

CIRNAC Comments to NIRB Re: TMAC Resources Inc.'s Doris North Gold Mine and Phase 2 Hope Bay Belt Projects 2019 Annual Report



Canada

Nunavut Regional Office
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Your File: Votre référence
05MN047 & 12MN001
Our File: Notre référence
CIDMS # 1287145

July 27, 2020

Keith Morrison
Technical Advisor II, Monitoring Officer
Nunavut Impact Review Board
P.O. Box 1360
Cambridge Bay, NU, X0B 0C0
Via electronic mail to: info@nirb.ca

Dear Mr. Morrison,

Re: Comment Request for TMAC Resources Inc.'s Doris North Gold Mine Project and Phase 2 Hope Bay Belt Project, 2019 Annual Report

On June 12, 2020, as per Section 12.7 of the *Agreement between the Inuit of the Nunavut Settlement Area and Her Majesty The Queen in Right of Canada* (Nunavut Agreement) and the Doris North Project Certificate [No. 003] and the Phase 2 Hope Bay Belt Project Certificate [No. 009], the Nunavut Impact Review Board (NIRB) requested parties to review TMAC Resources Inc.'s (TMAC's) 2019 Annual Report with respect to effects and compliance monitoring.

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has conducted a review of the 2019 Annual Report and related documents in areas under its mandate pertaining to effects and compliance monitoring. On this basis, CIRNAC would like to provide the comments attached for the NIRB's consideration.

CIRNAC appreciates the opportunity to review TMAC's Doris North Gold Mine and Phase 2 Hope Bay Belt Projects 2019 Annual Report and looks forward to working with the NIRB and TMAC through future reviews for these projects. Should you have any questions, please do not hesitate to contact Elena Petre at 867-945-4567 or by email at elena.petre@canada.ca.

Sincerely,



Felexce Ngwa
Manager, Impact Assessment



1. Effects Monitoring

The 2019 Annual Report has been evaluated to assess the measurable changes to the valued components/indicators under CIRNAC areas of interest, compared to the potential effects that were predicted to result from a proposed development of Doris North and Phase 2 Hope Bay Belt Projects, taking into account the Final Environmental Impact Statement (FEIS), Monitoring Reports of previous years and the requirements included in the Projects Certificates. The assessment considered the following:

- a. ***Whether the conclusions reached by TMAC Resources Inc. in the 2019 Annual Report are valid; and***
- b. ***Any areas of significance requiring further supporting information or any changes to the monitoring program which may be required***

Within the areas under its mandate, CIRNAC did not identify any information that would invalidate the conclusions reached by TMAC in the 2019 Annual Report. However, the data interpretation would benefit from the comments included in this document.



Comment Number:	CIRNAC #1
Subject:	Lake Sediment Metal Concentration Trends
Reference:	<ul style="list-style-type: none"> Section 2.2.2, Section 3.6 and Appendix C.3.3.1 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report's Appendix C-4: 2019 Aquatic Effects Monitoring Program Report
Issue/Rationale:	<p>Visually, there appears to be potential upward trends in some sediment metal concentrations. Chromium (Figure 3.4-3) and arsenic (Figure 3.4-1) concentrations appear to be increasing in Doris Lake and potentially in Patch Lake. Copper sediment concentrations in Doris Lake may also be increasing (Figure 3.4-4).</p> <p>These potential increases are dismissed as not statistically significant based on the chi-squared and p-values of a linear regression and similar regression on the Reference Lake B. (Appendix C.3.3.1 of Appendix C-4).</p> <p>The statistical power of the sediment sampling program appears such that a very large or long-term change would be required to register as 'significant.' The physical method of sample collection may also impact on the independence of annual samples.</p> <p><u>Statistical Power</u></p> <p>The 'significance' or 'non-significance' of a trend is more difficult to determine with few samples. If there have been ten years of sampling, and only the last few years have involved mine development, then there are only a handful of samples before and after mine development.</p> <p>Taking arsenic as an example, a standard deviation of 2.5 mg/kg was estimated from the Figure of Appendix C.3.3.1. In order to determine the difference between a population mean of 10 mg/kg (a long-term visual average) and the recent ~13 mg/kg, there would need to be 10-12 samples taken since mine development occurred to reliably detect the difference. In other words, since sediment sampling appears to be annual, it is not clear how many years of elevated results would be needed before the statistical tests chosen indicate significance, given the observed scatter in the data.</p> <p><u>Independence of Sediment Samples</u></p> <p>Sediment deposition rates in the sampled lakes are likely to be very low, on the order of mm/year. A sediment grab sample, compositing material over perhaps 5 cm of depth, is therefore likely to collect many years' worth of sediment deposition. The assumption of independence between chemistry data from annual sediment samples is made in the trend analysis. In fact, if impacted sediment exists it is limited to a thin layer near the surface, which is then 'averaged' with older non-impacted sediment, understating a potential trend.</p>
Recommendation:	<p>CIRNAC recommends that TMAC provide:</p> <ol style="list-style-type: none"> Further information on the sediment sample collection method,



Comment Number:	CIRNAC #1
	<p>specifically the depth of sediment retrieved and the depth range of sediment composited for analysis.</p> <p>b) Additional information on the natural sedimentation rate of Project-impacted lakes. The sample information could then be compared to any calculations or estimates of the natural annual sedimentation rates of the lakes in question.</p> <p>c) A comment on the statistical power of the annual sampling program, and if samples at the relevant guideline or action level were detected in one year, how many further years of identically high samples would be required before the chosen statistical test returns 'significance'.</p>

Comment Number:	CIRNAC #2
Subject:	Ice Thickness Plots
Reference:	<ul style="list-style-type: none"> • Appendix C-4 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Hope Bay Project: 2019 Aquatic Effects Monitoring Program Report • Appendix C of Appendix C-4: 2019 Evaluation of Effects Supporting Information
Issue/Rationale:	<p>Reporting of ice thickness for all lakes uses April data, but connects annual data with both linear and smoothed lines.</p> <p>The locally estimated scatterplot smoothing (LOESS) curves of ice thickness in Appendix C-4, Figure 3.1-1, while perhaps an attempt at improving readability or finding trends, appears to extrapolate outside of the available data. Furthermore, LOESS, as a regression technique, requires dense datasets; annual data frequency is not suitable. No smoothing of data is necessary for the discussion. The related figure in Appendix C, Section C.3.1 is appropriate except for the language around annual means, which is not applicable to N=1 measurements per year.</p>
Recommendation:	<p>CIRNAC recommends that TMAC:</p> <p>a) Choose smoothing coefficients (in Appendix C-4, Figure 3.1-1 and the graph and table of Appendix C, Section C.3.1) in such a way that extrapolation outside of the available data is avoided, or the curves removed.</p> <p>b) Clearly label the plots as April (or the actual month when the value was measured for that particular year) ice thickness, rather than maximum or annual mean unless multiple ice thicknesses are measured to support a mean or maximum determination, in any future annual reports.</p>



Comment Number:	CIRNAC #3
Subject:	Ice Thickness Trends
Reference:	<ul style="list-style-type: none"> • Section 3.1 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report's Appendix C-4: 2019 Aquatic Effects Monitoring Program Report • Appendix C of Appendix C-4: 2019 Evaluation of Effects Supporting Information • CIRNAC Comments to NIRB Re: Hope Bay 2018 Annual Report • ERM 2019a 2019 Doris Hydrology Compliance Monitoring Summary • Benson BJ, Magnuson JJ, Jensen OP, Card VM, Hodgkins G, Korhonen J, Livingstone DM, Stewart KM, Weyhenmeyer GA, Granin NG. Extreme events, trends, and variability in Northern Hemisphere lake-ice phenology (1855–2005). <i>Climatic Change</i>. 2012 May 1;112(2):299-323 • Shuter BJ, Minns CK, Fung SR. Empirical models for forecasting changes in the phenology of ice cover for Canadian lakes. <i>Canadian Journal of Fisheries and Aquatic Sciences</i>. 2013;70(7):982-91
Issue/Rationale:	<p>Ice thickness is not expected to change due to the Project, but under-ice water depth (and associated habitat) could be affected if lake levels decrease. CIRNAC (2019) requested reporting of ice thickness for all lakes and comparison to baseline values and FEIS predictions.</p> <p>April Ice thickness data are presented in the 2019 Annual Report, Appendix C-4 Figure 3.1-1 for monitored lakes since 2004. The figure allows a visual comparison to baseline conditions. More detailed ice thickness plots are found in Appendix C of Appendix C-4, Section C.3.1.</p> <p>Appendix C-4 Figure 3.1-1 and associated discussion addresses CIRNAC's 2019 Comment #2 regarding ice thickness. Doris Lake water levels for 2019 are available in ERM 2019a Appendix A Figure A8.</p> <p>A long-term plot of lake level in Doris Lake, presented alongside April (or the month of measurement) ice thickness and estimated under-ice water volume, would address the comment more completely.</p> <p>The finding of no statistically significant trend in lake ice thickness is questionable. Visually, there appears to be a consistent trend towards lower ice thickness, though with considerable scatter as expected from climate data. Project-related changes in ice thickness are not suspected, given that Reference Lake B appears to have the same trend.</p> <p>The statistical power of the ice thickness comparison, as in CIRNAC Comment #2 above, appears low based on the wide scatter in the baseline ice thickness data and the single measurement per year.</p>



Comment Number:	CIRNAC #3
	<p>Ice thickness is a cumulative result of an entire season's climate, and each individual ice measurement can be made with relatively high precision. A regression of ice thickness versus year appears to produce a negative trend with a p-value lower than 0.05, and many lakes appear to show a similar trend.</p> <p>Lake ice literature (e.g., Benson et al. 2012) predicts later freeze-up and earlier ice-off dates in the future, with lake mean depth and important predictor variable (Shuter et al. 2013). The difference in mean depth between Reference Lake B and Doris Lake reduces the value of this single reference lake as a proxy for detecting project change. Collecting data on ice-on and ice-off dates could improve the detection of potential trends in ice cover.</p> <p>Reporting of freeze-up and ice-off dates would allow comparison with trends in other Project-adjacent lakes (Little Roberts Lake, Patch Lake, Windy Lake, Glenn Lake, etc.) and lakes elsewhere in the literature and potentially be more reliable than a single ice thickness measurement at one point in time each year. It is recognized that ice thickness is the parameter relevant to overwintering fish habitat, and that April ice thickness, specified in the Aquatic Effects Monitoring Program (AEMP), must continue to be the measurement used for trend analysis due to the existing period of record.</p>
Recommendation:	<p>CIRNAC recommends that TMAC :</p> <ul style="list-style-type: none"> a) Present the available overwintering fish habitat volume in Doris Lake in a multi-year plot, incorporating both lake level and April (or other month of reference in that year) ice thickness. Such a plot would be simpler to interpret than separate statistics for both lake level and ice thickness when considering room for fish habitat over winter. b) Collect and report data on ice-on and ice-off dates, in future annual reports, to improve the detection of potential trends in ice cover.

Comment Number:	CIRNAC #4
Subject:	Water and Load Balance in TIA
Reference:	<ul style="list-style-type: none"> • SRK 2019 - Doris Mine Annual Water and Load Balance Assessment – 2019 Calendar Year • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document
Issue/Rationale:	The water and load balance model is being used appropriately to check the current and potential future concentrations of parameters of interest. The total quantity of mine water is tracking less than FEIS prediction and there has been, as of reporting time, no discharge to Roberts Bay. The following parameters of potential concern are highlighted by the Water and Load Balance Assessment report as



	<p>potential future issues.</p> <p><u>Cyanide and Arsenic</u></p> <p>According to the model, total cyanide concentrations may exceed the Metal and Diamond Mining Effluent Regulations (MDMER) limits in the future but appear manageable with appropriate Tailings Impoundment Area (TIA) and discharge management. Similarly, total arsenic concentrations are predicted to exceed MDMER limits within the next few years, and appropriate treatment is planned. Model calibrations to improve cyanide predictions were undertaken by SRK (2019) and are now trending well with observations (Table 9 vs Table 5). The annual calibration of the water and load balance model is essential in understanding the monitoring data and foreseeing potential issues.</p> <p><u>Total Suspended Solids (TSS) and Total Copper</u></p> <p>TSS, carried along with it the total copper concentration, appears to be a potential concern in the TIA (Table 15 of 2019 Annual Water and Load Balance Assessment). Adjustments to the model in SRK (2019) Table 9 have not resolved the model underprediction of TSS. The model is not expected to simulate TSS correctly due to non-conservative behaviour in the Doris TIA, presumably settling and/or resuspension.</p> <p>The Water and Load Balance Assessment report notes that “TMAC is actively taking steps to manage TSS in the Doris TIA.” Minimal mention of this topic is found in the 2019 Annual Report. Table 8-2 of the 2019 Annual Report notes that water quality in the TIA was monitored weekly and did not exceed relevant Canadian Council of Ministers of the Environment (CCME) guidelines, so no ecological risk assessment was conducted. The 2019 Annual Report mentions drill cuttings and mud being managed within the TIA, and the TIA is mentioned in various spill reporting sections as the disposal facility for contaminated material. TSS is only discussed in the context of individual reportable spills (2019 Annual Report Table 7.2-1. Summary of Reportable Spills in 2019).</p> <p><u>Ammonia</u></p> <p>“Unionized ammonia concentrations increased in August and September 2019 in the Doris TIA to just under three times the future MDMER limit”. We understand that the limit is only ‘future’ because it applies to discharge to Roberts Bay, which at the time of reporting had not yet occurred.</p> <p>This statement does not appear to be supported by the relevant row in Table 13 of the 2019 Annual Water and Load Balance. Exceeding un-ionized ammonia limits by a factor of three would be a concern once the Roberts Bay outfall is in operation. The ability of the TIA to hold non-compliant water before discharge is one potential mitigation for temporary water quality impacts, such as those from an algal bloom or a pH change, assuming the treatment plant can alter pH</p>
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	before discharge.
Recommendation:	<p>CIRNAC recommends that TMAC present in any future annual reports:</p> <ul style="list-style-type: none"> a) The steps being taken to manage TSS in the TIA in the main body of the annual report. b) Examination and discussion on any parameters of potential concern in the TIA against the ability of the TIA effluent treatment plant and/or saltwater mixing tank to mitigate before discharge to Roberts Bay. c) Discussion on the ability of the TIA to hold effluent until compliant given predicted inflows.

Comment Number:	CIRNAC #5
Subject:	Surface Water Hydrology
Reference:	<ul style="list-style-type: none"> • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document, Page 8-20 (pdf Page 186); Table 8-2 Summary of Madrid-Boston Residual Effects and Monitoring Program under Project Certificate No.009; Subject Area: Surface Hydrology • Appendix C-4 : 2019 Aquatic Effects Monitoring Program Report; Appendix B: 2019 Hydrology Compliance Monitoring Summary; Sections 4.2 (Runoff) and 4.3 (Outflows), Pages 15 and 16 (pdf Pages 192 and 193)
Issue/Rationale:	<p>The Table 8-2 summary of residual effects and monitoring for surface hydrology includes the result: “Monitoring results indicated that lake levels and outflow were within natural variation of previously collected baseline data.”</p> <p>The Hydrology Compliance Monitoring Summary presents a thorough description of the water level and outflow collected, modelled and estimated for 2019, but provides only limited baseline data. The limited baseline data are found in Table 4.3: Comparison of 2019 Runoff with Historical Averages and Predicted Values.</p> <p>Runoff is a measure of total annual outflow which does not provide information on annual fluctuation of lake levels or duration of seasonal outflow. Possible adverse impacts of reduced lake and stream water levels were not likely to be apparent in 2019 which was a very wet year (about 20-year recurrence) based on precipitation monitoring.</p> <p>Baseline water level and outflow hydrographs should be included in future hydrology compliance monitoring reports to be readily available for interpretation of dry year monitoring results. Monitoring results that are interpreted in relation to “natural variation of previously collected baseline data” should include the baseline data that were considered.</p> <p>Table 4-3 (reproduced below) presents monitored and predicted average runoff depths for seven sites. Monitored depths are</p>



Comment Number:	CIRNAC #5																																																					
	<p>presented for the 11-year period from 2004 to 2015. Predicted depths are from the Hope Bay Project FEIS (TMAC, 2017). The monitored and predicted depths (mm) are in poor agreement.</p> <p>Table 4-3: Comparison of 2019 Runoff with Historical Averages and Predicted Values</p> <table border="1"> <thead> <tr> <th rowspan="2">Station</th> <th colspan="3">Monitored Runoff (mm)</th> <th colspan="2">FEIS Predicted Runoff¹</th> </tr> <tr> <th>2018</th> <th>2019</th> <th>2004-2015 Average¹</th> <th>Predicted Average Runoff</th> <th>Predicted 20y Wet Runoff</th> </tr> </thead> <tbody> <tr> <td>Windy Outflow</td> <td>n/a</td> <td>174</td> <td>130</td> <td>58</td> <td>119</td> </tr> <tr> <td>Patch Outflow</td> <td>111</td> <td>189</td> <td>112</td> <td>77</td> <td>137</td> </tr> <tr> <td>PO Outflow</td> <td>128</td> <td>222</td> <td>153</td> <td>80</td> <td>143</td> </tr> <tr> <td>Ogama Outflow</td> <td>93</td> <td>167</td> <td>117</td> <td>100</td> <td>199</td> </tr> <tr> <td>Doris Creek TL-2</td> <td>129</td> <td>191</td> <td>110</td> <td>101</td> <td>213</td> </tr> <tr> <td>Roberts Outflow- 2</td> <td>111</td> <td>156</td> <td>112</td> <td>n/a</td> <td>n/a</td> </tr> <tr> <td>Little Roberts Outflow</td> <td>n/a</td> <td>175</td> <td>93</td> <td>161</td> <td>347</td> </tr> </tbody> </table> <p>Ratios of monitored average runoff to FEIS predictions are as follows:</p> <ul style="list-style-type: none"> • Windy Outflow 130 vs 58: 124% higher than predicted) • Patch Outflow 112 vs 77: 45% higher than predicted • PO Outflow 153 vs 80: 92% higher than predicted • Ogama Outflow 117 vs 100: 17% higher than predicted • Doris Creek TL-2 110 vs 101: 9% higher than predicted • Roberts Outflow-2 112 vs n/a: prediction not available • Little Roberts Overflow 93 vs 161: 42% lower than predicted <p>The lack of agreement between the FEIS-predicted runoff depths and the monitored values is of concern. Reasons for large discrepancies for Windy Outflow, Patch Outflow, PO Outflow and Little Roberts Outflow should be investigated, and implications on the project water and load balance models should be discussed.</p>	Station	Monitored Runoff (mm)			FEIS Predicted Runoff ¹		2018	2019	2004-2015 Average ¹	Predicted Average Runoff	Predicted 20y Wet Runoff	Windy Outflow	n/a	174	130	58	119	Patch Outflow	111	189	112	77	137	PO Outflow	128	222	153	80	143	Ogama Outflow	93	167	117	100	199	Doris Creek TL-2	129	191	110	101	213	Roberts Outflow- 2	111	156	112	n/a	n/a	Little Roberts Outflow	n/a	175	93	161	347
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Recommendation:	<p>CIRNAC recommends that TMAC:</p> <ol style="list-style-type: none"> a) Include baseline water level and outflow hydrographs in future hydrology compliance monitoring reports. b) Investigate the reasons for large discrepancies between predicted and measured runoff depths for Windy Outflow, Patch Outflow, PO Outflow and Little Roberts Outflow and discuss the associated implications on the project water and load balance models in hydrology compliance monitoring reports and future annual reports. 																																																					



Comment Number:	CIRNAC #6
Subject:	Thermal Data for the Roberts Bay Jetty – Geotechnical Inspection
Reference:	<ul style="list-style-type: none"> TMAC Resources Inc.'s 2019 Annual Geotechnical Inspection for the Doris and Madrid Sites, Attachment 4 – 2019 Annual Geotechnical Inspection of the Roberts Bay Jetty (SRK, 2020) Term and Condition #19 of Project Certificate No. 003
Issue/Rationale:	<p>It should be noted that Term and Condition # 19 of Project Certificate No. 003 required Ground Temperature Cables (GTCs) to be installed into the jetty foundation to monitor submarine permafrost. It states: <i>"The Proponent shall install thermistor cables temperature loggers in the jetty foundation as well as the new jetty foundation. The Proponent shall monitor the effects of the jetty on shallow water permafrost through operations, until such time as the NIRB determines that such monitoring is no longer necessary".</i></p> <p>Two GTCs [SRK-JT1-09 (approximately 50m from shore line along the jetty) and SRK-JT2-09 (approximately 10m from shore line along the jetty)] were installed through the jetty into submarine permafrost in 2009. One (SRK-JT2-09) was damaged in 2011, and a replacement (SRK-JT2-12) was installed in 2012. This GTC was again destroyed when the jetty was reconstructed in 2013.</p> <p>Based on the recent information provided, CIRNAC is of the opinion that the immediate replacement of the damaged near shore Ground Temperature Cable SRK-JT2-12 can be delayed for a short while. The need for the replacement of SRK-JT2-12 should be revisited in subsequent years upon receipt and review of the Annual Geotechnical Inspection reports. This is provided that the one remaining Ground Temperature Cable SRK-JT1-12 remains fully operational, has no future loss of data due to defective temperature beads and continues to show sub -1 degree C in the ocean bed sediments.</p> <p>CIRNAC also acknowledges SRK's recommendation <i>"...that an annual ground survey be completed at the jetty to monitor for settlement as an indicator of potential permafrost thaw. This would consist of a ground survey completed along the outside top crest of the jetty. The survey would be completed with a GPS or GNSS system capable of survey accuracies of ± 0.05 m and undertaken when there is no ice coverage in Roberts Bay (i.e. around freshet or in the summer months). A survey spacing of approximately 1 m around the crest is suggested as part of this additional data collection. Any areas where rig matting has been placed, or where additional maintenance activates have been completed in the year, should also be noted in the survey. The objectives of the annual ground survey are to provide better tracking of routine maintenance activities and to identify any areas of increased settlement or deformation, which could be an indicator of potential permafrost thaw. This would then provide a complimentary data set to go along with the existing GTC instrumentation."</i></p>



Comment Number:	CIRNAC #6
	<p>It should be noted that in CIRNAC's opinion the above does not waive the requirement of Term and Condition # 19 of Project Certificate No. 003 in terms of the requirement for TMAC to replace Ground Temperature Cable SRK-JT2-12.</p>
Recommendation:	<p>a) Given the recent information provided, CIRNAC is of the opinion that the immediate replacement of the damaged near shore Ground Temperature Cable SRK-JT2-12 can be delayed for a short while. The need for the replacement of SRK-JT2-12 should be revisited in subsequent years upon receipt and review of the Annual Geotechnical Inspection reports which will include the proposed additional Global Positioning System (GPS) or Global Navigation Satellite System (GNSS) ground survey settlement data.</p> <p>b) CIRNAC recommends replacement of SRK-JT2-12 should any of the following conditions arise:</p> <ul style="list-style-type: none"> • the jetty shows signs of marine permafrost degradation of the foundations; • the jetty show signs of instability; • Ground Temperature Cable SRK-JT1-12 is damaged beyond complete repair, this would require replacement of both SRK-JT1-12 and SRK-JT2-12; • Ground Temperature Cable SRK-JT1-12 becomes defective with the loss of additional temperature beads; or • Ground Temperature Cable SRK-JT1-12 shows temperature of greater than -1 degree C in the ocean bed sediments. <p>c) CIRNAC also recommends that TMAC undertake the GPS or GNSS ground survey settlement works for the jetty in September or late in the summer season when the active layer is at its deepest and the seawaters are warmest.</p>

Comment Number:	CIRNAC #7
Subject:	Geochemical Monitoring of Waste Rock – Doris Mine
Reference:	<ul style="list-style-type: none"> • Appendix C-5 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report: 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, Hope Bay Project- FINAL (SRK April 2020) • Appendix A of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Doris Mine • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document • TMAC Resources, Hope Bay Project, Waste Rock, Ore and Mine Backfill Management Plan, March 2019



Issue/Rationale:	<p>Text discussion of placement of waste rock on surface and underground does not reconcile in terms of tonnes of material presented in report tables. The manner in which the data is presented in the table is unclear and the text discussion is not in concordance with the table data.</p> <p>In Section 3 of the report, “2019 Geochemical Monitoring of Waste Rock Doris Mine” - the text discusses 165,000 tonnes of waste rock from the underground placed on Pad T, with the balance (unspecified amount) remaining underground and placed as structural backfill in stopes, and 433,000 tonnes of waste rock from the surface waste rock stockpiles on Pad T was placed as backfill in the Doris Crown Pillar Recovery (CPR). Table 3-1 presents the 165,000 tonnes of waste rock placed on Pad T and presents 265,000 tonnes of material placed as backfill in stopes. It is assumed that the 265,000 tonnes placed as backfill in stopes refers to the “balance (that) remained underground and placed as structural backfill. The Waste Rock Placement from Underground totals 430,000 tonnes.</p> <p>Table 3-1 presents material from the Doris CPR to have a total tonnage of 51,000 tonnes placed as backfill and cover of CPR and in the underground waste rock stockpile, broken down as 38,000 tonnes placed in CPR and 13,000 tonnes placed in the underground waste stockpile. This does not reconcile with the 433,000 tonnes of waste rock placed in the CPR which is discussed in the text.</p>
Recommendation:	<p>CIRNAC recommends that TMAC revise the text to match with the data presented in the table to provide a clear explanation of waste rock placement and volumes in accordance with the Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019).</p>

Comment Number:	CIRNAC #8
Subject:	Geochemical Monitoring of Waste Rock – Madrid North Mine
Reference:	<ul style="list-style-type: none"> • Appendix C-5 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report: 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, Hope Bay Project- FINAL (SRK April 2020) • Appendix B of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Madrid North Mine • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document • TMAC Resources, Hope Bay Project, Waste Rock, Ore and Mine Backfill Management Plan, March 2019
Issue/Rationale:	<p>Text discussion of placement of waste rock on surface and underground, does not reconcile in terms of volumes of material presented in tables. The manner in which the data is presented in the table is unclear and the text discussion is not in concordance with the table data.</p>



Comment Number:	CIRNAC #8
	In Section 4 of the report, “2019 Geochemical Monitoring of Waste Rock, Madrid North”- the text discusses production of approximately 11,000 m ³ of waste rock placed on the Madrid North Waste rock pile, and mining of the Naartok East Crown Pillar Recovery (NE CPR) resulted in the production of approximately 160,000 m ³ of waste rock, of which approximately 113,000 m ³ was placed on the Madrid North waste rock pile (WRP). Table 4-1 presents 10,813 m ³ which is assumed to correspond to the approximately 11,000 m ³ , and 112,841 which is assumed to correspond to the approximately 113,000 m ³ , however it is not clear in the table or the text where the remaining 87,000 m ³ from the NE CPR was placed or used. Table 4-1 includes additional volumes of material used in construction, which totals to 52,416 m ³ , and an overall total of 176,070 m ³ of waste rock placed in 2019, which also does not match the total volume placed in the text.
Recommendation:	CIRNAC recommends that TMAC revise the text to match with the data presented in the table to provide a clear explanation of waste rock placement and volumes in accordance with the Waste Rock, Ore and Mine Backfill Management Plan (TMAC 2019). Also the rounding of numbers between text and tables makes it somewhat more challenging to follow between the data presented in the text and table.

Comment Number:	CIRNAC #9
Subject:	Geochemical Monitoring of Waste Rock - Doris
Reference:	<ul style="list-style-type: none"> • Appendix C-5 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report: 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, Hope Bay Project- FINAL (SRK April 2020) • Appendix A of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Doris Mine • Appendix B of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Madrid North Mine • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document
Issue/Rationale:	Waste Rock monitoring for Doris mine is presented using tonnage, and waste rock monitoring for Madrid North is presented in terms of volume.
Recommendation:	CIRNAC recommends that TMAC use consistent units throughout a report to present similar information for different mine site monitoring.



Comment Number:	CIRNAC #10
Subject:	Geochemical Monitoring of Waste Rock – Doris Mine
Reference:	<ul style="list-style-type: none"> • Appendix C-5 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report: 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, Hope Bay Project- FINAL (SRK April 2020) • Appendix A of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Doris Mine • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document • TMAC Resources, Hope Bay Project, Waste Rock, Ore and Mine Backfill Management Plan, March 2019 • TMAC Resources, Waste Rock and Ore Management Plan, Hope Bay Project, Nunavut, August 2016
Issue/Rationale:	<p>There is no reference to, or information provided in the 2019 Waste Rock, Quarry and Tailings Monitoring Report, with respect to available mine void spaces relative to backfill volumes.</p> <p>The Waste Rock, Ore and Mine Backfill Management Plan includes the provision at the cessation of mining that all waste rock which is not suitable for use in construction will be placed underground as backfill material. The plan also includes the requirement for backfill volumes to be tracked together with each mine plan, to provide available mine void space at any given time in the mine life, providing a record of the progress towards ensuring that all mine waste is placed underground prior to the completion of mining.</p>
Recommendation:	CIRNAC recommends that TMAC incorporate presentation of data which includes already filled mine void space, currently available mine void space, along with backfill volumes of materials, in the next Waste Rock, Quarry and Tailings Monitoring Report, as well as in future annual reports.

Comment Number:	CIRNAC #11
Subject:	Geochemical Monitoring of Waste Rock – Madrid North Mine
Reference:	<ul style="list-style-type: none"> • Appendix C-5 of Hope Bay Project 2019 Nunavut Impact Review Board Annual Report: 2019 Waste Rock, Quarry and Tailings Monitoring Report, Doris and Madrid North Mines, Hope Bay Project- FINAL (SRK April 2020) • Appendix B of Appendix C-5: 2019 Geochemical Monitoring of Waste Rock, Madrid North Mine • Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document
Issue/Rationale:	Results of the geochemical monitoring for Madrid North includes classification of material that is suitable for construction and that which is not suitable for construction. The results provided in Table 3-



	<p>7 of Appendix B indicate that 64% of the material mined in 2019 was not suitable for construction, based on geologic or geochemical composition.</p> <p>The report does not comment as to whether or not the results of the geochemical assessment are consistent with pre-mining predictions of how much waste rock material will be suitable for construction. Given the requirement for all waste rock materials which are not suitable for construction to be placed underground, and there being a finite amount of underground space to accommodate mine backfill, the report should comment on whether or not the results from the 2019 monitoring impacts the overall expected volume of underground backfill.</p>
Recommendation:	CIRNAC recommends that TMAC include a brief discussion in the next Waste Rock, Quarry and Tailings Monitoring Report to indicate if findings of monitoring are consistent with pre-mining characterization and if there is any potential impact to estimates of waste rock which will be permanently stored underground.

Comment Number:	CIRNAC #12
Subject:	Mine Inflow Chemistry
Reference:	<ul style="list-style-type: none"> • Section 2.2 and 5.2 of Hope Bay Project, Groundwater Management Plan (TMAC 2020) • Appendix D.1 of Hope Bay Project 2019 Nunavut Water Board Annual Report
Issue/Rationale:	<p>The Groundwater Management Plan requires monitoring of mine inflow water quality at the mine water discharge point (TL-12) on a weekly and monthly schedule. If mine water discharge exceeds MDMER water quality criteria, discharge to Roberts Bay must occur via the TIA and/or with treatment.</p> <p>The 2019 Nunavut Water Board Annual Report (Appendix D.1) includes the monitoring data for station TL-12; however, there is no discussion of the water quality results. Tables D1-37 to D1-42 should include MDMER water quality criteria and any exceedances should be highlighted to demonstrate proper data analysis and application of the Groundwater Management Plan. In addition, a brief discussion of the water quality results and trend analysis would be useful. For example, TDS and chloride concentration appear to show a decreasing trend over 2019. This might be associated with a slight change in the source of groundwater from high saline to fresh water from lake infiltration.</p>
Recommendation:	<p>CIRNAC recommends that TMAC:</p> <ol style="list-style-type: none"> a) Include a discussion on TL-12 mine water quality and trend analysis to assess potential changes in the source of mine inflow water in future annual reports. b) Add MDMER water quality criteria to Tables D1-37 to D1-42 in future annual reports.



Comment Number:	CIRNAC #13
Subject:	Closure and Reclamation - Revegetation
Reference:	<ul style="list-style-type: none"> Hope Bay Project 2019 Nunavut Impact Review Board Annual Report Main Document – New Term and Condition # 18 of Project Certificate No. 009 Hope Bay Project Boston Conceptual Closure and Reclamation Plan (SRK 2017a) Hope Bay Project Doris-Madrid Interim Closure and Reclamation Plan (SRK 2017b)
Issue/Rationale:	<p>Term and Condition # 18 identifies the expectation that progressive reclamation efforts are to be <i>“informed by revegetation trials in the Project area and must include monitoring protocols over sufficient timeframes to measure success and ensure invasive plant species have not established.”</i></p> <p>While it is acknowledged that descriptions of progressive reclamation programs were submitted and approved by the NWB in 2019 (as signalled by the receipt of the applied for licence), there appears to be no plan to conduct any deliberate revegetation trials (or direct reclamation research), and instead compliance monitoring data will be relied upon to identify any potentially “problematic trends or unforeseen processes” (per Section 7 in SRK 2017a and Section 5.3 in SRK 2017b).</p> <p>This approach is reactive and may result in missed opportunities to identify reclamation techniques that are tailored to the project site (particularly with respect to deliberate revegetation efforts). Additionally, compliance monitoring programs are usually designed to answer specific questions, and the resulting data may not be fully suited to answering closure and reclamation questions as well.</p> <p>Sections 4.4.2 and 4.5.5 of the reclamation plans (SRK 2017a and b, respectively) state that <i>“revegetation works may consist of application of seeds collected from the surrounding vegetation”</i>; there are relatively straightforward, cost-effective ways to turn this statement into a simple revegetation trial.</p>
Recommendation:	CIRNAC encourages TMAC to implement revegetation trials to proactively inform reclamation approaches and decisions.



Comment Number:	CIRNAC # 14
Subject:	Labour Force Needs
Reference:	<ul style="list-style-type: none"> Term and Condition #46 of Project Certificate No. 003 Hope Bay Project 2019 Annual Report Main Document, Page 6-44
Issue/Rationale:	<p>Pursuant to T&C #46 of the Project Certificate, TMAC are required to do the following:</p> <p><i>To the extent that such communications are consistent with and not limited by the Proponent's obligations under the 2015 Hope Bay Inuit Impact and Benefit Agreement (IIBA), the Proponent shall provide the Government of Nunavut (GN) and the NIRB information regarding the labour force needs of the Project as it proceeds:</i></p> <ul style="list-style-type: none"> <i>the title and number of positions required by department or work area;</i> <i>the potential start dates;</i> <i>to the level of education required (with reference to the specific positions); and</i> <i>whether on-the-job or other forms of training and certification will be required (with reference to the specific positions).</i> <p>The T&C's reporting requirements state:</p> <ul style="list-style-type: none"> <i>To be included in the Proponent's annual reporting to the NIRB or when the Proponent anticipates significant changes in labour force needs for the Project.</i> <p>As noted in the 2019 Annual Report, TMAC regularly provides labour force information to Government of Nunavut, including recruitment challenges. This information is not included the Annual Report submission.</p>
Recommendation:	CIRNAC recommends that TMAC provide labour force information in future annual report submissions pursuant to T&C #46 unless such communications are inconsistent with the Inuit Impact and Benefit Agreement (IIBA) or it can be determined the information should only be provided when significant changes in the project's labour force are anticipated.



Comment Number:	CIRNAC # 15
Subject:	Staff Schedule
Reference:	<ul style="list-style-type: none"> Term and Condition #38 of Project Certificate No. 009 Hope Bay Project 2019 Annual Report Main Document, Page 6-86
Issue/Rationale:	<p>Pursuant to T&C #38 of Project Certificate No. 009: The Proponent is strongly encouraged to submit staff schedule forecasts that, at a minimum, include the following:</p> <ul style="list-style-type: none"> <i>Title of positions required by department and division;</i> <i>Quantity of positions available by project phase and year;</i> <i>Transferable skills, both certified and uncertified which may be required for, or gained during, employment within each position; and</i> <i>The National Occupational Classification code for each individual position.</i> <p>This T&C's reporting requirements state:</p> <ul style="list-style-type: none"> <i>The staff schedule forecasts should be provided on an annual basis to the Kitikmeot Socio-Economic Monitoring Committee, with a summary of forecasting provided in the annual reports to the Nunavut Impact Review Board.</i> <p>As noted in the 2019 Annual Report, during in-person meetings with the Hope Bay Socio-economic Monitoring Working Group and Kitikmeot Socio-economic Monitoring Committee in April 2019, TMAC provided a recruitment database report that detailed job vacancies and advertisements. The company also maintains a hiring list and provides labour force projections to the Government of Nunavut's Department of Family Services.</p> <p>A summary of the staff schedule forecast information identified in this T&C is not provided in the 2019 Annual Report.</p>
Recommendation:	CIRNAC recommends that TMAC provide the staff schedule forecast information identified in T&C #34 in future annual report submissions.



Comment Number:	CIRNAC # 16
Subject:	Training Opportunities and Transferrable Skills
Reference:	<ul style="list-style-type: none"> Term and Condition #41 of Project Certificate No. 009 Hope Bay Project 2019 Annual Report Main Document, Page 6-89
Issue/Rationale:	<p>Pursuant to T&C #41, TMAC</p> <ul style="list-style-type: none"> <i>“... shall maintain an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during project employment. The listing should indicate which of these certifications and licences would be transferable to a similar job site within Nunavut.”</i> <p>A listing of formal certificates and licences that may be acquired through project related training is not included in the 2019 Annual Report.</p>
Recommendation:	CIRNAC recommends that TMAC provide a listing of formal certificates and licences that may be acquired through on-site training or training during project employment in future annual report submissions. As stated in T&C #41, this listing should indicate which certifications and licences are transferable to similar job sites within Nunavut.
Comment Number:	CIRNAC #17
Subject:	Non-Traditional Activity and Resource Use
Reference:	<ul style="list-style-type: none"> Term and Condition #44 of Project Certificate No. 009 Hope Bay Project 2019 Annual Report Main Document, Page 6-92
Issue/Rationale:	<p>Pursuant to T&C #43, TMAC</p> <p><i>“...is strongly encouraged to consult with outfitting and guiding businesses that operate in or travel through the regional study area regarding whether project infrastructure or activities is adversely affecting their use and experience of the surrounding environment.”</i></p> <p>The 2019 Annual Report does not include a summary of ongoing consultation and monitoring activities in support of this T&C.</p>
Recommendation:	CIRNAC recommends that TMAC include a summary of ongoing consultation and monitoring of potential project impacts to regional outfitting and guiding businesses.



Comment Number:	CIRNAC #18
Subject:	Cross-cultural Awareness
Reference:	<ul style="list-style-type: none"> Term and Condition #48 of Project Certificate No. 009 Hope Bay Project 2019 Annual Report Main Document, Page 6-96
Issue/Rationale:	<p>Pursuant to T&C #48, TMAC are:</p> <p><i>...encouraged to promote consideration for Inuit culture and Inuit Qaujimaningit through the establishment of cross-cultural training initiatives, for all Project employees and on-site sub-contractors. The Proponent should actively monitor</i></p> <ul style="list-style-type: none"> <i>the implementation of these initiatives throughout the life of the Project.</i> <p>As stated in the 2019 Annual Report, “TMAC continues to deliver cross cultural training to every new Hope Bay employee.” It is not known if other initiatives are undertaken to promote consideration for Inuit culture and Inuit Qaujimaningit on an on-going basis.</p>
Recommendation:	CIRNAC recommends that TMAC identify all initiatives taken to promote consideration for Inuit culture and Inuit Qaujimaningit at its project, in addition to cross-cultural training provided to new employees and on-site sub-contractors. If no such initiatives exist, CIRNAC recommends that TMAC Resources Inc. consider expanding their cross-cultural awareness programs to ensure project staff have regular exposure to Inuit culture through organized programs.

2. Compliance Monitoring

- a) Provide a summary of any compliance monitoring and/or site inspections undertaken in association with the Project, including specifically;
- Identify the Terms and Conditions from the Project Certificate which have been incorporated into any permits, certificates, licences or other approvals issued for the Project, where applicable***

CIRNAC has a broad mandate for the co-management of water resources and the management of Crown land in Nunavut under the following applicable acts and regulations:

- The Department of Crown-Indigenous and Northern Affairs Canada Act;*
- The Nunavut Agreement;*
- The Arctic Waters Pollution Prevention Act and Regulations;*
- The Nunavut Waters and Nunavut Surface Rights Tribunal Act and Regulations; and*
- The Territorial Lands Act and Regulations.*

In terms of water management in Nunavut, CIRNAC has a number of different responsibilities. The Minister of Northern Affairs has a decision-making role with regards to the Nunavut Water



Board's (NWB) issuance of any Water Licences associated with a project. Furthermore, CIRNAC participates as an intervenor in the water licensing process, providing advice and expertise. When a proposed project is approved to proceed, CIRNAC is responsible for inspecting and enforcing any Terms and Conditions contained within any Water Licence associated with the project. The NWB ensures that Project Certificate Terms and Conditions are incorporated in Water Licences.

In December of 2007, CIRNAC issued a ten-year land lease (Nunavut Lease 77A/3-1-2) for the construction and operation of the Roberts Bay Jetty and Marine Outfall Berm. Land lease 77A/3-1-7 was renewed for the Jetty and Marine Outfall Berm for 30 years and expires now in June of 2047. CIRNAC issued land lease 77A/3-3-2 for the marine outfall pipe in 2018 for a 30 year period.

CIRNAC has reviewed the Type 'A' and Type 'B' Water Licences associated with the Doris North and Phase 2 Hope Bay Belt Projects with respect to Project Certificates [No. 003 and No. 009] and included a concordance table (Appendix A) which outlines how the Terms and Conditions have been incorporated in the Water Licences and land leases.

In 2019, the projects activities and monitoring were conducted under the following Water Licences:

- Type A Water Licence 2AM-DOH1323 Amendment #2
- Type A Water Licence 2AM-DOH1335 Amendment #2
- Type B Water Licence 2BB-MAE1727
- Type B Water Licence 2BB-BOS1727
- Type B Water Licence 2BE-HOP1222

ii. A summary of any inspections conducted during the 2019 reporting period, and the results of these inspections

CIRNAC's Water Resource Officers (WROs) conducted three of TMAC's Doris North Gold Mine Project and the Phase 2 Hope Bay Belt Project in May, August, and November of 2019.

Summaries of the May, August and November inspection reports are presented below for NIRB's consideration.

May 7-8, 2019

Facilities inspected under Type A Water Licence (2AM-DOH1335) included, but were not limited to: Roberts Bay Facilities, Waste Management Area, Bulk Fuel Storage at the Single Tank Farm, Lower Laydown Area by the Batch Plant, Burn Pit by Quarry 2, Mill Pad, Detox Tailings Area, Underground Laydown Area, Doris Crown Pillar, Tailings Impoundment Area, Windy Lake Raw Water Intake, Doris Lake Raw Water Intake, Doris Main Camp, Doris Camp Pad, Doris Camp Diversion Ditch North of Camp, Fuel Storage & Refueling Station, Waste Rock Pile, Sedimentation Control Pond, Pollution Prevention Control Pond, Tailings Line, Catchment Basins East and West, North and South Dams, Tailings Discharge Line, On-ice Drilling at Patch Lake, and six reported spills (19-177, 19-165, 19-132, 19-101, 18-487, and 18-430).

Two areas of concern were noted in the CIRNAC WRO's Inspection Report:

1. Roberts Bay Facilities: At the Bulk Fuel Storage at the Single Tank Farm, snow appeared to be piled within the berm, which could have reduced the storage capacity of the



secondary containment. As part of the inspection follow up process, TMAC clarified the issue and assured the maintenance of a 110% volumetric storage capacity of the fuel tank in the event of a tank failure.

2. Spills: Two reported spills (19-177 and 18-430): As part of the inspection follow up process, TMAC conducted internal investigations, identified preventive measures and implemented corrective actions.

August 13-15, 2019

Facilities inspected on August 13, 2019 under Type A Water Licence (2AM-DOH1335) included: Roberts Bay Facilities, Waste Management Area, Bulk Fuel Storage at the Single Tank Farm, Contract Drillers Laydown Area, Tailings Impoundment Area, Doris Lake Raw Water Intake, Doris Main Camp, Doris Camp Pad, Doris Camp Diversion Ditch North of Camp, Fuel Storage & Refueling Station, Waste Rock Pile, Sedimentation Control Pond, Pollution Prevention Control Pond, Tailings Line, Catchment Basins East and West, North and South Dams, Roberts Bay Ocean Discharge Pump House, Mechanical Shop, and Underground Mining Portal Sumps 1, 2 and 3. In addition, a few of the Madrid site's construction and development areas were inspected (e.g., Crown Pillar, Overburden Stockpile, Contact Water Pond, Madrid Road's culverts). No concerns were noted in the CIRNAC WRO's Inspection Report.

Facilities inspected at Boston Camp on August 14, 2019 under Type B Water Licence (2BB-BOS1727) included, but were not limited to: Waste Management Facility, BOS-3 Discharge Point, Oil-Water Separator System, BOS-9 Discharge Location, Burn Pan and Incinerator, Bulk Fuel Storage, BOS-7, Old Landfarm, Fuel Storage at the Runway, Water Treatment Facility, and two reported spills (19-252 and 19-301). In addition, the Drill Shack was inspected under Type B Water Licence (2BE-HOP1222), which covers exploration activities and infrastructure at Windy Camp.

No concerns were noted in the CIRNAC WRO's Inspection Report.

November 12-14, 2019

Facilities inspected under Type A Water Licence (2AM-DOH1335) included: Reagent Storage Facility, Catchment Basins East and West, Doris Lake Raw Water Intake, Sedimentation Control Pond, Pollution Prevention Control Pond, Roberts Bay Ocean Discharge Pump House, Bulk Fuel Storage at the Single Tank Farm, Roberts Bay Multi-Tank Farm, Aircraft De-icing Pad, Burn Pan and Incinerator by Quarry 2, and Lanfarm Area.

No concerns were noted in the CIRNAC WRO's Inspection Report.

Detailed inspection reports can be accessed through the NWB Public Registry:

<ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-DOH1335%20TMAC/3%20TECH/A%20SCOPE%20ENFORCE/1%20INSPECTION/>

iii. A summary of TMAC Resources Inc.'s compliance status with regard to authorizations that have been issued for the Project.

There has been no noted instance of non-compliance regarding any of the authorizations issued by CIRNAC for the Project.



3. Other

CIRNAC is a member of TMAC's Hope Bay Socio-economic Working Group along with the Kitikmeot Inuit Association and the Government of Nunavut's Department of Economic Development and Transportation. The working group met in Cambridge Bay in April 2020 during the Kitikmeot Socio-economic Monitoring Committee meeting and by teleconference in May 2018 to review the 2018 Socio-economic Monitoring Report and revisions to the Socio-economic Monitoring Program.

CIRNAC is also a member of the Kitikmeot Socio-economic Monitoring Committee chaired by the Government of Nunavut's Department of Economic Development and Transportation. Fellow members include various Government of Nunavut Departments and agencies (e.g., Department of Education, Department of Family Services, and Nunavut Bureau of Statistics), the Kitikmeot Inuit Association, community organizations and industry representatives including TMAC. On April 10-11, 2019, the committee met in Cambridge Bay to review data and consider the socio-economic impacts of mining projects in the region. Unfortunately, CIRNAC was unable to participate in these in-person meetings due to competing regulatory responsibilities. CIRNAC is committed to participating in future meetings.



Appendix A: Project Certificate Terms and Conditions incorporated into Project Water Licenses and Land Use Permits or Leases, where applicable:

Project Certificate 003 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM-DOH1323 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3-3-2)
5	The Proponent shall report by January 1st of each calendar year to NIRB on its development plan for future phases of the Hope Bay Belt, including identifying development plans that may affect the selection of TIA as the preferred alternative for tailings management.	Part B (Items 6 and 14)	
10	Should water from the TIA be discharged into Doris Creek, the Proponent shall ensure that monitoring of Tail Lake and Doris Creek water quality occurs, above and below the waterfall, and is verified by an independent, third party laboratory. The Proponent must provide copies of the results directly to the NIRB and NIRB's Monitoring Officer.	Part J (Items 3, 8, and 9) and Part K (Item 2)	
13	The Proponent shall collect additional water quality data for the 2006 field season and incorporate it into a revised water quality model to be submitted to the NWB as part of the water licence application. To ensure the protection of the receiving environment at the point of discharge, the Proponent will meet discharge criteria: a. Where discharge is to the freshwater environment, on a site specific basis set by the NWB where possible and as set by the Metal Mining Effluent Regulations (MMER); and, b. Where discharge is to Roberts Bay, discharge criteria set by the MMER and the Arctic Waters Pollution Prevention Act.	Part G (Items 3, 23, 24, 27, 28, 29, 30, 32) and Part J (Item 8)	
15	The Proponent shall not permit the water discharged into Doris Creek to exceed the criteria set by the NWB.	Part G (Items 28, 29 and 30)	Part 32
16	The Proponent shall take all reasonable steps to prevent any discharge that is not in compliance with applicable regulatory approvals or requirements. If such a situation is encountered, the Proponent shall take immediate action to address the noncompliant discharge.	Part G (Items 28, 29, 30, 32) and Part J (Item 8)	Part 32
18	The Proponent shall submit to the NWB, as part of the water licence application, a program detailing the methodology for testing quarried rock for acid generation and metal leaching potential. The sampling, testing, and analysis must be done by a professional geologist registered in Nunavut.	Part D (Items 9 and 10) and Part G (items 14 and 15)	
19	The Proponent shall install thermistor cables and	Part J (Items 14, 18,	Part 41.1



Project Certificate 003 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM- DOH1323 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3- 3-2)
	temperature loggers in the jetty foundation as well as the new jetty foundation. The Proponent shall monitor the effects of the jetty on shallow water permafrost through operations, until such time as the NIRB determines that such monitoring is no longer necessary, and report the results of the monitoring collection to NIRB's Monitoring Officer.	and 19)	Clause 55 (77A/3-3-2)
31	The Proponent shall maintain a complete Closure and Reclamation Plan on file with the NWB prepared in accordance with requirements of the NWB and other regulators.	Part L (Items 5, 6, and 7)	
32	Prior to the commencement of operation the Proponent shall have a complete Environment, Health and Safety Management System in place which includes the following: <ul style="list-style-type: none"> ▪ Wildlife Mitigation and Monitoring Plan; ▪ Environmental Protection Plan; ▪ Emergency Response and Spill Contingency Plan; ▪ Occupational Health and Safety Plan; ▪ Human Resources Plan; ▪ Community Relations Plan; ▪ Monitoring and Follow-up Plan; and ▪ Auditing and Continuous Improvement Plan. When complete, these Plans shall be forwarded to the NIRB's Monitoring Officer.	Part I	Parts 25 to 31; and 35.
33	The Proponent shall ensure spill kits are at hand at the Roberts Bay oil handling facility at all times, and that appropriate containment measures are used to prevent, contain and respond to a spill in accordance with the Most recent version of the Oil Pollution Emergency Plan and Oil Pollution Prevention Plan reviewed by Transport Canada.	Part G (Items 10, 11, and 12)	Part 37
36	The Proponent shall continue year-round monitoring and recording of Doris Lake water levels during construction and operations. This will allow for detection of actual Doris Lake draw down below the sill level; computation of the amount of drawdown, quantification of the project impact, and implementation of adaptive mitigation and management measures as appropriate.	Part G (Item 34c) Part J (Items 3 and 11) Schedule B (Item 6b)	
37	The Proponent shall develop and submit a detailed Groundwater Management Plan for review during the water licensing process and to the NIRB as part of the plans available on the Doris North project. The plan shall acknowledge uncertainties pertaining	Part B (Item 6i) Part G (Item 3)	



Project Certificate 003 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM-DOH1323 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3-2)
	to predictions of groundwater quantity and quality and inform the Groundwater Management Plan. Indigenous and Northern Affairs Canada should be consulted with respect to the contents of the Plan and any required mitigation measures.		
39	At least six (6) months prior to operation of the effluent pipeline and diffuser system, the Proponent shall conduct and submit to the Board a hazard and operability study of the pipeline and marine outfall system as part of the land authorization process.		Clause 42 (77A/3-3-2)

Project Certificate 009 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM-DOH1335 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3-2)¹
1	The Proponent shall maintain an Air Quality Management Plan that addresses the following areas/issues: <ul style="list-style-type: none"> a) regular stack testing of incinerators to demonstrate emissions are within levels predicted or within applicable guidelines or standards; b) continuous NO₂ monitoring and demonstration that NO₂ emissions do not exceed levels impact predictions nor relevant guidelines; and c) implementation of dust suppression measures and demonstration that dustfall and concentrations of suspended particulate matter are within levels predicted or committed to, and within levels or limits established by applicable guidelines and regulations. 	Part B (Item 13) Part E (Item 12) Part F (Items 1 and 6) Schedule D (Item 2m)	
3	The Proponent shall maintain a Mine Closure and Reclamation Plan that addresses the following areas/issues: <ul style="list-style-type: none"> a) adaptive management approaches for monitoring and mitigation measures to 	Part B (Item 13) Part J (Items 1, 2, 3 and 8) Schedule B (Items 4, 5, and 7)	

¹ The terms and conditions of Project Certificate 009 are not applicable to the lease agreements issued by CIRNAC Land Administration as they are contained within the project approved under Project Certificate 003.



Project Certificate 009 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM-DOH1335 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3-2)¹
	<p>ensure long-term containment of the Tailings Storage Facility and Waste Rock Storage Areas;</p> <ul style="list-style-type: none"> b) measures to maintain the integrity of the groundwater quality within and adjacent to the Project; and c) estimates of the approximate fill time for the mine pits. 		
5	<p>The Proponent shall maintain a stand-alone Acid Rock Drainage and Metal Leaching Management Plan (or equivalent as may be specified under the Type "A" Water Licence) that includes the following information:</p> <ul style="list-style-type: none"> a) procedures for inspection and sampling/testing of waste rock, ore, tailings storage facilities, and quarry source material; b) thermal monitoring of waste rock and tailings storage facilities, including tailings management areas; c) seepage management and monitoring; d) a schedule for reporting of results and periodic updating of predictions for seepage water quality; e) planning for optimal cover conditions above-ground mine- and quarry-related material storage facilities; f) contingency measures that may be implemented if required, including measures to address the potential for leaching of arsenic from waste rock and ore stockpiles, and tailings under neutral pH conditions; g) plans for comparing monitoring results from receiving waters to model predictions; and h) identification of thresholds that will trigger specific management actions, including active water treatment, if trends analyses indicate water quality objectives may be exceeded. 	Part B (Item 13) Part D (Items 2, 8, 11, 18, and 19) Schedule B (Item 2) Schedule D (Items 1c and 2e) Part F (Items 1, 14, 18, 19[b,d,e,f,g,h,i,k], 20b, 21, and 22) Part I (Items 3, 7, 8, 9, 10, 11, 12, 14, 16, 17, and 19) Schedule I Part J (Items 7 and 8)	
6	In consultation with applicable regulatory agencies and experts such as Natural Resources Canada, the Proponent shall undertake additional site-	Part B (Items 13 and 15) Part D (Items 1 and 21)	



Project Certificate 009 Terms and Conditions		Incorporation in NWB Type 'A' Water Licence (2AM-DOH1335 Amendment No. 2)	Incorporation in CIRNAC land lease (Nunavut Lease No.: 77A/3-1-7 and 77A/3-2)¹
	<p>specific geotechnical investigations, permafrost monitoring, mapping and thermal analysis to:</p> <ul style="list-style-type: none"> a) document permafrost conditions, including seasonal thaw, amount of ground ice; b) inform the detailed design of project infrastructure, including foundations, such as water management structures, mine site and haul roads, waste rock storage facilities, and tailings storage facilities, including dam structures associated with the Doris North Tailings Impoundment Area; c) inform updates/revisions to management plans related to waste rock, ore, and tailings storage facilities, including adaptive management strategies with clear thresholds for implementation to minimize the potential for impacts from these facilities; and d) ensure the integrity of project infrastructure and components, including tailings cover, is maintained post-closure. 	<p>Schedule D (Items 1o and 1p)</p> <p>Part I (Item 9)</p> <p>Part J (Items 8 and 10)</p> <p>Schedule B (Item 2)</p>	
7	<p>The Proponent shall maintain an Erosion Management Plan designed to prevent or minimize erosion and its resulting effects from project-related land disturbance.</p> <p>The Plan shall include the following:</p> <ul style="list-style-type: none"> a) identification of specific project activities that require erosion control; b) description of associated erosion issues; and c) specific measures to prevent or minimize erosion. 	<p>Part B (Item 13)</p> <p>Part D (Item 6)</p> <p>Schedule D (Items 1e and 2l)</p> <p>Part E (Item 10)</p> <p>Part F (Items 4 and 19c)</p> <p>Part G (Item 3g)</p> <p>Part I (Items 9 and 10)</p> <p>Part J (Items 13 and 14)</p>	
8	<p>As part of the Mine Closure and Reclamation Plan (or equivalent), the Proponent shall develop and implement a program to progressively reclaim disturbed areas within the project footprint, with an emphasis on restoring the natural aesthetics of the area through re-contouring to the extent practicable. Acceptability of reclamation efforts should be confirmed through the Proponent's public engagement with local communities and discussion of local aesthetic values (e.g., acceptability of the topography and landscape of the project areas following progressive reclamation efforts). Progressive reclamation efforts should also</p>	<p>Part B (Item 13)</p> <p>Part J (Item 12)</p>	



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	demonstrate consideration for the feasibility of topsoil/organic matter salvage to promote revegetation.		
9	The Proponent shall implement a Thermal Monitoring Plan to identify potential changes in talik distribution and flow paths that may result from the development of project infrastructure, including underground workings, tailings storage facilities, and water impoundment areas.	Part B (Item 13) Part I (Items 7, 8, 9 and 10) Schedule I	
10	Subject to potential receipt of more detailed direction from the Nunavut Water Board, the Proponent shall: <ol style="list-style-type: none"> monitor the effects of project activities and infrastructure on surface water quality conditions; ensure the monitoring data is sufficient to compare the impact predictions made for the Project with actual monitoring results; ensure that the sampling locations and frequency of monitoring is consistent with and reflects the requirements of the Aquatic Effects Monitoring Plan, and Water Management Plan; and on an annual basis, compare monitoring results with the impact assessment predictions in the FEIS and will identify any significant discrepancies between impact predictions and monitoring results. 	Part B (Item 13) Part D (Items 8 and 9) Part E (Items 2 and 11) Part F (Items 5b, 18a,b, 22, and 24) Part I (Items 1, 12, 13, 14, 15 and 19) Schedule B (Item 4) Schedule I	
11	The Proponent shall, reflecting any direction from responsible authorities, maintain an Aquatic Effects Monitoring Program (AEMP) designed to appropriately characterize the receiving environment and ensure that adequate data is available to assess impact predictions made for the Project and prevent adverse impacts from occurring. The AEMP should include measures to: <ol style="list-style-type: none"> determine the short and long-term effects in the aquatic environment resulting from the Project; evaluate the accuracy of Project effect predictions; assess the effectiveness of mitigation and management measures on Project effects; 	Part B (Item 13) Schedule B (Items 1, 7, 9, 17 and 18) Part I (Items 1, 3, 6, 14, 17, and 19) Schedule I	



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	<ul style="list-style-type: none"> d) identify additional mitigation measures to avert or reduce environmental effects due to Project activities; e) comply with Metal and Diamond Mining Effluent Regulations requirements, should an Environmental Effects Monitoring program be triggered; f) reflect site-specific water quality conditions; g) include details comparing the watershed features from the Aimaokatalok, Windy, and Doris watersheds to the reference watersheds (Reference A, Reference B, Reference C and Reference D lakes and streams); and h) evaluate the mixing and non-mixing portion of the pit. 		
12	Unless otherwise authorized, the Proponent shall maintain an appropriate setback distance between project quarries and borrow pits from fish-bearing or permanent water bodies as required to prevent acid rock drainage or metal leaching into such Water bodies and to mitigate the potential for impacts from runoff/sedimentation associated with project quarries and borrow pits.	Part B (Item 13) Part D (Item 18) Part F(Item 1)	
13	The Proponent shall ensure that all project infrastructure in watercourses are designed and constructed in such a manner that they do not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada.	Part D (Items 16 and 17)	
15	The Proponent shall implement all applicable Fisheries and Oceans Canada best management practices to avoid and mitigate serious harm to fish as a result of the construction, operations, and decommissioning of winter ice roads, and from under ice water withdrawals. This includes adequately screening the water intake pipes to prevent impingement and entrainment of fish.	Part D (Item 16) Part E (Item 8)	
16	The Proponent shall implement all applicable Fisheries and Oceans Canada best management practices to avoid and mitigate serious harm to fish as a result of water crossing construction, operations, and decommissioning for all fish-bearing water crossings.	Part D (Items 16 and 17) Part I (Item 13) Part J (Item13)	



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18	The Proponent shall ensure that the progressive reclamation efforts outlined in its Mine Closure and Reclamation Plan or equivalent encourage recolonization by native plant species. These efforts are expected to be informed by revegetation trials in the Project area and must include monitoring protocols over sufficient timeframes to measure success and ensure invasive plant species have not established.	Part B (Item 13) Part J (Items 12 and 16)	
19	The Proponent shall maintain a Road Management Plan which includes: <ul style="list-style-type: none"> a) maintenance of traffic logs and traffic counters along the all-weather road between the Doris-Madrid mine sites and Madrid-Boston mine sites. Where traffic levels exceed levels predicted for the Project, the Proponent shall develop and implement appropriate enhancements to its wildlife protection measures; b) information regarding the road design, safety barriers, berms and features designed to ensure safe wildlife movement; c) description of safety protocols and enforcement by the Proponent, including restrictions imposed during periods of low visibility, and training provided to road users; and d) program to monitor snow bank heights along Project roads to ensure they do not pose a barrier to movement of wildlife or other land users. 	Part B (Item 13) Part D (Items 1, 10, 11 and 21)	
43	The Proponent should ensure that the development of all project monitoring plans, associated reporting and updates are undertaken with active engagement of Kitikmeot communities, land users, and harvesters. The Proponent should work with the Kitikmeot Inuit Association, the local Hunters and Trappers Organizations and the Kitikmeot Socio-Economic Monitoring Committee to report on the collection and integration of Inuit Qaujimaningit through its monitoring programs for the Project.	Schedule B (Item 14)	
44	The Proponent is strongly encouraged to consult with outfitting and guiding businesses that operate in or travel through the regional study area regarding whether project infrastructure or activities is adversely affecting their use and experience of the surrounding environment.	Schedule B (Item 14)	



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49	<p>The Proponent shall maintain a current Community Involvement Plan which reflects relevant stakeholders with respect to the Project.</p> <p>a) Records of communication and engagement undertaken by the Proponent with stakeholders, including potentially impacted communities, are to be maintained throughout the life of the Project with outcomes reflected in this Plan.</p>	Schedule B (Item 14) Part J(Item 18)	
51	<p>The Proponent shall conduct additional studies prior to and during operations as part of its freshwater and marine aquatic effects analyses to ensure that toxic trace elements concentrations anticipated to increase in the aquatic and marine environments during operation (and potentially accumulating in fish tissue) do not exceed regulatory requirements. The results of these studies should inform the Proponent's assessment of potential risks from consumption of fish, using Health Canada's hazard quotients as a descriptive tool.</p>	Part I (Items 1, 2, 3, 4, 12, 13, 14, 15, 16, 17 and 19) Schedule I	
52	<p>The Proponent shall ensure that areas used to store fuel or hazardous materials include sufficient secondary containment and that all oil handling facilities have the required Oil Pollution Emergency Plan (OPEP) in place. The OPEP or other emergency response plans applicable to fuel or hazardous material storage areas are expected to include, as a minimum, the following:</p> <p>a) information on the placement of spill prevention and response equipment as necessary to initiate rapid response during an emergency;</p> <p>b) an up to date listing of critical TMAC and government spill response contacts, and a list of authorised emergency response personnel;</p> <p>c) an up to date listing of emergency response training conducted by TMAC's emergency response personnel;</p> <p>d) easily accessible and up to date spill report forms; and</p> <p>e) a listing of community organizations that would be contacted to inform traditional land users of any spills or response actions implemented to ensure continued public</p>	Part B (Items 11, 13 and 15) Part H (Items 1, 7, 8, 9 10, and 11)	



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	<p>safety.</p> <p>The Proponent shall also demonstrate that the provisions of the OPEP or other applicable emergency response plans associated with the fuel tank farm at Roberts Bay are coordinated with the individual shipboard OPEPs required for vessels servicing the Project, and that the Shipping Management Plan addresses how response procedures between ship and shore will be coordinated.</p>		
53	<p>The Proponent shall implement a monitoring and mitigation program for the tailings pipelines that includes the following:</p> <ul style="list-style-type: none"> a) regular inspections to assess the stability of the tailings pipeline and land within the footprint of this infrastructure; b) early warning system(s) to identify a pipeline breach; c) measures to respond to and mitigate any accidental spills of tailings from the pipeline; and e) adaptive management to address unanticipated changes to land within the footprint of the tailings pipeline to ensure that the integrity of this infrastructure is maintained for the life of the Project. 	Part B (Item 13) Part D (Item 21) Part F (Items 1 and 19) Part I (Item 9) Schedule B (Item 5)	

