Volume 1 Annex V1-7 Type A Water Licence Applications

Package P5-22

Hope Bay Project: Madrid North-Tailings Impoundment Area All-Weather Road Preliminary Design

MAC RESOURCES

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Memo

To:	John Roberts, PEng, Vice President Environment	**Client:**	TMAC Resources Inc.
From:	Cameron Hore, CPEng, PEng	**Project No:**	1CT022.013
Reviewed By:	Maritz Rykaart, PhD, PEng	**Date:**	November 30, 2017
Subject:	Hope Bay Project: Madrid North-Tailings Impoundment Area All-Weather Road Preliminary Design		

Change Log

The following table provides an overview of material changes to this report from the previous version issued as Appendix V3-4G as part of the DEIS for Phase 2 of the Hope Bay Project dated December 2016.

Changes by Section

Information Request, Technical Comment, or Other Change	Section	Comments
Addition of TIA reclaim water pipeline along road alignment	all	Was erroneously excluded in previous version
KIA-IR178 (1)	2.4	Clarification that foundation conditions will be investigated prior to detailed design
KIA-IR178 (2)	3.1.1 & Attachment 1	Traffic barriers included as option instead of berm
KIA-IR178 (3)	3.3.2	Clarification on catch-basin clean out procedure
Other	3.2	Stream crossing design now addressed in separate report (SRK 2017c)

1 Introduction

1.1 General

The Hope Bay Project (the 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 Water Licence, and Phase 2 (Madrid-Boston project) which is in the environmental assessment and regulatory stage. 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.

As a component to the Phase 2 infrastructure design a 5.4 km long single lane all-weather road connects the Doris tailings impoundment area (TIA) to the Madrid process plant. The primary function of the road is to provide a direct access corridor for the proposed tailings conveyance and water reclaim lines between Madrid North and the TIA.

1.2 Objective

This memo provides the preliminary design details for the Madrid North TIA all-weather road.

2 Design Concept

2.1 Approach

The overall design concepts for the Madrid North TIA all-weather road, and associated infrastructure (quarries, quarry access roads, and stream crossings) are based on the same principles used for existing roads at Doris. Road alignments are designed to minimize crossings and unfavorable foundation conditions. The Madrid North TIA all-weather road will be administered and controlled entirely by TMAC.

2.2 Road Components

Design components of the Madrid North TIA all-weather road include the road geometry and alignments, turnouts to allow for passing, roadside safety berms, tailings catch basins, and stream crossings. Ancillary quarries and quarry access roads are also associated with the road, but is considered incidental to quarry development and therefore not detailed herein.

2.3 Topographic data

Design of the Madrid North TIA all-weather road is based on topographic contour maps with 1.0 m vertical resolution, and aerial photography produced from 2008 satellite imagery supplied by Hope Bay Mining Limited. Detailed ground surveys have not been completed along the road alignment and are not planned prior to construction as this has been the adopted practice of all road construction in the Project.

2.4 Foundation Conditions

Detailed studies and site inspections have not been performed along the entire length of the proposed all-weather road. The encompassing Project area (Doris, Madrid and Boston) have been well studied, and it is expected that foundation conditions and geology along the road length are similar. For details on the foundation conditions refer to SRK (2017a). Additional geotechnical investigations will be completed prior to detailed engineering.

Permafrost at the Project area 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.

2.5 Environmental Setbacks

The following environmental setbacks have been applied when selecting the location of the road:

- Minimum 31 m setback from waterbodies, 51 m setback where ever possible;
- Minimum 30 m buffer zone from known rare plants; and
- Minimum 30 m buffer zone from known archeological sites.

While priority was given to avoid these areas, in some cases the minimum buffer around archeological sites could not be maintained. In these instances, the archeological site will be mitigated in accordance with the Heritage Resources Protection Plan (TMAC 2016).

3 Design of Road Components

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 therefore be designed to the haul road standards set out in the Nunavut Mine Health and Safety Regulations (WSCC 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 haul trucks travelling the road. The road design criteria are as follows:

- The design vehicles will be crew cab trucks, personnel transfer busses, Super B-fuel trucks and Super B-trucks, and lowbed trucks. In addition, construction equipment will periodically travel the road, 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 for single lane traffic and 11 m for dual lane traffic;
- The maximum allowable grade is 10%, wherever possible, grades less than 4% should be targeted;
- 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 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 selected road alignment spurs off to the east of the existing Madrid-Windy Camp access road approximately 3.5 km south of the Doris Camp. The Madrid North TIA all-weather road heading is east towards Doris Lake where it traverses north between the Ogama and Doris lakes, and then terminating at the proposed TIA dam location. The road alignment is presented in Drawing MTR-02 (Attachment 1).

Thermal modelling has been previously completed to determine fill thickness required to preserve permafrost under infrastructure. Thermal modelling details can be found in SRK (2017b). Four zones are used to represent the different road fill thicknesses: Bedrock Zone, Zone 1, Zone 2, and Zone 3. The zones range in thickness from 0.3 to 2.0 m and are illustrated in the road sections provided in Drawing MTR-09 (Attachment 1). The fill zones are assigned based on site specific ground conditions, identified through air photo interpretation:

- The 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 1.0 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 2.0 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. Typical cross sections can be seen in Drawing MTR-09 (Attachment 1).

The landowner requires designated animal crossings to be constructed along any linear structures to allow relatively unhindered passing of migrating animals. Animal crossings will generally be located at major horizontal bends in the road alignment and at junctions, with the final location of animal crossings to be determined by elders after construction has been completed. Animal crossings will consist of 10 m wide sections of the roadway where the shoulders are flattened to 5H:1V and topped with surfacing material. At these locations, additional surfacing material will be used on the side slopes of the tailings pipeline to permit animal crossing.

3.2 Stream Crossings

SRK has defined a stream in this memo as a preferential flow path for surface freshet melt water and rainfall such that it may contain water seasonally or permanently and frequently links permanent water bodies. All stream crossings for the Madrid North TIA all-weather road are covered in the Stream Crossing Design Brief (SRK, 2017c)

3.3 Tailings Catch Basins

3.3.1 Design Criteria

Tailings catch basins have been designed to provide locations along the pipeline where a controlled volume of tailings can be discharged into a contained area. These locations target low spots where the tailings pipeline can naturally drain (Attachment 1). General design criteria for tailings catch basins are listed below:

- Minimum containment volume of each tailings catch basin is 120 m^3;
- Tailings catch basins are to be generally located at local low points along the all-weather road alignment;
- Environmental containment to be provided via a geomembrane; and
- Catch basins are to be constructed above the existing ground surface with no excavation.

3.3.2 Design

At each tailings catch basin location along the Madrid North TIA all-weather road, the road is to be widened by 4 m to provide additional space for future pipeline maintenance and protective berms (Attachment 1). The tailings catch basins are constructed from ROQ rock, surfacing material, and bedding materials as used for construction of the road. All tailings catch basins are constructed above permafrost surfaces; therefore, no excavation is required.

The provided engineered drawings (Attachment 1) illustrate the typical geometry of the tailings catch basins. Tailings catch basins are to be constructed to provide a minimum of 120 m^3 of containment volume. Containment is provided by compacted fill berms and a lining system comprising a 60 mil HDPE geomembrane and a 12 oz. non-woven geotextile. As illustrated in Attachment 1, MTR-10, the protective geomembrane lining is exposed on the surface of the catch basin. It is imperative that this layer be maintained, and any punctures be mended and avoided during construction and operations. Once constructed, the tailings catch basins will be ‘no-traffic’ areas to protect the liner. As such, no snow removal from the tailings catch basins should be undertaken. The catch basins are only for emergency use and will only be cleaned out after an emergency spillage. Following an emergency spillage and clean-out the HDPE geomembrane will be inspected and repaired or replaced as required. Similarly, SRK recommends that vehicles (i.e., ATV’s, snowmobiles, and heavy equipment) also should not be operated on the containment berm crest to avoid damage to the geomembrane.

4 Quarries

4.1 Design Criteria

To allow for efficient road construction, haul distances for road building materials are recommended to be less than 5 km; therefore, quarries should be located at a maximum spacing of 10 km along the road alignment. Quarry material should be non-acid generating and suitable for construction (i.e., competent rock).

4.2 Design

One proposed quarry has been identified along the Madrid North TIA all-weather road. The location of the proposed quarries is sited based on air photo interpretation and geological maps of the area (Sherlock 2002). Details of the expected geochemistry of quarry rock is provided in SRK (2017c). An existing quarry will provide rock for road construction between the existing Madrid-Windy Camp road and the proposed AG Quarry area (Drawing MTR-02, Attachment 1).

Quarry depth will vary based on rock outcrop height and surrounding topography. The proposed quarry will be drilled and blasted in benches, with 3 to 5 m high benches and 80° high wall slopes. Quarry floors should be sloped at a minimum of 1% to shed water. These parameters will be adjusted as needed based on observed rock quality during quarry development. Prior to drilling and blasting all overburden material shall be stripped from the rock surface.

Surface runoff (rain and snowmelt) management will consist of an upstream quarry berm to prevent runoff from outside of the quarry footprint from entering the area, as well as a downstream berm to contain surface runoff within the quarry footprint. The rock will be quarried near to the elevation of the surrounding topography, but not below that elevation to avoid creating permanent ponds at closure.

5 Construction

All construction fill materials will be obtained from geochemically suitable permitted quarries, or geochemically suitable waste rock. Management and monitoring of these quarries will be according to the quarry monitoring plan (TMAC 2017). Surfacing (32 mm minus) materials will be produced at an on site crusher located within the permitted quarries. The estimated construction quantities are provided in Drawing MTR-11 (Attachment 1). These volumes are estimated to neat lines and do not account for tundra embedment.

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(s) and a crusher.

Prior to construction, the road alignment should be cleared of snow and ice. At no time will disturbance of the tundra vegetation or soils be allowed outside of the road footprint, and no permafrost disturbance will be allowed. Construction fill will be placed by end-dumping on the existing road surface 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 should be performed in accordance with the technical specifications (SRK 2011).

Construction of the clear span bridges should not impact the stream or stream banks. Both bridge abutments will be constructed before the bridge is installed. To construct abutments on the far side of stream crossings temporary winter roads will be constructed. The clear-span structure and its components will be installed by excavator or crane (using a sling), standing on the end of the constructed road to ensure no disturbance of original ground or stream. For the first few years after construction, silt fences will be installed along the toe of the roadway to ensure that sediments do not enter the streams. The silt fences will start a minimum of 3 m before the abutment of the clear-span structure.

Wherever possible, the road 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.

The road construction is expected to proceed simultaneously, accessed from existing site roads. Construction is expected to be completed in one year.

6 References

Sherlock, R.L. 2002. Bedrock Geology of the Wolverine-Doris Corridor, Hope Bay Volcanic Belt, Nunavut, Prepared for Miramar Hope Bay Ltd., 2002.

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

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SRK Consulting (Canada) Inc., 2017c. Hope Bay Project Culvert Crossing Design Brief. Report Prepared for TMAC Resources Inc. 1CT022.013. November 2017.

TMAC Resources Inc., 2016. Hope Bay Project, Heritage Resources Protection Plan, Management Report. December 2016.

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

[WSCC] Workers Safety & Compensation Commission, 2015. 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).

Attachment 1: Engineering Drawings for the Madrid-Boston All-Weather Road

Engineering Drawings for the Madrid North to TIA All-Weather Road, Hope Bay Project, Nunavut, Canada

ACTIVE DRAWING STATUS

DWG NUMBER	DRAWING TITLE	REVISION	DATE	STATUS
MN-MTR-01	Engineering Drawings for the Madrid North to TIA All-Weather Road, Hope Bay Project, Nunavut, Canada	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-02	General Arrangement	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-03	Road Alignment Plan and Profile (1 of 4)	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-04	Road Alignment Plan and Profile (2 of 4)	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-05	Road Alignment Plan and Profile (3 of 4)	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-06	Road Alignment Plan and Profile (4 of 4)	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-07	Typical Road Plan and Sections	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-08	Typical Tailings Catch Basin Layout	B	Nov. 24, 2017	Issued for Discussion
MN-MTR-09	Material List and Quantity Estimates	B	Nov. 24, 2017	Issued for Discussion

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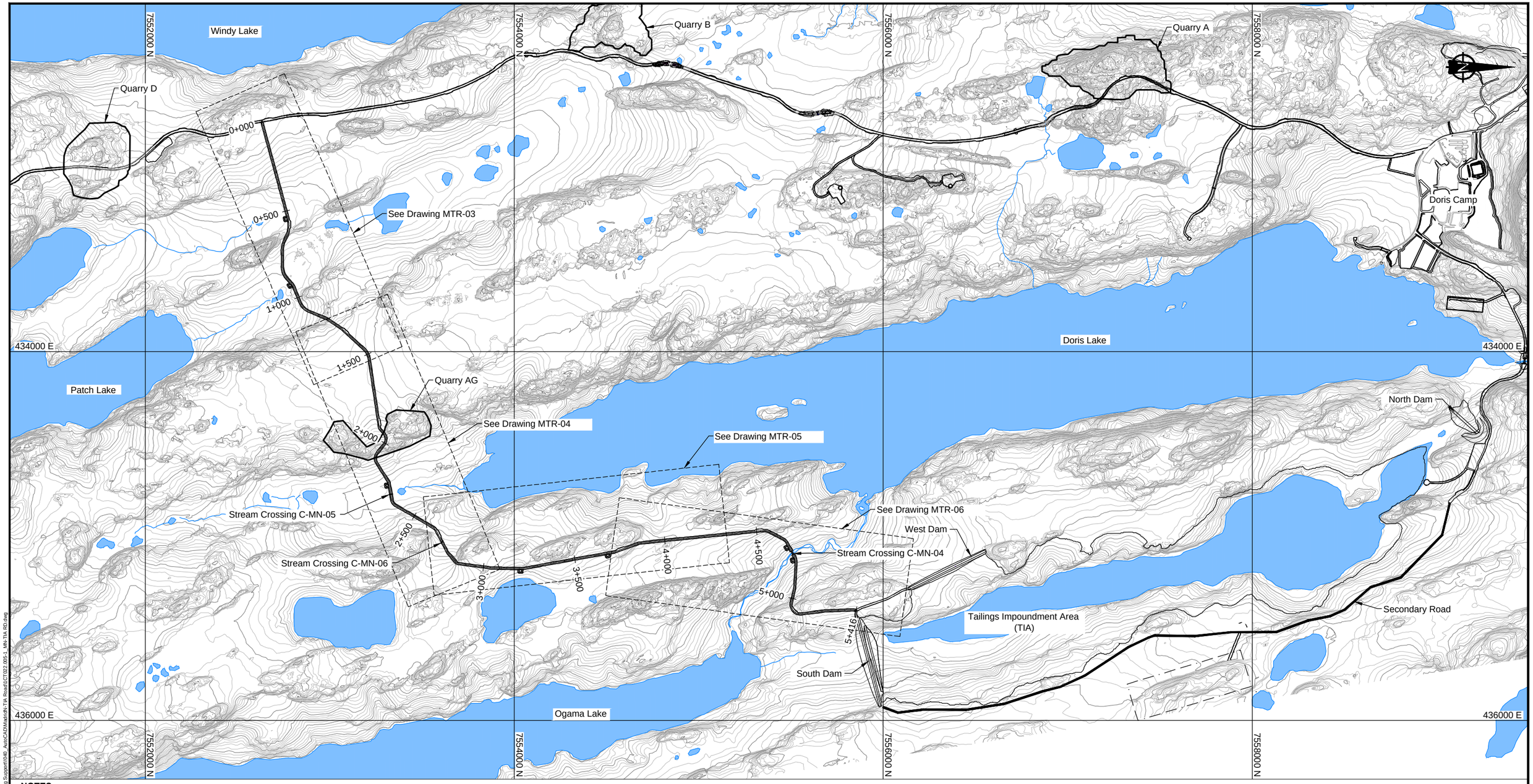
PROJECT NO: 1CT022.013
Revision B
November 24, 2017
Drawing MN-MTR-01



NOTES

1. The co-ordinate system is UTM NAD 83, Zone 13.
2. All dimensions are in metric units, unless otherwise specified.
3. All drawings are scaled appropriately for D-Size construction drawings. Scales may not be correct if these drawings are reproduced and presented in any other size format.
4. Notes in this drawing apply to all other active drawings.

PLAN VIEW
MADRID NORTH TO TIA

0 50 100 150 200 250
Scale in Metres

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
B	Issued for Discussion	CH	EMR	24Nov17
A	Issued for Discussion	CH	EMR	23Nov16

REVISIONS

PROFESSIONAL ENGINEER'S STAMP

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DESIGN:	DRAWN:	REVIEWED:
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CHECKED:	APPROVED:	DATE:
CH	EMR	Nov. 24, 2017

FILE NAME: 1CT022.013-1_MN-TIA RD.dwg

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HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE: General Arrangement

DRAWING NO.	SHEET	REVISION NO.
MN-MTR-02	2 of 9	B

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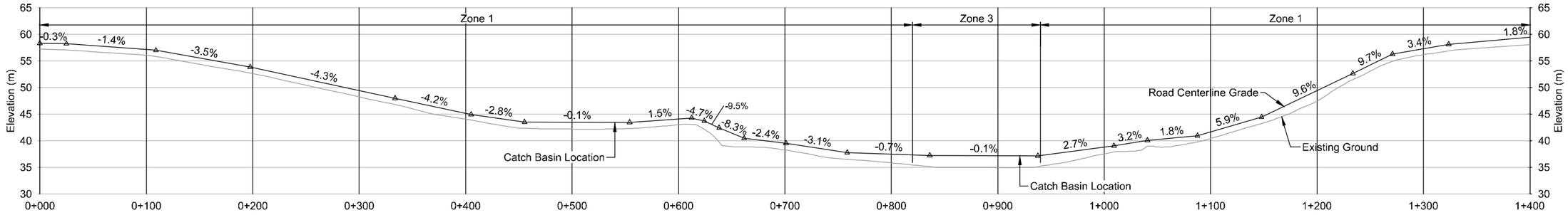

PROFILE LEGEND

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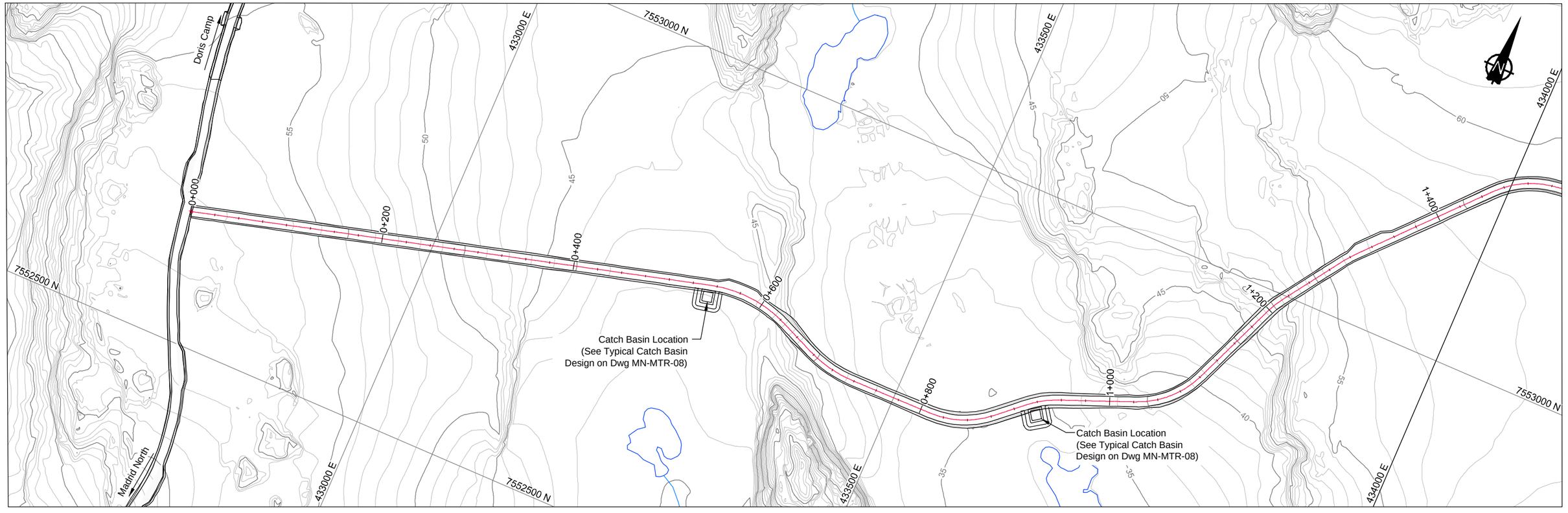
Horizontal Scale in Metres
Vertical Exaggeration 5X



LEGEND

Road Centerline (1+000)

Road Crest / Toe

Turnout Location

ROAD CONSTRUCTION ZONES TABLE:

Fill Zone 1	1.0m min. Overall Road Thickness with 1.5H:1V Side Slopes
Fill Zone 2	1.5m min. Overall Road Thickness with 1.5H:1V Side Slopes
Fill Zone 3	2.0m min. Overall Road Thickness with 2.0H:1V Side Slopes
Bedrock Zone	0.3m min Road Thickness (ROQ not required) with Side Slopes to be determined in the field

PLAN VIEW
MADRID NORTH TO TIA

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Scale in Metres

NOTE

1. All dimensions in metres unless noted otherwise.

NO.	DESCRIPTION	CH'K'D	APP'D	DATE
B	Issued for Discussion	CH	EMR	24Nov17
A	Issued for Discussion	CH	EMR	23Nov16

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

REVISIONS

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TMAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:
Road Alignment
Plan and Profile
(1 of 4)

DRAWING NO.	SHEET	REVISION NO.
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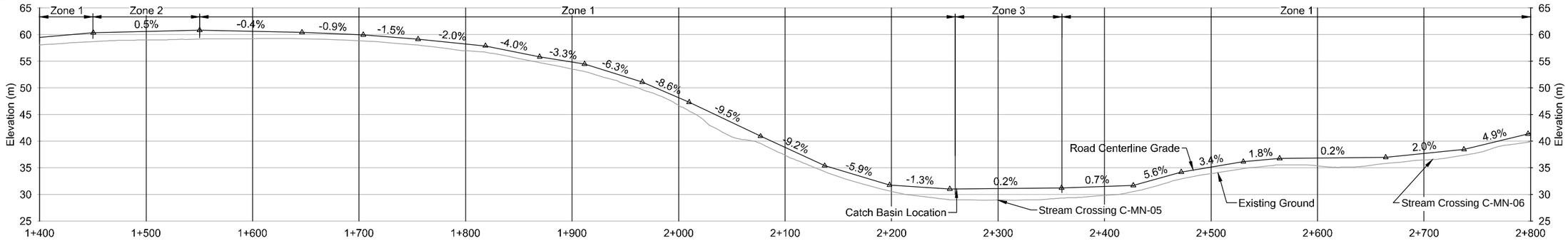

PROFILE LEGEND

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6.1% Grade

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MADRID NORTH TO TIA

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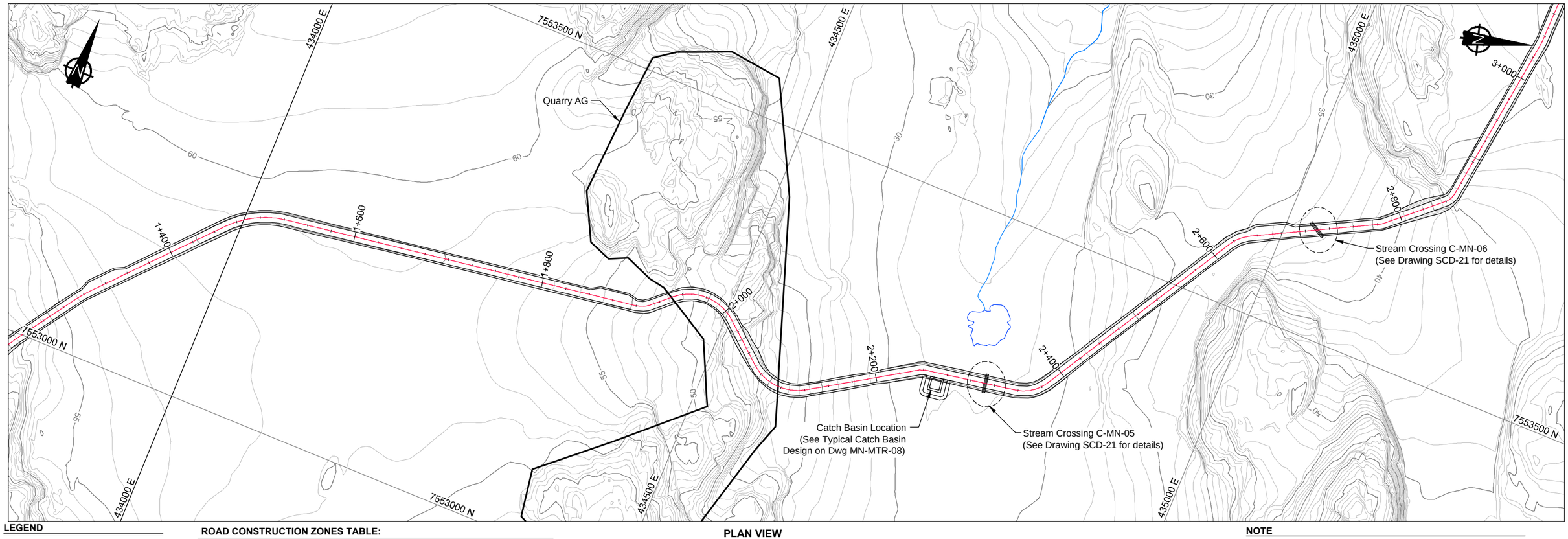
Horizontal Scale in Metres
Vertical Exaggeration 5X



LEGEND

1+000 Road Centerline

Road Crest / Toe

Turnout Location

ROAD CONSTRUCTION ZONES TABLE:

Fill Zone 1	1.0m min. Overall Road Thickness with 1.5H:1V Side Slopes
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Bedrock Zone	0.3m min Road Thickness (ROQ not required) with Side Slopes to be determined in the field

PLAN VIEW
MADRID NORTH TO TIA

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Scale in Metres

NOTE

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B	Issued for Discussion	CH	EMR	24Nov17
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HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:
Road Alignment
Plan and Profile
(2 of 4)

DRAWING NO. MN-MTR-04

SHEET 4 of 9

REVISION NO. B

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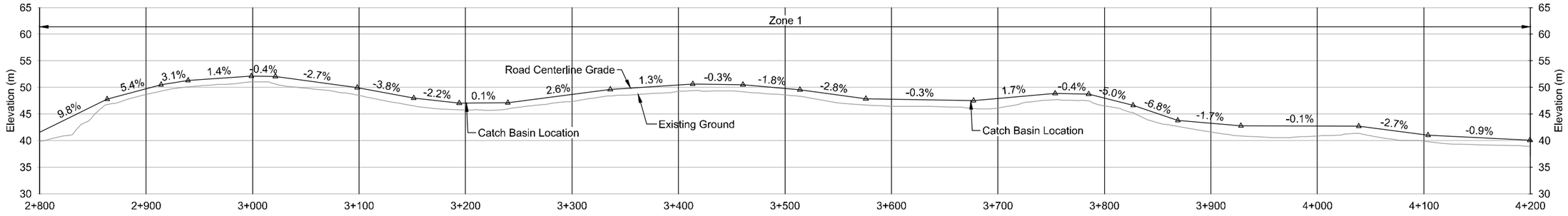

PROFILE LEGEND

- Point of Intersection
- 6.1% Grade

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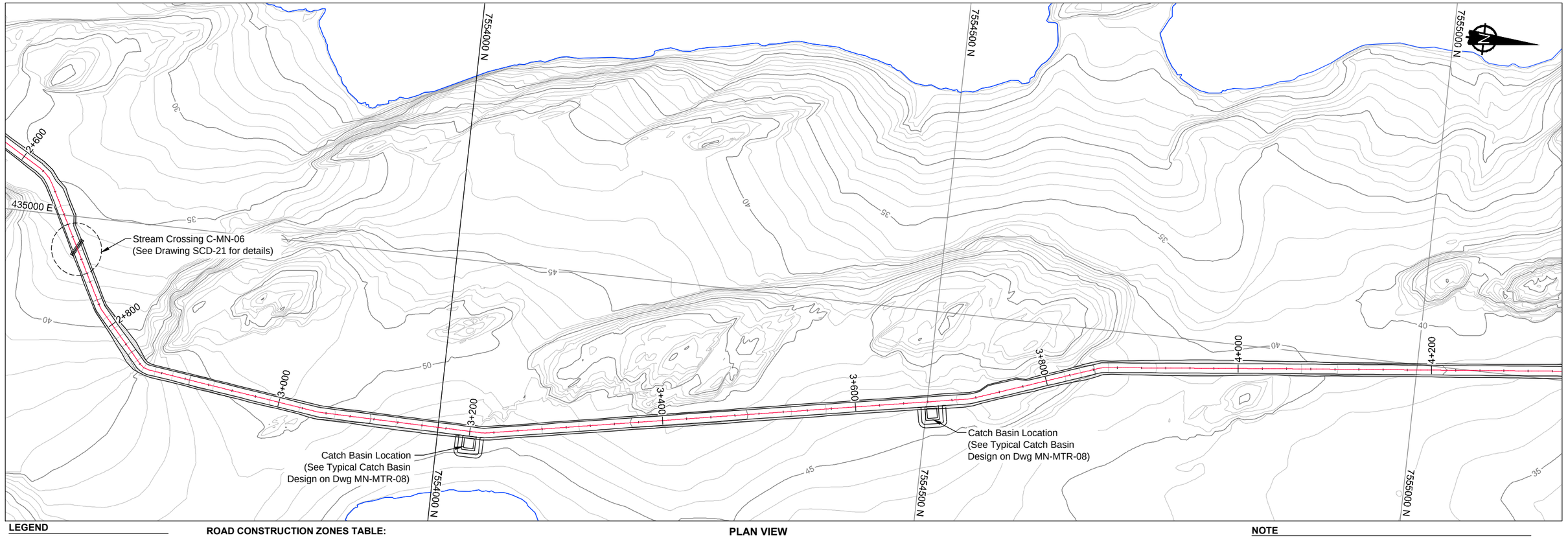
Horizontal Scale in Metres
Vertical Exaggeration 5X



LEGEND

- 1+000 Road Centerline
- Road Crest / Toe
- Turnout Location

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Scale in Metres

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REVISIONS

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TMAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:
Road Alignment
Plan and Profile
(3 of 4)

DRAWING NO.	SHEET	REVISION NO.
MN-MTR-05	5 of 9	B

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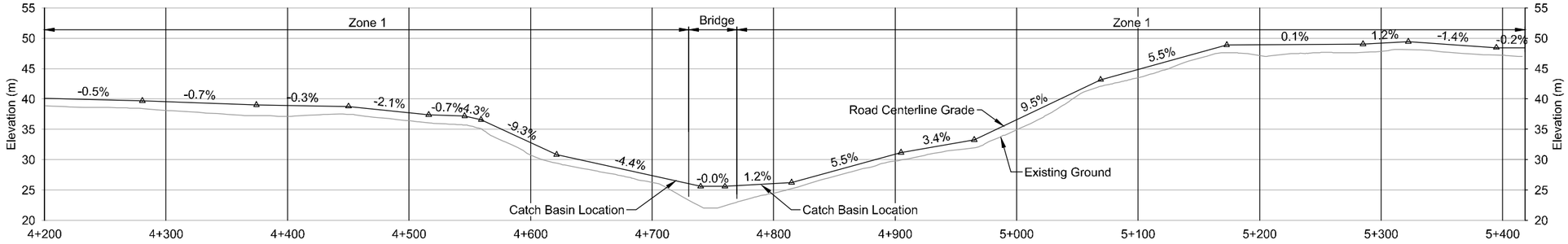

PROFILE LEGEND

△ Point of Intersection

6.1% Grade

PROFILE
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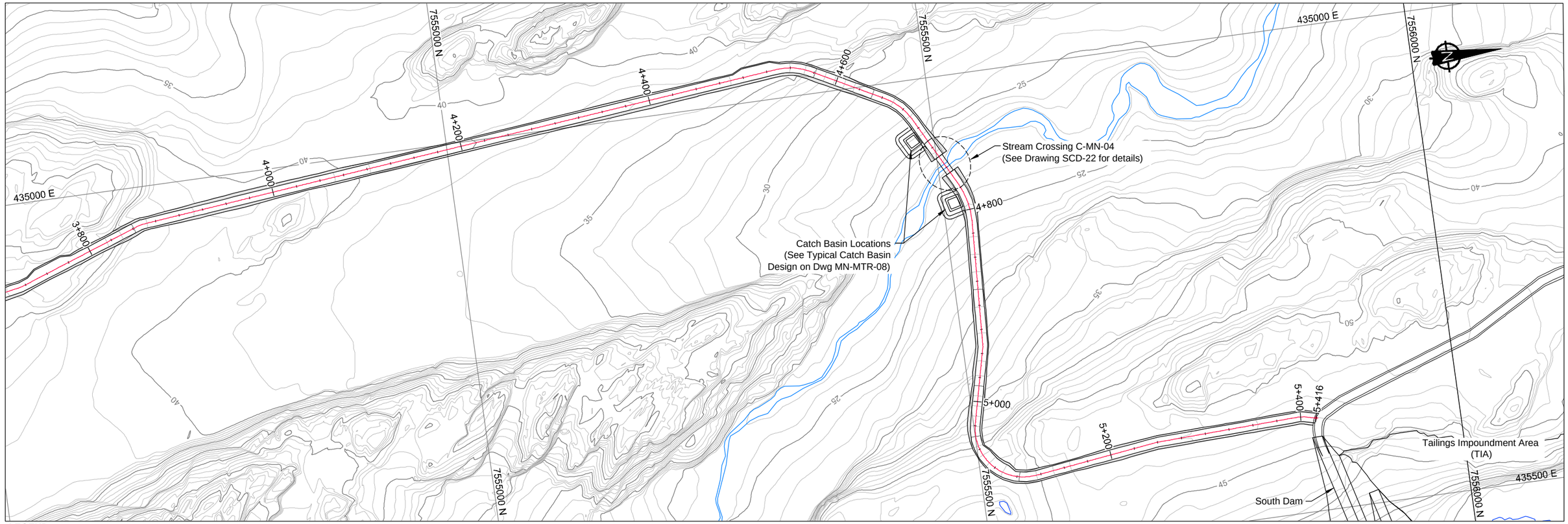
Horizontal Scale in Metres
Vertical Exaggeration 5X



LEGEND

1+000 Road Centerline

Road Crest / Toe

Turnout Location

ROAD CONSTRUCTION ZONES TABLE:

Fill Zone 1	1.0m min. Overall Road Thickness with 1.5H:1V Side Slopes
Fill Zone 2	1.5m min. Overall Road Thickness with 1.5H:1V Side Slopes
Fill Zone 3	2.0m min. Overall Road Thickness with 2.0H:1V Side Slopes
Bedrock Zone	0.3m min Road Thickness (ROQ not required) with Side Slopes to be determined in the field

PLAN VIEW
MADRID NORTH TO TIA

0 20 40 60 80 100

Scale in Metres

NOTE

1. All dimensions in metres unless noted otherwise.

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
B	Issued for Discussion	CH	EMR	24Nov17
A	Issued for Discussion	CH	EMR	23Nov16

REVISIONS

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DESIGN: SM	DRAWN: NV	REVIEWED: SM
CHECKED: CH	APPROVED: EMR	DATE: Nov. 24, 2017

FILE NAME: 1CT022.013-1_MN-TIA RD.dwg

TMAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:
Road Alignment
Plan and Profile
(4 of 4)

DRAWING NO.	SHEET	REVISION NO.
MN-MTR-06	6 of 9	B

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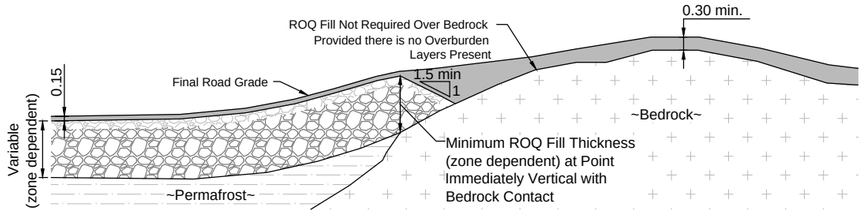
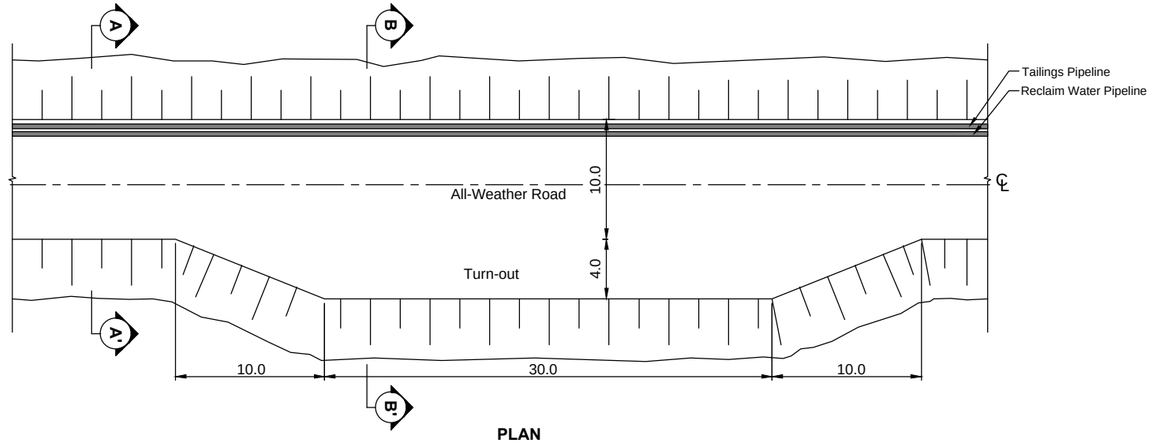


ALL-WEATHER ROAD PROFILE
TRANSITION FROM PERMAFROST TO BEDROCK

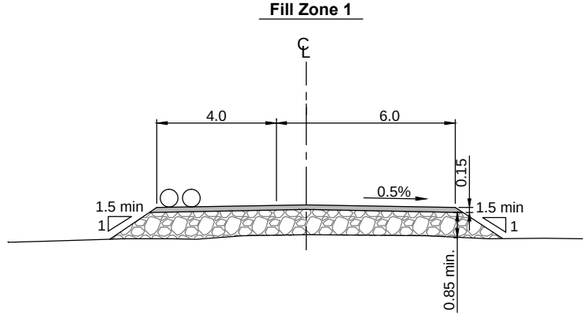
0 1 2 3 4 5
Scale in Metres



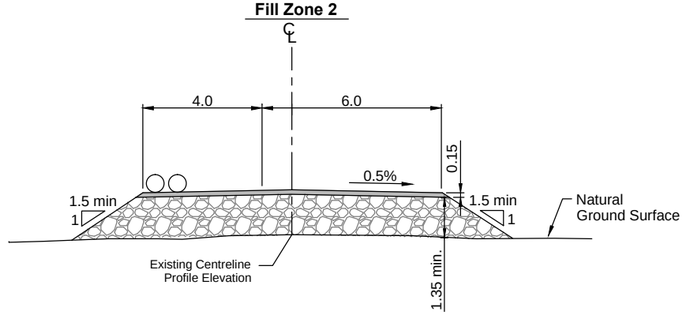
PLAN
TYPICAL ALL-WEATHER ROAD & TURNOUT

0 2 4 6 8 10
Scale in Metres

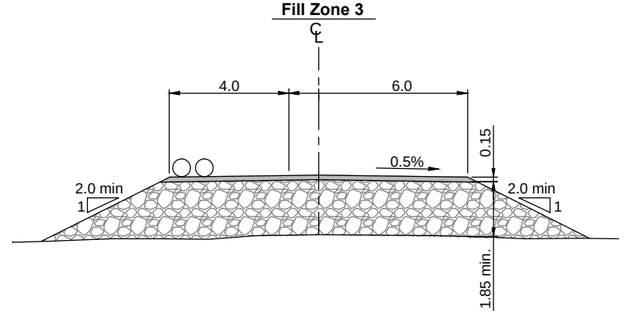
Fill Zone 1



Fill Zone 2

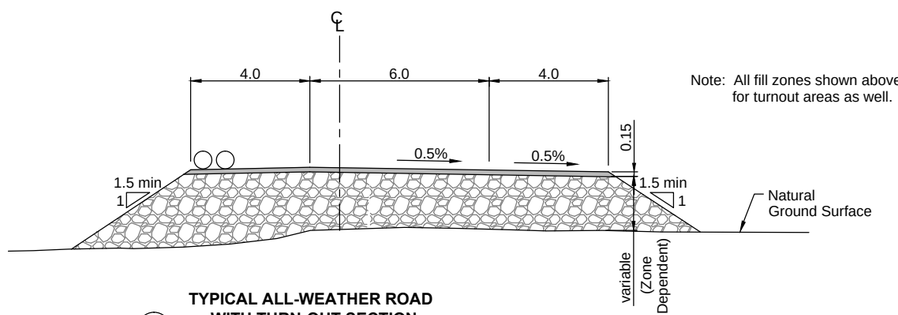


Fill Zone 3



TYPICAL
ALL-WEATHER ROAD SECTIONS
A

0 1 2 3 4 5
Scale in Metres



Note: All fill zones shown above apply for turnout areas as well.

TYPICAL ALL-WEATHER ROAD
WITH TURN-OUT SECTION
B

0 1 2 3 4 5
Scale in Metres

LEGEND

- Surfacing Material
- Run of Quarry Material

NOTES

1. All dimensions in metres unless noted otherwise.
2. Minimum design thickness must be maintained for all sections of the all-weather road including turnouts.
3. Notes in this drawing apply to all other active drawings.

DRAWING NO.	DRAWING TITLE	DRAWING NO.	DRAWING TITLE

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TMAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:
Typical Road
Plan and Sections

DRAWING NO. MN-MTR-07

SHEET 7 OF 9

REVISION NO. B

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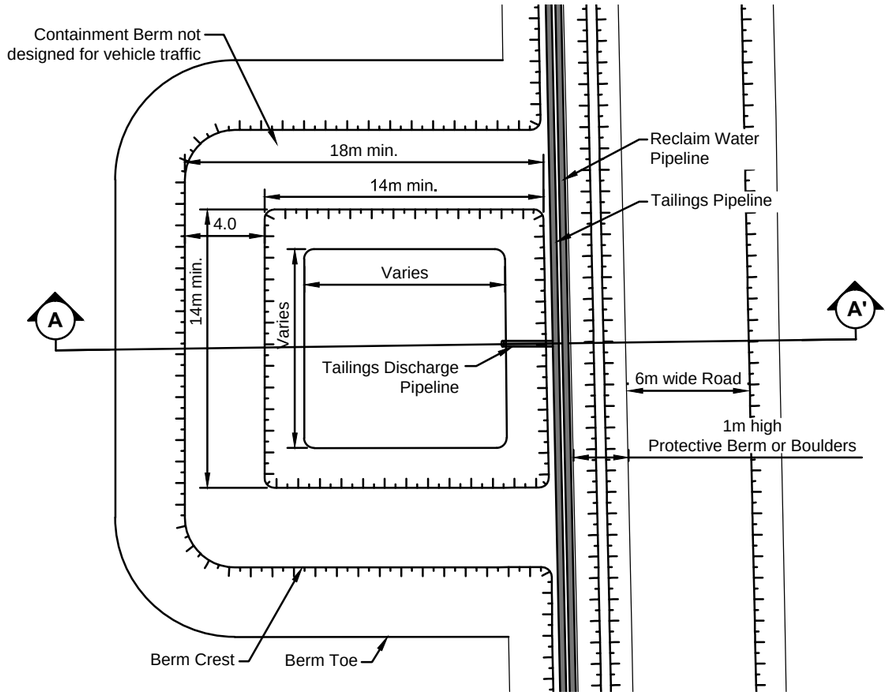


TYPICAL TAILINGS CATCH BASIN PLAN VIEW

0 2 4 6 8 10

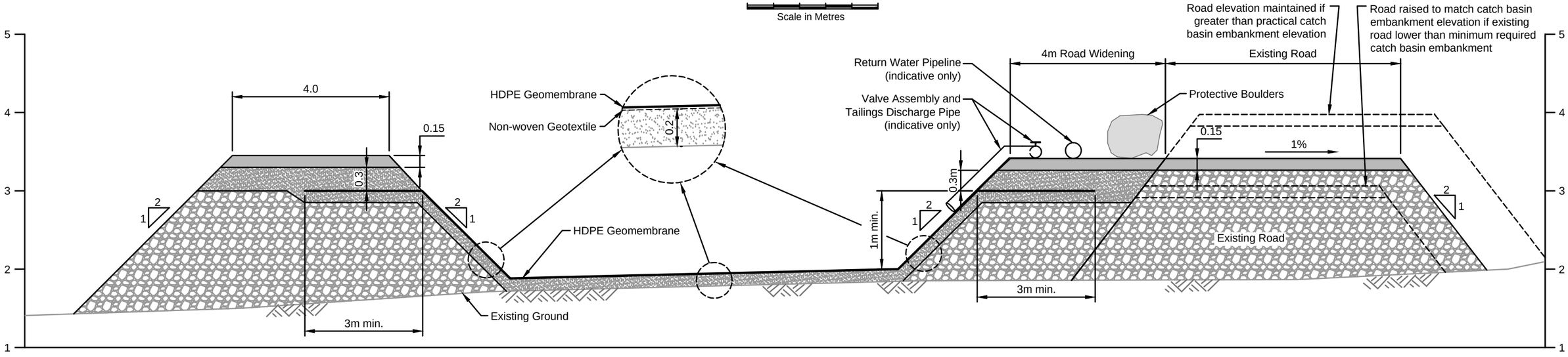
Scale in Metres

LEGEND

- Surfacing Material
- Bedding Material
- Run-of-Quarry Material
- 60 mil HDPE Geomembrane
- 12 oz. Non-woven Geotextile

NOTES

1. The final locations of the Tailings Catch Basins will be confirmed by the site engineer
2. The road will be widened at catch basin locations, to provide space for the tailings pipeline
3. The final constructed containment volume of the Tailings Catch Basins will be 120 m^3.
4. The Contractor shall be responsible to maintain and clear snow from the roadway with out damaging/moving the berm or the tailings pipeline.
5. Snow shall never be removed from the Tailings Catch Basin to prevent damaging the geomembrane lining.
6. Modifications to the liner tuck trench shall be allowed if equipment is inhibited. The details of any alteration shall be presented to the Engineer for approval.



A **SECTION A**

0 1 2 3 4 5

Horizontal Scale in Metres
Vertical Exaggeration 2X

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A	Issued for Discussion	CH	EMR	23Nov16

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SM	NV	SM
CHECKED:	APPROVED:	DATE:
CH	EMR	Nov. 24, 2017

FILE NAME: 1CT022.013-4_MN-TIA RD.dwg

MAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE: Typical Tailings Catch Basin Layout

DRAWING NO.	SHEET	REVISION NO.
MN-MTR-08	8 OF 9	B

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Materials List and Quantity Estimates

Item	Quantity / Area / Volume	Description
1. Culverts	4 (Estimated) (Dependant Final Crossing Selected)	AIL Corrugated Steel Pipe 68x13 corrugated profile varying diameter
2. Run of Quarry Material	Road: 85,850m^3	Approximate In-Place Neat-line Volume (3D volume based on Civil 3D surfaces - no allowance has been made for losses and/or tundra embedment)
3. Surfacing Material	Road: 8,150m^3	Approximate In-Place Neat-line Volume

Tolerances on Road Material Placement:

Location	Fill (mm)	Excavation (mm)
Vertical Tolerance on Roads	0 to +75	n/a
Horizontal Tolerance on Roads	-150 to +150	

Note: Grade shall not be uniformly high or low.

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REFERENCE DRAWINGS

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SM	NV	SM
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FILE NAME: 1CT022.013-3_MN-TIA RD.dwg

TMAC RESOURCES

HOPE BAY PROJECT

SRK JOB NO.: 1CT022.013

Madrid North-TIA All-Weather Road

DRAWING TITLE:

Material List and Quantity Estimates

DRAWING NO.	SHEET	REVISION NO.
MN-MTR-09	9 OF 9	B