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November 23, 2017

Kelli Gillard
Doris North Monitoring Officer
Nunavut Impact Review Board
29 Mitik Street
P.O. Box 1360
Cambridge Bay, NU, X0B 0C0

Re: Doris Crown Pillar Recovery

Dear Ms. Gillard,

Since Project Certificate No. 3 (Project Certificate) was amended by the Nunavut Impact Review Board (NIRB) in 2016, TMAC Resources Inc. (TMAC) has commenced production at the Doris North Mine and continued to refine its mine plan for the Doris North deposit. This letter is provided to notify you that during 2018 TMAC is planning to proceed with ore recovery from within a small portion of the mine crown pillar.

The crown pillar recovery is a short-term activity and the overall concept is based on the same principles as used for the existing mine infrastructure. The crown pillar recovery is within the existing scope as all mining will occur in the Doris North ore body and the change will not impact the expected mine life or overall production. No changes to existing site infrastructure will be required. As set out in further detail below, the only new infrastructure associated with the crown pillar recovery is a temporary trench located in the same location as a previously permitted vent raise and a short spur road. This percentage change to overall footprint resulting from the new infrastructure associated with the crown pillar is 0.5% from the original approved Doris Project. Figure 2 attached shows the location of Doris Crown Pillar Recovery activity relative to existing infrastructure.

The balance of this letter and enclosed memos provide further rationale for our conclusion that this incremental change to existing mining methods and surface footprint does not meaningfully change the Doris Project as reviewed by NIRB form an environmental and socioeconomic standpoint.

A. Overview of Crown Pillar Recovery Activities

The Doris North ore body is a roughly linear quartz feature that trends north-south immediately north of Doris Lake and west of Doris Creek. Its depth ranges from a surface outcrop at the shore of Doris Lake to a depth of up to 500 m at its maximum. The top of the ore body approaches the surface just to the south of the existing vent raise in a high grade vein extension. Because this upward extension of the orebody reaches into what is known as the “crown pillar”, TMAC has adjusted its mine plan to ensure these ounces are recovered in the safest and most environmentally responsible manner. The *crown pillar* is the thickness of rock

that must be left between the top of an underground mine and the ground surface to ensure the structural integrity of the mine beneath and the long term stability of the surface after closure. When ore intrudes into the crown pillar from an underground mine it is commonly recovered by bringing the mine workings to surface in a limited excavation at the desired location.

In the Doris North case, TMAC plans to extend the mine tunnels to beneath the area of the shallow ore in the crown pillar. On the surface a 320 m spur road will be created immediately to the west of the trench to facilitate access. From surface an excavation will be made to remove the overburden and waste rock to expose shallowest portion of the ore. This will create a small (50 m wide, 200 m long) trench that will be managed similarly to a small short-lived quarry. Overburden and waste rock will be stored on the permitted pads so that it can be recovered and used as backfill in the reclamation of the crown pillar recovery trench. Once the material has been removed from the surface trench, ore-bearing rock above the underground mine tunnels in that location will be removed by haulage through the underground workings. Once all ore has been removed the trench will be backfilled with the rock that was originally removed and the overburden placed at the top of the filled space.

The entire operation is expected to be completed over a period of about 4 months in the spring and summer of 2018. Further details respecting the trench and road design are set out in the attached memos prepared by SRK Consulting:

- Hope Bay Project Crown Pillar Recovery Concepts (November 6, 2017); and
- Hope Bay Project Crown Pillar Recovery Trench Access Road (September 29, 2017.)

B. **Confirmation of Compliance with Project Certificate No. 3**

TMAC has reviewed the Project Certificate in detail to confirm that the crown pillar recovery would proceed in full compliance with all terms and conditions and required plans, and that no amendments to the Project Certificate are required to proceed. TMAC has not identified any terms or conditions that would require amendment in order for the crown pillar recovery to proceed.

In addition, to confirm that the crown pillar recovery is consistent with the environmental, heritage and cultural impacts assessed in the Doris North Final Environmental Impact Statement and associated addendums, TMAC retained ERM Consultants Canada Ltd. (ERM) to prepare the attached memo, "Hope Bay - Doris Crown Pillar Recovery Trench and Access Road Assessment" (November 21, 2017).

ERM concluded that the crown pillar recovery "*is not likely to cause significant negative impacts to the environment, socio-economic conditions, or communities. TMAC has designed the mining and restoration activity to be of short duration, allowing for optimal minimization of effects to the environment. The company is committed to developing the Doris Mine in a sustainable manner such that the extraction of the crown pillar is anticipated to have no significant environmental effects, while providing economic benefits to Inuit communities, the region, and Nunavut as a whole*."

In summary, the activities that comprise the crown pillar recovery are addressed within the existing Project Certificate, Water Licence and management plans, and are not expected to have any adverse or significant environmental impact. The crown pillar recovery will occupy negligible geographic area, and will be confined to the areas described. These activities will not be located in an area of particular ecosystem sensitivity and the area of disturbance does not

impact areas historical, cultural or archeological significance. Human and wildlife are not likely to be adversely affected. The activities will not significantly change air emissions, impede water flow, impact any aquatic life, hinder wildlife access or increase noise levels, and the activities will not interact with fish or fish habitat. As noted above, the effects are reversible as reclamation will be carried out once the activity is complete. With respect to cumulative effects, as set out in the enclosed ERM memo, "*Given that there are no new residual effects arising from the reassessment of effects to terrestrial fauna resulting from habitat loss, or soil alteration, the cumulative effects of the Hope Bay - Doris Crown Pillar Recovery development remain unchanged from that presented in the Doris North EIS*."

C. **Regulatory and Inuit Requirements**

As part of our planning, we have undertaken a review to confirm crown pillar recovery would proceed in compliance with all applicable regulatory requirements. We have not identified any new regulatory approvals that would be required to proceed with these activities.

TMAC has not identified any required amendments to its Type A Water Licence in order to proceed with this activity. The crown pillar surface works are designed to minimize the overall footprint and avoid disturbance of watercourses. During this operation a minimum buffer of 31 m from Doris Lake will be maintained, no water crossings or additional water use will be required and existing plans for management of water and roads will be followed. Reclamation of the trench will be completed as soon as the extraction is complete. The roadway will be left in place and graded to ensure proper drainage.

All crown pillar recovery activities would be located on Inuit Owned Lands and so will also proceed in compliance with TMAC's Commercial Lease and Inuit Impact Benefit Agreement with Kitikmeot Inuit Association.

The safety and stability of the crown pillar recovery operations will be reviewed and approved by the mines inspector. Additionally, TMAC has a functioning environmental health and safety management system (EHSMS) composed of numerous management plans that were developed and approved under its NIRB Project Certificate No. 003, and, Type A Water Licence 2AM-DOH1323 for the Doris mine of the Hope Bay Belt to ensure proper management and mitigation during the crown pillar recovery program.

TMAC has an approved Hope Bay Project Spill Contingency Plan as well as a Surface Emergency Response Plan (SERP) and an Underground Emergency Response Plan (UERP). The Spill Contingency Plan will be utilized for the proposed Project to safeguard against accidental spills of harmful substances that may negatively affect the environment whilst the SERP and UERP provide TMAC employees and contractors with guidance on the systematic and effective response to emergency situations

D. Conclusion

Overall, the crown pillar recovery activities are short term in duration and minor in nature. These activities will proceed in full compliance with the Project Certificate and will not result in any significant difference in the environmental or socioeconomic impacts previously predicted for the Doris Project.

As TMAC intends to proceed with crown pillar recovery planning in the near term, please advise me or Oliver Curran if you have any questions in respect of this notification.

Regards

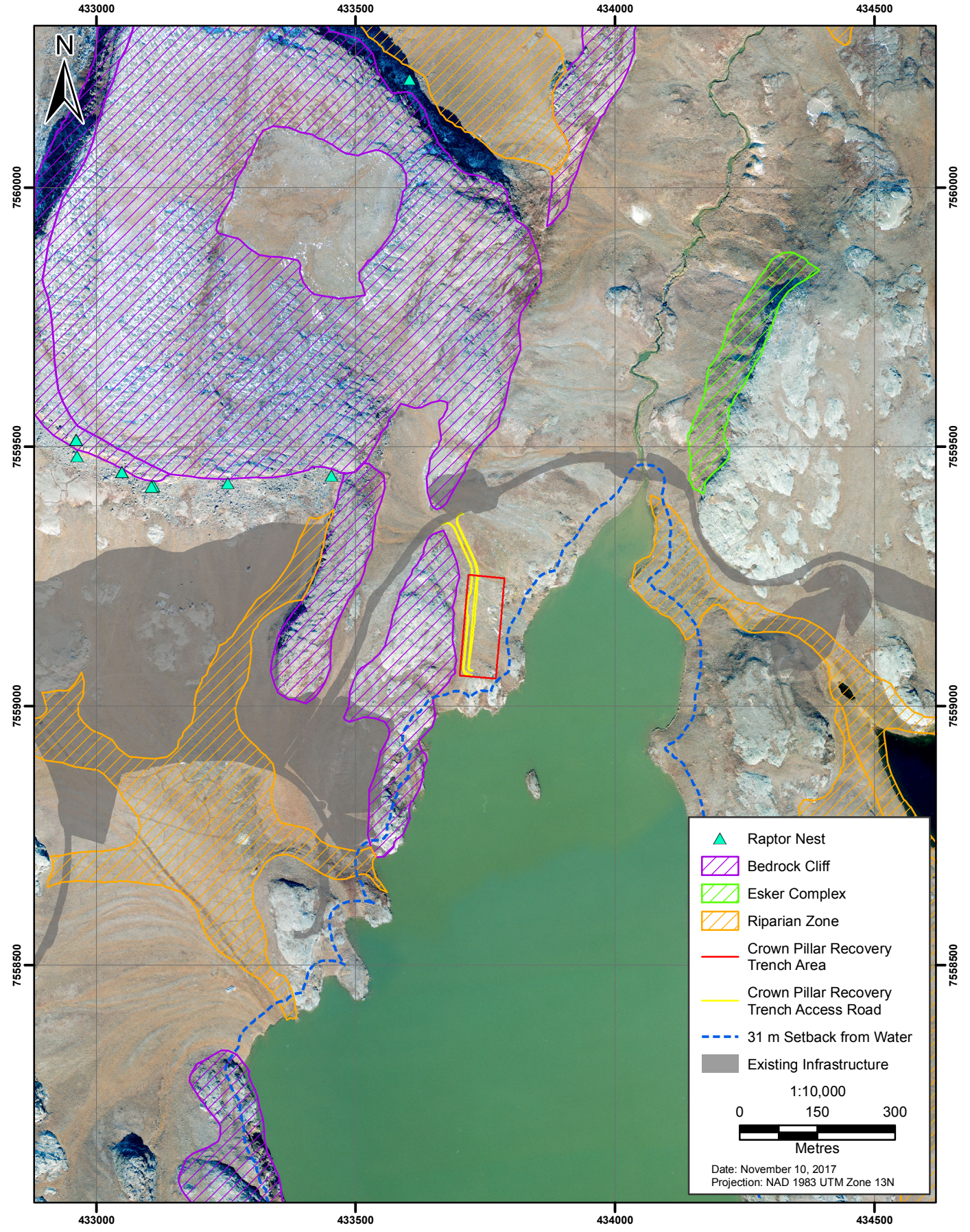
John Roberts, TMAC Resources Inc.

cc: Kitikmeot Inuit Association
Oliver Curran, TMAC Resources Inc.
Ryan Barry, Nunavut Impact Review Board

Attachments:

1. Hope Bay Project Crown Pillar Recovery Concepts (November 6, 2017)
2. Hope Bay Project Crown Pillar Recovery Trench Access Road (September 29, 2017)
3. Hope Bay - Doris Crown Pillar Recovery Trench and Access Road Assessment (November 21, 2017)

Figure 2
Value Components near the Doris North Crown Pillar Recovery Trench



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Memo

To:	John Roberts, PEng, Vice President Environment	**Client:**	TMAC Resources Inc.
From:	Cameron Hore, CPEng	**Project No:**	1CT022.015
Reviewed By:	Maritz Rykaart, PhD, PEng	**Date:**	November 6, 2017
Subject:	Hope Bay Project: Crown Pillar Recovery Concepts		

1 Introduction

The Doris Project is a gold mining and milling undertaking of TMAC Resources Inc. The Project is located 705 km northeast of Yellowknife and 153 km southwest of Cambridge Bay in Nunavut Territory, and is situated east of Bathurst Inlet. TMAC is currently operating the Doris Project under an existing water license.

TMAC plans to daylight the underground mine such that the ore within the crown pillar of the Doris mine can be recovered and processed. This process involves upward expansion of the underground mine. To ensure safe mining practices minor excavation from surface in the form of a trench is required. The safety and stability of the mining operations will be verified and approved by the mines inspector and are not in the scope of this memo. As per the existing mine plan and water license, the opened voids will be backfilled with waste rock. This memo presents the mining concept for the crown pillar recovery and should be read in conjunction with the attached set of illustrative figures.

2 Concept

2.1 Approach

The overall concept for the crown pillar recovery method are based on the same principles as used for the existing Doris mine and infrastructure. Mine voids will be backfilled with waste rock as part of the mining operations. All required pads and roads will be constructed either on bedrock, or geochemically suitable rock fill pads designed to protect the permafrost. Surface works are designed to minimize the overall footprint and avoid disturbance of waterways.

2.2 Location

The approximate location of the crown pillar recovery trench is shown on Figure 1. This is the approximate location of a previously proposed and permitted Vent Raise.

2.3 Surface Conditions

2.3.1 Overburden

Detailed geotechnical site characterization studies have not been performed for the specific surface disturbance area. The encompassing Project area (Doris) has however been well studied, and foundation conditions and geology in the crown pillar recovery trench area are similar. For details on these conditions refer to SRK (2016). The approximate area of the proposed crown pillar recovery trench is expected to have an overburden layer at surface of approximately 2 m thickness with a potential range of 0.5 m to 10 m thickness.

Permafrost at the Project area extends to depths of about 570 m and is absent beneath some large lakes. The ground temperature near the depth of zero annual amplitude ranges from −9.8 to −5.6°C, with an average of −7.6°C. Active layer depth based on ground temperatures measured in overburden soil averages 0.9 m with a range from 0.5 to 1.4 m. The average geothermal gradient is 0.021°C/m.

Permafrost soils are comprised mainly of marine clays, silty clay and clayey silt, with pockets of moraine till underlying these deposits. The marine silts and clays contain ground ice on average ranging from 10 to 30% by volume, but occasionally as high as 50%. The till typically contains low to moderate ice contents ranging from 5 to 25%.

Overburden soil pore water is typically saline due to past inundation of the land by seawater following deglaciation of the Project area. The salinity typically ranges from 37 to 47 parts per thousand which depresses the freezing point and contributes to higher unfrozen water content at below freezing temperatures.

General foundation conditions, material properties for geotechnical analysis, and development of the overburden isopach surface are described in more detail in SRK (2016).

2.4 Environmental Setbacks

The following environmental setbacks have been applied when defining the surface disturbances:

- Minimum 31 m setback from waterbodies, 50 m setback where possible;
- Minimum 30 m buffer zone from known rare plants; and
- Minimum 30 m buffer zone from known archeological sites.

There are no known instances where these setbacks have not been upheld for the crown pillar recovery trench.

3 System Design

3.1 Crown Pillar Recovery Trench

3.1.1 Design Criteria

The design criteria for the crown pillar recovery trenches are as follows:

- Maximum slope angles and depths as approved by the Mines Inspector;
- Minimum base width of 8 m to allow safe access for inspection of drill and blast operations;
- Waste rock to be stored on existing approved storage pads;
- Overburden to be stored on existing approved overburden stockpiles for re-use as surface backfill;
- Reinstate permafrost of backfilled crown pillar recovery trench; and
- External surface water to be diverted as required.

3.1.2 Design

The size of the crown pillar recovery trench is dependent on the ore body, minimum widths for equipment and environmental setbacks and slope of the excavation in overburden. The estimated size of the proposed Doris crown pillar recovery trench is approximately 200 m long and nominally up to 50 m wide at surface (10,000 m^2), and at least 15 m deep. The estimated volume of overburden requiring excavation is approximately 12,000 m^3. This will be temporarily placed on an existing approved overburden stockpile area. The estimated volume of waste rock requiring excavation from surface is approximately 13,000 m^3. This will be temporarily placed on an existing approved waste rock storage area.

The mine void will be backfilled to ensure no long-term permafrost degradation of the surrounding area. The bulk of the backfill will be waste rock material with stockpiled overburden to be used at surface.

3.1.3 Timing and Seasonal considerations

The crown pillar recovery is to be a brief mining operation. The total time from first surface excavation of the crown pillar recovery trench to mine void backfill is expected to be in the order of four months. The crown pillar recovery trench will not be opened earlier than necessary and the mine void will be backfilled as soon as possible following mining to minimize melting of the temporarily exposed slopes.

The seasonal timing of the crown pillar recovery trench excavation will be dependent on the mining operations. Should the mining operations occur in winter conditions (November – April) no surface water management will be required. Should the mining operations occur in non-winter conditions (May – October) some minor surface water management will be required to manage melt-water from exposed slopes and any direct precipitation within the crown pillar recovery trench. The crown pillar recovery trench has no significant external water catchment and therefore no major external surface water management activities are expected. Any flows into the

mine / crown pillar recovery trench would be managed as per the existing water management plan and would be treated as mine water inflows.

3.2 Access and Haul Roads

An access and haul road is required to provide equipment access to the crown pillar recovery trench. The road design and layout is addressed separately (SRK 2017).

4 Mining Methodology

4.1 Crown Pillar Recovery Trench Development

The mining methodology for the crown pillar recovery is illustrated in Figure 2. As shown in Stage 1; underground mining will continue into the crown pillar as per existing mining operations. The crown pillar recovery trench will remove overburden, waste rock and some ore to expose the bulk of the crown pillar from surface (shown in Stage 2 and 3). The bulk of the crown pillar will be drilled and blasted from underground and collapsed into the existing mine void. The mined material, ore and waste rock will be brought to surface via the existing Doris mine portal (shown in Stage 4). The final stage will be the void backfill from both underground and surface, with the upper section being entirely from surface.

The bulk of the backfill will be sourced from waste rock directly from underground mining operations or hauled from the designated waste rock pile. The overburden removed from the crown pillar recovery trench and stored in an overburden stockpile will be placed as the final layer(s) of backfill. Placement of the overburden backfill may require re-working and more than one summer of backfill activities due to the freezing of the overburden material in the stockpile.

4.2 Equipment

The equipment expected to be used in the mining and backfill operation includes underground longhole drills for drilling and blasting, load-haul-dump units for mucking the ore, 30 T or 40 T haul trucks, dozers, excavator(s), and a vibrating smooth drum compactor.

4.3 Water Management

Surface water and any water inflows to the mine will be managed in accordance with the existing Water Management Plan.

There is no sediment or contact water pond associated with the crown pillar recovery trench. Best management practices including silt fences will be required during the first spring after construction.

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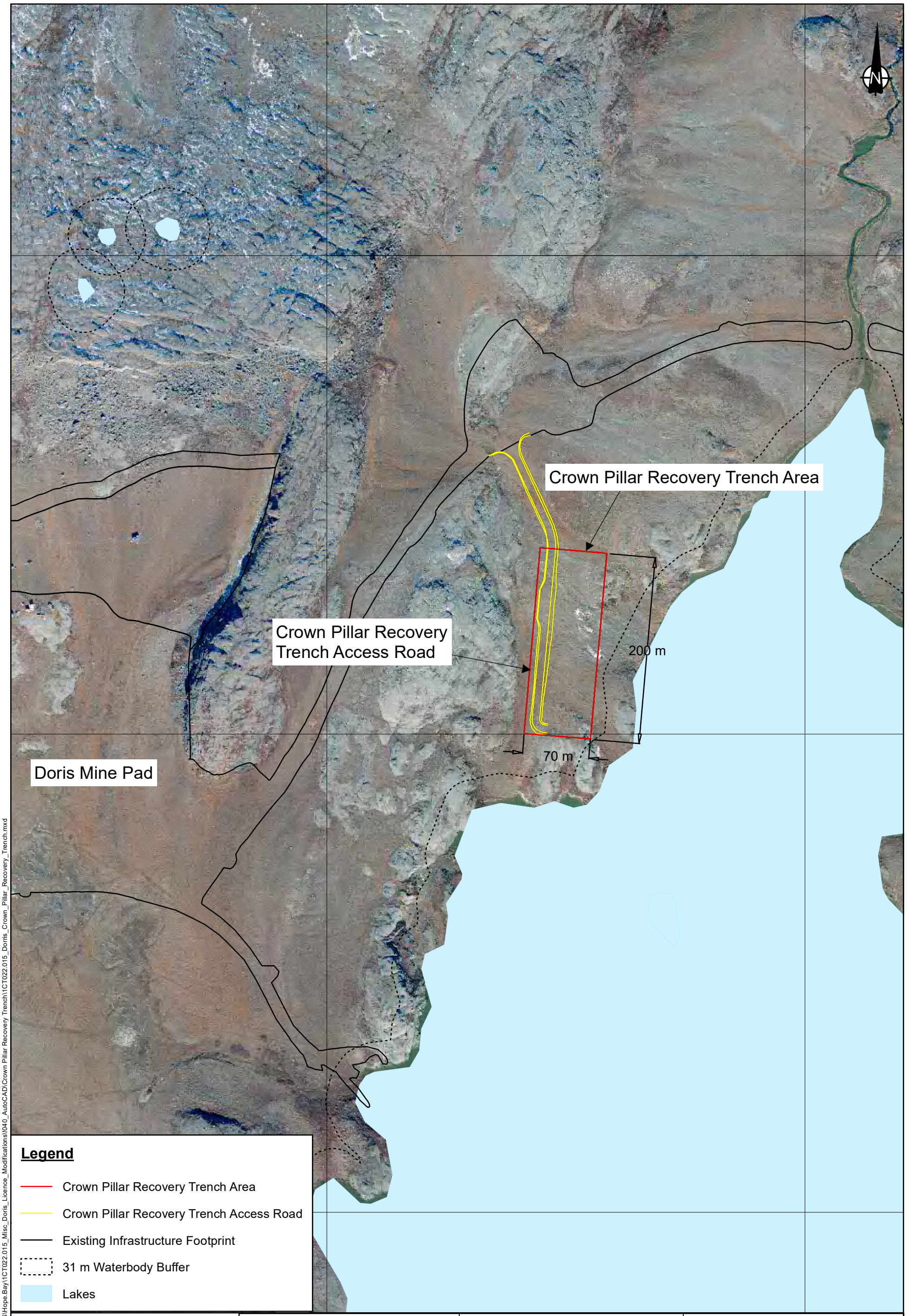
The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the 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.

5 References

SRK Consulting (Canada) Inc. 2016. Hope Bay Project, Geotechnical Design Parameters and Overburden Summary Report. Report prepared for TMAC Resources Inc. Project No.: 1CT022.004.

SRK Consulting (Canada) Inc. 2017. Hope Bay Project, Crown Pillar Recovery Trench Access Road. Memo prepared for TMAC Resources Inc. Project No.: 1CT022.015.

Figures



Legend

- Crown Pillar Recovery Trench Area
- Crown Pillar Recovery Trench Access Road
- Existing Infrastructure Footprint
- 31 m Waterbody Buffer
- Lakes

0 50 100 200

Meters

Notes:
1. Coordinate System: NAD 1983 UTM Zone 13N

srk consulting

Project No: 1CT022.015
Filename: Doris Crown Pillar Recovery Trench

TMAC RESOURCES

HOPE BAY PROJECT

Hope Bay Project

Doris Crown Pillar Recovery Trench Location Plan

Date:	Approved:	Figure:
Sept 2017	CH	1

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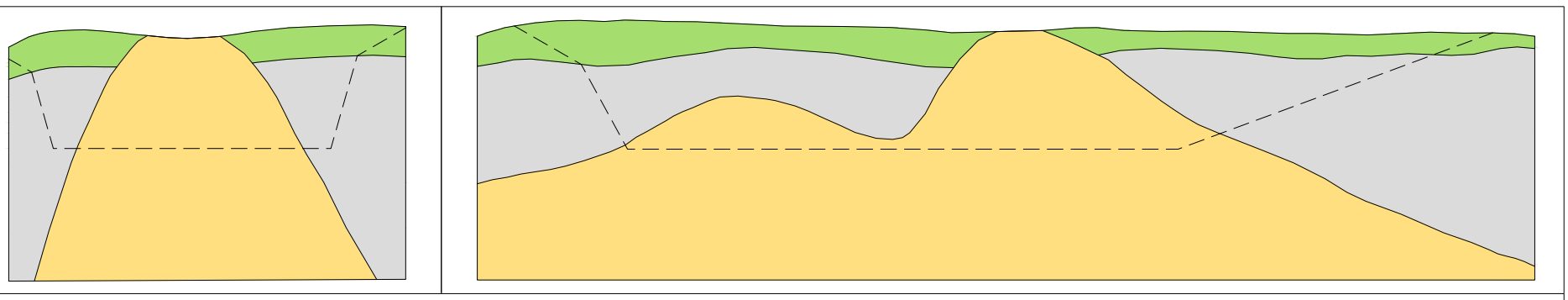
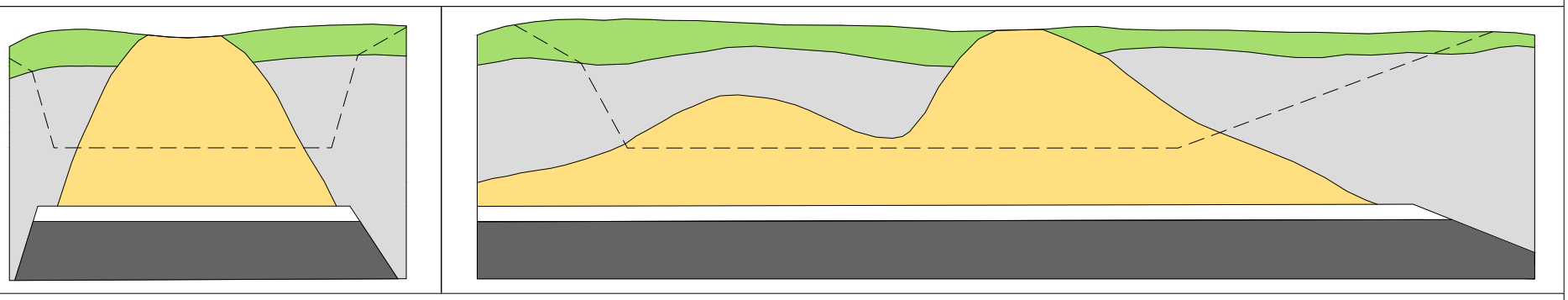
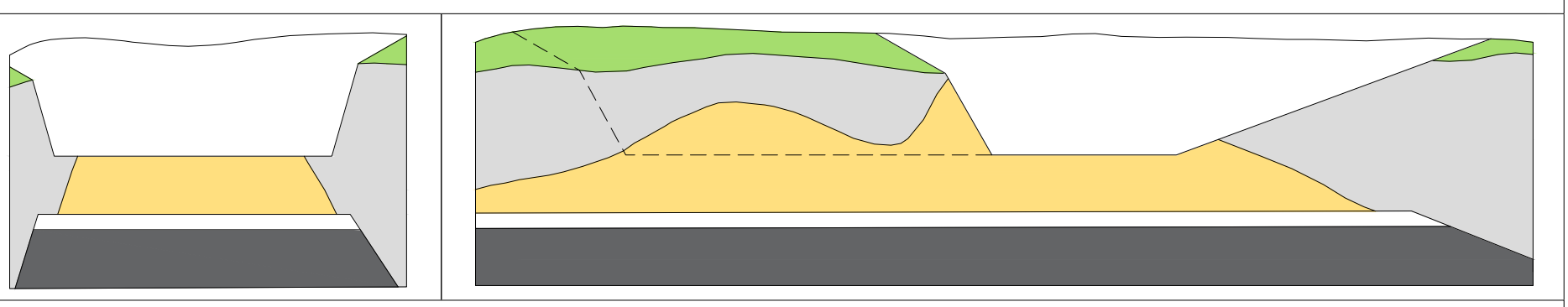


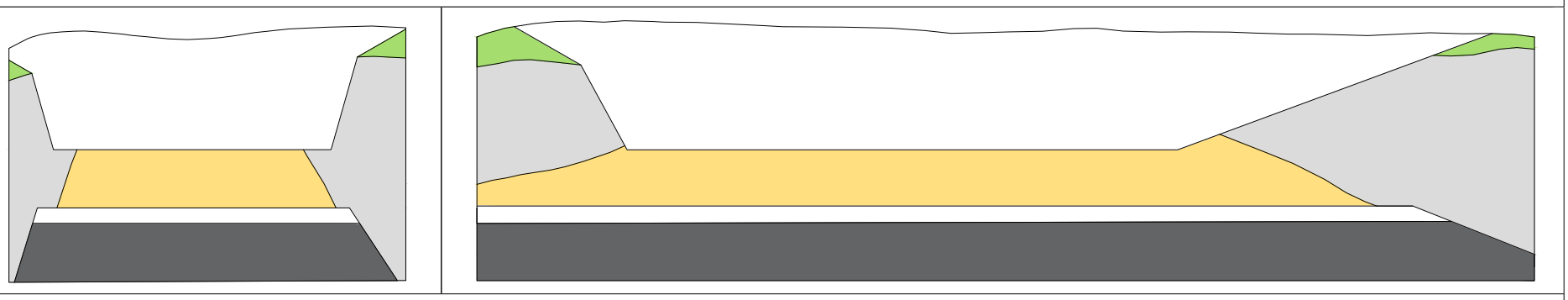
Stage 0: Pre-mining.



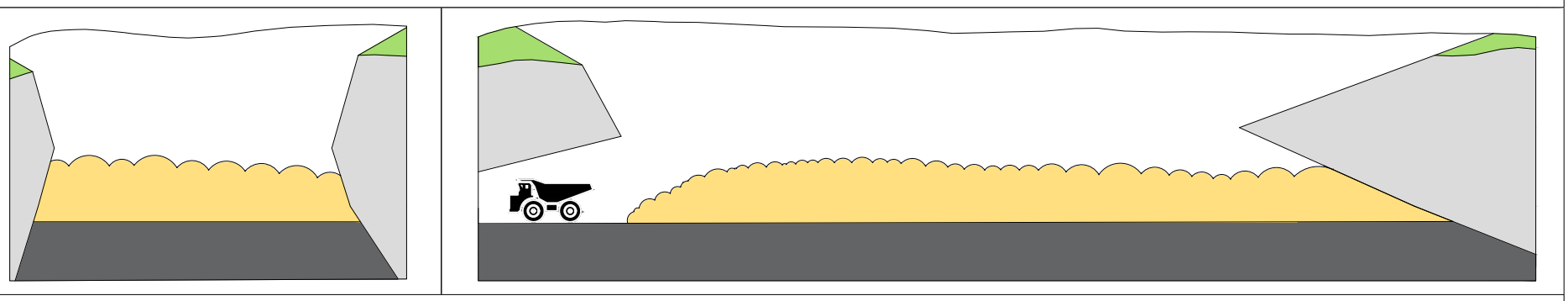
Stage 1: Underground mining complete up to crown pillar.



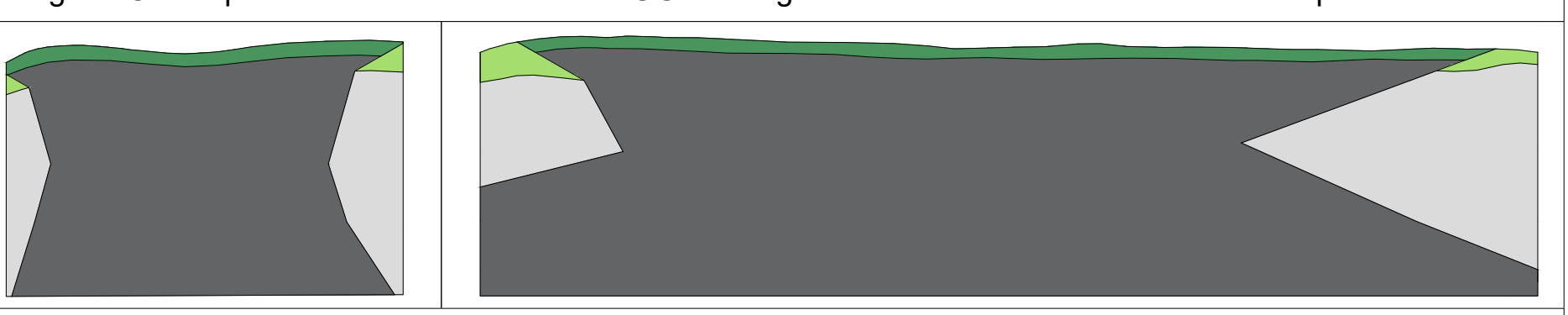
Stage 2: Excavation of crown pillar recovery trench. Materials hauled to surface from trench.



Stage 3: Crown pillar recovery trench excavation complete.



Stage 4: Crown pillar blasted and mined from UG workings. Material hauled to surface via mine portal.

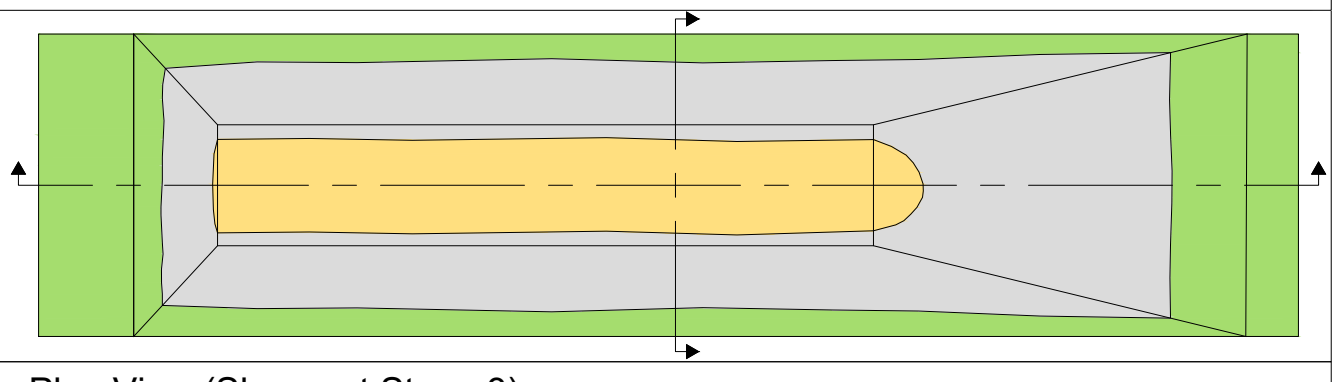


Stage 5: Backfilled mine void.

LEGEND

- Crown Pillar Recovery Excavation Plan
- Overburden
- Bedrock
- Ore Body
- Waste Rock Backfill
- Overburden Backfill
- Excavated Area

NOT TO SCALE



Plan View (Shown at Stage 3)

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TMAC RESOURCES

Crown Pillar Recovery

Crown Pillar Recovery Concept Figures

SRK JOB NO.: 1CT0022.015	Hope Bay	DATE: August 2017	APPROVED: TS	FIGURE: 2
FILE NAME: CrownPillar_ConceptFigures_Rev08_ts.dwg			

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Memo

To:	John Roberts, PEng, Vice President Environment	**Client:**	TMAC Resources Inc.
From:	Cameron Hore, CPEng Samantha Sam	**Project No:**	1CT022.015
Reviewed By:	Maritz Rykaart, PhD, PEng	**Date:**	September 29, 2017
Subject:	Hope Bay Project: Crown Pillar Recovery Trench Access Road		

1 Introduction

1.1 General

The Doris Project is a gold mining and milling undertaking of TMAC Resources Inc. The Project is located 705 km northeast of Yellowknife and 153 km southwest of Cambridge Bay in Nunavut Territory, and is situated east of Bathurst Inlet. TMAC is currently operating the Doris Project under an existing water license.

TMAC plans to daylight the underground mine such that the ore within the crown pillar of the Doris mine can be recovered and processed. This process requires road construction to allow vehicle access the crown pillar recovery trench. This memo presents the design concept for the crown pillar recovery trench access road and should be read in conjunction with the attached set of engineering drawings.

1.2 Objective

This memo provides the preliminary design details for the Crown Pillar Recovery Trench Access Road.

2 Design Concept

2.1 Approach

The overall concepts for the crown pillar recovery trench access road are based on the same principles as used for the existing roads at Doris. Road alignments are designed to minimize crossings and unfavorable foundation conditions. The crown pillar recovery trench access road will be administered and controlled entirely by TMAC.

2.2 Road Components

Design components of the crown pillar recovery trench access road include, road geometry, turnouts to allow for passing, and alignments. No stream crossings are required for this road.

2.3 Location

The approximate location of the crown pillar recovery trench access road is shown on Drawing TAR-01 (Attachment 1).

2.4 Topographic data

Design of the access road is based on topographic contour maps with 1.0 m vertical resolution, and aerial photography produced from 2012 satellite imagery supplied by Hope Bay Mining Limited. Detailed ground surveys have not been completed.

2.5 Foundation Conditions

2.5.1 Overburden

Detailed geotechnical site characterization studies have not been performed along the entire length of the proposed access road. The encompassing Project area (Doris) has however been well studied, and foundation conditions and geology in the crown pillar recovery trench area and access roads are similar. For details on these conditions refer to SRK (2016). The approximate area of the proposed crown pillar recovery trench access road is expected to have an overburden layer at surface of approximately 2 m thickness with a potential range of 0.5 m to 10 m thickness.

Permafrost at the Project area extends to depths of about 570 m and is absent beneath some large lakes. The ground temperature near the depth of zero annual amplitude ranges from −9.8 to −5.6°C, with an average of −7.6°C. Active layer depth based on ground temperatures measured in overburden soil averages 0.9 m with a range from 0.5 to 1.4 m. The average geothermal gradient is 0.021°C/m.

Permafrost soils are comprised mainly of marine clays, silty clay and clayey silt, with pockets of moraine till underlying these deposits. The marine silts and clays contain ground ice on average ranging from 10 to 30% by volume, but occasionally as high as 50%. The till typically contains low to moderate ice contents ranging from 5 to 25%.

Overburden soil pore water is typically saline due to past inundation of the land by seawater following deglaciation of the Project area. The salinity typically ranges from 37 to 47 parts per thousand which depresses the freezing point and contributes to higher unfrozen water content at below freezing temperatures.

General foundation conditions, material properties for geotechnical analysis, and development of the overburden isopach surface are described in more detail in SRK (2016).

2.6 Environmental Setbacks

The following environmental setbacks have been applied when defining the surface disturbances:

- Minimum 31 m setback from waterbodies, 50 m setback where possible;
- Minimum 30 m buffer zone from known rare plants; and
- Minimum 30 m buffer zone from known archeological sites.

There are no known instances where these setbacks have not been upheld for the crown pillar recovery trench access road.

3 Design

3.1 Road Design

3.1.1 Design Criteria

The road is designed to be a single lane haul road with turnouts to allow for passing. It will be designed to the haul road standards set out in the Nunavut Mine Health and Safety Regulations (2015), with an understanding that an exemption would be pursued from the Mines Inspector to allow the road to be a single lane road due to the low frequency of trucks travelling the road. The road design criteria are as follows:

- The design vehicles will be crew cab trucks and mining operations equipment which is expected to include CAT 988 loaders, CAT 16H graders, CAT 730, and CAT 773 haul trucks;
- The maximum design speed for any vehicle will be 50 km/hr;
- The minimum allowable radius of curvature for the road is 100 m; however, at this radius the maximum speed is reduced to 35 km/hr. The maximum radius of curvature while maintaining a maximum speed of 50 km/hr is 231 m. Wherever possible, corners with wider radii of curvature should be targeted;
- Minimum fill thickness of 1 m over permafrost soils and 0.3 m over bedrock;
- The minimum crest road width will be 8 m;
- Turnouts shall be included at a frequency of at least one per kilometer. Each turnout shall be at least 30 m long and 4 m wide;
- The maximum allowable grade is 10%; however, wherever possible, grades less than 4% should be targeted;
- The road shall be crowned at 0.5% to allow for water drainage;
- The road side slopes shall be 1.5H:1V when the road is less than 2 m thick and 2H:1V when the road is greater than 2 m thick; and
- Where road thickness is greater than or equal to 3 m safety berms or barriers will be placed along the road edge, and the road crest will be widened to accommodate the berms.

3.1.2 Design

The crown pillar recovery trench access road extends from the secondary road (Doris to TIA road) to the crown pillar recovery trench. Drawing TAR-02 (Attachment 1) shows the alignment and profile of the crown pillar recovery trench access road. The length of the crown pillar recovery trench access road is approximately 320 m.

Thermal modelling was completed to determine fill thickness required to preserve permafrost under infrastructure. Thermal modelling details can be found in SRK (2016). Four typical fill thicknesses (Bedrock Zone, Zone 1, Zone 2, and Zone 3), ranging from 0.3 to 2.0 m were identified based on observed performance of roads previously constructed on site and supported by conclusions drawn from thermal modelling. Fill zones are assigned based on site specific ground conditions, identified through air photo interpretation:

- Bedrock Zone is exposed bedrock outcrop that may be blasted if necessary and has a minimum fill thickness of 0.3 m;
- Zone 1 is even, un-patterned ground and in this zone the road has a minimum fill thickness of 1 m;
- Zone 2 is transitional, un-patterned ground with indications of drainage areas, but no frost polygons. This zone has a minimum fill thickness of 1.5 m; and
- Zone 3 is patterned ground with observable frost polygons or wet areas. This zone has a minimum fill thickness of 2 m.

The road will consist of 0.15 m of surfacing material overlying a layer of run-of-quarry (ROQ) material of varying thickness depending on the zone classification. Based in these criteria, the crown pillar recovery trench access road will have a minimum fill thickness of 1 m.

4 Construction

All access road construction fill materials will be obtained from geochemically suitable permitted quarries. Management and monitoring of these quarries will be according to the approved quarry monitoring plan (TMAC 2017). Surfacing (32 mm minus) material will be produced at an on-site crusher located within one of the proposed quarries. The estimated construction quantities are provided in Drawing TAR-03 (Attachment 1).

Based on previous surface infrastructure construction on the Project, it is assumed that the construction fleet will consist of CAT 730 haul trucks, CAT 773 haul trucks, CAT D8 dozers, CAT C330 excavator(s), CAT CS563 compactor and a crusher.

Prior to construction, the road alignments and the crown pillar recover trench access road will be cleared of snow and ice. At no time will disturbance of the tundra vegetation or soils be allowed outside of the infrastructure footprint, and no permafrost disturbance will be allowed. Construction fill will be placed by end-dumping on the existing road and pushing the dumped material with a bulldozer. Surfacing material will not be placed until the ROQ material layer is at design grade and level. All construction will be performed in accordance with the technical specifications

(SRK 2011). Where necessary, rock drains will be installed at topographic lows to ensure no standing water is created along the edges of roads or pads.

Wherever possible, pads and roads will be constructed in the winter to ensure the foundation materials remain frozen. Summer construction may be required to meet development schedules. Winter and summer construction techniques will be identical; however, summer construction will result in the use of more construction material as greater imbedding of material into the active layer will occur. Summer construction will also require careful screening of the site for nesting birds, and modifications to the construction schedule may be required to avoid disturbing nesting populations.

Excavation into overburden soils will not be permitted, except where otherwise specified in the design drawings. The excavated overburden materials will be placed in the overburden dump associated with a nearby quarry.

5 References

Nunavut Mine Health and Safety Regulations. 2015. Available at: http://www.wscc.nt.ca/documents/mine-health-and-safety-regulations-english-nu (Accessed July 5, 2016).

SRK Consulting (Canada) Inc. 2011. Technical Specifications Earthworks and Geotechnical Engineering, Hope Bay Project Nunavut, Canada, Revision G – Issued for Construction. Report Prepared for Hope Bay Mining Limited. Project No.: 1CH008.033. March 2011.

SRK Consulting (Canada) Inc. 2016. Hope Bay Project, Geotechnical Design Parameters and Overburden Summary Report. Report prepared for TMAC Resources Inc. Project No.: 1CT022.004.

TMAC Resources Inc. 2017, Quarry Management and Monitoring Plan, Hope Bay, Nunavut. February.

Attachment 1:
Engineering Drawings for the Crown Pillar Recovery Trench Access Road

Engineering Drawings for the Crown Pillar Trench Access Road

Hope Bay Project, Nunavut, Canada

Active Drawing Status

Drawing Number	Drawing Title	Issue	Date	Revision
TAR-01	General Arrangement	Issued for Discussion	September 20, 2017	A
TAR-02	Access Road Plan and Profile	Issued for Discussion	September 20, 2017	A
TAR-03	Access Road Typical Sections	Issued for Discussion	September 20, 2017	A

TMAC RESOURCES

srk consulting

Project Number: 1CT022.015

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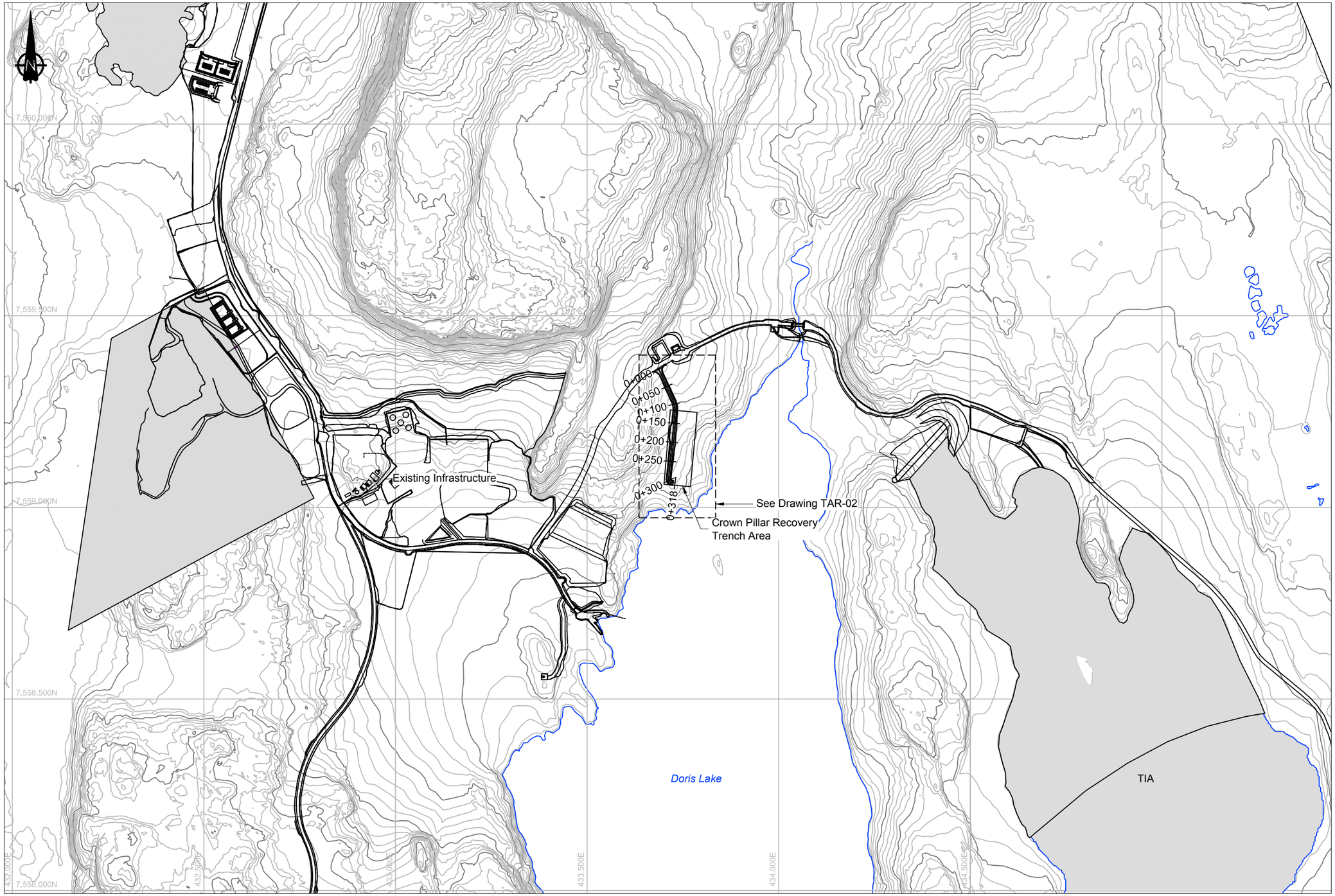

LEGEND

Proposed Access Road

NOTES

1. All dimensions shown are in meters unless noted otherwise.

DRAWING NO.	DRAWING TITLE
-	-

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
-	-			
A	Issued for Discussion	CH		17/09/22

REVISIONS

Original Drawings Stamped and Signed by Engineer

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SS	TAH	CH
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CH	EMR	2017/09/22

FILE NAME: 1CT022.015 - AR.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.015

Crown Pillar Trench Access Road

DRAWING TITLE:

General Arrangement

DRAWING NO.	SHEET	REVISION NO.
TAR-01	1 OF 3	A

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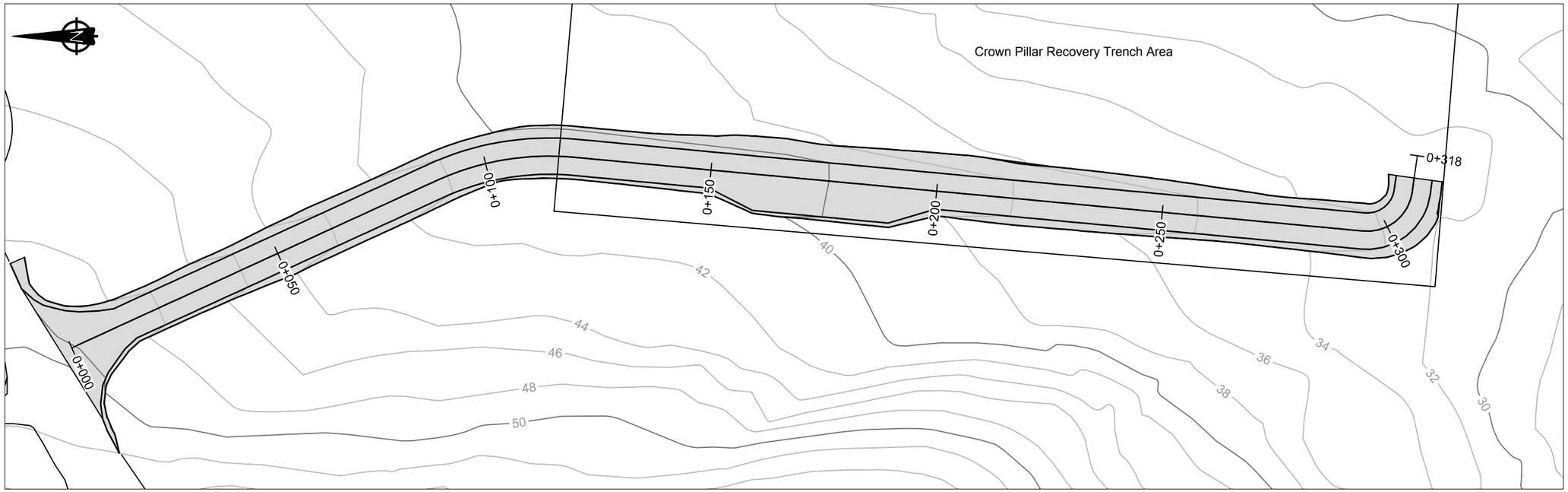


LEGEND

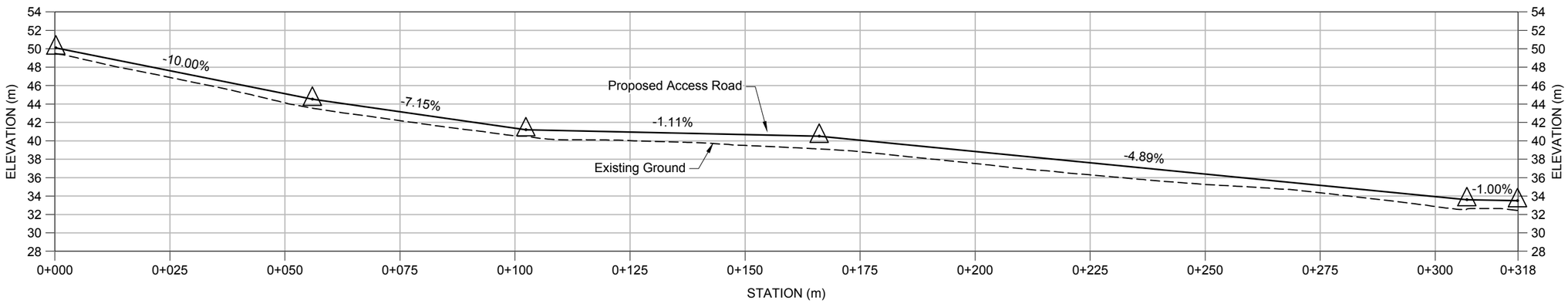
- Proposed Access Road
- Point of Inflection

NOTES

1. All dimensions shown are in meters unless noted otherwise.

Access Road Plan

0m 10 20 30 40



Access Road Profile

Vertical: 0m 5 10 15 20

Horizontal: 0m 10 20 30 40

DRAWING NO.	DRAWING TITLE	NO.	DESCRIPTION	CHK'D	APP'D	DATE
-	-	-	-			
		A.	Issued for Discussion	CH		17/09/22

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SS	TAH	CH
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CH	EMR	2017/09/22

FILE NAME: 1CT022.015 - AR.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.015

Crown Pillar Trench Access Road

DRAWING TITLE: Access Road Plan and Profile

DRAWING NO. TAR-02 | SHEET 2 OF 3 | REVISION NO. A

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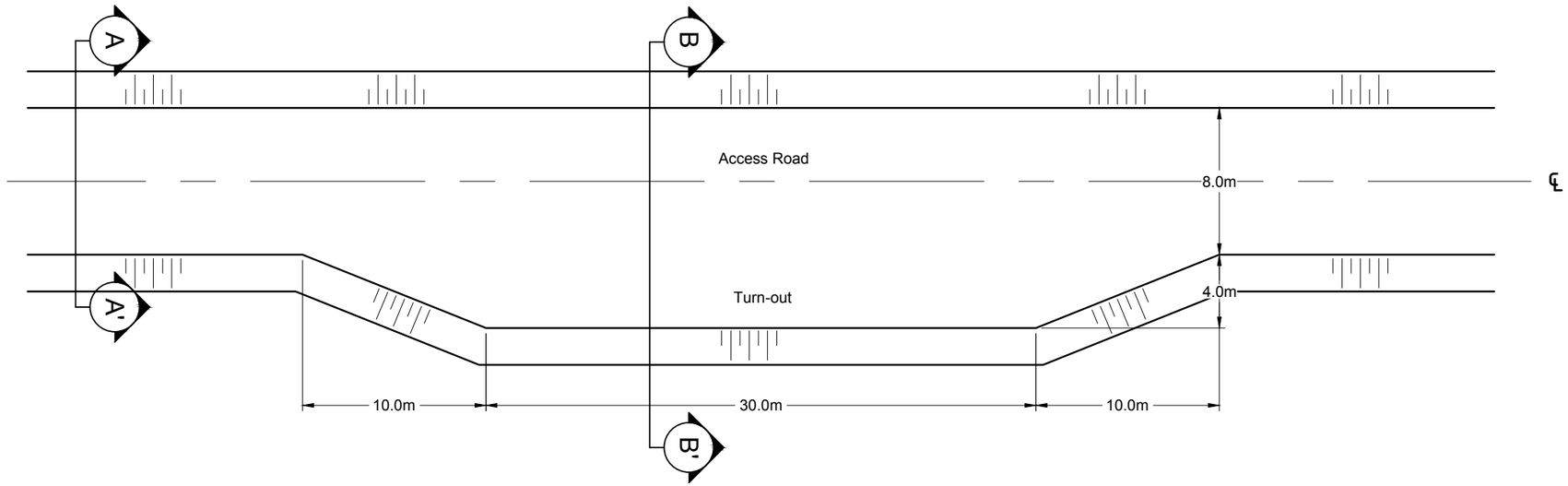


Typical Road Turn-out Section

0m 3 6 9 12

LEGEND

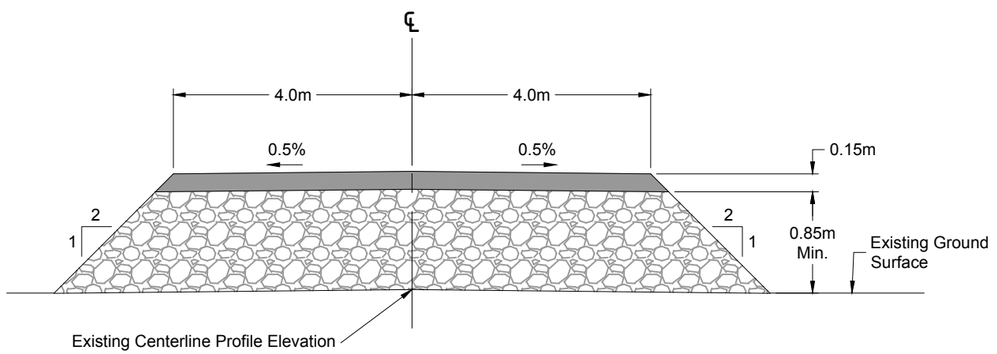
- Surfacing Material
- Run of Quarry Material

NOTES

1. All dimensions shown are in meters unless noted otherwise.
2. Minimum design thickness must be maintained for all sections of the road, including turnouts.

MATERIAL LIST AND QUANTITY ESTIMATES

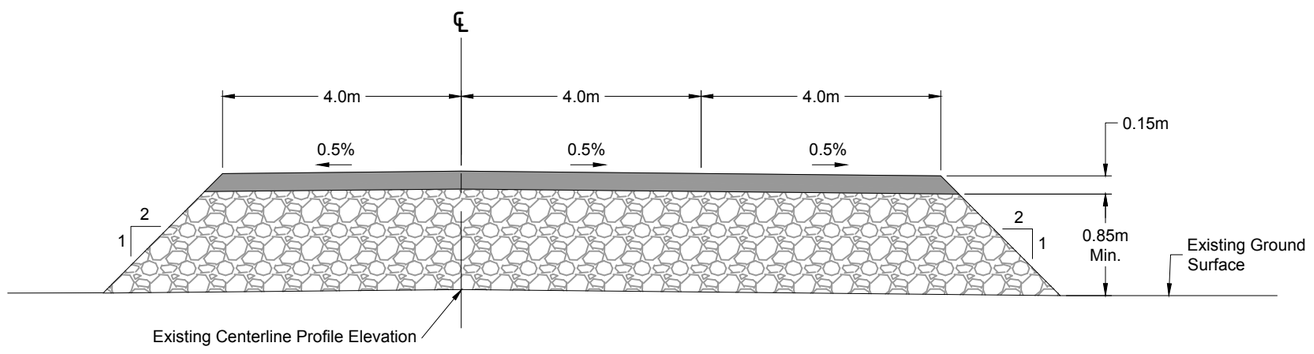
Item	Volume	Description
Run of Quarry Material	3050m³	Approximate In-Place Neat-Line Volume (3D volume based on Civil3D surfaces - no allowance has been made for losses and/or tundra embedment)
Surfacing Material	420m³	Approximate In-Place Neat-line Volume



Typical Road Section

2X Vertical Exaggeration

0m 1 2 3 4



Typical Road Turn-out Section

2X Vertical Exaggeration

0m 1 2 3 4

DRAWING NO.	DRAWING TITLE
-	-

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
-	-			

NO.	DESCRIPTION	CHK'D	APP'D	DATE
A	Issued for Discussion	CH		17/09/22

REVISIONS

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CH	EMR	2017/09/22

FILE NAME: 1CT022.015 - AR.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.015

Crown Pillar Trench Access Road

DRAWING TITLE:

Access Road
Typical Sections

DRAWING NO.	SHEET	REVISION NO.
TAR-03	3 OF 3	A

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Memorandum

Refer to File: 0194097

Date: November 21, 2017

To: John Roberts, Vice President, Environmental Affairs, TMAC Resources Inc.

From: ERM Consultants Canada Ltd.

Subject: **Hope Bay – Doris Crown Pillar Recovery Trench and Access Road Assessment**

1. INTRODUCTION

The Doris Mine (Mine) is a fully permitted gold mining and milling operation owned by TMAC Resources Inc. The Doris Mine is permitted under Project Certificate No. 003 and Type A Water Licence 2AM-DOH1323 which allows for the use of water and deposition of mine waste in support of a Mining and Milling Undertaking. The Mine is located approximately 700 km northeast of Yellowknife and 153 km southwest of Cambridge Bay, to the east of Bathurst Inlet, Nunavut Territory. Access to the Mine is by air from Yellowknife or seasonally by ship to a dock constructed at the Hope Bay Project site.

The Doris North ore body is a roughly linear quartz feature that trends north-south immediately north of Doris Lake and west of Doris Creek. Its depth ranges from a surface outcrop at the shore of Doris Lake to a maximum depth of up to 500 m. The top of the ore body approaches the surface just to the south of the existing underground mine workings, in a vein extension that exhibits quite good grades. Because this upward extension of the orebody reaches into what is known as the "crown pillar" and represents a valuable source of ore for the mine, TMAC is planning to recover the ore in the crown pillar in the safest and most environmentally responsible manner. The *crown pillar* is that thickness of rock that must be left between an underground mine and the surface at a thickness sufficient to ensure the structural integrity of the mine beneath and the long term stability after closure. When ore extends into the crown pillar from an underground mine it is commonly recovered by bringing the mine workings to surface in a limited excavation at the desired location. TMAC is proposing to mine gold ore from the crown pillar of the underground mine by daylighting the underground workings. The proposed mining of the crown pillar is a common practice at underground mines when the initial adjacent deposit area has been mined. The extraction of the crown pillar ensures optimal resource recovery from the deposit. The engineering and development is straightforward and utilizes existing infrastructure for crown pillar ore extraction, handling, waste rock management and water management. There are 4 stages for the mining methodology:

Stage 1: Underground mining will continue into the area beneath the crown pillar as per existing mining operations.

Stage 2: A small spur road will be created immediately to the west of the trench to facilitate access. The crown pillar recovery will commence with the removal of overburden, waste rock and some ore via a surface excavation. This will expose the shallowest part of the ore body and

create a small trench that will be managed similar to a short-lived quarry. Overburden and waste rock will be stored on the existing pads at the Doris property so that this material can be recovered and used as backfill in the reclamation of the crown pillar recovery trench.

Stage 3: The remaining crown pillar ore will be drilled and blasted from underground and collapsed into the existing mine void. The mined material, ore and waste rock, will be brought to surface via the existing Doris mine portal utilizing the existing underground workings.

Stage 4: The final stage will be backfilling of the opening from both underground and surface, with the upper section being entirely from surface, utilizing the material originally removed, augmented if necessary with other clean waste rock. The entire operation is expected to be completed over a period of about 4 months in the spring and summer. The short duration of work and rapid reclamation, will minimize the deterioration of exposed frozen overburden.

The equipment expected to be used in the mining and the backfill operation includes underground longhole drills for drilling and blasting, load-haul-dump (LHD) units for mucking the ore, 30T or 40T haul trucks, dozers, excavator(s), and a vibrating smooth drum compactor, and various pumps for water conveyance.

Waste rock excavated from the mining operations has geochemical characteristics consistent with waste rock currently mined at the Doris North operations, hence the placement of the waste rock on existing waste rock storage facilities will not result in new ML/ARD issues.

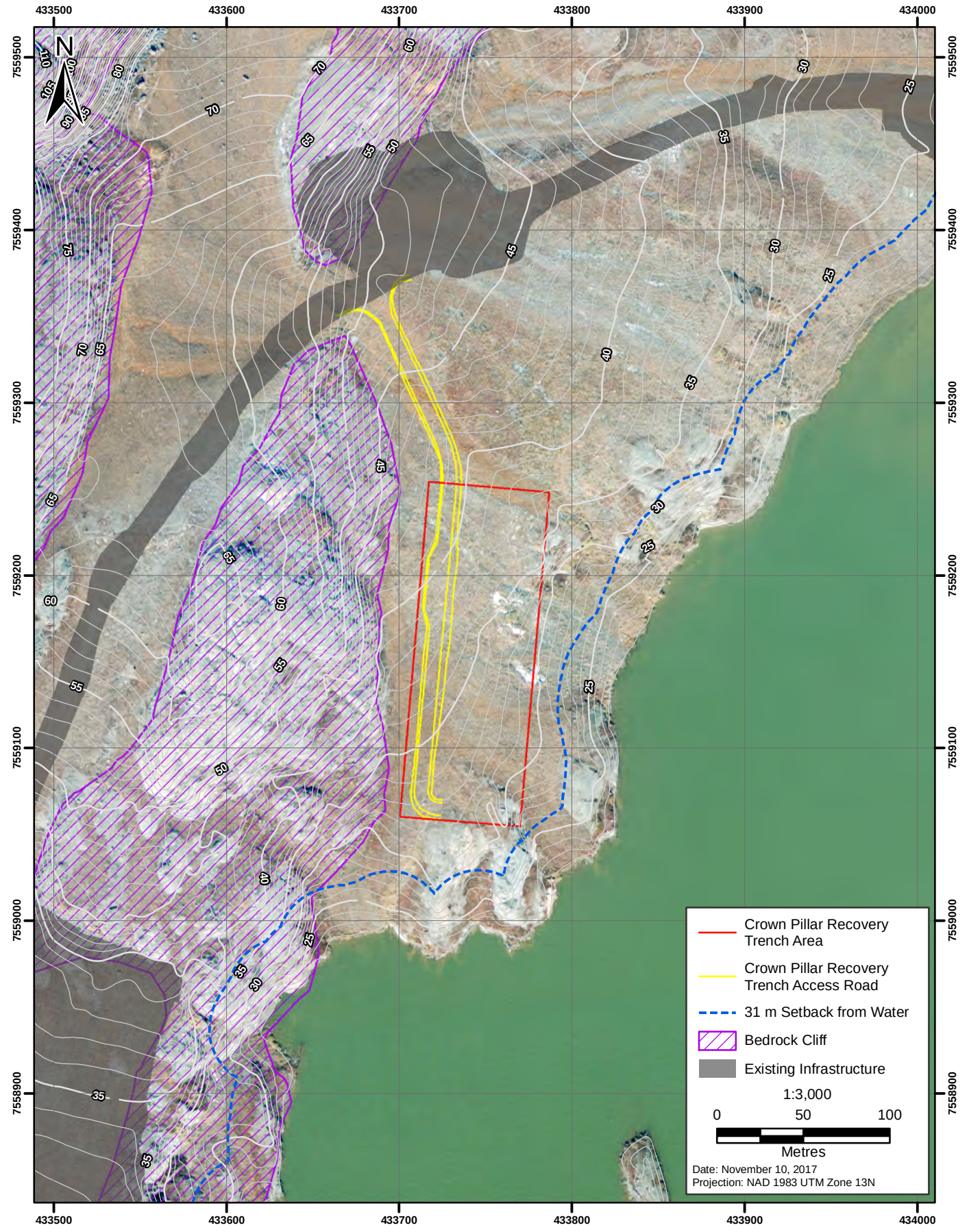
The proposed works for the Doris Crown Pillar recovery are located northwest of Doris Lake, and south of the mine site road connecting plant site operations with the Tailings Impoundment Area east of Doris Lake. Excavation of a surface trench is required to ensure safe mining practices of the upward expansion of underground mine workings and a stable ground surface following completion of the extraction. The safety and stability of the mining operations will be verified and approved by the mines inspector. Following removal of the ore, the surface excavation will be backfilled with waste rock and re-capped by overburden soils initially removed from the site.

The proposed excavation (box-cut) shown on Figure 1 is designed to be nominally 50 m wide, 200 m long, and up to 15 m deep with 2:1 slope angles. It will be located outside of the required 31 m setback west of Doris Lake. A 318 m access road will be constructed from the existing mine site road to access the south end of the excavation. There are no water crossings associated with this road. The total estimated volume of material to be removed from the recovery trench includes: overburden—12,000 m^3, waste rock—13,000 m^3, and ore—6,000 m^3, for an aggregate total excavated volume of approximately 31,000 m^3. The access road will require approximately 3,000 m^3 of run of quarry material for the 0.85 m thick base, and 420 m^3 of material for the 0.15 m thick, 8 m wide running surface.

The Crown Pillar excavation activities would span a duration of about four months, and scheduled to occur in relation to other mining operations; therefore the Project could occur in either the non-winter season (May to October), or during the winter season (November to March). Non-winter season construction has the benefit of avoiding influx of cold air into the underground mine workings and potential for associated icing, should daylighting occur during winter months.

Figure 1

Value Components Potentially Interacting with the Doris Crown Pillar Recovery Trench



The engineering basis for design, assumptions and plans for the excavation and access road are presented in SRK Consulting (2017a, 2017b). All provisions of the existing Hope Bay Project Water Management Plan (TMAC 2017) will apply to diversion of surface and seepage water, and post-closure surface water management and sediment transport control. The crown pillar trench activities are similar to those which TMAC is conducting safely and with acceptable environmental effect, on other areas within the permitted Doris North operations; i.e. access road construction, overburden and waste rock removal and stockpiling, permafrost management, surface water management, underground mining, safety and environmental management.

This memo evaluates the Doris Crown Pillar Recovery trench and road layout against environmental, heritage and cultural impacts assessed in the Doris North EIS and associated amendments. The conclusions reached through environmental assessment and permitting processes undertaken for the Doris Project to date are examined to determine whether there is a material, adverse effect resulting from the proposed Crown Pillar Recovery works.

2. SUMMARY OF COMPONENTS AND ENVIRONMENTAL MITIGATIONS

The Crown Pillar Recovery development will entail the following primary components:

- Open-cut trench (new);
- Access road (new);
- Site water diversion around the excavation (in accordance with the existing Hope Bay Project Water Management Plan; TMAC 2017);
- Overburden and waste rock storage pads (using existing permitted facility[1]);
- Milling and tailings disposal (using existing permitted operating facility[1]);
- LHD equipment staging area, fuel storage, maintenance shops (using existing permitted operating facility[1]); and
- Transport of material (31,000 m^3) involving 40 × 17 m^3 trucks per day (new).

The details of the proposed crown pillar recovery trench development and closure, the design and construction of the access road, and water management plan are described in the Crown Pillar Recovery Concepts and Road Access Design technical memos issued by SRK (2017a, 2017b) to TMAC.

2.1 Design of Environmental Mitigations

The Crown Pillar Recovery development is designed in accordance with the environmental management plans and all regulatory requirements approved for the Doris Mine. The proposed crown pillar recovery trench and access road environmental mitigations incorporated into the Mine are as follows:

[1] Project Certificate No. 003 and water licence 2AM-DOH1323

2.1.1 Timing and Seasonality of Work

The Doris crown pillar recovery and site restoration activity is intended to be a brief operation spanning a period of approximately four months. Ideally the mining operations will occur in the non-winter conditions (May to October); however, depending on scheduling of related underground mining operations, works could occur in the winter months (November to March). The road access construction will be commenced immediately prior to the excavation. Once the trench is excavated, it will be backfilled and restored immediately thereafter. The access road will be maintained for a short duration until the site is deemed to be fully reclaimed at which time the road will be closed as per the existing closure and reclamation plan. All construction and restoration works are planned to be undertaken within 4 months.

2.1.2 Overburden and Permafrost

The short duration of works will be of benefit to minimizing the melting of permafrost if the Crown Pillar Recovery is developed during the non-winter months. Meltwater will be captured in the excavation and removed as described below in Section 2.1.4. The excavation will be back-filled to ensure no long-term permafrost degradation at the site. Permafrost conditions will be maintained along the road route by applying run of quarry rock above the natural grade as per the techniques described in SRK (2017b) which are the proven construction techniques on the mine site.

2.1.3 Erosion and Sediment Control

The site will be managed in accordance with the existing Hope Bay Project Water Management Plan (TMAC, 2017) and best site practices concerning erosion prevention and sediment control. No sediment or contact water ponds are planned or anticipated to be required. During the first spring following construction/restoration works, the site will be monitored and pre-emptive management of erosion or sediment transport will be undertaken through the use of silt fences or other means. The access road is expected to preclude water for the majority of the trench. A small additional diversion berm could be constructed within the proposed footprint if necessary. Erosion and sediment control will be monitored during closure.

2.1.4 Surface Water Quality

The Hope Bay Project Water Management Plan will be implemented for the site. Clean surface water will be redirected around the site onto tundra or may flow overland to Doris Lake. As the trench is excavated, contact water flowing into the excavation will be trucked to the existing permitted sediment control pond. Contact water will not be allowed to enter Doris Lake. Once the excavation daylights to the underground, water in the excavation will be handled through the underground mine water management system. Following trench infill and post-closure, no surface water diversion features are planned to be remaining on site, natural infiltration and hydrology conditions will be restored. As the development site represents less than 0.1% of the Doris Lake watershed, with the foregoing water management and mitigation measures the surface water quality of Doris Lake will be maintained.

2.1.5 Landscape Restoration

Overburden soils temporarily excavated from the site will be replaced as the final layer(s) of backfill over waste rock. The overburden soils may require re-working and more than one summer of backfill activities if freezing of the overburden in the stockpile occurs and limits handling in one season. The final surface will have a positive relief aspect for surface water drainage and to avoid water ponding. No ancillary facilities will be constructed on the site and hence there is no need for such removal. Monitoring will determine when the site restoration is stable, in the event of minor settling, and when site access is no longer required at which time the access road will be closed as per reclamation and closure planning. Areal and sensory disturbance to wildlife will have been mitigated.

3. IDENTIFICATION OF POTENTIAL ENVIRONMENTAL EFFECTS

3.1 Environmental Assessment Methodology

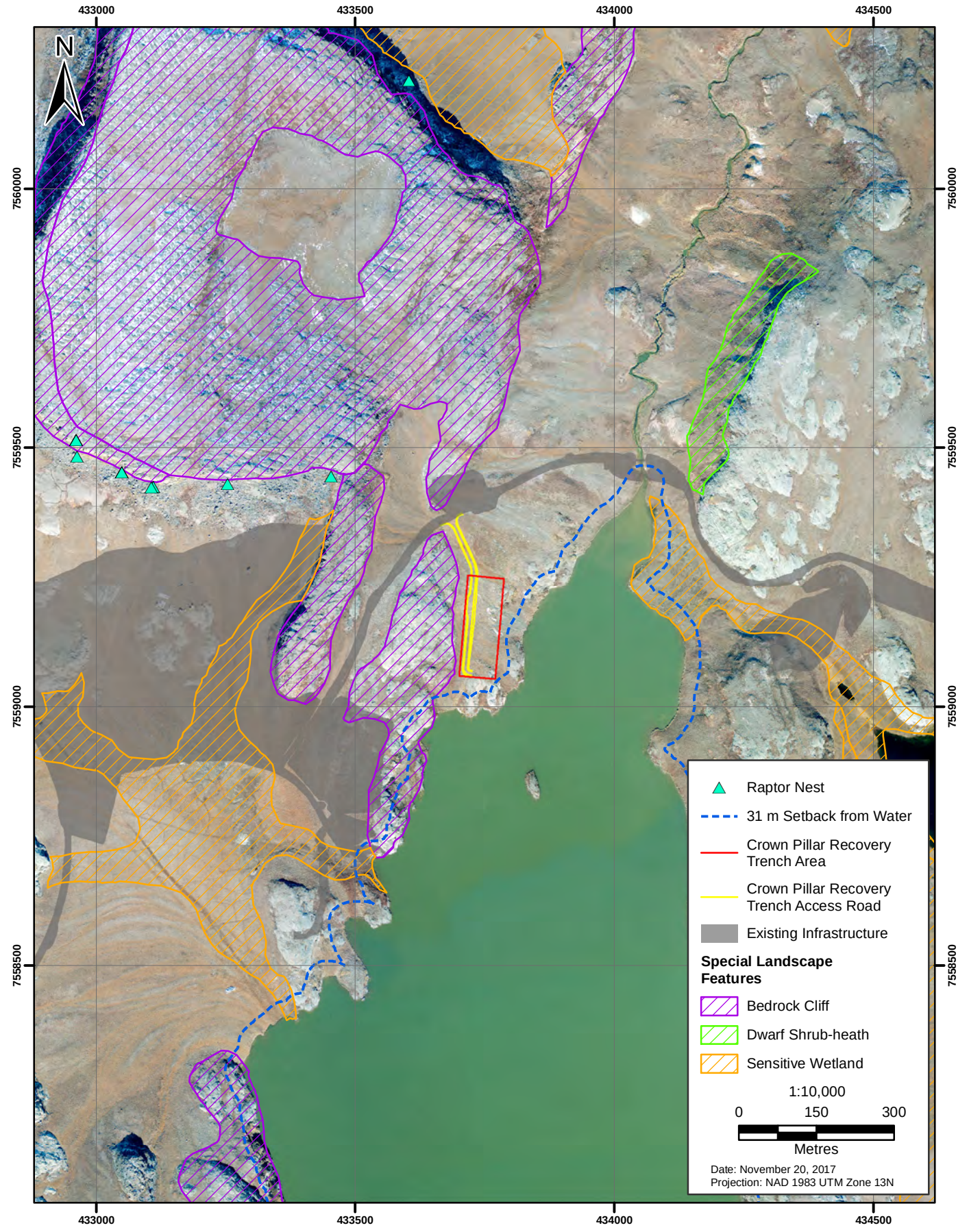
The Doris Crown Pillar Recovery environmental assessment was guided by the approach used for the Doris North Project Final Environmental Impact Statement (EIS; Miramar 2005). This assessment evaluated the potential effects of the proposed Doris North Mine on the same Valued Environmental Components (VEC) as those used in the Doris North Mine which are applicable to the site.

The environmental assessment involved a desk-based GIS analysis of the most current documented valued environmental components (VEC) of primary concern for potential alteration or displacement by the proposed Crown Pillar Recovery activities. All mapped VEC presence/ absence or sensitivity maps on file from the Doris North EIS, or updated thereafter through ongoing monitoring, were digitally overlain on the Project works shapefiles to identify direct interactions (Figure 2). There were none noted, excepting several broad wildlife habitat overlaps and soils. The Doris area has been subject to extensive baseline assessments and therefore no new field-based assessments were undertaken for the 1.13 ha of proposed project footprint.

Based on an interaction of a VEC with the Project it was examined whether each of those interactions are expected to result in changes that are positive, negative but mitigable, negative and not mitigable, unknown, or whether site characteristics and effects pathways are unchanged. VECs with no interactions were screened out, resulting in a shorter list of VECs remaining for consideration.

Non-mitigable effects could result in residual effects and would be further assessed in relation to the Doris North EIS effects assessment.

Figure 2
Value Components near the Doris North Crown Pillar Recovery Trench



3.2 Valued Ecosystem Components

Guidance on the choice of the VECs to examine came from the Doris North EIS. The VECs examined included the following:

- Terrestrial: rate plants and special landscape features (riparian ecosystems, sensitive wetlands, dwarf shrub-heath, cliffs, bedrock lichen and outcrop ecosystems, and beaches and marine intertidal areas);
- Wildlife: Raptor nests, Wolverine dens, Wildlife habitat suitability; and
- Surface water quality.

Habitat suitability for the general Doris area includes the following ratings:

- High value for short-eared owl; and
- Moderately high value for caribou (post-calving, summer, fall), grizzly (spring, summer, fall), wolverine, and peregrine falcon.

Figure 1 and Figure 2 illustrate the Doris North Crown Pillar Recovery plan relative to potentially interacting valued components. The proposed works overlap wildlife habitat and soil VECs, and additionally there are some VECs present within 100 m, notably a sensitive ecosystem (bedrock cliff) and one identified rare plant (rated as GS3 – Sensitive). The 30 m operational setback from the rare plant site can be easily accommodated in the road access final alignment. There is also a 31 m operational setback from the Doris Lake surface water VEC.

Table 3-1 lists the proposed Crown Pillar Concept components in relation to the approved Doris Project operations and notes the change or incremental activity and statement of effect. The table also lists the VECs potentially affected by the Project and documents the potential effect.

Table 3-1. Comparison of Doris Project Surface Layout vs. Crown Pillar Revision

Component/VEC	Doris Project, Approved 2016	Crown Pillar (including Doris)	Change in Component / Potential Effect
Mill			
Design Capacity	2,000 tpd	No Change	No Change
Waste Rock Pile			
Design Capacity	Current permit	No Change	Temporary – Minor / all waste rock back-filled into crown pillar excavation.
Overburden Stockpile			
Design Capacity	Current permit	No Change	Temporary – Minor / all overburden back-filled for crown pillar closure surface layer.

(continued)

Table 3-1. Comparison of Doris Project Surface Layout vs. Crown Pillar Revision (continued)

Component/VEC	Doris Project, Approved 2016	Crown Pillar Concept	Change in Component / Potential Effect
Total Footprint			
Doris North	226.5 ha	1.13 ha (incremental to Doris Footprint)	Footprint 0.5% larger (1.13 ha) / reclaimed in year 1.
Environmental Assessment by VEC			
Sediment Quality	Proposed components, activities and controls are unchanged; site characteristics and effects pathways are unchanged.		Site characteristics and effects pathways are unchanged. No sediment capture ponds or waterborne movement outside the excavated perimeter is anticipated and no contact waters will be discharged to surface waters, in accordance with TMAC's existing management plans.
Air Quality and Noise	Proposed components, activities and controls are unchanged; site characteristics and effects pathways are unchanged.		Site characteristics and effects pathways are unchanged. Short-term localized noise increase during excavation and trucking, entirely mitigated at the end of 4 month work duration, in accordance with TMAC's existing management plans.
Ground Stability and Permafrost	Site activity involves temporary excavation and replacement of frozen overburden over 4 month period.		Site characteristics and effects pathways are unchanged. Road access built on top of permafrost with approved design; excavation back-filled to restore permafrost condition. Active soil layer minor effects mitigated at closure.
Groundwater	Groundwater in excavation pumped and trucked to existing sediment control pond; groundwater after break-through will be addressed through underground mine water management plans; no groundwater connection between Doris Lake and temporary excavation.		Site characteristics and effects pathways are unchanged.
Surface Water Quality	Access road will act as berm to prevent clean surface water entering excavation; clean surface water routed to tundra or to flow to Doris Lake. Road contact surface water runoff will be diverted into the trench.		Site characteristics and effects pathways are unchanged.
Terrestrial Ecosystems			
Special Landscape Features	No effects to riparian ecosystems, sensitive wetlands, dwarf shrub-heath, cliffs, bedrock lichen and outcrop ecosystems, and beaches and marine intertidal areas		Site characteristics and effects pathways are unchanged.

(continued)

Table 3-1. Comparison of Doris Project Surface Layout vs. Crown Pillar Revision (completed)

Component/VEC	Doris Project Approved 2016	Crown Pillar Concept	Change in Component / Potential Effect
Terrestrial Ecosystems *(cont'd)*			
Vegetation	Located in area dominated by exposed bedrock with tundra between the outcrops.		Site characteristics and effects pathways are unchanged.
Riparian areas	Riparian areas > 31 m from site.		Works located outside 31 m Doris Lake buffer zone.
Aquatic Fauna	No standing water or streams.		Site characteristics and effects pathways are unchanged.
Historical and Traditional Uses	Field reconnaissance did not identify heritage or archaeological resources.[1]		Site characteristics and effects pathways are unchanged.
Terrestrial Fauna	Area of habitat lost: 226 ha	Area of habitat lost: temporary increment 1.13 ha	Effects on habitat loss due to infrastructure development and changes in movement and behaviour due to sensory disturbance is minor and represents about 0.5% of Doris Project footprint; and the project is intended to be of very short duration with effects immediately mitigated within the same season as the disturbance is created. The 1.13 ha of high or moderately high rated habitat will experience a minor negative effect which is mitigated within the same season of disturbance. No new habitat types are disturbed as a result of these activities, and they are not rated within these areas.
	Activities causing temporary sensory disturbance include construction, operation and closure activities.		Potential effects of disturbance on wildlife that may use the habitat area (1.13 ha) is mitigable within the same season of disturbance.
Hydrology	Infrastructure is located in the Doris Lake watershed.		The proposed footprint is less than 0.1% of the Doris Lake watershed (99.6 km^2), and therefore effects of surface disturbance (i.e., runoff diversions) on hydrology of Doris Lake would be negligible.

3.3 Potential Effects to Valued Ecosystem Components

Table 3-1 lists the results of the effects assessment. There are no non-mitigable effects determined to occur and none of the mitigable minor negative effects extend beyond the season in which they would occur. The mitigable minor negative effects were the following:

- Habitat Loss for terrestrial fauna during construction and excavation; and
- Unavoidable alteration of the active soil layer during construction and excavation.

Habitat Loss during Construction and Excavation

No loss of residences or loss of special landscape features will occur for grizzly bear, wolverine, ground-nesting or cliff-nesting raptors. The Doris Mine area is rated as having high to moderate value wildlife habitat for several species, and the Crown Pillar Recovery plan area is similarly ranked. The Crown Pillar recovery trench area is high value for short-eared owl, and moderately high value for Caribou, Grizzly Bear, Wolverine and Peregrine falcon. The temporary loss of foraging habitat represents 1.13 ha and while considered a negative loss, is of very minor scale, representing <0.1% of the Doris Lake watershed lands and 0.5% of the Doris footprint. There is other suitable habitat within the area of the Doris Mine footprint that wildlife can utilize.

If construction occurs during the non-winter period, then pre-construction bird nesting surveys will occur and the approved wildlife management plan mitigations will apply.

No residual effects are anticipated to occur.

Alteration of the Active soil Layer during Construction and Excavation

The active permafrost soil layer will be disturbed during construction and excavation of the trench. Soils will be either covered by quarry rock for the road access, or removed entirely from the excavated trench and stockpiled for later application as surface cover material during site restoration. The minor negative effect on soils (the site represents 0.5% of the Doris Mine footprint) will be mitigated at closure by replacement of the same soil material in the case of the trench excavation final closed surface. The restoration will be monitored to ensure performance similar to pre-work conditions.

No residual effects are anticipated to occur.

3.4 Closure and Reclamation

The crown pillar recovery trench will be backfilled to ensure no long-term permafrost degradation of the surrounding area based on the same principles as used for the existing Doris Mine. The bulk of the backfill will be waste rock material from the trench excavation, overlain with stockpiled overburden from the area to be used at the surface. The backfilling with waste rock and overburden will occur as part of mining activities and no additional closure works will be required.

3.5 Residual and Cumulative Effects

Given that there are no new residual effects arising from the reassessment of effects to terrestrial fauna resulting from habitat loss, or soil alteration, the cumulative effects of the Hope Bay – Doris Crown Pillar Recovery development remain unchanged from that presented in the Doris North EIS.

4. CONCLUSIONS AND RECOMMENDATIONS

This environmental assessment concludes that the Doris North Crown Pillar Recovery development is not likely to cause significant negative impacts to the environment, socio-economic conditions, or communities.

TMAC has designed the mining and restoration activity to be of short duration, allowing for optimal minimization of effects to the environment. The company is committed to developing the Doris Mine in a sustainable manner such that the extraction of the crown pillar is anticipated to have no significant environmental effects, while providing economic benefits to Inuit communities, the region, and Nunavut as a whole.

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REFERENCES

SRK. 2017a. *Hope Bay: Crown Pillar Recovery Concepts*. Prepared for TMAC Resources Inc. by SRK Consulting (Canada) Inc.: Vancouver, BC. September 2017.

SRK. 2017b. *Hope Bay: Crown Pillar Recovery Trench Access Road*. Prepared for TMAC Resources Inc. by SRK Consulting (Canada) Inc.: Vancouver, BC. September 2017.

TMAC. 2017. *Hope Bay Project Water Management Plan*. submitted to NIRB by TMAC Resources Inc. February 2017.

Nunavut Water Board. Water Licence MP: 2AM-DOH1323 – Amendment No. 1 – Amended November 4, 2016.

Miramar. 2005. *Final Environmental Impact Statement – Doris North Project.* Vancouver, BC.