Provincial Individual EA
Proposed Terms of Reference for the Côté Gold Project
Appendix C

Prepared for:
IAMGOLD Corporation

Prepared by:
AMEC Environment & Infrastructure

Project Number:
TC121522

APPENDIX C

TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT

IAMGOLD CORPORATION
CÔTÉ GOLD PROJECT



TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT

PREPARED FOR:

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NB101-497/3-1
Rev 0
March 5, 2013

Knight Piésold
CONSULTING
www.knightpiesold.com

ISO 9001 - FS 64925
ISO 14001 - EMS 550121
OHSAS 18001 - OHS 550122

IAMGOLD CORPORATION
CÔTÉ GOLD PROJECT

TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
NB101-497/3-1

Rev	Description	Date	Approved
0	Issued in Final	March 5, 2013	

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CONSULTING

EXECUTIVE SUMMARY

This report presents an assessment of alternatives for the Tailings Management Facility (TMF) for the Côté Gold Project. The selection of the preferred TMF Option is the focus of this report. Environmental, socio-economic, technical and economic criteria were considered to determine the preferred Option.

An initial site selection and pre-screening review process identified four TMF Options as suitable candidates for the tailings management facility. Sub-options involving different embankment layouts, surface water realignments and water management methods were developed for some of the Options. Six Options were carried forward to be evaluated further using a Multiple Accounts Analysis (MAA) to select the preferred TMF Option for tailings storage and water management.

The MAA was competed by establishing accounts, sub-accounts and indicators to compare and rank the identified TMF Options. The MAA was completed by maintaining account weighting factors consistent with the recommendations suggested in Environment Canada's guidelines. Sub-account and indicator weighting factors were established based on discussions with IAMGOLD and input from a multidisciplinary team to ensure that the evaluation accurately reflected the project parameters. A multi-step matrix type evaluation was used to establish a numerical rating for each Option. The MAA was completed to limit bias towards any of the TMF Options that were considered.

The results of the MAA indicate that TMF 1B is the preferred TMF Option for the Project. The results of the sensitivity analyses support the selection of TMF 1B.

It is recommended to initiate a pre-feasibility level design of TMF 1B.

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ABBREVIATIONS

EC ..... Environment Canada
ha ..... hectare
IAMGOLD ..... IAMGOLD Corporation
km ..... kilometre
KPL ..... Knight Piésold Ltd
m ..... metre
MAA ..... multiple accounts analysis
MRA ..... mine rock and overburden storage areas
m^3 ..... cubic metres
NAG ..... non-acid generating
O.Reg ..... Ontario Regulation
PAG ..... potentially acid generating
PWQO ..... Provincial Water Quality Objectives
TMF ..... tailings management facility

1 – INTRODUCTION

1.1 PROJECT LOCATION

IAMGOLD Corporation (IAMGOLD) is in the process of developing the Côté Gold Project (the Project), which includes a large tonnage, low to medium grade gold deposit within Chester and Neville Townships, District of Sudbury, approximately 20 kilometres (km) southwest of Gogama, Ontario. The Project area is situated just west of Highway 144, approximately 200 km by road northwest of Sudbury. Work is currently being completed to support upcoming pre-feasibility design and permitting. Figure 1.1 shows the location of the Côté Gold Project and the nearby communities.

1.2 SITE DESCRIPTION

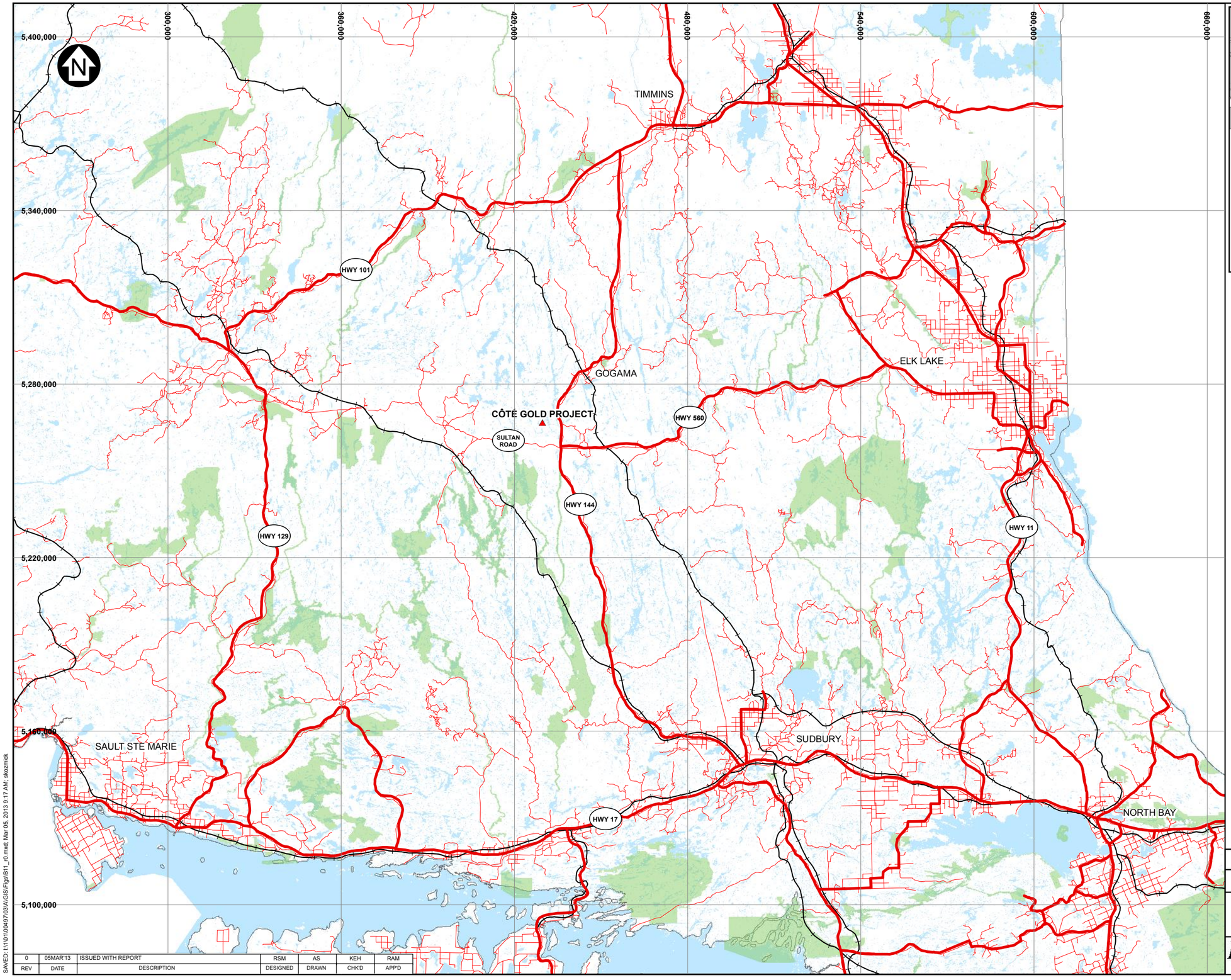
Topography at the project site is characterized by gentle to steep hilly terrain with ground surface elevations ranging from approximately El. 365 m to greater than El. 450 m. Low lying areas are characterized by abundant water bodies, including small to medium lakes, streams and swamps/boggy areas. Bedrock is exposed or very close to surface in most areas, with the exception of valley floors and low lying wet areas. The Project site is located within the Upper Mattagami River Watershed, which drains northward through the City of Timmins to James Bay. The site is located on two main sub-watersheds, the Mollie River system and the Mesomikenda River system. The intercontinental watershed divide is located south of the Project property. Surface water flows at the Project site are controlled by a number of lakes and creeks. The vegetation is generally dense in areas where the forest has not been historically harvested. The climate of this area is typical of northern areas within the Canadian Shield, with long cold winters, short warm summers and a moderate amount of precipitation throughout the year.

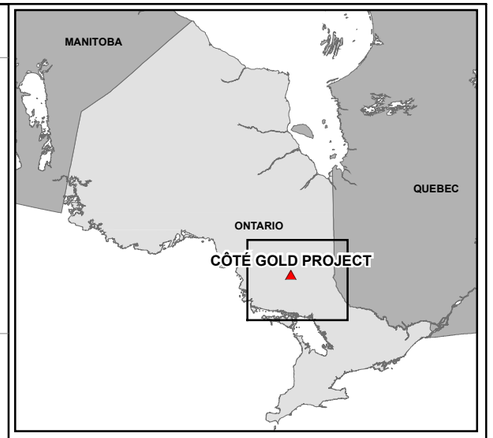
1.3 PROJECT DESCRIPTION

The Côté Gold Project will consist of a large open pit, Tailing Management Facility (TMF), Mine Rock and Overburden Storage Areas (MRA), Process Plant and ancillary facilities. A conceptual general site layout, detailing the proposed locations for the Project infrastructure, is shown on Figure 1.2.

Ore will be processed (crushed, ground, concentrated) at an on-site processing facility. During the operations phase of the Project, ore will be fed to the mill at an average rate of approximately 55,000 tonnes per day. The operating life of the mine is estimated to be approximately 15 years.

Disturbed areas within the Project footprint will be reclaimed in a progressive manner during all Project phases. Natural drainage patterns will be restored as much as possible. The ultimate goal of mine decommissioning will be to reclaim land within the Project footprint to allow future use by resident biota and as determined through consultation with the public, Aboriginal peoples and government. A certified Closure Plan for the Project will be prepared as required by Ontario Regulation (O.Reg.) 240/00 as amended by O.Reg. 307/12 (Ministry of the Northern Development and Mines, 2006)





LEGEND:

- CÔTÉ GOLD PROJECT LOCATION
- COMMUNITY/SERVICE CENTRE
- ROAD
- RAILWAY
- WATER
- PARK

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA DEPARTMENT OF NATURAL RESOURCES (2009.) ALL RIGHTS RESERVED.
2. CO-ORDINATE GRID IS IN METRES.
   DATUM: NAD83
   PROJECTION: UTM ZONE 17

SCALE 20 10 0 20 40 60 km

IAMGOLD CORPORATION

CÔTÉ GOLD PROJECT

PROJECT LOCATION MAP

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P/A NO. NB101-497/3 | REF NO. 1

FIGURE 1.1 | REV 0

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0	05MAR'13	ISSUED WITH REPORT	RSM	AS	KEH	RAM

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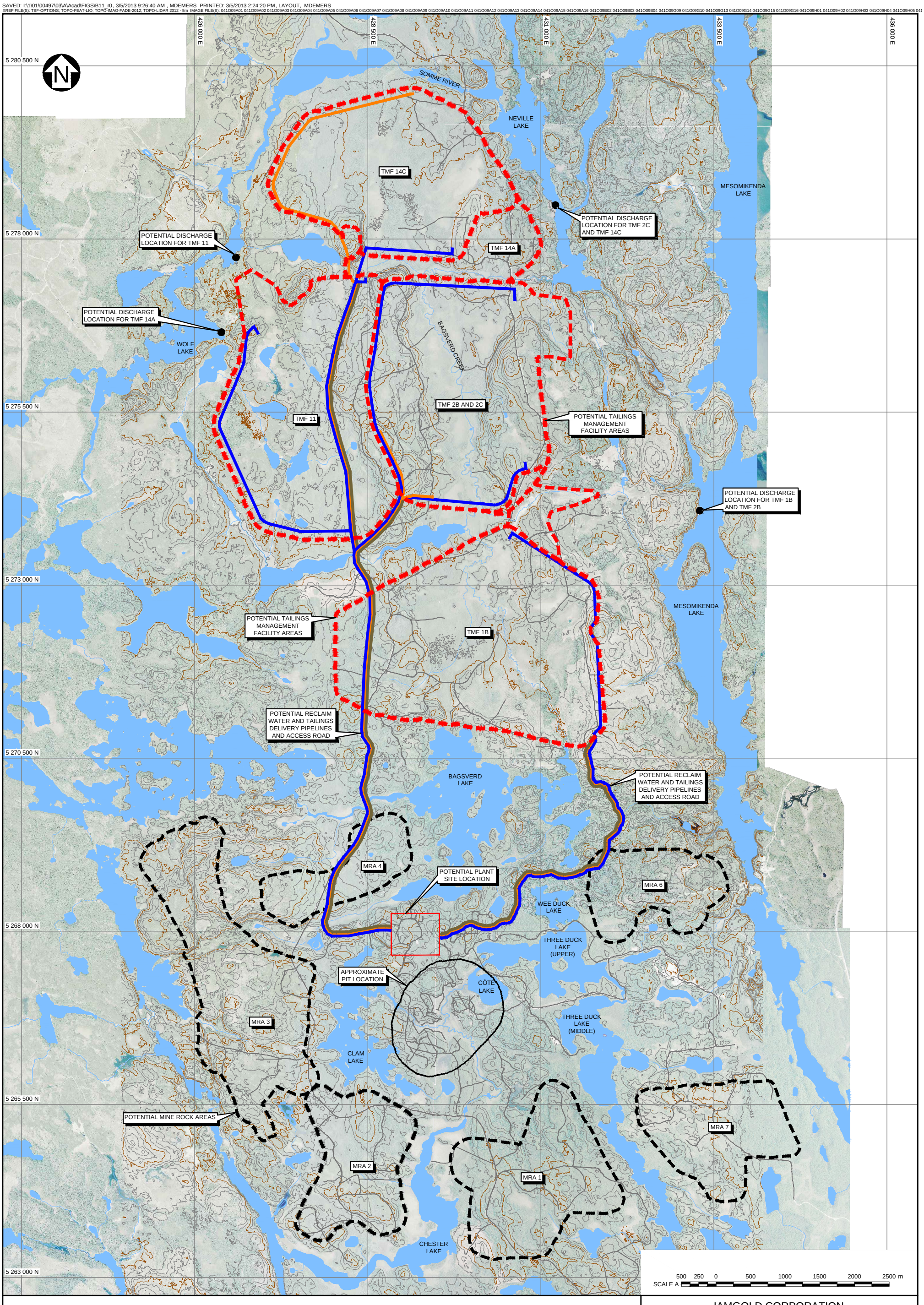

LEGEND:

- POTENTIAL PLANT SITE LOCATION
- EXISTING TRAIL/ATV/TRUCK ROADS
- POTENTIAL TAILINGS MANAGEMENT FACILITY AREAS
- POTENTIAL MINE ROCK AREAS
- RECLAIM WATER PIPELINE
- TAILINGS DELIVERY AND DISTRIBUTION PIPELINE TO EMBANKMENT
- ACCESS ROAD
- POTENTIAL DISCHARGE LOCATION

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 5 METRES.
4. ELEVATIONS ARE IN METRES.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
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CÔTÉ GOLD PROJECT

OVERALL SITE LAYOUT

Knight Piésold CONSULTING

P/A NO. NB101-497/3 | REF NO. 1

FIGURE 1.2 | REV 0

1.4 SCOPE OF REPORT

Knight Piésold Ltd. (KPL) has been retained by IAMGOLD to complete the TMF alternatives assessment for the Project. The objective of this work is to identify the most appropriate locations to store the tailings based on environmental, socio-economic, technical and economic considerations. The most appropriate areas shall have a minimal adverse effect on the environment and be technically sound with minimal potential for physical and economic failure. The alternatives assessment has been completed following Environment Canada's guideline (Environment Canada, 2011).

This report summarizes the results of the multiple accounts analysis used to select the best TMF Option for tailings storage and water management. The following items are addressed in this report:

1. Review and summary of the TMF options evaluated.
2. A discussion of the multiple accounts assessment methodology, approach to value-based analysis, and subsequent sensitivity analyses.
3. Summary of the indicator values, scales and scoring.
4. Results of the Multiple Accounts Analysis and sensitivity analysis for the TMF Options.

2 – BACKGROUND

A pre-screening assessment has been completed whereby a total of 14 candidate tailings management sites were identified and investigated as part of an initial pre-screening assessment (KPL, 2012).

A pre-screening assessment, employing fatal flaw analysis included the identification of factors or elements that are so severe or unfavourable that they would eliminate the site as a candidate TMF Option. A comparative analyses of the remaining sites was employed to optimize the decision making process and allow the Options that have a reasonable likelihood of success to be focussed upon.

The screening and comparative evaluations carried out identified Sites 1, 2, 11 and 14 as suitable candidates for the tailings management facility. Sub-options involving different embankment layouts, surface water realignments and water management methods were developed for some of the Options. Six options were identified for further analysis. The general location of the TMF Options (Options TMF 1B, 2A, 2B, 11, 14A and 14C) are shown on Figure 1.2.

An initial trade-off study was also completed to compare different tailings delivery and deposition methods for the project (KPL, 2012). In-process thickened tailings (50% solids content), high rate thickened tailings (60% solids content) and paste thickened tailings (68% solids content) were considered.

Paste tailings may be utilized when there is a significant benefit in reducing the water management requirements or when dry conditions require maximum recovery of process water within the plant. This benefit of paste tailings is not realised at the project due to the large amount of available and collected water associated with the runoff.

The initial evaluation recommended in-process thickened tailings (50% solids content) and it is carried forward for the options assessment. Tailings have been successfully deposited and managed at many other projects in similar climates (i.e., winter conditions) using conventional slurries.

3 – TAILINGS MANAGEMENT

3.1 GENERAL

Tailings will be managed in the tailings management facility (TMF). The TMF will need to store approximately 300 million tonnes of tailings, based on current reserves. For this assessment, the required storage volume for the tailings has been determined based on an estimated in-situ settled dry density of 1.3 tonnes/m^3. The corresponding storage volume required is approximately 231 million m^3.

The TMF will be designed to contain the tailings through the construction of embankment dams. The conceptual embankment cross-section that has been considered for the TMF consists of a zoned rockfill embankment with a geomembrane layer on the upstream face of the starter embankment and in areas where water ponds are to be maintained for embankment raises. The embankments will be raised in stages during the operations. The upstream slopes will be approximately 2H:1V.

Tailings would be transported to the facility from the plant site in a tailings delivery pipeline. Preliminary tailings delivery pipeline alignments are shown on Figure 1.2 and would be optimized (and potentially rerouted) during detailed design.

Tailings will be spigotted from the crest of the embankment and sub-aerially deposited. Sub-aerial deposition involves the scheduled rotation of the points of active deposition above a well-managed beach to achieve a laminated deposit comprising thin layers of drained tailings. This deposition technique enhances the separation of liquids and solids and produces a clear supernatant pond that can be kept to a minimal size.

Water collected within the TMF, as well as water collected around the mine site and mine rock areas, will be managed in the TMF for eventual reclamation in the milling process. Excess water not needed in the mill will be treated (as necessary) and discharged. The tailings are considered to be non-acid generating, however, further testing is currently ongoing to validate original results.

At closure, reclamation activities will include: physical stabilization measures, capping of the tailings surface (as required) and seeding, removal of pipeworks and ancillary facilities, vegetation of the disturbed areas, and implementation of an appropriate water management and water quality measures.

The location of the TMF Options considered are shown on Figure 1.2. Pertinent details of TMF Options 1B, 2A, 2B, 11, 14A and 14C are summarized on Table 3.1 and described in the following sections.

3.2 SUMMARY OF TMF OPTIONS

3.2.1 Option TMF 1B

TMF 1B is located approximately 4.5 km north of the plant site and has moderate natural containment due to being situated in a natural bowl feature with the height of land located on the east embankment. The general arrangement for this Option is shown on Figure 3.1.

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TABLE 3.1

IAMGOLD CORPORATION
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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SUMMARY OF TAILINGS MANAGEMENT FACILITY OPTION DETAILS

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Criteria	Option					
	TMF 1B	**TMF 2B**	**TMF 2C**	**TMF 11**	**TMF 14A**	**TMF 14C**
Land Ownership and Mineral Rights						
Within Mine/Claim Boundary	No (Surface Rights Only)	Partially (surface rights only on a portion)	Partially (surface rights only on a portion)	Yes	Yes	Yes
Condemnation Drilling Completed	Yes	Yes	Yes	No	No	No
Underlain by Potential Ore	No	No	No	Unknown	Unknown	Unknown
Impact on Existing Hydro Corridor (i.e. on a hydro corridor or adjacent to)	No	No	No	No	No	No
Impact on Existing Roads (i.e. on a road or adjacent to a road)	No	No	No	No	No	No
Watershed Considerations						
Number of Watersheds Within TMF Footprint	1	1	1	1	1	1
Requires Surface Water Realignment	Portion of Bagsverd Creek	Complete realignment of Bagsverd Creek	Complete realignment of Bagsverd Creek	No realignment of surface water required	Portion of Bagsverd Creek	No realignment of surface water required
Social						
First Nations / Métis Interests	Yes	Yes	Yes	Yes	Yes	Yes
Residences within TMF Footprint	No	No	No	No	No	No
Residences in Proximity to TMF	Yes	Yes	Yes	Yes	Yes	Yes
Environmental						
Potential Fisheries Compensation	Yes	Yes	Yes	Yes	Yes	Yes
Site Contains a Waterbody and/or Watercourse	Yes (Bagsverd Creek and wetlands)	Yes (Bagsverd Creek and wetlands)	Yes (Bagsverd Creek and wetlands)	Yes (many headwater waterbodies and wetlands)	Yes (Bagsverd Creek and wetlands)	Yes (very small and wetlands)
Basin Capacity						
Topographic Containment	Moderate	Good	Good	Moderate	Moderate	Poor
Approximate Footprint Area (ha)	899	763	774	749	786	637
Final Embankment Crest Length (m)	11,000	10,046	9,990	9,886	10,204	9,065
Maximum Embankment Height (m)	44	57	57	58	50	61
Maximum Tailings Elevation (m)	420	429	429	439	424	435
Final Embankment Volume (m^3)	20,300,000	26,900,000	25,300,000	34,100,000	32,100,000	43,600,000
Contains All Tailings	Yes	Yes	Yes	Yes	Yes	Yes
Storage Efficiency (ratio)	11.8	8.8	9.4	6.9	7.5	5.5
Potential for Staged Embankment Construction	Yes	Yes	Yes	Yes	Yes	Yes
Expandable	Conducive to expansion to the north	Minor dam raises and conducive to expansion to the south	Minor dam raises and conducive to expansion to the south	Not conducive to expansion	Not conducive to expansion	Not conducive to expansion
Infrastructure Development						
Straight Line Distance from the Mill to Centre of Basin (km)	4.5	8.0	8.0	7.8	11.0	11.0
Tailings Delivery Pipeline Length (km)	5.5	8.7	7.9	7.9	13.7	12.7
Water Reclaim Pipeline Length (km)	9.2	10.3	13.0	11.4	10.8	12.7
Access and Pipeline Roads (km)	5.5	8.7	7.9	7.9	13.7	12.7
Approximate Elevation Difference - Mill (El. 397 m) to Final Embankment Elevation (m)	24	33	33	43	28	39
Potential Number of Water Crossings	0	1 - 3	1 - 3	1 - 3	1 - 3	1 - 3
Investments						
Initial Investment (Million $)	84	98	91	125	142	150
Long term Investment (Million $)	157	212	196	249	260	348
Unit Cost ($/$m^3$ tailings)	1.04	1.34	1.24	1.62	1.74	2.16

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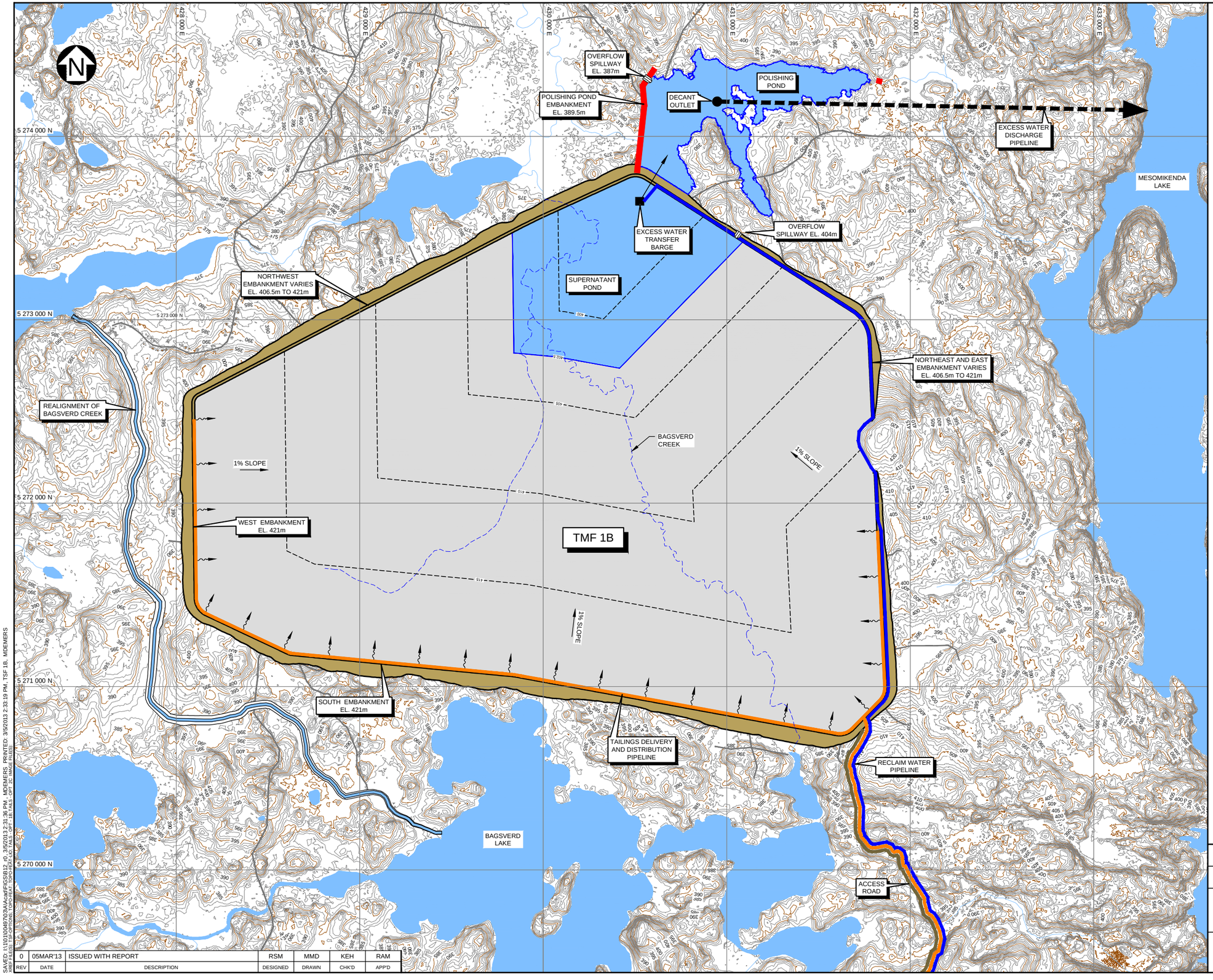

LEGEND:

- WATER
- TAILINGS
- EMBANKMENT
- EXISTING ATV ROAD/TRUCK ROAD/TRAIL
- EXISTING CREEK
- TAILINGS DELIVERY AND DISTRIBUTION PIPELINE
- RECLAIM WATER PIPELINE
- ACCESS ROAD
- EXCESS WATER DISCHARGE PIPELINE
- PROPOSED POLISHING POND EMBANKMENT
- TAILINGS CONTOURS

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 1 METRE.
4. ELEVATIONS ARE IN METRES.
5. REALIGNMENT SECTION PROVIDED BY CALDER ENGINEERING LTD. (DEC 12, 2012).

SCALE A: 150 75 0 250 500 750 m

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IAMGOLD CORPORATION

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OPTION TMF 1B

Knight Piésold CONSULTING

P/A NO. NB101-497/3

REF NO. 1

FIGURE 3.1

REV 0

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Tailings in this case would be deposited primarily from south to north to form a gently sloping beach. This arrangement will, ultimately, force runoff and supernatant to collect at the north side of the facility. The supernatant water will be reclaimed back to the plant for process make-up, as required. Any excess water will be treated (if required) and pumped via a pipeline for discharge to Mesomikenda Lake (Figure 1.2).

TMF 1B is situated over a portion of Bagsverd Creek, which will result in the loss of high quality fish habitat. A realignment of the creek will be required around the southwest corner of TMF 1B from Bagsverd Lake, which reconnects back into Bagsverd Creek downstream of the TMF. It is anticipated that fish habitat compensation measures will be incorporated in the realignment works. The new alignment of Bagsverd Creek will naturalize over the life of the Project and will form the permanent creek after closure.

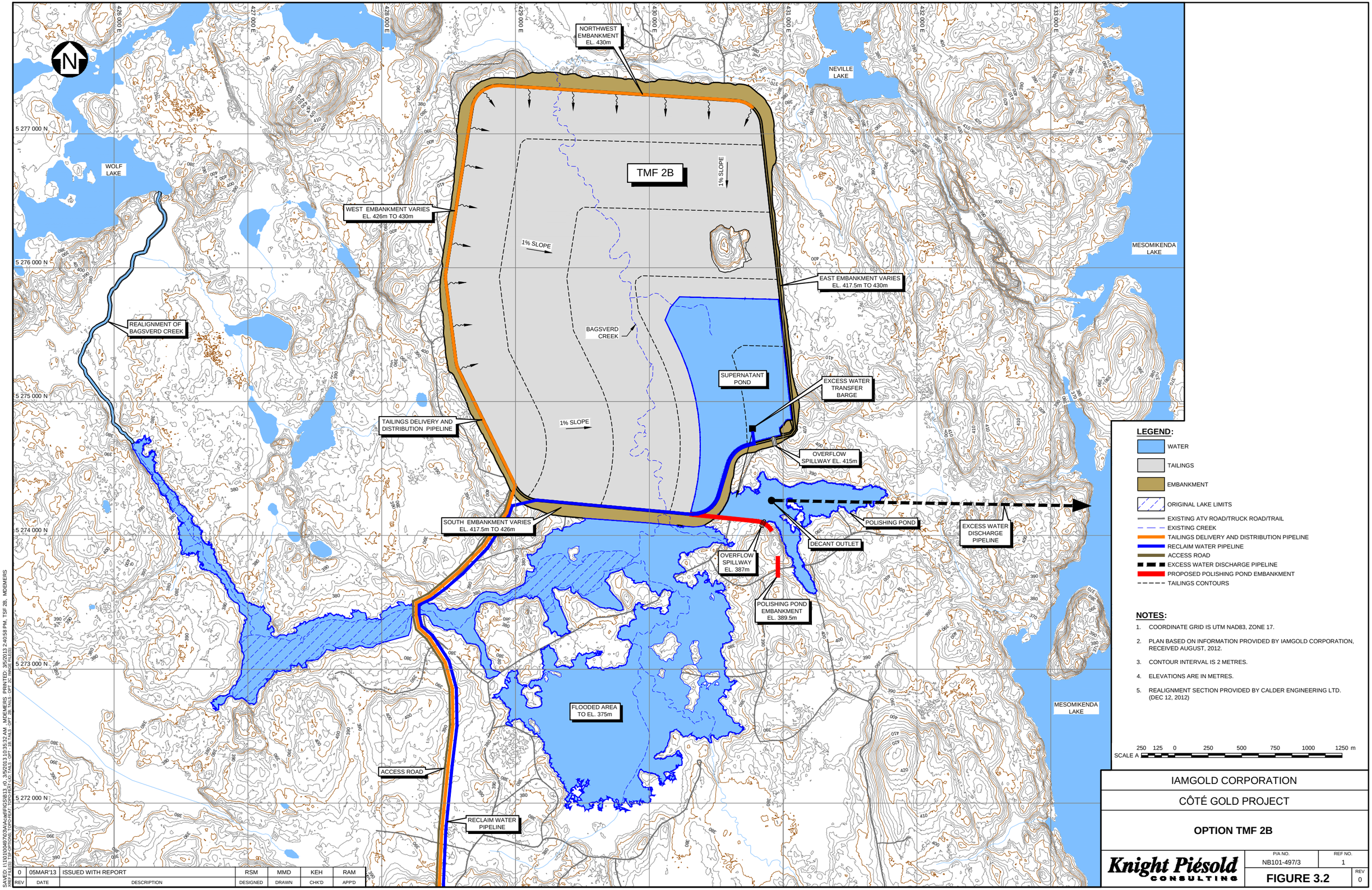
Specific comments on Option TMF 1B are provided below:

- The footprint area is approximately 899 ha
- It is the closest Option to the plant site
- Some geotechnical investigations have been completed and this option is considered to possess good foundation conditions along the embankment alignments
- Condemnation drilling has been carried out in the area and a reserve of ore is not suspected within the site
- Relatively low embankment heights are required
- The final rockfill embankment crest will be at a maximum El. 421 m
- This Option has the most favorable elevation difference from the plant site
- There are potentially no water crossings required for the tailings transport and water reclaim pipelines
- Additional capacity can be achieved by expanding to the north and/or by completing minor dam raises
- This option is likely to be the least expensive, due to smaller embankment volumes and ease of tailings transport

3.2.2 Option TMF 2B

TMF 2B is located approximately 8 km north of the plant site and has relatively good natural containment due to its location within a valley with heights of land on the east and west sides. The general arrangement for this Option is shown on Figure 3.2.

Tailings will be deposited primarily from the north and west to form a gently sloping beach. This arrangement will, ultimately force all runoff and supernatant to collect at the southeast corner of the facility. The supernatant water will be reclaimed back to the plant for process make-up, as required. Any excess water will be treated (if required) and pumped via a pipeline for discharge to Mesomikenda Lake (Figure 1.2).



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OPTION TMF 2B

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P/A NO. NB101-497/3

REF NO. 1

FIGURE 3.2

REV 0

TMF 2B is situated over a portion of Bagsverd Creek, which will result in the loss of high quality fish habitat. A realignment of the creek will be required that will involve the flooding of Bagsverd Creek to an approximate elevation of 375 m to redirect the flow to Wolf Lake. It is anticipated that fish habitat compensation measures will be incorporated in the realignment works. The new alignment of Bagsverd Creek will naturalize over the life of the Project and will form the permanent creek after closure.

Specific comments on Option TMF 2B are provided below:

- The footprint area is approximately 763 ha
- The tailings discharge pipeline from the plant to the embankment is approximately 8.7 km
- Some geotechnical investigations have been completed for this option and it is considered to possess good foundation conditions along the east, west and north embankment alignments. A portion of the south embankment alignment overlies thick overburden (approximately 12.8 m to bedrock).
- Condemnation drilling has been carried out in the area and a reserve of ore is not suspected within the site
- This Option has relatively low embankment heights
- The final rockfill embankment crest will be at a maximum El. 430 m
- Additional capacity can be achieved by expanding to the south and/or by completing minor dam raises

3.2.3 Option TMF 2C

TMF 2C is similar to TMF 2B. The general arrangement for this Option is shown on Figure 3.3. The following revisions are made to the comments provided to TMF 2B:

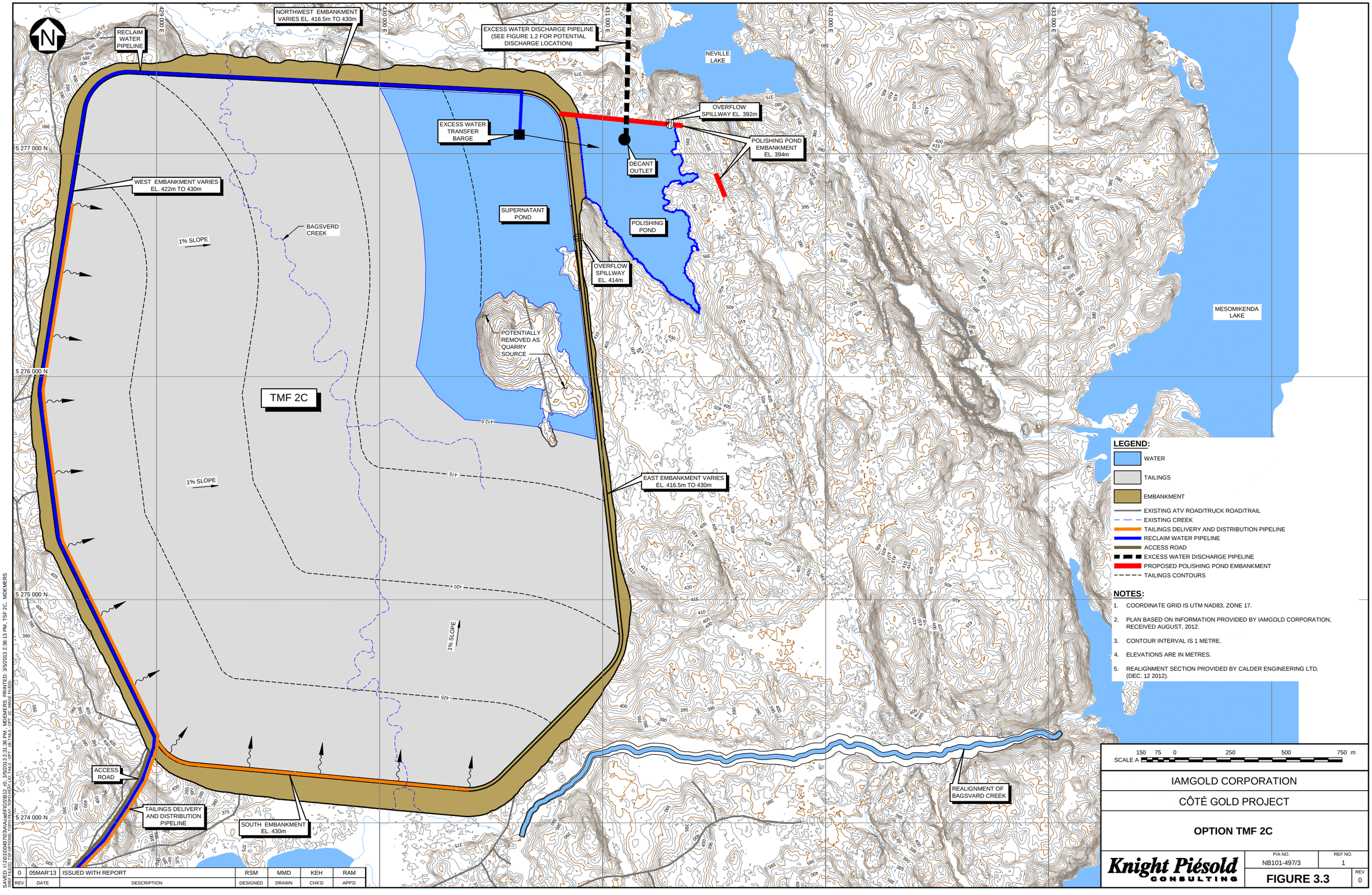
- Tailings will be deposited primarily from the south and west to form a gentle sloping beach. The arrangement will, ultimately, force all runoff and supernatant to collect at the northeast corner of the facility.
- Any excess water will be treated (if required) and pumped via a pipeline for discharge to Neville Lake (Figure 1.2)
- A realignment of Bagsverd creek will be required to the east to Mesomikenda Lake

Specific comments on Option TMF 2C are provided below:

- The footprint area is approximately 774 ha
- The tailings discharge pipeline from the plant to the embankment is approximately 7.9 km
- The final rockfill embankment crest will be at a maximum El. 430 m

3.2.4 Option TMF 11

TMF 11 is located approximately 7.8 km north of the plant site with the height of land located on the east embankment. The lack of natural containment along the west and south embankment alignments result in relatively high embankment heights along these sections. The general arrangement for this Option is shown on Figure 3.4.



LEGEND:

- WATER
- TAILINGS
- EMBANKMENT
- EXISTING ATV ROAD/TRUCK ROAD/TRAIL
- EXISTING CREEK
- TAILINGS DELIVERY AND DISTRIBUTION PIPELINE
- RECLAIM WATER PIPELINE
- ACCESS ROAD
- EXCESS WATER DISCHARGE PIPELINE
- PROPOSED POLISHING POND EMBANKMENT
- TAILINGS CONTOURS

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 1 METRE.
4. ELEVATIONS ARE IN METRES.
5. REALIGNMENT SECTION PROVIDED BY CALDER ENGINEERING LTD. (DEC. 12 2012).

SCALE A: 150 75 0 250 500 750 m

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OPTION TMF 2C

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FIGURE 3.3 | REV 0

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XREF FILE(S): TSF-OPTIONS; TOPO-FEAT; TOPO-FEAT-LIO; TAILS - OPT - 11; TAILS - OPT - 14A; TAILS - OPT - 14C IMAGE FILE(S):

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426 500 E
427 500 E
428 500 E
429 500 E
5 278 000 N
5 277 000 N
5 276 000 N
5 275 000 N
5 274 000 N
5 273 000 N

EXCESS WATER DISCHARGE PIPELINE
DECANT OUTLET
OVERFLOW SPILLWAY EL. 390m
POLISHING POND EMBANKMENT EL. 392.5m
POLISHING POND
NORTH EMBANKMENT VARIES EL. 418m TO 428m
BAGSVERD CREEK
TAILINGS DELIVERY AND DISTRIBUTION PIPELINE
SUPERNATANT POND
1% SLOPE
WOLF LAKE
OVERFLOW SPILLWAY EL. 418m
EXCESS WATER TRANSFER BARGE
EXISTING CREEK
EAST EMBANKMENT VARIES EL. 428m TO 440m
TMF 11
WEST EMBANKMENT VARIES EL. 418m TO 440m
EXISTING CREEK
EXISTING WATERBODIES
1% SLOPE
RECLAIM WATER PIPELINE
ACCESS ROAD

150 75 0 250 500 750 m
SCALE A

LEGEND:

- WATER
- EMBANKMENT
- TAILINGS
- ORIGINAL LAKE LIMITS
- EXISTING ATV ROAD/TRUCK ROAD/TRAIL
- EXISTING CREEK
- TAILINGS DELIVERY AND DISTRIBUTION PIPELINE
- RECLAIM WATER PIPELINE
- ACCESS ROAD
- EXCESS WATER DISCHARGE PIPELINE
- PROPOSED POLISHING POND EMBANKMENT
- TAILINGS CONTOURS

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 1 METRE.
4. ELEVATIONS ARE IN METRES.

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OPTION TMF 11

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P/A NO. NB101-497/3

REF NO. 1

FIGURE 3.4

REV 0

Tailings in this case would be deposited primarily from south and east to form a gently sloping beach. This arrangement will, ultimately, force all runoff and supernatant to collect at the northwest corner of the facility. The supernatant water will be reclaimed back to the plant for process make-up, as required. Any excess water will be treated (if required) and pumped via a pipeline for discharge to Wolf Lake (Figure 1.2).

TMF 11 is situated on approximately 11 small headwater waterbodies, which includes creeks, lakes and ponds. This arrangement will result in the loss of high quality fish habitat. No realignment of surface water is required.

Specific comments on Option TMF 11 are provided below:

- The footprint area is approximately 749 ha
- Some geotechnical investigations have been completed along the east embankment alignment. Foundation conditions along the east alignment are good. Foundation conditions along the south and west embankment are unknown and will need to be investigated. Moderate foundation conditions are expected.
- Condemnation drilling has not been carried out in the area
- This option has relatively high embankment heights
- The final rockfill embankment crest will be at a maximum El. 440 m

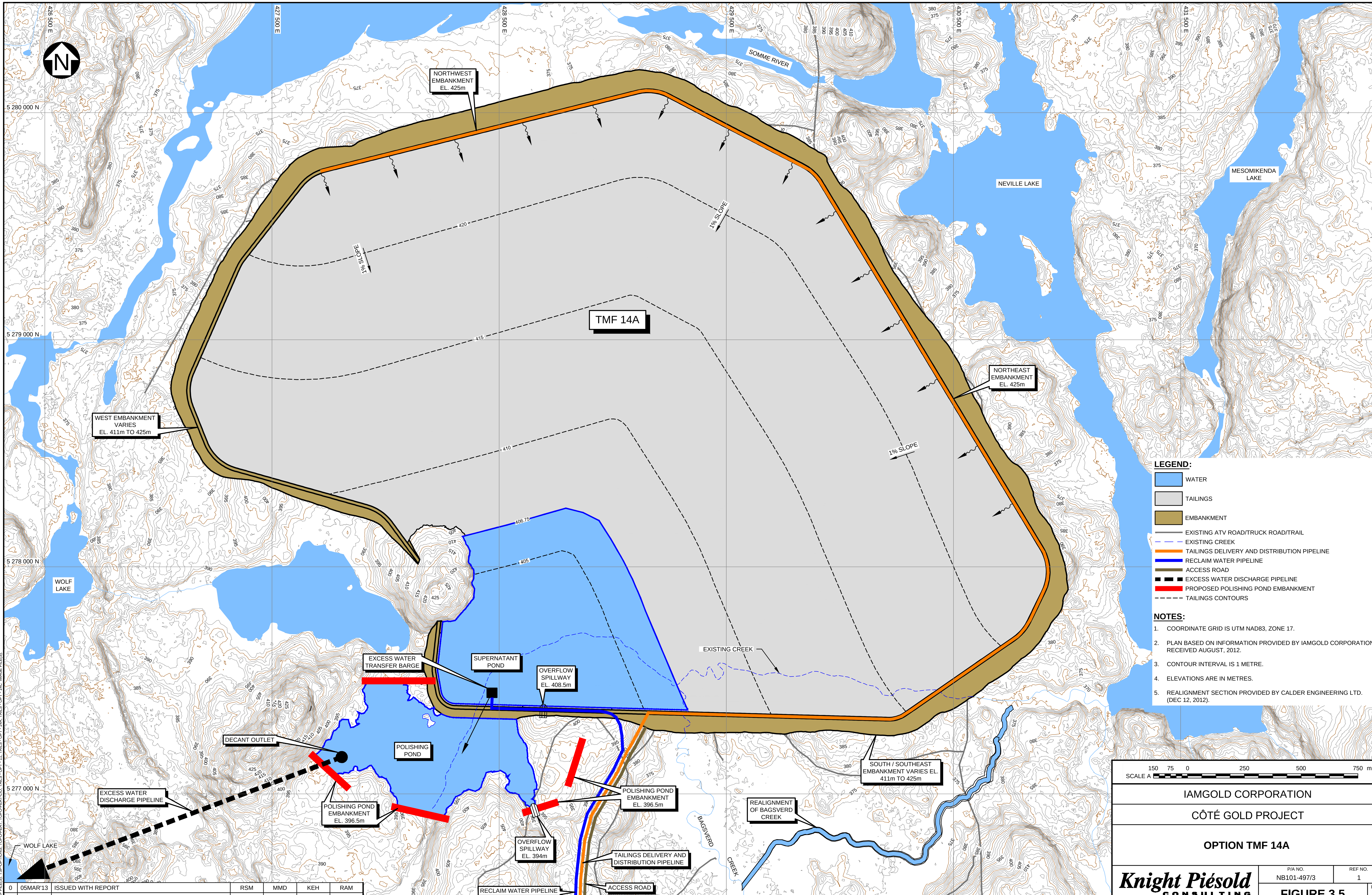
3.2.5 Option TMF 14A

TMF 14A is located approximately 11 km north of the plant site with a height of land located in the southwest. Natural containment only exists along the south embankment alignment and embankments will be required around most of the perimeter. The general arrangement for this Option is shown on Figure 3.5.

Tailings will be deposited primarily from the north and east to form a gently sloping beach. This arrangement will, ultimately, force all runoff and supernatant to collect at the southwest corner of the facility. The supernatant water will be reclaimed back to the plant for process make-up, as required. Any excess water will be treated (if required) and pumped via a pipeline for discharge to Wolf Lake (Figure 1.2).

The site is bounded by waterbodies to the west, north and east including Wolf Lake, Somme River and Neville Lake. Wetlands are situated within the footprint of TMF 14A.

TMF 14A is situated over a portion of Bagsverd Creek and will result in the loss of a few fish habitats of limited quality. A realignment of the creek will be required around the southeast corner of TMF 14A. It is anticipated that fish habitat compensation measures will be incorporated in the realignment works. The new alignment of Bagsverd Creek will naturalize over the life of the Project and will form the permanent creek after closure.



LEGEND:

- WATER
- TAILINGS
- EMBANKMENT
- EXISTING ATV ROAD/TRUCK ROAD/TRAIL
- EXISTING CREEK
- TAILINGS DELIVERY AND DISTRIBUTION PIPELINE
- RECLAIM WATER PIPELINE
- ACCESS ROAD
- EXCESS WATER DISCHARGE PIPELINE
- PROPOSED POLISHING POND EMBANKMENT
- TAILINGS CONTOURS

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 1 METRE.
4. ELEVATIONS ARE IN METRES.
5. REALIGNMENT SECTION PROVIDED BY CALDER ENGINEERING LTD. (DEC 12, 2012).

SCALE A 150 75 0 250 500 750 m

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OPTION TMF 14A

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P/A NO.	REF NO.
NB101-497/3	1

FIGURE 3.5 REV 0

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Specific comments on Option TMF 14A are provided below:

- The footprint area is approximately 786 ha
- TMF 14A has the longest tailings discharge pipeline from the plant to the embankment of the options under consideration (approximately 13.7 km). This is approximately 1.6 to 2.5 times longer than TMF 2B and TMF 1B Options, respectively.
- Limited geotechnical investigations have been completed along the south embankment alignment. Foundation conditions along the south alignment are generally good. Foundation conditions along the west, north and east embankment are unknown and will need to be investigated. Unfavorable conditions over significant portions of these embankments is expected.
- Condemnation drilling has not been carried out in the area
- The final rockfill embankment crest will be at a maximum El. 425 m
- This Option has limited potential for expansion, due to lack of natural containment and adjacent waterbodies

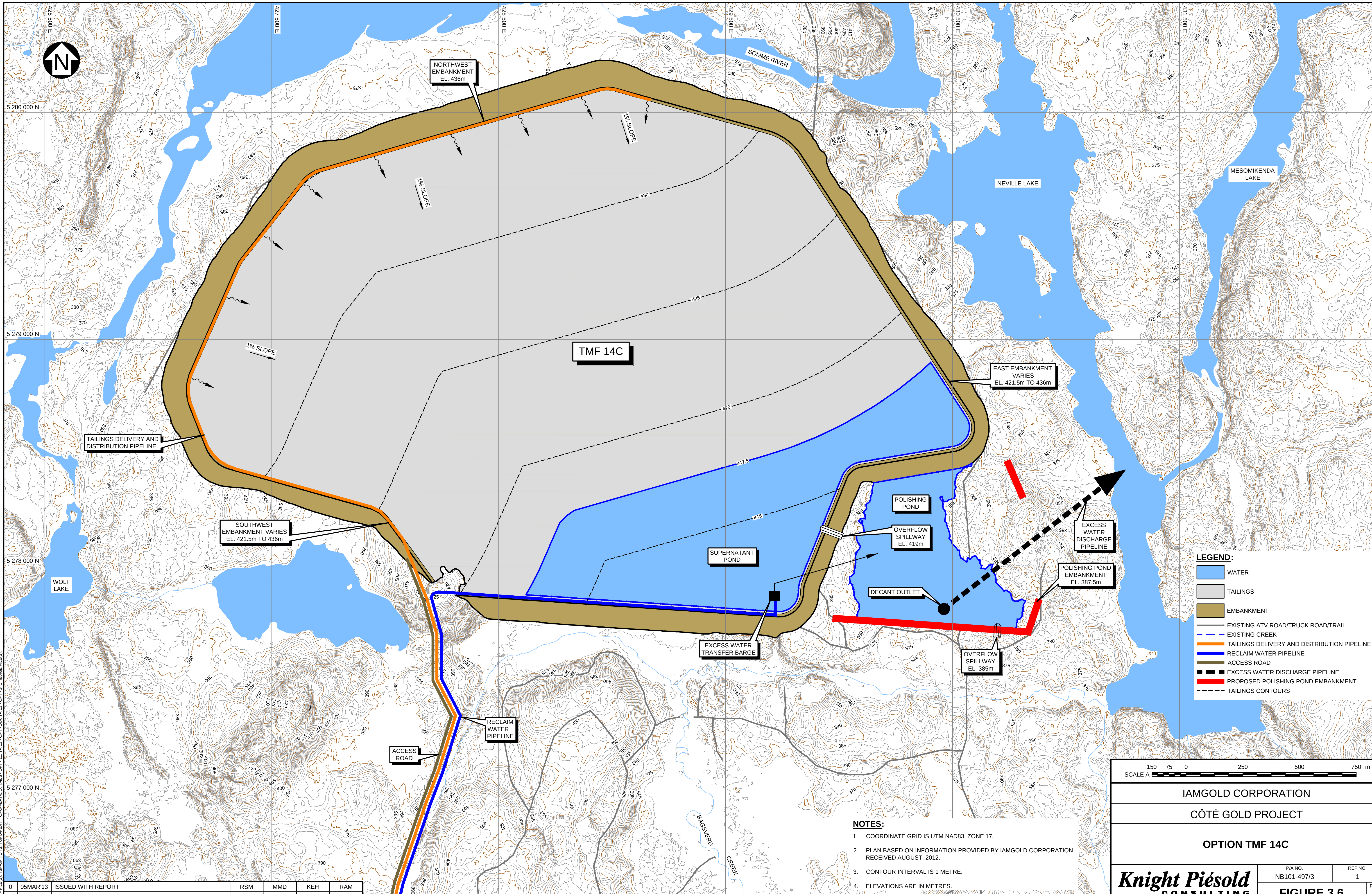
3.2.6 Option TMF 14C

TMF 14C is similar to TMF 14A. The general arrangement for this Option is shown on Figure 3.6. The following revisions are made to the comments provided to TMF 14A:

- The south embankment is moved north so as to not interfere with Bagsverd Creek, this will eliminate the need for any realignments
- Tailings will be deposited primarily from the west and north to form a gentle sloping beach. This arrangement will, ultimately, force all runoff and supernatant to collect at the southeast corner of the facility.
- Any excess water will be treated (if required) and pumped via a pipeline for discharge to Neville Lake (Figure 1.2)

Specific comments on Option TMF 14C are provided below:

- The footprint area is the smallest area of all the options (approximately 637 ha)
- The tailings discharge pipeline from the plant to the embankment of TMF 14C is approximately 12.7 km
- There are only wetlands within TMF 14C and this option would require no realignments of streams
- There is essentially no natural containment and significant embankment construction would be required over unfavorable foundations. TMF 14C will require approximately 30 % to 210 % more material to construct the embankments compared to TMF 11 and TMF 1B, respectively. The total embankment quantity is approximately 43,600,000 m^3.
- The final rockfill embankment crest will be at a maximum El. 436 m
- This option is expected to be the most expensive, due to large embankment volumes, longest length of access roads, tailings discharge pipeline, water reclaim pipeline and pumping costs, etc.



NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. PLAN BASED ON INFORMATION PROVIDED BY IAMGOLD CORPORATION, RECEIVED AUGUST, 2012.
3. CONTOUR INTERVAL IS 1 METRE.
4. ELEVATIONS ARE IN METRES.

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OPTION TMF 14C

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P/A NO.	REF NO.
NB101-497/3	1

FIGURE 3.6 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
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4 – ALTERNATIVES ASSESSMENT METHODOLOGY

4.1 MULTIPLE ACCOUNTS ANALYSIS METHOD

A Multiple Accounts Analysis (MAA) has been developed for the TMF Options. The purpose of the MAA is to provide a clear and transparent evaluation methodology to compare the Options and select the preferred alternative(s).

The MAA is a multi-step process that develops a matrix to provide a numerical rating for each Option. The approach is set out in Environment Canada's guidelines (Environment Canada, 2011).

4.2 ACCOUNTS, SUB-ACCOUNTS AND INDICATORS

The MAA employs a three-tiered approach, starting with generalized accounts, specific sub-accounts, and measurable indicators.

- **Accounts:** These are basic elements that encompass and integrate comprehensive specific qualities developed through the scoring and evaluation of focused sub-accounts and measurable indicators.

  The accounts used to evaluate the Options include:

  - Environmental (water quality and impacts to fisheries, vegetation and wildlife)
  - Socio-Economic (effects to the population)
  - Technical (complexity of the design, construction and operating considerations)
  - Economics (basic cost factors)

- **Sub-Accounts**: These utilize factual characterization criteria and are developed independently of any consideration of the tailings disposal options that will be evaluated in the subsequent MAA process. Evaluation criteria consider the benefit or loss (material impact) associated with the evaluated Options.

- **Indicators**: These allow for the qualitative or quantitative measurement of impacts associated with any given sub-account. Indicators tend to be measureable; whereas sub-accounts cannot be measured directly. For this reason, indicators need to be focused, deconstructed components that inform their respective parent sub-account. The indicators are grouped by parent accounts and sub-accounts and are described briefly in Appendix A.

The accounts, sub-accounts and indicators selected to evaluate the TMF Options at Côté Gold are summarized on Table 4.1.

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TABLE 4.1

IAMGOLD CORPORATION
CÔTÉ GOLD PROJECT

TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
ACCOUNT, SUB-ACCOUNT AND INDICATOR RATIONALE

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Account	Sub-Account	Rationale	Indicator	Comments
Environmental	Hydrology	A greater hydrological footprint implies a greater potential for water resources to be potentially affected.	Total Catchment Area	The total catchment area affects the amount of water intercepted by the TMF that may be potentially impacted.
			Number of Watersheds	A greater number of watersheds in the catchment area may allow for a greater distribution of potentially impacted runoff from the TMF, including seepage.
			Stream Length Removed	Disrupting stream flows is less desirable due to the potential impact on downstream waterbodies and aquatic life. This indicator is a direct quantitative measure of stream lengths affected under the TMF Options.
			Loss of Waterbodies	Disruption of existing waterbodies (excluding streams) and wetlands is less desirable due to potential loss of aquatic habitat.
			Requires Surface Water Realignment	It is desirable to locate a tailings management facility such that there is minimal requirement for surface flow realignments.
			Flow Change	Minimizing changes in the hydrologic flow regime is desirable. The change in flows downstream of the TMF due to the TMF and the associated realignment of surface water flows have been estimated.
	Water Quality	Adverse changes to water quality is not desirable.	Change in Receiving Water Quality	The potential for a change in the water quality at the discharge location is less desirable.
			Potential for Seepage	The TMF will include measures to reduce seepage. TMF options judged to have conditions where effective seepage control can be established with relative ease (i.e., low permeability bedrock close to surface) are rated higher for this indicator.
			Potential for Negative Influence on Surface Water Quality from Groundwater Seepage	Disruption of waterbodies from groundwater seepage from the TMF is not desirable.
	Aquatic	Removal or adverse impact to fish communities is not desirable.	Loss of Fish Bearing Water	The loss of aquatic habitat (quantity and quality) under the TMF Options has been estimated.
			Adjacent Fish Ecology	The potential change to aquatic habitat (quantity and quality) adjacent to the TMF Options has been estimated.
	Terrestrial	Removal or reduction in vegetation and wildlife habitat is less desirable.	Habitat of Species of Concern Removed	The loss of habitat of species of special concern under the TMF Options has been estimated.
			Total Moose Winter Habitat Removed	Moose winter habitat is considered significant wildlife habitat and is designated by MNR. The loss of moose winter habitat under the TMF Options has been estimated.
			Total Vegetative Habitat Removed	The smaller the TMF footprint the least adverse effect on the persistence of vegetative populations and communities.
			Total Wetland Area Removed	The loss of wetland area under the TMF Options has been estimated.
	Closure	Adverse changes to water quality post-closure is not desirable.	Post-Closure Chemical Stability	The tailings are expected to be relatively inert and not produce acid rock drainage or significant metal leaching after closure. Closure of the facilities will address long-term physical and chemical stability and impacts to the surrounding environment.
			Post-Closure Flow Change	Changes to the flow regime post-closure is not desirable. The impact to the flow regime has been qualitatively ranked by considering the changes to the flows within the surrounding waterbodies and whether or not there is a change in the receiver (i.e. Neville Lake).
Socio-Economic	Human Health	Adverse effects on human health are not desirable.	Human Health (Direct Exposure)	The potential likelihood for the TMF to affect human health due to exposure to emissions or other releases to the environment, including dust generation and potential for groundwater seepage were included in the assessment of the direct exposure indicator. The measurement is a receptor-based qualitative assessment considering wind direction, receptors in the path of the wind, wet versus dry beach area, location of the supernatant pond, prevailing location of spigots during operation, potential for seepage, etc.
			Human Health (Indirect Exposure)	The potential likelihood for the TMF to affect human health, including the consumption of impacted fish, wildlife, berries, etc. was included in the assessment of the indirect exposure indicator.
	Existing Communities and Human (Current and Historic) Land Uses	Adverse effects to the existing communities and land uses are not desirable. Sites with less impact on the existing communities and land uses are preferred.	Aboriginal Peoples Interests and Current Land Use	Adverse effect to Aboriginal Peoples interests is not desirable. The relative value of the potential effects to Aboriginal Peoples interests is estimated.
			Presence of Archaeological Sites	The archaeological potential of the footprint of options is important to consider. Potential disturbance or destruction of sites without prior examination, recording and mitigation is not permitted. This ranking is based on preliminary field work. High scores are applied to TMF sites that have no sites or the effects on the site can be mitigated.
			Proximity to Existing Permanent or Temporary Residences	Number of residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity of the TMF.
			Recreational Access	Reduction in recreational access is less desirable. The value of the potential effect on recreational access is estimated. A recreation area is defined as a provincial park, a cottage, fishing lakes, hunting grounds, etc.
			Visibility and Aesthetics	Reduced visibility of the TMF is preferred. Visual effects are qualitatively assessed to capture the effect on the visual aesthetic from receptor locations such as major routes, communities and existing temporary or permanent residences.

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TABLE 4.1

IAMGOLD CORPORATION
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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
ACCOUNT, SUB-ACCOUNT AND INDICATOR RATIONALE

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Account	Sub-Account	Rationale	Indicator	Comments
Technical	Tailings Management Facility Layout	A smaller tailings facility is generally less complex and more easily managed and therefore is preferred.	Maximum Embankment Height	For a given location, embankments which are higher generally are more complex, require more construction effort and carry more risk than lower dams. The maximum height of the embankment provides a quantitative measure for relative comparison of risks between the TMF Options.
			Average Embankment Height	A lower embankment is generally less complex, more easily managed, require less construction effort and have less overall risk associated with them and is preferred.
			Expansion Capacity	A number of factors can influence the required storage capacity of a tailings facility over the life of a mine. A TMF Option that can store additional tailings with minor dam raises and/or is located adjacent to suitable land conducive to expansion is preferred.
	Tailings Delivery and Deposition System	A shorter less complex delivery system is preferred to simplify design and reduce the risk of spills.	Pipeline Length	A shorter pipeline is preferred to simplify design, reduce pipe maintenance and reduce the risk of potential spills, and pipe blockage due to freezing or sanding up.
			Pumping Requirements	Large topographical relief presents technical and operational challenges with respect to pumping tailings and increases risk due to higher pipeline pressures. Less pumping simplifies the design and decreases the risks for delays due to maintenance and problems during operations.
			Ease of Operation During Start-up	Setting up pipelines and discharging of tailings from along the embankment during start-up is easier than discharging from natural ground and is preferred.
	Embankment Construction	Straightforward embankment construction is preferred to simplify the construction details and reduce the potential for construction errors.	Starter Embankment Volume	A smaller embankment volume to commission the facility is preferred to simplify construction and reduce risk to the project start-up schedule.
			Final Embankment Volume	Smaller and lower final embankments are preferred to simplify and reduce overall embankment construction. A smaller annual embankment volume for dam raises reduces the construction effort and subsequently the risk to efficient construction scheduling and transport of large fill quantities over a significant distance.
			Ultimate Storage Efficiency	The TMF storage efficiency indicator is a ratio of the TMF storage capacity (volume) to the volume of fill material required to construct the embankment that confines the tailings (based on downstream construction).
			Foundation Preparation	Less foundation preparation requirements are preferred to simplify construction and reduce risk to construction and project schedules.
			Geotechnical Conditions	Good geotechnical conditions are preferred for ease of construction and to ensure long-term stability. The geotechnical indicator provides a measure of the inherent risk to embankment stability of siting TMFs on deep overburden soils, weak bearing soils or potentially liquefiable soils, etc.
	Land Acquisition	Acquisition of land may present challenges. It is preferred that all development is on existing property rights.	Land Area and Title Holders	Area of land and quantity of title/mineral holders that need to be negotiated and acquired.
	Water Management	Water management is an important component of the overall operations and simpler operating systems are preferred.	TMF Catchment Area	Tailing facilities require provisions for management of runoff from large storm events which typically include overflow spillways, decant structures or additional freeboard for storage. A smaller facility footprint generally simplifies water management and reduces freeboard requirements which are preferred.
			Reclaim Pipeline	A shorter reclaim pipeline is preferred to simplify design, reduce the risk of failure, and reduce monitoring and maintenance requirements.
			Reclaim Pumping Requirements	Less pumping simplifies the design.
			Ease of Water Management Including Polishing Pond	A qualitative measure of the need for and complexity of water management required during the operations.
			Ease of Seepage Management	Less seepage management generally simplifies water management and is preferred.
	Monitoring and Maintenance	Complex monitoring and maintenance is less desirable.	Monitoring and Maintenance Requirements	The amount of monitoring and maintenance will be a function of the size and extent of the embankments including distance from the plant site.
			Consequence of Operational Error	A lower consequence of error is preferred. The relative value of operational error is estimated.
	Closure	Complex closure measures are less desirable.	Ease of Decommissioning and Closure	Qualitative measure of the relative ease of closing the mine. If progressive reclamation is practicable through operations, the relative ease of closure will be higher. Additionally, waste deposits that exhibit greater storage efficiency and have less embankment areas and heights to reclaim will also score higher.
			Post Closure Landform Stability	Landform stability is a key criterion for mine closure. Tailings management facilities should be left in a stable state following closure such that they are not subject to mobilization through erosion, mass movement, or other natural processes.
Economics	Capital Costs	Lower capital costs are preferred to reduce the pre-production cash flow requirements.	Initial Capital Cost	Initial capital cost is estimated for each option.
			Surface Water Realignments and Fish Habitat Compensation Costs	Cost to construct surface water realignments and to compensate for the loss of fish habitat for each option is estimated.
	Operational Costs	Higher operational costs are less desirable.	Embankment Raises	On-going capital costs are estimated for the staged construction for each option.
			Operational Costs	Operational costs are based on operating the tailings delivery and reclaim water systems during the life of the mine. Lower operational costs are preferred.
	Closure and Post Closure Costs	Closure and post closure costs should be reduced as much possible to reduce long term liabilities.	Reclamation	Lower reclamation costs are preferred. The costs will be a function of the final area to be reclaimed after operations.
			Monitoring and Maintenance	Less monitoring and maintenance is preferred. The cost is estimated based on the number of monitoring locations.

I:\1\01\00497\03\A\Report\Report 1, Rev 0 - TMF MAA\Tables\[Table 4.1 to 4.5 - TMF MAA.xlsx]Table 4.1_Rationale

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4.3 VALUE-BASED DECISION PROCESS

The value-based decision process is an essential component of the overall MAA. The process assesses the combined impacts of a given option by scoring and weighing all indicators, sub-accounts, and accounts. The results of weighting and scoring are then aggregated into an overall merit rating for each option.

The details of the weighting and scoring procedures are discussed below.

- **Weighting:** Weighting factors allow the analyst to introduce bias given a perceived relative importance of a given indicator or sub-account. Weighting factors are inherently subjective - often based on the perceptions of the Proponent or the outcomes of a potentially limited sampling from the public consultation process. As such, the selection of weighting factors is a value-based process.

Weighting factors are applied to each indicator, implying the relative significance or importance associated with each indicator. The weighting factors have been bracketed to range from 1 (least important) to 6 (most important).

The MAA was completed by maintaining account weighting factors consistent with the recommendations suggested in Environment Canada's guidelines. The sub-account and indicator weightings and relative importance were defined based on discussions with IAMGOLD and input from a multidisciplinary team to ensure that the evaluation accurately reflects the project parameters. Higher weightings indicate greater relative importance and reflect the issues relative to the Project and the site conditions. The selected weightings are summarized on Table 4.2.

- **Indicator Values:** Values for the indicators are defined based on the characteristics of each of the TMF Options. Indicator values were selected based on input from a multidisciplinary team specific to their area of expertise. The indicator values for the TMF Options are summarized on Table 4.3. Costs presented are relative and based on limited detail and analysis and do not represent actual estimated costs.

- **Indicator Value Scales:** It is important that the indicators be deconstructed to elements that can be measured and compared without bias. Building on this concept, 6-point qualitative scales that are specific to each indicator are developed. Quantifying the measureable differences between options allows for the systematic comparison of options. The indicator value scales are summarized on Table 4.4.

- **Scoring:** Using 6-point qualitative scales that have been developed for each indicator and the indicator values, scores are assigned using measurable quantities or parameters. A score of 6 is considered the most favourable, while a score of 1 is considered least favourable. The individual indicator scores are shown on Table 4.5.

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TABLE 4.2

IAMGOLD CORPORATION
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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
ACCOUNT, SUB-ACCOUNT AND INDICATOR WEIGHTS

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Account	Sub-Account	Indicator	Account Weight (W_A)	Sub-Account Weight (W_{SA})	Indicator Weight (W_I)
Environmental	Hydrology	Total Catchment Area	6	4	3
		Number of Watersheds			3
		Stream Length Removed			4
		Loss of Waterbodies			4
		Requires Surface Water Realignment			5
		Flow Change			5
	Water Quality	Change in Receiving Water Quality		5	5
		Potential for Seepage			5
		Potential for Negative Influence on Surface Water Quality from Groundwater Seepage			5
	Aquatic	Loss of Fish Bearing Water		5	5
		Adjacent Fish Ecology			3
	Terrestrial	Habitat of Species of Concern Removed		4	5
		Total Moose Winter Habitat Removed			5
		Total Vegetative Habitat Removed			4
		Total Wetland Area Removed			4
	Closure	Post-Closure Chemical Stability		6	6
		Post-Closure Flow Change			4
Socio-Economic	Human Health	Human Health (Direct Exposure)	3	6	6
		Human Health (Indirect Exposure)			4
	Existing Communities and Human (Current and Historic) Land Uses	Aboriginal Peoples Interests and Current Land Use		3	6
		Presence of Archaeological Sites			4
		Proximity to Existing Permanent or Temporary Residences			4
		Recreational Access			4
		Visibility and Aesthetics			3
Technical	Tailings Management Facility Layout	Maximum Embankment Height	3	3	5
		Average Embankment Height			3
		Expansion Capacity			3
	Tailings Delivery and Deposition System	Pipeline Length		3	3
		Pumping Requirements			3
		Ease of Operation During Start-up			3
	Embankment Construction	Starter Embankment Volume		5	5
		Final Embankment Volume			4
		Ultimate Storage Efficiency			4
		Foundation Preparation			2
		Geotechnical Conditions			3
	Land Acquisition	Land Area and Title Holders		2	2
	Water Management	TMF Catchment Area		5	3
		Reclaim Pipeline			3
		Reclaim Pumping Requirements			3
		Ease of Water Management Including Polishing Pond			4
		Ease of Seepage Management			2
	Monitoring and Maintenance	Monitoring and Maintenance Requirements		2	5
		Consequence of Operational Error			3
	Closure	Ease of Decommissioning and Closure		6	3
		Post Closure Landform Stability			6
Economics	Capital Costs	Initial Capital Cost	1.5	5	5
		Surface Water Realignments and Fish Habitat Compensation Costs			3
	Operational Costs	Embankment Raises		3	5
		Operational Costs			4
	Closure and Post Closure Costs	Reclamation		2	4
		Monitoring and Maintenance			6

I:\1\01\00497\03\A\Report\Report 1, Rev 0 - TMF MAA\Tables\[Table 4.1 to 4.5 - TMF MAA.xlsx]Table 4.2_Weighting Summary

NOTES:

1. GREATER WEIGHTS INDICATE GREATER RELATIVE IMPORTANCE.
2. POSSIBLE ACCOUNT, SUB-ACCOUNT AND INDICATOR WEIGHTS RANGE FROM 1 TO 6.

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0	05MAR'13	ISSUED WITH REPORT NB101-497/3-1	RSM	KEH	RAM

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TABLE 4.3

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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SUMMARY OF INDICATOR VALUES

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Account	Sub-Account	Indicator	Parameter	Unit	Indicator Value					
					TMF 1B	TMF 2B	TMF 2C	TMF 11	TMF 14A	TMF 14C
Environmental	Hydrology	Total Catchment Area	Area	ha	899	763	774	749	786	637
		Number of Watersheds	Quantity	No.	1	1	1	1	1	1
		Stream Length Removed	Length	km	9.2	7.2	7.2	3.9	3.2	0
		Loss of Waterbodies	Area	ha	112.0	146.6	148.2	73.3	94.6	80.6
		Requires Surface Water Realignment	Value	-	Portion of Bagsverd Creek	Complete realignment of Bagsverd Creek	Complete realignment of Bagsverd Creek	No realignment of surface water required	Portion of Bagsverd Creek	No realignment of surface water required
		Flow Change	Value	-	Very Low	Very Low	Moderate (portion of Bagsverd Creek diverted to Lake Mesomikenda)	Very Low	Very Low	Very Low
	Water Quality	Change in Receiving Water Quality	Value	-	Between baseline and PWQO	Between baseline and PWQO	Between baseline and PWQO	Between baseline and PWQO	Between baseline and PWQO	Between baseline and PWQO
		Potential for Seepage	Value	-	Low	Low-Moderate	Low-Moderate	Moderate	Moderate-High	Moderate-High
		Potential for Negative Influence on Surface Water Quality from Groundwater Seepage	Value	-	Low	Moderate	Moderate	Moderate	Moderate-High	High
	Aquatic	Loss of Fish Bearing Water	Value	-	Portion of Bagsverd Creek	Portion of Bagsverd Creek	Portion of Bagsverd Creek	Many headwater waterbodies	Few habitats of limited quality	Few habitats of limited quality
		Adjacent Fish Ecology	Value	-	Many habitats of higher quality	Few habitats of limited quality	Few habitats of limited quality	Few habitats of limited quality	Few habitats of limited quality	None
	Terrestrial	Habitat of Species of Concern Removed	Area	ha	540.0	415.3	431.7	162.9	298.4	191.1
		Total Moose Winter Habitat Removed	Area	ha	Moderate	Moderate	Moderate	None	Moderate	Moderate
		Total Vegetative Habitat Removed	Area	ha	899	763	774	749	786	637
		Total Wetland Area Removed	Area	ha	112.0	146.6	148.2	43.6	94.6	80.6
	Closure	Post-Closure Chemical Stability	Value	-	Stable	Stable	Stable	Stable	Stable	Stable
		Post-Closure Flow Change	Value	-	Low	Moderate	High	None	Very Low	Very Low
Socio-Economic	Human Health	Human Health (Direct Exposure)	Value	-	Low potential	Low potential	Low potential	Low potential	Low potential	Low potential
		Human Health (Indirect Exposure)	Value	-	Low potential	Low potential	Low potential	Low potential	Low potential	Low potential
	Existing Communities and Human (Current and Historic) Land Uses	Aboriginal Peoples Interests and Current Land Use	Value	-	No data on relative Aboriginal values or current uses	No data on relative Aboriginal values or current uses	No data on relative Aboriginal values or current uses	No data on relative Aboriginal values or current uses	No data on relative Aboriginal values or current uses	No data on relative Aboriginal values or current uses
		Presence of Archaeological Sites	Value	-	Sites mitigatable	Sites mitigatable	Sites mitigatable	Sites mitigatable	Sites mitigatable	Sites mitigatable
		Proximity to Existing Permanent or Temporary Residences	Value	-	20 to 25 potential residences	Over 30 potential residences	Over 30 potential residences	One potential residence near Wolf Lake	Over 30 potential residences	Over 30 potential residences
		Recreational Access	Value	-	Temporary loss of access	Temporary loss of access	Temporary loss of access	Temporary loss of access	Temporary loss of access	Temporary loss of access
		Visibility and Aesthetics	Value	-	Major change in landscape from baseline conditions	Major change in landscape from baseline conditions	Major change in landscape from baseline conditions	Major change in landscape from baseline conditions	Major change in landscape from baseline conditions	Major change in landscape from baseline conditions
Technical	Tailings Management Facility Layout	Maximum Embankment Height	Height	m	44	57	57	58	50	61
		Average Embankment Height	Height	m	25.3	29.7	28.6	35.8	34.2	44.1
		Expansion Capacity	Value	-	Conducive to expansion to the north	Minor dam raises and conducive to expansion to the south	Minor dam raises and conducive to expansion to the south	Not conducive to expansion (lack of natural containment and waterbodies surround TMF)	Not conducive to expansion (lack of natural containment and waterbodies surround TMF)	Not conducive to expansion (lack of natural containment and waterbodies surround TMF)
	Tailings Delivery and Deposition System	Pipeline Length	Length	km	5.5	8.7	7.9	7.9	13.7	12.7
		Pumping Requirements	Height	m	24	33	33	43	28	39
		Ease of Operation During Start-up	Value	-	Moderate ease	Moderate difficulty	Moderate difficulty	Moderate difficulty	Easy	Easy
	Embankment Construction	Starter Embankment Volume	Volume	Million m^3	2.1	3.2	3.0	4.9	4.3	5.2
		Final Embankment Volume	Volume	Million m^3	20.3	26.9	25.3	34.1	32.1	43.6
		Ultimate Storage Efficiency	Ratio	-	11.8	8.8	9.4	6.9	7.5	5.5
		Foundation Preparation	Area	ha	7.6	28.8	28.8	28.5	61.7	78.4
		Geotechnical Conditions	Value	-	Majority of embankment founded on competent bedrock	Majority of embankment founded on competent bedrock	Majority of embankment founded on competent bedrock	Unknown foundation conditions but suspect moderate area of poor foundations	Moderate area in suspected poor foundations	Large area in suspected poor foundations
	Land Acquisition	Land Area and Title Holders	Value	-	0	0	0	0	0	0
	Water Management	TMF Catchment Area	Area	ha	899	763	774	749	786	637
		Reclaim Pipeline	Length	km	9.2	10.3	13	11.4	10.8	12.7
		Reclaim Pumping Requirements	Head	m	-9	-20	-19.5	-23.5	-14	-24.5
		Ease of Water Management Including Polishing Pond	Value	-	Moderate ease	Moderate ease	Easy	Moderate difficulty	Moderate difficulty	Easy
		Ease of Seepage Management	Value	-	Very easy	Moderate ease	Moderate ease	Moderate difficulty	Moderate difficulty	Moderate difficulty
	Monitoring and Maintenance	Monitoring and Maintenance Requirements	Value	-	Easy	Moderate ease	Moderate ease	Moderate difficulty	Difficult	Difficult
		Consequence of Operational Error	Value	-	Potentially permanent and significant	Likely temporary but significant	Likely temporary but significant	Potentially permanent and significant	Potentially permanent and significant	Potentially permanent and significant
	Closure	Ease of Decommissioning and Closure	Value	-	Easy	Easy	Easy	Moderate ease	Moderate ease	Moderate ease
		Post Closure Landform Stability	Value	-	Very Stable	Moderate-High stability	Moderate-High stability	Moderate-High stability	Moderate-High stability	Moderately stable
Economics	Capital Costs	Initial Capital Cost	Value	Million $	84 (1)	98 (1)	91 (1)	125 (1)	142 (1)	150 (1)
		Surface Water Realignments and Fish Habitat Compensation Costs	Value	Million $	20 (1)	10 (1)	22.5 (1)	< 5 (1)	5 (1)	< 5 (1)
	Operational Costs	Embankment Raises	Value	Million $	157 (1)	212 (1)	196 (1)	249 (1)	260 (1)	348 (1)
		Operational Costs	Value	Million $	41 (1)	64 (1)	58 (1)	58 (1)	101 (1)	94 (1)
	Closure and Post Closure Costs	Reclamation	Area	ha	899	763	774	749	786	637
		Monitoring and Maintenance	Value	$	250,000	250,000	250,000	250,000	250,000	250,000

I:\1\01\00497\03\A\Report\Report 1, Rev 0 - TMF MAA\Tables\[Table 4.1 to 4.5 - TMF MAA.xlsx]Table 4.3_Indicator Values

NOTES:

1. COSTS PRESENTED ARE RELATIVE BASED ON LIMITED DETAIL AND ANALYSIS AND DO NOT REPRESENT ACTUAL ESTIMATED COSTS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	05MAR'13	ISSUED WITH REPORT NB101-497/3-1	RSM	KEH	RAM

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TABLE 4.4

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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SUMMARY OF INDICATOR VALUE SCALES

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Account, Sub-Account	Indicator	Value	Descriptor
Environmental, Hydrology	Total Catchment Area	6 (Best)	Less than 600 ha
		5	Between 600 and 700 ha
		4	Between 700 and 800 ha
		3	Between 800 and 900 ha
		2	Between 900 and 1000 ha
		1 (Worst)	Greater than 1000 ha
	Number of Watersheds	6 (Best)	1 Watershed
		5	2 Watersheds
		4	3 Watersheds
		3	4 Watersheds
		2	5 Watersheds
		1 (Worst)	Greater than 5 Watersheds
	Stream Length Removed	6 (Best)	None
		5	Between 0 and 3 km
		4	Between 3 and 6 km
		3	Between 6 and 9 km
		2	Between 9 and 12 km
		1 (Worst)	Greater than 12 km
	Loss of Waterbodies	6 (Best)	None
		5	Between 0 and 50 ha of waterbodies (including wetlands) removed
		4	Between 50 and 125 ha of waterbodies (including wetlands) removed
		3	Between 125 and 250 ha of waterbodies (including wetlands) removed
		2	Between 250 and 500 ha of waterbodies (including wetlands) removed
		1 (Worst)	Greater than 500 ha of waterbodies (including wetlands) removed
	Requires Surface Water Realignment	6 (Best)	None
		5	Very Low - minor diversion of ephemeral water flows
		4	Low - partial diversion of minor surface water systems
		3	Moderate - complete diversion of minor surface water systems
		2	High - Partial diversion of major surface water systems
		1 (Worst)	Very High - Complete diversion of major surface water systems
	Flow Change	6 (Best)	None
		5	Very Low - Less than 5% change to flows at the outlet from Neville Lake
		4	Low - 5 to 10% change to flows at the outlet from Neville Lake
		3	Moderate - 10 to 20% change to flows at the outlet from Neville Lake
		2	High - 20 to 100% change to flows at the outlet from Neville Lake
		1 (Worst)	Very High - Greater than 100% change to flows at the outlet from Neville Lake
Environmental, Water Quality	Change in Receiving Water Quality	6 (Best)	Less than baseline
		5	Between baseline and PWQO
		4	PWQO or site specific water quality objectives
		3	Less than chronic toxicity thresholds
		2	Less than acute toxicity thresholds
		1 (Worst)	Greater than acute
	Potential for Seepage	6 (Best)	Very Low
		5	Low
		4	Low-Moderate
		3	Moderate
		2	Moderate-High
		1 (Worst)	High
	Potential for Negative Influence on Surface Water Quality from Groundwater Seepage	6 (Best)	Very Low - relatively low seepage potential and surrounding waterbodies are large/high flow
		5	Low - relatively low seepage potential and surrounding waterbodies are small/low flow
		4	Low-Moderate - relatively moderate seepage potential and surrounding waterbodies are large/high flow
		3	Moderate - relatively moderate seepage potential and surrounding waterbodies are small/low flow
		2	Moderate-High - relatively high seepage potential and surrounding waterbodies are large/high flow
		1 (Worst)	High - relatively high seepage potential and surrounding waterbodies are small/low flow
Environmental, Aquatic	Loss of Fish Bearing Water	6 (Best)	None
		5	Few habitats of limited quality
		4	Many habitats of limited quality
		3	Few habitats of higher quality
		2	Many habitats of higher quality
		1 (Worst)	Loss of significant habitat
	Adjacent Fish Ecology	6 (Best)	None
		5	Few habitats of limited quality
		4	Many habitats of limited quality
		3	Few habitats of higher quality
		2	Many habitats of higher quality
		1 (Worst)	Loss of significant habitat
Environmental, Terrestrial	Habitat of Species of Concern Removed	6 (Best)	0 ha altered or removed
		5	1-108 ha altered or removed
		4	109-216 ha altered or removed
		3	217-324 ha altered or removed
		2	324-432 ha altered or removed
		1 (Worst)	>432 ha altered or removed
	Total Moose Winter Habitat Removed	6 (Best)	None
		5	Very Low
		4	Low
		3	Moderate
		2	High
		1 (Worst)	Very High
	Total Vegetative Habitat Removed	6 (Best)	0 ha altered or removed
		5	1-180 ha altered or removed
		4	181-360 ha altered or removed
		3	361-540 ha altered or removed
		2	541-720 ha altered or removed
		1 (Worst)	>720 ha altered or removed
	Total Wetland Area Removed	6 (Best)	0 ha altered or removed
		5	1-30 ha altered or removed
		4	31-60 ha altered or removed
		3	61-90 ha altered or removed
		2	91-120 ha altered or removed
		1 (Worst)	>121 ha altered or removed
Environmental, Closure	Post-Closure Chemical Stability	6 (Best)	Very stable
		5	Stable
		4	Moderate-high stability
		3	Moderately stable
		2	Low-moderate stability
		1 (Worst)	Unstable
	Post-Closure Flow Change	6 (Best)	None
		5	Very Low - small change to surface water systems with no change in receiver (i.e. Neville Lake)
		4	Low - moderate change to surface water systems with no change in receiver
		3	Moderate - large change to surface water systems with no change in receiver
		2	High - moderate change to surface water system with change in receiver
		1 (Worst)	Very High - large change to surface water system with change in receiver

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TABLE 4.4

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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SUMMARY OF INDICATOR VALUE SCALES

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Account, Sub-Account	Indicator	Value	Descriptor
Socio-Economic, Human Health	Human Health (Direct Exposure)	6 (Best)	No potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
		5	Very low potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
		4	Low potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
		3	Moderate potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
		2	High potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
		1 (Worst)	Very High potential for TMF to affect human health through exposure to emissions (air, noise) or other releases to the environment (water, etc.)
	Human Health (Indirect Exposure)	6 (Best)	No potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
		5	Very low potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
		4	Low potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
		3	Moderate potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
		2	High potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
		1 (Worst)	Very High potential for TMF to affect human health through exposure to emissions (air) or other releases to the environment (water) via consumption of impacted fish, wildlife, berries, etc.
Socio-Economic, Existing Communities and Human (Current and Historic) Land Uses	Aboriginal Peoples Interests and Current Land Use	6 (Best)	Proposed area has no importance to Aboriginal Peoples community (no current or historic uses)
		5	Proposed area has limited importance to Aboriginal Peoples interests (historic trail used by a few that is no longer used)
		4	Proposed area has low importance to the Aboriginal Peoples interests (seasonal trail to hunting or fishing area that could be re-routed)
		3	Proposed area has moderate importance to the Aboriginal Peoples interests (historic fishing, hunting or agricultural area no longer used)
		2	Proposed area has high importance to Aboriginal Peoples interests (regularly used for fishing, hunting, agriculture and is culturally significant)
		1 (Worst)	Proposed area has significant importance to Aboriginal Peoples interests (spiritual or burial grounds) and is currently heavily used to exercise Aboriginal or Treaty rights.
	Presence of Archaeological Sites	6 (Best)	No sites present
		5	Individual sites present but mitigatable
		4	Less than 5% of lands assessed as having moderate to high archaeological potential
		3	Less than 15% of lands assessed as having moderate to high archaeological potential
		2	More than 30% of lands assessed as having moderate to high archaeological potential
		1 (Worst)	Multiple high importance sites
	Proximity to Existing Permanent or Temporary Residences	6 (Best)	No residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
		5	Less than 5 residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
		4	6 to 10 residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
		3	11 to 20 residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
		2	21 to 30 residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
		1 (Worst)	Over 30 residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity to TMF
	Recreational Access	6 (Best)	No reduction in public access to recreation areas (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
		5	Short term loss (initial construction) of access to recreation areas (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
		4	Temporary loss (mine life) of access to a periodically used recreation area (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
		3	Temporary loss (mine life) of access to a heavily used public recreation area (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
		2	Permanent loss of access to a periodically used public recreation areas (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
		1 (Worst)	Permanent loss of access to a heavily used public recreation area (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.)
	Visibility and Aesthetics	6 (Best)	Not visible or visible (no noise emissions) for less than 5 receptors but is considered a minor change in landscape from baseline conditions
		5	Visible/noise emissions for more than 5 receptors but is considered a minor change in landscape from baseline conditions
		4	Visible for less than 5 receptors but is considered a moderate change in landscape from baseline conditions
		3	Visible for more than 5 receptors but is considered a moderate change in landscape from baseline conditions
		2	Visible for less than 5 receptors and is considered a major change in landscape from baseline conditions
		1 (Worst)	Visible for more than 5 receptors and is considered a major change in landscape from baseline conditions
Technical, Tailings Management Facility Layout	Maximum Embankment Height	6 (Best)	Less than 30 m
		5	Between 30 to 50 m
		4	Between 50 to 60 m
		3	Between 60 to 70 m
		2	Between 70 to 90 m
		1 (Worst)	Greater than 90 m
	Average Embankment Height	6 (Best)	Less than 25 m
		5	Between 25 to 30 m
		4	Between 30 to 35 m
		3	Between 35 to 40 m
		2	Between 40 to 45 m
		1 (Worst)	Greater than 45 m
	Expansion Capacity	6 (Best)	Very High - Additional capacity achievable with minor dam raises
		5	High - Additional capacity achievable with minor dam raises and/or is located adjacent to suitable land conducive to expansion
		4	Moderate - Additional capacity achievable with moderate dam raises and is located adjacent to suitable land conducive to expansion
		3	Low - Additional capacity achievable with moderate dam raises and land adjacent to TMF is not suitable or conducive to expansion
		2	Very Low - Additional capacity achievable with significant dam raises and land adjacent to TMF is not suitable or conducive to expansion
		1 (Worst)	No Potential
Technical, Tailings Delivery and Deposition System	Pipeline Length	6 (Best)	Less than 5 km
		5	Between 5 and 7 km
		4	Between 7 and 9 km
		3	Between 9 and 11 km
		2	Between 11 and 13 km
		1 (Worst)	Greater than 13 km
	Pumping Requirements	6 (Best)	25 m of head or less
		5	25 to 30 m of head
		4	30 and 35 m of head
		3	35 and 40 m of head
		2	40 and 45 m of head
		1 (Worst)	Greater than 45 m of head
	Ease of Operation During Start-up	6 (Best)	Very easy
		5	Easy
		4	Moderate ease
		3	Moderate difficulty
		2	Difficult
		1 (Worst)	Very difficult
Technical, Embankment Construction	Starter Embankment Volume	6 (Best)	Less than 2.5 million m^3
		5	2.5 to 3.5 million m^3
		4	3.5 to 4.5 million m^3
		3	4.5 to 6.5 million m^3
		2	6.5 to 8.5 million m^3
		1 (Worst)	Greater than 8.5 million m^3
	Final Embankment Volume	6 (Best)	Less than 20 million m^3
		5	20 to 25 million m^3
		4	25 to 30 million m^3
		3	30 to 35 million m^3
		2	35 to 40 million m^3
		1 (Worst)	Greater than 40 million m^3
	Ultimate Storage Efficiency	6 (Best)	>10
		5	9 to 10
		4	8 to 9
		3	7 to 8
		2	6 to 7
		1 (Worst)	< 6
	Foundation Preparation	6 (Best)	Less than 20 ha
		5	Between 20 and 35 ha
		4	Between 35 and 50 ha
		3	Between 50 and 65 ha
		2	Between 65 and 80 ha
		1 (Worst)	Greater than 80 ha
	Geotechnical Conditions	6 (Best)	No risk of geotechnical conditions and/or hazards
		5	Low risk of geotechnical conditions and/or hazards that can be mitigated during design and construction
		4	Moderate risk of geotechnical conditions and/or hazards that can be mitigated during design and construction
		3	Significant risk of geotechnical conditions and hazards that can be mitigated during design and construction
		2	Moderate risk of geotechnical conditions and/or hazards that cannot be mitigated during design and construction
		1 (Worst)	Significant risk of geotechnical conditions and/or hazards that cannot be mitigated during design and construction

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TABLE 4.4

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TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SUMMARY OF INDICATOR VALUE SCALES

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Account, Sub-Account	Indicator	Value	Descriptor
Technical, Land Acquisition	Land Area and Title Holders	6 (Best)	Less than 20 ha of land required for acquisition and/or 1 registered land user to compensate
		5	Between 20 and 40 ha of land required for acquisition and/or 2 - 3 registered land users to compensate
		4	Between 40 and 60 ha of land required for acquisition and/or 4 - 5 registered land users to compensate
		3	Between 60 and 80 ha of land required for acquisition and/or 6 - 7 registered land users to compensate
		2	Between 80 and 100 ha of land required for acquisition and/or 8 - 9 registered land users to compensate
		1 (Worst)	Greater than 100 ha of land required for acquisition and/or greater than 10 registered land users to compensate
Technical, Water Management	TMF Catchment Area	6 (Best)	Less than 250 ha
		5	Between 250 and 450 ha
		4	Between 450 and 650 ha
		3	Between 650 and 850 ha
		2	Between 850 and 1050 ha
		1 (Worst)	Greater than 1050 ha
	Reclaim Pipeline	6 (Best)	Less than 5 km
		5	Between 5 and 8 km
		4	Between 8 and 11 km
		3	Between 11 and 14 km
		2	Between 14 and 17 km
		1 (Worst)	Greater than 17 km
	Reclaim Pumping Requirements	6 (Best)	less than 0 m of head
		5	0 to 10 m of head
		4	10 to 20 m of head
		3	20 to 30 m of head
		2	30 to 40 m of head
		1 (Worst)	Greater than 40 m of head
	Ease of Water Management Including Polishing Pond	6 (Best)	Very easy
		5	Easy
		4	Moderate ease
		3	Moderate difficulty
		2	Difficult
		1 (Worst)	Very difficult
	Ease of Seepage Management	6 (Best)	Very easy
		5	Easy
		4	Moderate ease
		3	Moderate difficulty
		2	Difficult
		1 (Worst)	Very difficult
Technical, Monitoring and Maintenance	Monitoring and Maintenance Requirements	6 (Best)	Very easy
		5	Easy
		4	Moderate ease
		3	Moderate difficulty
		2	Difficult
		1 (Worst)	Very difficult
	Consequence of Operational Error	6 (Best)	No measureable impact
		5	Temporary minor environmental degradation
		4	Temporary significant environmental degradation
		3	Permanent minor environmental degradation
		2	Permanent significant environmental degradation
		1 (Worst)	Loss of life
Technical, Closure	Ease of Decommissioning and Closure	6 (Best)	Very easy
		5	Easy
		4	Moderate ease
		3	Moderate difficulty
		2	Difficult
		1 (Worst)	Very difficult
	Post Closure Landform Stability	6 (Best)	Very stable
		5	Stable
		4	Moderate-high stability
		3	Moderately stable
		2	Low-moderate stability
		1 (Worst)	Unstable
Economics, Capital Costs	Initial Capital Cost	6 (Best)	Less than $85,000,000
		5	Between $85,000,000 and $95,000,000
		4	Between $95,000,000 and $105,000,000
		3	Between $105,000,000 and $115,000,000
		2	Between $115,000,000 and $125,000,000
		1 (Worst)	Greater than $125,000,000
	Surface Water Realignments and Fish Habitat Compensation Costs	6 (Best)	Less than $4,000,000
		5	Between $4,000,000 and $9,000,000
		4	Between $9,000,000 and $14,000,000
		3	Between $14,000,000 and $19,000,000
		2	Between $19,000,000 and $24,000,000
		1 (Worst)	Greater than $24,000,000
Economics, Operational Costs	Embankment Raises	6 (Best)	Less than $160,000,000
		5	Between $160,000,000 and $180,000,000
		4	Between $180,000,000 and $200,000,000
		3	Between $200,000,000 and $220,000,000
		2	Between $220,000,000 and $240,000,000
		1 (Worst)	Greater than $240,000,000
	Operational Costs	6 (Best)	Less than $45,000,000
		5	Between $45,000,000 and $55,000,000
		4	Between $55,000,000 and $65,000,000
		3	Between $65,000,000 and $75,000,000
		2	Between $75,000,000 and $85,000,000
		1 (Worst)	Greater than $85,000,000
Economics, Closure and Post Closure Costs	Reclamation	6 (Best)	Less than 250 ha
		5	Between 250 and 450 ha
		4	Between 450 and 650 ha
		3	Between 650 and 850 ha
		2	Between 850 and 1050 ha
		1 (Worst)	Greater than 1050 ha
	Monitoring and Maintenance	6 (Best)	Less than $100,000
		5	Between $100,000 and $200,000
		4	Between $200,000 and $300,000
		3	Between $300,000 and $400,000
		2	Between $400,000 and $500,000
		1 (Worst)	Greater than $500,000

I:\1\01\00497\03\A\Report\Report 1, Rev 0 - TMF MAA\Tables\[Table 4.1 to 4.5 - TMF MAA.xlsx]Table 4.4 Indicator Value Scale

REV	DATE	DESCRIPTION	PREPD	CHK'D	APP'D
0	05MAR'13	ISSUED WITH REPORT NB101-497/3-1	RSM	KEH	RAM

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TABLE 4.5

IAMGOLD CORPORATION
CÔTÉ GOLD PROJECT

TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SCORING SUMMARY

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Account	Account Weight (W_A)	Sub-Account	Sub-Account Weight (W_{SA})	Indicator	Indicator Weight (W_I)	Indicator Values and Merit Scores											
						TMF 1B		TMF 2B		TMF 2C		TMF 11		TMF 14A		TMF 14C	
						Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)
Environmental	6	Hydrology	4	Total Catchment Area	3	2	6	4	12	4	12	4	12	4	12	5	15
				Number of Watersheds	3	6	18	6	18	6	18	6	18	6	18	6	18
				Stream Length Removed	4	2	8	3	12	3	12	4	16	4	16	6	24
				Loss of Waterbodies	4	4	16	3	12	3	12	4	16	4	16	4	16
				Requires Surface Water Realignment	5	2	10	1	5	1	5	6	30	2	10	6	30
				Flow Change	5	5	25	5	25	3	15	5	25	5	25	5	25
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			83		84		74		117		97		128
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			3.5		3.5		3.1		4.9		4.0		5.3
		Water Quality	5	Change in Receiving Water Quality	5	5	25	5	25	5	25	5	25	5	25	5	25
				Potential for Seepage	5	5	25	4	20	4	20	3	15	2	10	2	10
				Potential for Negative Influence on Surface Water Quality from Groundwater Seepage	5	5	25	3	15	3	15	3	15	2	10	1	5
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			75		60		60		55		45		40
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			5.0		4.0		4.0		3.7		3.0		2.7
		Aquatic	5	Loss of Fish Bearing Water	5	2	10	2	10	2	10	2	10	5	25	5	25
				Adjacent Fish Ecology	3	5	15	5	15	5	15	5	15	5	15	6	18
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			25		25		25		25		40		43
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			3.1		3.1		3.1		3.1		5.0		5.4
		Terrestrial	4	Habitat of Species of Concern Removed	5	1	5	2	10	2	10	4	20	3	15	4	20
				Total Moose Winter Habitat Removed	5	3	15	3	15	3	15	6	30	3	15	3	15
				Total Vegetative Habitat Removed	4	1	4	1	4	1	4	1	4	1	4	2	8
				Total Wetland Area Removed	4	2	8	1	4	1	4	4	16	2	8	3	12
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			32		33		33		70		42		55
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			1.8		1.8		1.8		3.9		2.3		3.1
		Closure	6	Post-Closure Chemical Stability	6	5	30	5	30	5	30	5	30	5	30	5	30
				Post-Closure Flow Change	4	4	16	2	8	3	12	6	24	5	20	5	20
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			46		38		42		54		50		50
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			4.6		3.8		4.2		5.4		5.0		5.0
		Account Merit Score ($\Sigma(R_S \times W_{SA})$)					89		80		80		101		96		104
		Account Merit Rating ($R_A = \Sigma(R_S \times W_{SA})/\Sigma W_{SA}$)					3.7		3.3		3.4		4.2		4.0		4.3
Socio-Economic	3	Human Health	6	Human Health (Direct Exposure)	6	4	24	4	24	4	24	4	24	4	24	4	24
				Human Health (Indirect Exposure)	4	4	16	4	16	4	16	4	16	4	16	4	16
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			40		40		40		40		40		40
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			4.0		4.0		4.0		4.0		4.0		4.0
		Existing Communities and Human (Current and Historic) Land Uses	3	Aboriginal Peoples Interests and Current Land Use	6	1	6	1	6	1	6	1	6	1	6	1	6
				Presence of Archaeological Sites	4	5	20	5	20	5	20	5	20	5	20	5	20
				Proximity to Existing Permanent or Temporary Residences	4	2	8	1	4	1	4	5	20	1	4	1	4
				Recreational Access	4	4	16	4	16	4	16	4	16	4	16	4	16
				Visibility and Aesthetics	3	1	3	1	3	1	3	2	6	1	3	1	3
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			53		49		49		68		49		49
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			2.5		2.3		2.3		3.2		2.3		2.3
		Account Merit Score ($\Sigma(R_S \times W_{SA})$)					32		31		31		34		31		31
		Account Merit Rating ($R_A = \Sigma(R_S \times W_{SA})/\Sigma W_{SA}$)					3.5		3.4		3.4		3.7		3.4		3.4

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TABLE 4.5

IAMGOLD CORPORATION
CÔTÉ GOLD PROJECT

TAILINGS MANAGEMENT FACILITY ALTERNATIVES ASSESSMENT
SCORING SUMMARY

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Account	Account Weight (W_A)	Sub-Account	Sub-Account Weight (W_{SA})	Indicator	Indicator Weight (W_I)	Indicator Values and Merit Scores											
						TMF 1B		TMF 2B		TMF 2C		TMF 11		TMF 14A		TMF 14C	
						Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)	Value (S)	Merit Score ($S*W_I$)
Technical	3	Tailings Management Facility Layout	3	Maximum Embankment Height	5	5	25	4	20	4	20	4	20	4	20	3	15
				Average Embankment Height	3	5	15	5	15	5	15	3	9	4	12	2	6
				Expansion Capacity	3	6	18	6	18	6	18	3	9	3	9	2	6
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			58		53		53		38		41		27
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			5.3		4.8		4.8		3.5		3.7		2.5
		Tailings Delivery and Deposition System	3	Pipeline Length	3	5	15	4	12	4	12	4	12	1	3	2	6
				Pumping Requirements	3	6	18	4	12	4	12	2	6	4	12	3	9
				Ease of Operation During Start-up	3	4	12	3	9	3	9	3	9	5	15	5	15
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			45		33		33		27		30		30
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			5.0		3.7		3.7		3.0		3.3		3.3
		Embankment Construction	5	Starter Embankment Volume	5	6	30	5	25	5	25	3	15	4	20	3	15
				Final Embankment Volume	4	5	20	4	16	4	16	3	12	3	12	1	4
				Ultimate Storage Efficiency	4	6	24	4	16	5	20	2	8	3	12	1	4
				Foundation Preparation	2	6	12	5	10	5	10	5	10	3	6	2	4
				Geotechnical Conditions	3	5	15	4	12	4	12	3	9	3	9	2	6
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			101		79		83		54		59		33
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			5.6		4.4		4.6		3.0		3.3		1.8
		Land Acquisition	2	Land Area and Title Holders	2	6	12	6	12	6	12	6	12	6	12	6	12
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			12		12		12		12		12		12
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			6.0		6.0		6.0		6.0		6.0		6.0
		Water Management	5	TMF Catchment Area	3	2	6	3	9	3	9	3	9	3	9	4	12
				Reclaim Pipeline	3	4	12	4	12	3	9	3	9	4	12	3	9
				Reclaim Pumping Requirements	3	6	18	6	18	6	18	6	18	6	18	6	18
				Ease of Water Management Including Polishing Pond	4	4	16	4	16	5	20	3	12	3	12	5	20
				Ease of Seepage Management	2	6	12	4	8	4	8	3	6	3	6	3	6
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			64		63		64		54		57		65
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			4.3		4.2		4.3		3.6		3.8		4.3
		Monitoring and Maintenance	2	Monitoring and Maintenance Requirements	5	5	25	4	20	4	20	3	15	2	10	2	10
				Consequence of Operational Error	3	2	6	4	12	4	12	2	6	2	6	2	6
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			31		32		32		21		16		16
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			3.9		4.0		4.0		2.6		2.0		2.0
		Closure	6	Ease of Decommissioning and Closure	3	5	15	5	15	5	15	4	12	4	12	4	12
				Post Closure Landform Stability	6	6	36	4	24	4	24	4	24	4	24	3	18
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			51		39		39		36		36		30
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			5.7		4.3		4.3		4.0		4.0		3.3
				Account Merit Score ($\Sigma(R_S \times W_{SA})$)			134		114		116		94		97		84
				Account Merit Rating ($R_A = \Sigma(R_S \times W_{SA})/\Sigma W_{SA}$)			5.2		4.4		4.5		3.6		3.7		3.2
Economics	1.5	Capital Costs	5	Initial Capital Cost	5	6	30	4	20	5	25	2	10	1	5	1	5
				Surface Water Realignments and Fish Habitat Compensation Costs	3	2	6	4	12	2	6	6	18	5	15	6	18
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			36		32		31		28		20		23
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			4.5		4.0		3.9		3.5		2.5		2.9
		Operational Costs	3	Embankment Raises	5	6	30	3	15	4	20	1	5	1	5	1	5
				Operational Costs	4	6	24	4	16	4	16	4	16	1	4	1	4
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			54		31		36		21		9		9
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			6.0		3.4		4.0		2.3		1.0		1.0
		Closure and Post Closure Costs	2	Reclamation	4	2	8	3	12	3	12	3	12	3	12	4	16
				Monitoring and Maintenance	6	4	24	4	24	4	24	4	24	4	24	4	24
				Sub-Account Merit Score ($\Sigma(S*W_I)$)			32		36		36		36		36		40
				Sub-Account Merit Rating ($R_S = \Sigma(S*W_I)/\Sigma W_I$)			3.2		3.6		3.6		3.6		3.6		4.0
				Account Merit Score ($\Sigma(R_S \times W_{SA})$)			46.9		37.5		38.6		31.7		22.7		25.4
				Account Merit Rating ($R_A = \Sigma(R_S \times W_{SA})/\Sigma W_{SA}$)			4.7		3.8		3.9		3.2		2.3		2.5
				Alternative Merit Rating ($A = \Sigma(R_A*W_A)/\Sigma W_A$)			4.1		3.6		3.7		3.9		3.6		3.7

I:\1\01\00497\03\A\Report\Report 1, Rev 0 - TMF MAA\Tables\[Table 4.1 to 4.5 - TMF MAA.xlsx]Table 4.5 Scoring Summary

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	05MAR'13	ISSUED WITH REPORT NB101-497/3-1	RSM	KEH	RAM

4.4 MAA METHOD OF ANALYSIS

The methodology for completing the MAA is outlined below.

- The total weighted scores for each indicator within its specific sub-account are multiplied by the sub-account weighting factor and summed to determine the total weighted score for each sub-account. The maximum possible score is 6 and the minimum possible score is 1 for each sub-account. The individual indicator scores are shown on Table 4.5.
- The combined total weighted score for each indicator within its specific sub-account is multiplied by the sub-account weighting factor and summed to determine the total weighted score for each sub-account.
- The combined total weighted scores for each sub-account within its specific account are multiplied by the account weighting factor and summed to determine the total weighted score for each account.
- The final score for each Option is calculated by summing the total weighted score for each account to produce a final score. The highest value of these scores represents the highest ranked Option.

4.5 SENSITIVITY ANALYSIS

The weightings defined for the accounts, sub-accounts and indicators have been selected based on their perceived relative importance and will, therefore, introduce bias into the analysis. To understand the impact of this bias on the results of the analysis a sensitivity analysis has been completed by adjusting the weightings of accounts, sub-accounts and indicators. The scenarios evaluated are summarized as follows:

- **Sensitivity Analysis 1 - Economics Excluded:** The economics account, sub-account and indicator weightings was decreased to zero (0) to remove all project economic influences. This analysis tends to favour alternatives that protect the environment without being influenced by the cost of environmental controls or mitigation measures.
- **Sensitivity Analysis 2 - Economics Excluded with Fisheries Bias:** The economics account, sub-account and indicator weightings was decreased to zero (0) to remove all project economic influences and the importance of aquatics sub-accounts and indicators are increased (weighting factors set to 6). All other accounts, sub-accounts and indicators are moderated with weighting factors set to 3. This analysis favours alternatives that present the lowest possible loss of fish habitat under and adjacent to the TMF.
- **Sensitivity Analysis 3 - Terrestrial Ecology Screening:** The general account weighting factors for sensitivity analysis 3 are consistent with the Environment Canada base case recommendations; however, the project terrestrial sub-account weights and the corresponding indicator weights were all increased to 6 to increase the importance of the terrestrial habitat area on the final result.
- **Sensitivity Analysis 4 - Technical Screening:** This analysis evaluates each alternative from a technical perspective in the absence of consideration for the environment or socio-economic impacts. The technical account weighting was given full-weighting (6) while the project economics account was given a moderate weighting factor (3) to ground the assessment from a

financial perspective (i.e., the best possible technical merits tempered by the comparative impact of cost). This analysis favours alternatives that are both technically sound and economically feasible.

- **Sensitivity Analysis 5 - Indicators Set to Unity:** All accounts, sub-accounts and indicator weightings were reduced to 1 to remove any factors or bias associated with the weighting factors and to compare the TMF Options relative to the indicator values.

5 – RESULTS AND SENSITIVITY ANALYSIS

5.1 MAA RESULTS

The MAA base case analysis was completed by maintaining account weighting factors consistent with the recommendations suggested in the Guidelines (EC, 2011), as follows:

- Environment: 6
- Socio-economic: 3
- Technical: 3
- Project Economics: 1.5

The weighting factors for all Accounts, Sub-accounts and Indicators are summarized on Table 4.2.

The Base Case account scores, total scores and ranking for each Option are summarized below:

Table 5.1 Ranking Summary - Base Case

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	3.7	3.3	3.4	4.2	4.0	4.3
Socio-Economic	3.5	3.4	3.4	3.7	3.4	3.4
Technical	5.2	4.4	4.5	3.6	3.7	3.2
Economics	4.7	3.8	3.9	3.2	2.3	2.5
WEIGHTED TOTAL	4.10	3.64	3.67	3.86	3.61	3.69
RANKING	**1**	**5**	**4**	**2**	**6**	**3**

- **Environmental** - TMF 14C ranked higher than the other Options. This Option benefited from limited loss of fish bearing habitat under and adjacent to the TMF, no requirement for realignment of surface water systems, no loss of streams under the TMF and a smaller catchment area.
- **Socio-economic** - TMF 11 is located further away from potential receptors (i.e., residences) than the other Options and therefore ranked higher in this account than the other Options.
- **Technical** - TMF 1B ranked higher than the other Options. The main indicators contributing to TMF 1B scoring higher included, superior storage efficiency ratios, smaller starter and final embankment volumes, available capacity for expansion, shorter pipeline lengths and reduced pumping requirements, better foundations, and lower dams.
- **Economics** - TMF 1B ranked higher than the other Options. TMF 1B scored highest due the lower initial and ongoing capital and operating costs.

The results of the TMF MAA indicate that TMF 1B is the preferred Option.

5.2 SENSITIVITY ANALYSIS

5.2.1 Sensitivity Analysis 1 - Economics Excluded

The account scores, total scores and ranking for each Option for Sensitivity Analysis 1 are summarized below:

Table 5.2 Ranking Summary - Sensitivity Analysis 1: Economics Excluded

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	3.7	3.3	3.4	4.2	4.0	4.3
Socio-Economic	3.5	3.4	3.4	3.7	3.4	3.4
Technical	5.2	4.4	4.5	3.6	3.7	3.2
Economics	-	-	-	-	-	-
WEIGHTED TOTAL	4.02	3.62	3.65	3.95	3.78	3.83
RANKING	**1**	**6**	**5**	**2**	**4**	**3**

As shown above, under Sensitivity Analysis 1, TMF 1B remains the preferred Option for tailings management.

5.2.2 Sensitivity Analysis 2 - Economics Excluded with Fisheries Bias

The Account scores, total scores and ranking each Option for Sensitivity Analysis 2 are summarized below:

Table 5.3 Ranking Summary - Sensitivity Analysis 2: Economics Excluded with Fisheries Bias

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	3.5	3.3	3.4	3.7	4.5	4.9
Socio-Economic	3.3	3.2	3.2	3.7	3.2	3.2
Technical	5.0	4.5	4.6	3.7	3.7	3.3
Economics	-	-	-	-	-	-
WEIGHTED TOTAL	3.84	3.57	3.59	3.73	3.83	3.96
RANKING	**2**	**6**	**5**	**4**	**3**	**1**

As shown above, under Sensitivity Analysis 2, TMF 14C marginally exceeds TMF 1B as the preferred Option for tailings management.

5.2.3 Sensitivity Analysis 3: Terrestrial Ecology Screening

The Account scores, total scores and ranking for each Option for sensitivity analysis 3 are summarized below:

Table 5.4 Ranking Summary - Sensitivity Analysis 3: Terrestrial Ecology Screening

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	3.6	3.2	3.2	4.2	3.8	4.2
Socio-Economic	3.5	3.4	3.4	3.7	3.4	3.4
Technical	5.2	4.4	4.5	3.6	3.7	3.2
Economics	4.7	3.8	3.9	3.2	2.3	2.5
WEIGHTED TOTAL	4.03	3.58	3.61	3.84	3.55	3.64
RANKING	**1**	**5**	**4**	**2**	**6**	**3**

As shown above, under Sensitivity Analysis 3, TMF 1B remains the preferred Option for tailings management.

5.2.4 Sensitivity Analysis 4: Technical Screening

The Account scores, total scores and ranking each Option for Sensitivity Analysis 4 are summarized below:

Table 5.5 Ranking Summary - Sensitivity Analysis 4: Technical Screening

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	-	-	-	-	-	-
Socio-Economic	-	-	-	-	-	-
Technical	5.2	4.4	4.5	3.6	3.7	3.2
Economics	4.7	3.8	3.9	3.2	2.3	2.5
WEIGHTED TOTAL	5.00	4.18	4.26	3.46	3.23	3.00
RANKING	**1**	**3**	**2**	**4**	**5**	**6**

As shown above, under Sensitivity Analysis 4, TMF 1B remains the preferred Option for tailings management.

5.2.5 Sensitivity Analysis 5: Indicators Set to Unity

The Account scores, total scores and ranking for each Option for Sensitivity Analysis 6 are summarized below:

Table 5.6 Ranking Summary - Sensitivity Analysis 5: Indicators Set to Unity

Account	TSF 1B	TSB 2B	TSF 2C	TSF 11	TSF 14A	TSF 14C
Environmental	3.7	3.3	3.3	4.3	3.9	4.3
Socio-Economic	3.3	3.2	3.2	3.7	3.2	3.2
Technical	5.0	4.5	4.6	3.7	3.7	3.3
Economics	4.3	3.7	3.7	3.3	2.5	2.8
WEIGHTED TOTAL	4.08	3.67	3.69	3.74	3.32	3.41
RANKING	**1**	**4**	**3**	**2**	**6**	**5**

The analysis favoured TMF 1B. This result suggests that the assigned weighting factors did not bias the results towards TMF 1B being the more favorable Option.

6 – CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

An alternatives assessment for the tailings management facility needed for the Côté Gold Project has been completed. The analysis was based on the relative consideration of the environmental, socio-economic and technical merits and costs to develop each Option.

Six TMF Options were evaluated using a multiple accounts analysis to select the preferred Option for tailings storage and water management. The MAA was completed by establishing accounts, sub-accounts and indicators to compare and rank the identified TMF Options.

The results of the MAA indicate that TMF 1B is the preferred TMF Option for the Project. The results of the sensitivity analyses support the selection of TMF 1B.

6.2 RECOMMENDATIONS

Recommendations based on the results of the MAA are as follows:

1. Additional site investigations carried out for TMF 11, TMF 14A and TMF 14C would verify geotechnical assumptions used in the alternatives assessment.
2. Initiate pre-feasibility level design of TMF 1B.

8 – REFERENCES

Environment Canada. September, 2011. *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*.

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9 – CERTIFICATION

This report was prepared, reviewed and approved by the undersigned.

Prepared:

Reagan McIsaac, Ph.D., P.Eng.
Senior Engineer

Reviewed:

Kevin Hawton, P.Eng.
Specialist Engineer/Project Manager

Approved:

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Managing Principal, North Bay

APPENDIX A

DESCRIPTION OF INDICATORS

(Pages A-1 to A-11)

APPENDIX A

DESCRIPTION OF INDICATORS

1.1 ENVIRONMENTAL ACCOUNT

The environmental account encompasses a range of issues pertaining to the direct and indirect influences on the surrounding environment as a result of developing each TMF option.

The environmental account is subdivided into a number of sub-accounts. Each sub-account is evaluated on the basis of a series of indicators. The environmental sub-accounts and indicators are summarized in the following table.

Table A.1 Environmental Sub-accounts and Indicators

Account	Sub-Account	Indicator
Environmental	Hydrology	Total Catchment Area
		Number of Watersheds
		Stream Length Removed
		Loss of Waterbodies
		Requires Surface Water Realignment
		Flow Change
	Water Quality	Change in Receiving Water Quality
		Potential for Seepage
		Potential for Negative Influence on Surface Water Quality from Groundwater Seepage
	Aquatic	Loss of Fish Bearing Water
		Adjacent Fish Ecology
	Terrestrial	Habitat of Species of Concern Removed
		Total Moose Winter Habitat Removed
		Total Vegetative Habitat Removed
		Total Wetland Area Removed
	Closure	Post-Closure Chemical Stability
		Post-Closure Flow Change

The indicators for the Environmental Account are described briefly below.

- **Total Catchment Area:** The TMF catchment area affects the amount of water intercepted that may be potentially impacted. Options having smaller catchment areas result in reduced intercepted water, and hence were assigned relatively higher scores.

- **Number of Watersheds:** Alternatives that minimize the number of catchments and/or watersheds directly impacted may have fewer potential cumulative effects on the environment. It is preferable for a tailings management facility to be located within a single watershed area in order to minimize risk for a greater distribution of potentially affected runoff from the TMF.
- **Stream Length Removed:** Disrupting stream flows is less desirable due to the potential impact on downstream waterbodies and aquatic life. This indicator is a direct quantitative measure of stream lengths affected under the TMF options.
- **Loss of Waterbodies:** It is desirable to minimize disruption of existing waterbodies and wetlands due to potential loss of aquatic habitat. While wetlands do not offer discrete fish habitat, the hydrological contributions to larger waterbodies create linkages between the wetlands and aquatic species habitat provided by larger associated waterbodies. Wetlands play an integral role in maintaining the water balance of the local environment through groundwater recharge, and flood flow alteration. The ranking is based on the relative area of waterbodies and wetlands that would be lost with each of the TMF options. The total area of all waterbodies and wetlands within the TMF option was used to assign the relative scores for this indicator. An option that does not disrupt a waterbody or wetland within the TMF footprint would receive a relative higher score than an option with waterbodies and wetlands.
- **Requires Surface Water Realignment:** The preservation of natural drainage patterns is preferred; however, as is common with construction of tailings management facilities realignment of surface water systems is typically required. Options that require partial realignment of minor surface water systems are scored more favourably than those that require complete diversion of major water systems.
- **Flow Change:** This indicator represents the potential relative flow reductions at the outlet from Neville Lake due to the TMF and the associated realignment of surface water flows for average annual conditions. Available regional data was used so the estimate is approximate of on-site conditions. Options that result in minimal changes in the hydrologic flow regime are more desirable.
- **Change in Receiving Water Quality:** The largest source of potential impacts to water quality is the ultimate release of water from the TMF. The potential for a change in the water quality at the discharge location is less desirable.

  Excess water not required in the process will be discharged, (following treatment as is necessary), to the environment. Construction of polishing ponds and a water treatment plant may be required for discharging excess water from all TMF options to the environment.

  The intent is that all options will release water at a quality that is between baseline and Provincial Water Quality Objectives (PWQO).
- **Potential for Seepage:** The TMF will include measures to reduce seepage. This indicator is primarily dependent on the anticipated ease with which effective seepage control can be established based on anticipated overburden depths and characteristics of the TMF dam sites. TMF options judged to have conditions where effective seepage control can be established with relative ease (i.e., low permeability bedrock close to surface) are rated higher for this indicator.

- **Potential for Negative Influence on Surface Water Quality from Groundwater Seepage:** The potential for negative influence on surface water quality from groundwater seepage is qualitatively assessed considering the seepage potential and the size and/or flow conditions in surrounding surface waterbodies. TMF options with surrounding waterbodies that are smaller or have limited catchment areas with low flow are more sensitive to influence from groundwater seepage from the TMF and are therefore ranked lower for this indicator.
- **Loss of Fish Bearing Water:** The expected quality and quantity of fish habitat potentially lost under the TMF options was used to assign relative scores as a measure of the impact of each option for this indicator. An option overlying many habitats of higher quality would receive a lower score than an option that overlies few habitats of limited quality.
- **Adjacent Fish Ecology:** The expected quality and quantity of adjacent fish habitat that could potentially be impacted by each TMF option, considering any surface water realignments, was considered to assign relative scores for each option. An option impacting many habitats of higher quality would receive a lower score than an option with few impacts on habitats of limited quality.
- **Habitat of Species of Concern Removed:** Four bird species, including the bald eagle (*Haliaeetus leucocephalus*), Canada warbler (*Wilsonia cnadensis*), common nighthawk (*Chordeiles minor*), and olive-sided flycatcher (*Contopus cooperi*), designated provincially as Special Concern and one bird species, rusty blackbird (*Euphagus carolinus*), designated federally as Special Concern were identified during the Baseline Terrestrial Studies completed for the Project (Golder, 2012). For the purpose of this alternatives assessment it is assumed that each of the five bird species has an equal potential to occur in their associated habitats identified throughout the Mine Site. The loss of habitat of species of special concern under the TMF Options has been estimated.
- **Total Moose Winter Habitat Removed:** Moose winter habitat (i.e. dense coniferous forest greater than 4 hectares) is considered significant wildlife habitat and is designated by MNR. TMF Options with less moose winter habitat are preferred. This indicator is a qualitative measure of the moose winter habitat based on land cover data and topography under each TMF Option.
- **Total Vegetative Habitat Removed:** Plant communities are distributed across the Mine Site and no plant species at risk were identified on the Mine Site (Golders, 2012). A smaller facility footprint will have the least adverse effect on the persistence of vegetative populations and communities which is preferred. Options with smaller footprints are assigned higher relative scores.
- **Total Wetland Area Removed:** Wetlands serve several ecological functions. They increase vegetation and wildlife diversity by offering a greater variety of habitats and forage. The diversity of habitat types offered in an area is a good indicator of the wildlife diversity likely present within it. This indicator is a direct quantitative measure of loss of wetland area under the tailings management facilities.
- **Post-Closure Chemical Stability:** The tailings are expected to be relatively inert and not produce acid rock drainage or significant metal leaching after closure. Closure of the facilities

will address long-term physical and chemical stability and impacts to the surrounding environment. A requirement of closure is to ensure that water quality objectives will continue to be met after closure. Specific reclamation activities will include physical stabilization measures, capping of the tailings surface (as required) and seeding, removal of pipeworks and ancillary facilities, vegetation of the disturbed areas and implementation of an appropriate water management and water quality measures. All options have been deemed to be equally chemically stable post-closure.

- **Post-Closure Flow Change:** Changes to the flow regime post-closure is not desirable. The impact to the flow regime has been qualitatively ranked by considering anticipated changes to the flows within the surrounding waterbodies at closure and if there is a change in the receiver (i.e. Neville Lake). Options that result in minimal changes in the flow regime post-closure from baseline with no change in receiver (i.e. Neville Lake) are more desirable.

1.2 SOCIO-ECONOMIC ACCOUNT

The socio-economic account addresses the social and cultural influences of the alternatives.

The socio-economic account is subdivided into a number of sub-accounts. Each sub-account is evaluated on the basis of a series of indicators. The socio-economic sub-accounts and indicators are summarized in the following table.

Table A.2 Socio-Economic Sub-accounts and Indicators

Account	Sub-Account	Indicator
Socio-Economic	Human Health	Human Health (Direct Exposure)
		Human Health (Indirect Exposure)
	Existing Communities and Human (Current and Historic) Land Uses	Aboriginal Peoples Interests and Current Land Use
		Presence of Archaeological Sites
		Proximity to Existing Permanent or Temporary Residences
		Recreational Access
		Visibility and Aesthetics

The indicators for the socio-economic account are described briefly below.

- **Human Health (Direct Exposure):** Fugitive dust may be released from vehicle and heavy equipment travel on gravel roads and from wind entrainment from stockpiles and other exposed earth materials. For the most part, dust can be adequately controlled on slurry TMF facilities and on roads with water and other Provincially-approved dust suppressants. At the Project site the prevailing wind direction is primarily from the south or southwest during the summer months, and from the north or northwest during the winter months. The potential likelihood for the TMF to affect human health due to exposure to emissions or other releases to the environment, including dust generation and potential for groundwater seepage were included in the

assessment of the direct exposure indicator. The measurement is a receptor-based qualitative assessment considering wind direction, receptors in the path of the wind, wet versus dry beach area, location of the supernatant pond, prevailing location of spigots during operation, potential for seepage, etc.

- **Human Health (Indirect Exposure):** Dust can affect vegetation and subsequently affect forage availability and wildlife species. The potential likelihood for the TMF to affect human health, including the consumption of impacted fish, wildlife, berries, etc. was included in the assessment of the indirect exposure indicator. It is preferred to have a facility with reduced ongoing dust generation and down-wind dispersion over water and land.
- **Aboriginal Peoples Interests and Current Land Use:** Adverse effect to Aboriginal Peoples interests is not desirable. The potential for the proposed Project to affect Aboriginal Peoples interests and current land use has not yet been determined. Traditional land use studies still need to be conducted to identify historic and current land uses in order to identify potential impacts to recent or ongoing traditional practices. All options have been given the lowest possible ranking until such studies have been completed.
- **Presence of Archaeological Sites:** Archaeological and historic heritage are non-renewable resources whose locations consist of the physical remains of past human activity. Unrecorded sites may be identified at any of the TMF options; however, individual sites are assumed to be mitigatable for all options. Studies are ongoing to determine if archaeological, paleontological or historic structures have the potential to be affected.
- **Proximity to Existing Permanent or Temporary Residences:** It is desirable to maximize the distance of the TMF from potential receptors. This indicator represents the number of existing residences (e.g. temporary camp sites, trapper cabins, seasonal residences, permanent residences and outfitter establishments) in proximity (i.e., approximately 5 km) of the TMF. A number of seasonal residences exist in proximity to the TMFs, primarily on Mesomikenda Lake.
- **Recreational Access:** Recreational use is generally a function of accessibility and opportunity. The expected duration (i.e., none, short-term (initial construction), temporary (mine life), permanent of loss of access and use (i.e., periodically, heavily) of public recreation areas (i.e. provincial park, cottages, favourite fishing lake accessible only by ATV, etc.) due to the TMF was used to assign relative scores as a measure of the impact of each option. An option with permanent loss of access to a heavily used public recreation area would receive a lower score than an option that impacts no reduction in access.
- **Visibility and Aesthetics:** Reduced visibility of the TMF is preferred. Visual effects are qualitatively assessed to capture the effect on the visual aesthetic from receptor locations such as major transportation routes, communities and existing temporary or permanent residences. This indicator considered such items as height, shape, and contrast with the surrounding terrain. All options are assumed to cause a major change in landscape from baseline conditions.

1.3 TECHNICAL ACCOUNT

The technical account assesses the technical merits of each of the alternatives.

The technical account is subdivided into a number of sub-accounts. Each sub-account is evaluated on the basis of a series of indicators. The technical sub-accounts and indicators are summarized in the following table:

Table A.3 Technical Sub-accounts and Indicators

Account	Sub-Account	Indicator
Technical	Tailings Management Facility Layout	Maximum Embankment Height
		Average Embankment Height
		Expansion Capacity
	Tailings Delivery and Deposition System	Pipeline Length
		Pumping Requirements
		Ease of Operation During Startup
	Embankment Construction	Starter Embankment Volume
		Final Embankment Volume
		Ultimate Storage Efficiency
		Foundation Preparation
		Geotechnical Conditions
	Land Acquisition	Land Area and Title Holders
	Water Management	TMF Catchment Area
		Reclaim Pipeline
		Reclaim Pumping Requirements
		Ease of Water Management Including Polishing Pond
		Ease of Seepage Management
	Monitoring and Maintenance	Monitoring and Maintenance Requirements
		Consequence of Operational Error
	Closure	Ease of Decommissioning and Closure
		Post Closure Landform Stability

The indicators for the technical are described briefly below.

- **Maximum Embankment Height:** The maximum height of the embankments provides a quantitative measure for relative comparison of risks between different options. For a given

location, embankments which are higher generally are more complex, require more construction effort and carry more risk than lower dams. TMF Options with lower embankment heights are assigned the highest relative score.

- **Average Embankment Height:** The average height of the embankments provides a quantitative measure for relative comparison of risks between different options. For a given location, embankments which are higher generally are more complex, are more difficult to manage, require more construction effort and carry more risk than lower dams. TMF Options with lower average embankment heights are assigned the highest relative score.
- **Expansion Capacity:** A number of factors can influence the required storage capacity of a tailings facility over the life of a mine. These may include climatic variations that impact water storage requirements, economic conditions that result in changes to pit designs and schedules. Scoring for this indicator is qualitative and based on local topography to reasonably allow additional tailings with dam raises and the availability of additional land adjacent to the TMF for expansion. A TMF is ranked higher if it can store additional tailings with minor dam raises and/or is located adjacent to suitable land conducive to expansion; and ranked lower where there is no or limited potential for expansion.
- **Pipeline Length:** A shorter pipeline is preferred to simplify design, reduce pipe maintenance and reduce the risk of potential spills, and pipe blockage due to freezing or sanding up. It is also recognized that shorter distances from the mill allows more frequent inspections and facilitates maintenance. TMF Options with shortest pipeline lengths are assigned the highest relative score.
- **Pumping Requirements:** Large topographical relief presents technical and operational challenges with respect to pumping tailings and increases risk due to higher pipeline pressures. Less pumping simplifies the design and decreases the risks for delays due to maintenance and problems during operations. TMF Options with the smallest head difference, pipeline length, and thus less pumping stations between the plant and the TMF are assigned the highest relative score.
- **Ease of Operation during Start-up:** This indicator provides a qualitative measure of the relative ease of operating the tailings storage facility at start-up. It is primarily based on topography and basin characteristics. Setting up pipelines and discharging of tailings from along the embankment during start-up is easier than discharging from natural ground.
- **Starter Embankment Volume:** A smaller embankment volume to commission the facility is preferred to simplify construction and reduce risk to the project start-up schedule. TMF Options with smaller embankment volumes are assigned higher relative scores. Smaller starter embankment volumes reduce the risk of not having enough embankment construction material while building other things at the same time.
- **Final Embankment Volume:** Smaller and lower final embankments are preferred to simplify and reduce overall embankment construction. A smaller annual embankment volume for dam raises reduces the construction effort and subsequently the risk to efficient construction scheduling and transport of large fill quantities over a significant distance. TMF Options with smaller embankment volumes are assigned higher relative scores.

- **Ultimate Storage Efficiency:** The TMF storage efficiency indicator is a ratio of the TMF storage capacity (volume) to the volume of fill material required to construct the embankment that confines the tailings (based on downstream construction). TMF Options with higher storage efficiencies require less embankment fill to contain the equivalent volume of tailings and are assigned higher relative scores.
- **Foundation Preparation:** Foundation preparation is expected to include at a minimum, the excavation of unsuitable soils below the embankment footprint and excavation of the key-in trench to bedrock to provide a suitable liner tie-in and to ensure long term stability of the embankment. Less foundation preparation requirements are preferred to simplify construction and reduce risk to construction and project schedules. TMF Options with larger embankment footprint areas overlying suspected deep unsuitable overburden material are assigned lower relative scores.
- **Geotechnical Conditions:** Tailings are deposited behind dams that are engineered structures constructed with processed materials. The performance and stability of these structures will depend on the foundation conditions, foundation preparation, fill materials, and quality of the construction. Good geotechnical conditions are preferred for ease of construction and to ensure long-term stability. The geotechnical indicator provides a measure of the inherent risk to embankment stability of siting TMFs on deep overburden soils, weak bearing soils or potentially liquefiable soils, etc. The relative value of the geotechnical conditions is estimated.
- **Land Area and Title Holders:** All TMF options are on lands that do not require any further land acquisitions.
- **TMF Catchment Area:** The TMF design will include measures to manage storm water and runoff within the affected catchment areas. Tailing facilities require provisions for management of runoff from large storm events which typically include overflow spillways, decant structures or additional freeboard for storage. Embankment freeboard is selected such that there is sufficient capacity within the facility to contain virtually all anticipated storm events during the operating period. A smaller facility footprint generally simplifies water management and reduces freeboard requirements which are preferred. TMF Options with smaller catchment areas are assigned higher relative scores.
- **Reclaim Pipeline:** The primary objective for water management at the TMF is to recycle process water to the maximum extent. A shorter reclaim pipeline is preferred to simplify design, reduce the risk of failure, and reduce monitoring and maintenance requirements. TMF Options with shorter reclaim pipeline lengths are assigned higher relative scores.
- **Reclaim Pumping Requirements:** Less pumping simplifies the design. Options with the smallest head difference between the plant and the TMF are assigned the highest relative score.
- **Ease of Water Management Including Polishing Pond:** Water management is an integral part of the management and operation of the TMF. The main considerations for water management at the TMF include storm water management (surface runoff), water quality and water supply. This indicator is a qualitative measure of the need for and complexity of water management required during the operations.

- **Ease of Seepage Management:** Less seepage management generally simplifies water management and is preferred. This indicator considers the measures that may be required to collect and control seepage from the TMF should seepage be deemed to adversely affect groundwater quality.
- **Monitoring and Maintenance Requirements:** The amount of monitoring and maintenance will be a function of the size and extent of the embankments including distance from the plant site. Less monitoring and maintenance requirements are preferred. The relative value of the amount and ease of monitoring and maintenance for each TMF option is estimated.
- **Consequence of Operational Error:** The consequence of operational error indicator provides an estimated measure of the severity (i.e. minor or significant) of impact to the environment and duration (i.e. temporary or permanent) should and embankment fail during operations. A lower consequence of error is preferred. The relative value of operational error is estimated.
- **Ease of Decommissioning and Closure:** This indicator is a qualitative measure of the relative ease of closing the mine. If progressive reclamation is practicable through operations, the relative ease of closure will be higher. Additionally, TMFs that exhibit greater storage efficiency and have less embankment areas and heights to reclaim will also score higher.
- **Post Closure Landform Stability:** Landform stability is a key criterion for mine closure. Tailings management facilities should be left in a stable state following closure such that they are not subject to mobilization through erosion, mass movement, or other natural processes. The relative post closure stability of the TMFs has been estimated based on the size and extent of the embankments and siting TMFs on deep overburden soils, weak bearing soils or potentially liquefiable soils, etc.

1.4 ECONOMICS ACCOUNT

The project economics account considers issues pertaining to the direct and indirect costs associated with the development of each alternative TMF option.

The economics account is subdivided into a number of sub-accounts. Each sub-account is evaluated on the basis of a series of indicators. The economic sub-accounts and indicators are summarized in the following table:

Table A.4 Economics Sub-accounts and Indicators

Account	Sub-Account	Indicator
Economics	Capital Costs	Initial Capital Cost
		Surface Water Realignments and Fish Habitat Compensation Costs
	Operational Costs	Embankment Raises
		Operational Costs
	Closure and Post Closure Costs	Reclamation
		Monitoring and Maintenance

The indicators for the economics account are described briefly below.

- **Initial Capital Cost:** Initial capital cost is estimated for each option including starter embankment construction and tailings distribution works, road construction, and water management infrastructure. TMF options with lower initial capital cost are ranked higher.
- **Surface Water Realignments and Fish Habitat Compensation Costs:** Compensation measures for lost stream length and productive capacity will be determined. The realignment of surface waters and fish habitat compensation cost indicator captures costs that may be required to construct realignments and place "compensation" aquatic habitat along new channels/ditches and flooded lake margins.
- **Embankment Raises:** Sustaining capital costs refer to any costs associated with the expansion or addition of facilities once mine operations have commenced (i.e. embankment raises). Sustaining capital cost is estimated for each option.
- **Operational Costs:** Operational costs are based on operating the tailings delivery and reclaim water systems during the life of the mine.
- **Reclamation:** Specific reclamation activities will include physical stabilization measures, capping of the tailings surface (as required) and seeding, removal of pipeworks and ancillary facilities, vegetation of the disturbed areas and implementation of an appropriate water management and water quality measures. Lower reclamation costs are preferred. The costs will be a function of the final area to be reclaimed after operations.
- **Monitoring and Maintenance:** Less monitoring and maintenance is preferred. The cost is estimated based on the number of monitoring locations.

2 – REFERENCES

Golder Associates. December 19, 2012. *Draft Summary of the Tailings Storage Facility Alternatives Selection Process Côté Gold Project. Ref. No. 12-1197-0005*. Sudbury, Ontario.