SRK Consulting (Canada) Inc.
2200–1066 West Hastings Street
Vancouver, BC V6E 3X2

T: +1.604.681.4196
F: +1.604.687.5532

vancouver@srk.com
www.srk.com

Memo

To:	Brendan Barron, Director of Projects	**Client:**	TMAC Resources Inc.
Cc:	Dan Redmond, Director of Strategic Mine Planning Oliver Curran, VP Environmental Affairs Shelley Potter, Environmental Affairs		
From:	Ryan Williams, CPEng	**Project No:**	1CT022.043
Reviewed:	Maritz Rykaart, PhD, PEng	**Date:**	March 19, 2019
Subject:	Hope Bay Project – Detailed Design of the Contact Water Pond Berm at Madrid North		

1 Introduction

1.1 General

The Hope Bay 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. The Project comprises of three distinct areas of known mineralization plus extensive exploration potential and targets. The three areas that host mineral resources are Doris, Madrid, and Boston.

The Project consists of two phases: Phase 1 (Doris project), which is currently being carried out under an existing Type A Water Licence, and Phase 2 (Madrid-Boston project) which has been granted a new Type A Water Licence. Phase 1 includes mining and infrastructure at Doris, while Phase 2 includes mining and infrastructure at Madrid and Boston located approximately 10 and 60 km due south from Doris, respectively.

A contact water pond (CWP) berm will be constructed at the Madrid North site to intercept contact water runoff from a waste rock pile (WRP). The WRP will be constructed uphill of the proposed CWP layout and will store waste rock from the Naartok East Crown Pillar Recovery Trench (CPRT). The CWP will normally be kept in a dry state with a maximum two-week (i.e., fourteen-day) residence time for water in the pond (SRK 2017a).

The design of the CWP berm incorporates a geomembrane liner on the upstream face to contain the contact water. The liner will be anchored and sealed to bedrock at the toe of the berm's upstream slope. The rest of the pond footprint will not be lined and instead the design relies upon the low permeability of the bedrock and achieving an adequate liner-bedrock seal.

Based on aerial photographs most of the berm's footprint will be founded on exposed bedrock; however, portions of the footprint are expected to overlie frozen overburden soil. Where overburden soil is encountered, it will be excavated at the upstream toe to facilitate liner tie-in to the underlying

bedrock. The remaining overburden material beneath the berm will not be excavated and the berm fill will provide thermal protection.

1.2 Objectives

This memo presents the geotechnical design of the Madrid North CWP Berm for Phase 2 of the Hope Bay Project. The methods and assumptions for the berm design are included.

Hydrotechnical design and an alternatives assessment of the CWP is presented in the site-specific Water Management Design Report (SRK 2017a). A stability and thermal analysis were completed for earlier versions of CWP berm design and is presented in a separate memo (SRK 2017b).

2 Design Concept

2.1 Approach

The overall design concept for the CWP berm is to achieve an impermeable barrier using the geomembrane liner installed on the upstream berm face. The design uses the permafrost and naturally low permeability of the foundation soils and bedrock to contain the contact water on the bottom of the pond. Containment will require establishing a reliable seal between the liner and the bedrock at the berm's upstream toe.

Permafrost present within the berm footprint will be adequately maintained due to the thermal protection of the berm fill, as discussed in Section 3.4. Any excavated overburden soil to facilitate liner tie-in to bedrock will be monitored and covered if necessary during construction to provide thermal protection.

2.2 Components

The CWP berm will consist of a liner system (including tie-in system to bedrock), bulk fill, and the final road surface (berms will be used as an access road).

2.3 Foundation Conditions

Detailed site investigations have not been performed along the length of the proposed berm alignment. Approximately 65% of the berm will be founded on exposed bedrock based on SRK's review of aerial photographs. Where overburden exists, it is expected to be thin (in the order of 1 m thick). However, site conditions are expected to vary, and the design will be adapted as necessary by the field engineer during construction.

The Doris, Madrid and Boston areas have been well-studied (SRK 2017c), and it is expected that foundation conditions and geology from these areas will be similar to those encountered along the berm alignment. Permafrost in these areas extends to depths of about 570 m and are 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 most prevalent rock type on site with surface exposure is mafic volcanics, predominantly basalt. 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.

3 CWP Berm Design

3.1 Berm Design Criteria

Berm specific design criteria are listed below:

- The pond will be normally empty (i.e., the pond will be kept in a dry state);
- Maximum residence time for ponded water is two weeks;
- 20-year design life;
- Effects of climate change during the 2011 to 2040 timeframe will be considered;
- The berm crest will be used as a light vehicle access road;
- Berms will be constructed from geochemically suitable run-of-quarry (ROQ) rock or run-of-mine (ROM) waste rock; and
- Disturbance of surface vegetation and soil resulting in permafrost degradation within the pond footprint should be minimized.

3.2 Liner System Design Criteria

Liner system specific design criteria are listed below:

- Containment liner to be textured high-density polyethylene (HDPE) liner;
- HDPE to be protected by heavy duty (12 oz) non-woven geotextile from all material except unfrozen in-situ overburden (silt and clay);
- Minimum 0.3 m thick layer of bedding material (crushed and screened geochemically suitable quarry or waste rock material) between the non-woven geotextile (covering the HDPE) and transition material;
- Maximum internal (within berm structure) geomembrane slope of 1.5H:1V (33.6°);
- Maximum external (exposed) geomembrane slope of 2H:1V (25.5°);

3.3 Design Overview

The key features of the CWP berm design are listed below and shown in the attached design drawings (Attachment 1):

- 8 m wide crest and crest elevation at 70.5 m;
- Upstream side slopes of 3H:1V (18.4°) and downstream side slopes of 2H:1V (26.5°);
- Textured HDPE liner underlain by one layer of heavy duty non-woven geotextile;
- External (exposed) geomembrane slope of 3H:1V (18.4°)
- Minimum of 1 m overlap of the HDPE liner overtop of the ROQ/ROM bulk fill (to prevent liner pull-out);
- One 0.3 m thick layer of bedding material (crushed and screened geochemically suitable quarry or waste rock material) underneath the HDPE liner;
- One 0.5 m thick layer of transition material (crushed and screened geochemically suitable quarry or waste rock material) between the bedding layer and bulk ROQ/ROM fill, and as a final layer on top of the berm; and
- Four surficial survey monitoring points to monitor for berm settlement.

3.4 Geotechnical Analysis

A stability and thermal analysis were completed previously in an earlier revision of a pond design for both Madrid and Boston. The analysis and results are presented in a separate memo (SRK 2017b). The design concept for the Madrid North CWP has since changed, and the implications for the previous stability and thermal analyses is discussed below.

3.4.1 Stability Analysis

The previous stability analysis found that the CWP berm design is stable and meets minimum factor of safety (FOS) criteria as per CDA (2014) under both long-term static and pseudo-static loading conditions (SRK 2017b). Both the upstream and downstream slopes of the previous design were 2H:1V and the analysis only considered overburden (thawed and unthawed) for the foundation conditions. The design of the Madrid North CWP incorporates a flatter upstream slope (3H:1V) and will be founded predominantly on bedrock. If overburden is encountered, it is expected to be thin (in the order of 1 m).

Based on these design changes a new stability analysis is not required at this time. If, during construction, areas of overburden are thicker than anticipated, changes to the design may be required and a new stability analysis may be warranted.

3.4.2 Thermal Analysis

A thermal analysis was completed for the previous CWP berm design since that design concept relied on founding the HDPE liner in a key trench in frozen overburden and maintaining permafrost conditions. The design for the Madrid North CWP berm does not rely upon maintaining the liner

keyed into permafrost to create an impermeable layer within the berm. However, permafrost will be maintained beneath the berm to limit instability of the foundation soil.

The previous thermal modeling included a berm thickness of 2.5 m and applied a background temperature cycle to the full supply level (FSL) for the 20-year design life (SRK 2017b). Heat sourced from the water was a conservative input to the model as the CWP will normally be kept dry. The CWP model demonstrated that the maximum depth of thaw beneath the downstream toe would be limited to approximately less than 2 m below the existing ground level over the design life. Greater thaw was predicted for the upstream toe due to the conservative water temperature boundary applied to the model. The previous stability analysis considered these conditions. The current design is expected to have a minimum berm fill thickness of 4.0 m over areas of overburden. The additional berm fill when compared to the previous design is expected to add thermal protection and further limit the thaw depth. Therefore, an updated thermal analysis is not required at this time.

3.5 Hydrotechnical Design

Hydrotechnical design and an alternatives assessment of the CWP is presented in the site-specific Water Management Design Report (SRK 2017a). The pond has been designed with the capacity to contain at a minimum the contact water from the 1:100 year, 24-hour storm event (55 mm), and the maximum daily snowmelt (18 mm). The full supply level has been designed at an elevation of 69.7 m (0.3 m below top of liner). Therefore, operational freeboard is 0.8 m.

3.6 Liner Design

The lining system will consist of a single HDPE geomembrane (textured) underlain by a heavy duty non-woven geotextile (12 oz.). The liner will be anchored to the top of the slope with a 0.5 m thick cover of transition or bedding material at a minimum length of 2 m, to prevent pull-out. Where the liner overlaps with the ROQ or ROM bulk fill, there is an additional requirement that the liner overlap a minimum of 1 m with the ROQ/ROM crest. At the toe of the slope, the liner will be anchored to bedrock using mechanical means. A bituminous seal may also be applied if necessary. If bedrock conditions are unfavourable (e.g. weathered, highly fractured) or the bedrock surface is highly irregular, a concrete plinth may be required to facilitate liner tie-in. In this case, the liner will be affixed to the top of the concrete plinth by welding to a GSE Polylock Concrete Embedment Strip or approved alternative.

The bedrock conditions and contact point for the liner will be inspected in the field by the engineer. The engineer will make a final decision for the required adhesion method.

3.7 Construction Materials

Crushed and screened geochemically suitable quarry rock and/or waste rock from selected areas of the mine will be used for the bedding, transition and bulk fill materials. Geochemical analysis of proposed quarry rock materials determined that rock from Quarries 1 to 4 (SRK 2007) and Quarries A to E (SRK 2008) are suitable for use as construction material. Development (waste) rock from the Naartok portal decline west and south of the Deformation Zone is expected to be geologically and geochemically similar to quarry materials from the Hope Bay Project, e.g. SRK (2007), SRK (2008), SRK (2015), and SRK (2017d). All construction materials will be subject to operational monitoring to validate their geochemical suitability for use as construction material (TMAC 2017a, 2017b). Based

on the findings of SRK (2017e), waste rock from the deposit area, e.g. Madrid Crown Pillar Recovery Trenches, are not recommended for construction due to risk of neutral pH metal leaching.

4 Construction

All construction should be performed in accordance with the technical specifications (SRK 2018). Construction fill materials will be obtained from geochemically suitable permitted quarries or geochemically suitable ROM rock. Management and monitoring of these quarries will be according to the quarry management and monitoring plan (TMAC 2017a). Surfacing (32 mm minus), bedding (19 mm minus), and transition (150 mm minus) materials will be produced at an on-site crusher located within one of the proposed quarries.

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 berm alignment should be cleared of snow and ice. Near-surface massive ground ice intercepted by overburden excavation at the liner tie-in to bedrock may be removed if detailed analysis confirms the need for it. At no time will disturbance of the tundra vegetation or soils be allowed outside of the infrastructure footprint. Initial construction of the bulk ROQ fill will be placed by end-dumping from a newly constructed CWP access road and pushing the dumped material with a bulldozer. Excavation of any overburden materials at the upstream toe will be achieved by an excavator with access provided by the upstream ROQ slope.

Placement of transition and bedding material will occur from the constructed crest of the bulk ROQ fill. The liner system will only be installed once the design surface of the bedding material and any overburden excavation at the upstream toe have been surveyed and approved by the supervising engineer. Placement of the last 0.5 m lift of transition fill above the ROQ and final road surfacing material will not proceed until both the HDPE liner and ROQ material layer is at design level.

Any excavated overburden materials will be placed in a designated overburden pile within the Madrid North WRP footprint, or at any other existing overburden dumps on the Hope Bay Belt.

Wherever possible, the entire berm will be constructed in the winter to ensure the foundation materials remain frozen. Some summer construction may be required to meet development schedules. Construction fill placement techniques in winter and summer 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 screening of the site for nesting birds, and modifications to the construction schedule may be required to avoid disturbing nesting birds.

Routine visual inspections of berm will be carried out by operational staff and by the engineer-of-record during annual inspections and if areas are identified requiring maintenance that will be carried out using similar materials used for initial construction.

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The opinions expressed in this document 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. While 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

Canadian Dam Association (CDA). 2014. Technical Bulletin: Application of Dam Safety Guidelines to Mining Dams. 2014.

SRK Consulting (Canada) Inc., 2007. Geochemical Characterization of Quarry Materials, Doris-North Project, Hope Bay, Nunavut, Canada (Revised March 2007). Report Prepared for Miramar Hope Bay Ltd., April 2007.

SRK Consulting (Canada) Inc., 2008. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report Prepared for Hope Bay Mining Ltd., 1CH008.000. August 2008.

SRK Consulting (Canada) Inc., 2015. Hope Bay Project, Geochemical Characterization Program for Quarry G, H and I. Report Prepared for TMAC Resources Inc., 1CT022.002. August 2015.

SRK Consulting (Canada) Inc., 2017a. Madrid Water Management Engineering Report, Hope Bay Project. Report Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

SRK Consulting (Canada) Inc., 2017b. Hope Bay Project – Contact Water Pond Design. Memo Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

SRK Consulting (Canada) Inc., 2017c. Geotechnical Design Parameters and Overburden Summary Report, Hope Bay Project. Report Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

SRK Consulting (Canada) Inc., 2017d. Geochemical Characterization of Madrid-Boston Project Quarries Report, Hope Bay Project. Report Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

SRK Consulting (Canada) Inc., 2017e. Geochemical Characterization of Waste Rock and Ore, Madrid North Deposit, Hope Bay Project. Report Prepared for TMAC Resources Inc., 1CT022.013. November 2017.

SRK Consulting (Canada) Inc., 2018. Technical Specifications Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H – Issued for Construction. Report Prepared for TMAC Resources Inc., 1CT022.031. April 2018.

TMAC Resources Inc., 2017a. Hope Bay Project Quarry Management Plan. December 2017.

TMAC Resources Inc., 2017b. Hope Bay Project Waste Rock, Ore and Mine Backfill Management Plan. December 2017.

Attachment 1: Engineering Drawings for Contact Water Pond Berm Design

Engineering Drawings for the Madrid North Contact Water Pond

Hope Bay Project, Nunavut, Canada

Active Drawing Status

Drawing Number	Drawing Title	Issue	Date	Revision
MN-CWP-01	General Arrangement (With Orthophoto)	Issued for Construction	March 19, 2019	0
MN-CWP-02	General Arrangement	Issued for Construction	March 19, 2019	0
MN-CWP-03	Contact Water Pond Anticipated Foundation Conditions Plan and Profile	Issued for Construction	March 19, 2019	0
MN-CWP-04	Contact Water Pond Plan and Profile	Issued for Construction	March 19, 2019	0
MN-CWP-05	Contact Water Pond Typical Sections	Issued for Construction	March 19, 2019	0
MN-CWP-06	Contact Water Pond Typical Details	Issued for Construction	March 19, 2019	0
MN-CWP-07	Liner Tie-in Typical Details	Issued for Construction	March 19, 2019	0

TMAC RESOURCES

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Project Number: 1CT022.043

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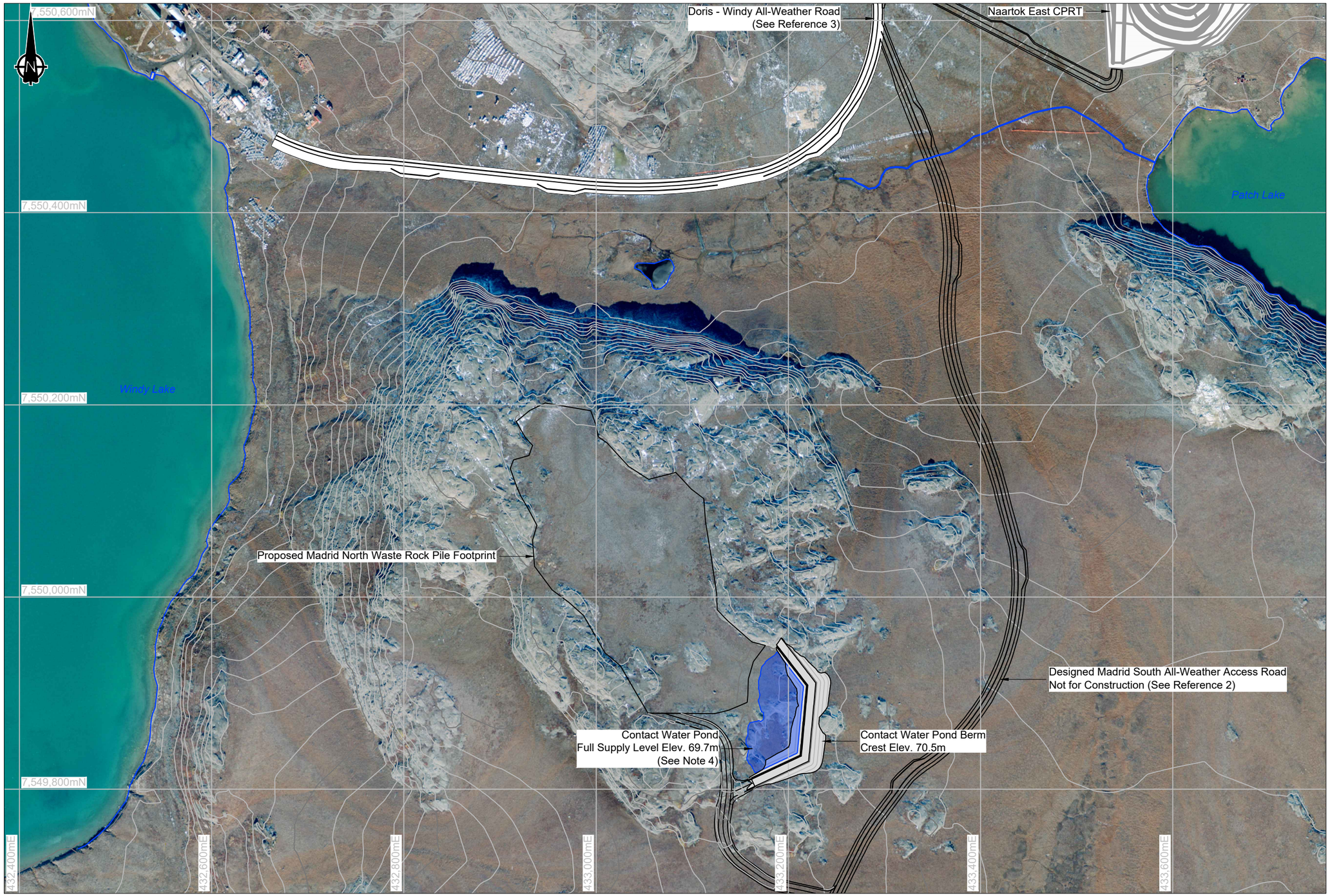

LEGEND

- Proposed Road
- Proposed Contact Water Pond

NOTES

1. Contours shown at 2.0m intervals.
2. All units shown in meters unless otherwise specified.
3. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).
4. The CWP will normally be kept in a dry state with a maximum two-week (i.e. fourteen day) residence time for water in the pond.
5. Imagery provided by client.

REFERENCES

1. NAD83 UTM Zone 13.
2. Details found in "Engineering Drawings for the Madrid South All-Weather Road, Hope Bay Project, Nunavut, Canada". Revision E Issued for Discussion drawings prepared for TMAC Resources. Project Number: 1CT022.043. March 2019.
3. Engineering Drawings for the Doris-Windy All-Weather Road, Doris Infrastructure Project, Nunavut, Canada. Revision AB1. As-Built drawings prepared for Hope Bay Mining Ltd. Project Number: 1CH008.033/058. May 11, 2012.
4. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report prepared for Hope Bay Mining Ltd., 1CH008.000. August 2008.

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DRAWING NO.	DRAWING TITLE
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REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
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NO.	DESCRIPTION	CHK'D	APP'D	DATE
0	Issued for Construction	RW	EMR	19/03/19
A	Issued for Discussion	RW	EMR	19/03/05

REVISIONS

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CHECKED:	APPROVED:	DATE:
RW	EMR	March 19, 2019

FILE NAME: 1CT022.043 - GA.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE: General Arrangement (With Orthophoto)

DRAWING NO.	SHEET	REVISION NO.
MN-CWP-01	1 OF 7	0

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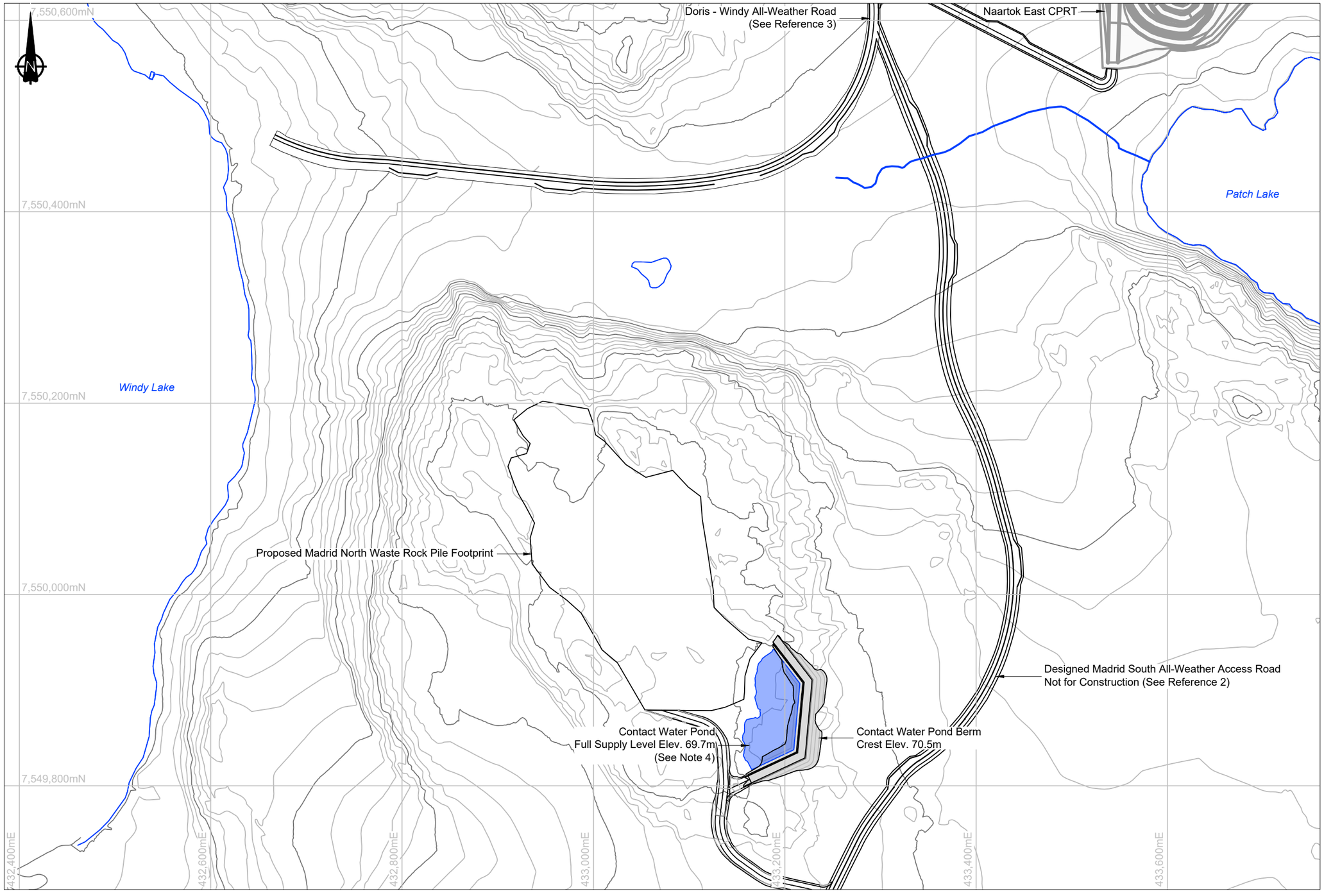

LEGEND

- Proposed Road
- Proposed Contact Water Pond

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2. Details found in "Engineering Drawings for the Madrid South All-Weather Road, Hope Bay Project, Nunavut, Canada". Revision E Issued for Discussion drawings prepared for TMAC Resources. Project Number: 1CT022.043. March 2019.
3. Engineering Drawings for the Doris-Windy All-Weather Road, Doris Infrastructure Project, Nunavut, Canada. Revision AB1. As-Built drawings prepared for Hope Bay Mining Ltd. Project Number: 1CH008.033/058. May 11, 2012.
4. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report prepared for Hope Bay Mining Ltd., 1CH008.000. August 2008.

MATERIAL LIST AND QUANTITIES

Overburden Excavation: 250m³
ROQ / ROM Material: 13,450m³
Transition Material: 1,705m³
Bedding Material: 450m³
Surfacing Material: 2,80m³
HDPE Geomembrane Liner: 2,005m²
Non-woven Geotextile: 2,005m²

*All volumes reported are calculated to neat lines. No bulking / shrinking factors have been utilized in volume determination.
Losses into the Tundra are not accounted for.

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REFERENCE DRAWINGS		REVISIONS								
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							A	Issued for Discussion	RW	EMR	19/03/05

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RW	EMR	March 19, 2019

FILE NAME: 1CT022.043 - GA.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE: General Arrangement

DRAWING NO.	SHEET	REVISION NO.
MN-CWP-02	2 OF 7	0

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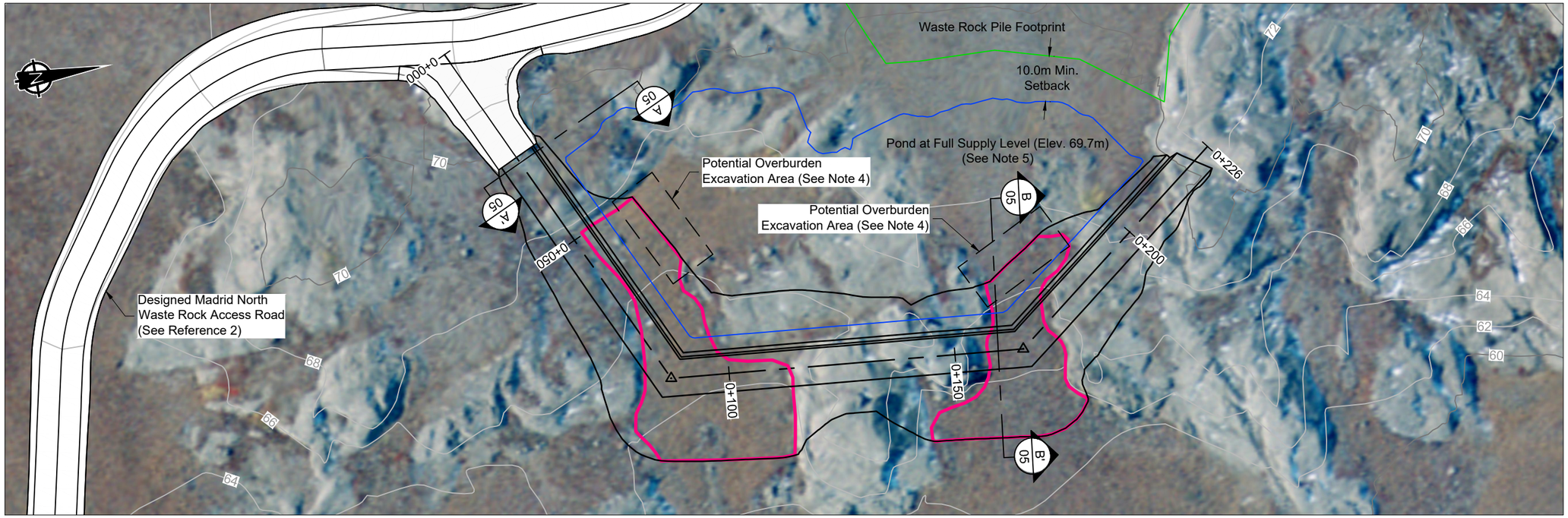
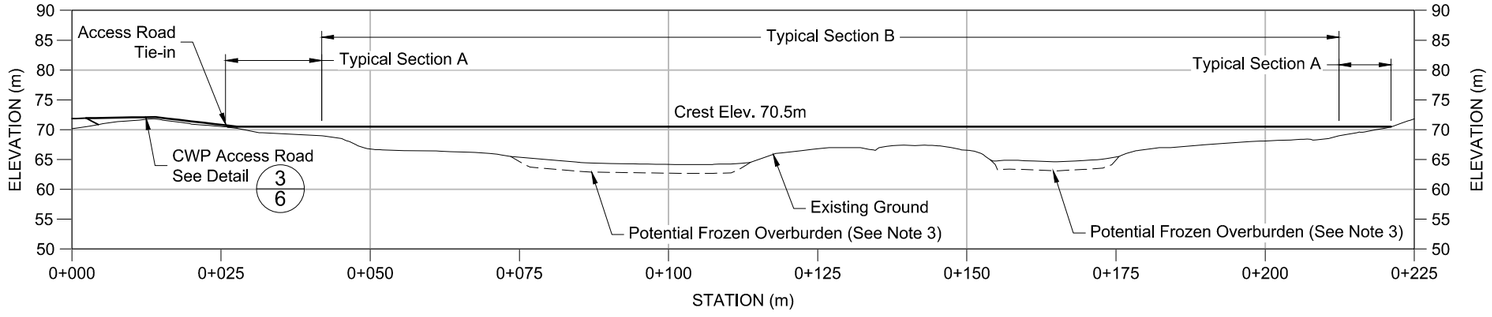


Contact Water Pond Berm Plan View



Contact Water Pond Berm Profile View

LEGEND

- Anticipated Overburden
- Contact Water Pond
- Contact Water Pond Berm
- Waste Rock Pile Footprint

NOTES

1. Contours shown at 2.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. The majority of the CWP berm footprint is expected to encounter bedrock outcrop. However, based on aerial imagery overburden may be encountered in low-lying areas.
4. If overburden is encountered at the upstream toe, it will be excavated to bedrock to allow liner to tie-in to the bedrock foundation.
5. The CWP will normally be kept in a dry state with a maximum two-week (i.e. fourteen-day) residence time for water in the pond.
6. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).

REFERENCES

1. NAD83 UTM Zone 13.
2. Engineering Drawings for the Madrid South All-Weather Road, Hope ay Project, Nunavut, Canada. Issued for Discussion. Revision A. Project No. 1CT022.043. March 2019.
3. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report prepared for Hope Bay Mining Ltd., 1CH008.000. August 2008.

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A	Issued for Discussion	RW	EMR	19/03/05

REFERENCE DRAWINGS

Original Drawings Stamped and Signed by Engineer

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CHECKED: RW | APPROVED: EMR | DATE: March 19, 2019
FILE NAME: 1CT022.043 - OB.dwg

TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE: Contact Water Pond Anticipated Foundation Conditions Plan and Profile

DRAWING NO.: MN-CWP-03 | SHEET: 3 OF 7 | REVISION NO.: 0

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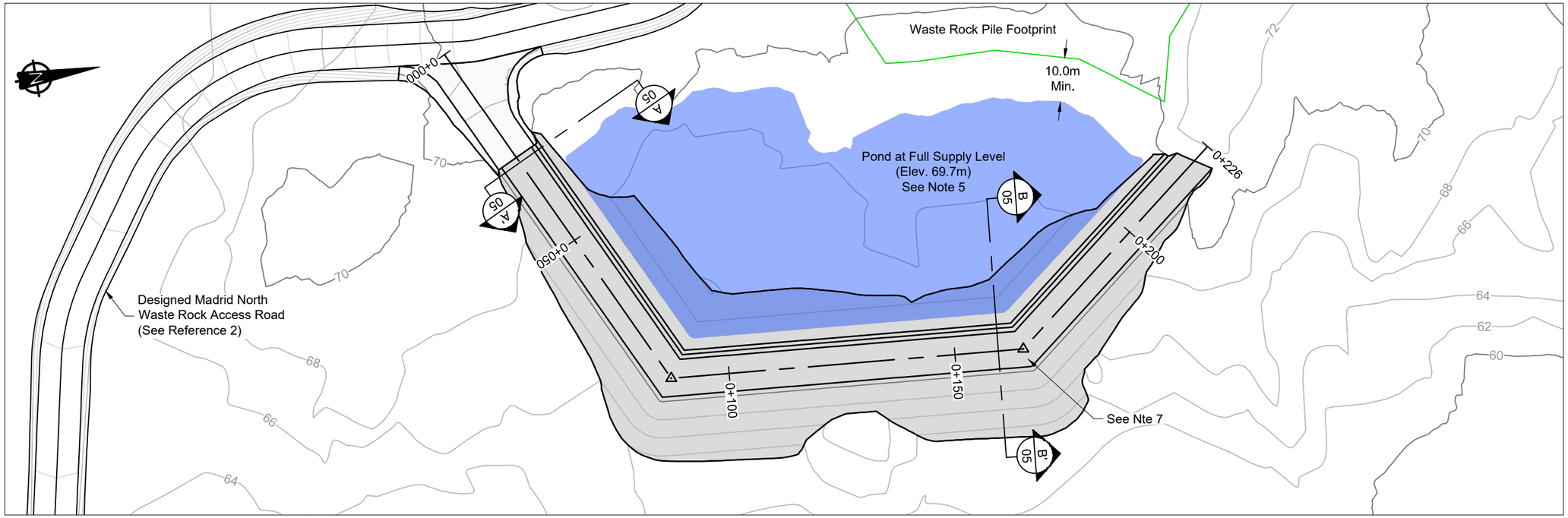
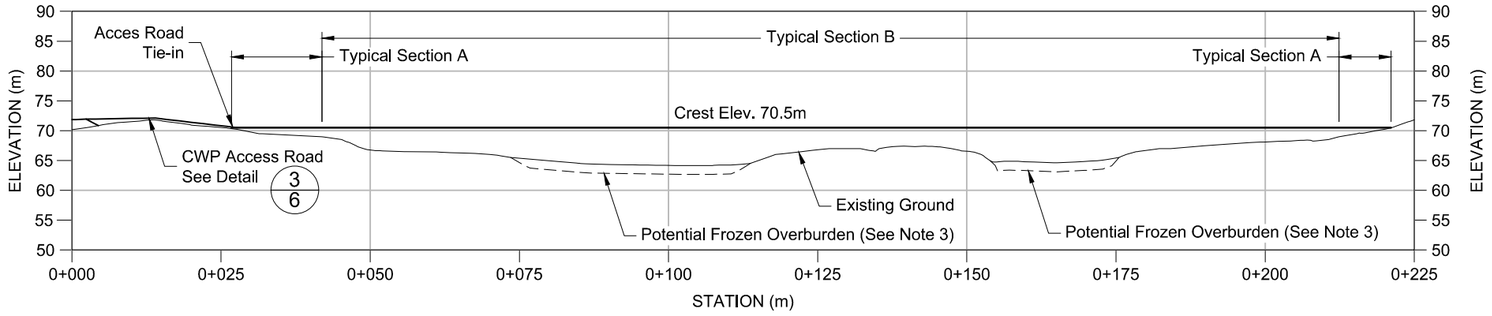


Contact Water Pond Berm Plan View



Contact Water Pond Berm Profile View

LEGEND

- Contact Water Pond
- Contact Water Pond Berm
- Waste Rock Pile Footprint

NOTES

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3. The majority of the CWP berm footprint is expected to encounter bedrock outcrop. However, based on aerial imagery overburden may be encountered in low-lying areas.
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5. The CWP will normally be kept in a dry state with a maximum two-week (i.e. fourteen-day) residence time for water in the pond.
6. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).
7. Where the height of the berm exceeds 3.0m, safety berms or barries are required on the crest. See Typical Berm Barrier Options on drawing MN-CWP-06.

REFERENCES

1. NAD83 UTM Zone 13.
2. Engineering Drawings for the Madrid South All-Weather Road, Hope ay Project, Nunavut, Canada. Issued for Discussion. Revision A. Project No. 1CT022.043. March 2019.
3. Geochemical Characterization of Quarry Materials for the Doris-Windy All-Weather Road, Hope Bay Project. Report prepared for Hope Bay Mining Ltd., 1CH008.000. August 2008.

0m 10 20 30 40

DRAWING NO.	DRAWING TITLE
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REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
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TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE:

Contact Water Pond
Plan and Profile

DRAWING NO.	SHEET	REVISION NO.
MN-CWP-04	4 OF 7	0

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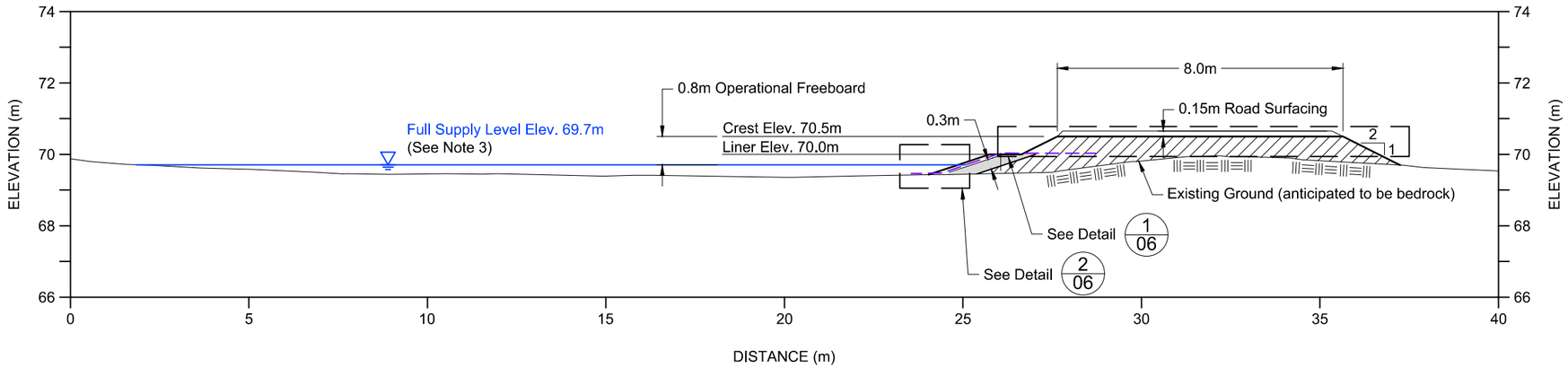


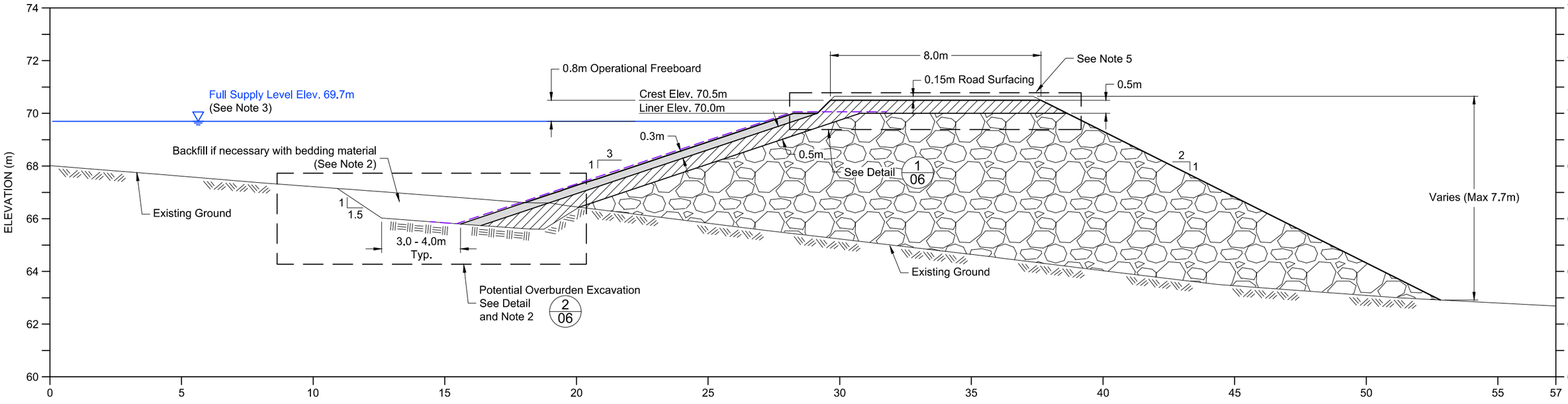
A/03 **Cross Section A-A' - Berm Sections less than 1.5m**

LEGEND

- Liner System
- Bedding Material
- Transition Material
- Run of Quarry (ROQ) or Run of Mine (ROM) Material

NOTES

1. All dimensions shown in meters unless otherwise stated.
2. If overburden is encountered at the upstream toe, it will be excavated to bedrock to tie-in to the bedrock foundation. Thickness of excavation will vary and will depend on conditions encountered. Excavation to be backfilled with bedding material if necessary to protect the liner tie-in.
3. The CWP will normally be kept in a dry state with a maximum two-week (i.e. fourteen-day) residence time for water in the pond.
4. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).
5. Where the height of the berm exceeds 3.0m, safety berms or barriers are required on the crest. See Typical Berm Barrier Options on drawing MN-CWP-06.



B/03 **Cross Section B-B' - Berm Sections 1.5m or higher**

0m 1 2 3 4 5 6

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TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE:
Contact Water Pond
Typical Sections

DRAWING NO. MN-CWP-05 | SHEET 5 OF 7 | REVISION NO. 0

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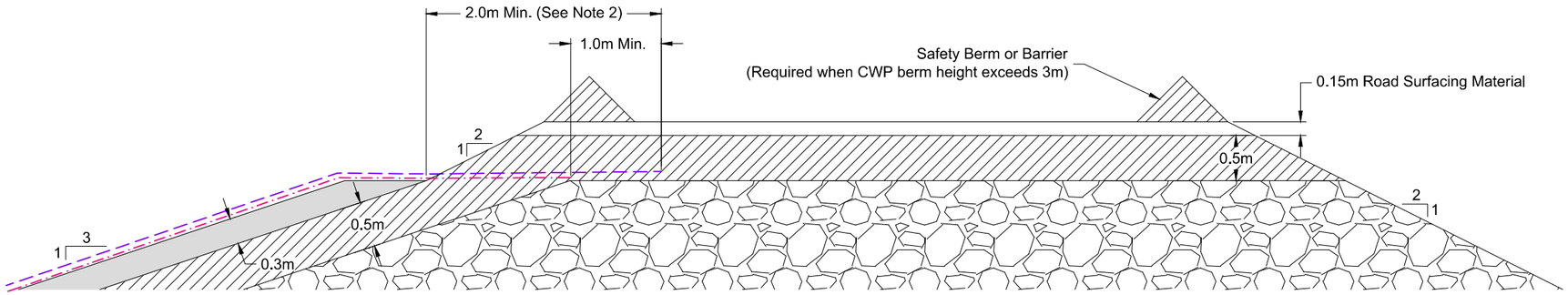


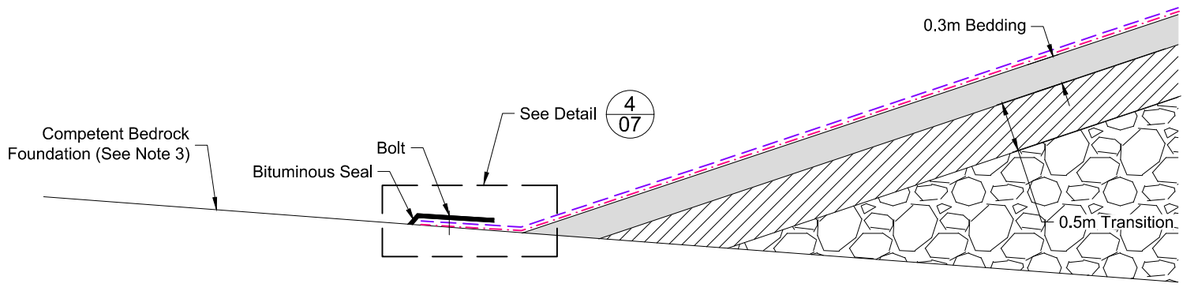
1/05 **Typical Liner Anchor Detail**

LEGEND

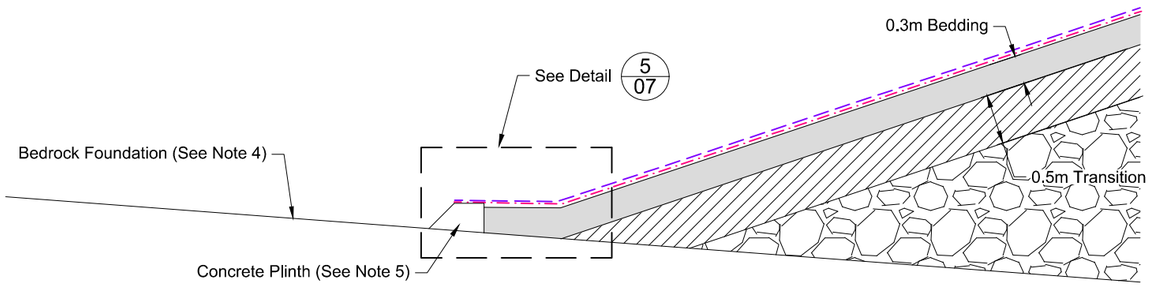
- Liner
- Non-woven Geotextile
- Bedding Material
- Transition Material
- Run of Quarry (ROQ) or Run of Mine (ROM) Material
- Bituminous Seal

NOTES

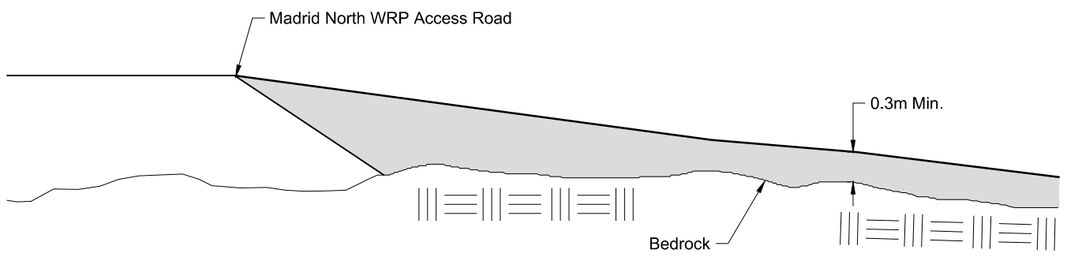
1. All dimensions shown in meters unless otherwise stated.
2. Minimum 1.0m liner overlap with ROQ/ROM material. Total covered liner overlap must be a minimum of 2.0m. Non-woven geotextile to terminate at ROQ/ROM.
3. If competent bedrock conditions are encountered, liner can be mechanically tied in to bedrock. A bituminous seal may also be applied. Bedrock conditions to be inspected and approved by field engineer.
4. If bedrock conditions are unfavourable (e.g. weathered, highly fractured) or the bedrock surface is highly irregular, a concrete plinth may be required to facilitate liner tie-in. Bedrock conditions to be inspected and approved by the field engineer.
5. Liner to be affixed to top of concrete plinth with GSE Polylock Concrete Embedment Strip or Approved Alterative. Steel reinforcement bars also required and should be typically drilled and grouted a minimum 450mm into bedrock.
6. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).



2/05 **Typical Liner Anchor at Bedrock - Mechanical Tie-down Option**

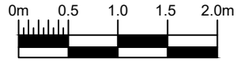


2/05 **Typical Liner Anchor at Bedrock - Concrete Plinth Option**



3/04,05 **CWP Access Road Detail**

Typical Safety Berm or Barrier Options



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TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE: Contact Water Pond Typical Details

DRAWING NO. MN-CWP-06 | SHEET 6 OF 7 | REVISION NO. 0

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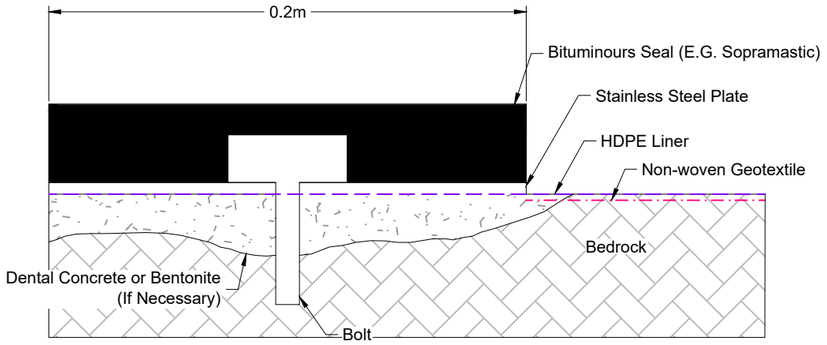
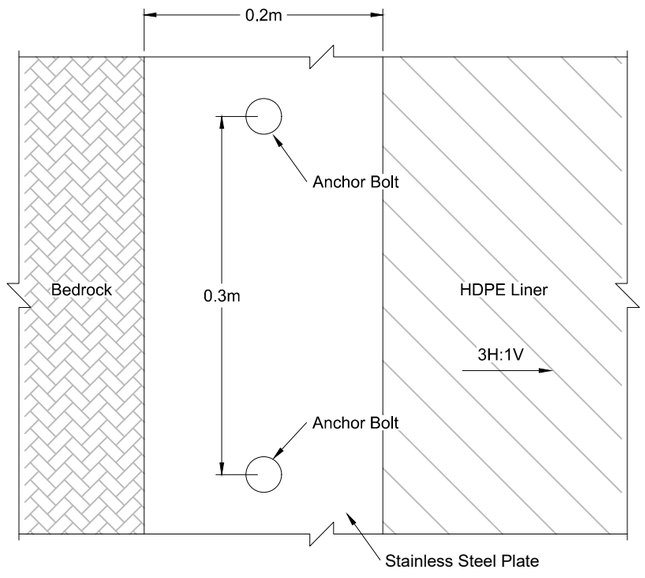


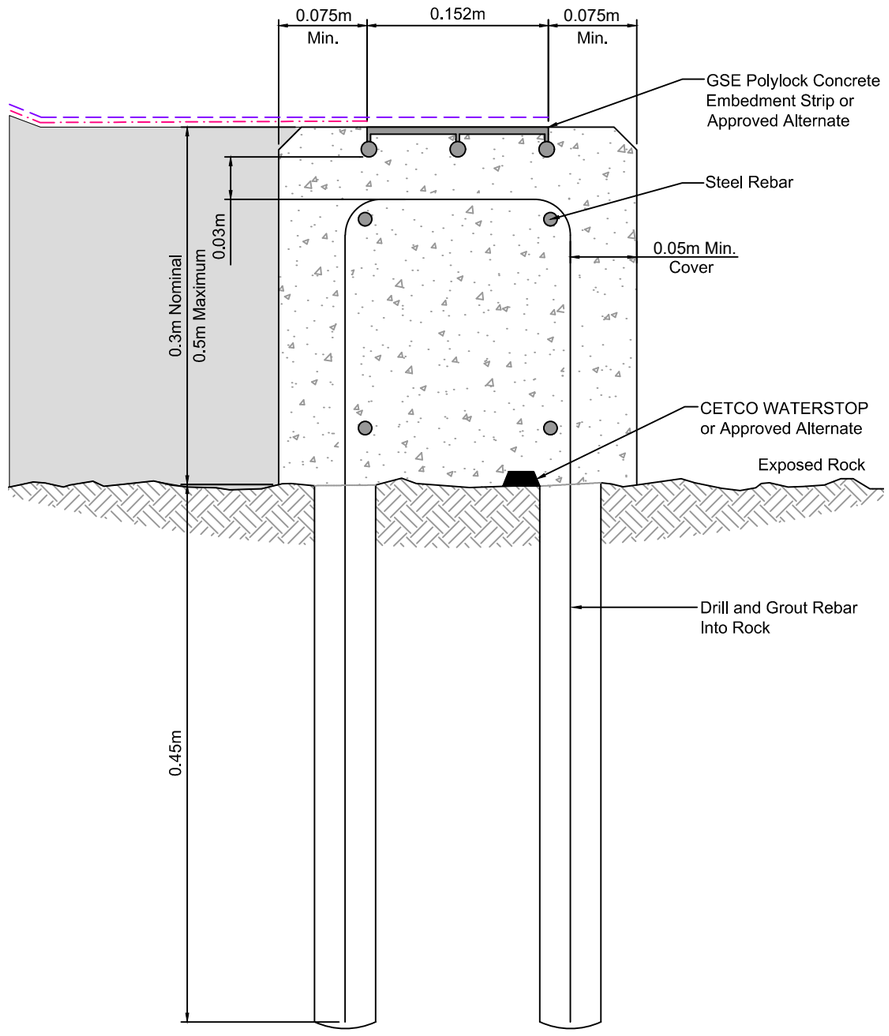
4/06 **Liner Anchored to Bedrock - Side View Typical Detail**

NOT TO SCALE



4/06 **Liner Anchored to Bedrock - Plan View Typical Detail**

NOT TO SCALE



5/06 **Liner Anchored to Concrete Plinth - Typical Detail**

0m 50 100 150 200

LEGEND

- HDPE Liner
- Non-woven Geotextile
- Bedding Material
- Concrete
- HDPE Liner
- Run of Quarry (ROQ) or Run of Mine (ROM) Material
- Bedrock
- Bituminous Seal

NOTES

1. All dimensions shown in meters unless otherwise stated.
2. Bedrock conditions and contact point for the liner will be inspected in the field by the engineer. The engineer will make a final decision for the required adhesion method.
3. Typical details shown may vary and additional details will be provided if required.
4. Construction and material specifications shall be in accordance with the following Technical Specifications: Earthworks and Geotechnical Engineering. Hope Bay Project, Nunavut, Canada. Revision H - Issued for Construction. SRK (2018).

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TMAC RESOURCES

Hope Bay Project

SRK JOB NO.: 1CT022.043

Madrid North Contact Water Pond

DRAWING TITLE:

Liner Tie-in Typical Details

DRAWING NO. MN-CWP-07 | SHEET 7 OF 7 | REVISION NO. 0

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