. *Application by TMAC Resources Inc. for the Madrid Project – Request for Information*. Letter to TMAC Resources. NWB File No. 2BB-MAE---, January 20.

### KIA Comment #K1 (KIA 2015):

If waste rock is to be moved in the future, then 2:1 slope is fine. If the waste rock slopes are to be regraded in the future to 2.5 to 3:1, then that shifts reclamation costs to the future. There is less liability to the KIA if final reclamation slopes were placed during operations.

### TMAC Response to KIA Comment #K1 (KIA 2015):

It is acknowledged that constructing the waste rock dumps to the final reclamation slopes from the outset would reduce closure liability. However, space for infrastructure development near the underground portals is limited due to challenging terrain, and there is a desire to remain as far as practical on sound foundation conditions. This demanded that design of the infrastructure for Madrid North and Madrid South be based on minimization of the disturbed footprint, such that any supporting water management features could equally be reduced in size. Furthermore, TMAC does believe that the bulk sample will demonstrate economic viability of the mine, which would imply transition to production mining which in turn would result in all waste rock returned underground as backfill. This careful balance of physical and economic constraints has led TMAC to the decision to construct the waste rock dumps with slope angles of 2H:1V, recognizing, that should they default, resloping to 3H:1V would be required prior to placement of the

closure cover. This has been carefully and conservatively estimated and the final closure cost estimate did include \$47,102 towards such resloping. This is a nominal cost considering the overall closure liability of \$7,228,000, and therefore TMAC does not believe this constitutes undue liability that outweighs the physical and economic constraints described.

KIA Comment #K8 (KIA 2015):

The conceptual closure plan of 60 mil HDPE covered with 30 cm of gravel may cause puncture risks, depending upon size of gravel fragments and equipment used to place. A less risky but costlier assumption would be HDPE covered by a heavy weight geotextile covered by sand and gravel layer. The KIA would be assuming risks regarding puncture of this cover layer.

TMAC Response to KIA Comment #K8 (KIA 2015):

It is acknowledged that lack of a protective geotextile layer may increase the risk of geomembrane puncture. Therefore, the low permeability cover concept was revised, to include a 0.15 m layer of crushed gravel underliner, as well as two layers of non-woven geotextile; one above and one below the HDPE membrane. Including the geotextile as an additional protective layer also means that the crushed gravel is adequate granular protection, and sand is not required.

The closure cost estimate already includes a total allowance of \$3,355,881 for tasks related to the waste rock dumps reclamation. Associated costs in excess of the costs already included are presented in Table 1 below. Unit rates for the crushed rock included at the time of the original cost estimate were used, for consistency. The cost of the geotextile was obtained from the RECLAIM 7.0 cost model template.

**Table 1: Additional Estimated Costs for Waster Rock Piles Reclamation**

Task	Quantity	Unit	Unit Rate	Cost
<b>Madrid North</b>				
Place 0.15 m underliner of crushed rock (LHDP)	4,875	m <sup>3</sup>	\$18.83	\$91,801.35
Place non-woven geotextile (supply and install)	71,500	m <sup>2</sup>	\$3.44	\$245,960.00
<b>Madrid South</b>				
Place 0.15 m underliner of crushed rock (LHDP)	6,273	m <sup>3</sup>	\$18.83	\$118,127.15
Place non-woven geotextile (supply and install)	92,004	m <sup>2</sup>	\$3.44	\$316,493.76
<i>Subtotal Madrid North</i>				\$337,761
<i>Subtotal Madrid South</i>				\$434,620
<b>Total Additional Cost</b>				<b>\$ 772,381</b>

During completion of the cost update, some inconsistencies and errors were noted and corrected, which resulted in the reduction of the cost for some of the tasks.

An error was found in the volume of HDPE liner protective gravel referenced for Madrid North. The initial cost estimate erroneously referenced 32,500 m<sup>3</sup> whereas the correct volume is 9,750 m<sup>3</sup>. Correction of this error resulted in a reduction of the direct costs associated with the waste rock dumps reclamation by \$428,406.

The Madrid North Conceptual Closure and Reclamation Plan (Appendix 9: SRK, October 2014 Memo – Hope Bay Project: Madrid Advanced Exploration Project: Conceptual Closure and Reclamation Plan) assumed that non-hazardous and demolition waste would be shipped off-site for disposal. This is inconsistent with the currently approved closure plan for Doris North Mine Interim Closure and Reclamation Plan (TMAC Resources Inc. June 2015), which includes use of an approved non-hazardous waste landfill. Since the landfill will be available, and will have the capacity to receive waste from Madrid, there is no longer a need to ship non-hazardous waste off-site. Correcting this inconsistency resulted in a further reduction of the closure cost by \$316,140.

On aggregate, the updated closure cost estimate increased by about \$97,000 after including the additional costs and taking into account the corrections noted above. A comparison between the initial cost estimate and the updated cost summary is shown in Table 2.

**Table 2: Updated Cost Summary (*Value that has changed are shown in italics*)**

	Initial Cost Estimate	2017 Update
<b>Madrid North Surface Infrastructure</b>	<b>\$1,834,000</b>	<b>\$1,743,000</b>
Upper Portal Area	\$25,000	\$25,000
Lower Portal Area	\$25,000	\$25,000
Fuel Storage Facility	\$7,000	\$7,000
Pond Access Road	\$1,000	\$1,000
Pollution Control Pond	\$12,000	\$12,000
Portal Pad Road	\$6,000	\$6,000
Ore Stockpile Pad	\$1,000	\$1,000
<i>Waste Rock Pile</i>	<i>\$1,707,000</i>	<i>\$1,617,000</i>
Madrid North Vent Raise	\$48,000	\$48,000
<b>Madrid South All-Weather Road</b>	<b>\$17,000</b>	<b>\$17,000</b>
Madrid South All-Weather Road	\$17,000	\$17,000
<b>Madrid South Surface Infrastructure</b>	<b>\$1,757,000</b>	<b>\$2,192,000</b>
Infrastructure Pad Area	\$36,000	\$36,000
Laydown Pad	\$1,000	\$1,000
Portal Area	\$25,000	\$25,000
Primary Pollution Control Area	\$11,000	\$11,000
Haul Road and Water Supply Infrastructure	\$5,000	\$5,000
Infrastructure Access Road	\$1,000	\$1,000
<i>Waste Rock Pile</i>	<i>\$1,648,000</i>	<i>\$2,083,000</i>
Ore Stockpile Pad	\$1,000	\$1,000
Madrid South Vent Raise Area	\$26,000	\$26,000
<i>Off-site Shipping for Disposal</i>	<i>\$740,000</i>	<i>\$432,000</i>
<i>Off-Site Disposal Fees</i>	<i>\$77,000</i>	<i>\$69,000</i>
<b>TOTAL DIRECT COSTS</b>	<b>\$4,425,000</b>	<b>\$4,453,000</b>
Contingency	\$720,000	\$789,000
Mobilization & Demobilization	\$712,000	\$712,000
General and Administration costs	\$34,000	\$34,000
Field support	\$30,000	\$30,000
Hydrocarbon decontamination	\$150,000	\$150,000
Post-closure Monitoring	\$1,060,000	\$1,060,000
<b>Subtotal Indirect Costs</b>	<b>\$2,706,000</b>	<b>\$2,775,000</b>
<b>CLOSURE COSTS - TOTAL</b>	<b>\$7,131,000</b>	<b>\$7,228,000</b>

BGC Comment (BGC 2017):

Waste rock pile side slopes of 2.3H:1V were designed while slope angles of 2H:1V were used for ore stockpiles. As noted previously, the ore piles would be processed and the tailings generated during processing would be placed in the Tailings Impoundment Area (TIA). Waste rock piles would remain on site with some waste rock being used later for plugging of the portals. Remnant waste rock would be regraded to 3H:1V slopes and covered with HDPE liner and 0.3 m of crushed rock. In order to minimize potential closure liability costs to the KIA, should TMAC default on the site, it is recommended that waste rock side slopes of 3H:1V be used during placement of the waste rock.

TMAC Response to BGC Comment (BGC 2017):

The reader is referred to the earlier response to KIA Comment #K1 (KIA 2015). The same response applies here.

NWB Comment (NWB 2017):

Following this, the NWB requires the following information to be submitted by TMAC:

- An update of the Project milestones that includes Doris as well as the Madrid Project.
- A discussion on the capacity of the TIA to be able to retain Doris as well as Madrid waters until a solution to the toxicity testing for marine environment can be attained or the TIA water salinity declines and it can be tested under current toxicity testing methodology and discharged, if compliant to the marine environment.
- A discussion on whether water level constraints in the TIA can be met following the Madrid water input on a regular basis, over a determined period of time.
- A discussion on TIA water quality predictions to ensure TIA discharges met water quality criteria required under the MMER, specifically referring to the following parameters: chloride, arsenic and nickel and any other parameter with environmentally relevant concentrations in the Madrid Area, and
- A discussion on how the Applicant plans to reuse PCP's water for drilling at Madrid; and how it would prevent the water impact on the surrounding environment, best management practices to be applied identifying any mitigation measures that will be considered for avoiding or reducing the introduction of contaminants to the environment.

TMAC Response

In accordance with the Proposed Amendment to the *Metal Mining Effluent Regulations, Overview for Information* release in December 2016 by Environment and Climate Change Canada (ECCC), the proposed amendments, which includes a solution to toxicity testing for the marine environment, are expected to be published in the Canada Gazette, Part I (CGI) in spring 2017. Canada Gazette, Part II (CGII) publication would likely occur 12 to 18 months following CGI, i.e. fall 2018 at the latest. This is therefore the expected time when TMAC will be permitted to discharge to the marine environment.



In accordance with TMAC's overall development plan, as most recently presented in their December 2016 Phase 2 Draft Environmental Impact Statement (DEIS) mining at Madrid North is proposed for 2019, and mining at Madrid South would occur in later years.

In accordance with TMAC's estimates of groundwater inflow (SRK Consulting (Canada) Inc. 2014. Hope Bay Project: Madrid Advanced Exploration Project: Underground Inflow Estimates. Memo submitted to TMAC Resources Inc., October 31), the Madrid North Bulk sample is entirely within permafrost and therefore no groundwater interaction is expected prior to Phase 2 approvals. Groundwater inflow is expected for Madrid South. In accordance with the schedule outlined above, and ECCC's schedule for amending the MMER, there is no instance where groundwater interaction from either the Madrid North or Madrid South bulk sample is expected that would require temporary storage within the TIA, and therefore no additional analysis is required with regard to the capacity of the TIA to manage such water both from a quantity or quality perspective.

TMAC would like to clarify that the use of PCP for drilling at Madrid North and Madrid South is limited to underground production drilling. Therefore all this water will be used in the underground mine with no exposure to the outside environment. Any water in the PCP that exceed the volume required for underground drilling will be discharged to the tundra if it has been demonstrated to meet discharge criteria, or trucked to the TIA as described in the application. The peak design capacity of both the Madrid North and Madrid South PCPs are about 15,000 m<sup>3</sup>, so assuming both ponds experience the peak design flood event every year, and requires drainage to the TIA, that would constitute 30,000 m<sup>3</sup> in any given year. The average annual TIA inflow is 1.5 million m<sup>3</sup>, so this inflow from Madrid North and South would add 2% to the overall inflow which will not have any material impact on the TIA operation.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.