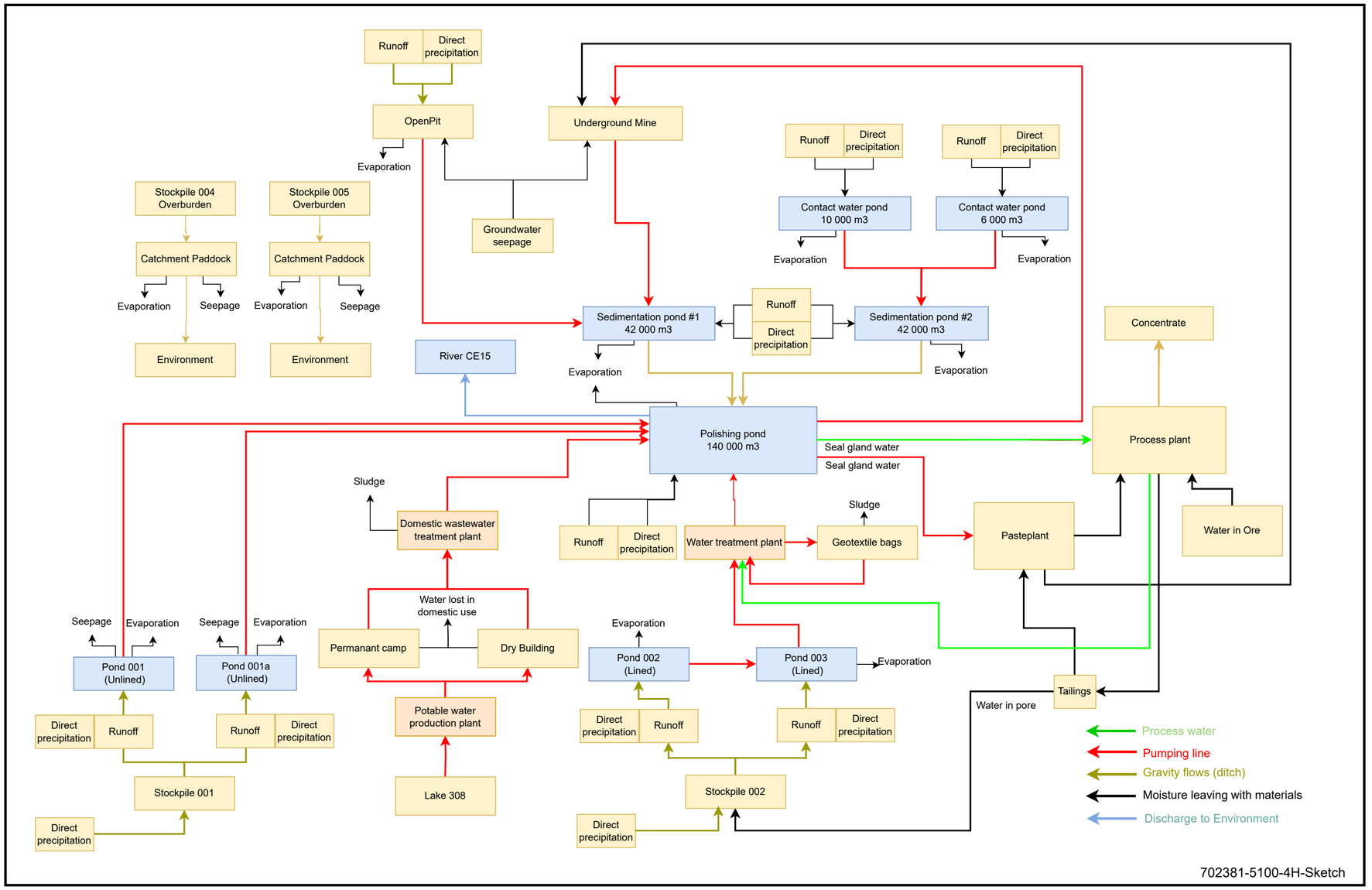
# Appendix B Drawings


Runoff
Direct precipitation
OpenPit
Evaporation
Underground Mine
Groundwater seepage
Stockpile 004 Overburden
Stockpile 005 Overburden
Catchment Paddock
Catchment Paddock
Evaporation
Seepage
Evaporation
Seepage
Environment
Environment
Runoff
Direct precipitation
Contact water pond 10 000 m3
Runoff
Direct precipitation
Contact water pond 6 000 m3
Evaporation
Evaporation
Sedimentation pond #1 42 000 m3
Runoff
Direct precipitation
Sedimentation pond #2 42 000 m3
Evaporation
Evaporation
River CE15
Concentrate
Polishing pond 140 000 m3
Process plant
Seal gland water
Seal gland water
Sludge
Domestic wastewater treatment plant
Runoff
Direct precipitation
Water treatment plant
Sludge
Geotextile bags
Pasteplant
Water in Ore
Water lost in domestic use
Permanant camp
Dry Building
Seepage
Evaporation
Seepage
Evaporation
Pond 001 (Unlined)
Pond 001a (Unlined)
Evaporation
Pond 002 (Lined)
Pond 003 (Lined)
Evaporation
Direct precipitation
Runoff
Runoff
Direct precipitation
Potable water production plant
Direct precipitation
Runoff
Runoff
Direct precipitation
Stockpile 001
Stockpile 002
Lake 308
Direct precipitation
Direct precipitation
Water in pore
Tailings
Process water
Pumping line
Gravity flows (ditch)
Moisture leaving with materials
Discharge to Environment
702381-5100-4H-Sketch

PAPER SIZE FORMAT: A1

E 568,000 E 570,000 E 572,000 E 574,000

N 5,934,000 N 5,932,000 N 5,930,000

CV24-594 CV24-601 CV24-588 CV24-599 CV24-778 CV24-649 CV24-641 CV24-774 CV24-634 CV24-575 CV24-647 CV24-557 CV24-658 CV24-670 CV24-665 CV24-656 CV24-653 CV24-560 CV24-580 CV24-552 CV24-673 CV24-568 CV24-544 CV24-729 CV24-566 CV24-776 CV24-557 CV24-186 CV24-537 CV24-531 CV24-780 CV24-782 CV24-772 CV24-770 CV24-775 CV24-541 CV24-530 CV24-527 CV24-542 CV24-528 CV24-556 CV24-562 CV24-533 CV24-606 CV24-787 CV24-785 CV24-784 CV24-534 CV24-786

EXISTING ACCESS ROAD

FRESH WATER INTAKE FOR POTABLE PRODUCTION

FW-P

LAKE 308

COLLECTION DITCH 02-02 (LINED)

COLLECTION POND 02 (LINED)

P2-P

COLLECTION DITCH 02-01 (LINED)

PAG WASTE ROCK

STOCKPILE 002

DMS TAILINGS

P1-P

COLLECTION DITCH 01-01

COLLECTION POND 01

STOCKPILE01

COLLECTION DITCH 03-01 (LINED)

CAMP

COLLECTION DITCH 03-02 (LINED)

COLLECTION POND 03 (LINED)

P3-P

ORGANICS PILE 01

PROCESS PLANT

SWT-PMP

CP1-P

COLLECTION DITCH 01A-01

COLLECTION DITCH 01A-02

CONTACT WATER POND 1

PHASE 1 AND 2 DIVERSION CHANNEL

COLLECTION POND 01A

P1A-PMP

ORGANICS PILE 02

TSS WATER TREATMENT PLANT (CONTINGENCY)

TRACE METAL WATER TREATMENT PLANT

SEDIMENTATION PONDS

CONTACT WATER POND 2

CP2-P

POLISHING POND

PP-P

CONNECTION CHANNEL

DISCHARGE TO ENVIRONMENT

EAST PIT

EAST PIT DAMS

BLASTING RADIUS 500m

BLASTING RADIUS 300m

WEST PIT DAM

SEDIMENT CONTROL DAM 1

SEDIMENT CONTROL DAM 2

WEST PIT

OVERBURDEN PILE 05

OVERBURDEN PILE 04

## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

LEGEND

CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION

OBSERVATION WELL

SURFACE GEOLOGY LEGEND

- ORGANICS
- DRUMLINS
- STABILIZED AEOLIAN
- FLUVIOGLACIAL
- FLUVIOGLACIAL LANDFORM
- FLUVIOGLACIAL WITH ESKER
- DECAY MORAINE
- ROGEN MORAINE (RIBBED MORAINE)
- ABLATION TILL
- UNDIFFERENTIATED TILL
- ROCK
- BARE ROCK

0 200 400 600m

200 SCALE= 1:10,000

ATKINSRÉALIS DOC#: 702381-0000-4GDD01-0002

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25/09/10 |
| B | CLIENT REVIEW / COMMENT | A.C. | B.M. | 25/07/28 |
| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | |
|---|---|
| CONCEPTEUR/DESIGN: A. COGULET | 25-09-10 |
| DESSINATEUR/DRAWN: M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: P. ADDIS | 25-09-10 |
| INGÉNIEUR/ENGINEER: B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: 1:10,000 | DATE |

PROJET/PROJECT:

SHAAKICHIUWAANAAN

PHASE:

ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:

-
-
-
-

TITLE

WATER MANAGEMENT
SITE GEOLOGY
-
-

DESSIN NUM./DRAWING NO.: CASN - A

001 - GO - DWG - 0001 - C

AREA DISC. TYPE SEQ. REV.

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PAPER SIZE FORMAT: A1

E 568,000
E 570,000
E 572,000
E 574,000
N 5,934,000
N 5,932,000
N 5,930,000

EXISTING ACCESS ROAD
FRESH WATER INTAKE FOR POTABLE PRODUCTION LAKE 308
FW-P
COLLECTION DITCH 02-02 (LINED)
COLLECTION POND 02 (LINED)
P2-P
PROPOSED SPILLWAY LOCATION (TYP.)
P1-P
COLLECTION DITCH 01-01
COLLECTION POND 01
COLLECTION DITCH 02-01 (LINED)
PAG WASTE ROCK
STOCKPILE 002
DMS TAILINGS
STOCKPILE01
COLLECTION DITCH 03-01 (LINED)
CAMP
COLLECTION DITCH 03-02 (LINED)
COLLECTION DITCH 01-02
P3-P
COLLECTION POND 03 (LINED)
ORGANICS PILE 01
COLLECTION DITCH 01A-01
PROCESS PLANT
SWT-P
CP1-P
COLLECTION DITCH 01A-02
CONTACT WATER POND 1
COLLECTION POND 01A
TSS WATER TREATMENT PLANT (CONTINGENCY)
ORGANICS PILE 02
P1A-P
DIVERSION CHANNEL
TRACE METAL WATER TREATMENT PLANT
SEDIMENTATION PONDS
CONTACT WATER POND 2
CP2-P
POLISHING POND
PP-P
CONNECTION CHANNEL
DIFFUSER
DISCHARGE TO ENVIRONMENT
EAST PIT
EAST PIT DAMS
BLASTING RADIUS 500m
WEST PIT DAM
BLASTING RADIUS 300m
SEDIMENT CONTROL DAM 1
SEDIMENT CONTROL DAM 2
OVERBURDEN PILE 05
WEST PIT
OVERBURDEN PILE 04

## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

0 200 400 600m
200 SCALE= 1:10,000

ATKINSRÉALIS DOC#: 702381-0000-4GDD01-0001

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
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| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | |
|---|---|
| CONCEPTEUR/DESIGN: A. COGULET | 25-09-10 |
| DESSINATEUR/DRAWN: M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: P. ADDIS | 25-09-10 |
| INGÉNIEUR/ENGINEER: B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: 1:10,000 | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

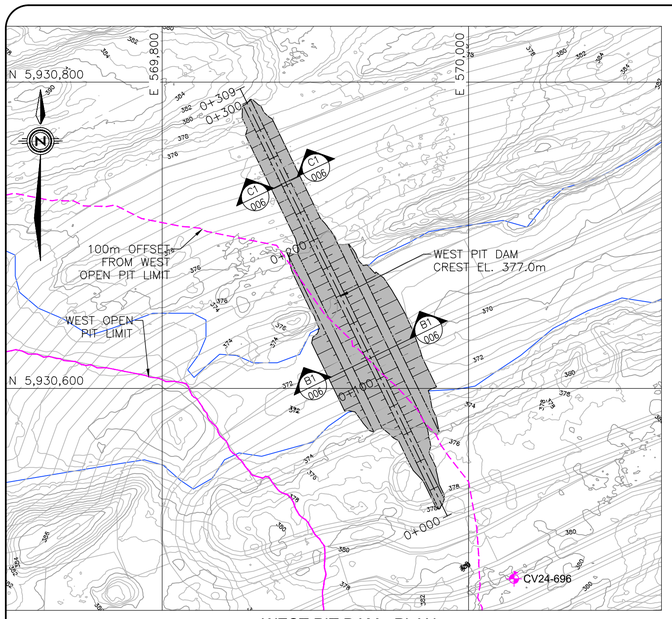
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TITLE
WATER MANAGEMENT
GENERAL ARRANGEMENT
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DESSIN NUM./DRAWING NO.: CASN - A

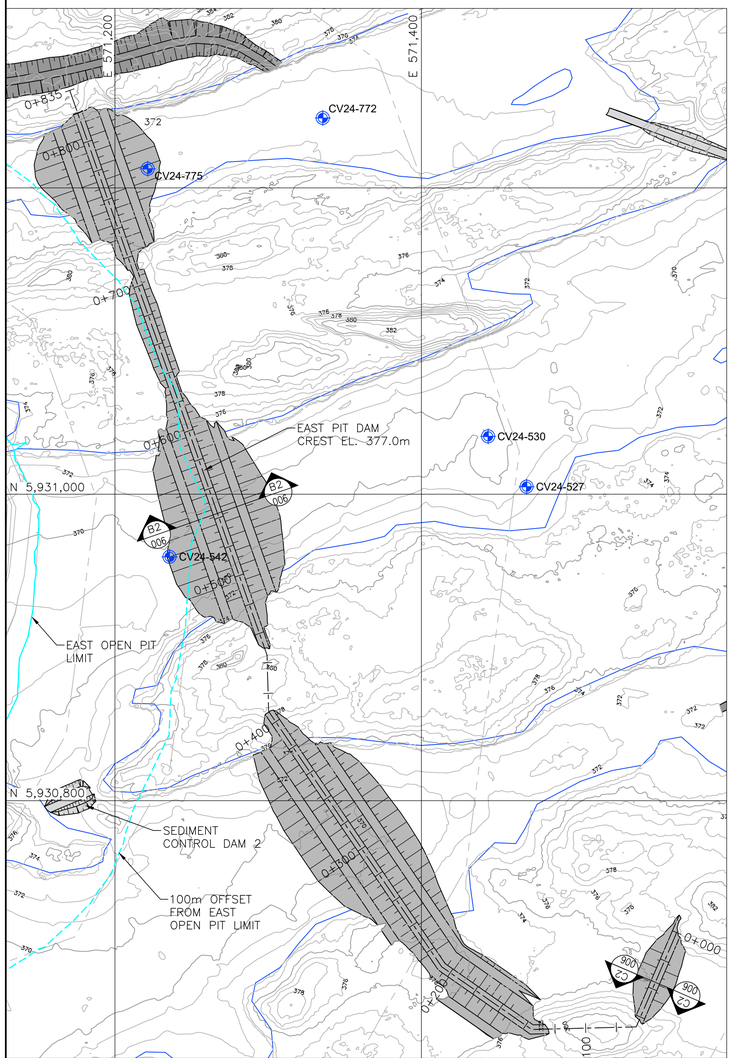
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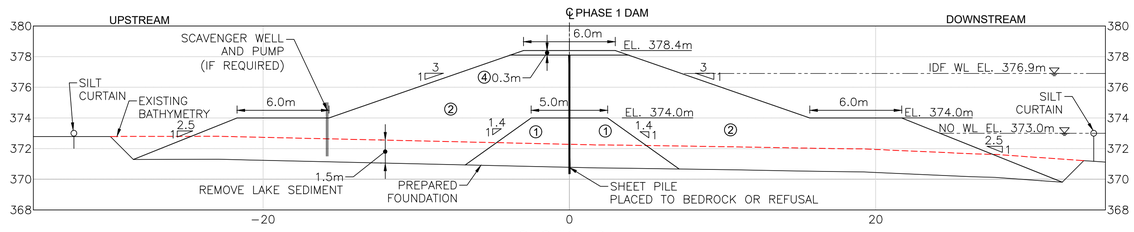

## WEST PIT DAM - PLAN

SCALE=1:2000



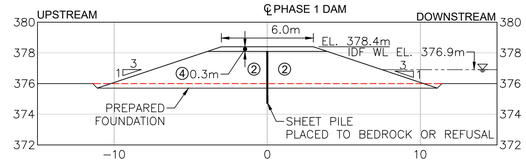

## EAST PIT DAMS - PLAN

SCALE=1:2000



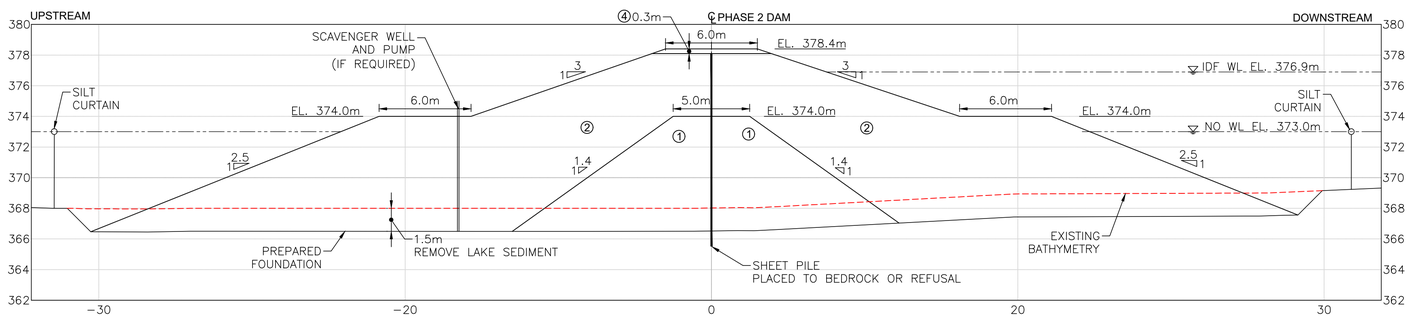

## SECTION B1
## WEST PIT DAM

SCALE=1:200



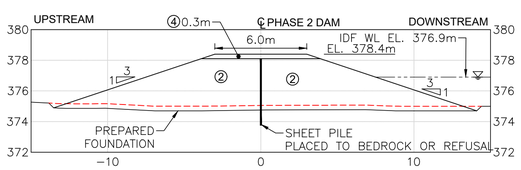

## SECTION C1
## WEST PIT DAM

SCALE=1:200




## SECTION B2
## EAST PIT DAM

SCALE=1:200




## SECTION C2
## EAST PIT DAM

SCALE=1:200

0 40 80 120m

SCALE= 1:2000

0 4 8 12m

SCALE= 1:200

## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

LEGEND

CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION

OBSERVATION WELL

MATERIALS

(1) CRUSHED STONE (-75mm)
(2) WASTE ROCK (-450mm)
(3) TILL / SAND BENTONITE CEMENT FILL
(4) GRANULAR B TYPE II
(5) FILTER / BEDDING SAND (-4.75mm)
(6) TRANSITION SAND AND GRAVEL (-26.5mm)
(7) RIP-RAP EROSION PROTECTION
(8) SAND / SILT (OVERBURDEN)
(9) CLEAR STONE (-19mm)
(G1) NON-WOVEN GEOTEXTILE (500g/m²)
(G2) NON-WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
(GL) 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE

ATKINSRÉALIS #: 702381-0000-4GDD00-0008

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25/09/10 |
| B | CLIENT REVIEW / COMMENT | A.C. | B.M. | 25/07/28 |
| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
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-

TITLE
DYKES AND DIVERSION FOR LAKE 001
PLAN, SECTIONS AND DETAILS
-
-

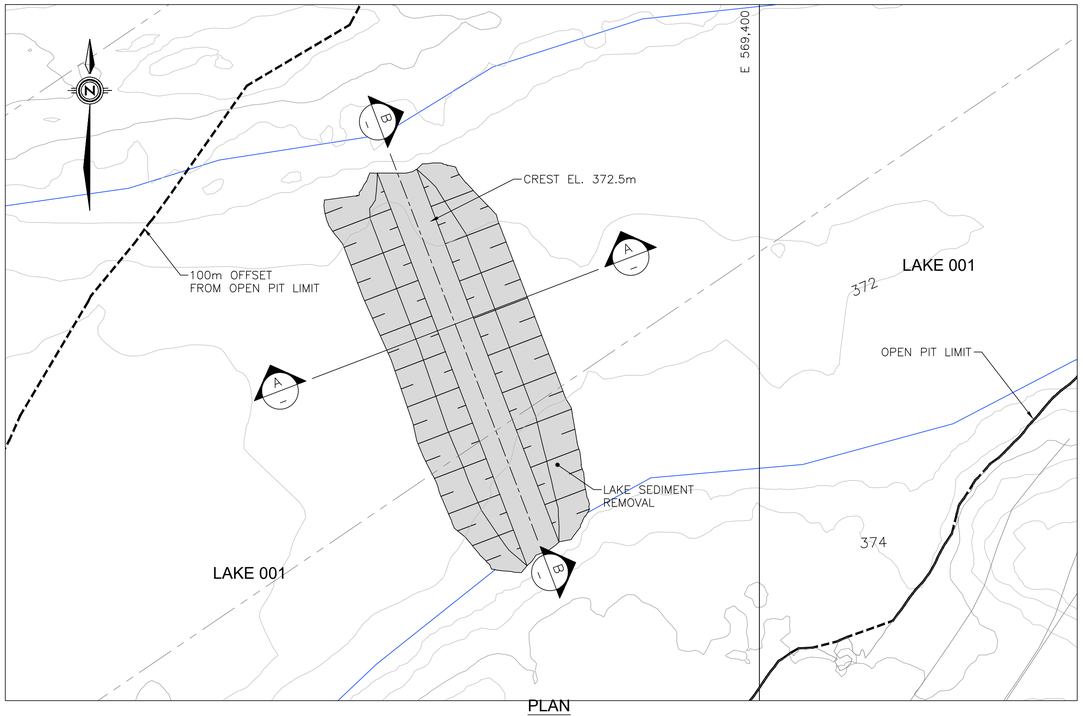
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327 - WM - DWG - 0001 - C
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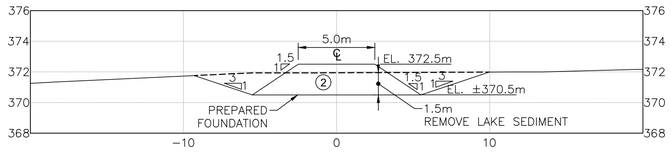
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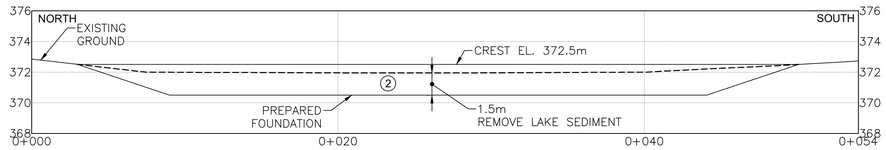
PAPER SIZE FORMAT : A1




PLAN
SEDIMENT CONTROL DAM 1
SCALE=1:500



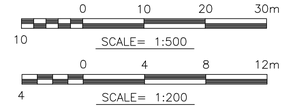

SECTION A
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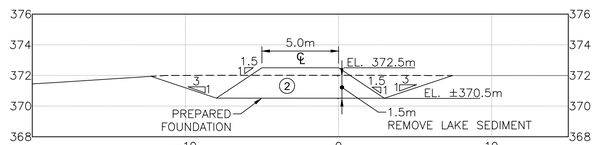

SECTION B
SCALE=1:200

## NOTES

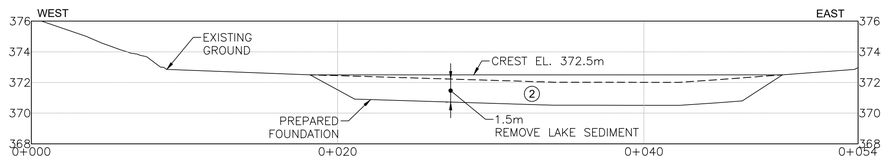
1. THE CO−ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO−ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.
3. STRIP LAKE SEDIMENT CONSISTS OF LOOSE SANDY SILT (ML) AND SILTY SAND (SM)



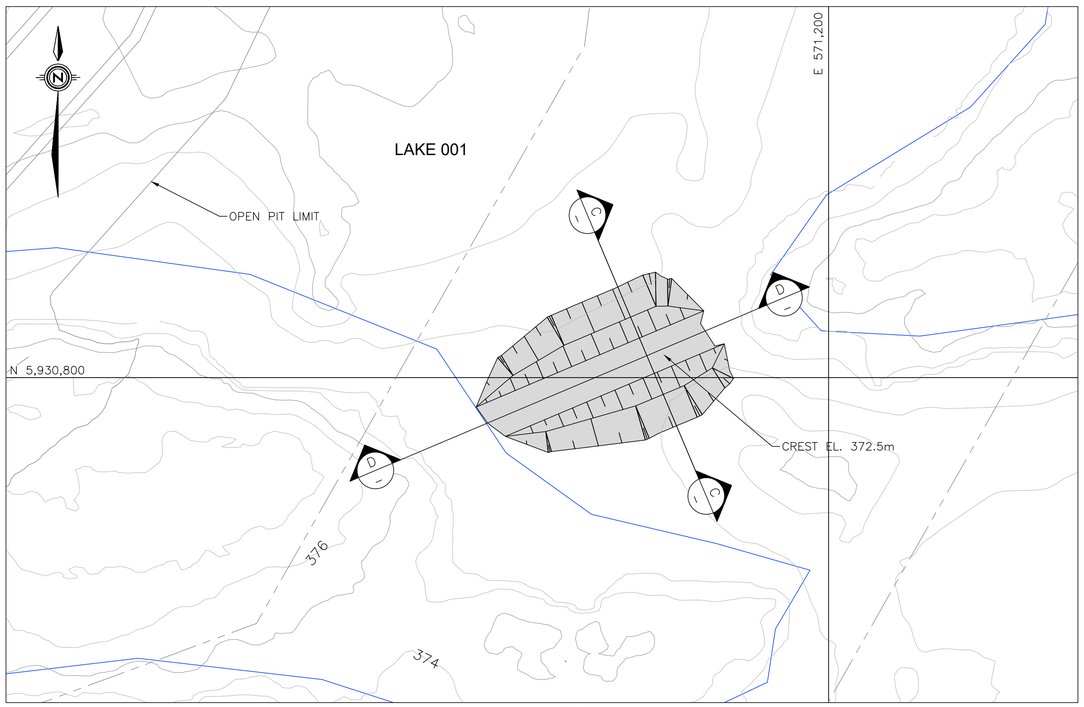

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| ATKINSRÉALIS #: 702381-0000-4GDD00-0009 | | | | |
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| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25/09/10 |
| B | CLIENT REVIEW / COMMENT | A.C. | B.M. | 25/07/28 |
| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |
| REV | DESCRIPTION | PAR BY | ING ENG | DATE |




SECTION C
SCALE=1:200




SECTION D
SCALE=1:200




PLAN
SEDIMENT CONTROL DAM 2
SCALE=1:400

**MATERIALS**

1. CRUSHED STONE (−75mm)
2. WASTE ROCK (−450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (−4.75mm)
6. TRANSITION SAND AND GRAVEL (−26.5mm)
7A. RIP−RAP EROSION PROTECTION ($D_{50}$=200mm)
7B. RIP−RAP EROSION PROTECTION ($D_{50}$=300mm)
7C. RIP−RAP EROSION PROTECTION ($D_{50}$=400mm)
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (−19mm)
G1. NON−WOVEN GEOTEXTILE (500g/m²)
G2. NON−WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
GL. 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | R. ALAM | |
| DESSINATEUR/DRAWN: | D. KRASNOV | 25-05-20 |
| VÉRIFIÉ PAR/CHECKED: | P. ADDIS | |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | |
| ÉCHELLE/SCALE: | AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
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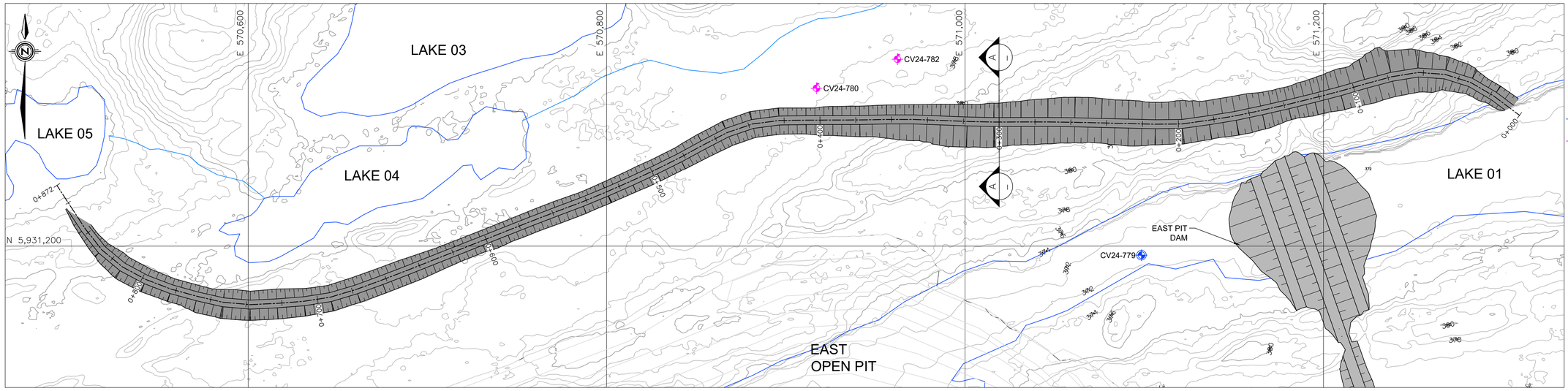
TITLE
SEDIMENT CONTROL DAM
FOR DEWATERED LAKE FOOTPRINT
PLAN AND SECTION
-

DESSIN NUM./DRAWING NO.: CASN - A

327 - WM - DWG - 0002 - C
AREA DISC. TYPE SEQ. REV.

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PAPER SIZE FORMAT : A1




PLAN
SCALE=1:1250

## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

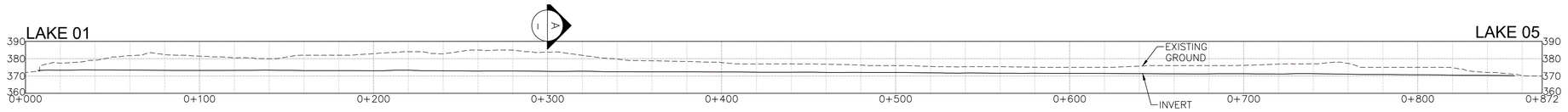
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- CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION
- OBSERVATION WELL

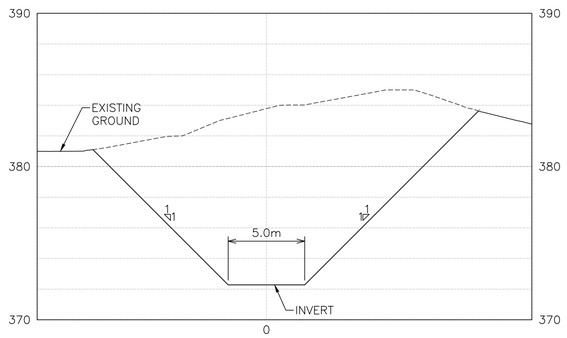
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0 25 50 75m
SCALE= 1:1250

0 4 8 12m
SCALE= 1:200




PROFILE ALONG DIVERSION CHANNEL CENTERLINE
SCALE=1:1500




SECTION A
SCALE=1:200

MATERIALS

1. CRUSHED STONE (-75mm)
2. WASTE ROCK (-450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (-4.75mm)
6. TRANSITION SAND AND GRAVEL (-26.5mm)
7A. RIP-RAP EROSION PROTECTION ($D_{50}$=200mm)
7B. RIP-RAP EROSION PROTECTION ($D_{50}$=300mm)
7C. RIP-RAP EROSION PROTECTION ($D_{50}$=400mm)
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (-19mm)
G1. NON-WOVEN GEOTEXTILE (500g/m²)
G2. NON-WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
GL. 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE

ATKINSRÉALIS #: 702381-0000-4GDD00-0010

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25/09/10 |
| B | CLIENT REVIEW / COMMENT | A.C. | B.M. | 25/07/28 |
| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | R. ALAM | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | P. ADDIS | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

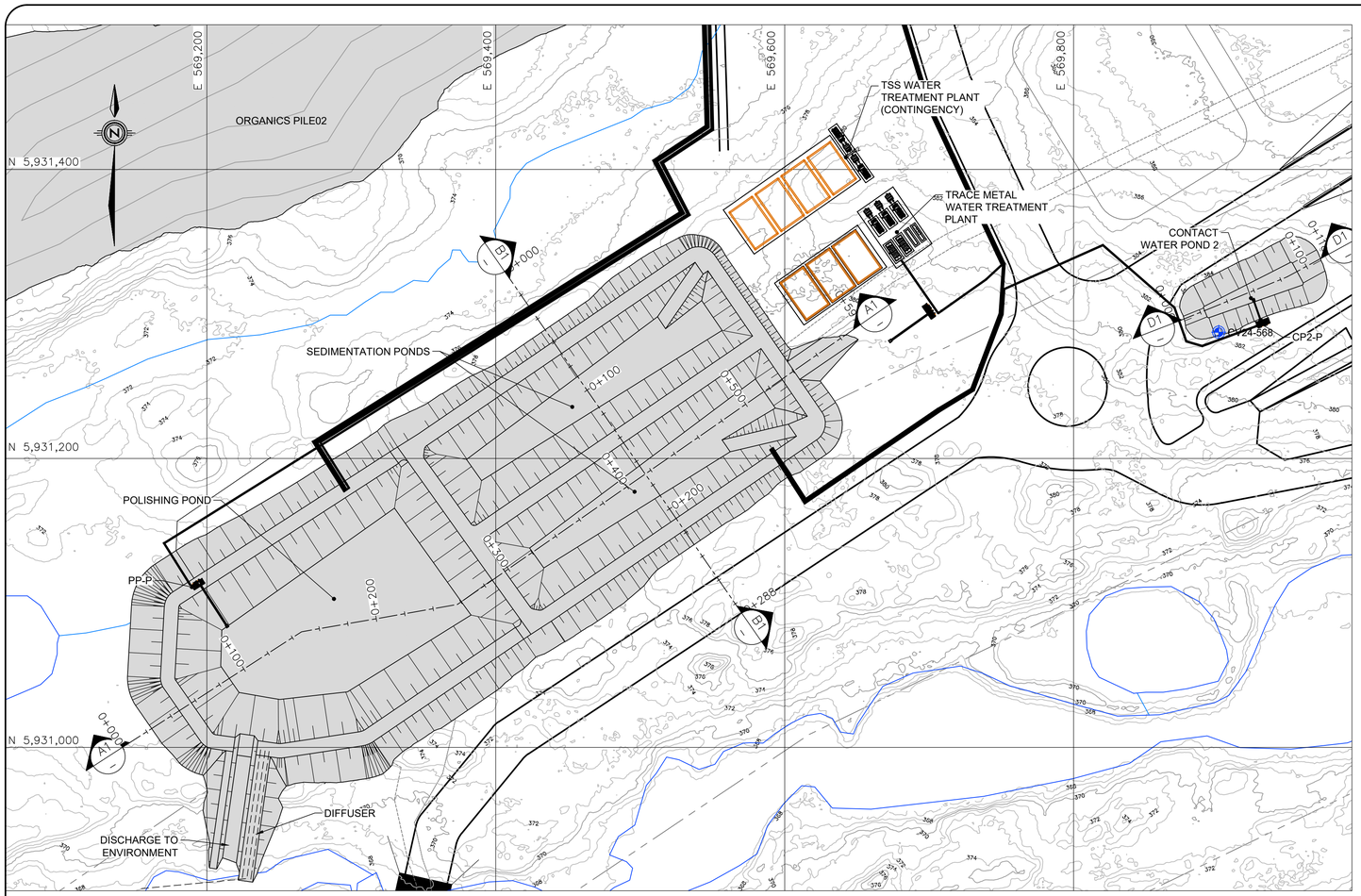
TITLE
DIVERSION DITCH

PLAN, PROFILE AND SECTION
-

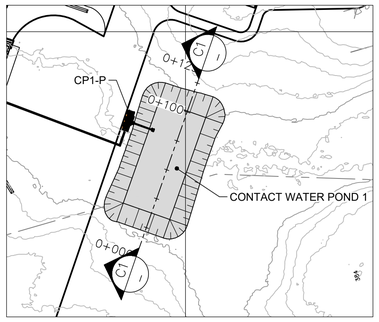
DESSIN NUM./DRAWING NO.: CASN - A

327 - WM - DWG - 0003 - C
AREA DISC. TYPE SEQ. REV.

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WATER MANAGEMENT PONDS - PLAN
SCALE=1:2000




WATER MANAGEMENT PONDS - PLAN
SCALE=1:2000

## NOTES

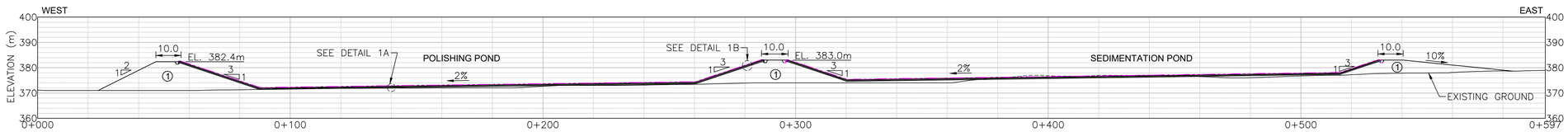
1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LIDAR SURVEY FROM PATRIOT LIDAR DATED OCT 11, 2022.

LEGEND

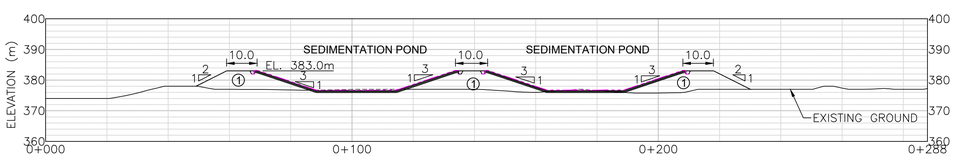
- CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION
- OBSERVATION WELL

0 40 80 120m
40 SCALE= 1:2000

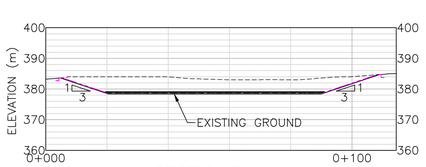
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20 SCALE= 1:1000



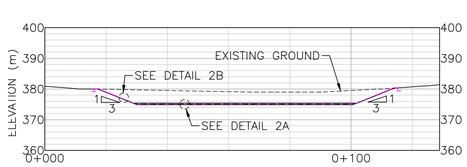

SECTION A1
SCALE=1:1000



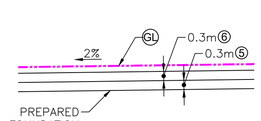

SECTION B1
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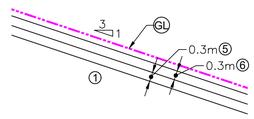

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SCALE=1:1000



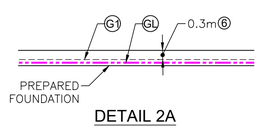

SECTION A1
SCALE=1:1000



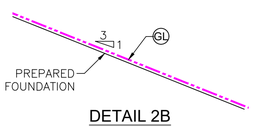

DETAIL 1A
WATER MANAGEMENT POND FLOOR
SCALE=1:100




DETAIL 1B
WATER MANAGEMENT POND SLOPE
SCALE=1:100




DETAIL 2A
CONTACT WATER POND FLOOR
SCALE=1:100




DETAIL 2B
CONTACT WATER POND SLOPE
SCALE=1:100

MATERIALS

1. CRUSHED STONE (-75mm)
2. WASTE ROCK (-450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (-4.75mm)
6. TRANSITION SAND AND GRAVEL (-26.5mm)
7A. RIP-RAP EROSION PROTECTION ($D_{50}$=200mm)
7B. RIP-RAP EROSION PROTECTION ($D_{50}$=300mm)
7C. RIP-RAP EROSION PROTECTION ($D_{50}$=400mm)
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (-19mm)
G1. NON-WOVEN GEOTEXTILE (500g/m²)
G2. NON-WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
GL. 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE

ATKINSRÉALIS #: 702381-0000-4GDD00-0011

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25/09/10 |
| B | CLIENT REVIEW / COMMENT | A.C. | B.M. | 25/07/28 |
| A | INTERNAL REVIEW | A.C. | B.M. | 25/04/12 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

TITLE
WATER TREATMENT PONDS
PLANS, SECTIONS AND DETAILS
-
-

DESSIN NUM./DRAWING NO.: CASN - A

320 - WM - DWG - 0004 - C
AREA DISC. TYPE SEQ. REV.

PAPER SIZE FORMAT: A1

SAVED ON: 25-10-08 7:46 PM BY: Sykes, Mark
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PAPER SIZE FORMAT : A1

E 568,000
E 569,000
E 570,000
E 571,000
N 5,933,000
N 5,932,000

LAKE 334 EL. ±375
LAKE 300 EL. ±373
LAKE 309 EL. ±376
LAKE 301 EL. ±374
LAKE 305 EL. ±380
LAKE 302 EL. ±376
LAKE 306 EL. ±392
LAKE 605 EL. ±365
LAKE 223 EL. ±3
LAKE 219 EL. ±389
LAKE 217 EL. ±377
LAKE 216 EL. ±377
LAKE 218 EL. ±370
LAKE 218 EL. ±367
LAKE 212 EL. ±371
LAKE 10 EL. ±366
LAKE 07 EL. ±367
LAKE 06 EL. ±369
LAKE 12 EL. ±380
LAKE 03 EL. ±374
LAKE 05 EL. ±370
LAKE 04 EL. ±374
LAKE 01 EL. ±373

PROPOSED SPILLWAY LOCATION (TYP.)
COLLECTION DAM 1 CREST EL. 373.0m
COLLECTION DAM 1A CREST EL. 378.0m
COLLECTION DITCH 01-01
COLLECTION DITCH 01-02
STOCKPILE01
ORGANICS PILE 01
ORGANICS PILE 02
3.25H:1V (AVG. GLOBAL SLOPE)
3.25H:1V
5H:1V
TSS WATER TREATMENT PLANT (CONTINGENCY)
TRACE METAL WATER TREATMENT PLANT
SEDIMENTATION PONDS
POLISHING POND
DIFFUSER
CONTACT WATER POND 1
CONTACT WATER POND 2
CAMP
PROCESS PLANT

CV24-544
CV24-729
CV24-657
CV24-673
CV24-537
CV24-547
CV24-560
CV24-557
CV24-558
CV24-559
CV24-665
CV24-656
CV24-653
CV24-552
CV24-548
CV24-671
CV24-562
CV24-580
CV24-553
CV24-782
CV24-780
CV24-779

0+000
0+200
0+400
0+600
0+800
0+862

A1 003

## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

LEGEND

CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION

OBSERVATION WELL

ATKINSRÉALIS #: 702381-0000-4GDD00-0003

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25-09-10 |
| B | ISSUED FORCLIENT REVIEW | P.A. | B.M. | 25-04-10 |
| A | ISSUED FOR INTERNAL REVIEW | P.A. | B.M. | 25-01-10 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | 1:5,000 | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

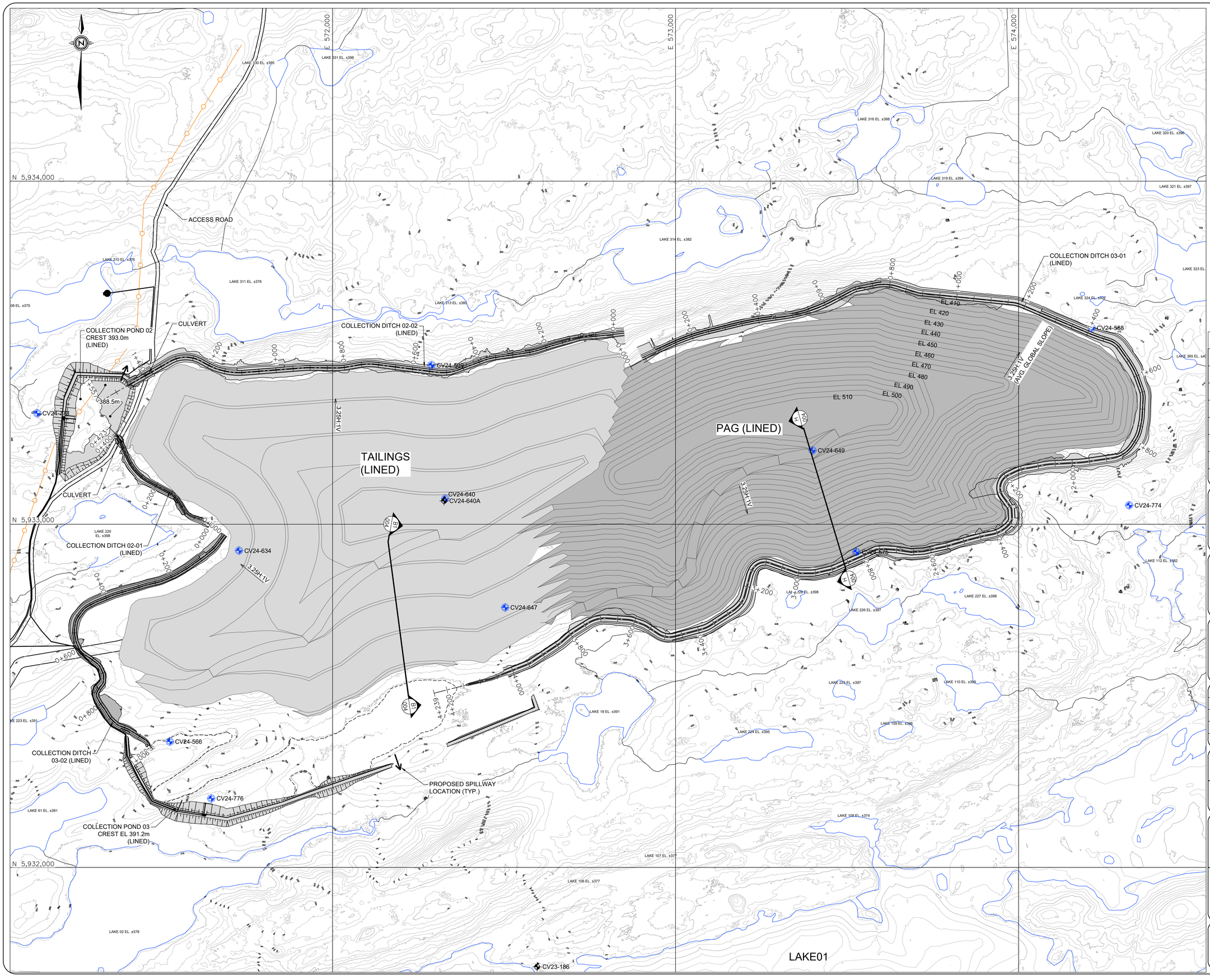
TITLE
STOCKPILE 001, ORGANICS PILES AND WATER MANAGEMENT AT INDUSTRAIL AREA PLAN
-

DESSIN NUM./DRAWING NO.: CASN - A

| 370 | GT | DWG | 0001 | C |
|---|---|---|---|---|
| AREA | DISC. | TYPE | SEQ. | REV. |

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PAPER SIZE FORMAT: A1




## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

LEGEND

CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION

OBSERVATION WELL

0 100 200 300m

100 SCALE= 1:5000

ATKINSRÉALIS #: 702381-0000-4GDD00-0004

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | P.A. | B.M. | 25-09-10 |
| B | ISSUED FOR PROJECT REVIEW/APPROVAL/COMMENTS | P.A. | B.M. | 25-01-24 |
| A | ISSUED FOR INTERNAL REVIEW | P.A. | B.M. | 25-01-10 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | |
|---|---|
| CONCEPTEUR/DESIGN: P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: 1:5,000 | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

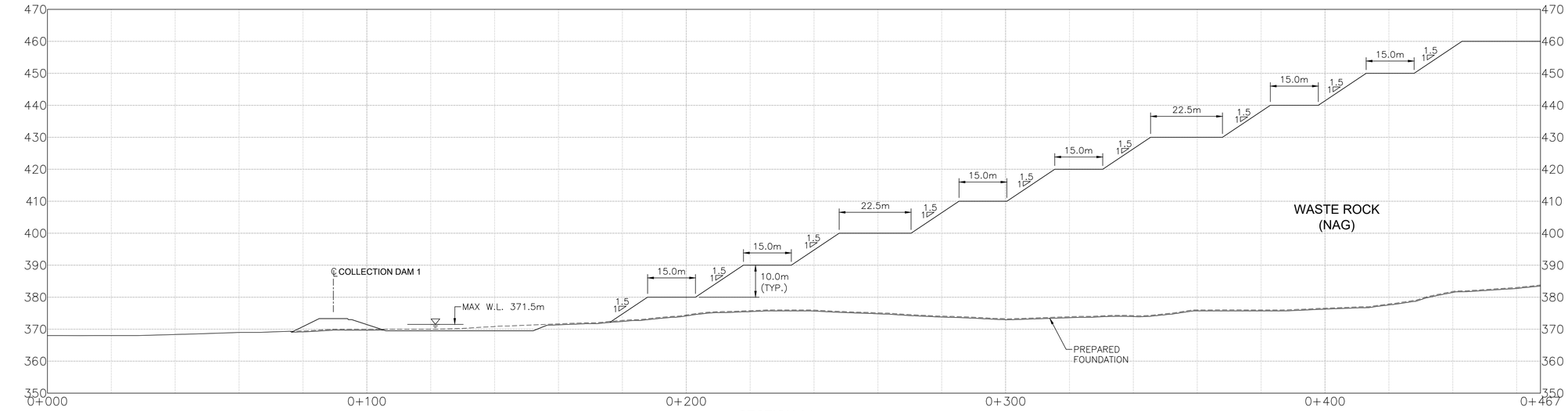
TITLE
STOCKPILE 002
PLAN
-
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DESSIN NUM./DRAWING NO.: CASN - A

370 - GT - DWG - 0002 - C
AREA DISC. TYPE SEQ. REV.

SAVED ON: 25-10-02 12:25 PM BY Silvia, Mak
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PAPER SIZE FORMAT : A1



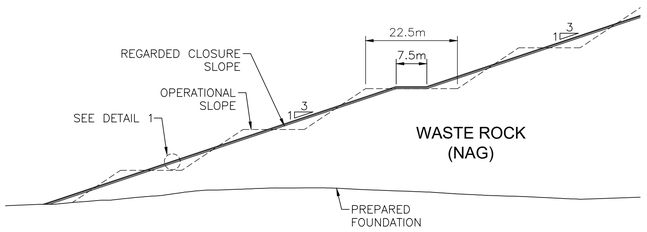

SECTION A1
STOCKPILE01 WASTE ROCK - OPERATION
SCALE=1:750

0 15 30 45m
SCALE= 1:750

0 4 8 12m
SCALE= 1:200

0 2 4 6m
SCALE= 1:100

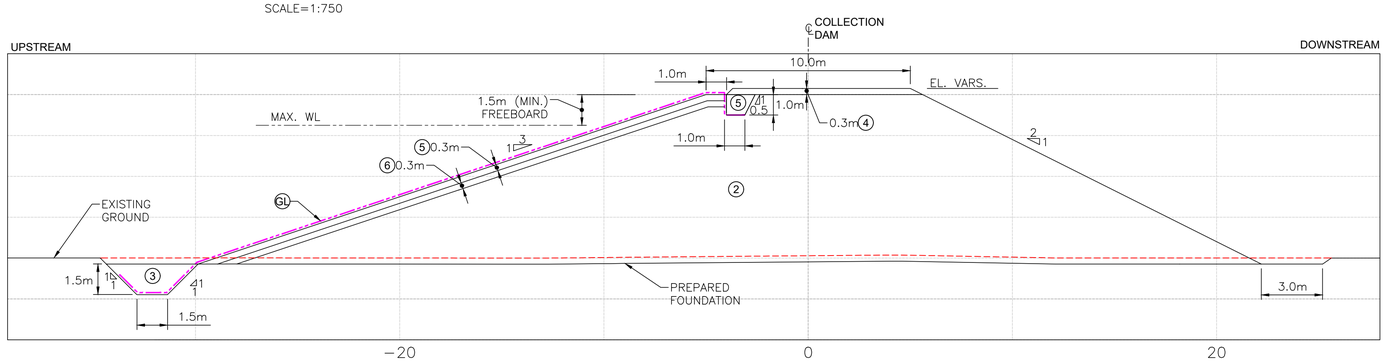
MATERIALS
1. CRUSHED STONE (−75mm)
2. WASTE ROCK (−450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (−4.75mm)
6. TRANSITION SAND AND GRAVEL (−26.5mm)
7. RIP−RAP EROSION PROTECTION
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (−19mm)
G1. NON−WOVEN GEOTEXTILE (500g/m²)
G2. NON−WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
GL. 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE



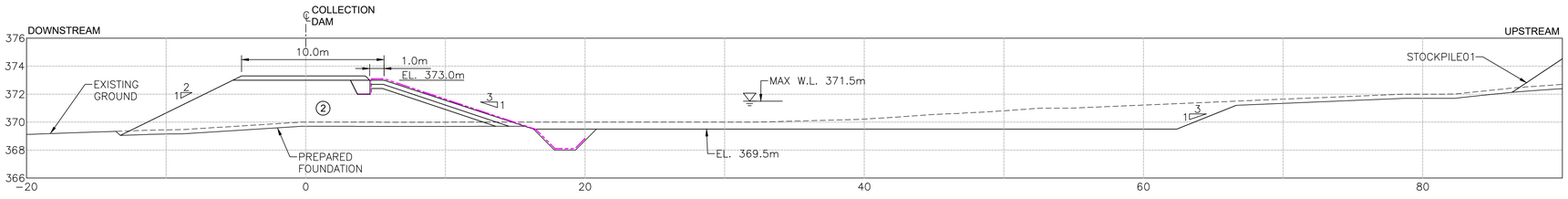

TYPICAL STOCKPILE01 SECTION
CLOSURE
SCALE=1:750



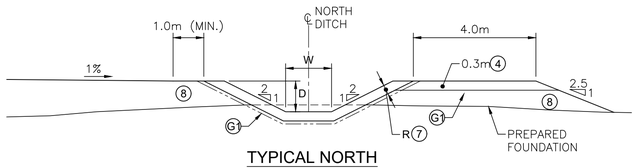

DETAIL 1
CLOSURE
SCALE=1:100



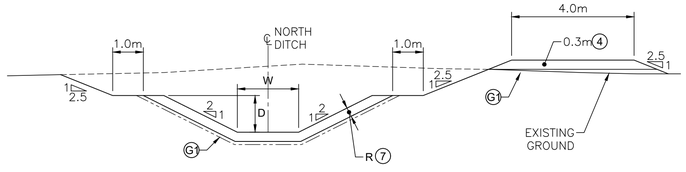

TYPICAL COLLECTION POND DAM SECTION
POND 1 AND 1A
SCALE=1:150



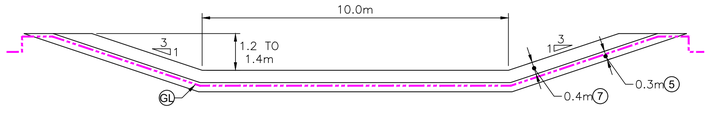

TYPICAL COLLECTION POND DAM SECTION
POND 1
SCALE=1:200




TYPICAL NORTH
COLLECTION DITCH
SCALE=1:100




TYPICAL NORTH
COLLECTION DITCH
SCALE=1:100




TYPICAL SPILLWAY SECTION
SCALE=1:100

| DITCH | CHAINAGE START | CHAINAGE END | WIDTH (W) | DEPTH (D) | RIPRAP THICKNESS (R) |
|---|---|---|---|---|---|
| 01−01 | 1+482 | 0+910 | 1.5 m | 1.2 m | 300 mm |
| | 0+910 | 0+718 | | | 450 mm |
| | 0+718 | 0+688 | | | 300 mm |
| | 0+688 | 0+000 | 2.0 m | 1.0 m | |
| 01−02 | 0+000 | 0+846 | 1.5 m | 1.0 m | 300 mm |
| 01A−01 | 0+000 | 1+068 | 2.0 m | 1.0 m | 300 mm |
| 01A−02 | 0+000 | 0+863 | 1.5 m | 1.0 m | 300 mm |

ATKINSRÉALIS #: 702381-0000-4GDD00-0005

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
|---|---|---|---|---|
| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25-09-10 |
| B | ISSUED FORCLIENT REVIEW | P.A. | B.M. | 25-04-10 |
| A | ISSUED FOR INTERNAL REVIEW | P.A. | B.M. | 25-01-10 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

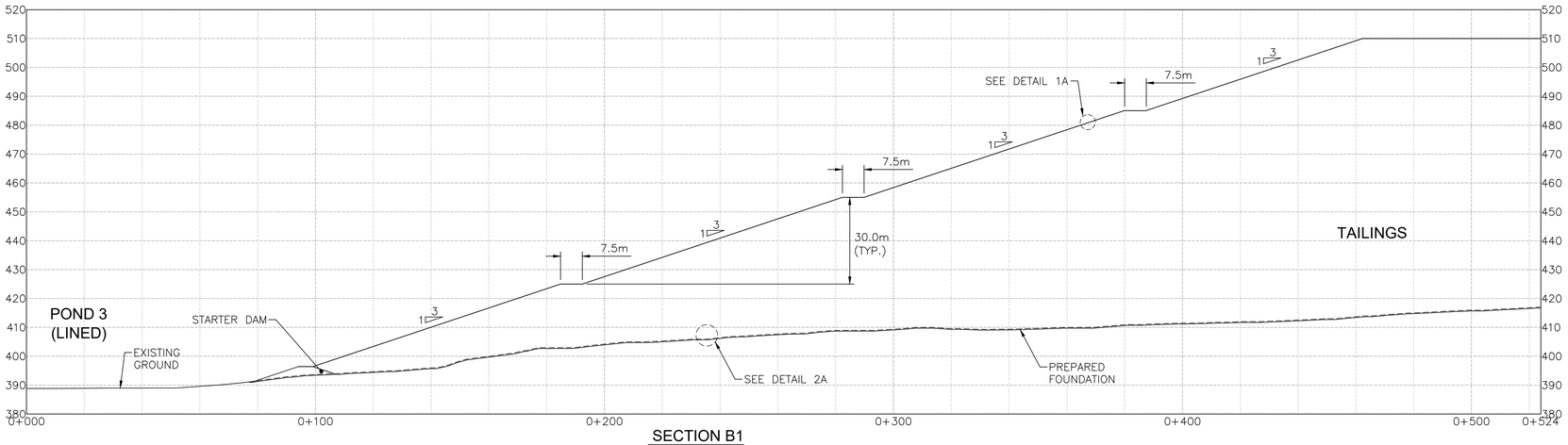
TITLE
STOCKPILE AND WATER MANAGEMENT
SECTIONS AND DETAILS
1 OF 2
-

DESSIN NUM./DRAWING NO.: CASN − A

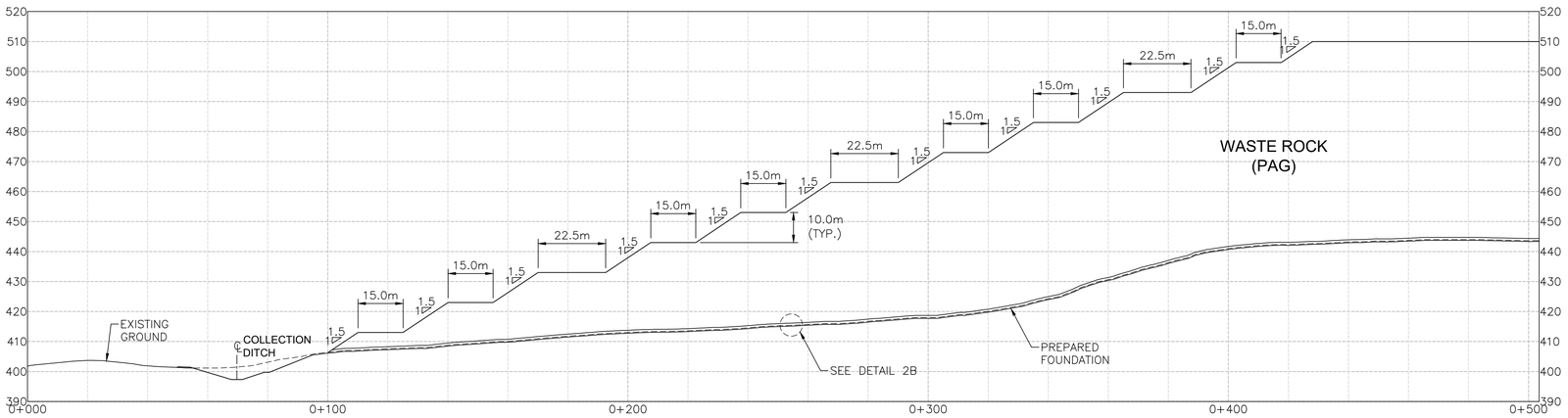
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| AREA | DISC. | TYPE | SEQ. | REV. |

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PAPER SIZE FORMAT : A1



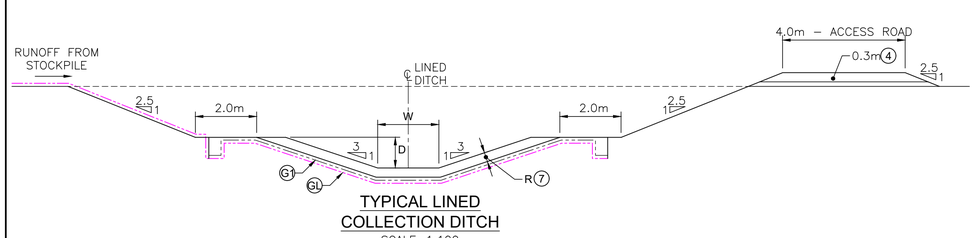

SECTION B1
STOCKPILE02 - TAILINGS - OPERATION
SCALE=1:1000




SECTION H
STOCKPILE02 - PAG - OPERATION
SCALE=1:1000

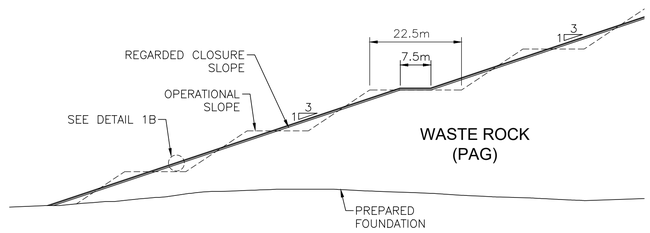



TYPICAL COLLECTION POND SECTION
LINED POND
SCALE=1:200

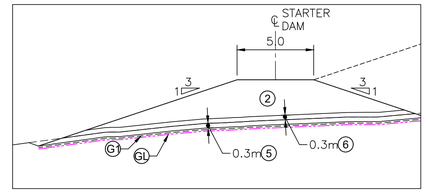



TYPICAL LINED
COLLECTION DITCH
SCALE=1:100

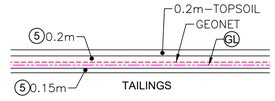
| DITCH | CHAINAGE START | CHAINAGE END | WIDTH (W) | DEPTH (D) | RIPRAP THICKNESS (R) |
|---|---|---|---|---|---|
| 02−01 | 0+000 | 0+423 | 2.5 m | 1.2 m | 300 mm |
| 02−02 | 0+000 | 0+515 | 1.5 m | 1.1 m | 300 mm |
| | 0+516 | 1+557 | 3.0 m | 1.3 m | |
| 03−01 | 0+000 | 0+508 | 2.0 m | 1.2 m | 300 mm |
| | 0+508 | 0+706 | | | 450 mm |
| | 0+706 | 1+786 | | 1.5 m | 300 mm |
| | 1+786 | 4+036 | 3.0 m | 2.2 m | |
| | 4+036 | 4+239 | 5.0 m | | |
| 03−02 | 0+000 | 0+578 | 2.0 m | 1.1 m | 300 mm |
| | 0+578 | 0+647 | | | 450 mm |
| | 0+647 | 1+006 | | | 300 mm |



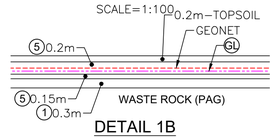

TYPICAL STOCKPILE01 SECTION
CLOSURE
SCALE=1:750




TYPICAL STARTER DAM
SCALE=1:200



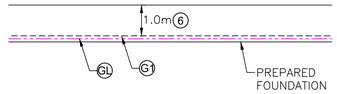

DETAIL 1A
CLOSURE-TAILINGS
SCALE=1:100




DETAIL 1B
CLOSURE-WASTE ROCK (PAG)
SCALE=1:100



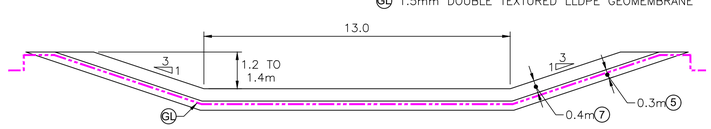

DETAIL 2A
BASIN GEOMEMBRANE - TAILINGS
SCALE=1:100




DETAIL 2B
BASIN GEOMEMBRANE - WASTEROCK (PAG)
SCALE=1:100

1. CRUSHED STONE (−75mm)
2. WASTE ROCK (−450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (−4.75mm)
6. TRANSITION SAND AND GRAVEL (−26.5mm)
7. RIP−RAP EROSION PROTECTION
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (−19mm)

G1. NON−WOVEN GEOTEXTILE (500g/m²)
G2. NON−WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
GL. 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE




TYPICAL SPILLWAY SECTION
SCALE=1:100

SCALE= 1:1000
SCALE= 1:200
SCALE= 1:100

ATKINSRÉALIS #: 702381-0000-4GDD00-0006

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| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25-09-10 |
| B | ISSUED FORCLIENT REVIEW | P.A. | B.M. | 25-04-10 |
| A | ISSUED FOR INTERNAL REVIEW | P.A. | B.M. | 25-01-10 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | |
|---|---|
| CONCEPTEUR/DESIGN: P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: AS SHOWN | DATE |

PROJET/PROJECT:

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

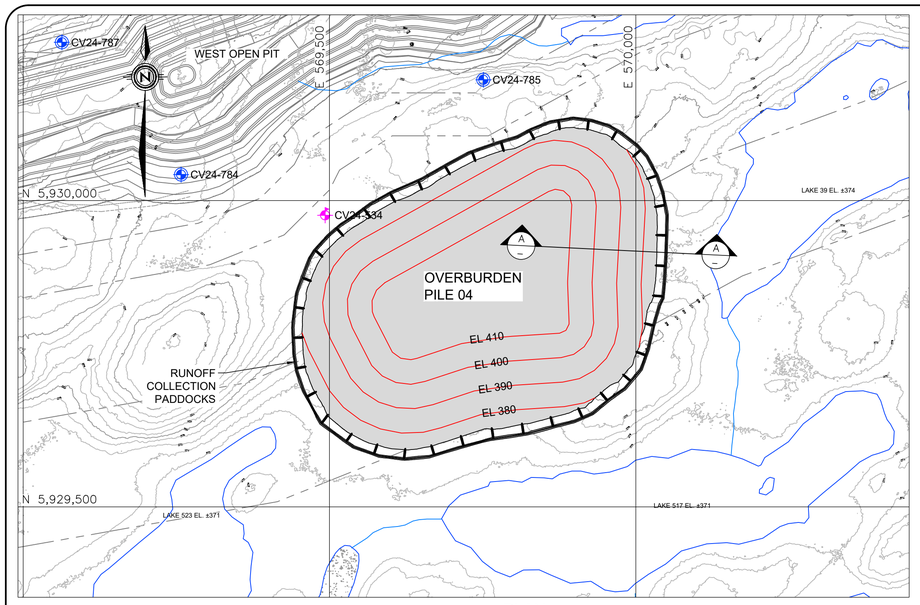
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TITLE
STOCKPILE AND WATER MANAGEMENT
SECTIONS AND DETAILS
2 OF 2
-

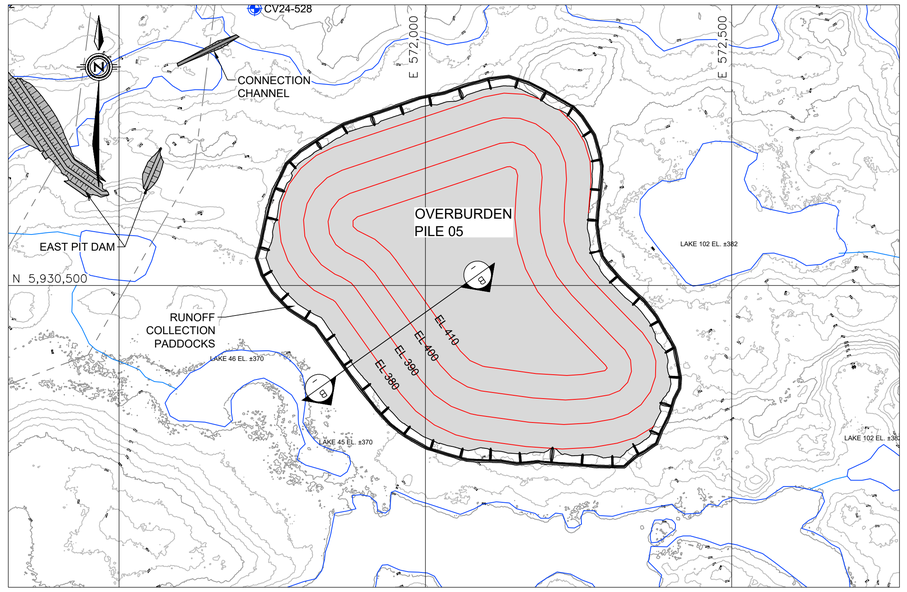
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370 − GT − DWG − 0004 − C
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PLAN
OVERBURDEN PILE 04
SCALE=1:5000




PLAN
OVERBURDEN PILE 04
SCALE=1:5000

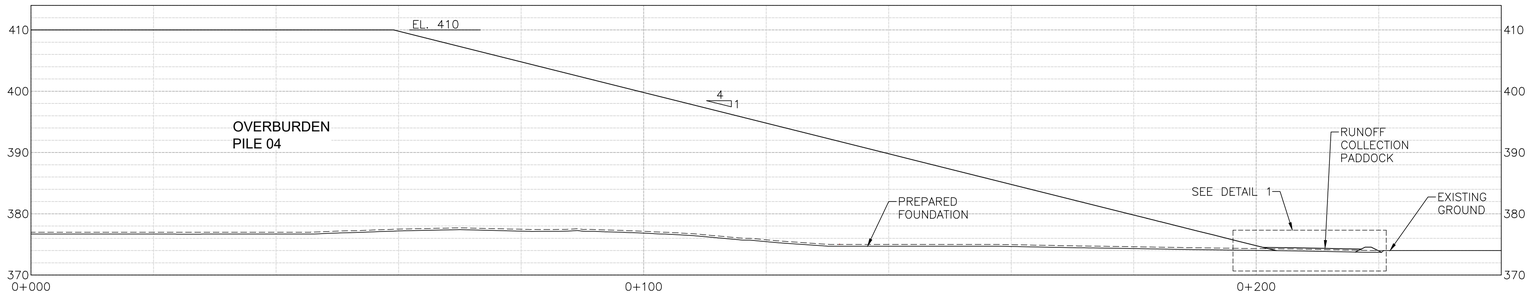
## NOTES

1. THE CO-ORDINATES, DIMENSIONS AND ELEVATIONS ARE IN METERS. ELEVATIONS ARE TIED TO MEAN SEA LEVEL. CO-ORDINATES ARE BASED ON UTM NAD83(CSRS) ZONE 18 METRIC GRID PROJECTION.
2. CONTOURS WERE DERIVED FROM LiDAR SURVEY FROM PATRIOT LiDAR DATED OCT 11, 2022.

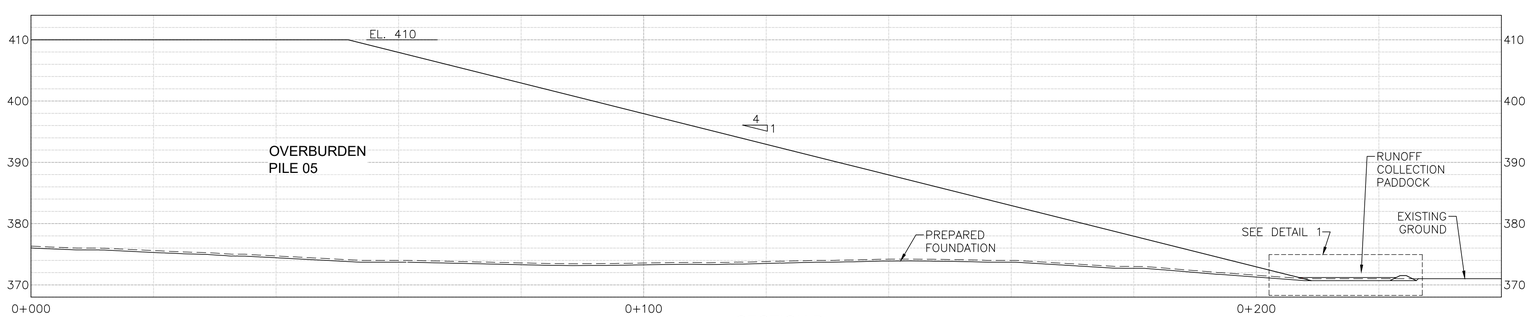
LEGEND

CV24 - BOREHOLES FROM 2024 GORTECHNICAL INVESTIGATION

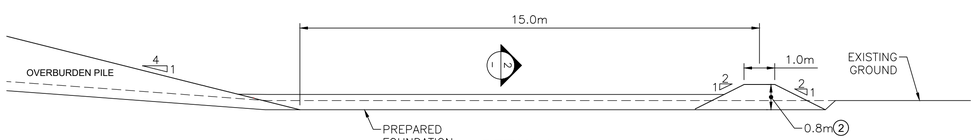
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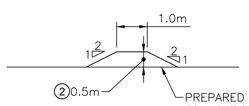

SECTION A
OVERBURDEN PILE 04
SCALE=1:500




SECTION B
OVERBURDEN PILE 05
SCALE=1:500

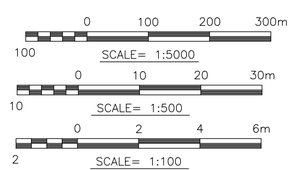



DETAIL 1
RUNOFF COLLECTION PADDOCK
SCALE=1:100




DETAIL 2
RUNOFF COLLECTION PADDOCK
SCALE=1:100

1. CRUSHED STONE (-75mm)
2. WASTE ROCK (-450mm)
3. TILL / SAND BENTONITE CEMENT FILL
4. GRANULAR B TYPE II
5. FILTER / BEDDING SAND (-4.75mm)
6. TRANSITION SAND AND GRAVEL (-26.5mm)
7. RIP-RAP EROSION PROTECTION
8. SAND / SILT (OVERBURDEN)
9. CLEAR STONE (-19mm)
- G1 NON-WOVEN GEOTEXTILE (500g/m²)
- G2 NON-WOVEN NEEDLE PUNCHED GEOTEXTILE (300g/m²)
- GL 1.5mm DOUBLE TEXTURED LLDPE GEOMEMBRANE




ATKINSRÉALIS #: 702381-0000-4GDD00-0007

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
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| C | ISSUED FOR FEASIBILITY STUDY | A.C. | B.M. | 25-09-10 |
| B | ISSUED FORCLIENT REVIEW | P.A. | B.M. | 25-04-10 |
| A | ISSUED FOR INTERNAL REVIEW | P.A. | B.M. | 25-01-10 |

PATRIOT BATTERY METALS

AtkinsRéalis

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | P. ADDIS | 25-09-10 |
| DESSINATEUR/DRAWN: | M. SYKES | 25-09-10 |
| VÉRIFIÉ PAR/CHECKED: | R. ALAM | 25-09-10 |
| INGÉNIEUR/ENGINEER: | B. MORRISSETTE | 25-09-10 |
| ÉCHELLE/SCALE: | 1:3,000 | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
-
-
-
-

TITLE
OVERBURDEN PILES04 AND 05
PLANS, SECTIONS AND DETAIL
-
-

DESSIN NUM./DRAWING NO.: CASN - A

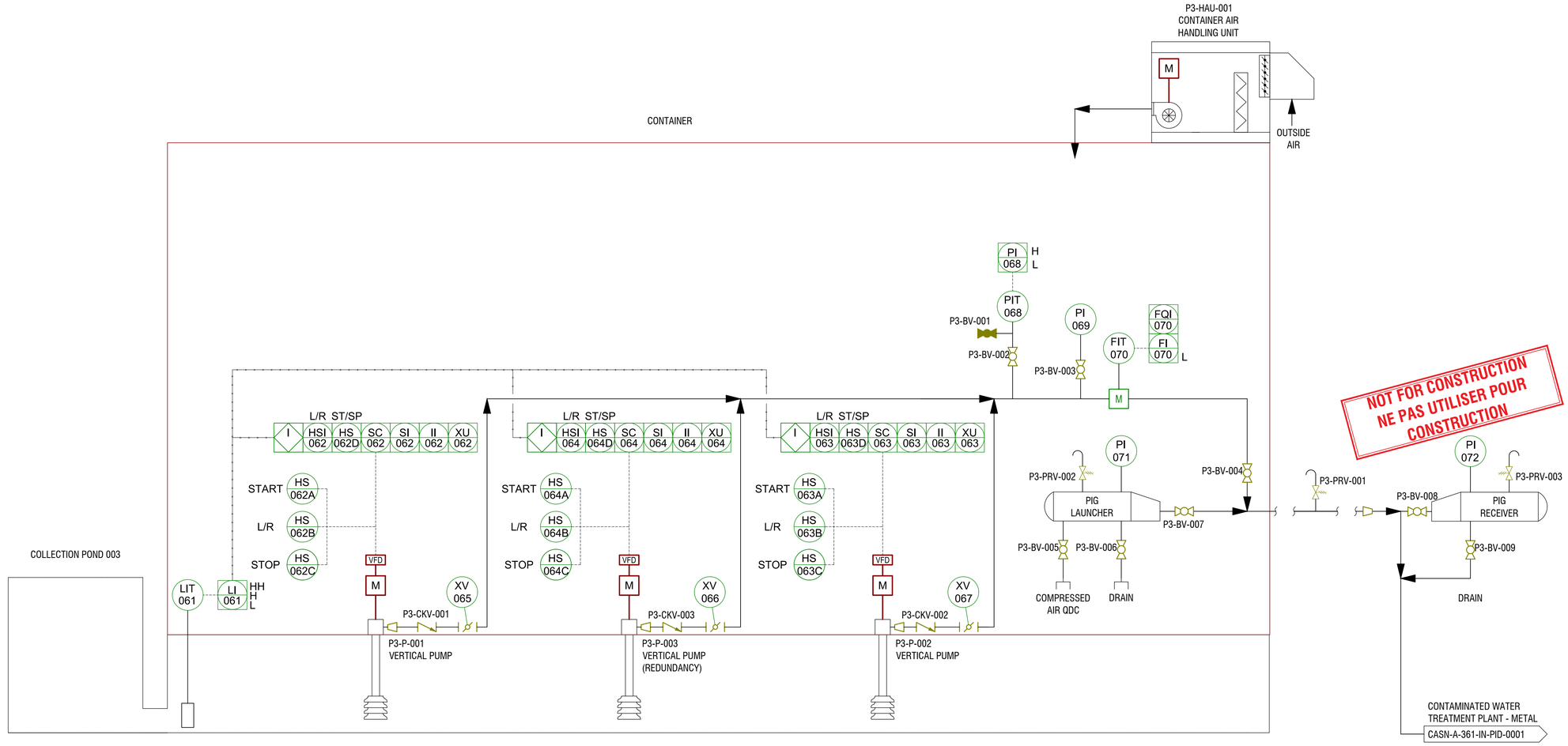
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# Appendix C Figures

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NOT FOR CONSTRUCTION
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| B | INITIAL RELEASE ISSUED FOR CLIENT REVIEW | D.K. | A.C. | 25-09-03 |
| A | INITIAL RELEASE ISSUED FOR INTERNAL REVIEW | R.D. | A.C. | 25-05-02 |

PATRIOT BATTERY METALS

AtkinsRéalis

702381-5100-45DG10-005

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | A. COGULET | 25-05-02 |
| DESSINATEUR/DRAWN: | R. DIDIER | 25-05-02 |
| VÉRIFIÉ PAR/CHECKED: | AL NGUYEN | 25-05-02 |
| INGÉNIEUR/ENGINEER: | A. COGULET | 25-05-02 |
| ÉCHELLE/SCALE: | N.T.S. | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
BASSIN DE COLLECTE 003
SCHÉMA DE TUYAUTERIE
ET D'INSTRUMENTATION
FRANCAIS

TITLE
COLLECTION POND 003
PIPING AND INSTRUMENTATION DIAGRAM

ENGLISH

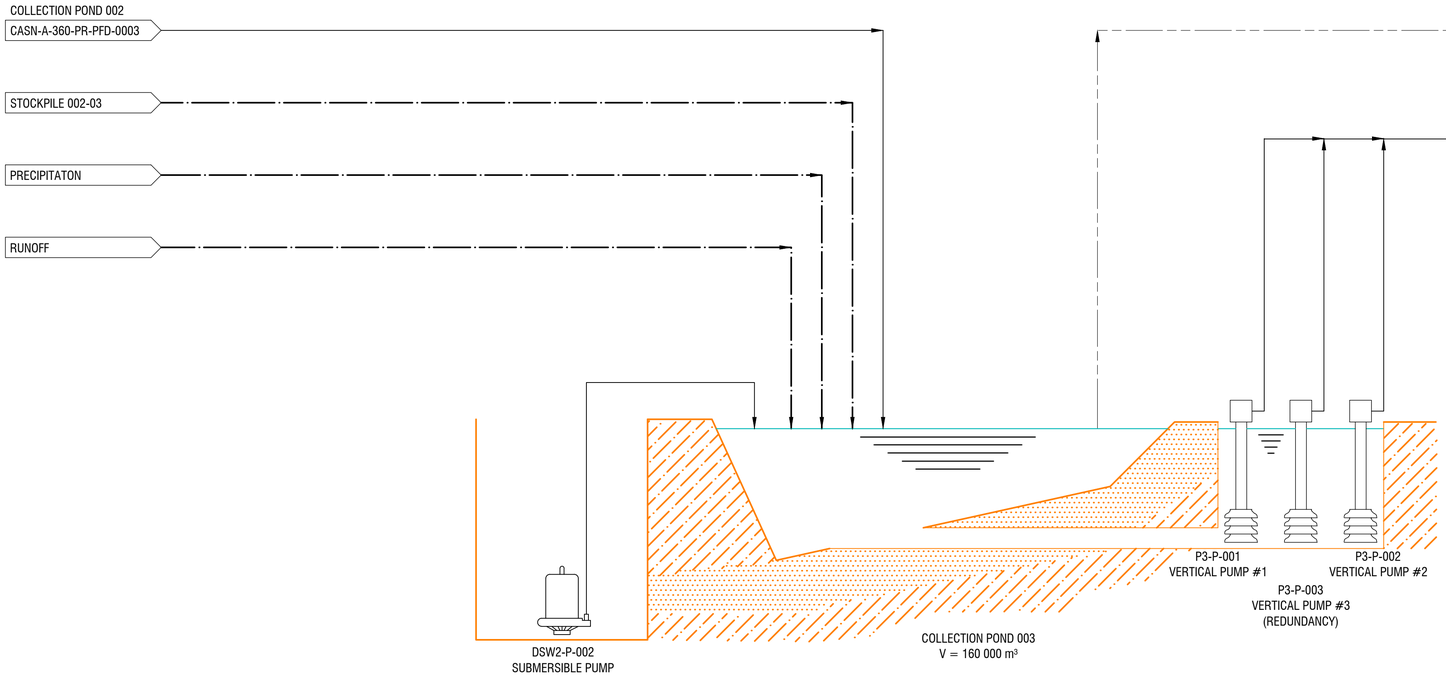
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INGÉNIEURE
Antoine Cogulet
6028243
QUÉBEC
Ing. PhD
# 6028243.

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LEGEND

PUMPED

GRAVITY

ALTERNATIVE

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PATRIOT BATTERY METALS

AtkinsRéalis

702381-5100-45DG02-004

Mining Services

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| DESSINATEUR/DRAWN: | R. DIDIER | 25-04-30 |
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| INGÉNIEUR/ENGINEER: | A. Cogulet | 25-04-30 |
| ÉCHELLE/SCALE: | N.T.S. | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
BASSIN DE COLLECTE 003
DIAGRAMME DE FLUX DE PROCESSUS
DESSIN ET NOTES
FRANCAIS

TITLE
COLLECTION POND 003
PROCESS FLOW DIAGRAM
DRAWING AND NOTES
ENGLISH

DESSIN NUM./DRAWING NO.: CASN - A

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| AREA | DISC. | TYPE | SEQ. | REV. |

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INGÉNIEUR.E
Antoine Cogulet
6028243
QUÉBEC
Ing. PhD
OIQ 6028243

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SODIUM HYPOHCLORITE

FIT 006

FW-GV-026

FW-GV-025

PT 003B

FIT 003B

FW-GV-018

FW-GV-017

FW-GV-019

FW-CHK-003

PT 003A

PT 003C

FW-CHK-004

FW-P-005
BOOSTER PUMP

FIT 003A

FW-GV-015

FW-GV-016

PT 001B

FW-GV-012

AE ORP

FW-XV-009

FW-GV-008

FW-XV-003

DRAIN

HEATER

FW-GV-001

FW-GV-002

FW-GV-003

FW-GV-011

FW-SV-004

AE TURB

FW-GV-013

FW-GV-014

FIT 001

PT 001A

FW-YS-001

COMPRESSED AIR

FW-SV-001

ANTISCALANT

FW-XV-002

FW-XV-001

FW-CHK-001

FW-P-003
BOOSTER PUMP

RAW WATER
LAKE 308
SEE DRAWING
CASN-A-310-IN-PID-0001

FW-XV-004

FW-XV-008

PT 002B

FW-SV-003

FW-GV-010

FW-GV-007

FW-GV-009

FW-GV-004

FW-GV-005

FW-GV-006

PT 004B

FIT 004B

FW-GV-023

FW-GV-022

FW-GV-024

FW-CHK-005

PT 004A

FIT 004A

PT 004C

FW-CHK-006

FW-GV-020

FW-GV-021

FW-P-006
BOOSTER PUMP

FIT 005

FW-GV-027

UV

FW-GV-028

FW-CHK-007

FW-P-007
RECIRCULATION PUMP

FW-GV-027

HEATER

FIT 002

PT 002A

FW-XV-006

FW-XV-005

CWPM-P-004
BOOSTER PUMP

FW-YS-002

FW-CHK-002

ANTISCALANT

COMPRESSED AIR

FW-SV-002

FW-XV-007

WASTE WATER TREATMENT
CASN-A-341-IN-PID-0001

LT 007A

TT 007A

POTABLE WATER
RESERVOIR #1
HEATER

FW-XV-010

FW-GV-029

FW-SV-005

AE CL2

AE PH

LT 007B

TT 007B

POTABLE WATER
RESERVOIR #2
HEATER

FW-XV-011

TREATED WATER DIST.

LT 007C

TT 007C

POTABLE WATER
RESERVOIR #3
HEATER

FW-XV-012

29 PSIG

PT 008

UF TRAINS

FW-GV-031

FW-RV-002

80 PSIG

SOLENOID PANEL

FW-GV-030

FW-RV-001

FW-GV-032

INGÉNIEUR E
Antoine Cogulet
6028243
QUÉBEC

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LEGEND

- PUMPED
- GRAVITY
- ALTERNATIVE
- FUTURE
- BACKUP

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| B | INITIAL RELEASE ISSUED FOR CLIENT REVIEW | D.K. | A.C | 25-09-03 |
| A | INITIAL RELEASE ISSUED FOR INTERNAL REVIEW | R.D. | A.C | 25-06-05 |

PATRIOT BATTERY METALS

AtkinsRéalis

702381-5300-4KDG10-001

Mining Services

| | | |
|---|---|---|
| CONCEPTEUR/DESIGN: | A. Cogulet | 25-06-05 |
| DESSINATEUR/DRAWN: | R. DIDIER | 25-06-05 |
| VÉRIFIÉ PAR/CHECKED: | AL Nguyen | 25-06-05 |
| INGÉNIEUR/ENGINEER: | A. Cogulet | 25-06-05 |
| ÉCHELLE/SCALE: | N.T.S. | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

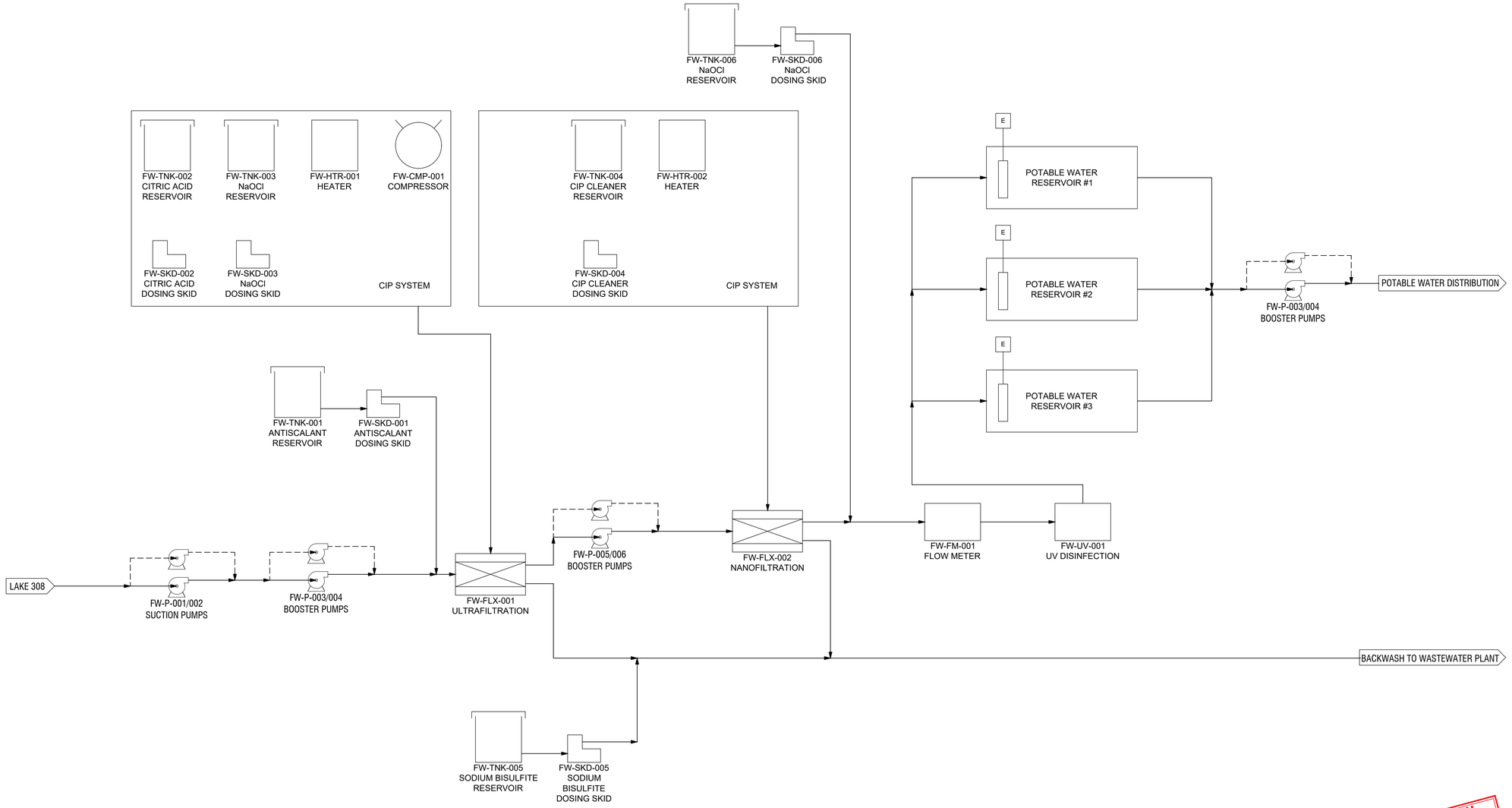
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USINE D'EAU POTABLE
SYSTÈME DE FILTRATION
DIAGRAMME DE FLUX DE PROCESSUS
DESSIN ET NOTES

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FILTRATION SYSTEM
PROCESS FLOW DIAGRAM
DRAWING AND NOTES

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LEGEND

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- ALTERNATIVE
- FUTURE
- BACKUP

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| A | INITIAL RELEASE ISSUED FOR INTERNAL REVIEW | R.D. | A.C | 25-05-13 |

PATRIOT BATTERY METALS

AtkinsRéalis

702381-5300-4KDG02-001

Mining Services

| | | |
|---|---|---|
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| DESSINATEUR/DRAWN: | R. DIDIER | 25-05-13 |
| VÉRIFIÉ PAR/CHECKED: | AL NGUYEN | 25-05-13 |
| INGÉNIEUR/ENGINEER: | A. COGULET | 25-05-13 |
| ÉCHELLE/SCALE: | N.T.S. | DATE |

PROJET/PROJECT:
SHAAKICHIUWAANAAN

PHASE:
ÉTUDE DE FAISABILITÉ
FEASIBILITY STUDY

TITRE:
STATION DE TRAITEMENT D'EAU POTABLE
DIAGRAMME DE FLUX DE PROCESSUS
DESSIN ET NOTES
FRANCAIS

TITLE
POTABLE WATER TREATMENT PLANT
PROCESS FLOW DIAGRAM
DRAWING AND NOTES
ENGLISH

DESSIN NUM./DRAWING NO.: CASN – A

331 – PR – PFD – 0001 – C
AREA | DISC. | TYPE | SEQ. | REV.

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INGÉNIEUR.E
Antoine Cogulet
6028243
QUÉBEC

Ing. PhD. #6028243.

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PAPER SIZE FORMAT - A1

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NE PAS UTILISER POUR CONSTRUCTION

PERMANENT CAMP KITCHEN WASTEWATER

GREASE TRAP

PERMANENT CAMP DOMESTIC WASTEWATER

DRY BUILDING DOMESTIC WASTEWATER

COLD SERVICE WATER

SWT-FLX-001
ROTARY
STRAINER

LIC 001
LI 001 HH H L LL
LAH 001
LAL 001
LT 001
LSL 001
LSH 001
PI 001
FIT 001
SWT-BV-003
SWT-BV-002
SWT-PRS-001
CASN-A-341-IN-PID-0002
SWT-BV-001
SWT-CHK-001
SWT-CHK-002

SWT-EQ-001
EQUALIZATION
TANK

SWT-P-001/002
SUBMERSIBLE
PUMPS

BAKING SODA

SWT-BLW-001
BLOWER

LIC 002
LI 002 HH H L LL
LAH 002
LAL 002
LT 002
LSL 002
LSH 002
SWT-BV-004
SWT-BV-006
SWT-BV-005

SWT-MBR-001
MOVING BED BIOFILM
REACTOR

ANTIFOAM
COAGULANT
POLYMER
MCC
M
SWT-BV-007

SWT-AGX-001
COAGULATION
CHAMBER

SWT-AGX-002
FLOCULATION
CHAMBER

MCC
M

SWT-DAF-001
DISSOLVED AIR
FLOATATION TANK

SWT-BV-022
SWT-BV-021
SWT-BV-008
SWT-BV-011

SWT-XV-002
LSH 003
LAH 003
SWT-XV-001
LSL 003
LAL 003

COLD SERVICE WATER

SWT-TNK-006
EFFLUENT HOLDING
TANK

SWT-CHK-005
SWT-CHK-004

POLISHING POND
CASN-A-360-PR-PFD-0008

SWT-MBR-002
CASN-A-341-IN-PID-0002

SWT-BV-020
SWT-BV-019
SWT-BV-018
SWT-BV-017
SWT-CHK-003

PI 004
SWT-GV-011
SWT-GV-012
VFD
SWT-BV-010
SWT-BV-009
SWT-P-007
DAF RECIRCULATION
PUMP

PI 005
SWT-GV-015
SWT-GV-016
SWT-BV-014
SWT-BV-013
SWT-P-008
DAF RECIRCULATION
PUMP

SWT-BLW-002
BLOWER

LEGEND

- PUMPED
- GRAVITY
- ALTERNATIVE
- FUTURE
- BACKUP

| REV | DESCRIPTION | PAR BY | ING ENG | DATE |
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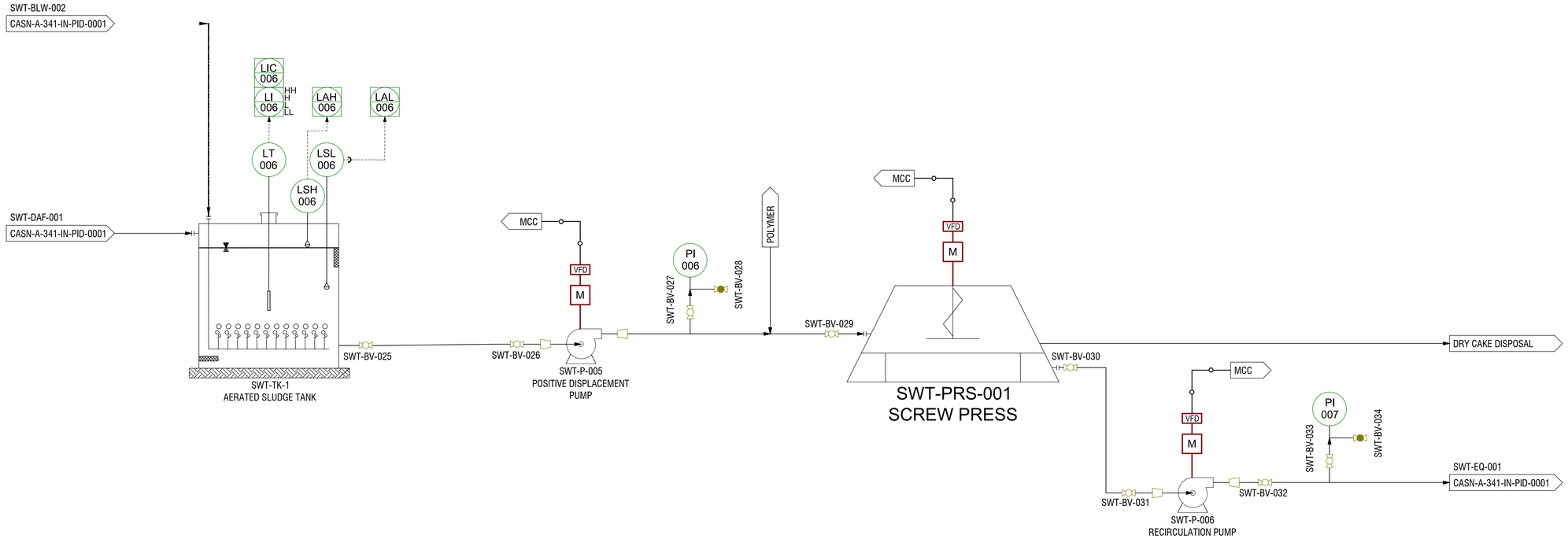
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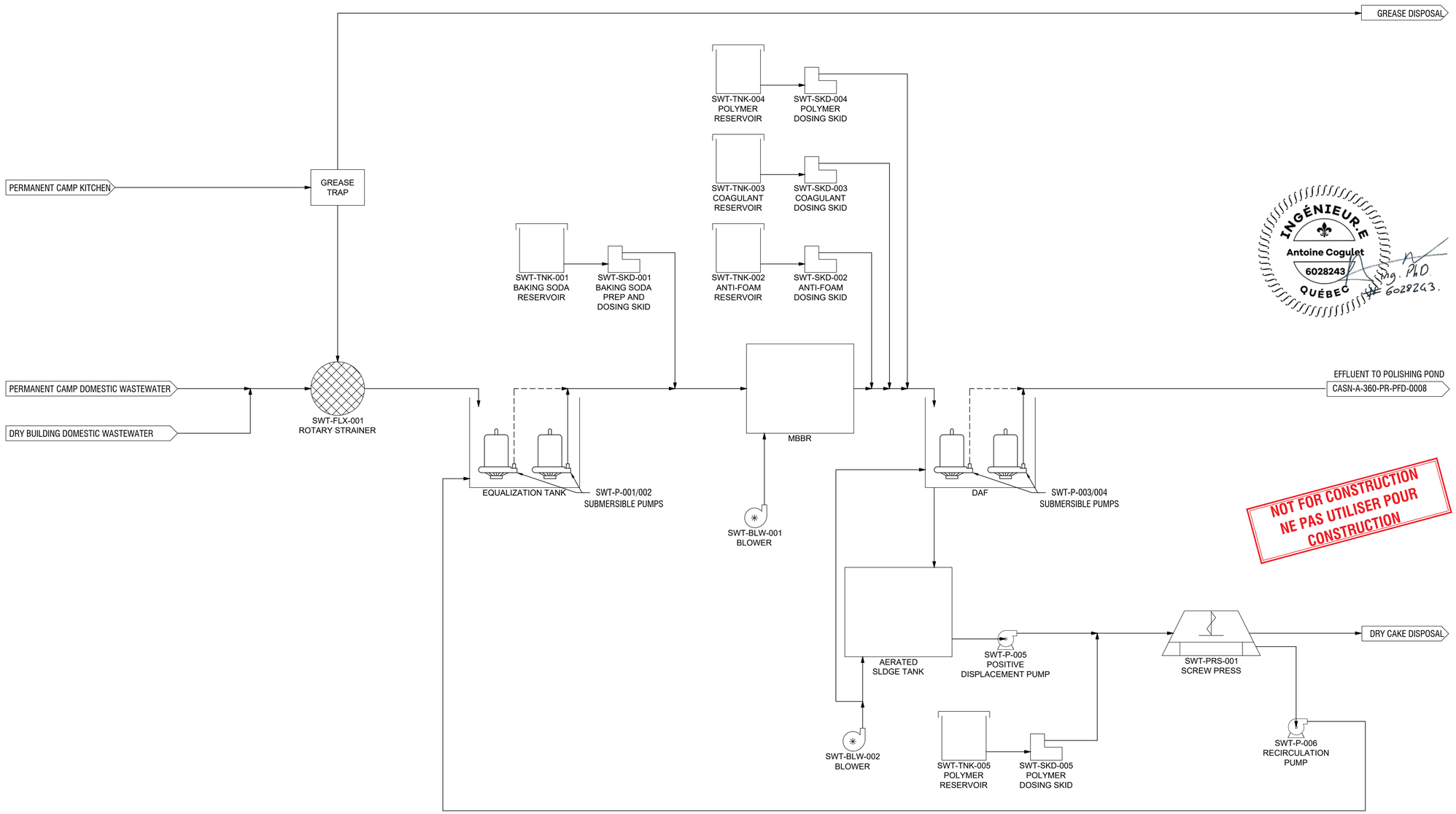
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# Appendix D Stockpile 001 and 002 Stability Analyses Technical Note

| AtkinsRéalis | TECHNICAL NOTE<br>Shaakichiuwaanaan Project – Waste and Water Management | | |
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**Title of Document:** **STOCKPILE 001 AND 002 STABILITY ANALYSIS TECHNICAL NOTE**

**Client:** **PATRIOT BATTERY METALS INC.**

**Project:** **SHAAKICHIUWAANAAN PROJECT – WASTE AND WATER MANAGEMENT**


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## List of Revisions

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| D | RA | PA | BM | 2026-02-12 | Section 2.2.3 | Issued with little correction for feasibility study |

# Table of Contents

**1 Introduction ..... 1**

**2 Stability Analyses ..... 2**

2.1 Model Geometry ..... 3

2.1.1 Waste Rock Stockpiles (Stockpile 001 and Stockpile 002) ..... 4

2.1.2 Tailings Stockpile (Stockpile 002) ..... 7

2.2 Loading Scenarios and Minimum FoS ..... 8

2.2.1 Drained ..... 9

2.2.2 Undrained ..... 9

2.2.3 Seismicity ..... 9

2.3 Material Properties ..... 10

2.3.1 Foundation ..... 10

2.3.2 Tailings ..... 11

2.3.3 Waste Rock ..... 11

2.3.4 Geomembrane Liner and Geotextile ..... 11

2.3.5 Bedrock ..... 12

2.4 Phreatic Surface Assumption ..... 12

2.5 Stability Analysis Results ..... 12

**3 Conclusions ..... 15**

**4 References ..... 16**

# List of Tables

Table 2-1 Minimum Factors of Safety for Stockpile 001 and Stockpile 002 (MRNF, 2024; BCMWRPRC, 1991a and Hawley and Cunning, 2017) ..... 9

Table 2-2 Material Geotechnical Parameters – Stockpile 001 and 002 ..... 10

Table 2-3 Factor of Safety of the Slope Stability Analysis ..... 13

# List of Figures

Figure 1-1 Layout of Stockpiles 001 and 002 ..... 1
Figure 2-1 Layout of Critical Sections for Slope Stability Analysis – Waste Rock Stockpile 001 Cross-Section A1-A1 ..... 2
Figure 2-2 Layout of Critical Sections for Slope Stability Analysis – Waste Rock Stockpile 002 Cross-Section H-H ..... 3
Figure 2-3 A1-A1 Section of Waste Rock Stockpile (NAG) (Stockpile 001) for the operational phase ..... 4
Figure 2-4 H-H Section of Waste Rock Stockpile (PAG) (Stockpile 002) for the operational phase ..... 5
Figure 2-5 A1-A1 Section of Waste Rock Stockpile (NAG) (Stockpile 001) for the Closure ..... 6
Figure 2-6 H-H Section of Waste Rock Stockpile (PAG) (Stockpile 002) for Closure ..... 7
Figure 2-7 B1-B1 Section of Tailings Stockpile for Operation and Closure ..... 8

# List of Appendices

Appendix A Stability Analysis Results

# 1 Introduction

Patriot Battery Metals Inc. (PMET) has retained AtkinsRéalis to conduct a feasibility study on waste and water management for the Shaakichiuwaanaan Project. The proposed lithium mine in the Eeyou Istchee James Bay region of northern Québec will involve open-pit and underground mining operations. The project will feature stockpiles for overburden, waste rock, tailings and organic materials, a water treatment plant, and other necessary mining infrastructure. Mining operations are anticipated to commence in 2028, with an expected mine life of 22 years.

Two sites have been identified for the disposal of tailings and waste rock, as shown in **Figure 1-1**. Stockpile 001, located northwest of the plant site, will be dedicated solely to storing waste rock due to its proximity to the open pit. In contrast, Stockpile 002, situated northeast of the plant, is intended for potentially acid-generating waste rock and tailings, with plans to store the tailings separately from the waste rock, as shown in **Figure 1-1**.

As part of the feasibility study, stability analyses have been conducted for the proposed Stockpiles 001 and 002. This technical note summarizes the findings of those stability analyses.

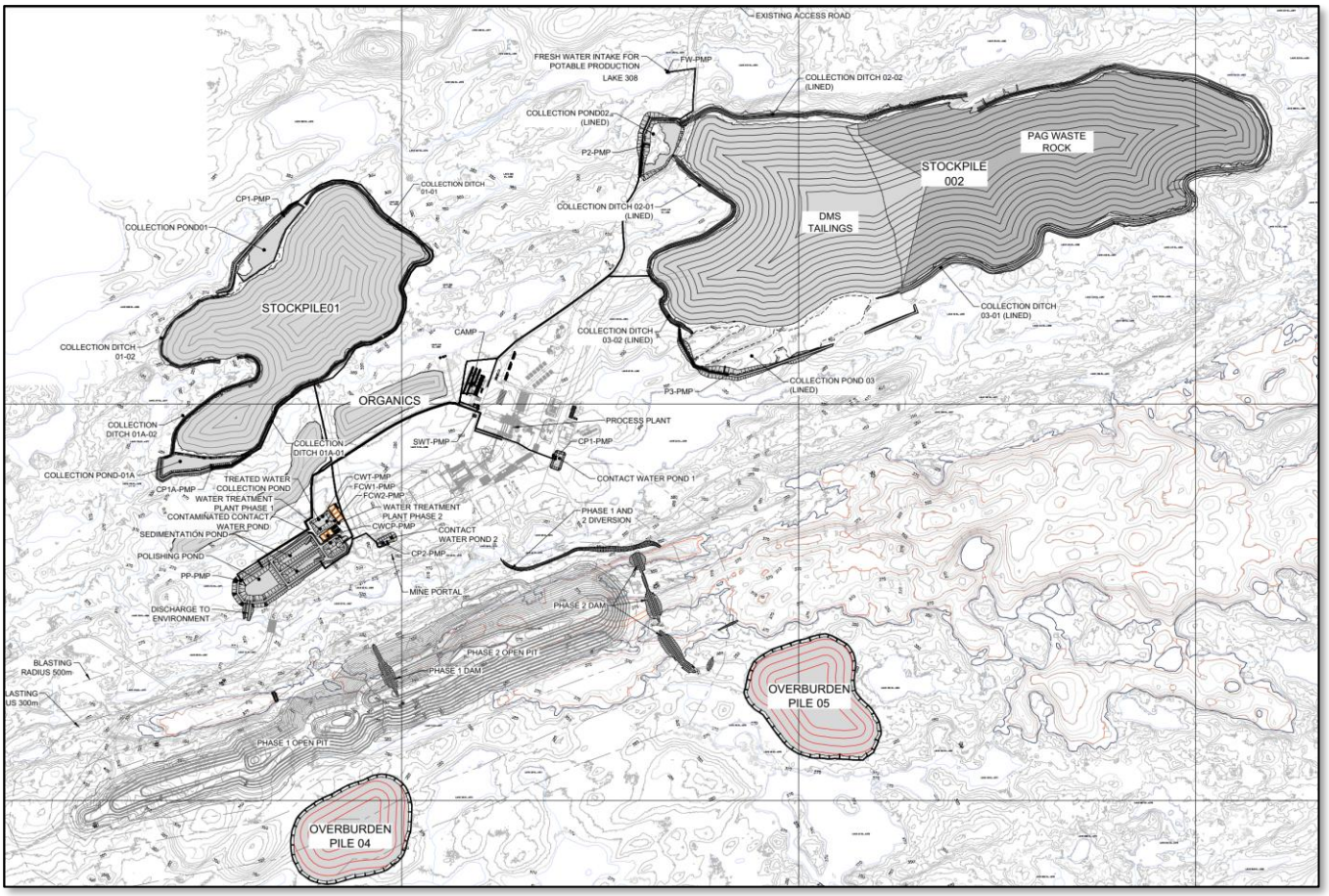



**Figure 1-1 Layout of Stockpiles 001 and 002**

# 2 Stability Analyses

Slope stability analyses were conducted on three critical sections: one for the Non-Acid Generating Stockpile (NAG) (Section A1-A1 for stockpile 001) as shown in **Figure 2-1**, one for the Acid Generating Stockpile (PAG) (Section H-H for stockpile 002) and one for the tailings stockpile (Section B1-B1 for stockpile 002) as shown in **Figure 2-2**. These sections are illustrated in **Figure 2-3** to **Figure 2-7**, where the stack reaches its maximum height and has the steepest slope.

Slope stability analyses were conducted using SLOPE/W Version 2023.1.2, a two-dimensional limit equilibrium software developed by Geo-Slope International Limited.

The Morgenstern-Price method was utilized to identify potential failure surfaces within the slopes of the stockpiles and their underlying foundations. The primary objective of these analyses was to determine the most critical failure surfaces that would produce the most conservative Factor of Safety (FoS). The FoS is the ratio of the average available shear strength (resisting force) to the average mobilized shear stress (driving force) along a specific failure surface. The following subsections provide details on the stockpile geometry, material properties, loading scenarios, and phreatic surface used in the model, along with a discussion of the stability analysis results.

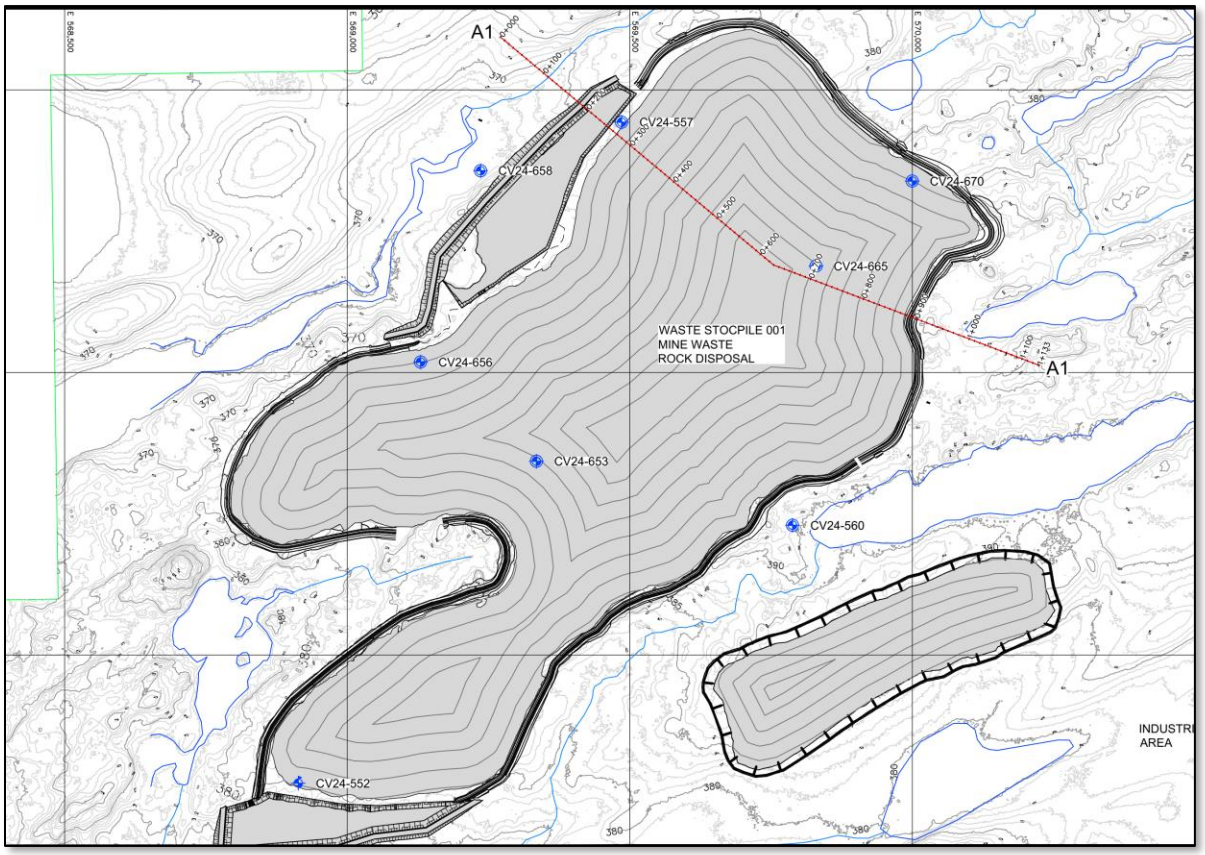



**Figure 2-1 Layout of Critical Sections for Slope Stability Analysis – Waste Rock Stockpile 001 Cross-Section A1-A1**

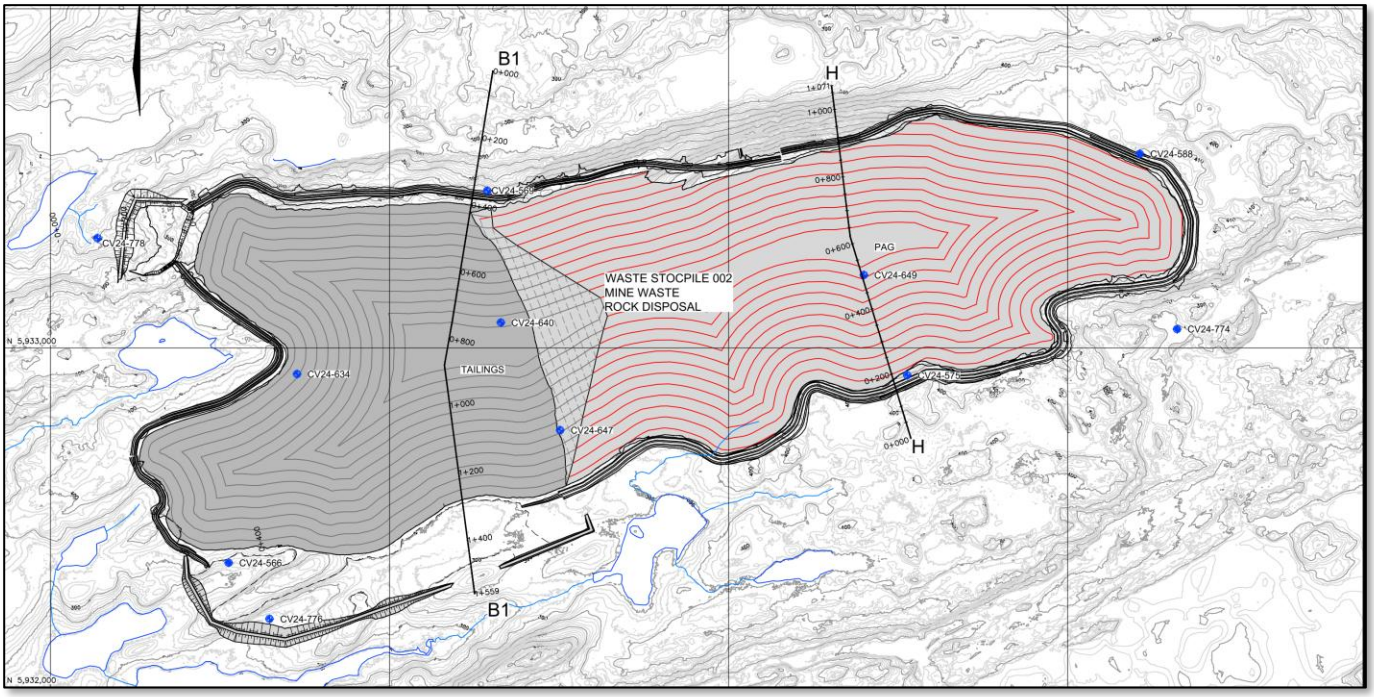



**Figure 2-2 Layout of Critical Sections for Slope Stability Analysis – Waste Rock Stockpile 002 Cross-Section H-H**

## 2.1 Model Geometry

The mine is projected to generate a total of 154.1 million tonnes (Mt) of waste rock. This amount includes 73.1 Mt of non-acid generating (NAG) waste rock and 81.0 Mt of potentially acid-generating (PAG) waste rock. Of the NAG waste rock, 29.6 Mt will be stored in the open pit, while the remaining amount will be placed in Stockpile 001, which is designed to accommodate a total of 43.5 Mt of NAG waste.

Over the 22-year lifespan of the mine, the anticipated production of tailings is estimated to be 71.1 Mt. Approximately 54.0 Mt of these tailings will be disposed of on the surface, while the remaining 17.1 Mt will be used for paste backfill. Stockpile 002 is designated for storing 54.0 Mt of tailings and 81.0 Mt of PAG waste rock.

Stockpile 001 has a footprint of 80 hectares (ha) and a maximum height of about 90 meters (m). Stockpile 002, which contains PAG rock, covers approximately 126 ha (58%), while the tailings portion covers about 91 ha (42%), with a maximum height of approximately 120 m. Two configurations have been designed for Stockpiles 001 and 002 for both operational and closure stages. The foundation profile has been incorporated into the model geometry based on the information on the available boreholes.

A detailed description of the geometric models for Stockpile 001 and Stockpile 002 is provided in the following subsections.

## 2.1.1 Waste Rock Stockpiles (Stockpile 001 and Stockpile 002)

### 2.1.1.1 Operational Phase

The typical geometry for the operational phases of Stockpiles 001 and 002 is illustrated in **Figure 2-3** and **Figure 2-4**, respectively. During the operational phase, the waste rock stockpiles are designed in 10-meter-high lifts, with local slopes of approximately 1.5 horizontal (H) to 1 vertical (V). Each bench is 15 meters wide, and every third bench is 22.5 meters wide. This design achieves an overall external slope of 3.25 horizontal (H) to 1 vertical (V).

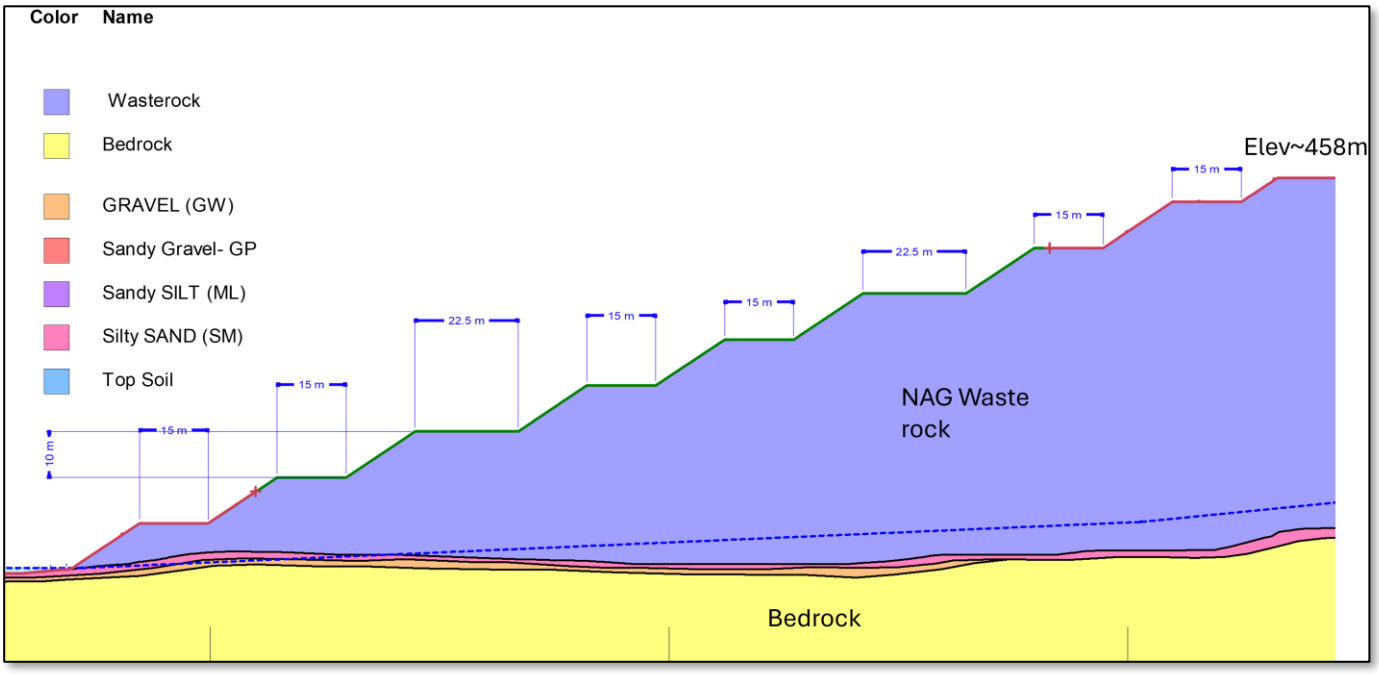



**Figure 2-3 A1-A1 Section of Waste Rock Stockpile (NAG) (Stockpile 001) for the operational phase**

Stockpile 002's basin is lined with a 1.5 mm double-textured LLDPE geomembrane. A cushion geotextile is placed on top of this geomembrane, followed by a protective cushion layer that is 1 meter thick. In contrast, Stockpile 001 has no liner integrated into its geometry.

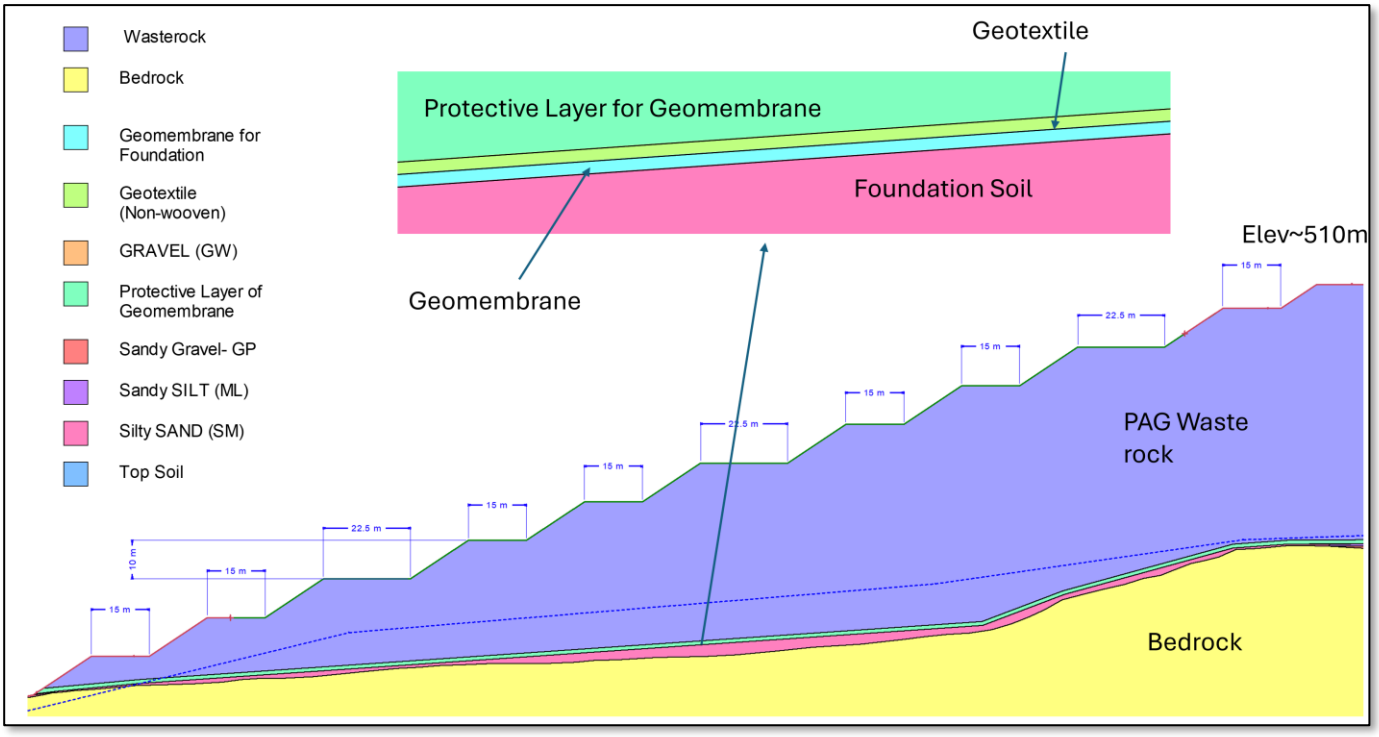



**Figure 2-4 H-H Section of Waste Rock Stockpile (PAG) (Stockpile 002) for the operational phase**

### 2.1.1.2 Closure

The typical geometry for the closure phases of Stockpiles 001 and 002 is illustrated in **Figure 2-5** and **Figure 2-6**. During the closure Phase, the benches are designed with a local slope of 3:1 (horizontal to vertical) to promote effective water management. Each bench is 7.5 meters wide.

For Stockpile 001, the closure design consists of a 30 cm-thick layer of crushed stone, topped with a 20 cm layer of topsoil to support hydroseeding (**Figure 2-5**).

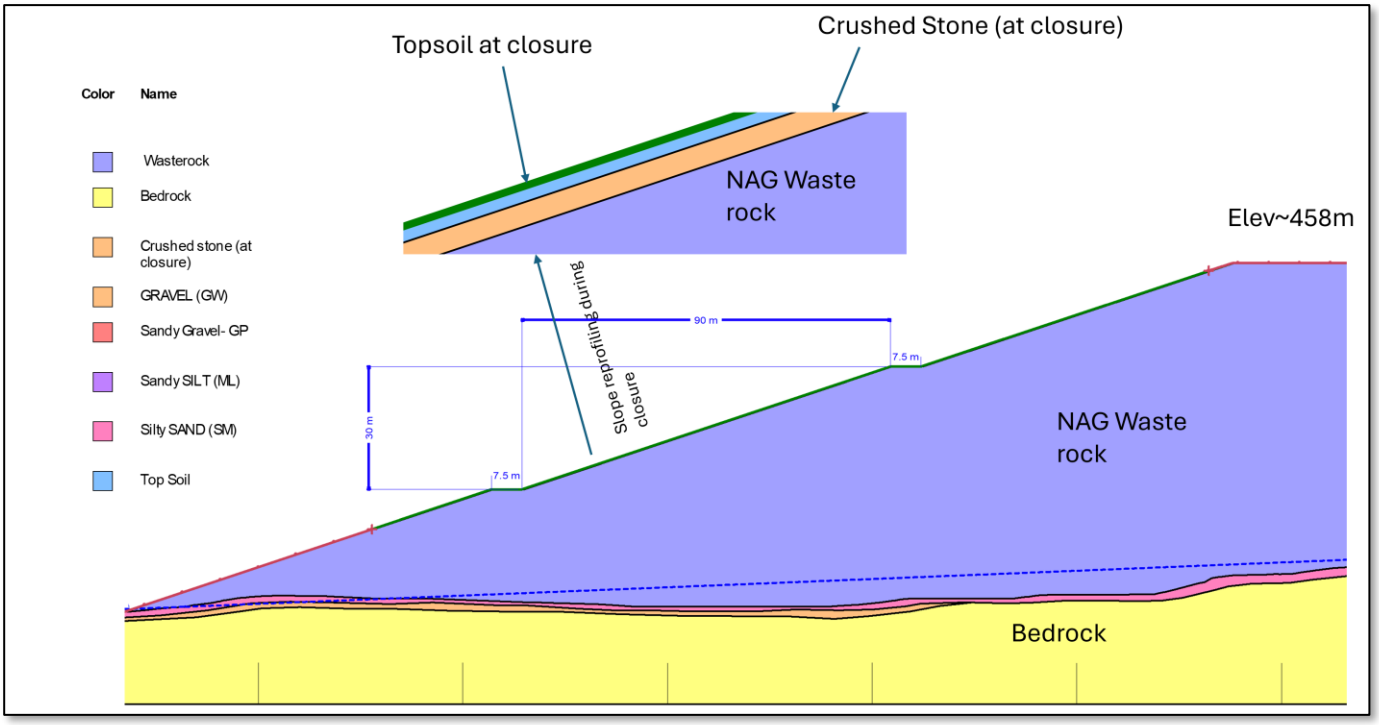



**Figure 2-5 A1-A1 Section of Waste Rock Stockpile (NAG) (Stockpile 001) for the Closure**

In contrast, the closure model for Stockpile 002 consists of a 30 cm thick layer of crushed stone on the slope, followed by a 15 cm thick sand liner (will be borrowed from overburden) to support the geomembrane. On top of this liner, a 1.5 mm double-textured HDPE geomembrane is incorporated. A geonet is then placed on top of the geomembrane, serving as a drainage layer. Additionally, another 20 cm thick layer of sand borrowed from overburden is applied over the geonet, which is capped with a 20 cm layer of topsoil to facilitate hydroseeding (see **Figure 2-6**). This design ensures accurate replication of the intended closure structure.

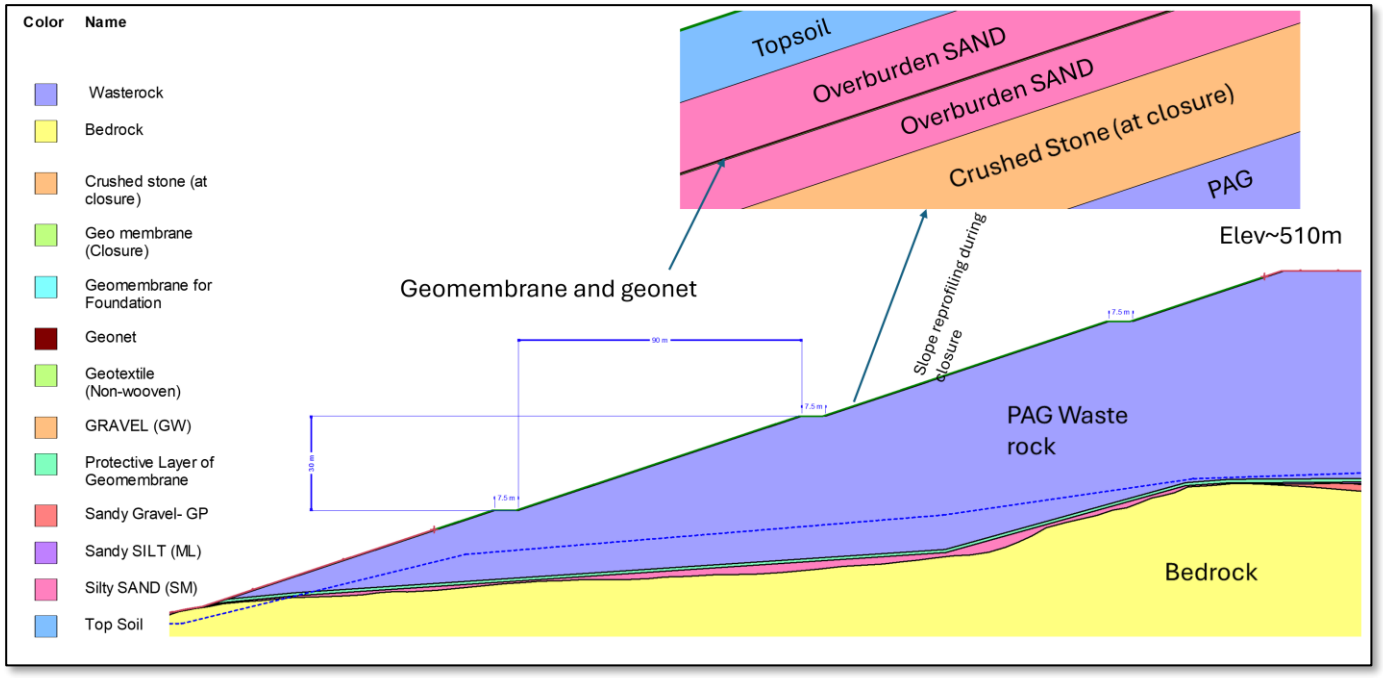



**Figure 2-6 H-H Section of Waste Rock Stockpile (PAG) (Stockpile 002) for Closure**

## 2.1.2 Tailings Stockpile (Stockpile 002)

### 2.1.2.1 Operation

The typical geometry of the tailings portion of stockpile 002 is illustrated in **Figure 2-7**. The tailings stack features a global external slope of 3.25 horizontal to 1 vertical (3.25 H:1 V) and includes intermediate benches that are 7.5 meters wide, spaced every 30 meters of elevation (refer to **Figure 2-7**). The basin is lined with a 1.5 mm double-textured linear low-density polyethylene (LLDPE) geomembrane. A cushion geotextile is placed on top of the geomembrane, and the tailings are modelled directly above this layer.

Additionally, the starter embankment has been incorporated into the model to allow vehicular access to the toe of the tailings facility for inspection purposes. This starter embankment will be constructed using low-risk waste rock. It will be 3 meters high and will have a crest width of 5 meters, as shown in **Figure 2-7**.

### 2.1.2.2 Closure

Compared to the waste rock at Stockpile 002, the closure model for the tailings does not require a 30 cm thick layer of crushed stone on the slope. A 1.5 mm double-textured HDPE geomembrane is incorporated into the model directly above the tailings (see **Figure 2-7**). A geonet is then placed on top of the geomembrane, acting as a drainage layer. Additionally, a 20 cm thick layer of granular materials is placed over the geomembrane, capped with another 20 cm layer of topsoil to facilitate hydroseeding. This configuration in the model accurately reflects the intended structure of the closure.

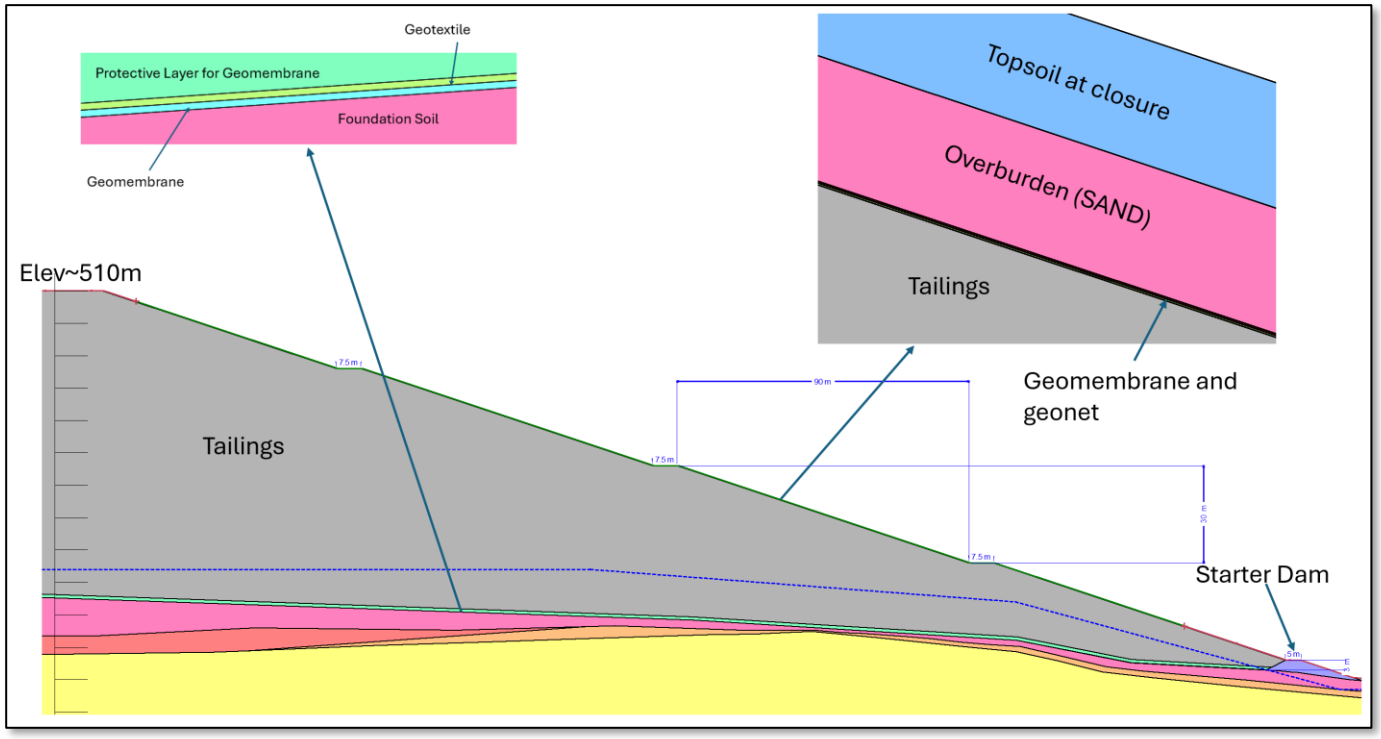



**Figure 2-7 B1-B1 Section of Tailings Stockpile for Operation and Closure**

## 2.2 Loading Scenarios and Minimum FoS

Stability analyses were performed under both static and pseudo-static conditions for the three critical sections mentioned earlier. It is important to note that the factor of safety (FoS) for stockpiles classified as non-liquefiable is not addressed by CDA (2019). However, CDA (2019) indicates that if the tailings are non-liquefiable and cannot flow, the facility can be considered a waste disposal area similar to an overburden disposal area. Design guidelines exist for dumps and overburden disposal areas, which would be applicable in this case.

Based on this guidance, the FoS values were determined according to the Quebec Regulations (MRNF, 2024) for dump and overburden stockpiles. Notably, the guidelines from MNRF (2024) are identical to those suggested by BCMWRPRC (1991a) and Hawley and Cunning (2017). The minimum required FoS for both tailings and waste rock stockpiles is presented in **Table 2-1**. The rationale for selecting the loading conditions is explained in the following subsections.

**Table 2-1 Minimum Factors of Safety for Stockpile 001 and Stockpile 002 (MRNF, 2024; BCMWRPRC, 1991a and Hawley and Cunning, 2017)**

| Condition | Minimum Factors of Safety (MRNF, 2024) | |
|---|---|---|
| **Consequence Classification (CDA, 2019)** | **Low to Significant** | **High to Extreme** |
| **Local Stability (each bench)** | | |
| Static (Undrained Condition) | 1.0 | 1.1 |
| Static (Drained Condition) | 1.2 | |
| **Global stability (entire stockpile)** | | |
| Static (Undrained condition) | 1.3 | 1.5 |
| Long-term static | 1.5 | |
| Pseudo-static | 1.1 | 1.3 |

### 2.2.1 Drained

The drained loading condition reflects long-term stability and employs effective stress shear strengths for all materials in the slope stability model. A minimum targeted factor of safety (FOS) of 1.5 has been adopted for the long-term static conditions based on **Table 2-1**.

### 2.2.2 Undrained

Undrained loading is typically characterized by rapid, short-term loading. Undrained loading can lead to positive excess pore pressures, unlike drained loading conditions, particularly in contractive soils. The minimum target Factor of Safety (FOS) for undrained limit equilibrium stability analyses is 1.3 for low to significant risk and 1.5 for high to extreme risk. However, the tailings materials analyzed in the laboratory are coarse-grained (AtkinsRéalis, 2025b), which means they can be classified as free-draining. Similarly, both Potentially Acid-Generating (PAG) and Non-Acid-Generating (NAG) stockpiles are also free-draining.

It is assumed that all organic materials, topsoil, and clay susceptible to pore water pressure generation from rapid loading will be removed from the footprint of the stockpiles. As a result, undrained loading conditions have not been considered in this study.

### 2.2.3 Seismicity

This study did not include post-earthquake analyses, which usually evaluate the residual shear strengths of foundational materials that may have liquefied. This decision was made based on borehole investigations indicating that the foundation materials are not expected to experience liquefaction. However, during the detailed design phase, further geotechnical investigations will be necessary to determine whether any thick, weak layers beneath the stockpile footprints might be at risk of liquefaction.

The tailings will be compacted to 95% of the standard Proctor maximum dry density, which makes them non-liquefiable. Consequently, residual strength is not considered in this study. CDA (2019) also clarifies that a tailings facility without ponded water (such as a dry stack) can be designed according to the guidelines for dumps and overburden stockpiles, as long as the dry stack materials are non-liquefiable and cannot flow. Therefore, no post-earthquake analysis was conducted for any of the stockpile materials.

Pseudostatic analysis was performed to assess the dynamic stability of the two stockpiles. Any dry stack designed according to GISTM should meet design criteria corresponding to the extreme consequence classification for post-closure conditions. The site is classified as Class D, with a horizontal seismic acceleration coefficient ($K_h$) of 0.1g (50% of the PGA for a 1 in 10,000-year event (Extreme), extrapolated from NBCC (2020)) used in the pseudo-static analysis. However, a site-specific seismic hazard assessment is recommended in the next study phase.

## 2.3 Material Properties

The material density and strength parameters used in the stability analyses were derived by AtkinsRéalis, based on geotechnical investigations conducted by BBA (BBA, 2024), and from laboratory tests on tailings performed at the WSP laboratory (AtkinsRéalis, 2025b). When data from field or laboratory tests was unavailable, assumptions were made based on AtkinsRéalis' experience with similar materials. **Table 2-2** summarizes the material parameters and models utilized in this study. A detailed description of the properties of these materials is provided in the following subsections.

**Table 2-2 Material Geotechnical Parameters – Stockpile 001 and 002**

| Description | γ (kN/m$^3$) | C' (kPa) | Φ' (˚) | Slope Stability Material Model |
|---|---|---|---|---|
| Organics/top soil | 14 | 0 | 18 | Mohr-Coulomb |
| ML - Silt/Sandy Silt/Silt with Gravel | 18.5 | 0 | 31 | Mohr-Coulomb |
| SM - Silty Sand/Silty Sand with Gravel | 19.0 | 0 | 34 | Mohr-Coulomb |
| GM - Silty Gravel with Sand/Gravel with Silt and Sand | 20.0 | 0 | 38 | Mohr-Coulomb |
| GW - Gravel | 20.5 | 0 | 39 | Mohr-Coulomb |
| Tailings | 18 | 0 | 37 | Mohr-Coulomb |
| Waste Rock | 20 | 0 | 38 | Mohr-Coulomb |
| 1.5 mm double-textured LLDPE geomembrane (base layer) | 9 | 3.15 | 30.1 | Mohr-Coulomb |
| Non-woven Geotextile (base layer) | 1 | 3.15 | 30.1 | Mohr-Coulomb |
| 1.5 mm HDPE geomembrane (Cover) | 9 | 0.65 | 17.8 | Mohr-Coulomb |
| Geonet (Cover) | 9 | 0.65 | 17.8 | Mohr-Coulomb |
| Protective Layer of Geomembrane/Geotextile | 19 | 0 | 34 | Mohr-Coulomb |
| Crushed stone (at closure) | 19 | 0 | 38 | Mohr-Coulomb |
| Bedrock | Impenetrable | | | |

### 2.3.1 Foundation

BBA Engineering Ltd. (BBA) conducted a geotechnical investigation to assess the subsurface conditions at the proposed stockpile locations (BBA, 2024). BBA (2024) completed a total of sixty-one (61) boreholes for field tests (SPT tests) and laboratory analysis across the entire site. Among these boreholes, eleven (11) are located in stockpile 001, and eight (8) are situated in stockpile 002. The purpose of these boreholes is to determine the stratigraphy and assess the properties of the foundation soil. The selected soil samples were analyzed at the Englobe laboratory in Montréal, where tests were conducted to evaluate particle size distribution, water content, specific gravity, and uniaxial compressive strength (UCS). Additionally, assessments of elastic modulus and Poisson's ratio were performed. AtkinsRéalis analyzed the borehole logs created by BBA, along with laboratory

test data from this investigation, to develop soil profiles for the site according to the Unified Soil Classification System (USCS) and ASTM D2487-17 standards (AtkinsRéalis, 2025a). AtkinsRéalis interpreted the 'N-values' obtained from BBA's Standard Penetration Test (SPT) to provide recommendations on the material properties of the classified soil units.

Based on AtkinsRéalis' interpretations, the foundation beneath the footprints of stockpiles 001 and 002 consists of organic material, followed by a soil unit classified as SILT/Sandy SILT/SILT with Gravel (ML). Below the ML layer, a Silty SAND/Silty SAND with Gravel unit (SM) was identified. Underneath this SM layer is a Silty GRAVEL with Sand/GRAVEL with Silt and Sand unit (GM), followed by a Gravel unit (including cobbles) (GW), which is situated above the bedrock. The estimated friction angles of 31º, 34º, 38º, and 39º, along with unit weights of 18.5, 19.0, 20.0, and 20.5 kN/m³, were derived from the analysis of the SPT 'N-values' for ML, SM, GM, and GW, respectively, and were used in the model.

### 2.3.2 Tailings

Tailings intended for surface disposal consist of a mixture that includes Primary Coarse DMS floats and degrit, Secondary Coarse DMS degrit, Fine DMS floats and degrit, Ultrafine DMS floats and degrit, Recrushed DMS floats, DMS Mags, and Belt Filter Cake. Laboratory tests of this tailings' mixture indicate a particle size distribution with a $D_{80}$ of 7.68 mm and 2.9% of the material being finer than 75 microns (AtkinsRéalis, 2025b).

The laboratory analysis also determined a standard Proctor maximum dry density of 1,958 kg/m³ and an optimum moisture content of 11.7% (Ww/Ws). Consequently, a unit weight of 95% of the standard Proctor density (1,860 kg/m³ or 18.2 kN/m³) has been utilized in the model.

Based on the interpretations of CIU tests (ASTM D4767), an effective friction angle has been estimated from the model for drained loading conditions. An effective friction angle of 42° has been estimated from the CIU tests for drained loading conditions. For details, please refer to AtkinsRéalis, 2025b. However, it is essential to note that this test was conducted in a controlled laboratory environment, which may not be replicated in the field. Therefore, as a conservative approach, a friction angle of 37° has been used in the stability model analysis.

### 2.3.3 Waste Rock

There is no laboratory data available for the waste rock. An effective friction angle of 38° and a unit weight of 20 kN/m³ have been assigned to the model based on AtkinsRéalis' prior experience with similar materials, taking a conservative approach.

### 2.3.4 Geomembrane Liner and Geotextile

As discussed in section 2.1.2.1, the basin of stockpile 002 is lined with a geomembrane that has a cushion of nonwoven geotextile placed on top, which has been incorporated into the model geometry. The interface between the geotextile and the geomembrane is crucial for ensuring slope stability. To address this issue, a series of stability analyses were conducted using various combinations of geomembrane and geotextile types at a fully defined slip surface. The study demonstrated that the combination of a 1.5 mm (60 mil) double-textured LLDPE geomembrane and a nonwoven geotextile provided the highest factor of safety (FoS). As a result, this combination was selected for the design.

The LLDPE was modelled as drained, with an effective friction angle of 30.1 degrees and a unit weight of 9 kN/m³. At the same time, the nonwoven geotextile was also modelled assigning a unit weight of 1 kN/m³ for each loading condition. These model parameters were adopted from the AtkinsRéalis' database and based on specifications from various vendors.

### 2.3.5 Bedrock

The Slope failure surfaces are assumed not to pass through the bedrock. Therefore, bedrock is modelled as impenetrable, and no model parameter was assigned.

## 2.4 Phreatic Surface Assumption

The model has assigned a conservative phreatic surface based on a steady-state model where the water table lowers to the level of the peripheral drains below the natural terrain.

## 2.5 Stability Analysis Results

Drained and pseudo-static loading conditions were evaluated for all three sections at the maximum stockpile height. Undrained loading conditions were not assessed because it was assumed that water could quickly drain from the soil. Both global and local failures were investigated.

The analysis considered the critical failure surface at the interfaces between the geomembrane and geotextile materials. It was determined that the interface between the double-textured LLDPE geomembrane and the nonwoven geotextile was not a critical failure surface.

Both circular and non-circular failure mechanisms were evaluated. The predominant failure mechanism, which resulted in the lowest FoS, was identified as non-circular. Consequently, the results presented in this memo are based on non-circular failure.

There is a slight geometry difference between the project's operational and closure phases. For example, the number of benches in waste rock stockpiles 001 and 002 is higher during the operational phase than in the closure phase. While this difference may have a minor impact on the factor of safety (FoS), it is not significant. Overall, the FoS during the operational phase is slightly higher than during the closure phase.

The FoS for stockpile 001 is slightly higher than that for stockpile 002, which can be attributed to the lower height and weight of stockpile 001. This results in a comparatively lower sliding moment relative to the resisting moment. Additionally, the FoS of the tailings stockpile is lower than that of the waste rock stockpile since tailings generally have less shear strength than waste rock.

There are slight variations in the FoS among local failures across different benches, attributed to the varying orientation of entry-exit lines and the positioning of the benches. Generally, benches at higher elevations exhibit a higher FoS than those at lower elevations.
As shown in **Table 2-3**, the proposed configurations and optimizations demonstrate that the FoS for stockpile 001 meets the minimum requirements established by the Québec Regulations (MRNF, 2024) across all loading scenarios, including both global and local failure.

**Table 2-3 Factor of Safety of the Slope Stability Analysis**

| Stockpile | Phase | Section | Loading Conditions | Minimum requirement of FoS | FoS | Reference | Failure Type |
|---|---|---|---|---|---|---|---|
| 001 | Operational | A1-A1 | Static (Drained) | 1.5 | 2.53 | Figure A-1 | Global |
| 002 | Operational | H-H | Static (Drained) | 1.5 | 2.31 | Figure A-2 | Global |
| 002 | Operational | B1-B1 | Static (Drained) | 1.5 | 2.13 | Figure A-3 | Global |
| 001 | Operational | A1-A1 | Pseudo-static | 1.3 | 1.91 | Figure A-4 | Global |
| 002 | Operational | H-H | Pseudo-static | 1.3 | 1.76 | Figure A-5 | Global |
| 002 | Operational | B1-B1 | Pseudo-static | 1.3 | 1.60 | Figure A-6 | Global |
| 001 | Closure | A1-A1 | Static (Drained) | 1.5 | 2.41 | Figure A-7 | Global |
| 002 | Closure | H-H | Static (Drained) | 1.5 | 2.32 | Figure A-8 | Global |
| 002 | Closure | B1-B1 | Static (Drained) | 1.5 | 2.13 | Figure A-9 | Global |
| 001 | Closure | A1-A1 | Pseudo-static | 1.3 | 1.84 | Figure A-10 | Global |
| 002 | Closure | H-H | Pseudo-static | 1.3 | 1.75 | Figure A-11 | Global |
| 002 | Closure | B1-B1 | Pseudo-static | 1.3 | 1.60 | Figure A-12 | Global |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.80 | Figure A-13 | Local (Bench 1) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.30 | Figure A-14 | Local (Bench 2) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.22 | Figure A-15 | Local (Bench 3) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.27 | Figure A-16 | Local (Bench 4) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.26 | Figure A-17 | Local (Bench 5) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.25 | Figure A-18 | Local (Bench 6) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.25 | Figure A-19 | Local (Bench 7) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.38 | Figure A-20 | Local (Bench 8) |
| 001 | Operational | A1-A1 | Static (Drained) | 1.2 | 1.24 | Figure A-21 | Local (Bench 9) |
| 001 | Closure | A1-A1 | Static (Drained) | 1.2 | 2.41 | Figure A-22 | Local (Bench 1) |
| 001 | Closure | A1-A1 | Static (Drained) | 1.2 | 2.33 | Figure A-23 | Local (Bench 2) |
| 001 | Closure | A1-A1 | Static (Drained) | 1.2 | 2.21 | Figure A-24 | Local (Bench 3) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.63 | Figure A-25 | Local (Bench 1) |

| Stockpile | Phase | Section | Loading Conditions | Minimum requirement of FoS | FoS | Reference | Failure Type |
|---|---|---|---|---|---|---|---|
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.49 | Figure A-26 | Local (Bench 2) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.31 | Figure A-27 | Local (Bench 3) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.37 | Figure A-28 | Local (Bench 4) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.36 | Figure A-29 | Local (Bench 5) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.42 | Figure A-30 | Local (Bench 6) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.37 | Figure A-31 | Local (Bench 7) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.42 | Figure A-32 | Local (Bench 8) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.46 | Figure A-33 | Local (Bench 9) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.37 | Figure A-34 | Local (Bench 10) |
| 002 | Operational | H-H | Static (Drained) | 1.2 | 1.35 | Figure A-35 | Local (Bench 11) |
| 002 | Closure | H-H | Static (Drained) | 1.2 | 2.43 | Figure A-36 | Local (Bench 1) |
| 002 | Closure | H-H | Static (Drained) | 1.2 | 2.37 | Figure A-37 | Local (Bench 2) |
| 002 | Closure | H-H | Static (Drained) | 1.2 | 2.44 | Figure A-38 | Local (Bench 3) |
| 002 | Closure | H-H | Static (Drained) | 1.2 | 2.21 | Figure A-39 | Local (Bench 4) |
| 002 | Operational | B1-B1 | Static (Drained) | 1.2 | 2.36 | Figure A-40 | Local (Bench 1) |
| 002 | Operational | B1-B1 | Static (Drained) | 1.2 | 2.28 | Figure A-41 | Local (Bench 2) |
| 002 | Operational | B1-B1 | Static (Drained) | 1.2 | 2.28 | Figure A-42 | Local (Bench 3) |
| 002 | Operational | B1-B1 | Static (Drained) | 1.2 | 1.84 | Figure A-43 | Local (Bench 4) |
| 002 | Closure | B1-B1 | Static (Drained) | 1.2 | 2.33 | Figure A-44 | Local (Bench 1) |
| 002 | Closure | B1-B1 | Static (Drained) | 1.2 | 2.36 | Figure A-45 | Local (Bench 2) |
| 002 | Closure | B1-B1 | Static (Drained) | 1.2 | 2.29 | Figure A-46 | Local (Bench 3) |
| 002 | Closure | B1-B1 | Static (Drained) | 1.2 | 1.90 | Figure A-47 | Local (Bench 4) |

# 3 Conclusions

A study has investigated the stability of stockpiles 001 and 002. The following conclusions can be drawn from the study:

- The Factor of Safety (FoS) for both stockpiles 001 and 002 meets the minimum requirements set by the Quebec Regulations (MRNF, 2024) under different loading conditions for both the operational and closure stages;
- The lowest safety factors identified were found to be non-circular;
- The factor of safety (FoS) for stockpile 001 is slightly higher than that for stockpile 002. This is due to the lower height and weight of stockpile 001 compared to stockpile 002, which results in a relatively lower sliding moment than the resisting moment;
- The FoS of the tailings stockpile is lower than that of the waste rock stockpile since tailings generally have less shear strength than waste rock, and
- There are some uncertainties regarding the foundation's strength under the footprint of stockpiles 001 and 002. During the detailed design phase, further geotechnical investigations will be necessary to determine whether any thick, weak layers beneath the stockpile footprints might be at risk of liquefaction. The design should be adjusted accordingly based on these findings.

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# Appendix A Stability Analysis Results

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

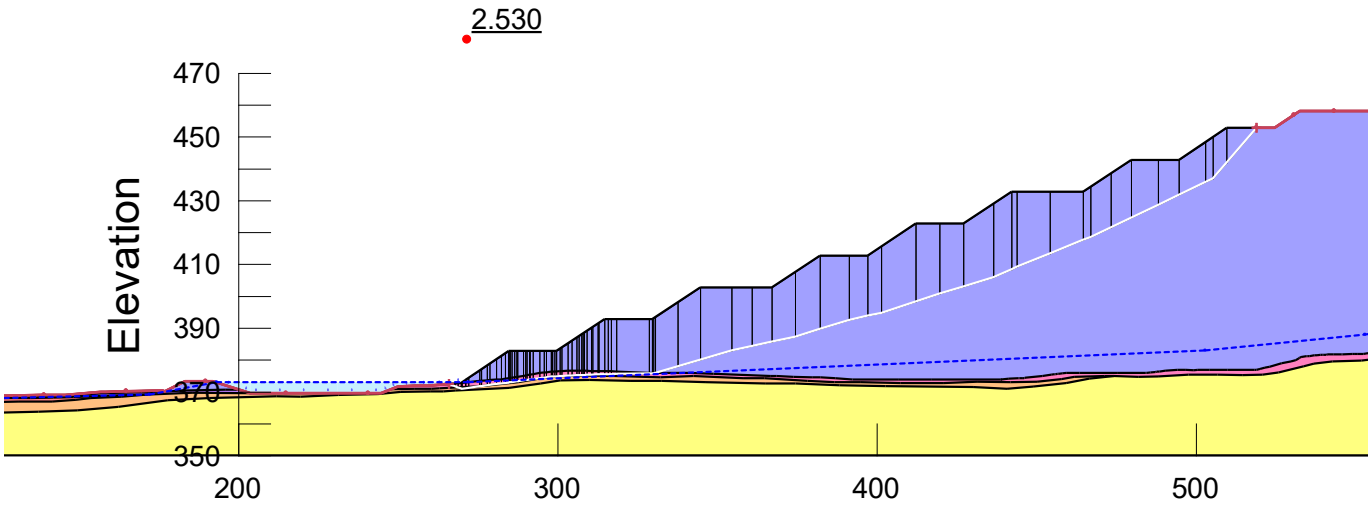



Figure A-1: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase

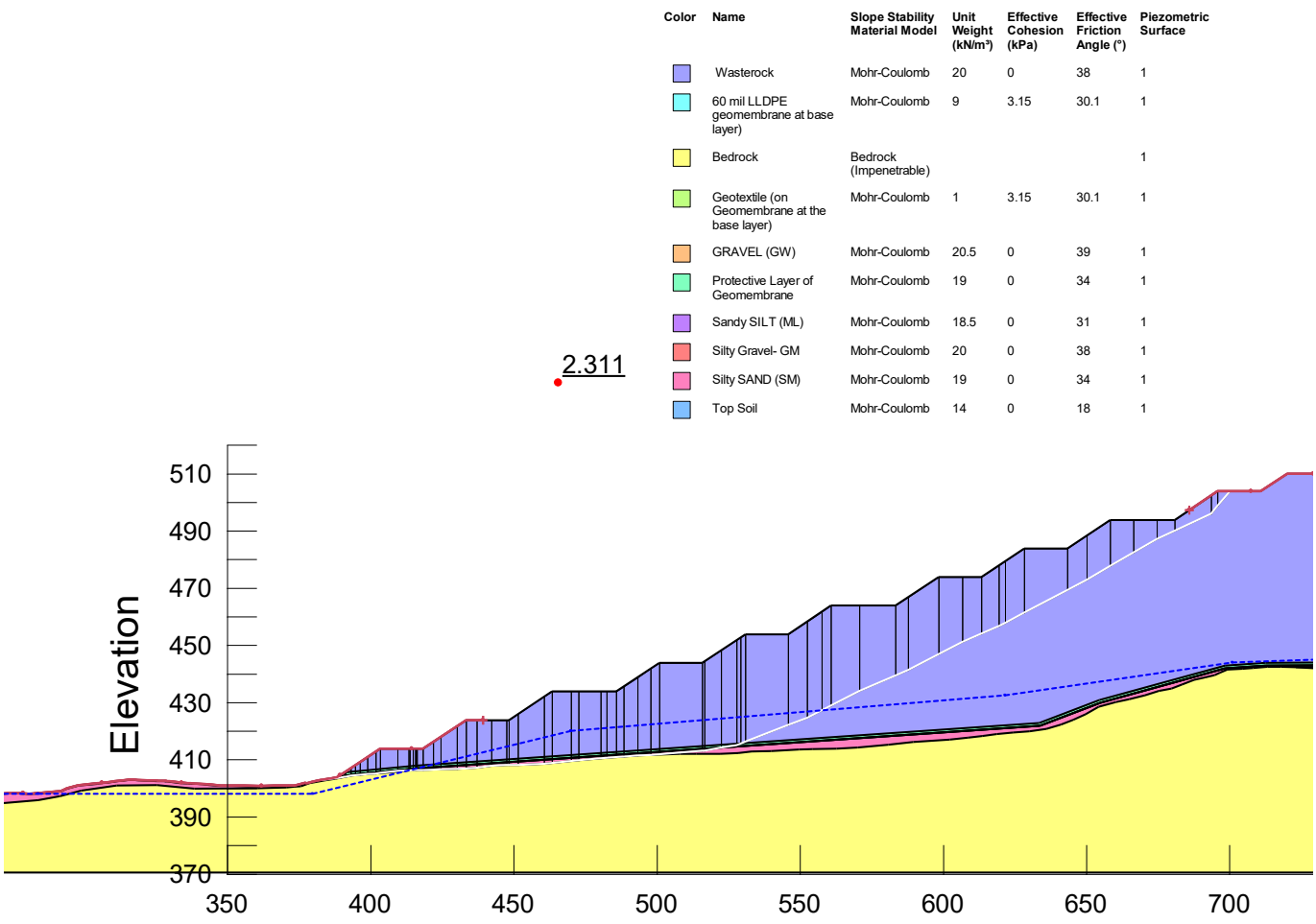



Figure A-2: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

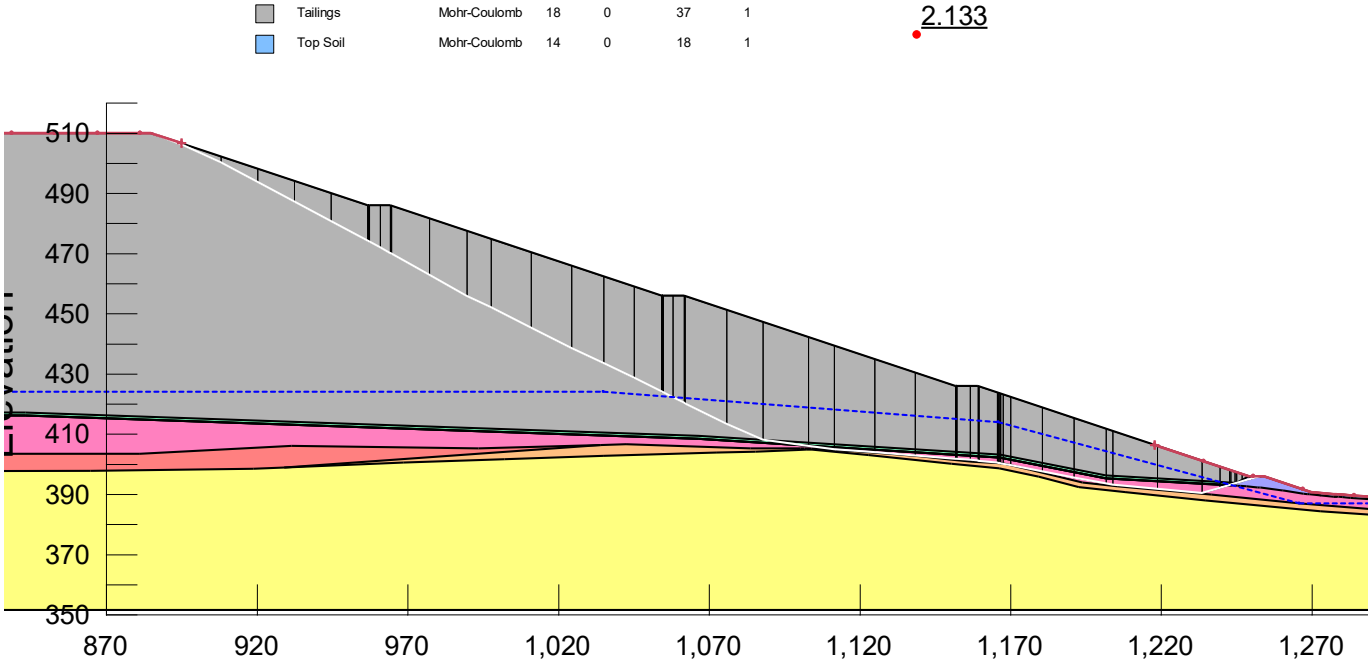



Figure A-3: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Operational Phase

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | | | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 0 | 0 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 0 | 0 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 0 | 0 | 1 |

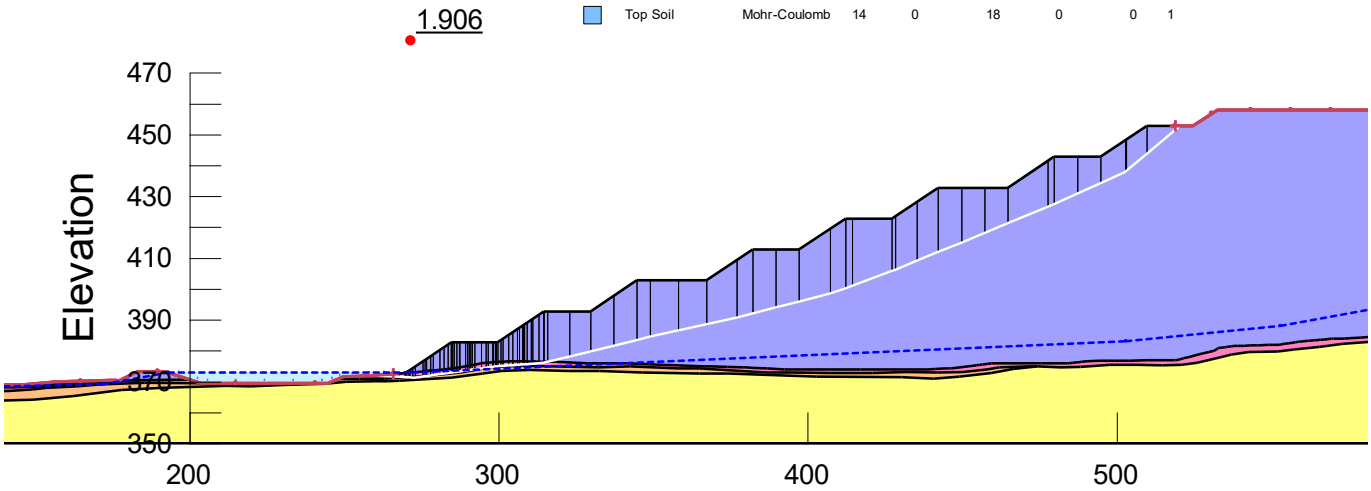



Figure A-4: Stability Results for Static (Pseudostatic) Analysis at Stockpile 001 for NAG at Operational Phase

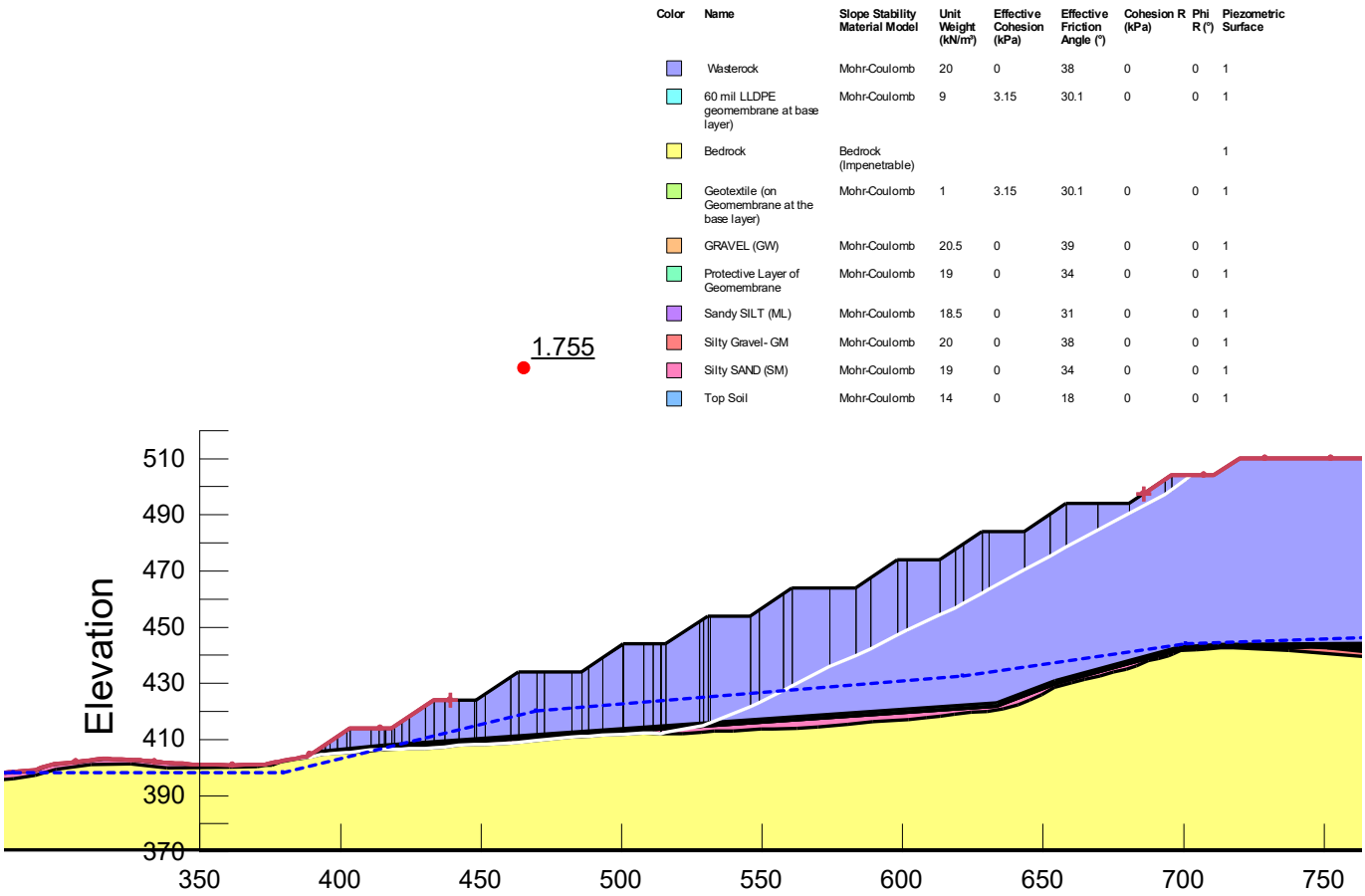



Figure A-5: Stability Results for Static (Pseudostatic) Analysis at Stockpile 002 for PAG at Operational Phase

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 0 | 0 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | | | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 0 | 0 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 0 | 0 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 0 | 0 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 0 | 0 | 1 |

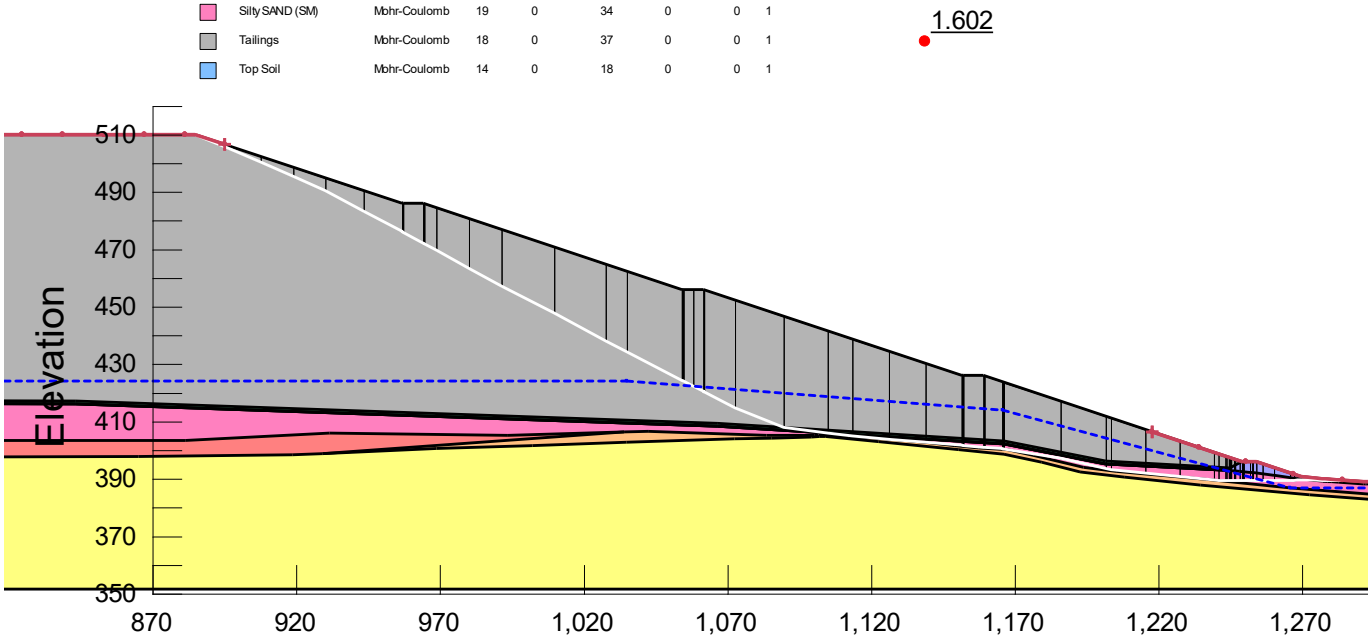



Figure A-6: Stability Results for Static (Pseudostatic) Analysis at Stockpile 002 for Tailings at Operational Phase

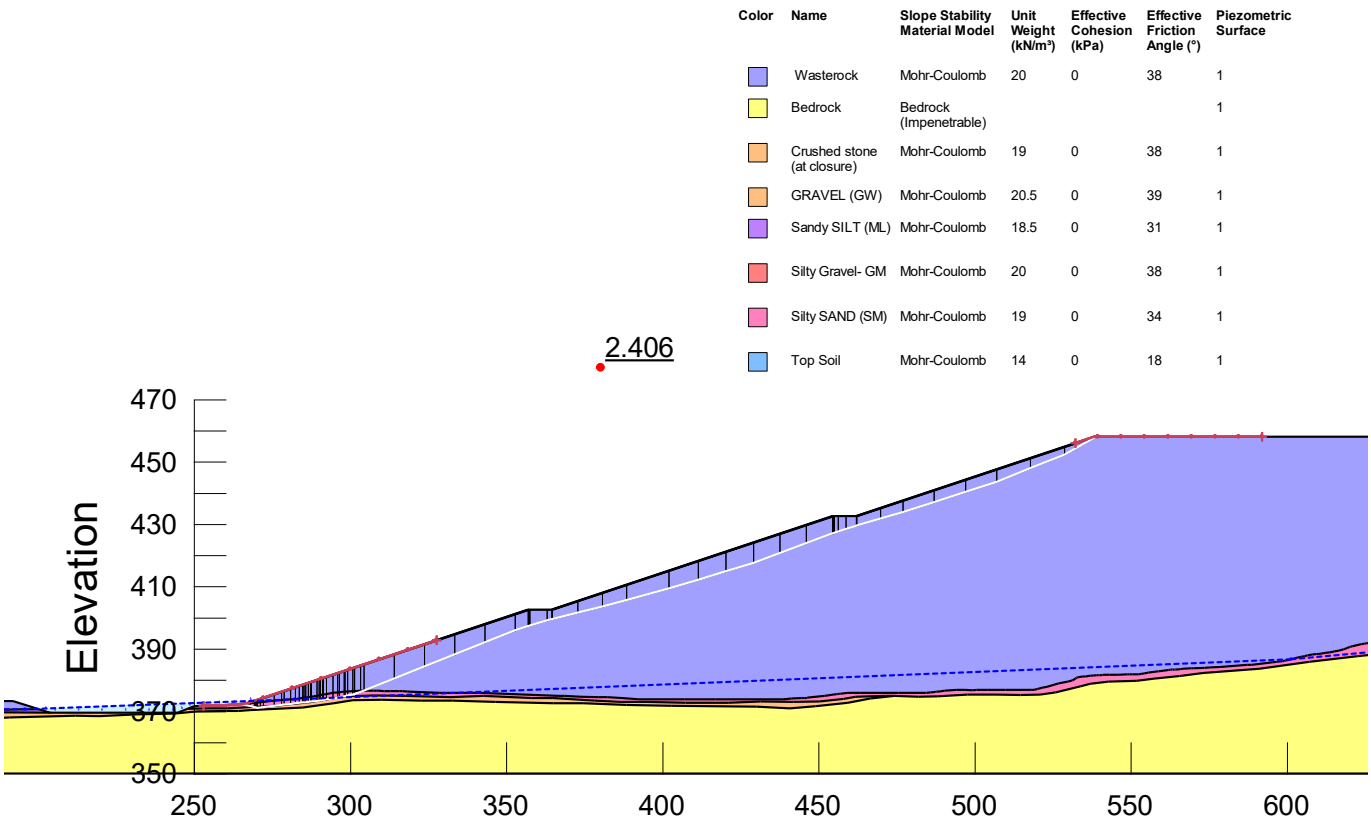



Figure A-7: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Closure

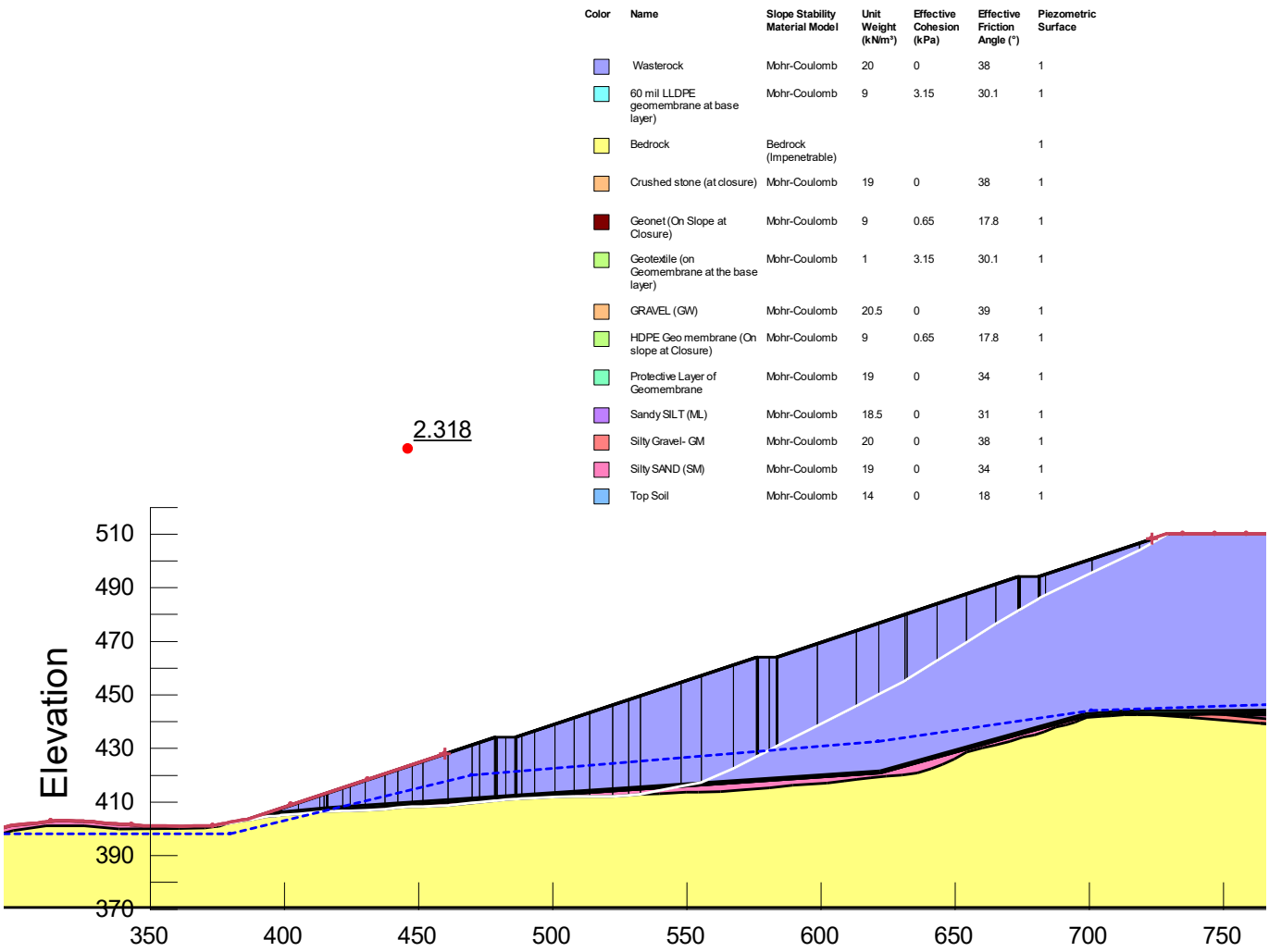



Figure A-8: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Closure

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

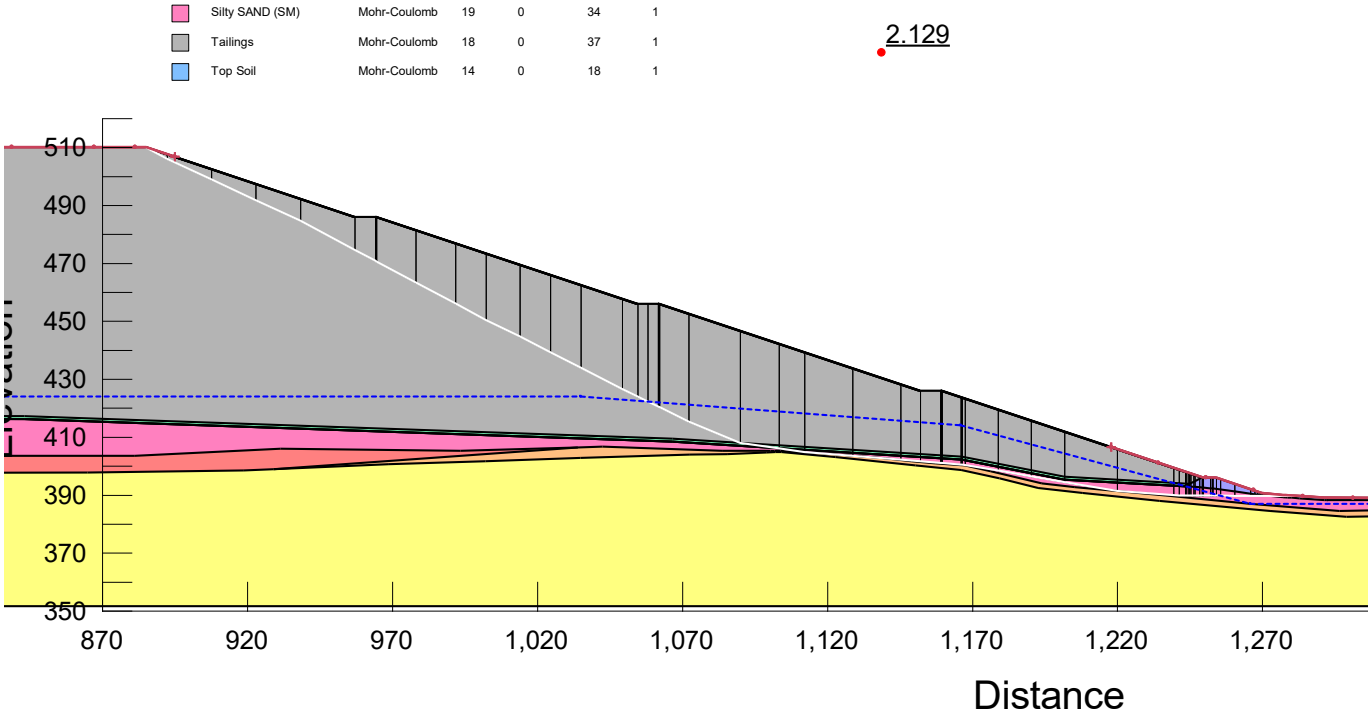



Figure A-9: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Closure

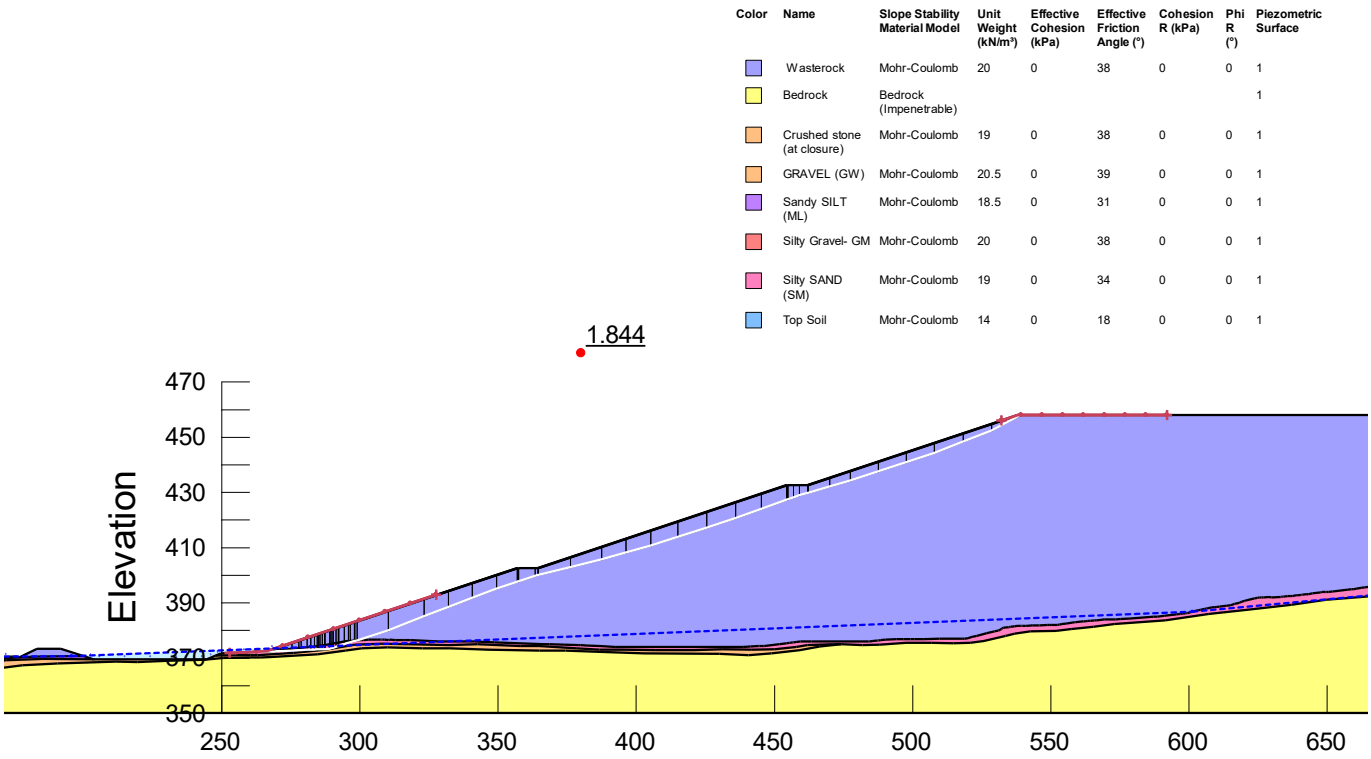



Figure A-10: Stability Results for Psudostatic Analysis at Stockpile 001 for NAG at Closure

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 0 | 0 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | | | 1 |
| | Crushed stone (at closure) | Mohr-Coulomb | 19 | 0 | 38 | 0 | 0 | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 0 | 0 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 0 | 0 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 0 | 0 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 0 | 0 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 0 | 0 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 0 | 0 | 1 |

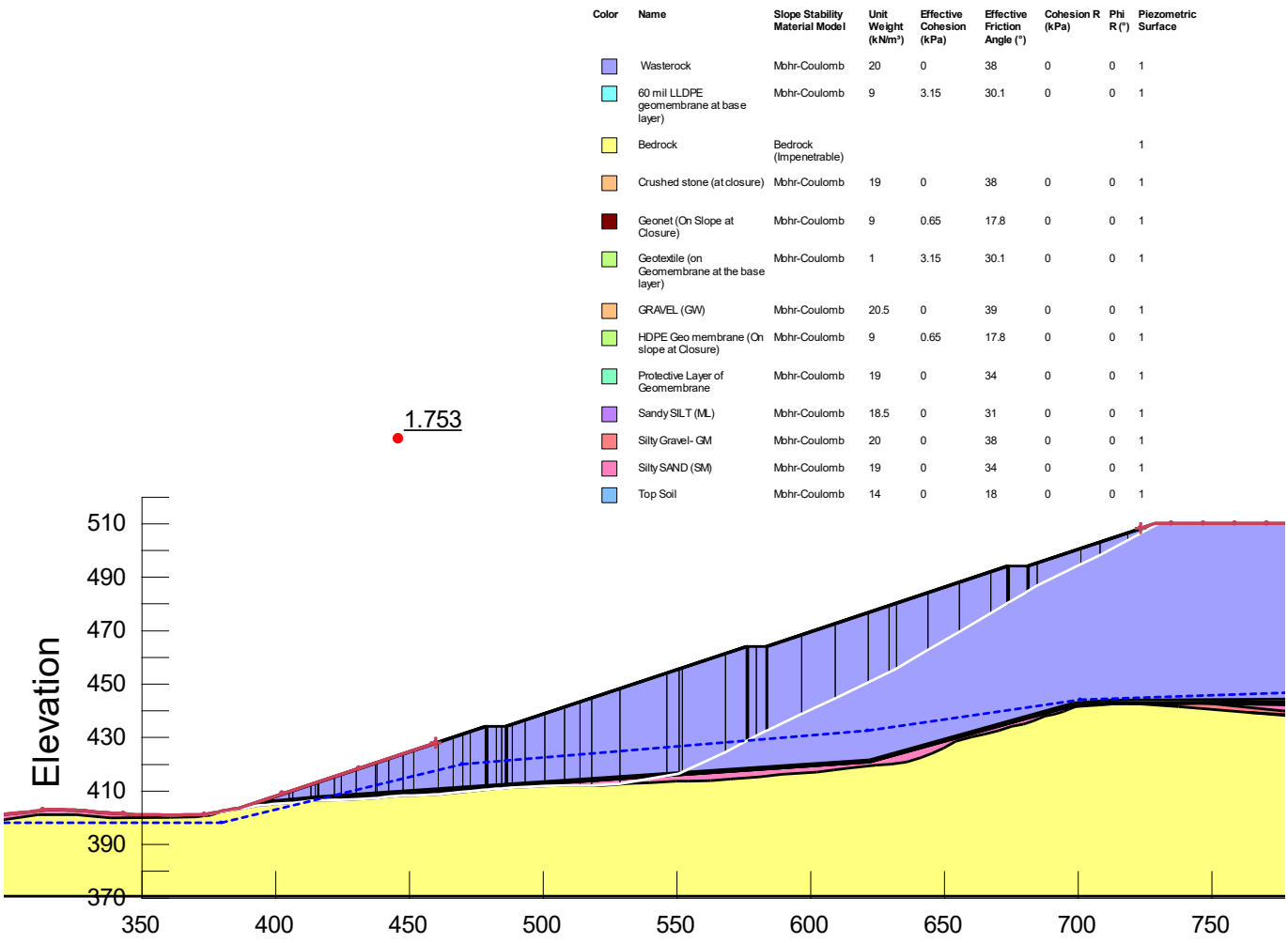



Figure A-11: Stability Results for Psudostatic Analysis at Stockpile 002 for PAG at Closure

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Cohesion R (kPa) | Phi R (°) | Piezometric Surface |
|---|---|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 0 | 0 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | | | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 0 | 0 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 0 | 0 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 0 | 0 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 0 | 0 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 0 | 0 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 0 | 0 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 0 | 0 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 0 | 0 | 1 |

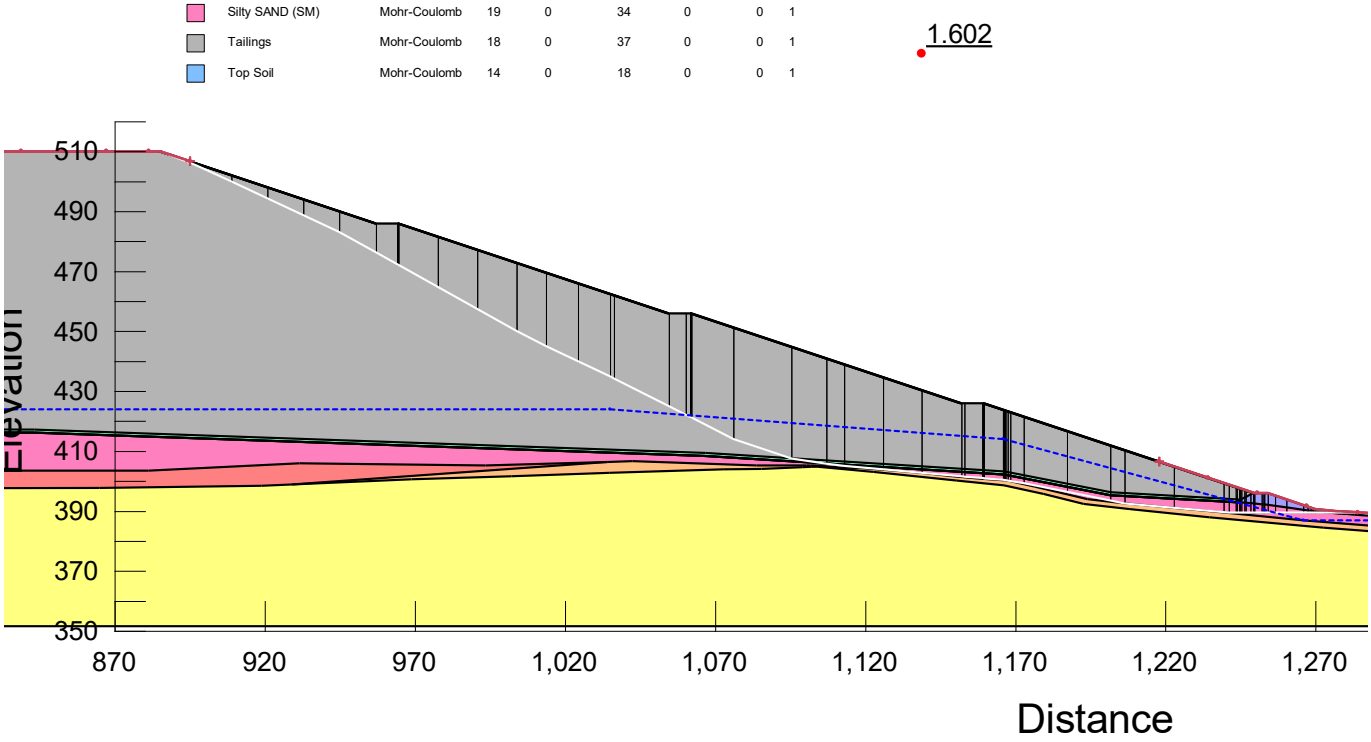



Figure A-12: Stability Results for Psudostatic Analysis at Stockpile 002 for Tailings at Closure

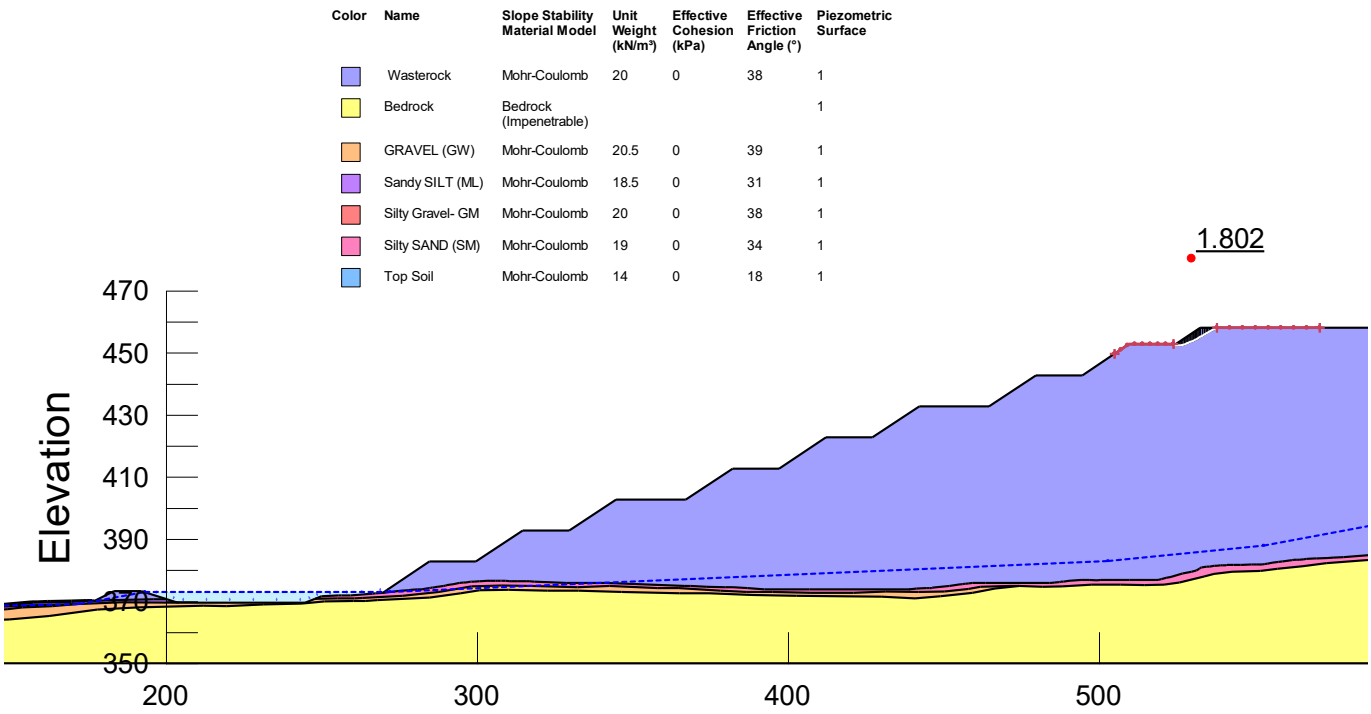



Figure A-13: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 1)

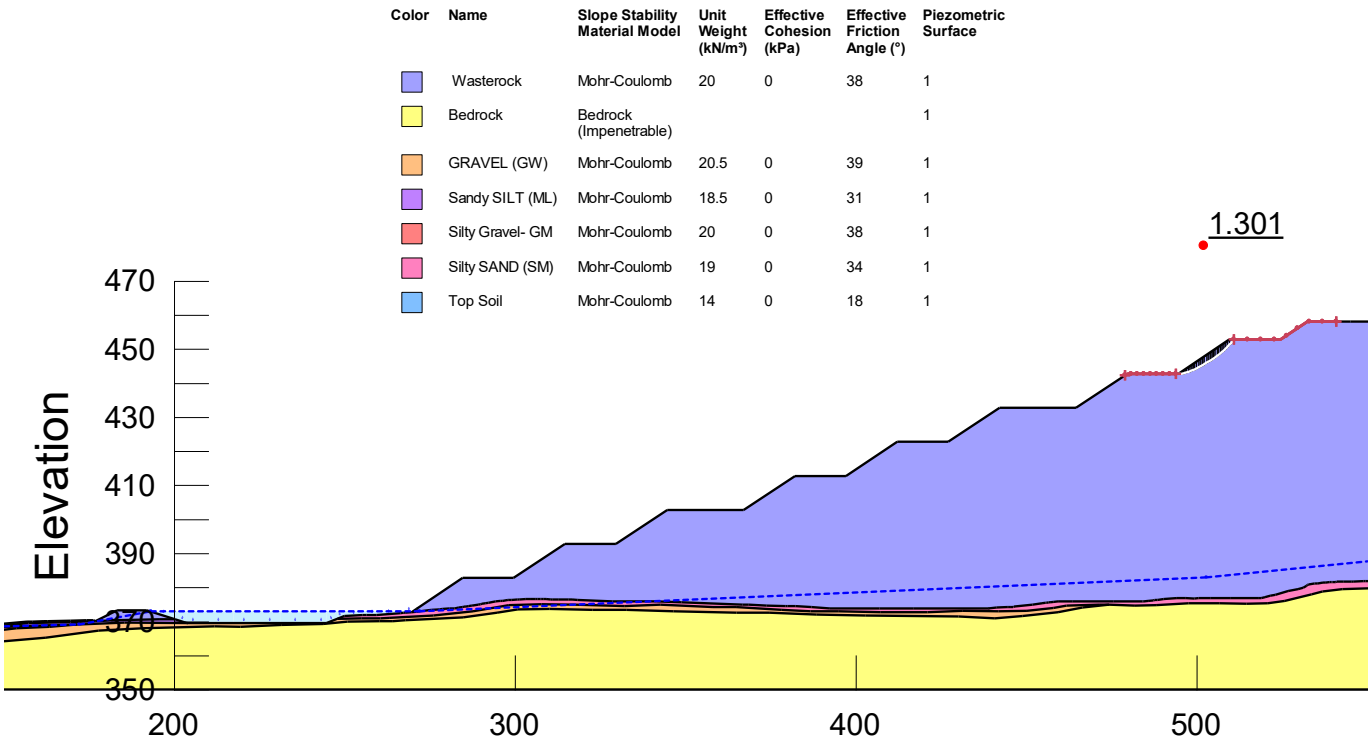


Figure A-14: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 2)

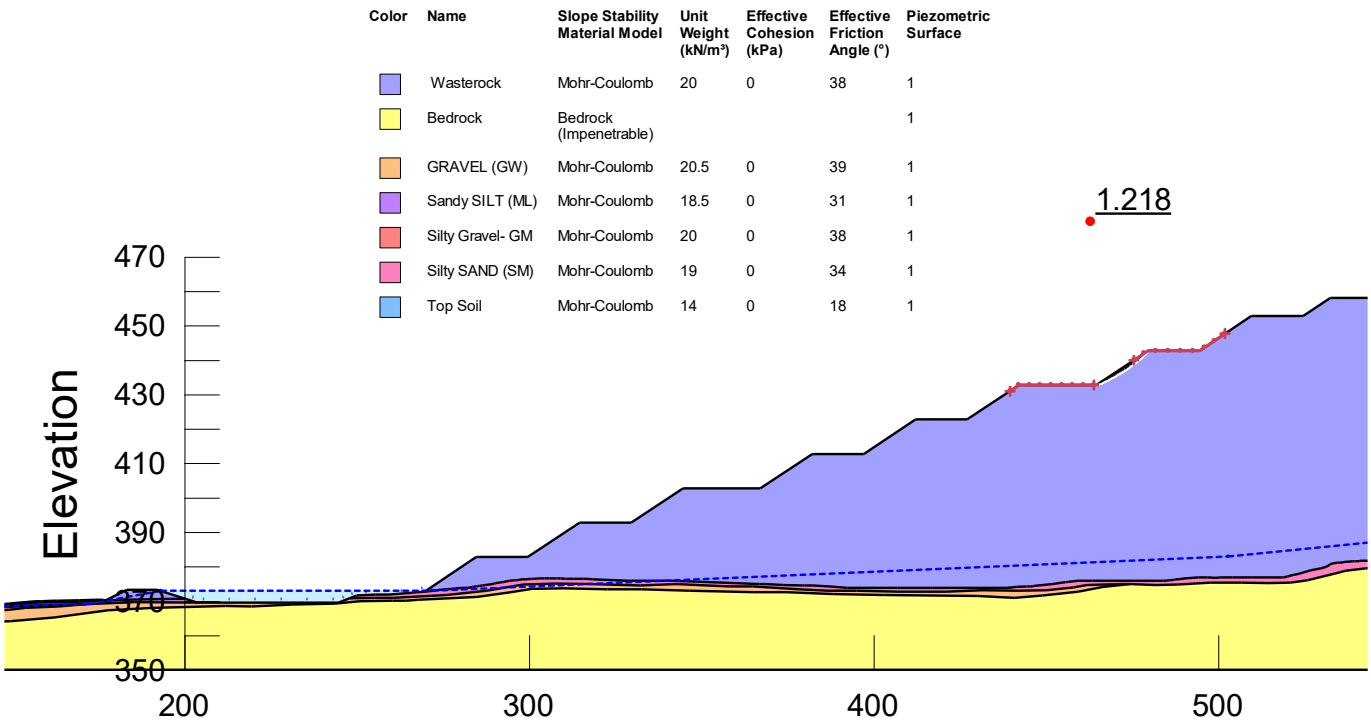



Figure A-15: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 3)

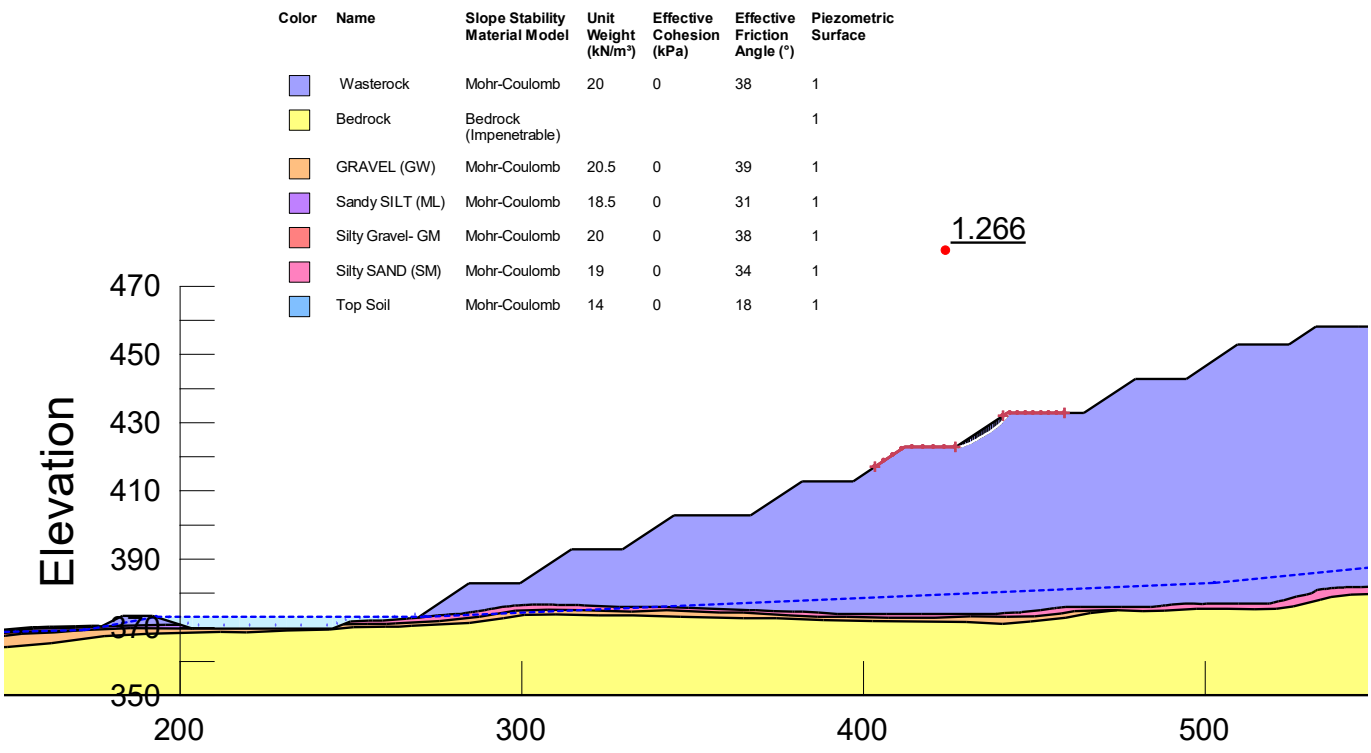



Figure A-16: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 4)

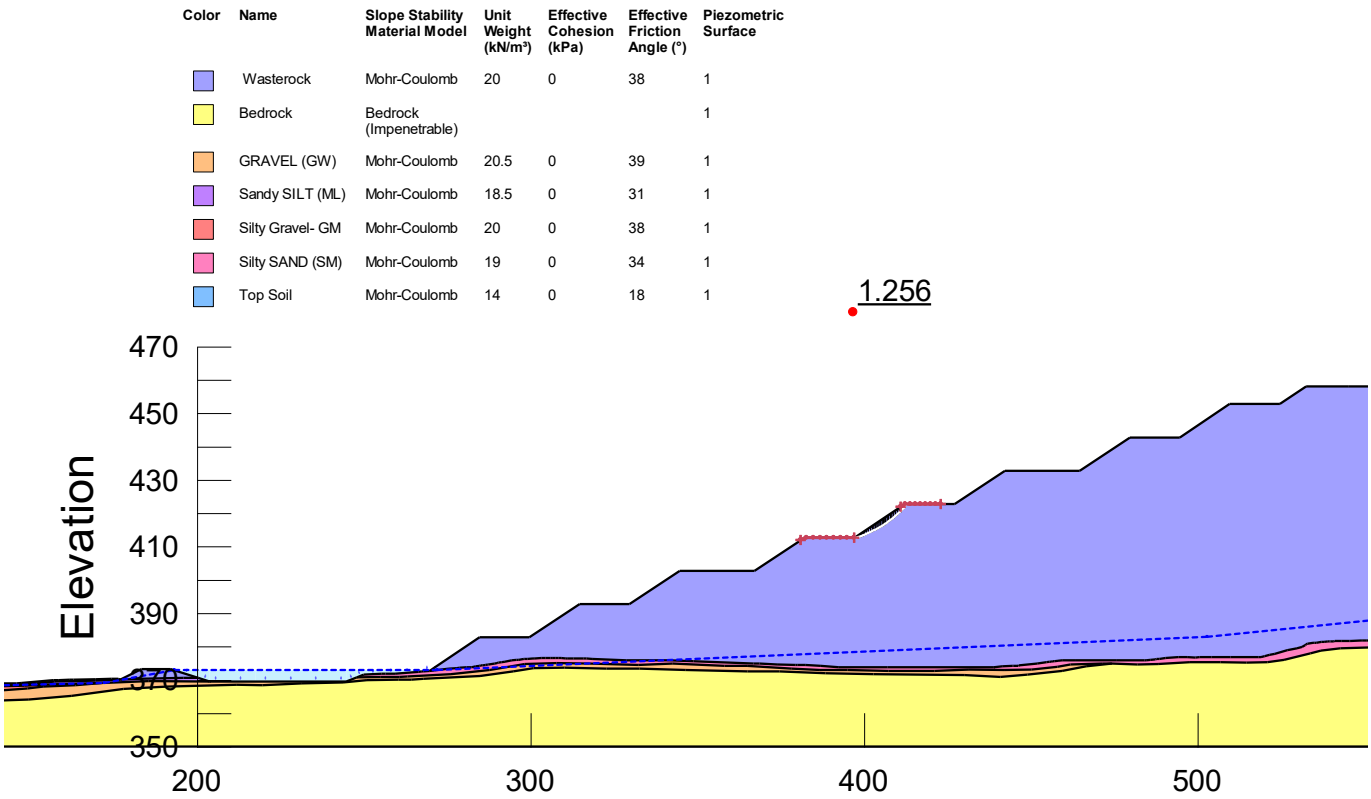



Figure A-17: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 5)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

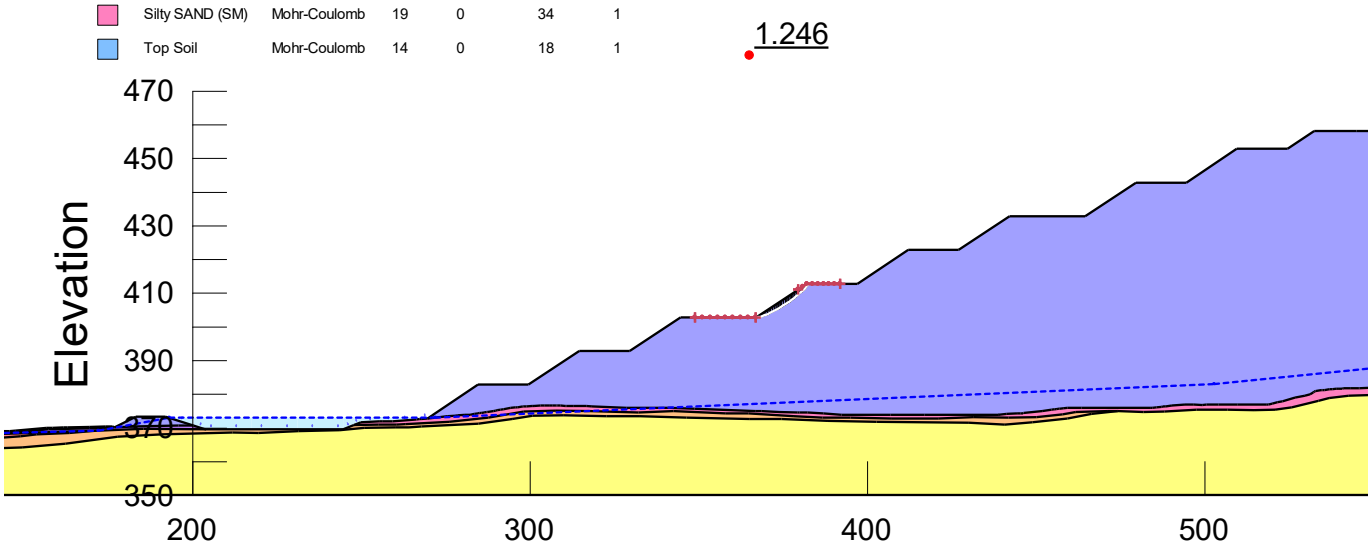



Figure A-18: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 6)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

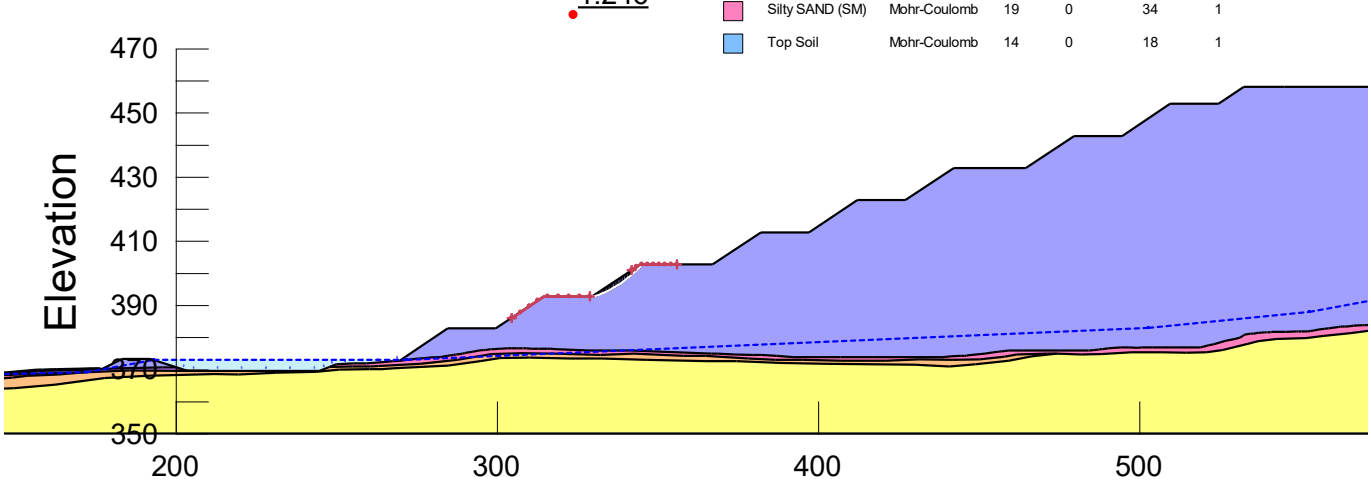


Figure A-19: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 7)

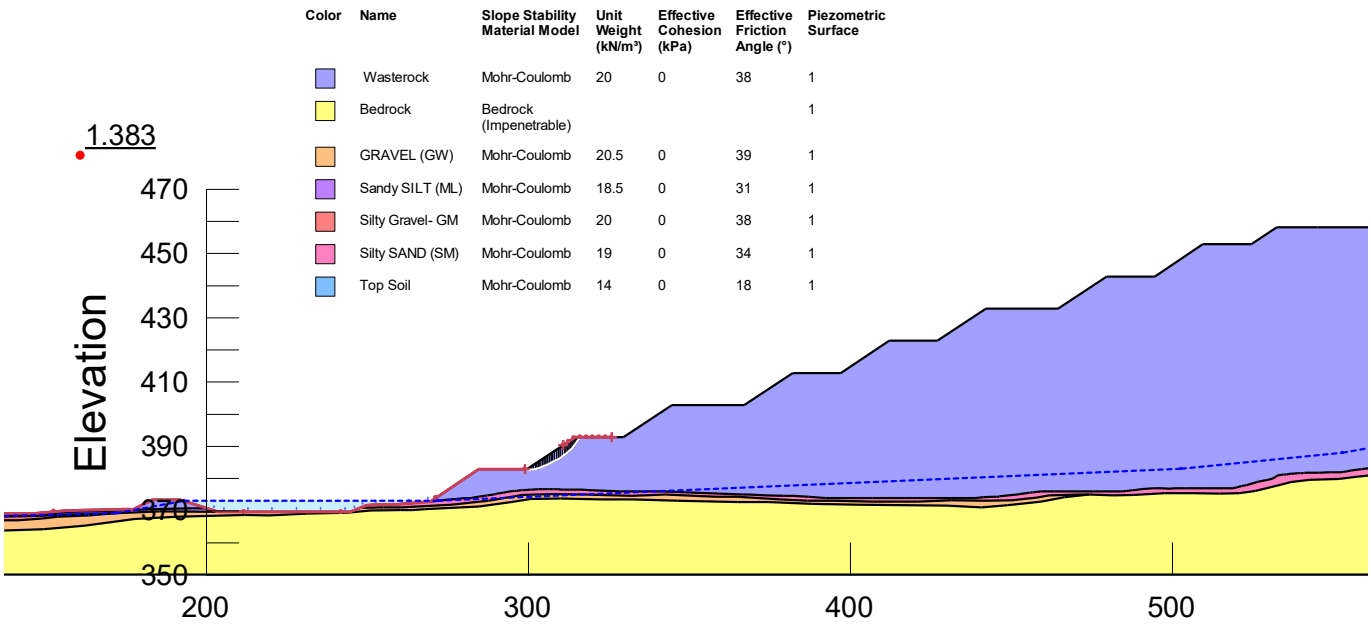



Figure A-20: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 8)

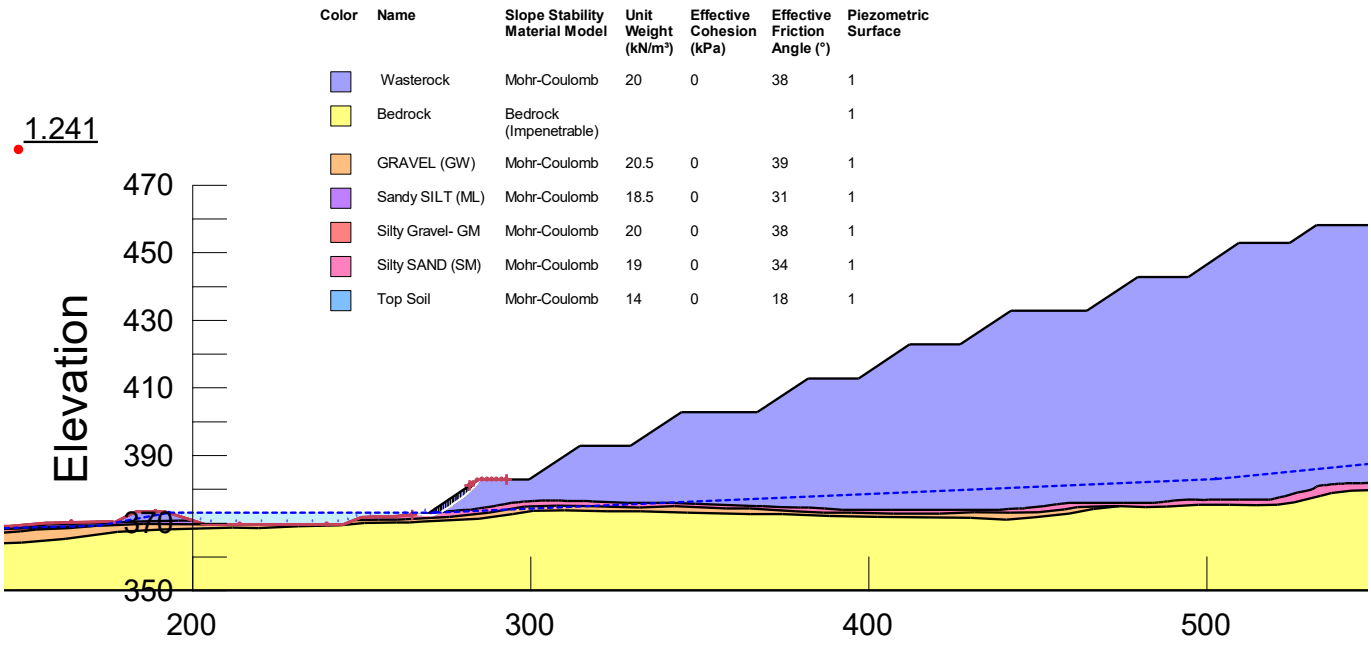



Figure A-21: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Operational Phase of Local Failure (Bench 9)

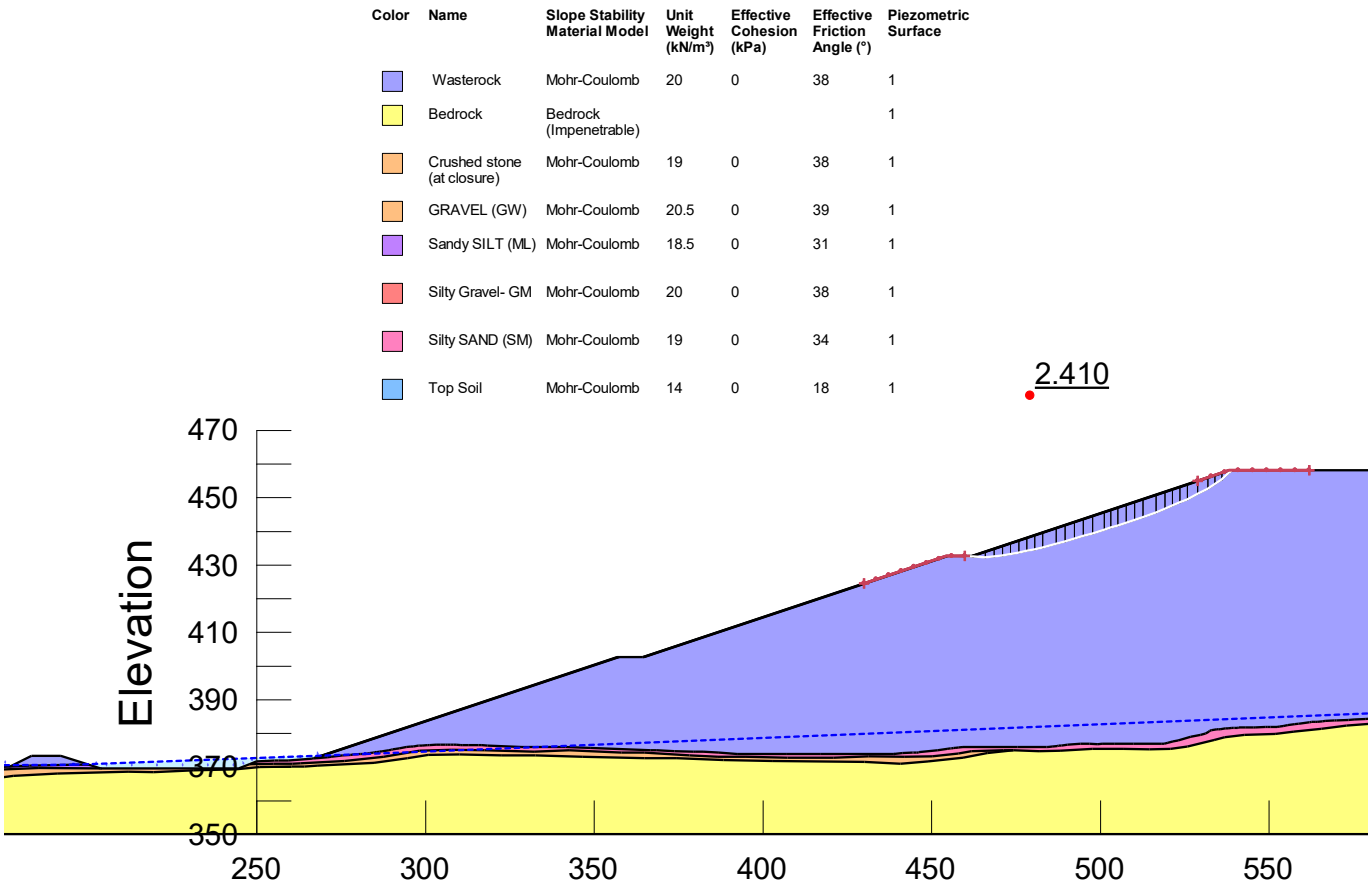



Figure A-22: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Closure Phase of Local Failure (Bench 1)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Crushed stone (at closure) | Mohr-Coulomb | 19 | 0 | 38 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

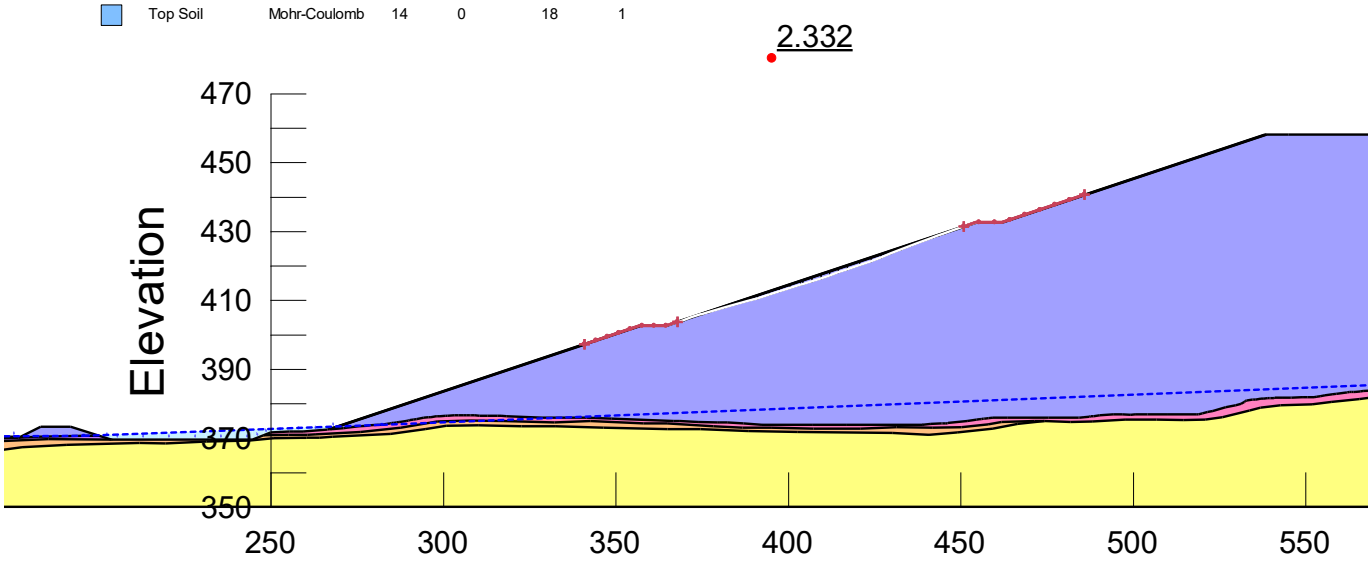



Figure A-23: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Closure Phase of Local Failure (Bench 2)

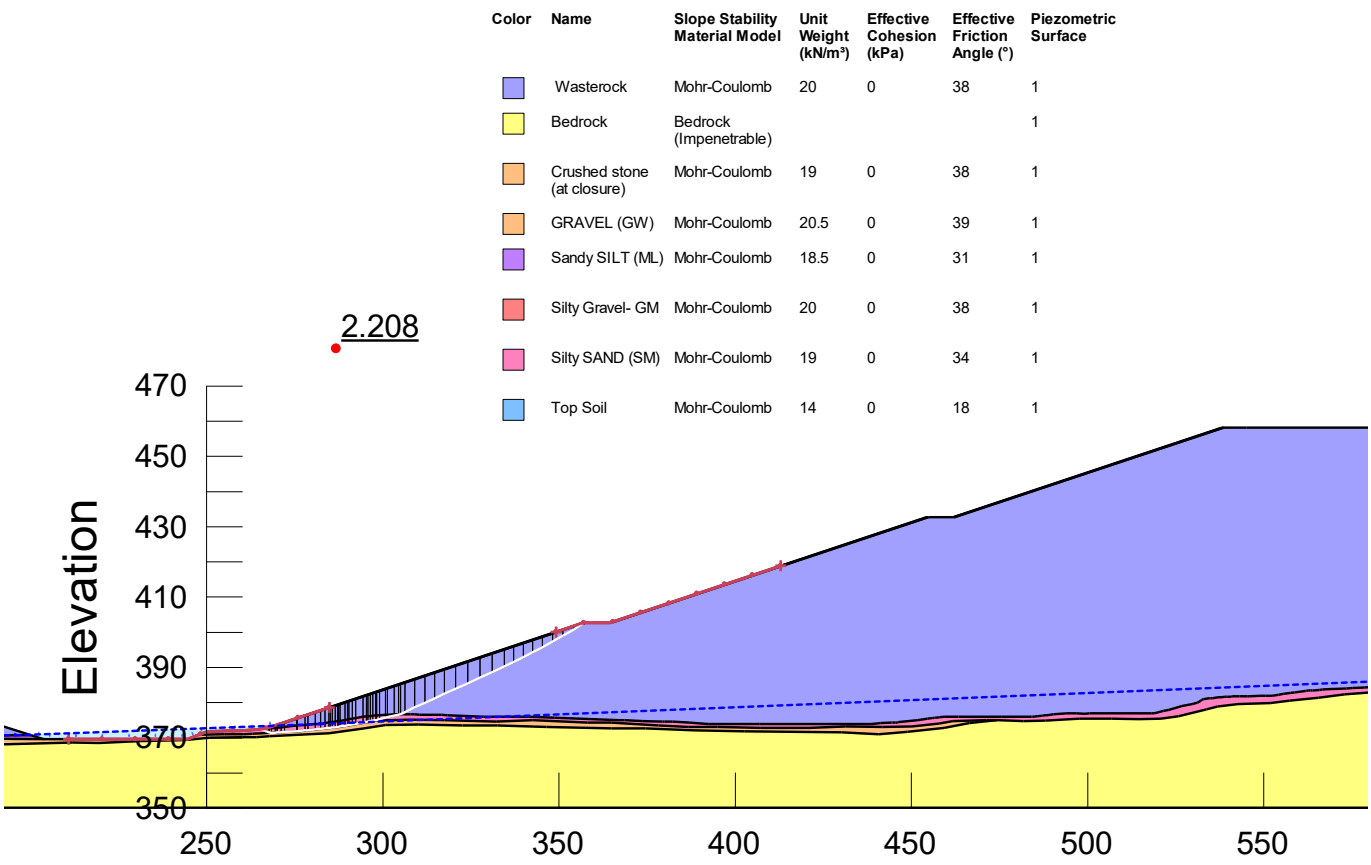



Figure A-24: Stability Results for Static (Drained) Analysis at Stockpile 001 for NAG at Closure Phase of Local Failure (Bench 3)

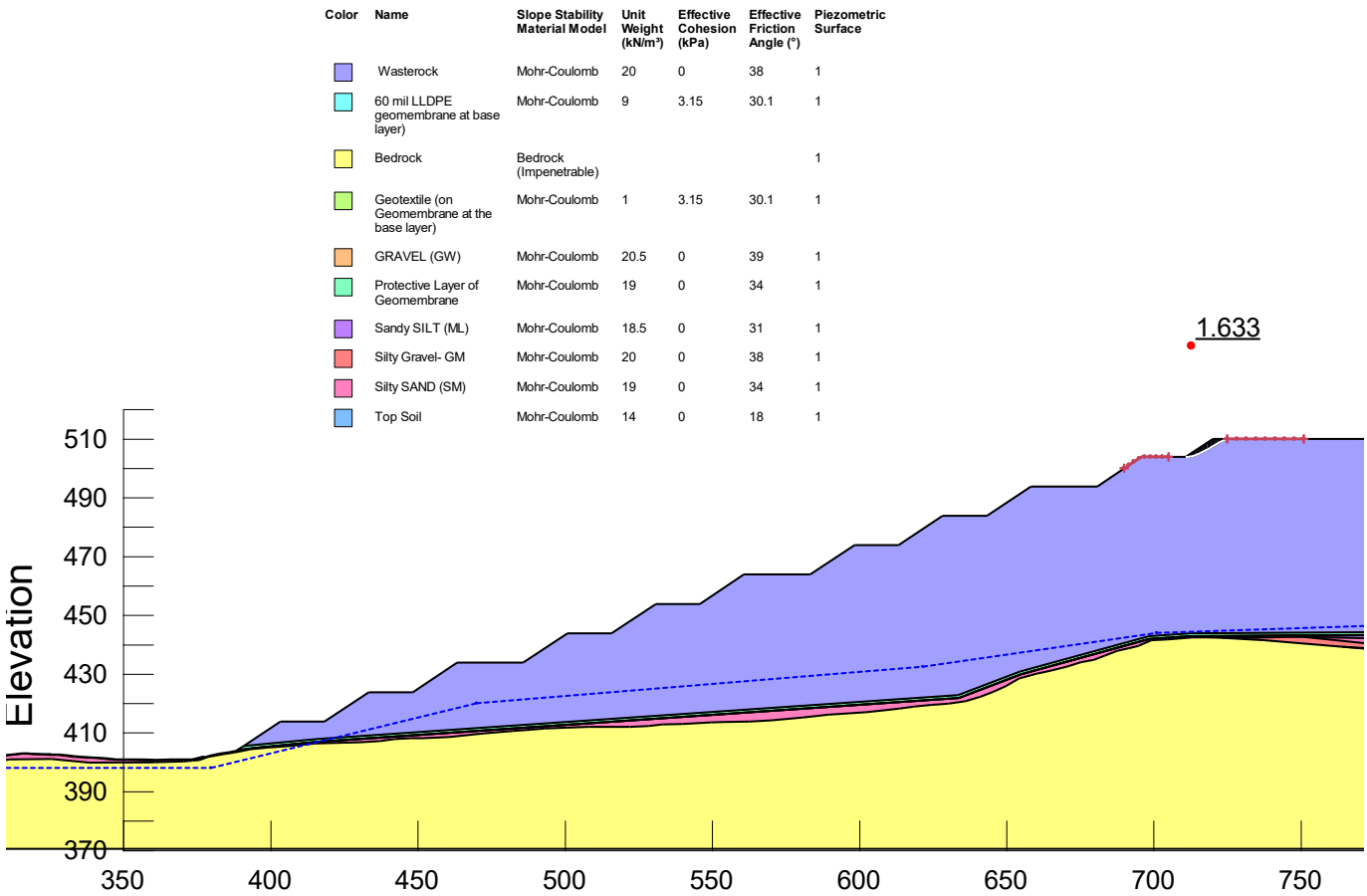



Figure A-25: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 1)

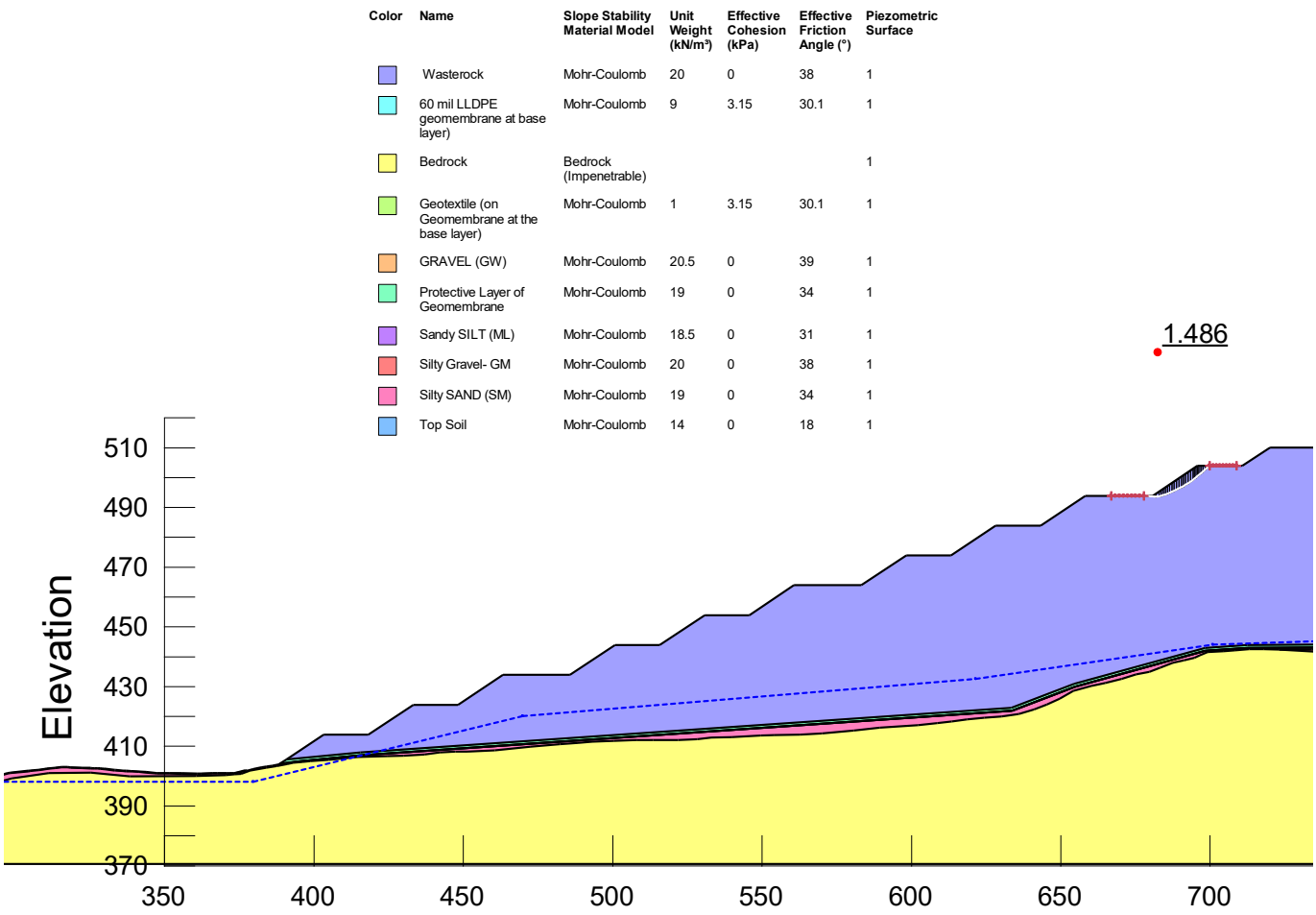



Figure A-26: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 2)

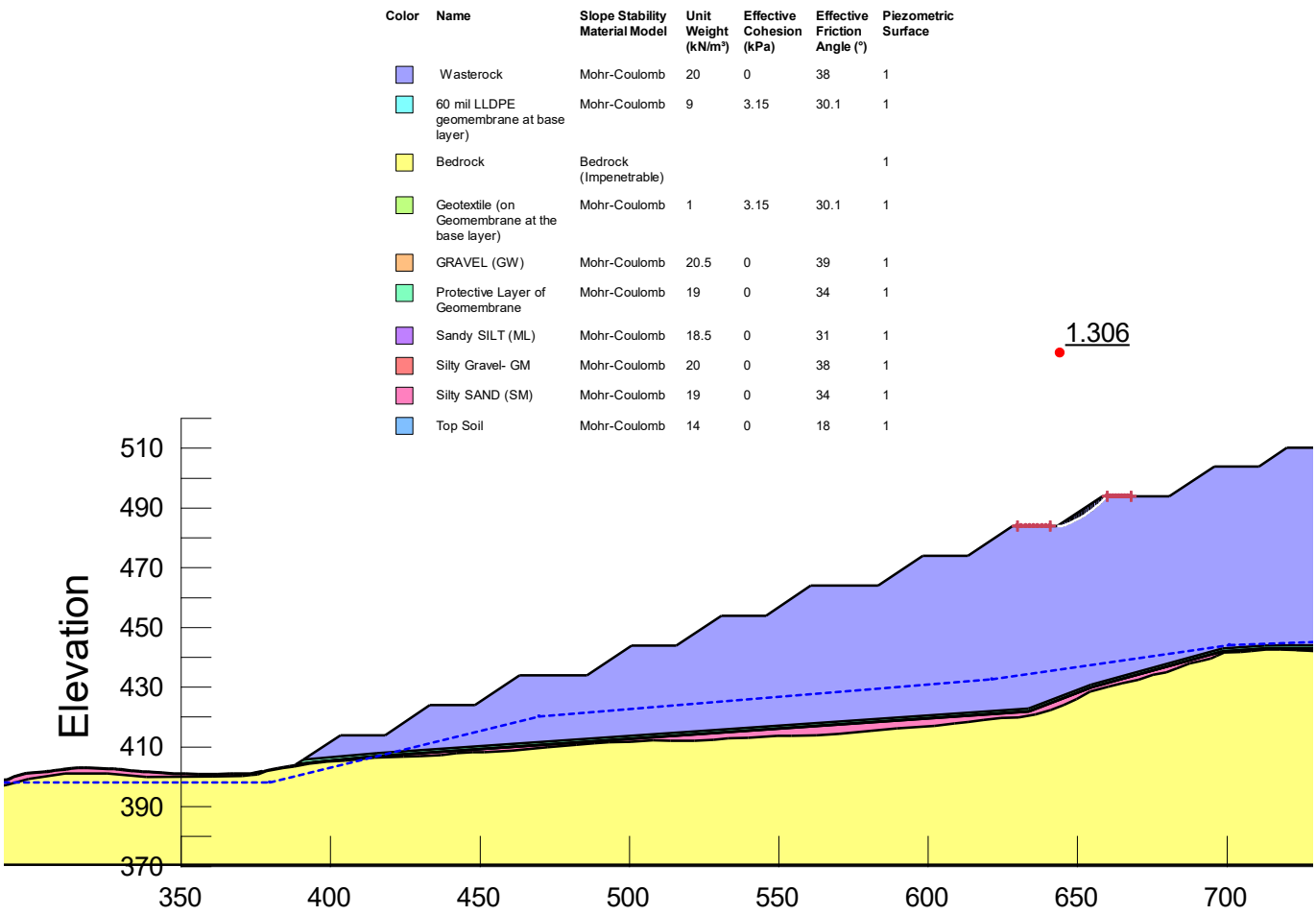



Figure A-27: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 3)

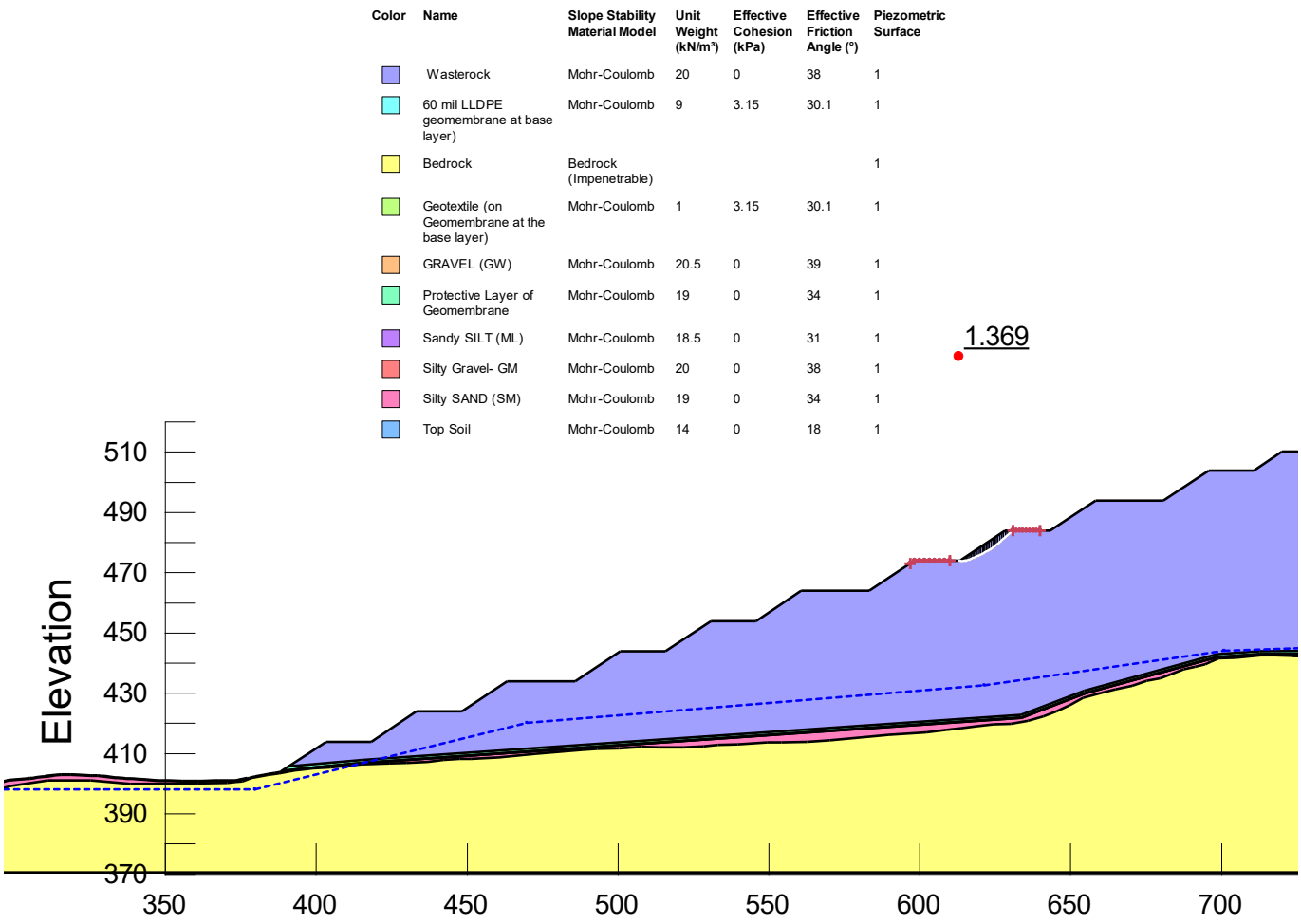



Figure A-28: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 4)

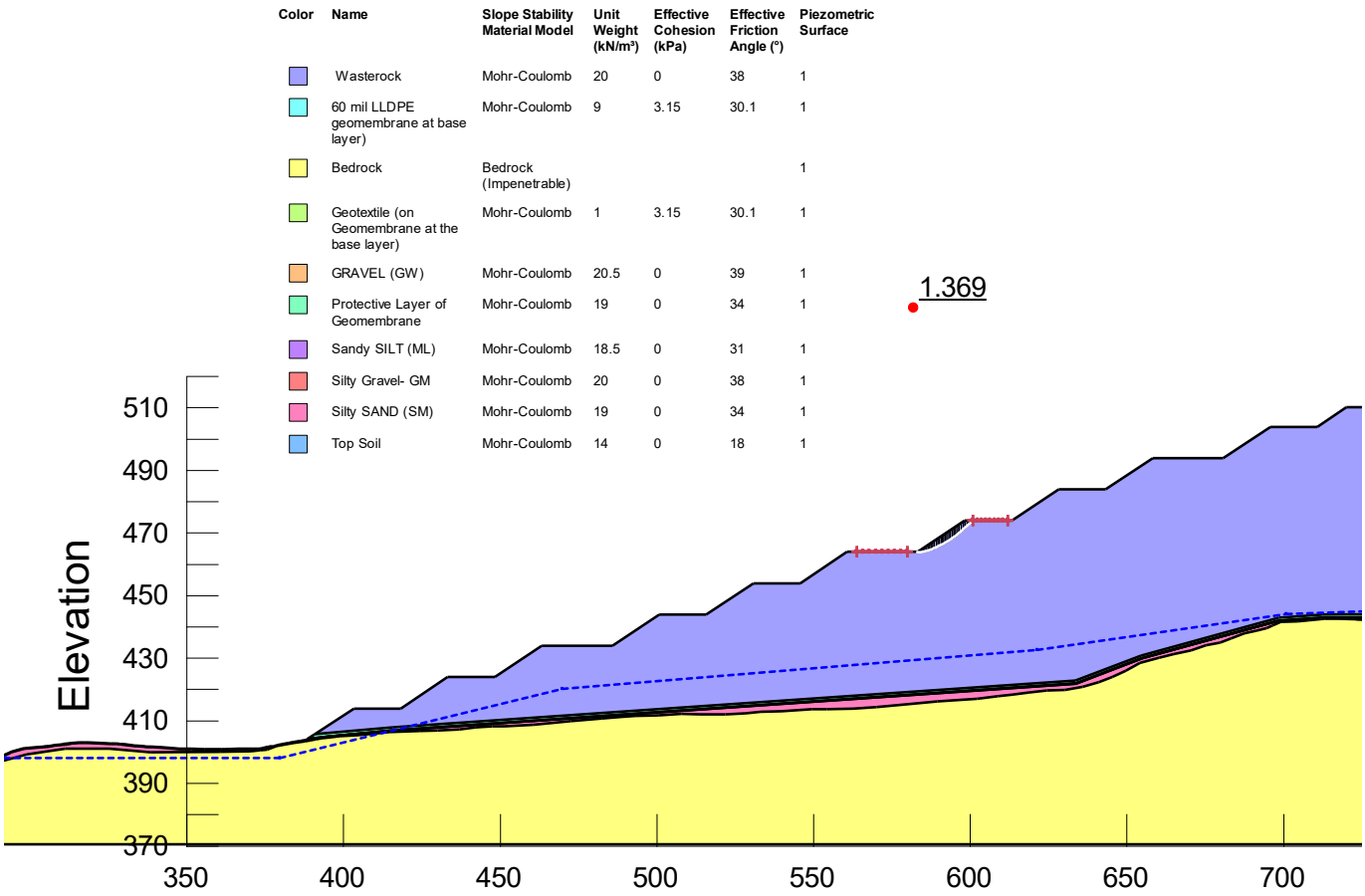



Figure A-29: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 5)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

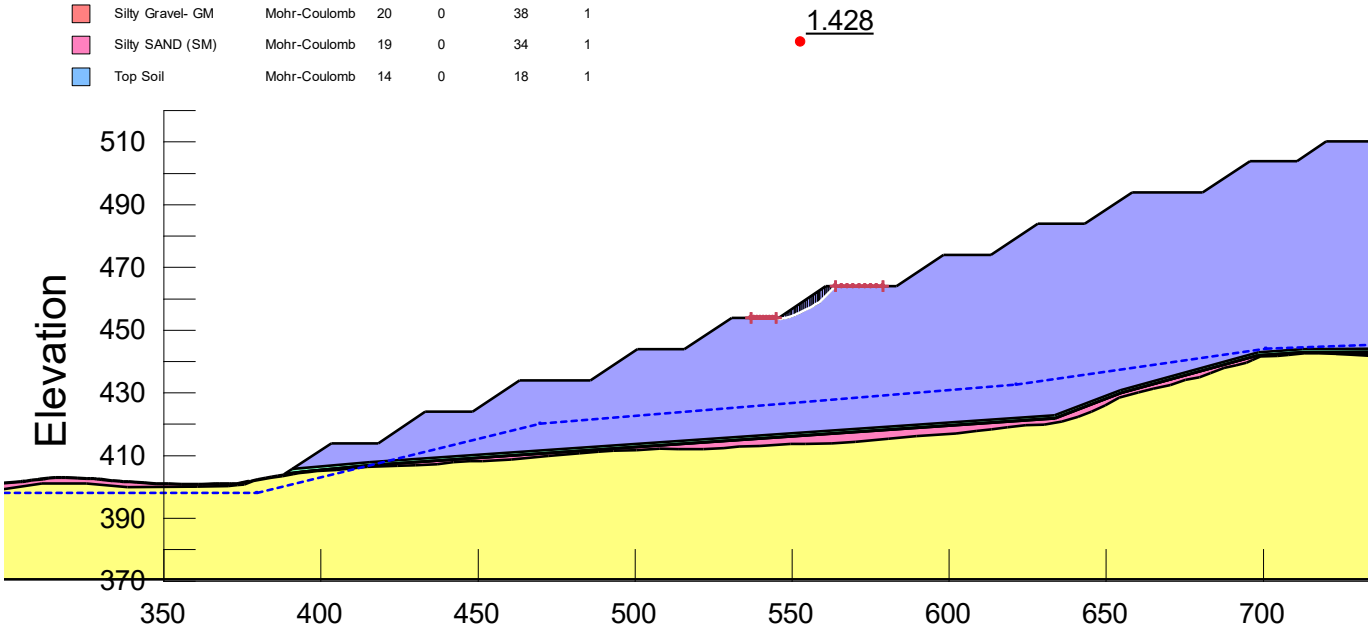



Figure A-30: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 6)

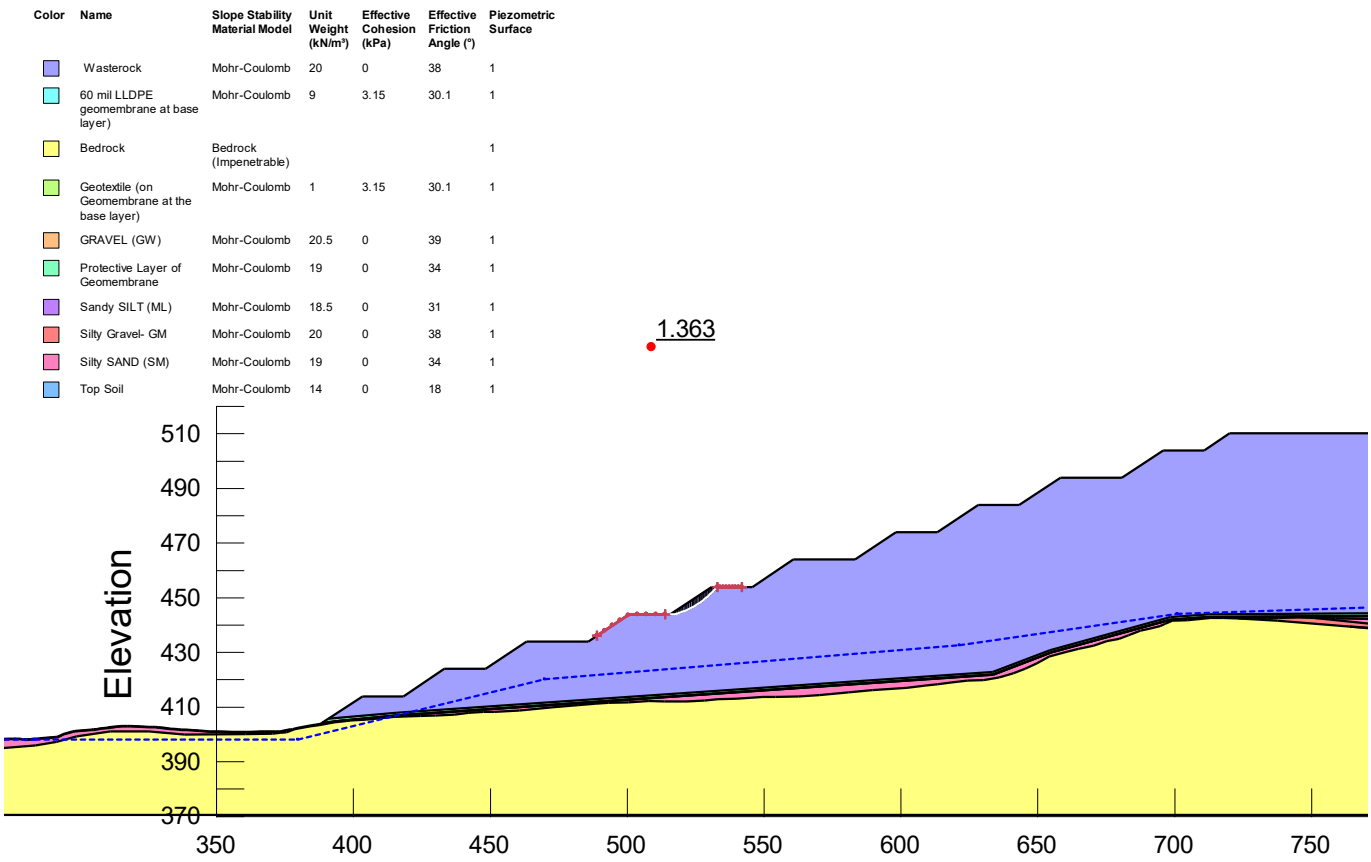



Figure A-31: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 7)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

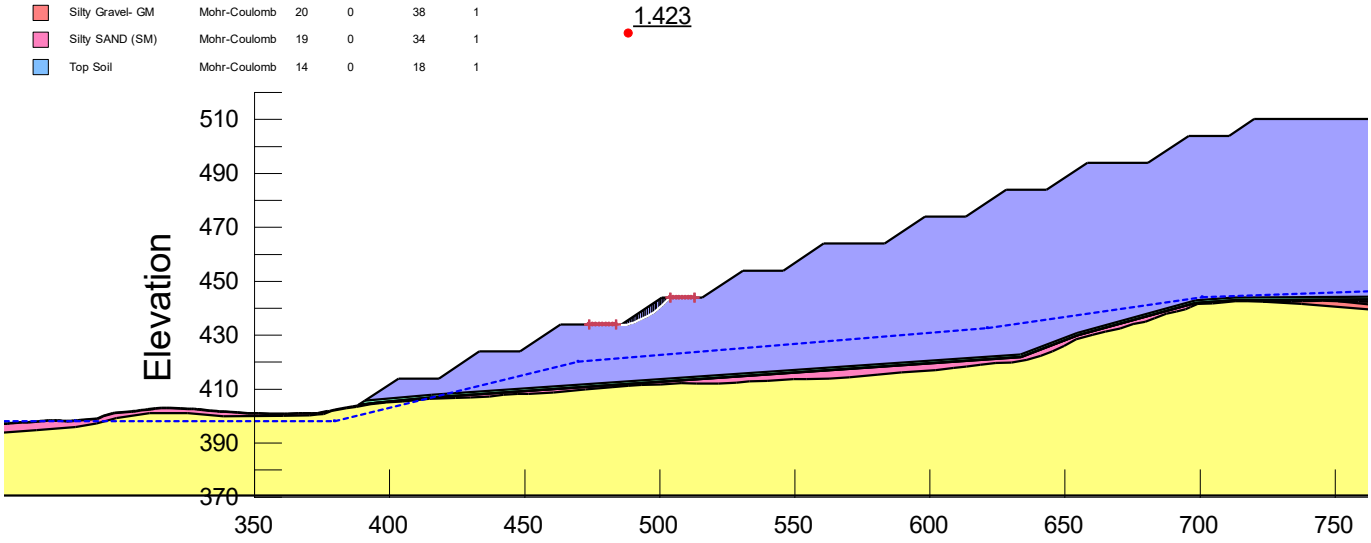



Figure A-32: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 8)

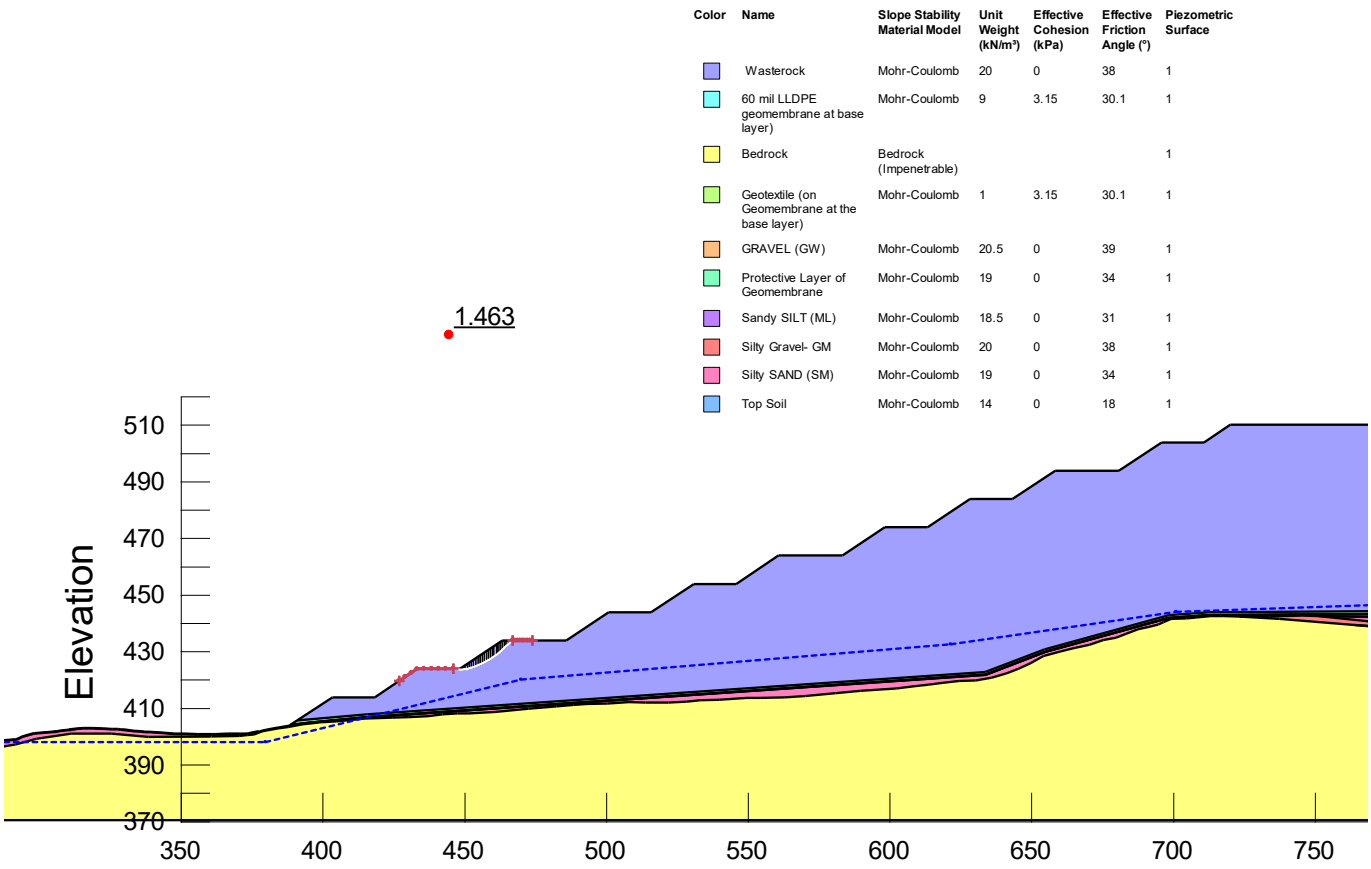



Figure A-33: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 9)

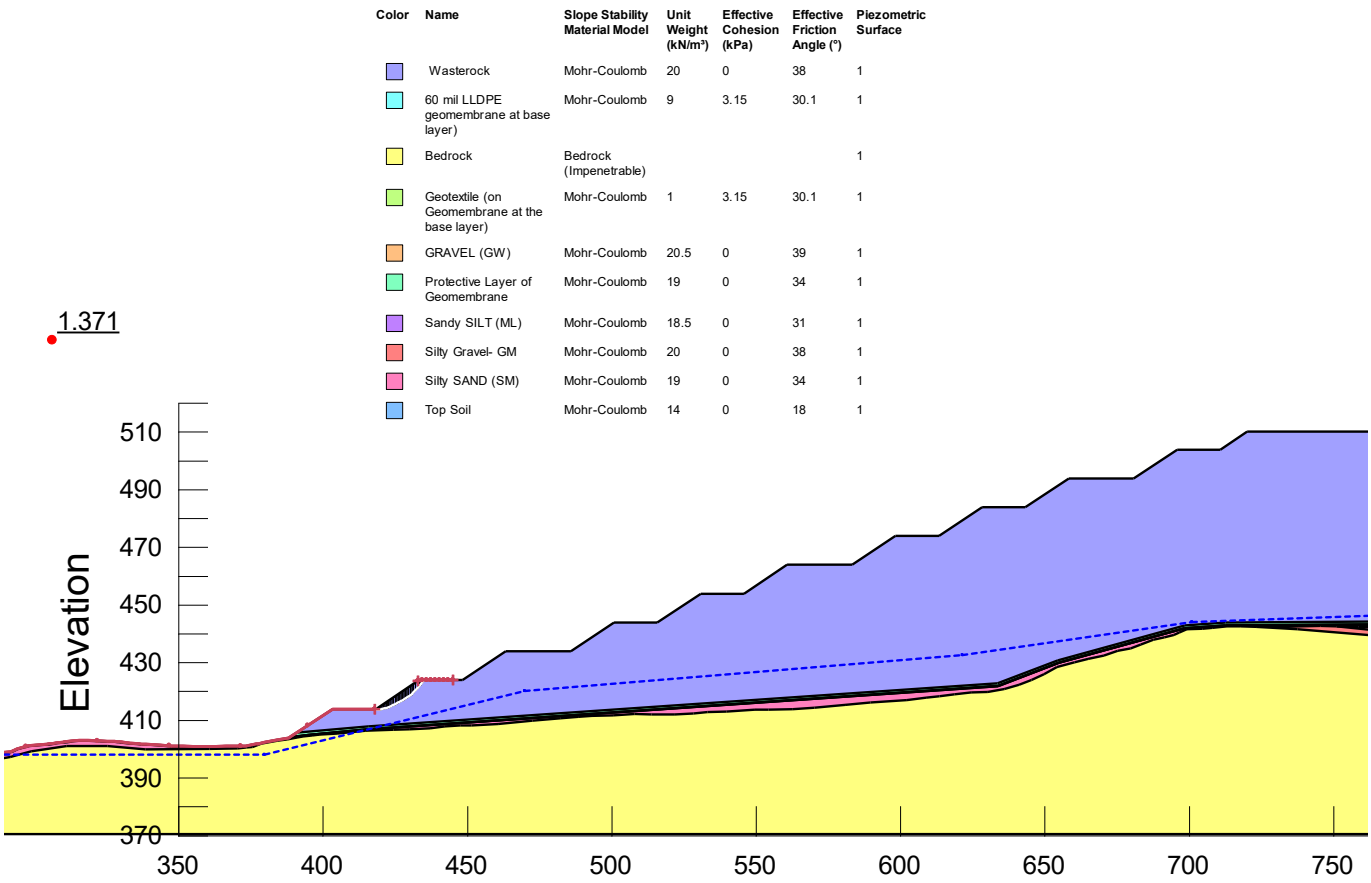



Figure A-34: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 10)

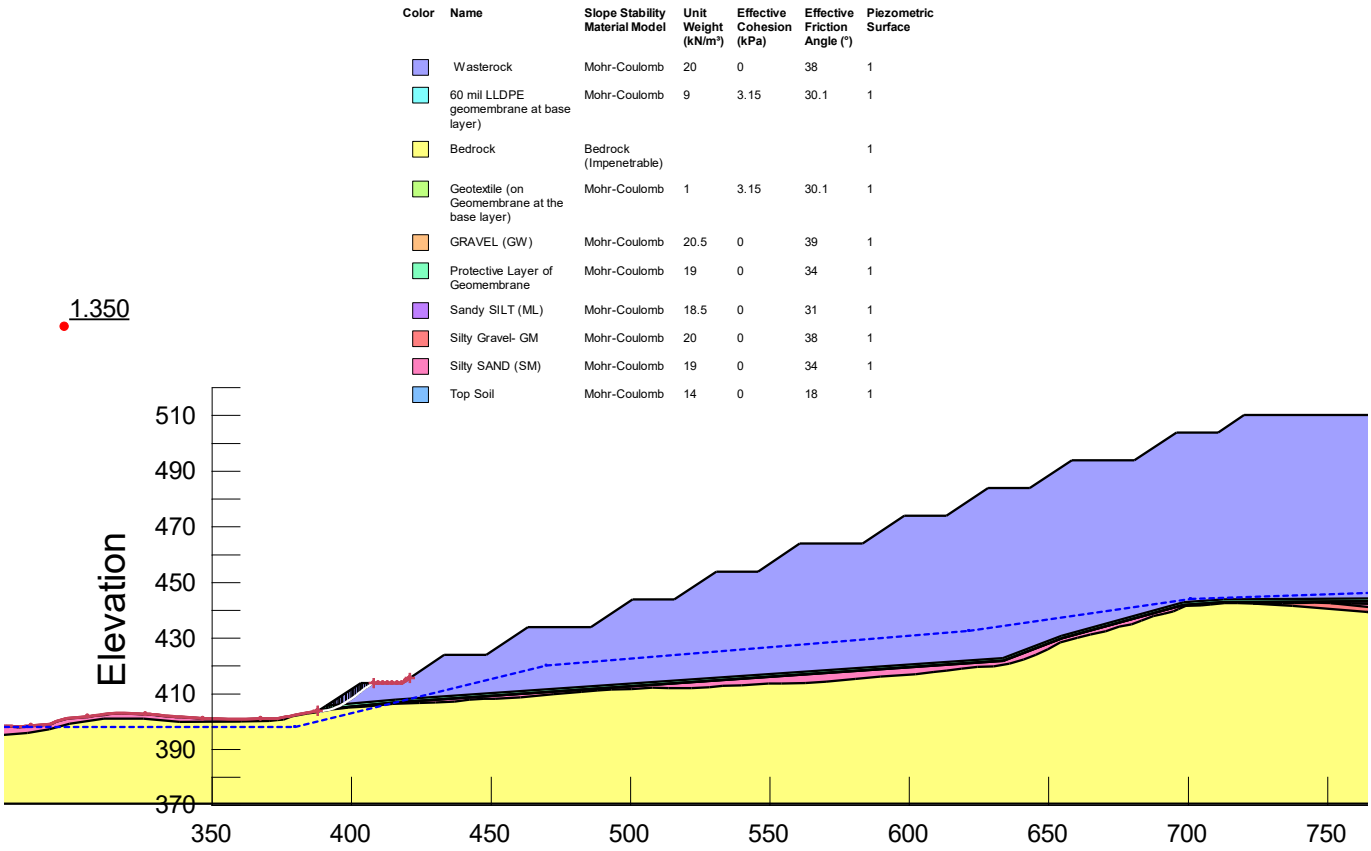



Figure A-35: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Operational Phase of Local Failure (Bench 11)

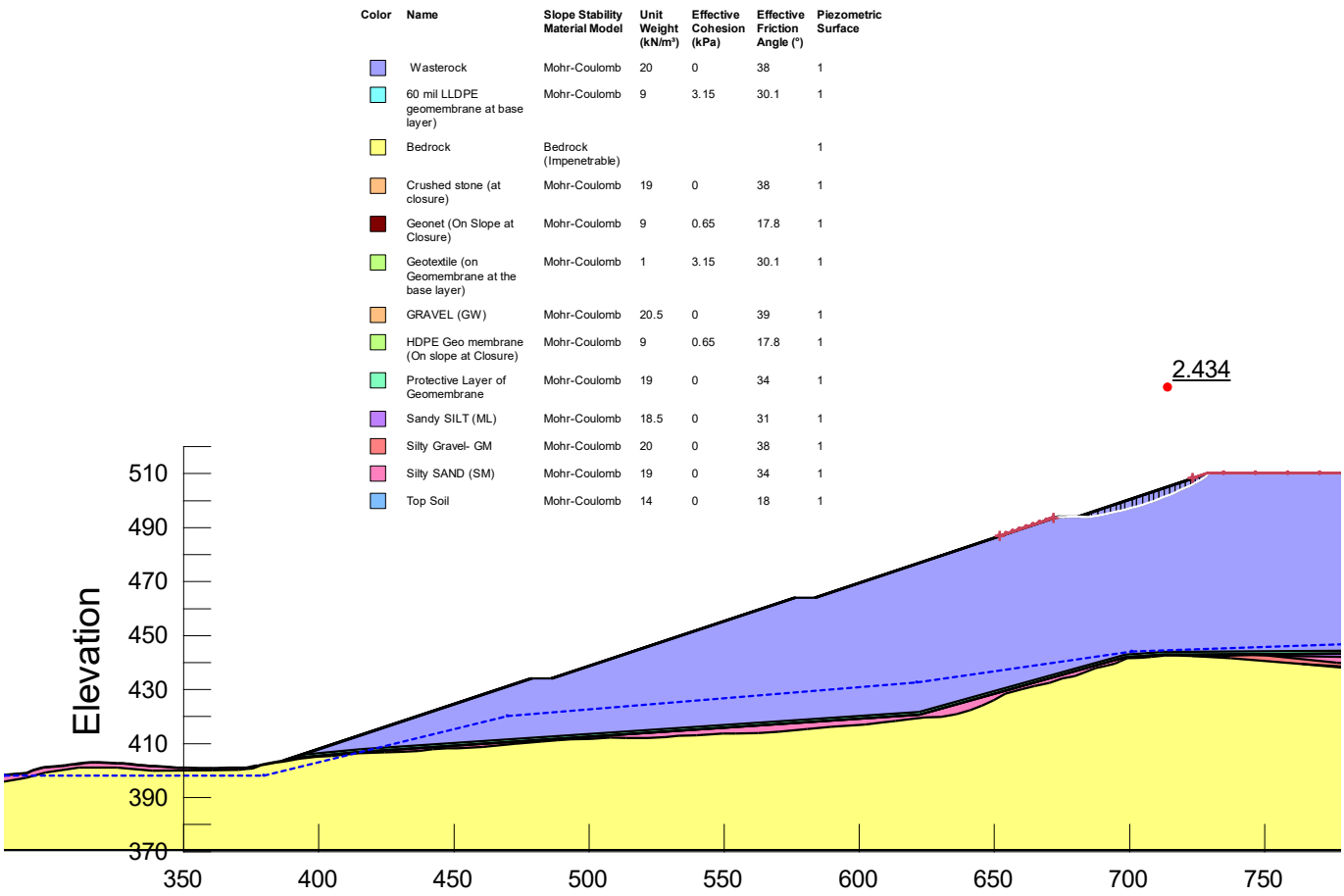



Figure A-36: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Closure Phase of Local Failure (Bench 1)

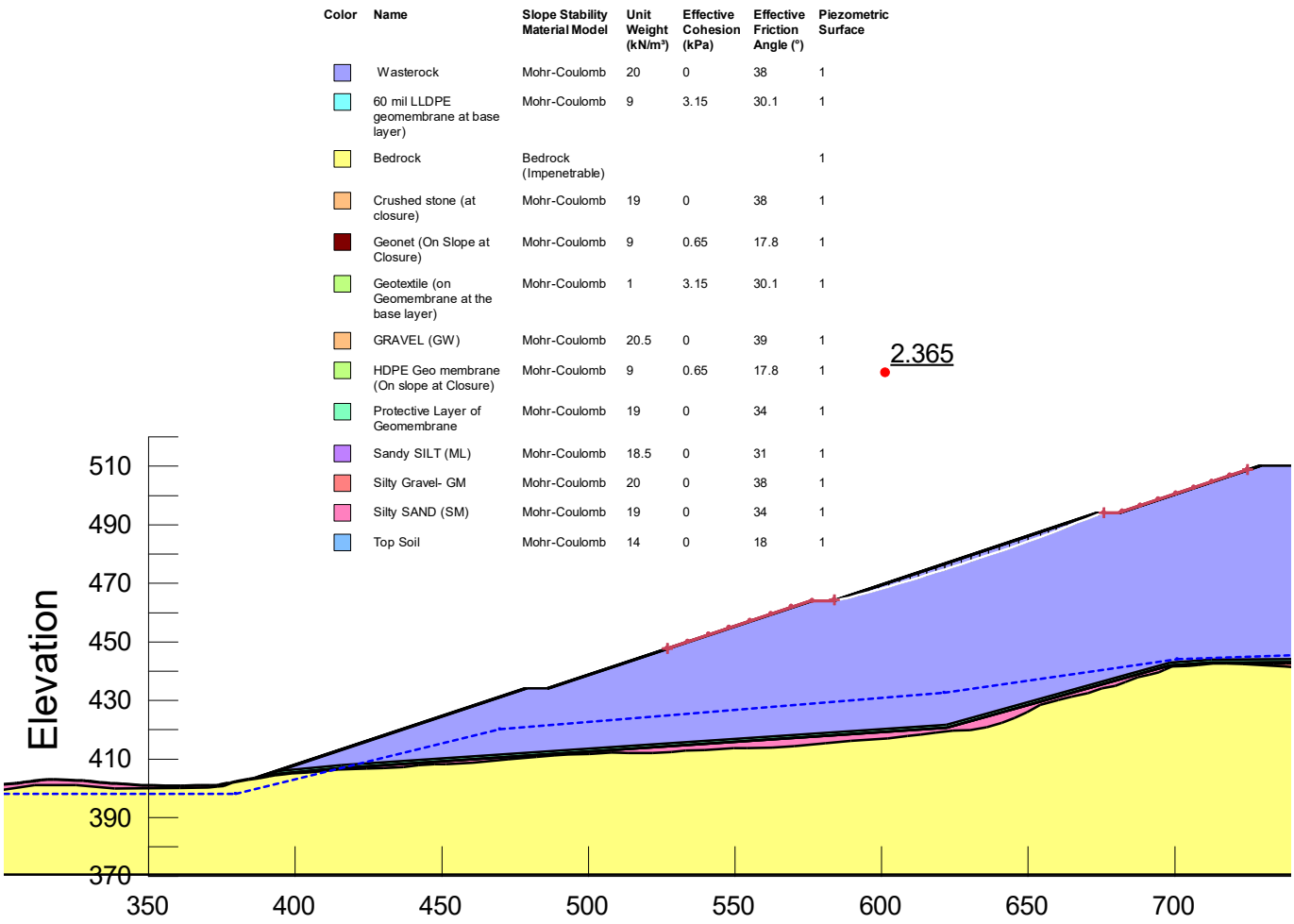



Figure A-37: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Closure Phase of Local Failure (Bench 2)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Crushed stone (at closure) | Mohr-Coulomb | 19 | 0 | 38 | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Sandy SILT (ML) | Mohr-Coulomb | 18.5 | 0 | 31 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

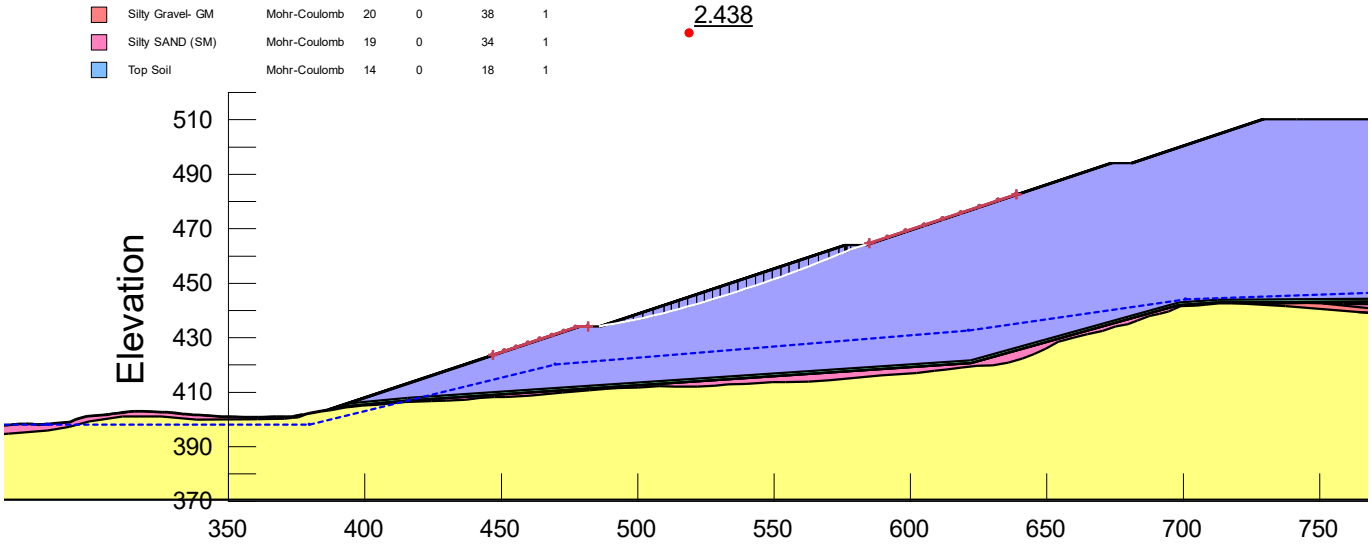



Figure A-38: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Closure Phase of Local Failure (Bench 3)

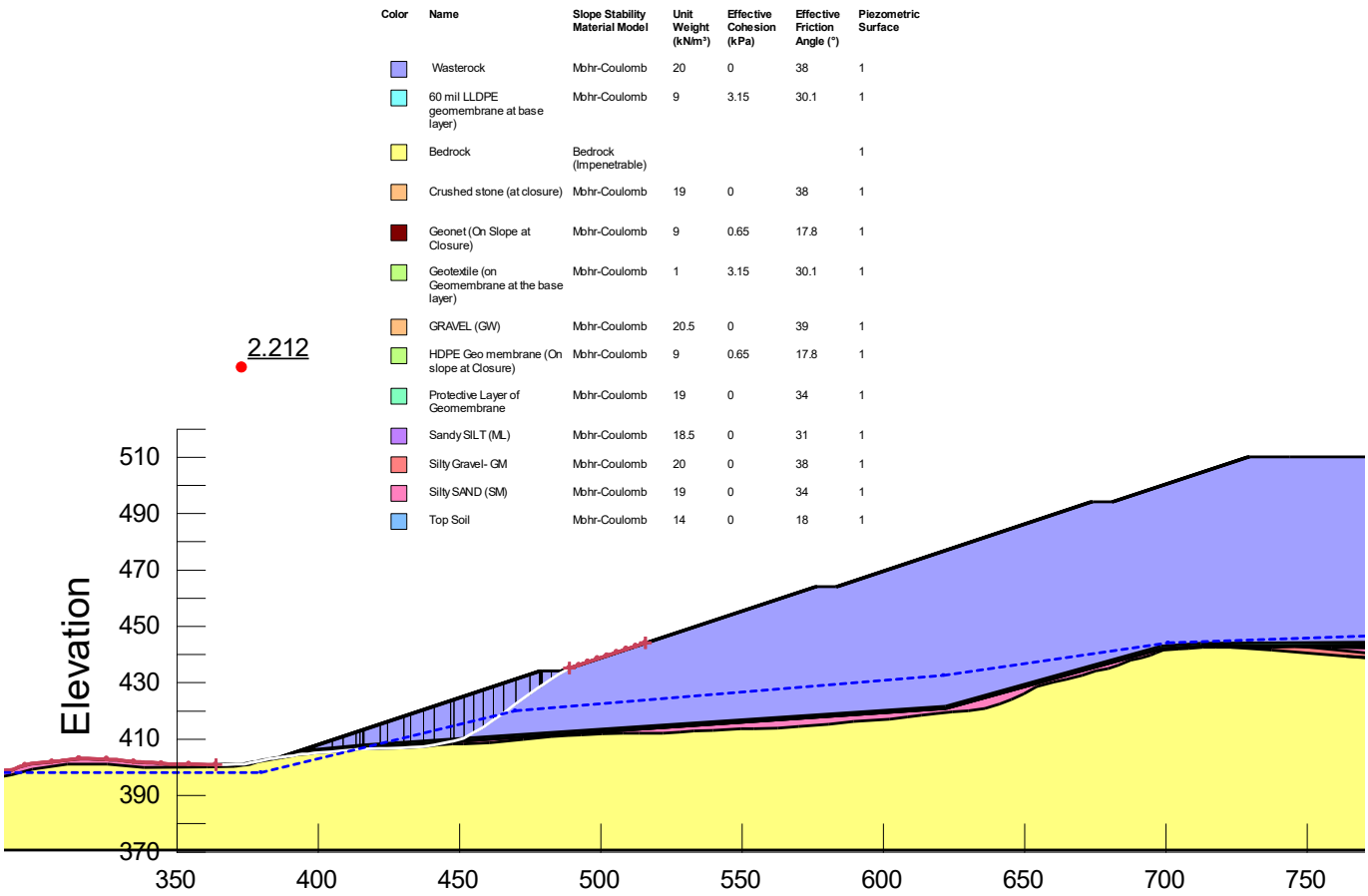



Figure A-39: Stability Results for Static (Drained) Analysis at Stockpile 002 for PAG at Closure Phase of Local Failure (Bench 4)

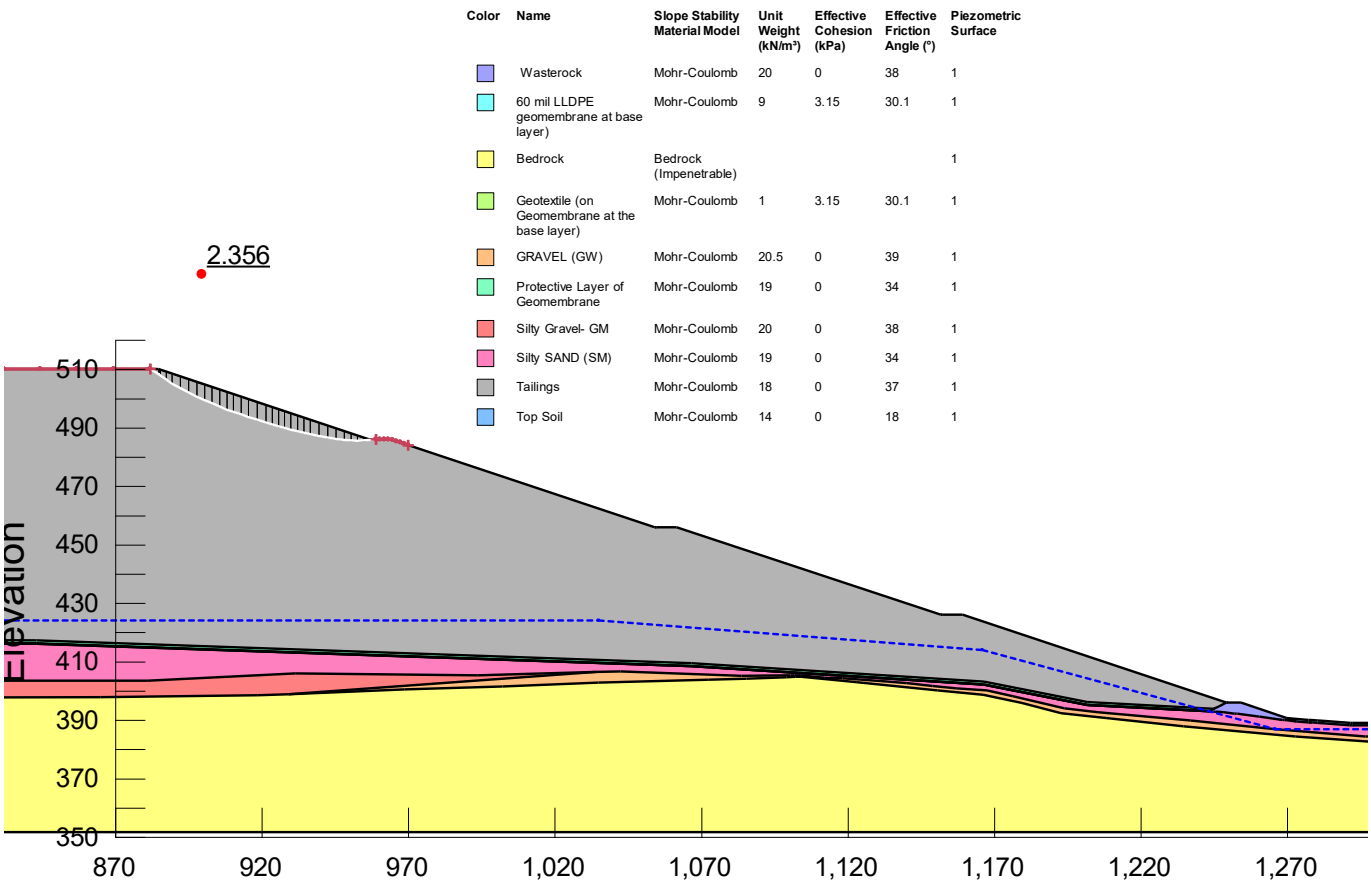



Figure A-40: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Operational Phase of Local Failure (Bench 1)

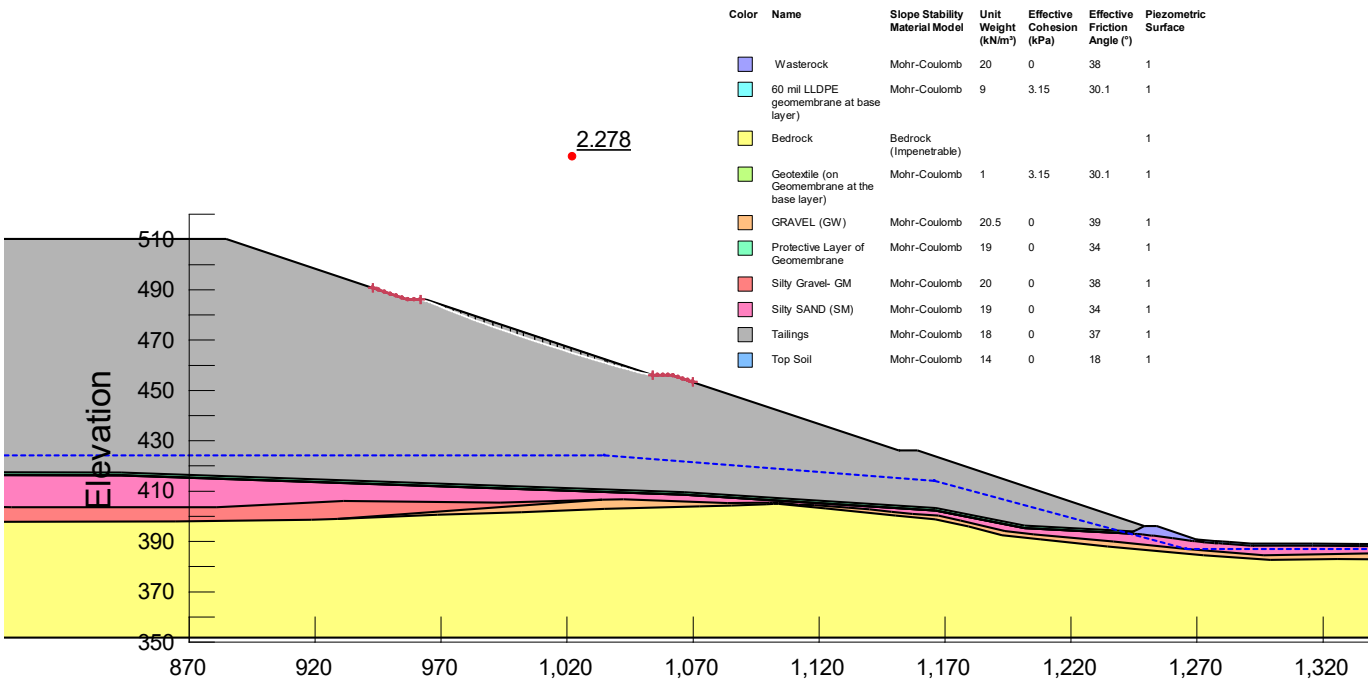



Figure A-41: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Operational Phase of Local Failure (Bench 2)

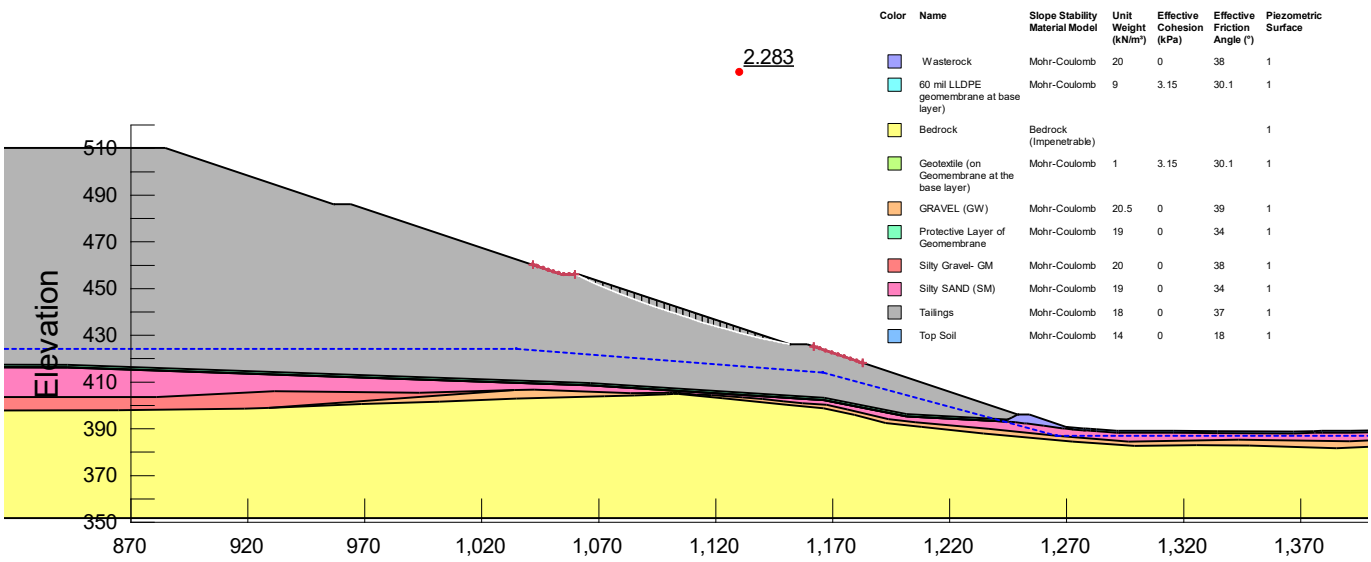



Figure A-42: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Operational Phase of Local Failure (Bench 3)

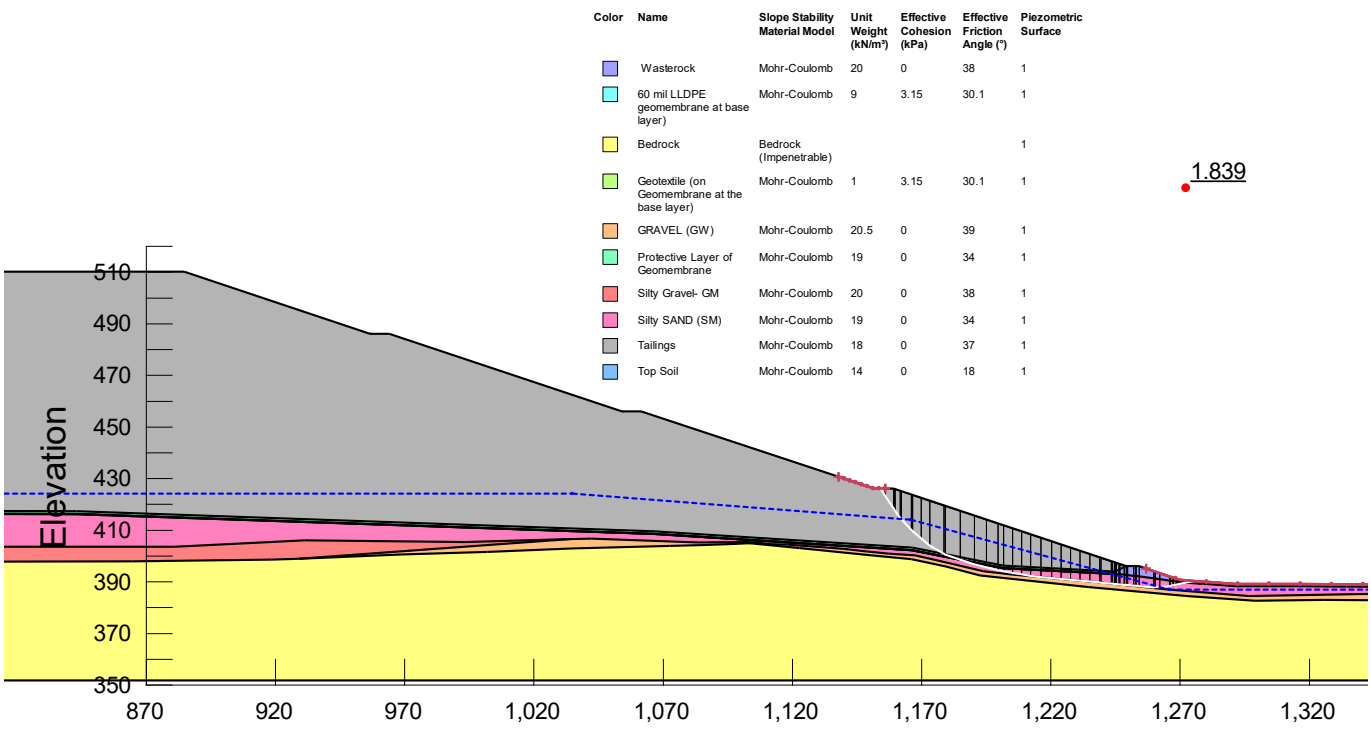



Figure A-43: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Operational Phase of Local Failure (Bench 4)

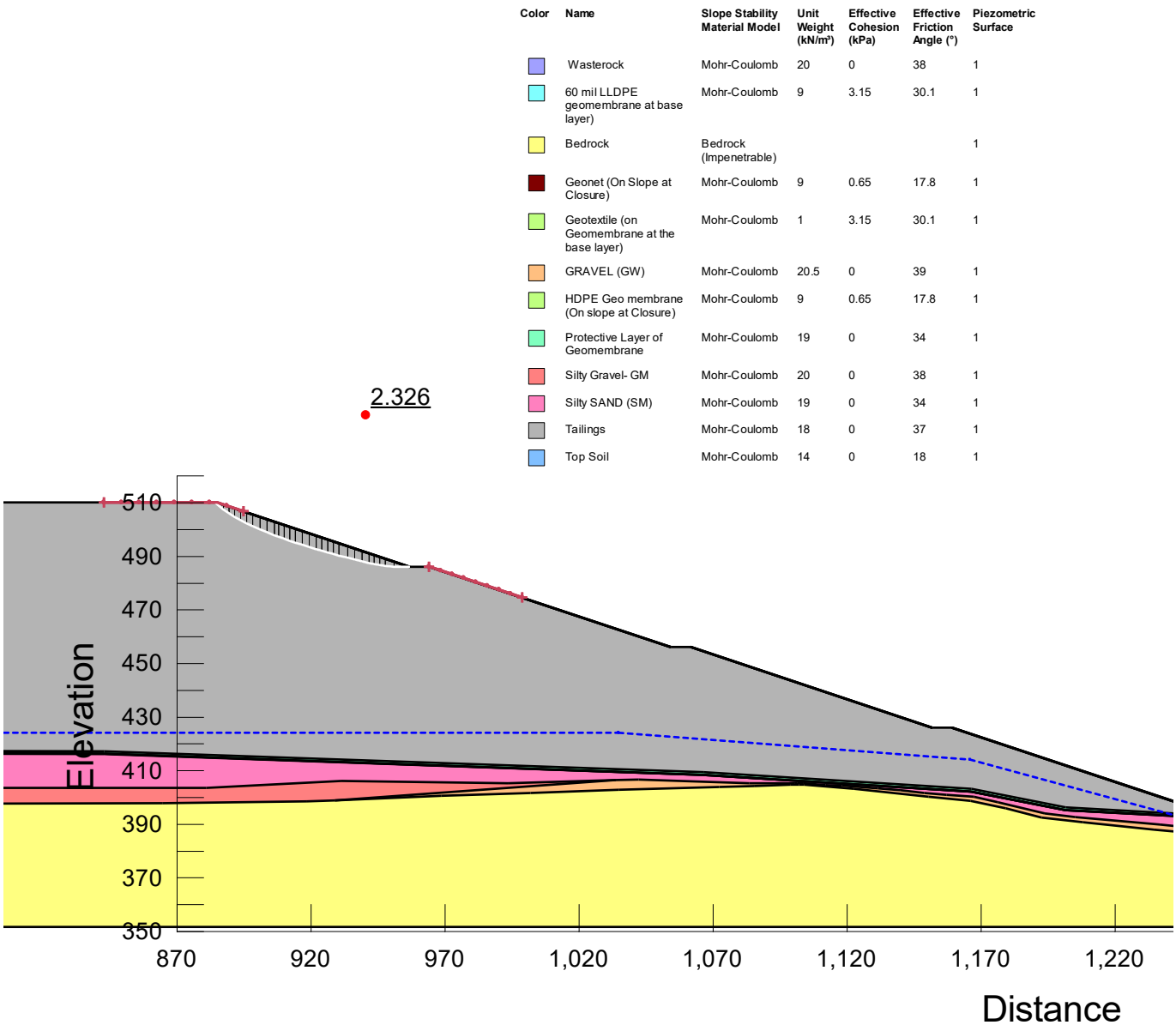



Figure A-44: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Closure Phase of Local Failure (Bench 1)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

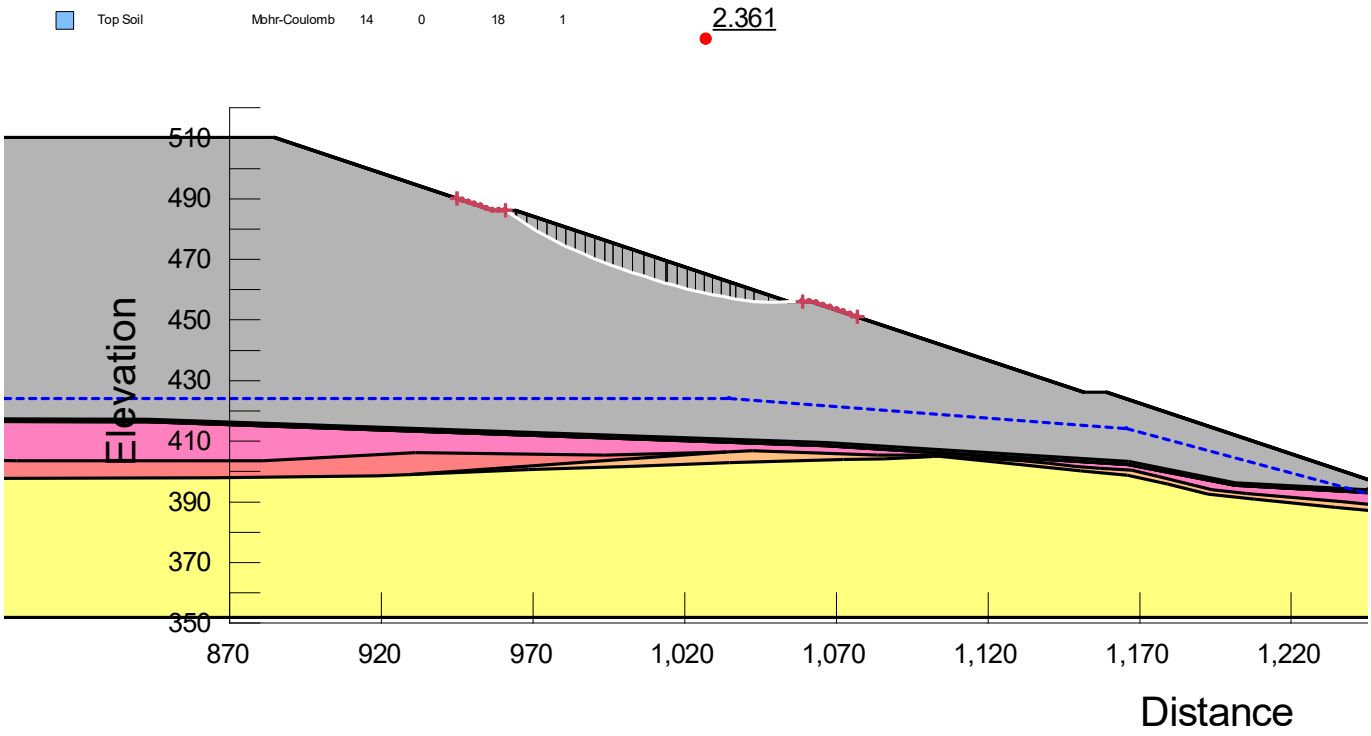



Figure A-45: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Closure Phase of Local Failure (Bench 2)

| Color | Name | Slope Stability Material Model | Unit Weight (kN/m³) | Effective Cohesion (kPa) | Effective Friction Angle (°) | Piezometric Surface |
|---|---|---|---|---|---|---|
| | Wasterock | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | 60 mil LLDPE geomembrane at base layer) | Mohr-Coulomb | 9 | 3.15 | 30.1 | 1 |
| | Bedrock | Bedrock (Impenetrable) | | | | 1 |
| | Geonet (On Slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Geotextile (on Geomembrane at the base layer) | Mohr-Coulomb | 1 | 3.15 | 30.1 | 1 |
| | GRAVEL (GW) | Mohr-Coulomb | 20.5 | 0 | 39 | 1 |
| | HDPE Geo membrane (On slope at Closure) | Mohr-Coulomb | 9 | 0.65 | 17.8 | 1 |
| | Protective Layer of Geomembrane | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Silty Gravel- GM | Mohr-Coulomb | 20 | 0 | 38 | 1 |
| | Silty SAND (SM) | Mohr-Coulomb | 19 | 0 | 34 | 1 |
| | Tailings | Mohr-Coulomb | 18 | 0 | 37 | 1 |
| | Top Soil | Mohr-Coulomb | 14 | 0 | 18 | 1 |

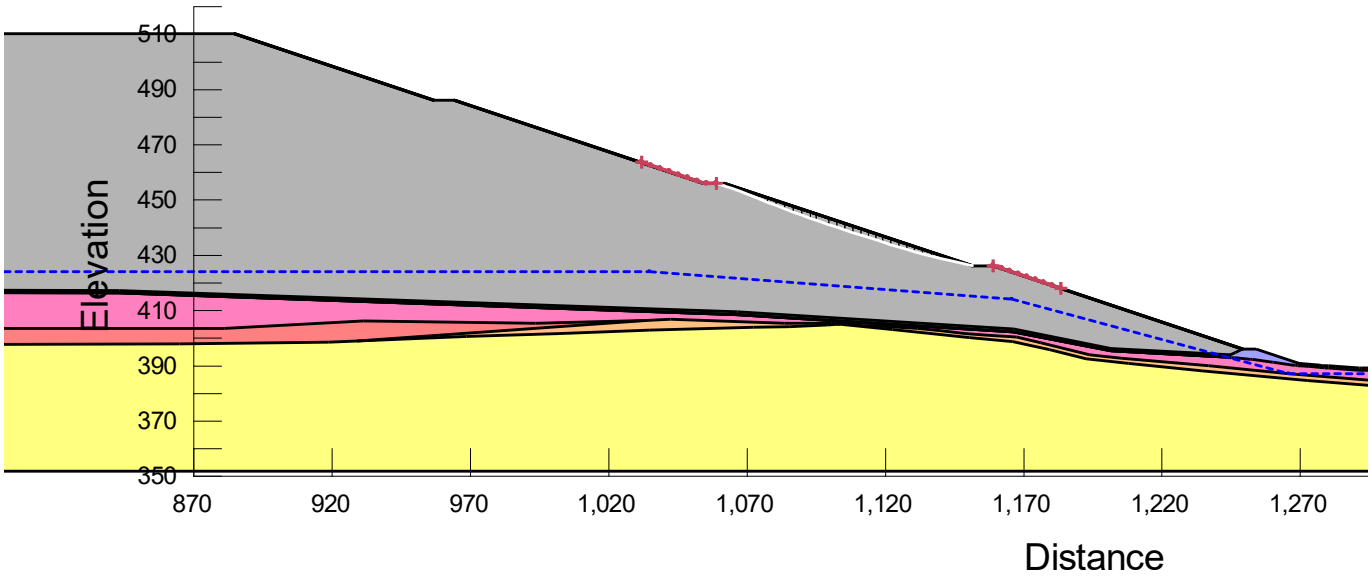



Figure A-46: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Closure Phase of Local Failure (Bench 3)

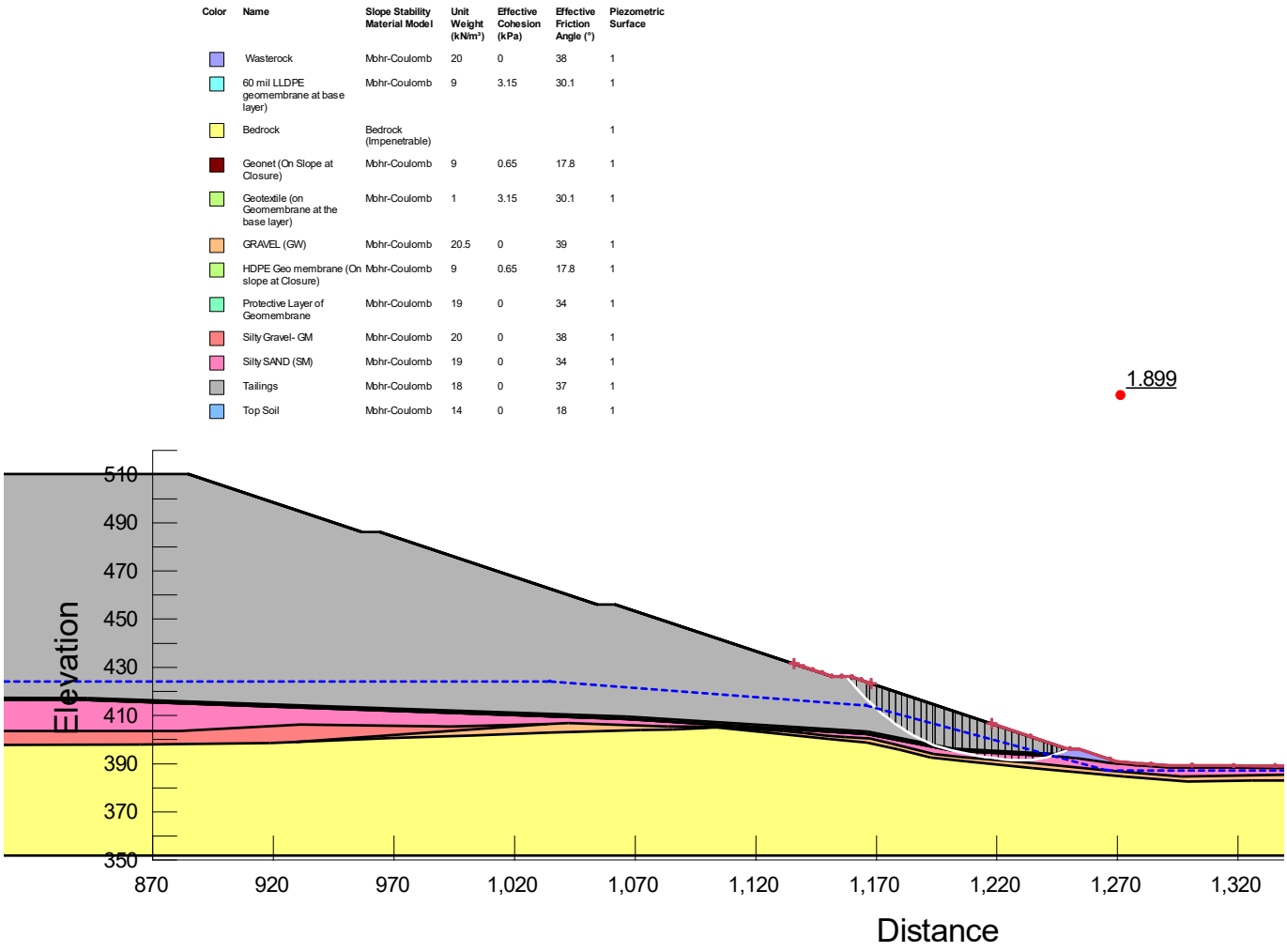



Figure A-47: Stability Results for Static (Drained) Analysis at Stockpile 002 for Tailings at Closure Phase of Local Failure (Bench 4)

# Appendix E Material Take Offs

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - FRESH WATER INTAKE FOR POTABLE PRODUCTION**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | BASIS OF PRICE |
|---|---|---|---|---|---|---|
| **A** | **Pumping station - FW-PMP-001/002** | | | | | |
| 311 | SUBMERGED - GRUNDFOS 150S150-8 / MS6000, 15HP, 60 Hz, 3Ph, 575V | UNIT | 2 | $12 458,00 | $24 916,00 | Quote from Nord-flo 16.04.2025 |
| 311 | Flotation module for container | UNIT | 1 | $75 000,00 | $75 000,00 | Quote from Nord-flo 16.04.2025 |
| 311 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 |
| 311 | Delivery of the plant to the site - 1 container | | | | | |
| 311 | | | | | | |
| 311 | | | | | | |
| | | | | | | |
| **B** | **Pipeline** | | | | | |
| 311 | HDPE - DR11 (200PSI) - 3" - Butt fusion - Flange on both sides | m | 2 186 | $6,84 | $14 952,24 | Quote from Marcel Baril 09.04.2025 |
| 311 | HDPE - DR11 (200PSI) - 3" - Fittings | Lot | 1 | $5 980,90 | $5 980,90 | |
| 311 | Heat Tracing cables (cables & splice kits only) | ft | 7 889 | $39,18 | $309 095,24 | Quote from George Fisher, 09.04.2025 |
| 311 | Electronic Thermostat NGUTC 6340-01 | UNIT | 3 | $6 911,00 | $20 733,00 | Quote from George Fisher, 09.04.2025 |
| 311 | Temperature Sensor URTD 15G | UNIT | 3 | $298,25 | $894,75 | Quote from George Fisher, 09.04.2025 |
| 311 | Temperature Sensor URTD 15R | UNIT | 3 | $298,25 | $894,75 | Quote from George Fisher, 09.04.2025 |
| 311 | Oversize Kits | UNIT | 17 | $600,00 | $10 200,00 | Quote from George Fisher, 09.04.2025 |
| 311 | Nominal 76 mm (3.0 in) thick standard U.I.P.® urethane insulation c/w black extruded polyethylene, integral heat trace channels on customer supplied pipe | ft | 7 889 | $42,70 | $336 864,90 | Quote from George Fisher, 09.04.2025 |
| 311 | 2"X 2" Air & Vacuum Valve, Crispin, Model AX20-2 | | | | | |
| 311 | | UNIT | 2 | $6 665,70 | $13 331,40 | Quote from Conval Quebec, 24.04.2025 |
| 311 | | | | | | |
| 311 | | | | | | |
| 311 | | | | | | |
| **C** | **Electrical** | | | | | |
| 311 | Panelboard 600V, 100A, 25kA, 7 FEEDERS (2X20, 1X30A, 2X40A, 1X60A, 1X80A) | UNIT | 1 | $15 000,00 | $15 000,00 | RSMEANS |
| 311 | Divers | Lot | 1 | $2 000,00 | $2 000,00 | |
| 311 | VFD 15HP, 600V | UNIT | 2 | $2 000,00 | $4 000,00 | Quote from ABB 02.05.2025 |
| **D** | **Ground preparation** | | | | | |
| 311 | Pipe bench beside the access road. See the typical cross-section by G-Mining. To be planned with Genipur | lot | 1 | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - PUMPING AND DISTRIBUTION FOR PROCESS**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | BASIS OF PRICE | NOTES |
|---|---|---|---|---|---|---|---|
| **A** | **Pumping station - PP-PMP-001/002** | | | | | | |
| 313 | Vertical pumps - GOULDSVIT-DIFM 14RJMC, 1 Stage, 50HP, 3Ph, 60Hz, 575V | UNIT | 2 | $60 491,00 | $120 982,00 | Quote from Nord-flo 16.04.2025 | |
| 313 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 | |
| 313 | Delivery of the plant to the site - 1 container | lot | 1 | | | | |
| | | | | | | | |
| **B** | **Pipeline** | | | | | | |
| | **B1 - Pumping well and suction line** | | | | | | |
| 313 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 15 | $- | | | |
| 313 | HDPE DR21 pipe 20 in diameter | m | 40 | $123,33 | $4 933,20 | | |
| 313 | HDPE - DR11 (200PSI) - 12" - Butt fusion | m | 1 930 | $91,04 | $175 707,20 | | |
| 313 | HDPE - DR11 (200PSI) - 12" - Fittings | Lot | 1 | $70 282,88 | $70 282,88 | | |
| 313 | Heat Tracing cables C13-574-COJ | Ft | 6 965 | $39,18 | $272 888,70 | | |
| 313 | Concrete prefabricated Pumping station SP9000 base of 2400 mm by Lecuyer for pipe of 500mm | Unit | 1 | $74 400,00 | $74 400,00 | | |
| 313 | Concrete prefabricated Pumping station SP9000 extension of 5000 mm by Lecuyer | m | Included | | | Quote from Marcel Baril dated of 08.04.2025 | |
| 313 | Concrete prefabricated Pumping station SP9000 Connexion of 2100 mm by Lecuyer | Lot | Included | | | Quote from Lecuyer 11.04.205 | |
| 313 | galvanized steel ladder with anchor | Lot | Included | | | | |
| 313 | butyl gasket for sealing sections (For pumping well and manhole) | Lot | Included | | | | |
| 313 | Flex-Lok gasket for sealing the pipe (For pumping well and manhole) | Lot | Included | | | | |
| 313 | Prefabricated concrete Manhole ⌀915 mm Base of 1110mm for pipe of 500mm | Unit | 1 | $1 600,00 | $1 600,00 | | |
| 313 | Prefabricated concrete Manhole ⌀915 mm ring of 25 mm | Lot | Included | | | | |
| 313 | Prefabricated concrete Manhole ⌀915 mm head of 200mm | Lot | Included | | | | |
| 313 | Cast iron cover of ⌀750 mm. 300mm thick | Lot | Included | | | | |
| 313 | Electronic Thermostat NGUTC 6340-01 | UNIT | 2 | $6 911,00 | $13 822,00 | Quote from George Fisher, 09.04.2025 | |
| 313 | Temperature Sensor URTD 15G | UNIT | 2 | $298,25 | $596,50 | Quote from George Fisher, 09.04.2025 | |
| 313 | Temperature Sensor URTD 15R | UNIT | 2 | $298,25 | $596,50 | Quote from George Fisher, 09.04.2025 | |
| 313 | Power Feed Kit 1 | UNIT | 7 | $600,00 | $4 200,00 | Quote from George Fisher, 09.04.2025 | |
| 313 | Nominal 76 mm (3.0 in) thick standard U.I.P.® urethane insulation c/w black extruded polyethylene, integral heat trace channels on customer supplied pipe | ft | 6 965 | $88,00 | $612 939,63 | Quote from George Fisher, 09.04.2025 | |
| 313 | 2"X 2" Air & Vacuum Valve, Crispin, Model AX20-2 | UNIT | 2 | $6 665,70 | $13 331,40 | Quote from Conval Quebec, 24.04.2025 | |
| **C** | **Electrical Room** | | | | | | |
| 313 | Panelboard 600V, 125A, 25kA, 7 FEEDERS (2X20, 1X40A, 3X45A, 1X75A) | UNIT | 1 | $20 000,00 | $20 000,00 | | |
| 313 | VFD 50HP, 600V | UNIT | 2 | $8 010,00 | $16 020,00 | Quote from ABB 02.05.2025 | |
| 313 | Divers | Lot | 1 | $2 000,00 | $2 000,00 | | |
| | | | | | | | |
| **D** | **Treatment** | | | | | | |
| 313 | Sampson Bag Filter Unit Housings. Flowrate 900gpm. SS304 | Unit | 2 | 13999 | $27 998,00 | Quote from ERE, 10.04. Ensuring good quality for process water | |
| 313 | Filtration bags 7" x 32" - 1 micron | Unit | 100 | 14,56 | $1 456,00 | Quote from ERE Ensuring good quality for process water | |
| | | | | | | | |
| | | | | | | | |
| **E** | **Instrumentation** | | | | | | |
| 364 | Non-Contact Rader Level Transmitter | Unit | 1 | $ 3 000,00 | $3 000,00 | | |
| 364 | Motorized Isolation Valve | Unit | 2 | $ 18 000,00 | $36 000,00 | | |
| 364 | Pressure Transmitter | Unit | 1 | $ 3 000,00 | $3 000,00 | | |
| 364 | Pressure Indicator | Unit | 1 | $ 3 000,00 | $3 000,00 | | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $ 10 000,00 | $10 000,00 | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - WATER PONDS AND WATER MANAGEMENT (PLANT AREA)**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | BASIS OF QUANTITY |
|---|---|---|---|---|---|---|
| | **Note: items and quantities completed in client template** | | | | | |
| **A** | **CONTACT WATER PONDS 1 and 2** | | | | | |
| 324 | CWP1: Tree clearing within local construction area, to include removal of stumps and stockpile in designated area. | $m^2$ | 7 269 | | | Calculated from 3D model |
| 324 | CWP1: Remove muskeg, organics, topsoil, overburden and unsuitable soil from pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 2 181 | | | Calculated from 3D model |
| 324 | CWP1: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 21 406 | | | Calculated from 3D model |
| 324 | CWP1: Excavate 500 mm wide trenches in overburden for installation of subsurface drainage system in base of pond to a depth of up to 1 m, as indicated on the drawings. | $m^3$ | 36 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 234 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 36 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 111 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth up to 3 m. | No. | 1 | | | Estimated from preliminary design |
| 324 | CWP1: Supply and install pump in concrete manhole (costed in water treatment section) | No. | 1 | | | Estimated from preliminary design |
| 324 | CWP1: Excavate 1 m x 1 m trench in overburden around perimeter of pond for geomembrane anchor trench. | $m^3$ | 333 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install 1.5 mm double textured LLDPE geomembrane on base and slopes of pond as shown in drawings and anchor at crest. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 7 306 | | | Calculated from 3D model |
| 324 | CWP1: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 333 | | | Calculated from 3D model |
| 324 | CWP1: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 2 482 | | | Calculated from 3D model |
| 324 | CWP1: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 683 | | | Calculated from 3D model |
| 324 | CWP2: Tree clearing within local construction area, to include removal of stumps and stockpile in designated area. | $m^2$ | 5 632 | | | Calculated from 3D model |
| 324 | CWP2: Remove muskeg, organics, topsoil, overburden and unsuitable soil from pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 1 690 | | | Calculated from 3D model |
| 324 | CWP2: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 13 358 | | | Calculated from 3D model |
| 324 | CWP2: Excavate 500 mm wide trenches in overburden for installation of subsurface drainage system in base of pond to a depth of up to 1 m, as indicated on the drawings. | $m^3$ | 35 | | | Calculated from 3D model |
| 324 | CWP2: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 231 | | | Calculated from 3D model |
| 324 | CWP2: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 35 | | | Calculated from 3D model |
| 324 | CWP2: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 110 | | | Estimated from preliminary design |

| | | | | | | |
|---|---|---|---|---|---|---|
| 324 | CWP2: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth up to 3 m. | No. | 1 | | | Estimated from preliminary design |
| 324 | CWP2: Supply and install pump in concrete manhole (costed in water treatment section) | No. | 1 | | | Estimated from preliminary design |
| 324 | CWP2: Excavate 1 m x 1 m trench in overburden around perimeter of pond for geomembrane anchor trench. | $m^3$ | 323 | | | Calculated from 3D model |
| 324 | CWP2: Supply and install GL 1.5 mm double textured LLDPE geomembrane on base and excavated side slopes of pond as shown in drawings and anchor at crest. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 4 851 | | | Calculated from 3D model |
| 324 | CWP2: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 323 | | | Calculated from 3D model |
| 324 | CWP2: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 1 093 | | | Calculated from 3D model |
| 324 | CWP2: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 278 | | | Calculated from 3D model |
| | **Subtotal** | | | | | |

| B | SEDIMENTATION AND POLISHING PONDS | | | | | |
|---|---|---|---|---|---|---|
| 325 | SP1&2: Tree clearing within local construction area, to include removal of stumps and stockpile in designated area. | $m^2$ | 42 358 | | | Calculated from 3D model |
| 325 | SP1&2: Remove muskeg, organics, topsoil, overburden and unsuitable soil from dam and pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^3$ | 12 311 | | | Calculated from 3D model |
| 325 | SP1&2: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 4 308 | | | Calculated from 3D model |
| 325 | SP1&2: Regrade excavated overburden and nominally compact to achieve uniform slopes indicated in the drawings. Stockpile excess excavated material in designated stockpile. | $m^3$ | 8 422 | | | Calculated from 3D model |
| 325 | SP1&2: Excavate 500 mm wide trenches in overburden for installation of subsurface drainage system in base of pond to a depth of 0.5 m, as indicated on the drawings. | $m^3$ | 63 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 575 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 63 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 250 | | | Calculated from 3D model |
| 325 | SP1&2: Rip base of dam embankment to a depth of 200 mm and compact to 95% Standard Proctor density. | $m^2$ | 31 976 | | | Calculated from 3D model |
| 325 | SP1&2: Construct embankments with Zone 2 Waste Rock (-450 mm), including perimeter and central dams. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 170 594 | | | Calculated from 3D model |
| 325 | SP1&2: Construct access ramps using Zone 2 Waste Rock (-450 mm) to grades shown on drawings. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 1 820 | | | Calculated from 3D model |
| 325 | SP1&2: Construct upstream Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick on upstream dam and access ramp slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 6 586 | | | Calculated from 3D model |
| 325 | SP1&2: Construct upstream Zone 5 Filter/Bedding Sand (-4.75 mm) layer 0.3 m thick on upstream dam and access ramp slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 6 586 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the highest portion of the lined pond dam (1 per dam). Rate to include transport, offloading, installation, calibration. | No. | 2 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 2 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the dam above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 2 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 2 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 100 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install GL 1.5 mm double textured LLDPE geomembrane on pond base and upstream slopes of embankments and anchor at crest as shown in drawings. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 33 918 | | | Calculated from 3D model |
| 325 | SP1&2: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 1 161 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 9 985 | | | Calculated from 3D model |
| 325 | SP1&2: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 2 719 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install Zone 4 Granular B Type II 300 mm on access ramp surfaces. | $m^3$ | 330 | | | Calculated from 3D model |

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|---|---|---|---|---|---|---|
| 325 | SP1&2: Supply and install 20 MPa concrete pad 0.3 m thick on lined access ramp surfaces. | $m^3$ | 330 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install Zone 4 Granular B Type II minimum 300 mm thick wearing course on crest of dam for vehicular access as well as graded ramps between connecting dams of different heights. | $m^3$ | 3 874 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and install Zone 4 Granular B Type II safety berms on both sides of dam crest as indicated on the drawings. | $m^3$ | 1 393 | | | Calculated from 3D model |
| 325 | SP1&2: Excavate in each Sedimentation Pond dam to form spillway to Polishing Pond as indicated on the drawings. | $m^3$ | 500 | | | Estimated from preliminary design |
| 325 | SP1&2: Supply and install Zone 4 Granular B Type II 300 mm on spillway base as indicated on the drawings. | $m^3$ | 34 | | | Calculated from 3D model |
| 325 | SP1&2: Supply and place 30 MPa reinforced concrete spillway as shown on drawings. Rate to include formwork and reinforcement. | $m^3$ | 50 | | | Estimated from preliminary design |
| 325 | SP1&2: Provide and install anchor bolts to affix GL 1.5 mm double textured LLDPE geomembrane to concrete. Rate to include stainless steel batton and rubber gaskets. | No. | 150 | | | Estimated from preliminary design |
| 325 | PP: Tree clearing within local construction area including spillway chute, to include removal of stumps and stockpile in designated area. | $m^2$ | 49 297 | | | Calculated from 3D model |
| 325 | PP: Remove muskeg, organics, topsoil, overburden and unsuitable soil from dam, pond, and spillway chute footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^3$ | 14 186 | | | Calculated from 3D model |
| 325 | PP: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 3 532 | | | Calculated from 3D model |

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|---|---|---|---|---|---|---|
| 325 | PP: Regrade excavated overburden and nominally compact to achieve uniform slopes indicated in the drawings. Stockpile excess excavated material in designated stockpile. | $m^3$ | 6 906 | | | Calculated from 3D model |
| 325 | PP: Excavate 500 mm wide trenches in overburden for installation of subsurface drainage system in base of pond to a depth of 0.5 m, as indicated on the drawings. | $m^3$ | 75 | | | Calculated from 3D model |
| 325 | PP: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 690 | | | Calculated from 3D model |
| 325 | PP: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 75 | | | Calculated from 3D model |
| 325 | PP: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 300 | | | Calculated from 3D model |
| 325 | PP: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth of 1 to 2 m. | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Supply and install pump in concrete manhole (costed in water treatment section) | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Rip base of dam embankment to a depth of 200 mm and compact to 95% Standard Proctor density. | $m^2$ | 30 473 | | | Calculated from 3D model |
| 325 | PP: Construct embankments with Zone 2 Waste Rockfill (-450 mm), including perimeter and central dams. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 187 024 | | | Calculated from 3D model |
| 325 | PP: Construct upstream Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick on upstream dam slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 4 190 | | | Calculated from 3D model |
| 325 | PP: Construct upstream Zone 5 Filter/Bedding Sand (-4.75 mm) layer 0.3 m thick on upstream dam slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 4 190 | | | Calculated from 3D model |
| 325 | PP: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the highest portion of the lined pond dam. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the dam above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Estimated from preliminary design |
| 325 | PP: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 50 | | | Estimated from preliminary design |
| 325 | PP: Supply and install GL 1.5 mm double textured LLDPE geomembrane on pond base and upstream slopes of embankments and anchor at crest as shown in drawings. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 28 590 | | | Calculated from 3D model |
| 325 | PP: Backfill geomembrane anchor trench with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 574 | | | Calculated from 3D model |
| 325 | PP: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 13 689 | | | Calculated from 3D model |
| 325 | PP: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 3 956 | | | Calculated from 3D model |
| 325 | PP: Supply and install Zone 4 Granular B Type II minimum 300 mm thick wearing course on crest of dam for vehicular access as well as graded ramps between connecting dams of different heights. | $m^3$ | 1 847 | | | Calculated from 3D model |
| 325 | PP: Supply and install Zone 4 Granular B Type II safety berms on both sides of dam crest as indicated on the drawings. | $m^3$ | 861 | | | Calculated from 3D model |
| 325 | PP: Construct spillway chute with Zone 2 Waste Rockfill (-450 mm). Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 12 810 | | | Calculated from 3D model |

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|---|---|---|---|---|---|---|
| 325 | PP: Supply and install three 36 inch DR21 HDPE pipes through dam (covered under WBS 366). | m | 315 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Zone 4 Granular B Type II for pipe bedding and trench backfill around pipes through dam in layers of 200 mm thick and compact to 90% standard Proctor density. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 80 | | | Estimated from preliminary design |
| 325 | PP: Excavate emergency spillway in Polishing Pond dam embankment and spillway chute to the lines and grades shown on the drawings. | $m^3$ | 3 517 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Zone 4 Granular B Type II in layers of 200 mm thick and compact to 90% standard Proctor density in base of emergency spillway. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 30 | | | Estimated from preliminary design |
| 325 | PP: Supply and install 20 MPa concrete sill 0.3 m thick on Zone 4 placed on base of spillway to set the spillway sill elevation as indicated on the drawings. | $m^3$ | 30 | | | Estimated from preliminary design |
| 325 | PP: Provide and install anchor bolts to affix GL 1.5 mm double textured LLDPE geomembrane to concrete. Rate to include stainless steel batton and rubber gaskets. | No. | 67 | | | Estimated from preliminary design |
| 325 | PP: Supply and install G1 500 $g/m^2$ nonwoven geotextile on spillway side slopes through the dam and on the base and side slopes in the spillway chute. Rate to include allowance for anchoring, wastage, overlap, etc. | $m^2$ | 2 483 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile on sideslopes in spillway weir on dam crest. Rate to include excavate, select, load, transport, offload, spread or backfill, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. Sourced from open pit development or stockpiles as identified by Owner. | $m^3$ | 75 | | | Estimated from preliminary design |
| 325 | PP: Supply and install Zone 7c Spillway Erosion Protection with D50 = 400 mm and place in 500 mm thick layer on geotextile in base of ditch and sideslopes in spillway chute. Rate to include excavate, select, load, transport, offload, spread or backfill, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. Sourced from open pit development or stockpiles as identified by Owner. | $m^3$ | 3 122 | | | Estimated from preliminary design |
| | **Subtotal** | | | | | |

| c | CONTAMINATED CONTACT WATER POND | | | | | |
|---|---|---|---|---|---|---|
| 326 | CCWP: Tree clearing within local construction area, to include removal of stumps and stockpile in designated area. | $m^2$ | 15 684 | | | Calculated from 3D model |
| 326 | CCWP: Remove muskeg, organics, topsoil, overburden and unsuitable soil from dam and pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^3$ | 4 288 | | | Calculated from 3D model |
| 325 | CCWP: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 1 637 | | | Calculated from 3D model |
| 326 | CCWP: Regrade excavated overburden and nominally compact to achieve uniform slopes indicated in the drawings. Stockpile excess excavated material in designated stockpile. | $m^3$ | 3 200 | | | Calculated from 3D model |
| 326 | CCWP: Excavate 500 mm wide trenches in overburden for installation of subsurface drainage system in base of pond to a depth of 1 m, as indicated on the drawings. | $m^3$ | 120 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 792 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 120 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 240 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth of 1 to 2 m. | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install pump in concrete manhole (costed in water treatment section) | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Rip base of dam embankment to a depth of 200 mm and compact to 95% Standard Proctor density. | $m^2$ | 11 382 | | | Calculated from 3D model |
| 326 | CCWP: Construct embankments with Zone 2 Waste Rock (-450 mm), including perimeter and central dams. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 34 119 | | | Calculated from 3D model |
| 326 | CCWP: Construct upstream Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick on upstream dam slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 1 376 | | | Calculated from 3D model |
| 326 | CCWP: Construct upstream Zone 5 Filter/Bedding Sand (-4.75 mm) layer 0.3 m thick on upstream dam slopes. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 1 376 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the highest portion of the lined pond dam. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the dam above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 40 | | | Estimated from preliminary design |
| 326 | CCWP: Supply and install GL 1.5 mm double textured LLDPE geomembrane on pond base and upstream slopes of embankments and anchor at crest as shown in drawings. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 8 187 | | | Calculated from 3D model |
| 326 | CCWP: Backfill geomembrane anchor trench with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 352 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 2 937 | | | Calculated from 3D model |

| | | | | | | |
|---|---|---|---|---|---|---|
| 326 | CCWP: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 846 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install Zone 4 Granular B Type II minimum 300 mm thick wearing course on crest of dam for vehicular access as well as graded ramps between dams of varying heights. | $m^3$ | 1 055 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install Zone 4 Granular B Type II safety berms on both sides of dam crest as indicated on the drawings. | $m^3$ | 527 | | | Calculated from 3D model |
| 326 | CCWP: Construct access road to dam with Zone 2 Waste Rock (-450 mm). Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from pit development or stockpiles as identified by Owner. | $m^3$ | 764 | | | Calculated from 3D model |
| 326 | CCWP: Supply and install Zone 4 Granular B Type II minimum 300 mm thick wearing course on dam access road. | $m^3$ | 144 | | | Calculated from 3D model |
| | **Subtotal** | | | | | |
| **D** | **TREATED WATER COLLECTION POND** | | | | | |
| 361 | Treated water collection pond (TWCP): Tree clearing within local construction area, to include removal of stumps and stockpile in designated area. | $m^2$ | 10 122 | | | Calculated from 3D model |
| 361 | TWCP: Remove muskeg, organics, topsoil, overburden and unsuitable soil from pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 10 122 | | | Calculated from 3D model |
| 361 | TWCP: Excavate overburden to bedrock within pond footprint. Stockpile excavated material in designated stockpile. | $m^3$ | 52 255 | | | Calculated from 3D model with assumed bedrock elevation at El. 374 m based on limited available borehole data |
| 361 | TWCP: Blast bedrock to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 6 848 | | | Calculated from 3D model with assumed bedrock elevation at El. 374 m based on limited available borehole data |
| 361 | TWCP: Supply and install slush grout on exposed bedrock surface for liner surface preparation. | $m^2$ | 2 911 | | | Calculated from 3D model |
| 361 | TWCP: Blast 500 mm wide trench in bedrock for installation of subsurface drainage system in base of pond to a depth of up to 1 m, as indicated on the drawings. | $m^3$ | 43 | | | Bedrock elevation assumed at El. 374 m based on limited available borehole data. 0.5 m width x 1 m depth x 86 m length |
| 361 | TWCP: Supply and install G2 300 g/$m^2$ non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 285 | | | Calculated from 3D model |
| 361 | TWCP: Supply and install Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 43 | | | 0.5 m width x 1 m depth x 86 m length |
| 361 | TWCP: Supply and install 75 mm ID double walled perforated HDPE pipes (DR11) with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system, to grades and slopes indicated on the drawings. Rate to include transport, offloading, installation, and allowance for wastage. | m | 110 | | | Estimated from preliminary design |
| 361 | TWCP: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth up to 3 m. | No. | 1 | | | Estimated from preliminary design |
| 361 | TWCP: Supply and install pump in concrete manhole (costed in water treatment section) | No. | 1 | | | Estimated from preliminary design |
| 361 | TWCP: Excavate 1 m x 1 m trench in overburden around perimeter of pond for geomembrane anchor trench. | $m^3$ | 393 | | | Calculated from 3D model |
| 361 | TWCP: Supply and install GL 1.5 mm double textured LLDPE geomembrane on base and slopes of pond as shown in drawings and anchor at crest. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 10 251 | | | Calculated from 3D model |
| 361 | TWCP: Backfill geomembrane anchor trench with Zone 3 Till/Sand Bentonite Cement Fill. | $m^3$ | 393 | | | Calculated from 3D model |
| 361 | TWCP: Supply and install G1 500 g/$m^2$ nonwoven geotextile over geomembrane on base of pond. Rate to include allowance for wastage, overlap, etc. | $m^2$ | 3 133 | | | Calculated from 3D model |
| 361 | TWCP: Construct ballast layer at base of ponds with Zone 6 Transition Sand and Gravel (-26.5 mm), 0.3 m thick. Rate to include excavate, select, load, transport, offload, spread or backfill, water, compact, final grading, complying with required tolerances, providing for testing, and disposal of spoil. Material sourced from processed material temporary stockpiles. | $m^3$ | 843 | | | Calculated from 3D model |
| | **Subtotal** | | | | | |
| | **TOTAL COST** | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT -PHASE 1 DYKES**

| WBS | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of Quantities |
|---|---|---|---|---|---|---|
| **A** | **DYKE IN LAKE 001 PHASE 1** | | | | | |
| 327 | Remove muskeg, organics, topsoil, overburden and unsuitable soil from dyke footprint (on dry land) to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 5 600 | | | The dam footprint on land from the Autocad model |
| 327 | Remove lake sediments from below dyke footprint with dredging or long reach excavator to a depth of 1.5 m. | $m^3$ | 7 800 | | | The dam footprint underwater from the Autocad model, and the thickness of the loose materilas in lake sediment interpreted from BH logs |
| 327 | Supply and Install silt curtains in Lake 001 on the upstream and downstream sides of Phase 1 Dyke | $m^2$ | 1 200 | | | Considering the height from the water level to the lake bed |
| 327 | Load, haul , dump and construct central berm in water with dumping and dozing method from edge of water with Zone 1 crushed stone (-75 mm) sourced from on-site stockpile | $m^3$ | 3 700 | | | From deisgn of dam, using Civil 3D |
| 327 | Construct side berms in water with select Mine Rockfill (-450 mm) with dumping and dozing method from edge of water. (Below El 375m) | m3 | 13 900 | | | From deisgn of dam, using Civil 3D |
| 327 | Supply and install steel sheet piles to bedrock within Zone 1 to form a barrier against water infiltration and to ensure the structural integrity of the dyke. Top of sheet pile elevation to match final dyke elevation | $m^2$ | 1 500 | | | From the dam length and depth of the IDF water level to the bedrock |
| 327 | Construct remaining berm above crushed stone layer and adjacent to sheet pile to final berm elevation with Zone 2 Mine Rockfill (-450 mm) (Above EL 375m) | $m^3$ | 10 500 | | | From deisgn of dam, using Civil 3D |
| 327 | Load, haul, place, and compact Granular B Type II from stockpile on crest of dyke for vehicular access, including safety berms on dam crest. | $m^3$ | 600 | | | From deisgn of dam, using Civil 3D |
| | **Subtotal** | | | | $0,00 | |
| **B** | **DYKE IN LAKE 001 PHASE 2** | | | | | |
| 327 | Remove muskeg, organics, topsoil, overburden and unsuitable soil from dyke footprint (on dry land) to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 9 800 | | | The dam footprint on land from the Autocad model |
| 327 | Remove lake sediments from below dyke footprint with dredging or long reach excavator to a depth of 1.5 m. | $m^3$ | 44 300 | | | The dam footprint underwater from the Autocad model, and the thickness of the loose materilas in lake sediment interpreted from BH logs |
| 327 | Supply and Install silt curtains in Lake 001 on the upstream and downstream sides of Phase 1 Dyke | $m^2$ | 2 800 | | | Considering the height from the water level to the lake bed |
| 327 | Load, haul , dump and construct central berm in water with dumping and dozing method from edge of water with Zone 1 crushed stone (-75 mm) sourced from on-site stockpile. | $m^3$ | 23 900 | | | From deisgn of dam, using Civil 3D |
| 327 | Construct side berms in water with select Mine Rockfill (-450 mm) with dumping and dozing method from edge of water. (below EL 375m) | m3 | 71 100 | | | From deisgn of dam, using Civil 3D |
| 327 | Supply and install steel sheet piles to bedrock within Zone 1 to form a barrier against water infiltration and to ensure the structural integrity of the dyke. Top of sheet pile elevation to match final dyke elevation | $m^2$ | 7 200 | | | From the dam length and depth of the IDF water level to the bedrock |
| 327 | Construct remaining berm above crushed stone layer and adjacent to sheet pile to final berm elevation with Zone 2 Mine Rockfill (-450 mm) (Above EL 375m) | $m^3$ | 26 800 | | | From deisgn of dam, using Civil 3D |
| | Load, haul, place, and compact Granular B Type II from stockpile on crest of dyke for vehicular access, including safety berms on dam crest. | $m^3$ | 1 400 | | $0,00 | From deisgn of dam, using Civil 3D |
| **C** | **SEDIMENT CONTROL DAM** | | | | | |
| 327 | Remove lake sediments from below dyke footprint with dredging or long reach excavator to a depth of 1.5 m. | $m^3$ | 1 188 | | | The dam footprint from the Autocad model, and the thickness of the loose materilas in lake sediment interpreted from BH logs |
| 327 | Construct berm with Zone 2 Mine Rockfill (-450 mm) | $m^3$ | 772 | | | From deisgn of dam, using Civil 3D |
| | **Subtotal** | | | | **$0,00** | |
| | **TOTAL COST** | | | | **$0,00** | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - DIVERSION DITCH**

| WBS | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | |
|---|---|---|---|---|---|---|
| **A** | **FOUNDATION PREPARATION** | | | | | |
| 329 | Excavate topsoil and soft material (overburden) to form the required channel profile in areas where it is aligned through natural soil. To be placed in Overburden Pile 04 or 05. | $m^3$ | 6 000 | | | 0.4 m of overburden as per BH CV 780/782 |
| 329 | Blast bedrock to form the required channel profile in areas where it is aligned through rocky terrain. Remove blast muck and place it in the StockPile 001 | $m^3$ | 61 000 | | | Assuming bed rock below 0.4 m of surface as per BH CV 780/782. |
| 329 | Supply and install 500g/m2 non-woven needle punched geotextile below rip-rap for erosion protection in the channel including anchoring as per detail in areas where is is aligned through natural soil. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 157 | | | Assuming 15% of the channel needs to be ripraped. |
| 329 | Install Zone 7 rip-rap for erosion protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base and sideslopes of the ditches as per detail in areas where it is aligned through natural soil. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 517 | | | Assuming 15% of the channel needs to be ripraped. |
| 329 | Backfill with blasted rock along the channel crest to meet the required channel profile and depth where required. Rate to include loading, transport, offloading, spreading or backfilling. | $m^3$ | 200 | | | Assummed |
| **C** | **MISCELLANEOUS WORK ITEMS** | | | | | |
| | | | | | | |
| | **Subtotal** | | | | | |
| | **TOTAL COST** | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - WATER TREATMENT FOR POTABLE PRODUCTION**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of estimate |
|---|---|---|---|---|---|---|
| **A** | **Treatment plant** | | | | | |
| 331 | Potable water production - Treatment Unit - 176 m3/d (450 rooms) - No installation, no delivery | UNIT | 1 | $1 671 554,00 | $1 671 554,00 | Supplier quote |
| 331 | Delivery of the plant to the site - 4 containers | | | | | |
| 331 | Installation and interconnecting piping | | | | | |
| 331 | First fill of chemical for start-up | lot | 1 | $1 200,00 | $1 200,00 | |
| 331 | Commissioning and training of operators (5% of total price) | lot | 1 | $83 577,70 | $83 577,70 | |
| 331 | | | | | | |
| | | | | | | |
| **B** | **Pipeline** | | | | | |
| 331 | | | | | | |
| 331 | | | | | | |
| 331 | | | | | | |
| **C** | **Electrical Room** | | | | | |
| 331 | Panelboard 600V, 125A, 25kA, 9 FEEDERS (9X20A, 1x30A) | UNIT | 1 | $6 262,29 | $6 262,29 | Quote from ABB 01.05.2025 |
| 331 | VFD 7,5HP, 600V | UNIT | 2 | $2 000,00 | $4 000,00 | Quote from ABB 0xx.05.2025 |
| 331 | VFD 20HP, 600V | UNIT | 2 | $3 400,00 | $6 800,00 | Quote from ABB 0xx.05.2025 |
| 331 | Divers | Lot | 1 | | | |
| **D** | **Services** | | | | | |
| 331 | | | | | | |
| 331 | | | | | | |
| | | | | | | |
| **E** | **Ground preparation** | | | | | |
| 331 | Remove muskeg, organics, topsoil, overburden and unsuitable soil from designated footprint and stockpile in designated area. | m2 | 120 | | | |
| 331 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 74 | | | |
| 331 | | m3 | | | | |
| 331 | | m2 | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - POTABLE WATER DISTRIBUTION**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT |
|---|---|---|---|---|---|
| | | | | | |
| **A** | **Pumping station - FWD-PMP-001/002** | | | | |
| 333 | | | | | |
| 333 | | | | | |
| | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - SEWAGE TREATMENT PLANT**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of estimate |
|---|---|---|---|---|---|---|
| **A** | **Treatment plant** | | | | | |
| 341 | Ultimo SMBR - Sewage water treatment unit - Mabarex - 176 m3/d (450 rooms) - No installation, no delivery | UNIT | 1 | $4 618 114,00 | $4 618 114,00 | Supplier quote from Mabarex |
| 341 | Delivery of the plant to the site - 5 containers + 2 reservoirs | | | | | |
| 341 | | | | | | |
| 341 | First fill of chemical for start-up | lot | 1 | $18 800,00 | $18 800,00 | |
| 341 | Commissioning and training of operators (5% of total price) | lot | 1 | $230 905,70 | $230 905,70 | |
| 341 | | | | | | |
| 341 | | | | | | |
| **B** | **Pipeline** | | | | | |
| 341 | Potable water pipeline between potable production plant and sewage treatment plant - DR17 - 2in - Butt fusion | m | 100 | $3,08 | $308,00 | |
| 341 | Potable water pipeline between potable production plant and sewage treatment plant - DR17 - 2in - fittings | lot | 1 | $92,40 | $92,40 | |
| **C** | **Electrical Room** | | | | | |
| 341 | Panelboard 600V, 600A, 25kA, 11 FEEDERS (20X20A, 1X40) | UNIT | 1 | $25 000,00 | $25 000,00 | |
| 341 | VFD 7,5HP, 600V | UNIT | 8 | $2 000,00 | $16 000,00 | Quote from ABB 0xx.05.2025 |
| 341 | VFD 15HP, 600V | UNIT | 8 | $2 800,00 | $22 400,00 | Quote from ABB 0xx.05.2025 |
| | | | | | | |
| **D** | **Services** | | | | | |
| | | TBD | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| **E** | **Ground preparation** | | | | | |
| 341 | Crushed stone, backfill and compaction | m2 | 500 | | | |
| 341 | Remove muskeg, organics, topsoil, overburden and unsuitable soil from designated footprint and stockpile in designated area. | m2 | 500 | | | |
| 341 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 53 | | | |
| | | | | | | |
| | | | | | | |

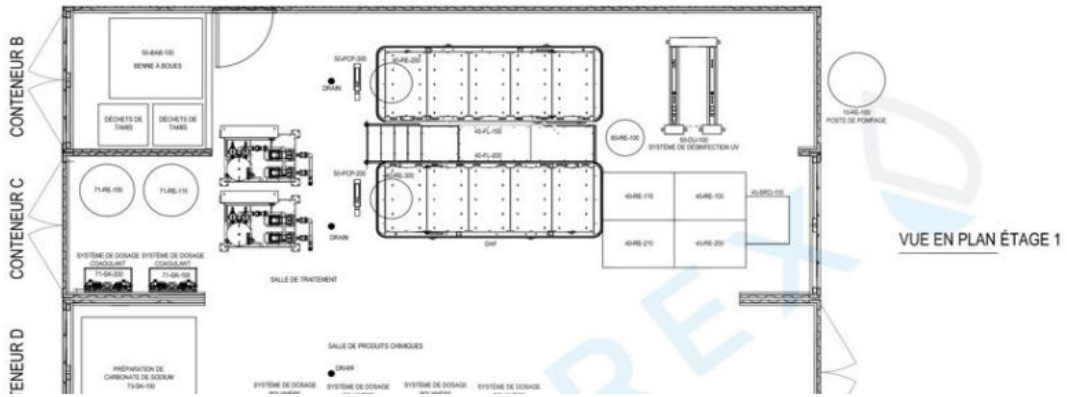
**NN10260950**
25,000 gal. (US) 20,880 gal. (UK) 94,600 L
Diamètre: 3,048 mm (10')
Longueur: 13,996 aim (45' 11")
Poids: 3,425 kg (7,550 livres)

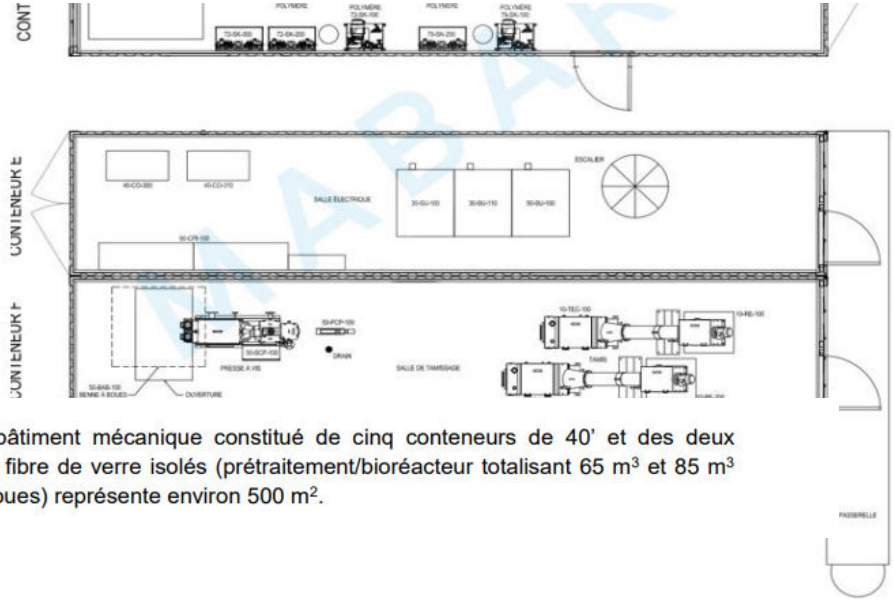


**NN08350687**
18,000 gal. (US) 14,990 gal. (UK) 68,100 L
Diamètre: 2,438 mm (8')
Longueur: 16,573 mm (54' 4 1/2")
Poids: 2,654 kg (6,860 livres)



*Considering the footprint of 3X40' containers + 2 X40' containers for the two reservoirs






VUE EN PLAN ÉTAGE 2

sol du bâtiment mécanique constitué de cinq conteneurs de 40' et des deux -sols en fibre de verre isolés (prétraitement/bioréacteur totalisant 65 $m^3$ et 85 $m^3$ ge des boues) représente environ 500 $m^2$.

MABAE

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - TREATED DOMESTIC WATER DISCHARGE**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Base of estimate |
|---|---|---|---|---|---|---|
| **A** | **Pumping station - SWT-PMP-001/002** | | | | | included in 341 for electricity |
| 342 | Barmesa Submersible Stainless Dewatering Pump - 2KLEIN-202, 2", 153 GPM, 2.0 HP, Stainless, 230V, Single-Phase | Unit | 2 | $2 000,00 | $4 000,00 | Barmesa Submersible Stainless Dewatering Pump - 2KLEIN-202, 2", 153 GPM, 2.0 HP, Stainless, 230V, Single-Phase |
| 342 | Concrete prefabricated Pumping station SP9000 base of 2400 mm by Lecuyer for pipe of 500mm | Lot | 1 | $43 400,00 | $43 400,00 | Quote from Lecuyer 11.04.205 (70% of the price to consider a smaller pumping station) |
| 342 | Concrete prefabricated Pumping station SP9000 Connexion of 2100 mm by Lecuyer | Lot | Included | | | |
| 342 | galvanized steel ladder with anchor | Lot | Included | | | |
| 342 | butyl gasket for sealing sections (For pumping well and manhole) | Lot | Included | | | |
| 342 | Flex-Lok gasket for sealing the pipe (For pumping well and manhole) | Lot | Included | | | |
| 342 | Non-Contact Rader Level Transmitter | unit | 1 | $3 000,00 | $3 000,00 | |
| **B** | **Pipeline** | | | | | |
| 342 | HDPE - DR11 (200PSI) - 3" Butt Fusion | m | 1 525 | $6,84 | $10 431,00 | Quote from Marcel Baril 09.04.2025 |
| 342 | HDPE - DR11 (200PSI) - 3" - Fittings | lot | 1 | $3 129,30 | $3 129,30 | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - CONTACT WATER TREATEMENT PLANT - PHASE 1**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of estimate | |
|---|---|---|---|---|---|---|---|
| **A** | **Treatment plant** | | | | | | |
| 361 | Trace Metal Water Treatment - Veolia - 1 165 m3/h - No installation, no delivery | Lot | 1 | $4 375 000,00 | $4 375 000,00 | Quote from Veolia (2025.04.14). 20% of contingency added | |
| 361 | Laboratory in 20" container - Insulated and heated | Unit | 1 | $150 000,00 | | Quote from Veolia (2025.04.16). 20% of contingency added | |
| 361 | Delivery of the plant to the site - 6 containers + 2 geotubes | lot | 1 | | | | |
| 361 | | | | | | | |
| 361 | First fill of chemical for start-up | lot | 1 | $15 000,00 | $15 000,00 | | |
| 361 | Commissioning and training of operators (5% of total price) | lot | 1 | $218 750,00 | $218 750,00 | | |
| 361 | Megadome XP high Profiles - 30m wide x 40m length | Unit | 1 | | | | |
| 361 | Barmesa Submersible Stainless Steel Vortex Sewage Pump - 2BSV-101DS, 2", 127 GPM, 1.0 HP, Single-Phase, 115 Volt - FCW-PMP-001 | UNit | 2 | $1 061,00 | $2 122,00 | To transfer water from filtered water to contaminated water - | Barmesa Submersible Stainless Steel Vortex Sewage Pump - 2BSV-101DS, 2", 127 GPM, 1.0 HP, Single-Phase, 115 Volt |
| 361 | HDPE DR17 pipe 2 in diameter Butt fusion - FCW-PMP-001 | m | 100 | $3,08 | $308,00 | | |
| 361 | HDPE - DR17 - 2" - Fittings - FCW-PMP-001 | lot | 1 | $92,40 | $92,40 | | |
| 361 | Heat Tracing cables C13-574-COJ - FCW-PMP-001 | Ft | 361 | $12,00 | $4 330,71 | | |
| 361 | Electronic Thermostat NGUTC 6340-01 - FCW-PMP-001 | Unit | 1 | $6 911,00 | $6 911,00 | | |
| 361 | Temperature Sensor URTD 15G - FCW-PMP-001 | Unit | 1 | $298,25 | $298,25 | | |
| 361 | Temperature Sensor URTD 15R - FCW-PMP-001 | Unit | 1 | $298,25 | $298,25 | | |
| 361 | Power Feed Kit 1 - FCW-PMP-001 | Unit | 1 | $935,90 | $935,90 | | |
| 361 | Nominal 76 mm (3.0 in) thick standard U.I.P.® urethane insulation c/w black extruded polyethylene, integral heat trace channels on customer supplied pipe - FCW-PMP-001 | Ft | 361 | $30,00 | $10 826,77 | | |
| **B** | **Electrical Room** | | | | | | |
| 361 | Panelboard 600V, 400A, 25kA, 11 FEEDERS (20X20A, 1x40A, 4x100A) | UNIT | 1 | $30 000,00 | $30 000,00 | | |
| 361 | VFD 5HP, 600V | UNIT | 8 | $1 500,00 | $12 000,00 | Quote from ABB 0xx.05.2025 | |
| 361 | VFD 75HP, 600V | UNIT | 4 | $11 000,00 | $44 000,00 | Quote from ABB 0xx.05.2025 | |
| 361 | | | | | | | |
| **C** | **Ground preparation** | | | | | | |
| 361 | Remove muskeg, organics, topsoil, and unsuitable soil from designated footprint to a nominal depth of 300 mm and stockpile in designated area. | m2 | 1575 | | | | |
| 361 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 5775 | | | | |
| **D** | **SERVICES** | | | | | | |
| 361 | Insulated potable water tank of 5 m3 with recirculating flow to protect againt freezing | Unit | 1 | | | | |
| 361 | Centrifugal pump rated at 55 Usgpm | Unit | 1 | | | | |
| 361 | All the piping to allow the recirculation of 15 Usgpm + 40 Usgpm for 2 emergency shower in the plant | Unit | 1 | | | | |
| 361 | All the fitting to allow the recirculation of 15 Usgpm + 40 Usgpm for 2 emergency shower in the plant | Unit | 1 | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - CONTACT WATER TREATEMENT PLANT - PHASE 2**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of quantities |
|---|---|---|---|---|---|---|
| **A** | **Treatment plant -** | | | | | |
| **A1** | **Trace Metal** | | | | | |
| 362 | Trace Metal Water Treatment - Veolia - 1 895 m3/h (NOT IN INITIAL CAPEX) | Lot | 1 | $2 880 000,00 | $2 880 000,00 | Quote from Veolia (2025.04.14). |
| 362 | Delivery of the plant to the site - 1 container + 1 geotube | | | | | |
| 362 | | | | | | |
| **A1** | **TSS** | | | | | |
| 362 | TSS Water Treatment - Veolia 1 570 m3/hr (NOT IN INITIAL CAPEX) | Lot | 1 | $3 700 000,00 | $3 700 000,00 | Quote from Veolia (2025.04.14). |
| 362 | Delivery of the plant to the site - 2 container + 4 geotubes | Lot | 1 | | | |
| 362 | First fill of chemical for start-up | Lot | 1 | $15 000,00 | $15 000,00 | |
| 362 | Commissioning and training of operators (5% of total price) | Lot | 1 | $185 000,00 | $185 000,00 | |
| 362 | | | | | | |
| **B** | **Electrical Room** | | | | | |
| 362 | Panelboard 600V, 400A, 25kA, 21 FEEDERS (20X20A, 1x40A) | UNIT | 1 | $25 000,00 | $25 000,00 | |
| 362 | VFD 5HP, 600V | UNIT | 10 | $1 500,00 | $15 000,00 | Quote from ABB 0xx.05.2025 |
| 362 | VFD 10HP, 600V | UNIT | 3 | $2 500,00 | $7 500,00 | Quote from ABB 0xx.05.2025 |
| 361 | VFD 75HP, 600V | UNIT | 1 | $11 000,00 | $11 000,00 | Quote from ABB 0xx.05.2025 |
| **C** | **Ground preparation** | | | | | |
| **C1** | **Trace Metal** | | | | | |
| 362 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m3 | 805,00 | | | |
| 362 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 6 370 | | | |
| 362 | | m2 | | | | |
| 362 | | | | | | |
| **C2** | **TSS** | | | | | |
| 362 | Remove muskeg, organics, topsoil, and unsuitable soil from designated footprint to a nominal depth of 300 mm and stockpile in designated area. | m2 | 3150 | | | |
| 362 | | m2 | | | | |
| **D** | **SERVICES** | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - PUMPS & PIPING - PHASE 1**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **A** | **Pumping station - P1-PMP-001/002** | | | | | |
| | **A1 Pumping station** | | | | | |
| 364 | Centrifugal pump, Sewatec K 150-403G 3ENH 504/504 | UNIT | 2 | $69 300,00 | $138 600,00 | Quote fromKSB 05.12.2025 |
| 364 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | unit | 1 | $200 000,00 | $200 000,00 | |
| 364 | Priming System | unit | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Delivery of the plant to the site - 1 container | unit | 1 | | | |
| | **A2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 14" - Butt fusion | m | 2 971 | $109,79 | $326 186,09 | Quote from Marcel Baril 09.04.2025 |
| | HDPE - DR11 (200PSI) - 14" - Fittings | lot | 1 | $97 855,83 | $97 855,83 | |
| | | | | | | |
| | | | | | | |
| 364 | HDPE - DR11 (200PSI) - 24" (Suction) - Butt fusion | m | 40 | $322,58 | $12 903,20 | Quote from Marcel Baril 09.04.2025 |
| | HDPE - DR11 (200PSI) - 24" - Fittings | lot | 1 | $3 870,96 | $3 870,96 | |
| | Piping installation | | | | | |
| 364 | 3" Air & Vacuum Valve Crispin Model AX30 | Unit | 2 | $14 952,72 | $29 905,44 | Quote from Conval Quebec 24.04.2025 |
| 364 | Ball valve - 316 S.S. Body - Model 3"K-456666PTSE-v3 cadenassable | Unit | 4 | $4 153,19 | $16 612,76 | Quote from ISCO 29.04.2025 |
| 364 | 316 AI ROBINET A BOUTS FILETE 4 BILLE 2MC PASS 1000 WOG | UNIT | 4 | $944,09 | $3 776,36 | Quote from ISCO 29.04.2025 |
| 364 | 20" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 4 | $1 128,14 | $4 512,56 | Quote from ISCO 29.04.2025 |
| 364 | 4" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 4 | $36,33 | $145,32 | Quote from ISCO 29.04.2025 |
| 364 | 4" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 4 | $109,70 | $438,80 | Quote from ISCO 29.04.2025 |
| 364 | 14" X 3" ELECTROFUSION BRANCH SADDLE | UNIT | 4 | $570,51 | $2 282,04 | Quote from ISCO 29.04.2025 |
| 364 | 3" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 4 | $24,41 | $97,64 | Quote from ISCO 29.04.2025 |
| 364 | 3" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 4 | $73,79 | $295,16 | Quote from ISCO 29.04.2025 |
| 364 | 304 RACCORDS FILETE CLASSE 150 4 BOUCHON TETE CARREE | UNIT | 4 | $36,90 | $147,60 | Quote from ISCO 29.04.2025 |
| | **A3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 225A, 25kA, 5 FEEDERS (2X200A, 2X20A, 1X40A) | UNIT | 1 | $30 000,00 | $30 000,00 | |
| 364 | VFD 200HP, 600V | UNIT | 2 | $26 000,00 | $52 000,00 | Quote from ABB 02.05.2025 |
| | **A4 Ground Preparation** | | | | | |
| 364 | | | | | | |
| 364 | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **A5 Instrumentation** | | | | | |
| 364 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 364 | Motorized Isolation Valve | Unit | 2 | $10 000,00 | $20 000,00 | |
| 364 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |
| 364 | Mobile diesel air compressor - 100 PSI - 1600 cfm (for purging all pipelines) | Unit | 1 | $500 000,00 | $500 000,00 | |
| **B** | **Pumping station - P3-PMP-001/002** | | | | | |
| | **B1 Pumping station** | | | | | |
| 364 | Centrifugal pump, CPO 10x8x16H - 200HP, 60 hz | UNIT | 4 | $89 864,59 | $359 458,36 | |
| 364 | Pump house - 40' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $270 000,00 | $270 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Delivery of the plant to the site - 1 container | | | | | |
| 364 | Priming System | UNIT | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| | | | | | | Quote from Nord-flo 16.04.2025 |
| | | | | | | |
| | **B2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 32" - Butt fusion | m | 3 469 | $573,47 | $1 989 367,43 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR11 (200PSI) - 32" - Fittings | UNit | 1 | $795 746,97 | $795 746,97 | |
| 364 | HDPE - DR9 (250PSI) - 18" - Butt fusion | m | 15 | $181,44 | $2 721,60 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR9 (250PSI) - 18" - Fittings | Lot | 1 | $1 088,64 | $1 088,64 | |
| 364 | HDPE - DR11 (200PSI) - 30" (Suction) - Butt fusion | m | 80 | $418,79 | $33 503,20 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR11 (200PSI) - 30" - Fittings | Lot | 1 | $13 401,28 | $13 401,28 | |
| 364 | Piping installation | | | | | |
| 364 | Line Drainage system | | | | | |
| | Knife gate valve 24" - 24" C67S-316EBU-EZ-LK7- 316/316/EPDM ITT FABRI E-Z MAN.KGV | Unit | 2 | $16 132,00 | $32 264,00 | Quote from Conval Quebec 16.04.2025 |
| | Straight Tee - HDPE - 20" | Unit | 2 | | | |
| | Reducer - HDPE - 24" x 20" | Unit | 2 | | | |
| | Flange Adapter + Backup ring - HDPE - 24" | Unit | 2 | | | |
| | 1" nipple | Unit | 2 | | | |
| | Ball valve - 316 S.S. Body - 1"446666PMSE-v3 cadenassable | UNIT | 2 | $57,14 | $114,28 | |
| | Foam Pig - 16-1/2" SLS BARE SWAB | UNIT | 5 | $137,00 | $685,00 | |
| | Ball valve - 316 S.S. Body - 1"446666PMSE-v3 cadenassable | unit | 2 | $14 952,72 | $29 905,44 | |
| | Foam Pig - 15-1/2" SLS BARE SWAB | UNIT | 5 | $137,00 | $685,00 | |
| | Knife gate valve - 18" C67S-316EBU-EZ-LK7- 316/316/EPDM ITT FABRI E-Z MAN.KGV | Unit | 2 | $14 346,79 | $28 693,58 | |
| | Ball valve - 316 S.S. Body - 1"446666PMSE-v3 cadenassable | UNIT | 2 | $536,35 | $1 072,70 | |
| | 3" Air & Vacuum Valve Crispin Model AX30 | Unit | 2 | $14 952,72 | $29 905,44 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **B3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 225A, 25kA, 5 FEEDERS (2X300A, 2X20A, 1X40A) | UNIT | 1 | $40 000,00 | $40 000,00 | |
| 364 | VFD 25 HP, 600V | UNIT | 2 | $4 250,00 | $8 500,00 | |
| 364 | VFD 250 HP, 600V | UNIT | 2 | $32 000,00 | $64 000,00 | |
| | **B4 Ground Preparation** | | | | | |
| 364 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 29,52 | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| | **B5 Instrumentation** | | | | | |
| 364 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 364 | Motorized Isolation Valve | Unit | 2 | $10 000,00 | $20 000,00 | |
| 364 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |
| **C** | **Pumping station - CWT1-PMP-001** | | | | | |
| | **C1 Pumping station** | | | | | |
| 364 | Centrifugal pump,\ Xylen 7030 3 -621 38HP - Flygt | UNIT | 4 | $92 469,00 | $369 876,00 | Quote from Nord-flo |
| 364 | Pump box | UNIT | 3 | $140 000,00 | $420 000,00 | Quote from Veolia |
| | **C2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 20" - Butt fusion | m | 99 | $68,28 | $6 759,72 | |
| 364 | HDPE - DR11 (200PSI) - 20" - Fittings | Lot | 1 | $2 703,89 | $2 703,89 | |
| 364 | HDPE - DR11 (200PSI) - 26" - Butt fusion | m | 340 | $115,40 | $39 236,00 | |
| 364 | HDPE - DR11 (200PSI) - 26" - Fittings | Lot | 1 | $15 694,40 | $15 694,40 | |
| | **C3 Electrical Room** | | | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| | **C4 Ground Preparation** | | | | | |
| 364 | | | | | | |
| | **C5 Instrumentation** | | | | | |
| 364 | Heat Tracing cables C13-574-COJ | Ft | 3795 | $16,42 | $62 313,90 | |
| 364 | Electronic Thermostat NGUTC 6340-01 | UNIT | 1 | $6 911,00 | $6 911,00 | |
| 364 | Temperature Sensor URTD 15G | UNIT | 1 | $298,25 | $298,25 | |
| 364 | Temperature Sensor URTD 15R | UNIT | 1 | $298,25 | $298,25 | |
| 364 | Power Feed Kit 1 | UNIT | 1 | $935,90 | $935,90 | |
| 364 | Nominal 76 mm (3.0 in) thick standard U.I.P.® urethane insulation c/w black extruded polyethylene, integral heat trace channels on customer supplied pipe | Ft | 1265 | $173,55 | $219 540,75 | |
| 364 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |

| D | Pumping station - CP1-PMP-001/002/003 | | | | | |
|---|---|---|---|---|---|---|
| | **D1 Pumping station** | | | | | |
| 364 | Centrifugal Pump, RUHRPUMPEN CPP10X8X13 (OH1), Ductile Iron casing, 75HP, 3PH, 60Hz, 230/460V | UNIT | 3 | $52 999,98 | $158 999,94 | Quote from Nord-flo 16.04.2025 |
| 364 | Priming System | UNIT | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Delivery of the plant to the site - 1 container | | | | | |
| | **D2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 20" - Butt fusion | m | 30 | $224,01 | $6 720,30 | Quote from Marcel Baril 09.04.2025 |
| | HDPE - DR11 (200PSI) - 20" - Fittings | Lot | 1 | $2 688,12 | $2 688,12 | |
| 364 | HDPE - DR9 (250PSI) - 16" - Butt fusion | m | 1 948 | $143,35 | $279 245,80 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR9 (250PSI) - 16" - Fittings | Lot | 1 | $111 698,32 | $111 698,32 | |
| 364 | Marine Oil Skimming Boom - Spillage response to apply in contact water pond 1 to prevent oil getting in the pump station | m | 60 | $100,00 | $6 000,00 | |
| 364 | 3" Air & Vacuum Valve Crispin Model AX30 | Unit | 1 | $14 952,72 | $14 952,72 | Quote from Conval Quebec 24.04.2025 |
| 364 | Ball valve - 316 S.S. Body - Model 3"K-456666PTSE-v3 cadenassable | Unit | 2 | $4 153,19 | $8 306,38 | |
| 364 | 316 AI ROBINET A BOUTS FILETE 4 BILLE 2MC PASS 1000 WOG | Unit | 2 | $944,09 | $1 888,18 | |
| 364 | 20" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 2 | $1 128,14 | $2 256,28 | |
| 364 | 4" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 2 | $36,33 | $72,66 | |
| 364 | 4" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 2 | $109,70 | $219,40 | |
| 364 | 304 RACCORDS FILETE CLASSE 150 4 BOUCHON TETE CARREE | UNIT | 2 | $36,90 | $73,80 | |
| | **D3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 100A, 25kA, 5 FEEDERS (3X80A, 1X40A, 2x20A) | UNIT | 1 | 8000 | $8 000,00 | |
| 364 | VFD 75HP, 600V | UNIT | 3 | 12000 | $36 000,00 | Quote from ABB 02.05.2025 |
| | **D4 Ground Preparation** | | | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| | **D5 Instrumentation** | | | | | |
| 364 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 364 | Local Control Station - Local/Remote Selector, Start/Stop PushButton | Unit | 2 | $10 000,00 | $20 000,00 | |
| 364 | Variable Frequency Drive | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Local PLC Control Panel | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Motorized Isolation Valve | Unit | 1 | $10 000,00 | $10 000,00 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **E** | **Pumping station - CP2-PMP-001/002** | | | | | |
| | **E1 Pumping station** | | | | | |
| 364 | Centrifugal pump, RUHRPUMPEN CPP 10X8X13 (OH1), Ductile Iron casing, 50HP, 3PH, 60Hz, 230/460V | UNIT | 2 | $45 656,64 | $91 313,28 | Quote from Nord-flo 16.04.2025 |
| 364 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Compressor for priming system | UNIT | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Delivery of the plant to the site - 1 container | | | | | |
| | **E2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 20" - Butt fusion | m | 25 | $224,01 | $5 600,25 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR11 (200PSI) - 20" - Fittings | Lot | 1 | $2 240,10 | $2 240,10 | |
| 364 | HDPE - DR9 (250PSI) - 16" - Butt fusion | m | 430 | $109,79 | $47 209,70 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR9 (250PSI) - 16" - Fittings | Lot | 1 | $18 883,88 | $18 883,88 | |
| 364 | Marine Oil Skimming Boom - Spillage response to apply in contact water pond 1 to prevent oil getting in the pump station | m | 45 | $100,00 | $4 500,00 | |
| 364 | 3" Air & Vacuum Valve Crispin Model AX30 | Unit | 1 | $14 952,72 | $14 952,72 | |
| 364 | Ball valve - 316 S.S. Body - Model 3"K-456666PTSE-v3 cadenassable | Unit | 2 | $4 153,19 | $8 306,38 | |
| 364 | 316 AI ROBINET A BOUTS FILETE 4 BILLE 2MC PASS 1000 WOG | UNIT | 2 | $944,09 | $1 888,18 | |
| 364 | 20" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 2 | $1 128,14 | $2 256,28 | |
| 364 | 4" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 2 | $36,33 | $72,66 | |
| 364 | 4" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 2 | $109,70 | $219,40 | |
| 364 | 304 RACCORDS FILETE CLASSE 150 4 BOUCHON TETE CARREE | UNIT | 2 | $36,90 | $73,80 | |
| | **E3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 100A, 25kA, 5 FEEDERS (2X20A, 2X50A, 1X40A) | UNIT | 1 | $8 000,00 | $8 000,00 | |
| 364 | VFD 50HP, 600V | UNIT | 2 | $8 010,00 | $16 020,00 | Quote from ABB 02.05.2025 |
| | **E4 Ground Preparation** | | | | | |
| 364 | Slab on Grade Concrete 30 Mpa for containers 4in (100mm) - Including FormWork, Welded Wire Mesh, Embeds and anchor Bolts | m2 | 14,76 | | | |
| | **E5 Instrumentation** | | | | | |
| 364 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 364 | Motorized Isolation Valve | Unit | 2 | $10 000,00 | $20 000,00 | |
| 364 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |
| **F** | **Pumping station - CWCP-PMP-001/002/003** | | | | | |
| | **F1 Pumping station** | | | | | |
| 364 | | UNIT | 0 | | | |
| 364 | | UNIT | 0 | | | |
| 364 | | | | | | |
| | **F2 Pipeline** | | | | | |
| | **Pumping well and suction line** | | | | | |
| 364 | | Lot | | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| | **Discharge** | | | | | |
| 364 | | | | | | |
| 364 | | | | | | |
| | **F3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 225A, 25kA, 5 FEEDERS (3X300A, 2X20A, 1X40A) | UNIT | 0 | $0,00 | | |
| 364 | | | | | | |
| | **F4 Ground Preparation** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 364 | Backfill of Granular B Type II 12in (300mm) | m3 | | | |
| 364 | | m3 | | | |
| 364 | | | | | |
| | **F5 Instrumentation** | | | | |
| 364 | HydroStatic Level Transmitter | Unit | 0 | | |
| 364 | Local Control Station - Local/Remote Selector, Start/Stop PushButton | Unit | 0 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **G** | **Pumping station - P1A-PMP-001/002** | | | | | |
| | **G1 Pumping station** | | | | | |
| 364 | Centrifugal pump, Sewatec K 150-403G 3ENH 504/504 | UNIT | 2 | $39 300,00 | $78 600,00 | Quote fromKSB 05.12.2025 |
| 364 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Compressor for priming system | UNIT | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| 364 | Delivery of the plant to the site - 1 container | unit | 1 | | | |
| | | | | | | |
| | **G2 Pipeline** | | | | | |
| 364 | HDPE - DR11 (200PSI) - 12" - Butt fusion | m | 1 400 | $91,04 | $127 456,00 | Quote from Marcel Baril 09.04.2025 |
| 364 | HDPE - DR11 (200PSI) - 12" - Fittings | Lot | 1 | $38 236,80 | $38 236,80 | |
| 364 | HDPE - DR11 (200PSI) - 26" (Suction) - Butt fusion | m | 40 | $143,35 | $5 734,00 | |
| 364 | HDPE - DR11 (200PSI) - 26" - Fittings | Lot | 1 | $1 720,20 | $1 720,20 | |
| 364 | 16" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 2 | $1 128,14 | $2 256,28 | Quote from ISCO 29.04.2025 |
| 364 | 4" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 2 | $36,33 | $72,66 | Quote from ISCO 29.04.2025 |
| 364 | 4" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 2 | $109,77 | $219,54 | Quote from ISCO 29.04.2025 |
| 364 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 364 | Motorized Isolation Valve | Unit | 2 | $10 000,00 | $20 000,00 | |
| 364 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 364 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 364 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | **G3 Electrical Room** | | | | | |
| 364 | Panelboard 600V, 225A, 25kA, 5 FEEDERS (2X30A, 2X20A, 1X40A) | UNIT | 1 | $6 262,29 | $6 262,29 | |
| | | | | | | |
| | | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - PUMPS & PIPING - PHASE 2**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **A** | **Pumping station - P2-PMP-001/002** | | | | | |
| | **A1 Pumping station** | | | | | |
| 365 | Centrifugal pump, RUHRPUMPEN CPO 10x8x16H, Ductile Iron casing, 100HP, 3PH, 60Hz, 230/460V (NOT IN INITIAL CAPEX) | UNIT | 2 | $59 276,18 | $118 552,36 | Quote from Nord-flo 16.04.2025 |
| 365 | Pump house - 20' insulated and heated container containing all the piping, valve, fittings, instrumentation, a transformer 600V/240V, a Local PLC, Motor Control Started, VFD, Local Control Station and HVAC | UNIT | 1 | $200 000,00 | $200 000,00 | Quote from Nord-flo 16.04.2025 |
| 365 | Compressor for priming system | UNIT | 1 | $20 000,00 | $20 000,00 | Quote from Nord-flo 16.04.2025 |
| | Delivery of the plant to the site - 1 container | UNIT | 1 | $- | | |
| | **A2 Pipeline** | | | | | |
| 365 | HDPE - DR11 (200PSI) - 20" - Butt fusion | m | 40 | $224,01 | $8 960,40 | Quote from Marcel Baril 09.04.2025 |
| 365 | HDPE - DR11 (200PSI) - 20" - Fittings | Lot | 1 | $3 584,16 | $3 584,16 | |
| 365 | HDPE - DR11 (200PSI) - 16" - Butt fusion | m | 1 800 | $143,35 | $258 030,00 | Quote from Marcel Baril 09.04.2025 |
| 365 | HDPE - DR11 (200PSI) - 16" - Fittings | Lot | 1 | $103 212,00 | $103 212,00 | |
| 365 | 3" Air & Vacuum Valve Crispin Model AX30 | Unit | 2 | $14 952,72 | $29 905,44 | Quote from Conval Quebec 24.04.2025 |
| 365 | Ball valve - 316 S.S. Body - Model 3"K-456666PTSE-v3 cadenassable | UNIT | 4 | $4 153,19 | $16 612,76 | Quote from Conval Quebec 24.04.2025 |
| 365 | 316 AI ROBINET A BOUTS FILETE 4 BILLE 2MC PASS 1000 WOG | UNIT | 4 | $944,09 | $3 776,36 | Quote from ISCO 29.04.2025 |
| 365 | 20" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 4 | $1 128,14 | $4 512,56 | Quote from ISCO 29.04.2025 |
| 365 | 16" X 4" ELECTROFUSION BRANCH SADDLE | UNIT | 4 | $1 128,14 | $4 512,56 | |
| 365 | 4" IPS MANCHON ELECTROFUSION TEGA FM | UNIT | 4 | $36,33 | $145,32 | Quote from ISCO 29.04.2025 |
| 365 | 4" DR 11 IPS TRANSITION MPT ACIER STAINLESS 304, CAT 3 | UNIT | 4 | $109,70 | $438,80 | Quote from ISCO 29.04.2025 |
| | 304 RACCORDS FILETE CLASSE 150 4 BOUCHON TETE CARREE | UNIT | 4 | $36,90 | $147,60 | Quote from ISCO 29.04.2025 |
| | **A3 Electrical Room** | | | | | |
| 365 | Panelboad 600V, 100A, 25kA, 5 FEEDER (2X20A, 1X40A, 2X150A) | UNIT | 1 | $15 000,00 | $15 000,00 | RSMEANS |
| 365 | VFD 100HP, 600V | UNIT | 2 | $12 630,00 | $25 260,00 | Quote from ABB 02.05.2025 |
| | **A4 Ground Preparation** | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| | **A5 Instrumentation** | | | | | |
| 365 | HydroStatic Level Transmitter | Unit | 1 | $2 000,00 | $2 000,00 | |
| 365 | Motorized Isolation Valve | Unit | 2 | $10 000,00 | $20 000,00 | |
| 365 | Pressure Transmitter | Unit | 1 | $2 500,00 | $2 500,00 | |
| 365 | Pressure Indicator | Unit | 1 | $1 000,00 | $1 000,00 | |
| 365 | Magnetic Flow Transmitter | Unit | 1 | $10 000,00 | $10 000,00 | |
| **B** | **Pumping station - CWT2-PMP-001/002** | | | | | |
| | **B1 Pumping station** | | | | | |
| 365 | Centrifugal pump,\ Xylen 7030 3 -621 38HP - Flygt | UNIT | 3 | $92 469,00 | $277 407,00 | |
| 365 | Puimp box | UNIT | 2 | $140 000,00 | $280 000,00 | |
| | **B2 Pipeline** | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| | **B3 Electrical Room** | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| | **B4 Ground Preparation** | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| | **B5 Instrumentation** | | | | | |
| 365 | | | | | | |
| 365 | | | | | | |
| | | | | | | |
| | | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - DISCHARGE & DIFFUSER**

| Item # | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | |
|---|---|---|---|---|---|---|
| | | | | | | |
| **A** | **Discharge pipe** | | | | | |
| 366 | HDPE - DR11 (100 PSI) - 36" - pipe spool - Flange on one side (3x) | m | 315 | $399,50 | $125 842,50 | |
| 366 | HDPE - DR11 (100 PSI) - 36" - Fittings (3x) | Lot | 1 | $50 337,00 | $50 337,00 | |
| 366 | HDPE DR21 pipe 36in diameter (3x) pipe spool - Installation | | | | | |
| 366 | Vent Valve 8in | UNit | 1 | | | |
| **B** | **Emergency Spillway** | | | | | |
| 366 | | | | | | |
| 366 | | | | | | |
| **C** | **Flow measurement** | | | | | |
| 366 | Staff gauge | Unit | 1 | | | |
| 366 | | | | | | |
| **D** | **Diffuser** | | | | | |
| 366 | HDPE DR17 pipe 24 in diameter with 6in fused vertical risers. Flange on one side and blind flange at the end | m | 300 | | | |
| 366 | Reducer and fitting to go from 36in pipe to 24 in pipe | unit | 3 | | | |
| 366 | Proflex style 730 or tideflex tf-2 elastomeric sleeve type check valve with 300 series stainless steel retaining band(s). (without installation) | Uni | 42 | $1 250,00 | $52 500,00 | Quote from Conval Valve, 14.04.2 |
| 366 | Installation of the diffuser (3x) in the river | Lot | 1 | | | |
| 366 | Concrete ballast blocks with steel reinforcing rods 270kg/block every 5m | Unit | 60 | | | |
| | | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - STOCKPILE 001**

| WBS (Level 3) | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of quantities |
|---|---|---|---|---|---|---|
| **A** | **STOCKPILE 001** | | | | | |
| 371 | Capital: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 441 400 | | | Stockpile footprint from AutoCAD model, footprint from engineering design |
| 371 | Sustaining: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 361 100 | | | Stockpile footprint from AutoCAD model, footprint from engineering design |
| **B** | **STOCKPILE 001 DITCHES AND PONDS** | | | | | |
| 372 | Capital, Ditches: Excavate overburden to form ditch to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 22 400 | | | Ditch dimensions from AutoCAD model and depth to bedrock as determined by BBA's geotechnical investigation |
| 372 | Sustaining, Ditches: Excavate overburden to form ditch to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 33 800 | | | Ditch dimensions from AutoCAD model and depth to bedrock as determined by BBA's geotechnical investigation |
| 372 | Capital, Ditches: Compact base of ditch to 95% Standard Proctor density | $m^2$ | 42 600 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ditches: Compact base of ditch to 95% Standard Proctor density | $m^2$ | 53 600 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ditches: Construct ditch embankments with Zone 8 Sand/Silt (Overburden), where required and as indicated in the drawings. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 14 000 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ditches: Construct ditch embankments with Zone 8 Sand/Silt (Overburden), where required and as indicated in the drawings. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 10 900 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ditches: Supply and install 500g/m2 non-woven needle punched geotextile in ditch below rip-rap for erosion protection including anchoring as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 12 600 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ditches: Supply and install 500g/m2 non-woven needle punched geotextile in ditch below rip-rap for erosion protection including anchoring as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 18 200 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ditches: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base of ditch and sideslopes. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 3 410 | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Sustaining, Ditches: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base of ditch and sideslopes. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 4 950 | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Capital, Ditches: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course alongside ditch for vehicular access. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 2 270 | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Sustaining, Ditches: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course alongside ditch for vehicular access. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 250 | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Capital, Ditches, Culvert: Excavate trench for culvert installation (1x 2 m wide and minimum 2 m deep with 2H:1V side slopes) with a longitudinal slope as per detail. Stockpile excavated material in designated stockpile. | $m^3$ | 250 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ditches, Culvert: Excavate trench for culvert installation (1x 2 m wide and minimum 2 m deep with 2H:1V side slopes) with a longitudinal slope as per detail. Stockpile excavated material in designated stockpile. | $m^3$ | - | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ditches, Culvert: Supply and install 800 mm diameter CSP culvert with 1.6 mm wall thickness, 68x13 mm corrugation profile and light galvanised Z275 with couplings suppled by manufacturer. Rate to include transport, offloading, installation, allowance for wasteage. | m | 20 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |

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| 372 | Sustaining, Ditches, Culvert: Supply and install 800 mm diameter CSP culvert with 1.6 mm wall thickness, 68x13 mm corrugation profile and light galvanised Z275 with couplings suppled by manufacturer. Rate to include transport, offloading, installation, allowance for wasteage. | m | - | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ditches, Culvert: Supply and install Zone 4 Granular B Type II for pipe bedding and trench backfill and place in layers of 200mm thick and compact to 90% standard Proctor density. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles). | $m^3$ | 190 | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Sustaining, Ditches, Culvert: Supply and install Zone 4 Granular B Type II for pipe bedding and trench backfill and place in layers of 200mm thick and compact to 90% standard Proctor density. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles). | $m^3$ | - | | | Ditch dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Capital, Pond: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 62 700 | | | Pond dimensions from AutoCAD model, design based on pond volumes |
| 372 | Sustaining, Pond: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 45 900 | | | Pond dimensions from AutoCAD model, design based on pond volumes |
| 372 | Capital, Pond: Rip base of embankment and pond foundation to a depth of 200 mm and compact to 95% Standard Proctor density | $m^2$ | 74 500 | | | Pond dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Sustaining, Pond: Rip base of embankment and pond foundation to a depth of 200 mm and compact to 95% Standard Proctor density | $m^2$ | 46 000 | | | Pond dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 372 | Capital, Pond: Construct embankment with Zone 2 Waste Rock (-450 mm). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 46 200 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Sustaining, Pond: Construct embankment with Zone 2 Waste Rock (-450 mm). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 36 600 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Capital, Pond: Construct upstream embankment Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 2 450 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Sustaining, Pond: Construct upstream embankment Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 2 320 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Capital, Pond: Construct upstream embankment Zone 5 Filter/Bedding Sand (-4.75 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 190 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Sustaining, Pond: Construct upstream embankment Zone 5 Filter/Bedding Sand (-4.75 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 2 970 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Capital, Pond: Supply and install 1.5 mm double textured LLDPE geomembrane on upstream slopes of embankments and anchor at toe, crest and abutments as shown in drawings. Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 12 300 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Pond: Supply and install 1.5 mm double textured LLDPE geomembrane on upstream slopes of embankments and anchor at toe, crest and abutments as shown in drawings. Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 11 200 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Pond: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill | $m^3$ | 2 900 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Sustaining, Pond: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill | $m^3$ | 2 380 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Capital, Pond: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course on crest of dam for vehicular access, including safety berms on dam crest. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 1 780 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |

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| 372 | Sustaining, Pond: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course on crest of dam for vehicular access, including safety berms on dam crest. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 1 620 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 372 | Capital, Pond, Spillway: Excavate natural ground/embankment to form the required dimensions and slopes indicated in the drawings. Stockpile excavated material in the designated stockpile. | $m^3$ | 1 429 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Sustaining, Pond, Spillway: Excavate natural ground/embankment to form the required dimensions and slopes indicated in the drawings. Stockpile excavated material in the designated stockpile. | $m^3$ | 2 765 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Capital, Pond, Spillway: Excavate 1m wide x 1 m deep trench in spillway at outlet location. | $m^3$ | 10 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Sustaining, Pond, Spillway: Excavate 1m wide x 1 m deep trench in spillway at outlet location. | $m^3$ | 8 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Capital, Pond, Spillway: Backfill 1m wide x 1m deep trench in spillway with 20 MPa mass concrete to fix spillway invert level. Rate to include transport, backfilling, complying with required tolerances, providing for testing, and disposal of spoil. | $m^3$ | 10 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Sustaining, Pond, Spillway: Backfill 1m wide x 1m deep trench in spillway with 20 MPa mass concrete to fix spillway invert level. Rate to include transport, backfilling, complying with required tolerances, providing for testing, and disposal of spoil. | $m^3$ | 8 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| 372 | Capital, Pond, Spillway: Supply and install 500 g/m2 nonwoven needle punched geotextile below riprap for erosion protection and separation in spillway, including anchoring, as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 1 510 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Pond, Spillway: Supply and install 500 g/m2 nonwoven needle punched geotextile below riprap for erosion protection and separation in spillway, including anchoring, as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 3 090 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ponds, Spillways: Install Zone 7b Rip-Rap Erosion Protection with D50 = 300 mm and place in 600 mm thick layer on geotextile in base and sideslopes spillway chute as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 830 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ponds, Spillways: Install Zone 7b Rip-Rap Erosion Protection with D50 = 300 mm and place in 600 mm thick layer on geotextile in base and sideslopes spillway chute as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 1 740 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Capital, Ponds, Spillways: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base and sideslopes of spillway weir as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 30 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| 372 | Sustaining, Ponds, Spillways: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base and sideslopes of spillway weir as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 30 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | **Subtotal** | | | | | |
| | **TOTAL COST** | | | | | |

## Schedule of Quantities

**702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - STOCKPILE 001**

| WBS (Level 3) | Description | UNIT | QUANTITY | UNIT RATE ($) CDN | AMOUNT | Basis of quantities |
|---|---|---|---|---|---|---|
| **A** | **STOCKPILE 002** | | | | | |
| 374 | Capital: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile footprint to a nominal depth of 300 mm and stockpile in designated area | $m^2$ | 759 400 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design |
| 374 | Sustaining: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile footprint to a nominal depth of 300 mm and stockpile in designated area | $m^2$ | 1 424 100 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design |
| 374 | Capital: Rip base of Stockpile 002 to a depth of 200 mm and compact via proof-rolling | $m^2$ | 759 400 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design |
| 374 | Sustaining: Rip base of Stockpile 002 to a depth of 200 mm and compact via proof-rolling | $m^2$ | 1 424 100 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design |
| 374 | Capital: Supply and install sand cushion layer at base of Stockpile to a minimum thickness of 200 mm in locations as required (assume 30% of footprint). Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, disposal of spoil. (Material sourced from on-site borrow pit or stockpiles as identified by Owner) | $m^3$ | 45 600 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Supply and install sand cushion layer at base of Stockpile to a minimum thickness of 200 mm in locations as required (assume 30% of footprint). Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, disposal of spoil. (Material sourced from on-site borrow pit or stockpiles as identified by Owner) | $m^3$ | 85 500 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Capital: Construct Starter Dam around footprint of Tailings portion of the stockpile using Zone 2 Waste Rock (-450 mm) to a height of 3 m with 3H:1V side slopes and a 5 m crest. Rate to include selection, loading, transport, offloading, spreading, final grading, compaction, disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 50 900 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Construct Starter Dam around footprint of Tailings portion of the stockpile using Zone 2 Waste Rock (-450 mm) to a height of 3 m with 3H:1V side slopes and a 5 m crest. Rate to include selection, loading, transport, offloading, spreading, final grading, compaction, disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 105 500 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Capital: Install Zone 5 Filter/Bedding Sand (-4.75 mm) cushion layer below Starter Dam, 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil (material sourced from processed material temporary stockpiles). | $m^3$ | 8 400 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Install Zone 5 Filter/Bedding Sand (-4.75 mm) cushion layer below Starter Dam, 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil (material sourced from processed material temporary stockpiles). | $m^3$ | 17 400 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Capital: Construct Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick on upstream slope of Starter Dam. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 500 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Construct Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick on upstream slope of Starter Dam. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 7 200 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Capital: Construct Zone 5 Filter/Bedding Sand (-4.75 mm) 0.3 m thick on upstream slope of starter dam. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 500 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Construct Zone 5 Filter/Bedding Sand (-4.75 mm) 0.3 m thick on upstream slope of starter dam. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 7 200 | | | Stockpile footprint from AutoCAD model, dimensions from engineering design, spec. from engineering best practice |
| 374 | Capital: Supply and install 1.5 mm double textured LLDPE geomembrane including anchoring as per detail (footprint of PAG/Tailings portion of the stockpile). Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 774 400 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Supply and install 1.5 mm double textured LLDPE geomembrane including anchoring as per detail (footprint of PAG/Tailings portion of the stockpile). Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 1 435 500 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Capital: Supply and install 500g/m2 non-woven needle punched geotextile cushion layer over geomembrane including anchoring (footprint of PAG/Tailings portion of the stockpile). Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 774 400 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |

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| 374 | Sustaining: Supply and install 500g/m2 non-woven needle punched geotextile cushion layer over geomembrane including anchoring (footprint of PAG/Tailings portion of the stockpile). Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 1 435 500 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Capital: Backfill stockpile geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill (footprint of PAG/Tailings portion of the stockpile) | $m^3$ | 7 495 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Backfill stockpile geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill (footprint of PAG/Tailings portion of the stockpile) | $m^3$ | 5 705 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Capital: Install Zone 8 Sand/Silt (Overburden) at base of stockpile over geotextile for protection of geomembrane to a thickness of 1 m. Fill to be placed in layers not exceeding 300 mm, moisture conditioned and compacted to 95% Standard Proctor density. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 132 500 | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Sustaining: Install Zone 8 Sand/Silt (Overburden) at base of stockpile over geotextile for protection of geomembrane to a thickness of 1 m. Fill to be placed in layers not exceeding 300 mm, moisture conditioned and compacted to 95% Standard Proctor density. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | - | | | Stockpile footprint from AutoCAD model, PAG/Tailings footprint from engineering design, spec. from engineering best practice |
| 374 | Capital, Instrumentation: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the upstream slope of the starter dam. Rate to include transport, offloading, installation, calibration. | No. | 4 | | | Spec. from engineering best practice |
| 374 | Sustaining, Instrumentation: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the upstream slope of the starter dam. Rate to include transport, offloading, installation, calibration. | No. | 8 | | | Spec. from engineering best practice |
| 374 | Capital, Instrumentation: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 4 | | | Spec. from engineering best practice |
| 374 | Sustaining, Instrumentation: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 8 | | | Spec. from engineering best practice |
| 374 | Capital, Instrumentation: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the starter dam above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 4 | | | Spec. from engineering best practice |
| 374 | Sustaining, Instrumentation: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the starter dam above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 8 | | | Spec. from engineering best practice |
| 374 | Capital, Instrumentation: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 4 | | | Spec. from engineering best practice |
| 374 | Sustaining, Instrumentation: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 8 | | | Spec. from engineering best practice |
| 374 | Capital, Instrumentation: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 40 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| 374 | Sustaining, Instrumentation: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 80 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| **B** | **STOCKPILE 002 DITCHES AND PONDS** | | | | | |
| 375 | Capital, Ditches: Excavate overburden to form ditch in below-ground sections to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile | $m^3$ | 95 700 | | | Ditch dimensions from AutoCAD model and depth to bedrock as determined by BBA's geotechnical investigation |
| 375 | Sustaining, Ditches: Excavate overburden to form ditch in below-ground sections to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile | $m^3$ | 171 400 | | | Ditch dimensions from AutoCAD model and depth to bedrock as determined by BBA's geotechnical investigation |
| 375 | Capital, Ditches: Compact base of ditch to 95% Standard Proctor density | $m^2$ | 85 000 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Compact base of ditch to 95% Standard Proctor density | $m^2$ | 160 500 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Construct ditch embankments and sub-grade of vehicular access with Zone 8 Sand/Silt (Overburden), where required and as indicated in the drawings. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 23 400 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Construct ditch embankments and sub-grade of vehicular access with Zone 8 Sand/Silt (Overburden), where required and as indicated in the drawings. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 67 400 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Supply and install 1.5 mm double textured LLDPE geomembrane in ditch including anchoring as per detail. Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 41 000 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Supply and install 1.5 mm double textured LLDPE geomembrane in ditch including anchoring as per detail. Rate to include allowance for wasteage, overlap, welding of seams etc. | $m^2$ | 88 200 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Supply and install 500g/m2 non-woven needle punched geotextile below rip-rap for erosion protection in ditch including anchoring as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^3$ | 25 400 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |

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| 375 | Sustaining, Ditches: Supply and install 500g/m2 non-woven needle punched geotextile below rip-rap for erosion protection in ditch including anchoring as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^3$ | 58 500 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Backfill ditch geotextile/geomembrane anchoring with Zone 8 Sand/Silt (Overburden), as per detail. (Material sourced from overburden stockpiles) | $m^3$ | 1 200 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Backfill ditch geotextile/geomembrane anchoring with Zone 8 Sand/Silt (Overburden), as per detail. (Material sourced from overburden stockpiles) | $m^3$ | 2 300 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Install Zone 7a Rip-Rap Erosion Protection with $D_{50}$ = 200 mm and place in 300 mm thick layer on geotextile in base of ditch and sideslopes as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 7 000 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Install Zone 7a Rip-Rap Erosion Protection with $D_{50}$ = 200 mm and place in 300 mm thick layer on geotextile in base of ditch and sideslopes as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 18 100 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course alongside ditch for vehicular access as per detail (above and below-ground sections). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 400 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course alongside ditch for vehicular access as per detail (above and below-ground sections). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 6 400 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches, Culvert: Excavate trenches for culvert installation (1x 2.5 m wide and minimum 2.5 m deep with 3H:1V side slopes) with a longitudinal slope as per detail. Stockpile excavated material in designated stockpile. | $m^3$ | 250 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches, Culvert: Excavate trenches for culvert installations (2x 2 m wide and minimum 2 m deep with 2H:1V side slopes, 1x 2.5 m wide and minimum 2.5 m deep with 3H:1V side slopes) with a longitudinal slope as per detail. Stockpile excavated material in designated stockpile. | $m^3$ | - | | #VALEUR! | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches, Culvert: Supply and install 800 mm diameter CSP culvert with 1.6 mm wall thickness, 68x13 mm corrugation profile and light galvanised Z275 with couplings suppled by manufacturer. Rate to include transport, offloading, installation, allowance for wasteage. | m | 20 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches, Culvert: Supply and install 800 mm diameter CSP culvert with 1.6 mm wall thickness, 68x13 mm corrugation profile and light galvanised Z275 with couplings suppled by manufacturer. Rate to include transport, offloading, installation, allowance for wasteage. | m | - | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Ditches, Culvert: Supply and install Zone 4 Granular B Type II for pipe bedding and trench backfill and place in layers of 200mm thick and compact to 90% standard Proctor density. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles). | $m^3$ | 190 | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ditches, Culvert: Supply and install Zone 4 Granular B Type II for pipe bedding and trench backfill and place in layers of 200mm thick and compact to 90% standard Proctor density. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles). | $m^3$ | - | | | Ditch dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Clean Water Diversion Channels: Excavate overburden to form ditch in below-ground sections to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile | $m^3$ | 27 700 | | | |
| 375 | Capital, Clean Water Diversion Channels: Compact base of ditch to 95% Standard Proctor density | $m^2$ | 51 900 | | | |
| 375 | Capital, Clean Water Diversion Channels: Construct ditch embankments and sub-grade of vehicular access with Zone 8 Sand/Silt (Overburden), where required and as indicated in the drawings. Rate to include selection, loading, transport, offloading, spreading or backfilling, final grading, compaction, disposal of spoil. (Sourced from overburden stockpiles or on-site borrow pits) | $m^3$ | 11 500 | | | |
| 375 | Capital, Clean Water Diversion Channels: Supply and install 500g/m2 non-woven needle punched geotextile below rip-rap for erosion protection in ditch including anchoring as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 19 300 | | | |

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|---|---|---|---|---|---|---|
| 375 | Capital, Clean Water Diversion Channels: Install Zone 7a Rip-Rap Erosion Protection with $D_{50}$ = 200 mm and place in 300 mm thick layer on geotextile in base of ditch and sideslopes as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 4 900 | | | |
| 375 | Capital, Ponds: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 66 900 | | | Pond dimensions from AutoCAD model, design based on pond volumes |
| 375 | Sustaining, Ponds: Excavate overburden to form base of pond to the dimensions and slopes indicated in the drawings. Stockpile excavated material in designated stockpile. | $m^3$ | 42 300 | | | Pond dimensions from AutoCAD model, design based on pond volumes |
| 375 | Capital, Ponds: Rip base of embankment and pond foundation to a depth of 200 mm and compact to 95% Standard Proctor density | $m^2$ | 223 000 | | | Pond dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 375 | Sustaining, Ponds: Rip base of embankment and pond foundation to a depth of 200 mm and compact to 95% Standard Proctor density | $m^2$ | 59 000 | | | Pond dimensions from AutoCAD model, spec. and thickness from engineering best practice |
| 375 | Capital, Ponds: Construct embankment with Zone 2 Waste Rock (-450 mm). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 136 600 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Sustaining, Ponds: Construct embankment with Zone 2 Waste Rock (-450 mm). Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from pit development, quarry or stockpiles as identified by Owner) | $m^3$ | 102 300 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Capital, Ponds: Construct upstream Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 4 810 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Sustaining, Ponds: Construct upstream Zone 6 Transition Sand and Gravel (-26.5 mm) layer 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 2 940 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Capital, Ponds: Construct upstream Zone 5 Filter/Bedding Sand (-4.75 mm) 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 6 220 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Sustaining, Ponds: Construct upstream Zone 5 Filter/Bedding Sand (-4.75 mm) 0.3 m thick. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 480 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Capital, Ponds: Supply and install 1.5 mm double textured LLDPE geomembrane on upstream slopes of embankments and base of pond and anchor at toe, crest and abutments as shown in drawings. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 202 900 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Sustaining, Ponds: Supply and install 1.5 mm double textured LLDPE geomembrane on upstream slopes of embankments and base of pond and anchor at toe, crest and abutments as shown in drawings. Rate to include allowance for wastage, overlap, welding of seams etc. | $m^2$ | 46 700 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| 375 | Capital, Pond: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill | $m^3$ | 4 230 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Sustaining, Pond: Backfill geomembrane anchor with Zone 3 Till/Sand Bentonite Cement Fill | $m^3$ | 1 550 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Capital, Ponds: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course on crest of dam for vehicular access, including safety berms on dam crest. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 3 480 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| 375 | Sustaining, Ponds: Supply and install Zone 4 Granular B Type II 300 mm thick wearing course on crest of dam for vehicular access, including safety berms on dam crest. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Material sourced from processed material temporary stockpiles) | $m^3$ | 1 360 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice and volumes from engineering design |
| | Capital, Ponds, Spillways: Excavate natural ground/embankments to form the required dimensions and slopes indicated in the drawings. Stockpile excavated material in the designated stockpile. | $m^3$ | 6 501 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Sustaining, Ponds, Spillways: Excavate natural ground/embankments to form the required dimensions and slopes indicated in the drawings. Stockpile excavated material in the designated stockpile. | $m^3$ | 5 561 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| | Capital, Ponds, Spillways: Excavate 1m wide x 1 m deep trench in spillway for geomembrane at spillway outlet location. | $m^3$ | 20 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| | Sustaining, Ponds, Spillways: Excavate 1m wide x 1 m deep trench in spillway for geomembrane at spillway outlet location. | $m^3$ | 13 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| | Capital, Ponds, Spillways: Backfill 1m wide x 1m deep trench in spillway with 20 MPa mass concrete to fix spillway invert level. Rate to include transport, backfilling, complying with required tolerances, providing for testing, and disposal of spoil. | $m^3$ | 20 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| | Sustaining, Ponds, Spillways: Backfill 1m wide x 1m deep trench in spillway with 20 MPa mass concrete to fix spillway invert level. Rate to include transport, backfilling, complying with required tolerances, providing for testing, and disposal of spoil. | $m^3$ | 13 | | | Spillway dimensions from AutoCAD model, dimensions from engineering design |
| | Capital, Ponds, Spillways: Supply and install 500 g/m2 nonwoven needle punched geotextile below riprap for erosion protection and separation in spillways, including anchoring, as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 5 960 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Sustaining, Ponds, Spillways: Supply and install 500 g/m2 nonwoven needle punched geotextile below riprap for erosion protection and separation in spillways, including anchoring, as per detail. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 5 240 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Capital, Ponds, Spillways: Install Zone 7b Rip-Rap Erosion Protection with D50 = 300 mm and place in 600 mm thick layer on geotextile in base and sideslopes select spillway chutes (Pond 02 and Pond 04) as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 3 420 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Sustaining, Ponds, Spillways: Install Zone 7b Rip-Rap Erosion Protection with D50 = 300 mm and place in 600 mm thick layer on geotextile in base and sideslopes select spillway chutes (Pond 02 and Pond 04) as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 2 980 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Capital, Ponds, Spillways: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base and sideslopes of spillway weir as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 45 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Sustaining, Ponds, Spillways: Install Zone 7a Rip-Rap Erosion Protection with D50 = 200 mm and place in 300 mm thick layer on geotextile in base and sideslopes of spillway weir as per detail. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, water, compaction, final grading, complying with required tolerances, providing for testing, and disposal of spoil. (Sourced from open pit development or stockpiles as identified by Owner) | $m^3$ | 40 | | | Spillway dimensions from AutoCAD model, spec. from engineering best practice |
| | Capital, Ponds: Excavate 500 mm wide trenches for installation of subsurface drainage system in base of pond to a depth of up to 1 m. | $m^3$ | 550 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Sustaining, Ponds: Excavate 500 mm wide trenches for installation of subsurface drainage system in base of pond to a depth of up to 1 m. | $m^3$ | 50 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Capital, Ponds: Supply and install 300g/m2 non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 550 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Sustaining, Ponds: Supply and install 300g/m2 non-woven needle punched geotextile as filter layer in subsurface drainage system trench prior to provision of drainage stone. Geotextile to have minimum 300 mm overlap after placement of perforated pipe and drainage stone. Rate to include allowance for wasteage, overlap, stitching of seams etc. | $m^2$ | 50 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Capital, Ponds: Supply and installl Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 550 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Sustaining, Ponds: Supply and installl Zone 9 Clear Stone (-19 mm) as drainage medium in subsurface drainage system trench. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. Rate to include excavation, selection, loading, transport, offloading, spreading or backfilling, final grading, complying with required tolerances, and disposal of spoil, all in accordance with the requirements of the specification. | $m^3$ | 50 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Capital, Ponds: Supply and install 75 mm ID double walled perforated pipes with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system. Rate to include transport, offloading, installation, allowance for wasteage. | m | 2 330 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Sustaining, Ponds: Supply and install 75 mm ID double walled perforated pipes with smooth bore supplied in 6 m length with push fit couplings in trench for subsurface drainage system. Rate to include transport, offloading, installation, allowance for wasteage. | m | 220 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Capital, Ponds: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth of 1 to 2 m. Rate to include transport, offloading, installation, allowance for wasteage. | No. | 3 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Sustaining, Ponds: Supply and install 1.5 m diameter concrete manhole with prefabricated concrete rings, base slab, cover slab, concrete lid and internal step irons. Concrete rings to be 500 mm wide and 83 mm thick. For manhole depth of 1 to 2 m. Rate to include transport, offloading, installation, allowance for wasteage. | No. | 1 | | | Pond dimensions from AutoCAD model, spec. and dimensions from engineering design |
| | Capital, Ponds, Instrumentation: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the highest portion of the lined pond embankments (1 per embankment). Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Spec. from engineering best practice |
| | Sustaining, Ponds, Instrumentation: Supply and install vibrating wire piezometers (VWP, RST Instruments Part #VW2100, 0.35 MPa) at the toe of the highest portion of the lined pond embankments (1 per embankment). Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Spec. from engineering best practice |
| | Capital, Ponds, Instrumentation: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Spec. from engineering best practice |
| | Sustaining, Ponds, Instrumentation: Supply and install VWP enclosures (4", RST Instruments Part #DT2011-SE) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Spec. from engineering best practice |
| | Capital, Ponds, Instrumentation: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the embankment above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Spec. from engineering best practice |
| | Sustaining, Ponds, Instrumentation: Supply and install Single Channel VWP Datalogger (RST Instruments Part #DT2011B) at the crest of the embankment above each VWP location. Rate to include transport, offloading, installation, calibration. | No. | 1 | | | Spec. from engineering best practice |
| | Capital, Ponds, Instrumentation: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Spec. from engineering best practice |
| | Sustaining, Ponds, Instrumentation: Supply and install Cable splice kit (RST Instruments Part #ELSPLICE4) at each VWP location. Rate to include transport, offloading, installation. | No. | 1 | | | Spec. from engineering best practice |
| | Capital, Ponds, Instrumentation: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 40 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| | Sustaining, Ponds, Instrumentation: Supply and install cable to connect each VWP to a data logger. Rate to include transport, offloading, installation, calibration. | m | 40 | | | Embankment dimensions from AutoCAD model, spec. from engineering best practice |
| | **Subtotal** | | | | | |
| **TOTAL COST** | | | | | | |

| Schedule of Quantities | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | **702381 SHAAKICHIUWAANAAN - WASTE AND WATER MANAGEMENT - OVERBURDEN PILES 004 and 005 AND ORGANICS PILE** | | | | | |
| | | | | | | |
| **Item #** | **Description** | **UNIT** | **QUANTITY** | **UNIT RATE ($) CDN** | **AMOUNT** | **Basis of Quantities** |
| **A** | **FOUNDATION PREPARATION** | | | | | |
| 391 | Stockpile 004: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile and paddock footprint to a nominal depth of 300 mm and stockpile in the designated area | $m^2$ | 234 700 | | | The stockpile and paddock footprint on land from the Autocad model |
| 391 | Stockpile 005: Remove muskeg, organics, topsoil, overburden and unsuitable soil from stockpile, ditches and pond footprint to a nominal depth of 300 mm and stockpile in designated area. | $m^2$ | 282 700 | | | The stockpile and paddock footprint on land from the Autocad model |
| 391 | Organics Stockpile: Remove muskeg, organics, topsoil, overburden and unsuitable soil from the stockpile and paddock footprint to a nominal depth of 300 mm and stockpile in the designated area | $m^2$ | 108 000 | | | The stockpile and paddock footprint on land from the Autocad model |
| | Sub Total | | | | $0,00 | |
| **B** | **CONTAINMENT PADDOCKS AND TEMPORARY SILT FENCING FOR OVERBURDEN PILE 004** | | | | | |
| 393 | Stockpile 004: Construct collection paddocks for run-off with Zone 2 Mine Rockfill (-450 mm). | $m^3$ | 4 300 | | | From the design of the paddock, using Civil 3D |
| 393 | Stockpile 004: Temporary silt fencing | m | 1 700 | | | Perimeter Length |
| | Sub Total | | | | **$0,00** | |
| **B** | **CONTAINMENT PADDOCKS AND TEMPORARY SILT FENCING FOR OVERBURDEN PILE 005** | | | | | |
| 393 | Stockpile 005: Construct collection paddocks for run-off with Zone 2 Mine Rockfill (-450 mm). | $m^3$ | 5 100 | | | From the design of the paddock, using Civil 3D |
| 393 | Stockpile 005: Temporary silt fencing (if required, because if waste rock is not available for the paddock berm) | m | 2 000 | | | Perimeter Length |
| | Sub Total | | | | **$0,00** | |
| **C** | **CONTAINMENT PADDOCKS AND TEMPORARY SILT FENCING FOR ORGANICS PILE** | | | | | |
| 393 | Organics Stockpile: Construct collection paddocks for run-off with Zone 2 Mine Rockfill (-450 mm). | $m^3$ | 3 700 | | | From the design of the paddock, using Civil 3D |
| 393 | Organics Stockpile: Temporary silt fencing (if required because if wasterock is not available for paddock berm) | m | 1 500 | | | Perimeter Length |
| | | | | | | |
| | | | | | | |
| **Subtotal** | | | | | **$0,00** | |
| **TOTAL COST** | | | | | **$0,00** | |

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# APPENDIX

# 5-11 FRESHWATER INTAKE – LAKE 308

# NOTE TECHNIQUE

| | | | |
|---|---|---|---|
| **Client :** | Ressources PMET Inc. | | |
| **Projet :** | Projet minier Shaakichiuwaanaan | **Référence WSP :** | CA0001724.3318 |
| **Objet :** | Prélèvement eau fraîche – Lac 308 | **Date :** | 27 novembre 2025 |
| **c. c. :** | Elsa Sormain et Dominique Poissant WSP Canada Inc.M., WSP Canada Inc | | |

# 1 Introduction

## 1.1 Objectif et mise en contexte

Le projet minier Shaakichiuwaanaan, développé par Ressources PMET Inc.(Client), vise l'extraction de lithium à partir d'une fosse à ciel ouvert sur une propriété située au sud du 55e parallèle, dans le territoire visé par la Convention de la Baie-James et du Nord québécois (CBJNQ). Ce projet est assujetti à une évaluation environnementale fédérale en vertu de la *Loi sur l'évaluation d'impact* (L.C. 2019, ch. 28, art. 1) ainsi qu'au régime provincial d'évaluation environnementale applicable via les instances du *Comité d'évaluation des répercussions sur l'environnement et le milieu social* (COMEV) et du *Comité d'examen* (COMEX).

Dans ce contexte, Ressources PMET a mandaté WSP Canada Inc. (WSP) pour réaliser certaines études environnementales visant à documenter les conditions environnementales de base du milieu récepteur du projet. Le *Rapport sectoriel – Hydrologie* (WSP, 2025) décrit les conditions hydrologiques existantes dans la zone d'étude locale (ZEL).

Afin de satisfaire les besoins en eau potable du projet minier, une prise d'eau est envisagée dans le lac 308 qui est localisé dans la ZEL. WSP a été mandatée pour estimer la capacité hydrologique du lac 308 au moyen d'un bilan hydrique du lac, afin d'aider à l'analyse des options de prélèvement d'eau potable. Cette note technique présente la méthodologie utilisée pour estimer ce bilan hydrique ainsi que les résultats obtenus.

## 1.2 Scénarios de volumes d'eau prélevés

À la demande du Client, trois scénarios de volumes d'eau journaliers prélevés ont été analysés. Le scénario 1 correspond au volume de prélèvement de conception déterminé par AtkinsRealis (courriel du 27 février 2025). Les scénarios 2 et 3 sont des hypothèses qui ont été posées afin de réaliser une analyse de sensibilité sur ce chiffre. Le tableau 1-1 présente ces trois scénarios et indique le débit de prélèvement en considérant un débit constant sur 24 heures.

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**Tableau 1-1 Volumes journaliers et débits de prélèvement des trois scénarios analysés**

| Scénario | Volume journalier ($m^3$) | Débit de prélèvement ($m^3/s$) |
|---|---|---|
| 1 | 117 | 0,0014 |
| 2 | 150 | 0,0017 |
| 3 | 200 | 0,0023 |

## 1.3 Description de la zone d'étude

Le lac 308 est situé dans la ZEL du projet minier Shaakichiuwaanaan, dans la région d'Eeyou Istchee Baie-James. La carte 1 et la figure 1-1 localisent le lac 308, son bassin versant ainsi que le cours d'eau à l'exutoire du lac (identifié à l'emplacement de la sonde LL-10), qui a été utilisé pour mesurer le niveau d'eau à l'exutoire du lac lors des campagnes terrain de 2023 et 2024.

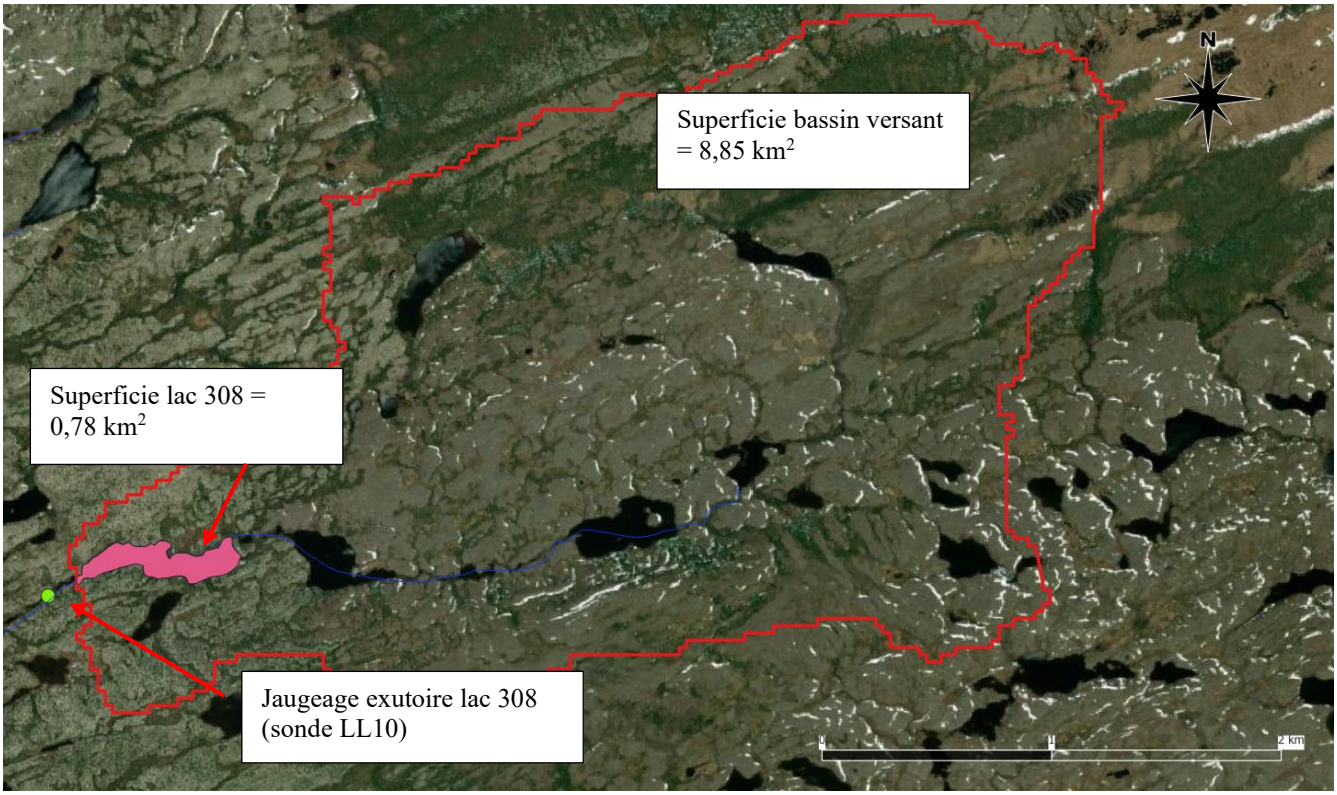



**Figure 1 Bassin versant du lac 308**

# 2 Lois et règlements en vigueur

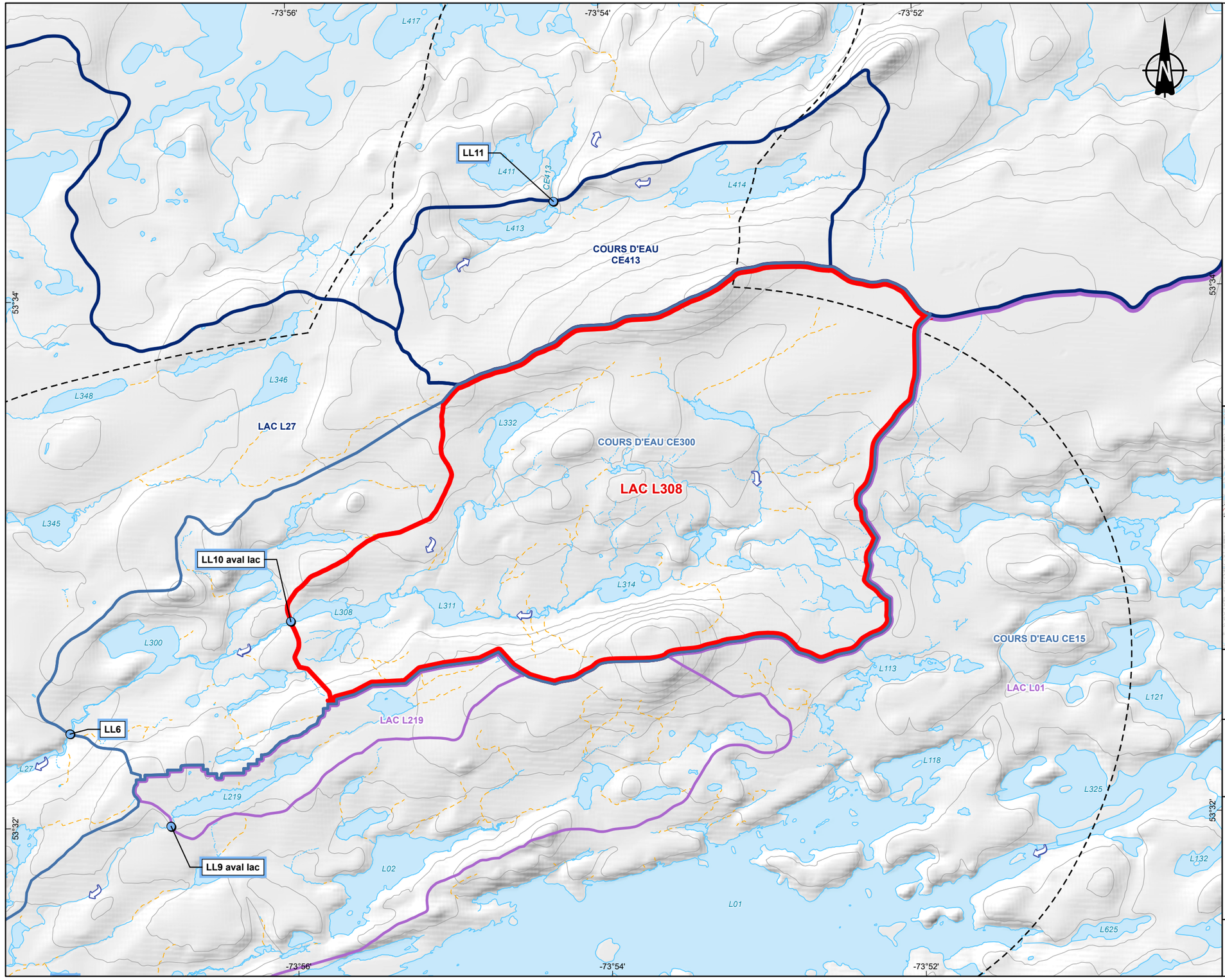
## 2.1 Cadre législatif applicable

Le prélèvement d'eau potable au Québec, y compris sur le territoire d'Eeyou Istchee, est soumis à un cadre législatif complexe visant à protéger la ressource et les écosystèmes. Les principales lois sont :

- **Loi sur l'eau (C-6.2)** : Affirme le caractère collectif de l'eau et impose un régime d'autorisation pour tout prélèvement significatif.
- **Loi sur la qualité de l'environnement (LQE)** : Encadre les activités ayant un impact sur l'environnement, dont les prélèvements d'eau.
- **Convention de la Baie-James et du Nord québécois** : Reconnaît les droits des Cris et prévoit des mécanismes de gouvernance partagée.

## 2.2 Règlements clés

- Règlement sur le prélèvement des eaux et leur protection (RPEP) (MELCCFP, 2025a) :
    1. Obligation d'obtenir une autorisation pour la majorité des prélèvements supérieurs à 75 000 L/jour (50 000 L/jour dès 2026).
    2. Imposition d'analyses de vulnérabilité et de zones de protection autour des points de captage.
- Règlement sur la déclaration des prélèvements d'eau (MELCCFP, 2025b) :
    1. Déclaration obligatoire pour tout prélèvement ≥ 50 000 L/jour, même si aucune autorisation n'est requise.
- Règlement sur les habitats fauniques (MELCCFP, 2025c) :
    1. Article 17 : Interdit toute activité susceptible de modifier un élément biologique, chimique ou physique d'un habitat faunique, sauf autorisation.
    2. Les habitats aquatiques (lacs, marais, cours d'eau) sont protégés.




**Composantes du projet / *Project Components***

Zone d'inventaire / *Inventory area*

**Hydrologie / *Hydrology***

Sens d'écoulement de l'eau / *Waterflow direction*

Point de calcul / *Calculation point*

**Bassins versants / *Watersheds***

Principal / *Principal*

Intermédiaire / *Intermediate*

Sous-bassin versant / *Sub-watershed*

**Composantes de l'écosystème / *Ecosystem Components***

**Milieux hydriques / *Hydrous Environnements***

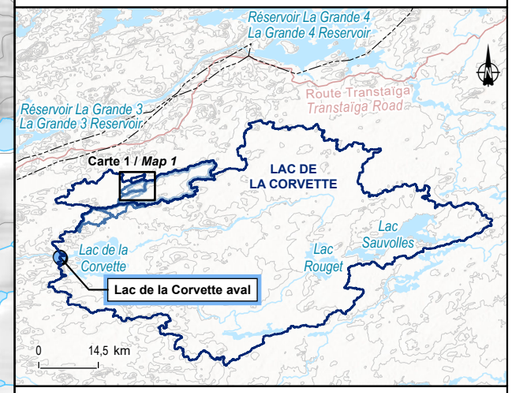
Plan d'eau / *Waterbody*

**Cours d'eau / *Watercourse***

Intermittent / *Intermitent*

Permanent / *Permanent*

Souterrain / *Underground*




**Projet minier Shaakichiuwaanaan /**
***Shaakichiuwaanaan Mining Project***

Note technique - Prélèvement eau fraîche - Lac 308/
*Technical Note - Freshwater Sampling - Lac 308*

## Carte 1 / *Map 1*
## Lac 308 et son bassin versant / *Lac 308 and Its Watershed*

***Sources :***
*CanVec, 1/250 000, RNCan, 2017*
*BDGA, 1M, MERN, 2014*
*Cartographie écologique de la végétation du Nord Québécois, MFFP, 2013*

0 270 540 m
NAD 1983 CSRS UTM Zone 18N

**2025-11-20**

*Préparation / Preparation : E. Sormain*
*Dessin / Drawing : M. Dupraz*
*Approbation / Approval : M.-H. Brisson*
*CA0001724_3318_nt_prelevement_eau_fraiche_251120.aprx*
*CA0001724_3318_nt_c01_072_lac_308_251120*

## 2.3 Exceptions à l'autorisation ministérielle

L'article 17 du règlement sur les habitats fauniques mentionne :

« Dans un habitat du poisson, une personne ne peut effectuer du pompage d'eau que conformément à l'une ou l'autre des conditions suivantes :

1. dans le cas d'un cours d'eau, le prélèvement ne peut excéder 15 % du débit du cours d'eau à l'endroit où le prélèvement est effectué;
2. dans le cas d'une plaine d'inondations, le prélèvement ne peut excéder 45 000 litres par jour;
3. dans le cas d'un lac, le prélèvement ne peut abaisser le niveau de plus de 15 cm; un avis écrit doit être transmis par poste recommandée au ministre des Ressources naturelles et de la Faune au moins 15 jours avant la date prévue pour le début du pompage d'eau; cet avis doit indiquer le nom et la localisation du lac où le pompage d'eau est projeté, sa durée prévue ainsi que la date du début de cette activité. » (MELCCFP, 2025c)

De plus, certaines autres situations permettent un prélèvement sans autorisation, sous conditions, soit :

- **Prélèvements d'urgence** (ex. incendie, sécurité publique).
- Prélèvements temporaires pour essais ou études (durée limitée, faible volume).
- Prélèvements inférieurs au seuil réglementaire (moins de 50 000 L/jour dès 2026).
- Pompage dans un habitat du poisson à des fins agricoles : permis si effectué dans un cours d'eau et n'excède pas 15 % du débit à l'endroit du prélèvement.
- **Prélèvements pour besoins domestiques isolés** (p. ex. chalet non raccordé à un réseau public) sont souvent exemptés si le volume est faible.

## 2.4 Critères à respecter pour un projet de prélèvement

1. **Seuils réglementaires** : Déterminer le volume journalier prévu.
2. **Autorisation ministérielle** : Requise si seuil dépassé ou si en habitat faunique (Sauf exception. Voir point nº 4).
3. **Zones de protection** : Délimiter trois zones (immédiate, rapprochée, éloignée).
4. Protection des habitats fauniques (art. 17) :
    a. Vérifier si le site est dans un habitat identifié.
    b. Maintenir les débits/niveaux écologiques et protéger les frayères.
5. Respect des droits autochtones :Consultation obligatoire.
6. **Déclaration et suivi** : Déclaration annuelle et programme de suivi qualité.

À noter que ce document n'évalue que l'aspect quantité du prélèvement et que des évaluations pour des mesures de protection de la source d'eau potable et de la qualité de celle-ci devront être effectuées.

# 3 Méthodologie

## 3.1 Caractéristiques du lac 308 et de son bassin versant

Les caractéristiques du lac 308 et de son bassin versant sont tirées du *Rapport sectoriel – Hydrologie* (WSP, 2025).

Les caractéristiques physiographiques du lac 308 et de son bassin versant utilisées pour estimer le bilan hydrique sont décrites au tableau 3-1.

**Tableau 3-1 Caractéristiques physiographiques du lac 308 et de son bassin versant**

| Caractéristique | Valeur |
|---|---|
| Superficie du bassin versant (km²) | 8,85 |
| Pourcentage de lacs et milieux humides du bassin versant (%) | 4,94 |
| Superficie du lac 308 (km²) | 0,78 |

## 3.2 Étiages estimés par la méthode du MELCCFP (MDDELCC, 2017)

Les étiages présentent des cas critiques à considérer pour les prélèvements d'eau. Les valeurs d'étiages qui ont été estimées à l'exutoire du lac 308 dans le *Rapport sectoriel – Hydrologie* (WSP, 2025), par la méthode de régression linéaire du MELCCFP (MDDELCC, 2017) sont présentées au tableau 3-2. Ces valeurs présentent cependant une incertitude élevée, comme discuté dans WSP (2025). Cette incertitude est inhérente à la méthode d'estimation et aux données utilisées par le MELCCFP (MDDELCC, 2017). Afin de suppléer à cette incertitude, les étiages ont aussi été estimés au moyen d'un bilan hydrique et en utilisant les données recueillies lors des campagnes terrain.

**Tableau 3-2 Débits d'étiages estimés à l'exutoire du lac 308**

| Crues / Étiages | Période de retour | Débit (m³/s) |
|---|---|---|
| Étiages | Q2-7 | 0,015 |
| | Q10-7 | 0,007 |
| | Q5-30 | 0,010 |

## 3.3 Débits à l'exutoire du lac 308

La relation débit-niveau à l'exutoire du lac 308 a été estimée à l'aide des données de jaugeage réalisées lors des campagnes terrain en 2023 et 2024. Cette relation est définie telle que :

$Q = 19{,}1 \times (h - 374{,}89)\ ^{1{,}97}$

où :
Q est le débit en m³/s
h est l'élévation de l'eau en m

## 3.4 Modélisation du bilan hydrique

Puisque le bassin versant du lac 308 est non jaugé, la série de débit a dû être reconstituée. Pour ce faire, un modèle hydrologique a été calibré à l'aide des séries de débits et météorologiques – précipitations totales et températures – du bassin versant le plus adéquat pour modéliser les apports au lac 308.

Le modèle hydrologique calibré a ensuite été utilisé pour simuler la série de débit du bassin versant du lac 308, en utilisant les séries météorologiques spécifiques au site.

### *3.4.1 Données hydrométriques*

La station nº 03OA015 (Flora Creek) a été utilisée pour estimer le débit du bassin versant du lac 308. Cette station est localisée au Labrador à approximativement 25 km au nord-est de Fermont. WSP (2025) a fait une revue des stations hydrométriques disponibles et a montré que cette station était la plus adéquate pour estimer les débits pour les petits bassins versants de la ZEL. La station de référence sélectionnée pour estimer le débit du bassin versant du lac 308 se situe environ à la même latitude que ce dernier près de la frontière du Québec et du Labrador. Cette station hydrométrique est celle qui est la plus proche du site parmi les stations qui répondent aux deux critères suivants :

- la superficie du bassin versant de la station est d'un même ordre de grandeur que celle du bassin versant à l'étude;
- la station est en activité.

Le tableau 3-3 présente la description de cette station appelée par la suite station de référence.

**Tableau 3-3 Description de la station hydrométrique 03OA015**

| Nº station | Nom station | Superficie (km²) | Coordonnées géographiques (NAD 83) | | État | Période d'activité | Distance approximative (km²) |
|---|---|---|---|---|---|---|---|
| | | | LAT (degré déc.) | LON (degré déc.) | | | |
| 03OA015 | Flora Creek | 139 | 52,9634 | -66,8367 | Ouverte | 2012-2024 | 479 |

La sonde LL-10 a mesuré les niveaux d'eau à l'exutoire du lac 308 durant les campagnes terrain de 2023 et 2024. Des jaugeages ont permis d'établir sa courbe de tarage (relation niveau-débit). Cette courbe de tarage permet de convertir les niveaux enregistrés en débits. Cette série est cependant trop courte pour calibrer adéquatement un modèle hydrologique.

### *3.4.2 Données météorologiques*

Les données météorologiques proviennent des données de réanalyse satellite ERA5-Land (Copernicus, 2023) via l'application Open-meteo (Zippenfenig, 2023).

Ces données ont été extraites à l'exutoire de la station de référence et à l'exutoire du lac 308, afin de pouvoir caractériser les deux bassins versants pour la période allant de 1980 à 2024.

### 3.4.3 Calibration du modèle hydrologique

Le modèle hydrologique GR4J (Perrin et Andréassian, 2003), couplé au module d'accumulation et de fonte de la neige CemaNeige (Valéry, 2010) dans sa version à 15 paramètres libres (Poissant & al., 2017), a démontré son aptitude à modéliser le débit des bassins versants nordiques. Ce modèle, nommé GR4J-15 dans la suite du texte, a été utilisé pour modéliser les séries de débits.

Le critère de Nash-Sutcliffe (NSE) permet de juger le degré d'ajustement du modèle hydrologique calibré. Le domaine des valeurs du NSE est [-∞ ; 1]. Plus la valeur est élevée, meilleur est l'ajustement du modèle. Le modèle GR4J-15 calibré avec la série hydrométrique de la station de référence et les séries météorologiques ERA5-Land pour ce bassin versant présentent un NSE égal à 0,85. Ce modèle est jugé adéquat.

Puisque la finalité de l'étude est de fournir un bilan hydrique sous forme de volumes mensuels au lac 308, les volumes mensuels observés et simulés à la station de référence ont été validés afin de s'assurer de la justesse de prédiction du modèle. Le tableau 3-4 présente la moyenne des volumes observés et calibrés pour les dix années complètes de la station de référence. Afin de faciliter la lecture des résultats, le ratio des volumes (volume observé / volume simulé) a été calculé; il est présenté au tableau 3-5.

La valeur du NSE ainsi que l'analyse des volumes permettent de conclure que la calibration du modèle est adéquate.

**Tableau 3-4 Volumes moyens ($10^3$ $m^3$) observés et simulés à la station no. 03OA015**

| | JAN | FÉV | MAR | AVR | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV | DÉC | ANNUEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Observé | 2012 | 1454 | 1383 | 2805 | 24050 | 14960 | 6610 | 7250 | 8455 | 7405 | 5861 | 3132 | 85378 |
| Simulé | 2112 | 1268 | 1272 | 2641 | 22438 | 15266 | 7502 | 6787 | 8258 | 8052 | 5357 | 2865 | 83818 |

**Tableau 3-5 Ratio entre les volumes observés et simulés à la station no. 03OA015**

| | JAN | FÉV | MAR | AVR | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV | DÉC | ANNUEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2013 | 1,15 | 1,34 | 0,97 | 1,00 | 0,89 | 1,60 | 1,30 | 1,16 | 1,32 | 1,34 | 1,32 | 1,38 | 1,13 |
| 2014 | 1,05 | 1,08 | 1,20 | 1,83 | 1,64 | 1,12 | 0,76 | 1,16 | 0,92 | 0,88 | 0,86 | 1,02 | 1,17 |
| 2015 | 1,19 | 1,27 | 1,19 | 1,46 | 1,32 | 0,95 | 0,80 | 0,91 | 0,83 | 0,92 | 1,21 | 1,02 | 1,02 |
| 2016 | 1,07 | 1,26 | 1,50 | 1,36 | 0,92 | 0,99 | 0,78 | 0,89 | 0,96 | 1,10 | 1,10 | 1,14 | 0,97 |
| 2017 | 1,08 | 1,20 | 1,29 | 0,50 | 1,10 | 1,35 | 1,16 | 1,18 | 1,03 | 0,73 | 1,14 | 1,50 | 1,08 |
| 2018 | 1,60 | 1,56 | 1,48 | 0,90 | 0,77 | 0,90 | 1,01 | 1,38 | 1,13 | 0,83 | 1,25 | 1,08 | 0,98 |
| 2019 | 0,97 | 1,39 | 1,30 | 0,56 | 0,83 | 1,08 | 0,78 | 0,88 | 0,76 | 0,76 | 1,14 | 1,17 | 0,92 |
| 2020 | 1,02 | 0,71 | 0,87 | 3,14 | 1,39 | 0,75 | 0,71 | 0,94 | 0,88 | 0,85 | 1,09 | 0,91 | 0,94 |
| 2021 | 0,48 | 0,77 | 0,56 | 1,02 | 1,08 | 0,82 | 0,60 | 0,31 | 1,43 | 1,21 | 1,14 | 0,80 | 0,95 |
| 2022 | 0,81 | 1,07 | 1,33 | 0,99 | 1,11 | 0,91 | 1,31 | 1,51 | 1,13 | 0,91 | 0,93 | 1,10 | 1,09 |
| **moyenne** | **1,04** | **1,16** | **1,17** | **1,28** | **1,11** | **1,05** | **0,92** | **1,03** | **1,04** | **0,95** | **1,12** | **1,11** | **1,02** |

### 3.4.4 Validation du modèle hydrologique

Les débits calculés à l'aide des niveaux d'eau observés à l'aide de la sonde LL-10 à l'exutoire du lac 308 ont été comparés aux débits modélisés avec le modèle GR4J-15. La figure 3-1 présente les deux hydrogrammes. Comme spécifié dans WSP, 2025, les niveaux d'eau mesurés par la sonde LL-10 pour la période allant du 14 décembre 2023 au 14 avril 2024 sont erronés, probablement dû à l'effet des glaces. Cette portion des débits pour la sonde LL-10 n'est dons pas représentée sur la figure. La figure montre que les crues simulées par le modèle GR4J-15 sont potentiellement sous-estimées. Puisque la capacité d'emmagasinement du lac 308 est faible et que par conséquent le volume d'eau généré par les crues ne peut pas être emmagasiné, l'impact est négligeable. La figure montre aussi que les étiages simulés par le modèle GR4J-15 pourraient être sous-estimés. Ce constat sera discuté dans l'analyse des résultats.

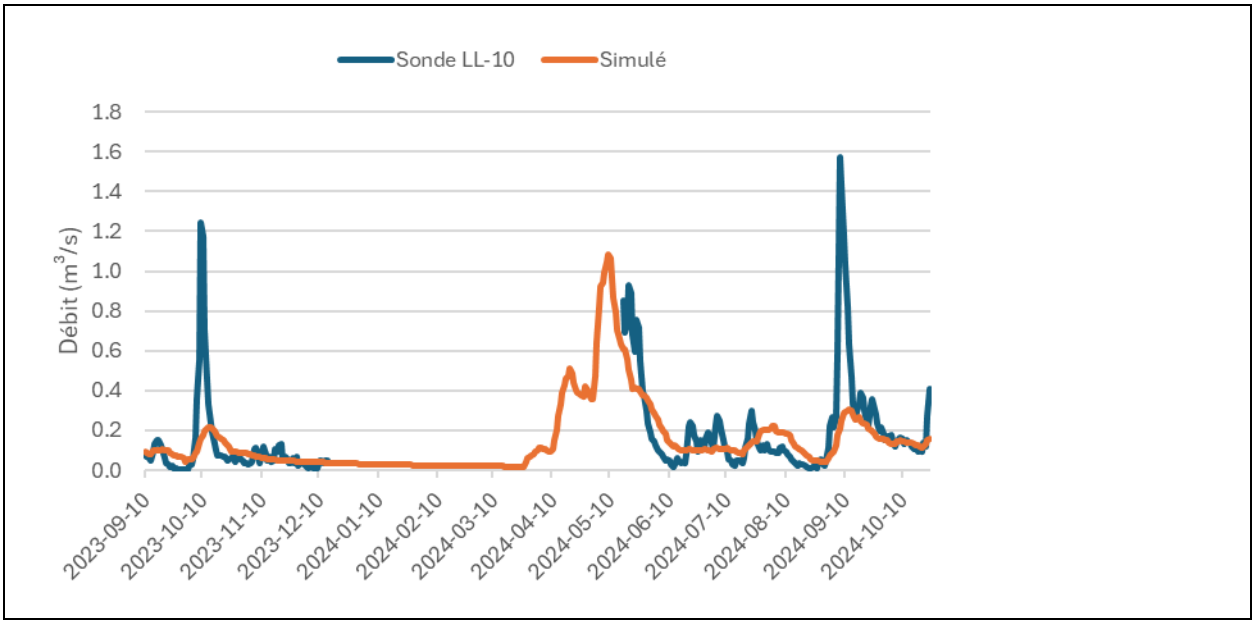



**Figure 3-1 Débits calculés avec les données de niveau observé par la sonde LL-10 et débits simulés avec le modèle GR4J-15**

Le tableau 3-6 présente le ratio entre les volumes calculés à partir des niveaux d'eau observés par la sonde LL-10 et les volumes calculés avec les débits simulés par le modèle hydrologique GR4J-15 pour chaque mois d'observation disponible à la sonde LL-10. Pour ces six mois répartis sur deux années, la moyenne du ratio est de 1,21, ce qui indique que les volumes estimés à l'aide des débits simulés par le modèle hydrologique sont conservateurs.

**Tableau 3-6 Ratio entre les volumes observés par la sonde LL-10 et simulés par le modèle hydrologique GR4J-15**

| | JAN | FÉV | MAR | AVR | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV | DÉC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2023 | - | - | - | - | - | - | - | - | | 1,67 | 1,12 | - |
| 2024 | - | - | - | - | - | 0,72 | 1,07 | 0,44 | 2,22 | - | -- | - |

Il existe peu de données de débits pour valider le modèle hydrologique et ces données de débits sont sujettes à une grande incertitude. Il apparaît toutefois que les débits simulés avec le modèle hydrologique présentent une estimation satisfaisante des débits à l'exutoire du lac 308.

### 3.4.5 Modélisation du bilan hydrique

La série de débits simulés à l'aide du modèle hydrologique GR4J-15 a été moyennée afin d'obtenir un hydrogramme annuel de débits moyens journaliers. Le modèle du bilan hydrique a été estimé en quantifiant les intrants, les extrants et l'emmagasinement dans le lac 308.

Pour chaque scénario de prélèvement, un bilan hydrique a été modélisé sur une base journalière. Un scénario de référence sans prélèvement a aussi été modélisé.

Les intrants, les extrants et l'emmagasinement du modèle de bilan hydrique sont définis ici :

- **Intrants** : Les apports de débits simulés par le modèle hydrologique GR4J-15.
- **Extrants** : Le débit évacué à l'exutoire du lac (calculé à partir de la courbe de tarage spécifique au lac 308) et le volume d'eau prélevé selon chaque scénario.
- **Emmagasinement** : Le niveau d'eau du lac est recalculé à chaque pas de temps en tenant compte du volume d'eau emmagasiné, des intrants et des extrants.

### 3.4.6 Courbe de tarage

La courbe de tarage ($Q = 19{,}1 \times (h - 374{,}89)^{1{,}97}$) provient de WSP, 2025. Elle permet de convertir les niveaux d'eau simulés en débits à l'exutoire.

### 3.4.7 Comparaison des niveaux d'eau

Les niveaux d'eau simulés pour chaque scénario de prélèvement sont comparés à la situation de référence (sans prélèvement).

### 3.4.8 Hypothèses de calcul

Afin de modéliser le bilan hydrique du lac 308, des hypothèses de calculs ont été posées. Elles sont identifiées et expliquées ici.

#### 3.4.8.1 Courbe d'emmagasinement du lac 308

Le lac 308 a été considéré comme étant un prisme à paroi verticale dont la superficie est de 78 000 m². Le profil du cours d'eau LL-10 présenté dans WSP (2025) montre un seuil à l'aval du lac. Le volume d'eau du lac sous ce seuil est donc un volume mort. Ce constat permet de qualifier l'hypothèse comme étant acceptable.

# 4 Résultats

La capacité d'emmagasinement du lac 308 est faible, ce qui fait que le débit sortant du lac est pratiquement égal au débit entrant. La figure 4-1 présente les hydrogrammes moyens qui comparent les scénarios de prélèvements analysés avec le scénario de référence. La figure montre que le niveau d'eau du lac 308 n'est pas affecté par les trois scénarios de prélèvement analysés. La figure 4-2 présente ces mêmes hydrogrammes pour les mois de janvier à mars qui sont ceux où les étiages sont les plus sévères. La figure permet de constater que l'écart est de l'ordre de quelques millimètres. L'écart est donc négligeable.

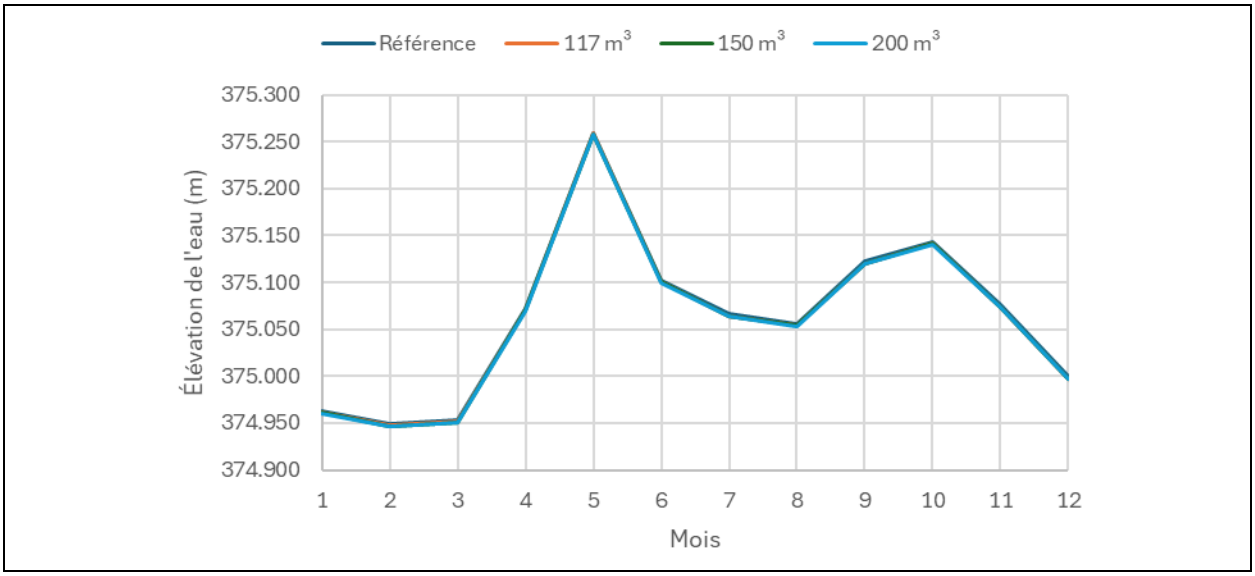



**Figure 4-1** **Hydrogrammes moyens comparant l'impact de l'élévation de l'eau dans le lac 308 pour les scénarios analysés**

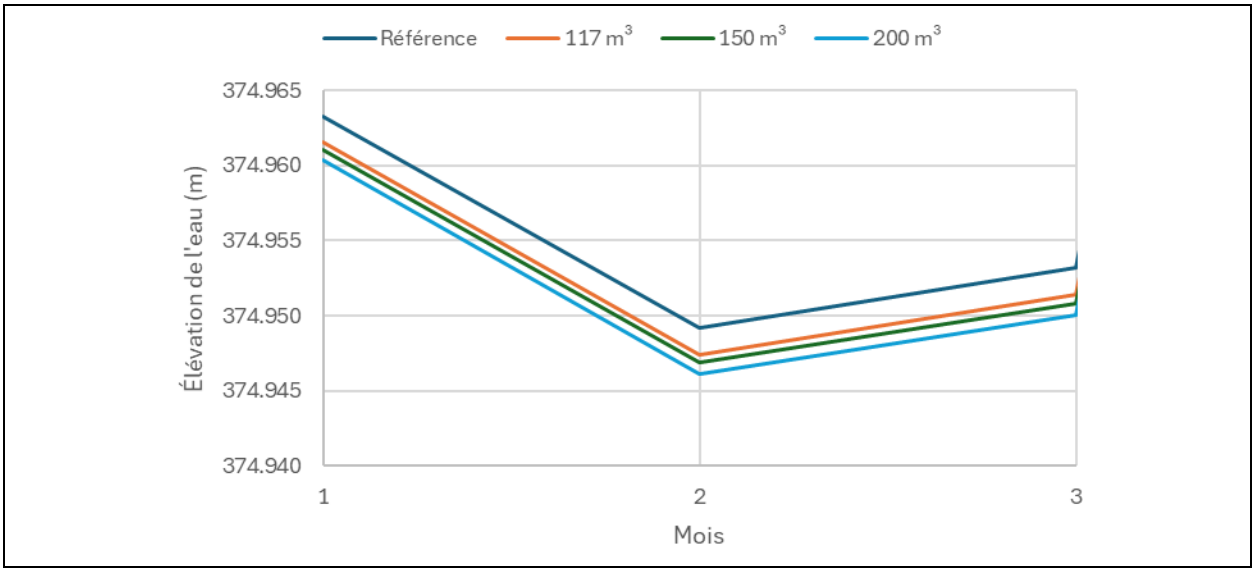



**Figure 4-2** **Hydrogrammes moyens des mois de janvier à mars comparant l'impact de l'élévation de l'eau dans le lac 308 pour les scénarios analysés**

Le tableau 4-1 présente les volumes emmagasinés dans le lac 308 qui ont été estimés avec les modèles de bilan hydrique. Le tableau montre que la différence de volume emmagasiné dans le lac entre le scénario de référence et les trois scénarios de prélèvement est minime. Cela s'explique par le fait que les apports d'eau provenant du bassin versant compensent les volumes d'eau prélevés.

**Tableau 4-1 Estimation du volume emmagasiné dans le lac 308 pour les scénarios comparés (10³ m³)**

| SCÉNARIO | JAN | FÉV | MAR | AVR | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV | DÉC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Référence | 63,43 | 62,34 | 62,65 | 71,97 | 86,56 | 74,30 | 71,44 | 70,68 | 75,81 | 77,46 | 72,19 | 66,24 |
| 117 m³ | 63,30 | 62,20 | 62,51 | 71,85 | 86,46 | 74,18 | 71,32 | 70,56 | 75,69 | 77,35 | 72,07 | 66,11 |
| 150 m³ | 63,26 | 62,16 | 62,47 | 71,81 | 86,43 | 74,15 | 71,29 | 70,53 | 75,66 | 77,31 | 72,03 | 66,08 |
| 200 m³ | 63,21 | 62,10 | 62,40 | 71,76 | 86,38 | 74,10 | 71,24 | 70,48 | 75,61 | 77,26 | 71,98 | 66,02 |

Le bilan a été réalisé avec des données simulées. Afin de valider les résultats, deux autres approches ont été utilisées.

La première approche a consisté à comparer les débits estimés à l'aide de la sonde LL-10 – convertis en volumes journaliers – aux volumes prélevés des trois scénarios. Les tableaux 4-2 et 4-3 comparent respectivement les volumes journaliers extrants minimums et moyens mensuels aux volumes intrants. Les volumes intrants sont ceux estimés à partir des niveaux d'eaux mesurés par la sonde LL-10. La série de niveaux d'eau enregistrés étant courte, chaque mois comportant un minimum de 20 enregistrements a été conservé. Le tableau 4-2 montre que les apports du bassin versant ont été insuffisants (-30 m³) en septembre 2023 pour le scénario de prélèvement de 200 m³/s. Une analyse des données a permis de constater qu'une seule journée affichait un bilan négatif, soit celle de septembre 2023. Il s'agit d'une valeur journalière qui n'est pas représentative du bilan mensuel. Le tableau 4-3 montre que le bilan des volumes moyens mensuels est toujours positif.

**Tableau 4-2 Bilan des volumes minimums mensuels (m³) entrants estimés avec la sonde LL-10 et extrants pour les trois scénarios analysés**

| SCÉNARIO | ANNÉE | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV |
|---|---|---|---|---|---|---|---|---|
| 117 m³ | 2023 | - | - | - | - | 53 | 137 | 1 825 |
| | 2024 | 16 052 | 1 249 | 1 771 | 548 | 9 845 | 7 800 | - |
| 150 m³ | 2023 | - | - | - | - | 20 | 104 | 1 792 |
| | 2024 | 16 019 | 1 216 | 1 738 | 515 | 9 812 | 7 767 | - |
| 200 m³ | 2023 | - | - | - | - | **-30** | 54 | 1 742 |
| | 2024 | 15 969 | 1 166 | 1 688 | 465 | 9 762 | 7 717 | - |

**Tableau 4-3 Bilan des volumes moyens mensuels (m³) entrants estimés avec la sonde LL-10 et extrants pour les trois scénarios analysés**

| SCÉNARIO | ANNÉE | MAI | JUIN | JUIL | AOU | SEP | OCT | NOV |
|---|---|---|---|---|---|---|---|---|
| 117 m³ | 2023 | - | - | - | - | 4 849 | 18 420 | 5 477 |
| | 2024 | 131 281 | 8 858 | 11 282 | 4 572 | 39 144 | 13 210 | - |
| 150 m³ | 2023 | - | - | - | - | 4 816 | 18 387 | 5 444 |
| | 2024 | 131 248 | 8 825 | 11 249 | 4 539 | 39 111 | 13 177 | - |
| 200 m³ | 2023 | - | - | - | - | 4 766 | 18 337 | 5 394 |
| | 2024 | 131 198 | 8 775 | 11 199 | 4 489 | 39 061 | 13 127 | - |

La deuxième approche a consisté à comparer les débits associés aux volumes des trois scénarios de prélèvements – présentés au tableau 1-1 – avec les débits d'étiages estimés par WSP, 2025 – présentés au tableau 3-2. Le tableau 4-4 présente cette comparaison.

Le tableau montre que le cas le plus critique est un prélèvement de 200 m³, qui représente 32,3 % du débit en étiage sept jours de récurrence 10 ans. Il en résulte que même en période d'étiage, le bilan d'eau reste positif pour les trois scénarios de prélèvement. Il convient de rappeler que ces étiages sont des débits moyens sur sept jours (Q2-7 et Q10-7) et 30 jours (Q5-30), alors que les valeurs présentées au tableau 4-2 sont des valeurs journalières. C'est ce qui explique la différence entre les conclusions.

**Tableau 4-4 Débits d'eau prélevés sous forme de pourcentage des débits d'étiage**

| Scénario | Q2-7 (%) | Q10-7 (%) | Q5-30 (%) |
|---|---|---|---|
| 117 m³ | 9,3 | 18,9 | 13,9 |
| 150 m³ | 11,9 | 24,2 | 17,8 |
| 200 m³ | 15,8 | 32,3 | 23,8 |

# 5 Conclusion

L'impact des trois scénarios de prélèvement évalués a été estimé au moyen de trois méthodes : comparaison des débits associés aux prélèvements avec les débits d'étiages Q2-7, Q10-7 et Q5-30 estimés par la méthode du MELCCFP (MDDELCC, 2017); comparaison des volumes prélevés avec les volumes estimés un moyen d'un bilan hydrique modélisé et; comparaison des débits et volumes prélevés avec les débits de la sonde installée lors de campagnes de terrain.

La comparaison avec les valeurs d'étiages estimées par la méthode du MELCCFP (MDDELCC, 2017) montre que les débits associés aux volumes des trois scénarios de prélèvement sont inférieurs aux débits d'étiages estimés.

Les résultats de la modélisation du bilan hydrique indiquent que, pour les trois scénarios de prélèvement étudiés, l'impact sur le niveau d'eau et le volume du lac 308 est négligeable.

La comparaison avec les données enregistrées par la sonde LL-10 a permis de constater que le volume moyen mensuel d'apports provenant du bassin versant est suffisant pour les trois scénarios de prélèvements.

De plus, le déficit volumétrique maximal journalier de -30 m³ estimé au mois de septembre 2023 est considéré comme négligeable, car ponctuel (sur une seule journée).

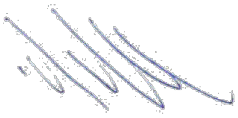
À noter que si le client le juge nécessaire ou pertinent, il est possible d'adopter des mesures de gestion modulables et spécifiques associées aux prélèvements d'eau, particulièrement lors des périodes d'étiage. Par exemple, il pourrait être prévu d'entreposer de l'eau dans des réservoirs durant les périodes où l'approvisionnement est abondant, soit lors de crues, afin de limiter les prélèvements directs dans le lac 308 pendant l'automne ou lors d'épisodes critiques pour minimiser l'impact sur le niveau du lac et le débit d'étiage.

De plus, il est suggéré de mettre en place un programme de suivi hydrométrique renforcé à l'exutoire du lac 308 pendant la période d'exploitation. Cela inclurait le déploiement de stations de mesure automatiques pour collecter des données en continu sur les niveaux, complétées par des campagnes de jaugeage en périodes critiques. Cela permettrait, d'une part, la validation régulière des modèles hydrologiques et, d'autre part, à suivre en temps réel l'impact du prélèvement sur les niveaux du lac.

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## PRÉPARÉ PAR



27 novembre 2025

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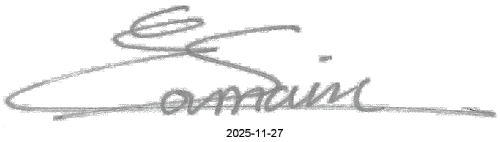


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## RÉVISÉ PAR




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# APPENDIX

# 5-12 GREENHOUSE GAS EMISSIONS ASSESSMENT

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# Note technique

**Ressources PMET inc.**
**Projet minier Shaakichiuwaanaan**
**Étude des émissions de gaz à effet de serre**

**Référence WSP : CA0001724-3318_016_NT_Rev0**

2026-03-03

**Destinataire(s) :** Cathryn Moffett, Vice-présidente Environnement, Ressources PMET

## 1. Introduction

Ressources PMET Inc. (PMET) est une société d'exploration minière qui se concentre sur l'acquisition et le développement de projets miniers contenant des métaux de base et des métaux précieux. La société est propriétaire à 100 % de la compagnie Innova Lithium, laquelle détient 100% du projet Shaakichiuwaanaan (le projet).

L'extraction projetée de spodumène dans un mode d'exploitation hybride (fosse à ciel ouvert et exploitation souterraine) à un taux d'extraction supérieur à 5 kt/j est assujettie au régime d'évaluation provincial des impacts sur l'environnement et le milieu social applicable au territoire visé par la Convention de la Baie-James et du Nord québécois (CBJNQ) (sud du 55e parallèle – via le Comité d'évaluation [COMEV] et le Comité d'examen [COMEX]) de même qu'à la procédure fédérale d'évaluation des impacts prévue en vertu de la *Loi sur l'évaluation d'impact* (L.C. 2019, ch. 28, art. 1).

Le projet a pour objectif de produire en moyenne 800 kt de concentré de spodumène par an à une teneur de 5,5 % de $Li_2O$. Une flotte de camions transportera le concentré par la route Transtaïga et la route Billy-Diamond à destination de la gare ferroviaire de Matagami.

Cette note technique se concentre sur les émissions de gaz à effet de serre (GES) pour la construction ainsi que l'exploitation du projet.

# 2. Évaluation des émissions de GES

## 2.1 Identification des sources et puits de carbone de GES

La norme ISO 14064-1:2006[1] définit :

- une source de GES comme *une unité physique ou un processus rejetant un GES dans l'atmosphère*;
- un puits de GES comme *une unité physique ou un processus retirant un GES de l'atmosphère*.

## 2.2 Calcul des émissions

Les émissions de GES provenant de la consommation énergétique sont calculées de façon directe suivant la formule suivante :

$$\text{Émission GES} = \text{activité} \times \text{facteur d'émission de l'activité } (FE_{\text{activité}})$$

Les GES sont quantifiés en tonnes de $CO_2$ équivalent ($tCO_2eq$), où 1 T GES = 1 T $CO_2eq$ multipliés par le pouvoir de réchauffement global (PRP), à l'échelle planétaire, spécifique à chaque GES. Les PRP du 5e rapport d'évaluation du Groupe d'experts intergouvernemental sur l'évolution du climat (GIEC) sont utilisés lors de la réalisation de ce projet.

Pour le 4e rapport du GIEC, ce sont :

- 1 T $CO_2$ = 1 T $CO_2eq$;
- 1 T $CH_4$ = 28 T $CO_2eq$;
- 1 T $N_2O$ = 265 T $CO_2eq$;
- 1 T CN = 460 T $CO_2eq$.

Il est à noter que la variation des PRP affecte principalement les sources émettant du $CH_4$ et du $N_2O$; les sources de combustion émettant principalement du $CO_2$ sont moins affectées par un recalcul des émissions de $CO_2eq$ utilisant des PRP différents. Les autres GES (HFC, PFC, $SF_6$ et $NF_3$) ne sont pas considérés ici puisqu'ils ne sont pas émis dans les travaux du projet.

[1] La norme ISO 14064-1:2006 spécifie les principes et les exigences, au niveau des organismes, pour la quantification et la rédaction de rapports sur les émissions de gaz à effet de serre (GES) et leur suppression. Elle comprend des exigences pour la conception, la mise au point, la gestion, la rédaction de rapports et la vérification de l'inventaire des GES d'un organisme.

Les HFC et PFC sont utilisés comme réfrigérant dans les climatiseurs, le $SF_6$ dans la réalisation de disjoncteur haute-tension et le $NF_3$ dans la fabrication d'équipements électroniques. Le CN représente les émissions de carbone noir.

## 2.3 Facteurs d'émission

Les facteurs d'émission (FE) proviennent du *Règlement sur la déclaration obligatoire de certaines émissions de contaminants dans l'atmosphère* (RDOCECA) (Gouvernement du Québec, 2025) pour la consommation de gaz naturel et du *Guide de quantification des émissions de gaz à effet de serre* (MELCCFP, 2025a) pour le reste des combustibles.

**Tableau 2-1 Facteurs d'émission des différents équipements**

| Combustible | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| | g/L | | |
| Voiture à essence | 2 307 | 0,11 | 0,007 |
| Camion lourd | 2 681 | 0,11 | 0,151 |
| Hors-route | 2 681 | 0,073 | 0,227 |
| Train | 2 681 | 0,15 | 1,029 |
| Gaz naturel liquéfié (g/GJ) | 49 010 | 0,966 | 0,861 |

**Tableau 2-2 Facteurs d'émission de la consommation électrique**

| Combustible | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| | g/L | | |
| Électricité | 1,9 | - | - |

**Tableau 2-3 Facteurs d'émission des explosifs**

| Combustible | $CO_2$ | $CH_4$ | $N_2O$ |
|---|---|---|---|
| | T/T d'explosif | | |
| Émulsion | 0,17 | - | - |

**Tableau 2-4 Facteurs d'émission du carbone noir**

| Combustible | CN |
|---|---|
| | g/L |
| Essence | 0,132 |
| Diesel | 0,391 |

Le facteur d'émission pour la consommation électrique dans la province de Québec provient du Rapport d'inventaire national (Environnement Canada 1990-2023) et est de 1,9 g $CO_2$eq/kWh.

## 2.4 Définition des types d'émission

### 2.4.1 Émissions directes de GES (portée 1)

Les émissions directes sont des émissions provenant de sources qui appartiennent ou qui sont contrôlées par PMET pendant toute la durée du projet. Ainsi, ces émissions comprennent également celles provenant d'activités sous-traitées sur le site du projet

Les émissions directes de GES provenant des sources d'émission suivantes sont comprises dans la présente quantification :

- combustion stationnaire d'énergie fossile;
- combustion d'énergie fossile par des équipements mobiles lors des phases de construction;
- combustion d'énergie fossile par des équipements mobiles lors des activités d'extraction et de transport;
- utilisation d'explosifs lors de la phase d'extraction du minerai;
- déboisement, incluant la perte de milieux humides.

### 2.4.2 Émissions indirectes de GES dues à l'utilisation d'énergie (portée 2)

Les émissions indirectes de GES dues à l'utilisation d'énergie sont des émissions pour lesquelles PMET a un contrôle indirect. En d'autres termes, il s'agit de la production d'électricité produite par Hydro-Québec et consommée par PMET.

### 2.4.3 Autres émissions indirectes (portée 3)

Les autres émissions indirectes sont toutes les autres émissions de GES reliées aux activités du projet, mais qui appartiennent ou qui sont contrôlées par un autre organisme. Ces émissions ont lieu à l'extérieur des limites de la quantification des émissions de GES et peuvent être rapportées de façon optionnelle afin d'avoir une indication de l'impact des activités du projet à l'extérieur des installations minières, par exemple, le transport logistique.

### 2.4.4 Émissions de $CO_2$ biogéniques

Les émissions biogéniques sont des émissions de $CO_2$ associées au cycle naturel du carbone et la dégradation, décomposition et/ou combustion des matières organiques en présence d'oxygène. Les émissions de $CO_2$ du cycle des matières organiques sont considérées comme carboneutres et ne sont pas comptabilisées comme un GES dans la présente quantification. Néanmoins, dans le cadre du RDOCÉCA, il est demandé de les fournir dans une section à part, à titre indicatif. Pour cela, ces émissions ont été évaluées ici.

Dans le cadre du projet, les émissions biogéniques de $CO_2$ proviennent :

- du $CO_2$ généré lors du compostage des résidus forestiers laissés sur place.

### 2.5 Inclusions et exclusions

Les émissions de GES ont été évaluées durant la phase de construction et la phase d'exploitation. La section suivante décrit les sources d'émission incluses dans la présente quantification, ainsi que celles qui sont exclues.

#### 2.5.1 Inclusions

Toutes les émissions provenant de sources gérées et contrôlées par PMET sont incluses dans la présente quantification. Ces émissions sont des émissions directes.

Certaines émissions indirectes ont été quantifiées dans le cadre de cette évaluation, pour les besoins du projet seulement.

Il s'agit :

- des émissions relatives au transport hors site du concentré de minerai;
- des émissions relatives au transport des équipements et du personnel durant la phase de construction;
- de la consommation d'électricité par les infrastructures du site;
- la perte de séquestration de $CO_2$ provenant de la suppression de la forêt et de milieux humides.

## 3. Quantification des émissions de GES

Les émissions des GES liées à des activités sont calculées à l'aide de facteurs d'émission (FE), qui indiquent la quantité de $CO_2$eq générée par unité d'activité réalisée. Les hypothèses de calcul et la méthodologie utilisée pour le calcul des émissions de GES sont expliquées dans les sous-sections suivantes, pour chacune des activités évaluées.

### 3.1 Informations générales

Comme il a été mentionné dans la section précédente, les GES émis par le projet sont du $CO_2$, du $CH_4$ et du $N_2O$.

Les GES sont quantifiés en tonnes de $CO_2$ équivalent (T $CO_2$eq), où 1 T GES = 1T $CO_2$eq multiplié par le potentiel de réchauffement global planétaire spécifique à chaque GES.

Ainsi, pour la présente évaluation, les potentiels de réchauffement suivant ont été utilisés [2]:

- 1 T $CO_2$ = 1 T $CO_2$eq;
- 1 T $CH_4$ = 28 T $CO_2$eq;
- 1 T $N_2O$ = 265 T $CO_2$eq.

## 3.2 Émissions en construction

### 3.2.1 Émissions directes de projet en construction

La consommation de diesel par la machinerie au site minier a été estimée dans l'étude de faisabilité de novembre 2025 (GMining, 2025). Les facteurs d'émissions du rapport d'inventaire national 1990-2023 d'Environnement Canada pour les véhicules hors route ont été utilisés (ECCC, 2025).

Le calcul des émissions de GES est réalisé à partir de l'équation suivante :

**Émissions *GES* = $\sum$ *($Carburant_j$ * $FE_j$)***

Source : Environnement Canada 2012, Annexe 2, Équation A2-1

Où :

- $Carburant_j$ = quantité de carburant j consommée (en litres, kg ou $m^3$)
- $FE_j$ = facteur d'émission (g GES/litre, kg ou $m^3$ de carburant)
- j = type de carburant

Les émissions de GES proviennent de la combustion de carburant d'origine fossile et sont principalement le $CO_2$, le $CH_4$ et le $N_2O$.

Les facteurs d'émission utilisés sont ceux de la section 2.3.

Avec une consommation projetée de 68 867 litres de diesel, les émissions de GES de la machinerie pour les activités de la période de construction sont estimées à 189 tonnes CO2eq.

La machinerie est aussi utilisée durant la période de construction pour réaliser une préproduction. La consommation projetée pour cette préproduction est de 1 585 kilolitres de

[2] Source : Gazette du 2 novembre 2013, http://gazette.gc.ca/rp-pr/p1/2013/2013-11-02/html/notice-avis-fra.html#d114

diesel, les émissions ponctuelles de GES de la machinerie en préproduction sont estimées à 4 250 tonnes $CO_2$eq.

### 3.2.2 Déboisement

La méthodologie de calcul est présentée dans le volume 4 des lignes directrices 2006 du GIEC. Cette équation détermine un facteur d'émissions (FE) de $CO_2$ par hectare (ha) déboisé. Le GIEC a mis à jour cette méthode et les paramètres dans la révision de 2019.

FE (déboisement) = $t_{MSh}$ x (1 + $T_x$) x CC x 44/12

Avec :

- $t_{MSh}$ : quantité en tonnes de matières sèches par hectare;
- $T_x$ : taux de biomasse souterraine par rapport à la biomasse aérienne;
- CC : teneur en carbone dans la biomasse (tonne de carbone/tonne de matière sèche).

WSP a utilisé les paramètres proposés par le GIEC aux tableaux 4-4 et 4-7 des lignes directrices 2019 :

- CC : 0,47 (valeur par défaut);
- 44/12 : ratio masse moléculaire de $CO_2$ par rapport à la masse moléculaire de C.

Avec une empreinte au sol de 1122 ha, les émissions de $CO_2$eq associées au déboisement en construction sont de 88 kT $CO_2$eq.

Un déboisement supplémentaire aura lieu pendant l'exploitation dans le cadre du développement par agrandissement graduel du site.

WSP a utilisé les paramètres proposés par le GIEC aux tableaux 4-4 et 4-7 des lignes directrices 2019 :

- CC : 0,47 (valeur par défaut);
- 44/12 : ratio masse moléculaire de $CO_2$ par rapport à la masse moléculaire de C;
- $t_{MSH}$ : 62,9 tonnes ms/ha pour les résineux (climat boréal, conifère, primaire) et 24,5 tonnes ms/ha pour la partie en régénération (62,9 x Tx);
- $T_x$ : 0,39 tonne racine/tonne pousse matière sèche (climat boréal, moins de 75 tonnes de biomasse au sol/ha).

Avec une empreinte au sol de 429 ha de résineux et 426 ha en régénération pour tout le projet, les émissions de $CO_2$eq associées au déboisement additionnel sont de 90 kT $CO_2$eq (64,6 kT + 25,0 kT) pour un total d'émissions reliées au déboisement de 178 kT $CO_2$eq.

### 3.2.3 Transport logistique

La consommation de diesel par les camions de transport a été estimée dans l'étude de faisabilité (GMining, 2025). Les facteurs d'émissions du rapport d'inventaire national 1990-2023 d'Environnement Canada pour les véhicules lourds routiers ont été utilisés (ECCC, 2025).

Avec une consommation estimée de 768 805 litres de diesel, les émissions de GES du transport logistique de la construction sur une période de 2 ans sont évaluées à 2,1 kT $CO_2$eq.

### 3.2.4 Émission totale en construction

Le total des émissions de GES pour la construction s'élève à 94,5 kT $CO_2$eq incluant le transport logistique.

## 3.3 Émissions en exploitation

### 3.3.1 Émissions directes (portée 1)

#### 3.3.1.1 Combustion fixe - Utilisation de génératrices

Les activités de combustion fixes représentent l'ensemble des équipements stationnaires utilisant une source énergétique d'origine fossile.

Les données sur la consommation de carburant ainsi que les quantités de GES émis par les génératrices par année sont présentées au tableau 3-1.

**Tableau 3-1 Quantification des émissions de GES – Génératrices**

| Consommation de diesel | Unité | 2028 | 2029 |
|---|---|---|---|
| Genset | L | 147 381 | 1 748 050 |
| Émissions $CO_2$eq, fixe | T $CO_2$eq | 404 | 4 795 |

La quantité totale de GES émise par les génératrices durant la phase d'exploitation est estimée à environ **5,2 kT $CO_2$eq**.

#### 3.3.1.2 Combustion fixe – Gaz naturel

La consommation du gaz naturel est celle pour le chauffage des installations du camp. Le tableau suivant fournit le minimum, le maximum, la moyenne et le total de la consommation de gaz naturel, ainsi que des émissions de GES en utilisant les taux du tableau 2-1.

**Tableau 3-2 Quantification des émissions de GES – Gaz naturel**

| Émissions | GJ | T $CO_2$eq | Année |
|---|---|---|---|
| Minimum | 9 064 | 447 | en 2028 |
| Maximum | 186 487 | 9 187 | 2034-2047 |
| Moyenne | 163 087 | 8 035 | - |
| Total du projet | 3 261 743 | 160 692 | - |

Les émissions minimales ont lieu lors de la construction/début de l'exploitation. Le total des émissions de GES pour les équipements fixes – gaz naturel pour tout le projet s'élèvent à 161 kT $CO_2$eq et en moyenne annuellement 8 kT $CO_2$eq.

### 3.3.2 Équipements mobiles (portée 1)

Les équipements mobiles représentent l'ensemble des véhicules utilisés sur le site minier.

La quantification des GES liés à l'utilisation des équipements mobiles appartenant à PMET qui sont dédiés à l'extraction et la manutention du minerai sur le site a été réalisée.

Les activités ont lieu de 2028 à 2049. L'année 2028 correspond à l'année de démarrage, tandis que 2048 et 2049 correspondent aux années de fermeture.

Le tableau 3-3 indique les émissions minimales et maximales des années d'exploitation en excluant l'année de démarrage et les années de fermeture. Le détail pour chaque année est disponible en annexe.

**Tableau 3-3 Quantification des émissions de GES – Mobiles hors route**

| Émissions | T $CO_2$eq | Année |
|---|---|---|
| Minimum | 23 574 | en 2033 |
| Maximum | 61 298 | en 2036 |
| Moyenne, exploitation | 44 901 | - |
| Total du projet | 897 736 | - |

Le total des émissions de GES pour les équipements mobiles hors route sur tout le projet s'élève à 898 kT $CO_2$eq et en moyenne annuellement 44 kT $CO_2$eq.

Les FE du tableau 2-4 sont utilisés pour calculer les émissions de carbone noir (tableau 3-4).

**Tableau 3-4 Quantification des émissions de CN – Mobiles hors route**

| Mobiles | Émissions | T CN | T $CO_2eq$ | Année |
|---|---|---|---|---|
| Hors-route | Minimum | 1,2 | 2 525 | en 2049 |
| | Maximum | 4,7 | 15 205 | en 2038 |
| | Moyenne | 3,7 | 11 133 | - |
| | Total projet | 73,5 | 222 664 | - |

### 3.3.3 Utilisation d'explosifs (portée 1)

Les quantités d'explosifs de type émulsion qui seront utilisées pour l'extraction et qui ont été considérées sont celles prévues dans l'étude de faisabilité (GMining, 2025), soit 6 178 tonnes annuellement. Le facteur d'émissions de $CO_2$ du guide de quantification des GES du MELCCFP (2025a) a été utilisé, soit 0,17 tonne de $CO_2eq$ par tonne d'explosif. Les émissions directes de l'utilisation d'explosifs sont donc de 1050 T $CO_2eq$ annuellement et 21 kT $CO_2eq$ pour tout le projet.

### 3.3.4 Consommation d'électricité (portée 2)

Les émissions de GES liées à la consommation d'électricité provenant d'une ligne d'Hydro-Québec sont calculées en fonction de la quantité de kWh utilisée. Cette consommation varie annuellement et le détail annuel se trouve en annexe.

Le tableau 3-5 donne les informations sur les émissions minimales, maximales, moyenne et totale.

**Tableau 3-5 Quantification des émissions de GES – consommation électrique**

| Émissions | MWh | T $CO_2eq$ | Année |
|---|---|---|---|
| Minimum | 22 349 | 42 | en 2029 |
| Maximum | 303 500 | 577 | 2034-2047 |
| Moyenne | 258 961 | 492 | - |
| Total du projet | 4 920 262 | 9 348 | - |

Les émissions totales de GES liées à la consommation d'électricité s'élèvent à 9 kT $CO_2eq$ pour une émission annuelle d'environ 0,5 kT $CO_2eq$.

### 3.3.5 Transport logistique (portée 3)

La consommation de diesel par les camions de transport du concentré a été estimée par WSP basée sur les estimations de nombre de voyages et de distance parcourue par les camions

établies dans l'avis de projet et l'étude de faisabilité (844 km). Les facteurs d'émissions du guide de quantification des GES du MELCCFP (2025a) ont été utilisés et sont indiqués au tableau 2-2.

Le total du diesel consommé par le camionnage entre 2030 et 2049 est de 187 866 054 L.

Les émissions de GES venant des locomotives ont été estimées par WSP basée sur les estimations du tonnage transporté et les distances de transport ferroviaire fournies par le promoteur du projet (1125 km). Le facteur d'émissions du rapport d'évaluation des émissions du secteur ferroviaire de 2021 de l'association canadienne des chemins de fer a été utilisé.

Le total du diesel consommé par le transport ferroviaire entre 2030 et 2049 est de 156 508 672 L.

Les émissions de GES minimales, maximales et moyenne du transport logistique par camion et de train sont indiquées au tableau 3-6. Le détail du calcul se trouve en annexe.

**Tableau 3-6 Quantification des émissions de GES – Transport**

| Mobiles | Émissions | T $CO_2eq$ | Année |
|---|---|---|---|
| Camion | Minimum | 8 120 | en 2049 |
| | Maximum | 32 884 | en 2038 |
| | Moyenne | 25 768 | - |
| | Total projet | 515 354 | - |
| Train | Minimum | 7 295 | en 2049 |
| | Maximum | 29 540 | en 2038 |
| | Moyenne | 23 148 | - |
| | Total projet | 462 953 | - |

Le total des émissions de GES pour la partie mobile pour tout le projet s'élève à 978 kT $CO_2eq$. Annuellement, c'est en moyenne 49 kT $CO_2eq$.

Les FE du tableau 2-4 sont utilisés pour calculer les émissions de carbone noir (tableau 3-7).

**Tableau 3-7 Quantification des émissions de CN – Transport**

| Mobiles | Émissions | T CN | T $CO_2eq$ | Année |
|---|---|---|---|---|
| Camion | Minimum | 1,2 | 532 | en 2049 |
| | Maximum | 4,7 | 2 156 | en 2038 |
| | Moyenne | 3,7 | 1 689 | - |
| | Total projet | 73,5 | 33 790 | - |
| Train | Minimum | 1,0 | 444 | en 2049 |

| Mobiles | Émissions | T CN | T $CO_2$eq | Année |
|---|---|---|---|---|
| | Maximum | 3,9 | 1 796 | en 2038 |
| | Moyenne | 3,1 | 1 407 | - |
| | Total projet | 61,2 | 28 150 | - |

Le total des émissions de GES pour la partie du carbone noir venant des mobiles pour tout le projet s'élève à 62 kT $CO_2$eq et en moyenne annuellement de 3 kT $CO_2$eq.

# 4. Sommaire des émissions du projet

Les émissions totales associées à la construction incluant la préproduction sont de 95 kT de $CO_2$eq, majoritairement dues au déboisement. Ces émissions ont lieu une seule fois.

Le déboisement représente 178 kT $CO_2$eq sur tout le projet.

Le tableau suivant résume les émissions de GES par portée.

**Tableau 4-1 Quantification des émissions de GES par portée**

| Portée | Type | Émissions de GES (T $CO_2$eq) | | | |
|---|---|---|---|---|---|
| | | Minimum | Maximum | Moyenne | Total du projet |
| Portée 1 | Déboisement (construction) | 88 000 | | | |
| | Déboisement additionnel | 89 582 | | | |
| | Fixe | 1 902 | 10 238 | 9 345 | 186 896 |
| | Mobile incluant le CN | 12 303 | 76 503 | 50 927 | 1 120 400 |
| Portée 2 | Électricité | 42 | 577 | 492 | 9 348 |
| Portée 3 | Transport incluant le CN | 16 391 | 66 376 | 52 012 | 1 040 246 |

# 5. Implications réglementaires

## 5.1 Réglementation provinciale

Dans le cadre du Règlement sur la déclaration obligatoire de certaines émissions de contaminants atmosphériques (RDOCECA), une installation en exploitation sur le territoire du Québec doit déclarer ses émissions à l'inventaire québécois des émissions atmosphériques (IQEA) si les émissions de GES des sources fixes ou de procédé sont de 10 000 tonnes de $CO_2$eq ou plus sur une période d'une année calendrier. Cette obligation de déclaration s'applique pour les installations en exploitation, ce qui exclut donc la période de construction du projet. Il est à noter que bien que ses émissions de GES soient de moins de 10 000 tonnes de

$CO_2$eq sur une année, d'autres substances, avec chacune leurs seuils de déclaration, pourraient déclencher l'obligation de déclaration à l'IQEA.

Avec des émissions annuelles de GES moyennes de 9 345 tonnes de $CO_2$eq et un pic à 10 238 tonnes de $CO_2$eq, les émissions réelles devront être quantifiées annuellement pour vérifier l'atteinte ou non du seuil.

Par ailleurs, les exploitations minières peuvent être assujetties au Règlement sur le système de plafonnement et échange des droits d'émissions (RSPEDE), puisque l'extraction minière est incluse comme secteur d'activité à l'annexe A du RSPEDE.

Une entreprise exploitant un établissement visé à l'annexe A doit participer au SPEDE si ses émissions annuelles fixes ou de procédé atteignent ou dépassent 25 000 tonnes de $CO_2$eq. Toutefois, les émissions de la machinerie et des véhicules sont spécifiquement exclues lors de la détermination de l'atteinte du seuil de participation au SPEDE de 25 000 tonnes de $CO_2$eq. Une participation volontaire est aussi possible pour une installation émettant au moins 10 000 tonnes de $CO_2$eq.

De cette manière, avec des émissions annuelles de GES moyennes de 9 345 tonnes de $CO_2$eq et un pic à 10 238 tonnes de $CO_2$eq, l'installation en exploitation telle que projetée n'aura pas l'obligation de participer au SPEDE. Il est à noter que la possibilité d'une participation volontaire au SPEDE est aussi peu probable avec les émissions moyennes annuelles quantifiées pour le projet.

### 5.2 Exigences fédérales

Toute installation qui rejette 10 000 tonnes de $CO_2$eq ou plus de GES annuellement doit aussi produire une déclaration annuelle au Programme de déclaration des émissions de GES (PDGES) du gouvernement canadien. Cette déclaration est indépendante des autres obligations d'émissions au gouvernement du Canada, notamment la déclaration à l'inventaire national de rejet de polluants (INRP).

## 6. Importance des émissions du projet

Les activités liées à l'exploitation de la mine produiront en moyenne 117 kT de $CO_2$eq/année (excluant la période de fermeture). Cette moyenne inclut la contribution des émissions de GES liées à la logistique de projet.

## 6.1 Au Québec

En 2023, les émissions totales de GES au Québec se chiffraient à 78 MT de $CO_2$eq, soit 8,8 T par habitant, représentant 11,2 % des émissions canadiennes, lesquelles atteignaient 694 MT de $CO_2$eq.

Le secteur qui produisait le plus d'émissions de GES au Québec, en 2023, était celui du transport (routier, aérien, maritime, ferroviaire, hors route) générant 34,9 MT de $CO_2$eq. Le secteur de l'industrie arrivait en deuxième place avec 24,7 MT de $CO_2$eq, soit 32 % des émissions totales. Ces émissions se répartissaient comme suit : 51,5 % provenaient de la consommation énergétique; 47,4 % des procédés industriels et 1,1 % des émissions fugitives et de l'utilisation de solvants et d'autres produits (MELCCFP, 2025b).

Le projet étudié fait partie du secteur Industrie. Durant l'exploitation de la mine, les émissions (directes) de GES excluant le transport seraient en moyenne d'environ 64,5 kT $CO_2$eq/an. Ces émissions représentent 0,26 % des émissions provenant du secteur Industrie et 0,08 % des émissions totales à l'échelle provinciale.

## 6.2 Au Canada

Selon le rapport national des émissions de GES 1990-2023 (ECCC, 2025), les émissions totales de GES en 2023 atteignaient pour le Canada 694 MT de $CO_2$eq.

Selon les secteurs d'activité définis dans le sommaire exécutif du rapport d'inventaire national 1990-2023, les activités minières autres que l'exploitation de pétrole et gaz sont classées dans la catégorie des « Industries lourdes ». Ce secteur a émis pour 78 MT de $CO_2$eq en 2023. La contribution estimée du projet par ses émissions se chiffrerait à 0,08 % des émissions liées à ce secteur d'activité.

Les émissions annuelles provenant des activités du projet représentent 0,017 % des émissions totales à l'échelle fédérale. L'apport des émissions indirectes liées à l'exploitation du projet est donc faible.

# 7. Références

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3 mars 2026
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p. j. : Détails des calculs GES

# Annexe A

## Détails des calculs de GES

Opération

Combustible Émissions de GES (T CO2eq)

| | Construction | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Diesel, fixe | 4 439 | 404 | 4 795 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Diesel, mobile | | 19 280 | 45 175 | 38 801 | 23 583 | 52 868 | 23 574 | 48 479 | 56 451 | 61 298 | 54 132 | 56 148 | 57 116 | 53 522 | 44 967 | 49 041 | 40 294 | 40 110 | 38 457 | 36 575 | 32 532 | 13 028 | 12 303 |
| Carbone noir, mobile | | 2 525 | 6 410 | 5 225 | 4 541 | 9 861 | 6 321 | 13 499 | 14 593 | 15 205 | 14 286 | 14 935 | 14 853 | 14 003 | 13 376 | 13 119 | 12 590 | 12 660 | 12 392 | 12 158 | 10 111 | | |
| Gaz naturel, fixe | | 447 | 2 647 | 5 372 | 7 205 | 9 187 | 7 211 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | 9 187 | | |
| Émulsion | | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | 1 050 | | |
| Déboisement en construction | 88 000 | | | | | | | | | | | | | | | | | | | | | | |
| Déboisement additionnel | 89 582 | | | | | | | | | | | | | | | | | | | | | | |
| Électricité | | 0 | 42 | 238 | 341 | 424 | 231 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | 577 | | |
| Total au site en construction | 92 439 | | | | | | | | | | | | | | | | | | | | | | |
| Total exploitation | | 23 707 | 60 121 | 50 686 | 36 720 | 73 390 | 38 387 | 72 792 | 81 859 | 87 318 | 79 232 | 81 897 | 82 783 | 78 339 | 69 157 | 72 975 | 63 698 | 63 584 | 61 663 | 59 548 | 53 458 | 13 028 | 12 303 |
| Total fixe | 4 439 | 1 902 | 8 493 | 6 422 | 8 255 | 10 237 | 8 261 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | 10 238 | | |

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transport logistique, camion | 2 100 | | | 10 677 | 13 551 | 23 507 | 14 021 | 30 959 | 31 263 | 31 221 | 31 223 | 32 884 | 32 007 | 30 353 | 32 350 | 29 038 | 31 558 | 31 956 | 31 718 | 31 751 | 25 252 | 11 945 | 8 120 |
| Transport logistique, train | | | | 9 591 | 12 173 | 21 117 | 12 595 | 27 811 | 28 084 | 28 046 | 28 048 | 29 540 | 28 753 | 27 266 | 29 061 | 26 085 | 28 349 | 28 706 | 28 493 | 28 523 | 22 685 | 10 731 | 7 295 |
| Carbone noir, transport | | | | 1 283 | 1 629 | 2 825 | 1 685 | 3 721 | 3 757 | 3 752 | 3 753 | 3 952 | 3 847 | 3 648 | 3 888 | 3 490 | 3 793 | 3 841 | 3 812 | 3 816 | 3 035 | 1 436 | 976 |

# APPENDIX

## 5-13 ECONOMIC IMPACTS STUDY

PMET RESOURCES INC.

# SHAAKICHIUWAANAAN MINING PROJECT

## ECONOMIC IMPACT STUDY

MARCH 2026

WSP REF.: CA0001724.3318_017_R_REV0

CONFIDENTIAL

FINAL VERSION



PMET RESOURCES INC.

# SHAAKICHIUWAANAAN MINING PROJECT

## ECONOMIC IMPACT STUDY

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# REVISIONS

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| RevA | 2026-01-16 | Preliminary version |
| RevB | 2026-03-06 | Revised preliminary version |
| RevC | 2026-03-16 | Prefinal version |
| Rev0 | 2026-03-24 | Final version |

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## REFERENCE TO BE CITED

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# TABLE OF CONTENTS


1 Introduction ..... 1

2 Methodology ..... 3
2.1 Québec Intersectoral Model (MISQ) ..... 3
2.2 Regional Impacts ..... 4

3 Project Expenditures ..... 7
3.1 Construction Expenditures ..... 7
3.1.1 Phase 1 – Open Pit ..... 7
3.1.2 Phase 2 – Underground ..... 8
3.2 Operating Period Expenditures ..... 10
3.2.1 Operating Expenditures ..... 10
3.2.2 Sustaining Capital Expenditures ..... 12
3.3 Closure and Rehabilitation Expenditures ..... 13

4 Results ..... 15
4.1 Provincial Results ..... 15
4.1.1 Construction ..... 15
4.1.2 Operations Phase ..... 17
4.1.3 Closure ..... 21
4.2 Regional Results ..... 22
4.2.1 Construction ..... 22
4.2.2 Operation ..... 24
4.2.3 Closure ..... 25
4.3 Summary Results ..... 26

Bibliography ..... 29


## *Tables*


Table 1 Phase 1 Capital Expenditures Summary, Open Pit Construction (M$) ..... 7
Table 2 Phase 1 Capital Expenditures Breakdown by Productive Sector ($million) ..... 8
Table 3 Phase 2 Capital Expenditures Summary, Underground Construction ($million) ..... 9
Table 4 Phase 2 Capital Expenditures Breakdown by Productive Sector ($million) ..... 9
Table 5 Operating Expenditures Summary, Total Period and Operation Peak ($million) ..... 10
Table 6 LOM Operating Expenditures Breakdown by Productive Sector ($million) ..... 11

| | | |
|---|---|---|
| Table 7 | Sustaining Capital Expenditures Summary ($million) | 12 |
| Table 8 | Sustaining Capital Expenditures Breakdown by Productive Sector ($million) | 12 |
| Table 9 | Closure Expenditures Summary ($million) | 13 |
| Table 10 | Closure Expenditures Breakdown by Productive Sector ($million) | 13 |
| Table 11 | Provincial Economic Impacts of the Construction of Phase 1 | 15 |
| Table 12 | Provincial Economic Impacts of the Construction of Phase 2 | 16 |
| Table 13 | Provincial Economic Impacts of the Operations – Total Period | 17 |
| Table 14 | Provincial Economic Impacts of the Operations – 2035-2036 | 19 |
| Table 15 | Provincial Economic Impacts of the Sustaining Capital Expenditures | 20 |
| Table 16 | Provincial Economic Impacts of the Closure Phase | 21 |
| Table 17 | Regional Economic Impacts of the Construction of Phase 1 | 23 |
| Table 18 | Regional Economic Impacts of the Construction of Phase 2 | 23 |
| Table 19 | Regional Economic Impacts of the Operations – Total Period | 24 |
| Table 20 | Regional Economic Impacts of the Operations – 2035-2036 | 24 |
| Table 21 | Regional Economic Impacts of the Sustaining Capital Expenditures | 25 |
| Table 22 | Regional Economic Impacts of the Closure Phase | 26 |
| Table 23 | Provincial Economic Impacts – Summary | 27 |
| Table 24 | Regional Economic Impacts – Summary | 28 |

# 1 Introduction

WSP Canada Inc. (WSP) is preparing an environmental impact assessment (EIA) for the Shaakichiuwaanaan Project, a new hybrid open-pit and underground lithium mine about 220 kilometers east of Radisson (Québec) proposed by PMET Resources Inc. (PMET). Over the Project lifecycle, total material mined is expected to reach 256.9 million tonnes, peaking at 24.6 million tonnes per year when the open-pit and underground phases operate concurrently. At full capacity, the Project is expected to produce up to approximately 800,000 tpa of spodumene concentrate (SC5.5 basis).

To support the EIA, this report estimates the project's economic effects in Québec using the Institut de la statistique du Québec's Modèle intersectoriel du Québec (MISQ). Starting from the project expenditure streams, the model traces how demand propagates through Québec supply chains to estimate impacts on value added, employment, and net indirect taxes, while identifying leakages (imports and other leakages); it reports direct, indirect, and induced impacts. The MISQ produces province-wide results. Regional effects presented in this report were derived using a separate allocation procedure.

The construction of the mine is separated between open pit mining (Phase 1) and underground mining (Phase 2). Costs incurred during the 19 years of operations include operating expenditures and sustaining capital expenditures. Finally, project expenditures are projected for the mine closure and rehabilitation phase. Note that the provincial guidelines ("Directive") for the EIA require the assessment of economic effects of the construction and operation phases. However, the expenditures of the mine closure are expected to add to the total economic effects of the project, and therefore the effects of the closure phase have also been produced.

# 2 Methodology

## 2.1 Québec Intersectoral Model (MISQ)

The Modèle intersectoriel du Québec is an input–output model developed and operated by the Institut de la statistique du Québec (ISQ) to project the economic impacts of projects. The MISQ simulates how a project's spending, treated as an exogenous final-demand shock or as purchases from productive sectors, propagates through Québec's economy to estimate the share retained in Québec and to quantify the resulting impacts on value added, labour, and net indirect taxes after subsidies, while identifying leakages such as imports and stock variations. Québec content refers to the share of the spending shock that is met by production in Québec. In this study, Québec content is interpreted through the model's estimated leakages (imports and other leakages) and the corresponding retention of value added, employment, and fiscal revenues within Québec.

For this study, ISQ provided output tables reporting results as direct, indirect, and induced effects. Under the MISQ's demand-propagation mechanism, each dollar of project spending becomes revenue for first-tier suppliers in Québec (direct effects). Those suppliers increase output and purchase intermediate inputs from their own suppliers (indirect effects), with the process iterating upstream until the initial demand shock is fully absorbed. At every iteration, MISQ decomposes the response into value added (wages and salaries, mixed income), net taxes on products, and intermediate inputs, net of identified leakages. Note that 95% of payroll is assumed to accrue to workers residing in Québec (proponent estimate). For goods and services, vendor origin is not specified ex-ante, therefore the Québec content share is estimated endogenously by the MISQ (with the remainder recorded as leakages such as imports and other leakages), consistent with ISQ's framework. Only the portion of costs explicitly identified as internal payroll are treated as primary labour income in MISQ; the labour embedded in contractor prices is captured indirectly through supplier sectors.

Employment impacts are expressed in person-years, where one person-year corresponds to one full-time job sustained for one year. For ease of interpretation, and to support comparison with typical employment figures, the results tables also present the average annual employment supported over the duration of each project phase. As for value added, it measures the new economic value created in Québec as a result of the Project. It is equal to total production minus the cost of goods and services purchased from other firms, and includes wages and salaries, business income, and net taxes on production. Value added is the standard indicator used to assess a project's contribution to GDP.

Although the MISQ reflects the production and input structure of the Québec economy for a given reference year, its results should be interpreted in light of the following limitations:

- The model uses a static (single-period) framework, being calibrated on Québec input–output relationships for a specific reference year. As a result, multi-year CAPEX/OPEX streams are evaluated against that single-year production structure, and are commonly interpreted as if occurring within one modelling period.
- MISQ results are proportional to the size of the shock: a $10 million shock yields ten times the effects of a $1 million shock in the same sector mix. This linear structure does not capture economies (or diseconomies) of scale, nor changes in production techniques as output expands.

- The input–output framework assumes that suppliers can meet the simulated demand without binding capacity constraints (no resource scarcity). It does not endogenously represent bottlenecks, substitution among inputs, or the additional investment that might be required over time to expand capacity.

## 2.2 Regional Impacts

The MISQ and Statistics Canada input-output multipliers are not available at the regional scale. Moreover, regional economic effects are particularly uncertain because they depend on the capacity of the workforce and entrepreneurs in a specific region, their willingness to contribute to the project, and their purchasing decisions. High-level estimates of regional effects for the Northern Québec region (Nord-du-Québec) were performed by using the following approach.

Some effects are known to occur in the region as per information provided by PMET. According to the latter, 15% of the labour force for the construction phase is expected to be regional. The proportion increases to 20% for the operation phase. It is therefore assumed that the same percentages (15% for construction, 20% for operation) of direct jobs and labour income remain in the Northern Québec region. In addition, the Feasibility Study indicates that the direct municipal taxes are expected to be paid by PMET in the municipality in which the project is set.

For other direct effects (other than the direct jobs and labour income discussed above), as well as for indirect effects, the following assumptions are made regarding regional share of the effects by sector:

- Certain services are usually procured from nearby, such as utilities, construction, food and personal care retail, waste management, health and social services, accommodation and food services, as well as local and Indigenous government. This means that the project itself, the project's labour force, and the project's suppliers are likely to procure these services from the region, and therefore the economic effects in those sectors are likely to occur regionally. For these sectors, the percentage of the labour that is expected to be regional (15% for construction, 20% for operation) is used as a proxy for the share of the suppliers that will be regional, in the absence of better data. This is applied to the following sectors.
- For the remaining sectors, it is assumed that additional industry output (and associated income, jobs, etc.) supported by the project in each sector is distributed among the administrative regions of Québec according to their share of the gross domestic product (GDP) of that sector in all of Québec . This is based on the rationale that in each sector, the region is at least as likely to contribute to the project through indirect effects as it is contributing to the output of the sector in Québec as a whole. This is likely an underestimate, because economic output supported by the project is more likely to occur in the region of the project than the average for that sector in Québec (as reflected by the GDP statistics). However, it is used here as a conservative assumption in the absence of better data.

Note that the MISQ provides a breakdown by sector for direct and indirect effects, but not for induced effects. Therefore, in the absence of better data for induced effects, it is assumed that for each indicator (jobs, labour income, other income), the regional share of induced effects is roughly equal to the regional share of indirect effects in total across all sectors for the same indicator. The rationales provided above for the assumed regional shares of indirect effects for each sector are also largely valid for induced effects, so assuming a roughly similar sectoral breakdown of indirect and induced effects, the overall regional share of indirect effects across all sectors is an acceptable proxy for the regional share of induced effects.

The table below summarizes the assumed regional shares of direct, indirect and induced effects per indicator.

| Indicator | Direct effects | Indirect effects | Induced effects |
|---|---|---|---|
| Jobs, labour income / mixed income | According to PMET, 15% of the labour force of the construction phase and 20% of the labour of the operations phase is expected to be regional. | Based on the region's % share of Québec GDP for each sector, except certain services* that are assumed to be supplied regionally at the same % share as labour (15% for construction and 20% for operations). | Results are not available by sector, so the same regional % share as indirect effects (total for all sectors) is assumed. |
| Other income (value added not from labour, such as profits, rental income, consumption of fixed capital) | Based on the region's % share of Québec GDP for each sector, except certain services* that are assumed to be supplied regionally at the same % share as labour (15% for construction and 20% for operations). | | Results are not available by sector, so the same regional % share as indirect effects (total for all sectors) is assumed. |
| Government revenue | Direct municipal taxes paid by PMET are expected to occur in the region.<br>Federal and provincial government income is not considered a regional effect. | Indirect/induced effects on municipal taxes are very small compared to direct municipal taxes. They are assumed to occur outside the region.<br>Federal and provincial government income is not considered a regional effect. | |

Notes: * This is applied to the following sectors: utilities, construction, food and personal care retail, waste management, health and social services, accommodation and food services, as well as local and Indigenous government.

# 3 Project Expenditures

The Project's costs are organized by lifecycle phase, starting with construction, followed by operations, and finally by closure and rehabilitation. Furthermore, the project is composed of open pit mining and underground mining, further disaggregating the project's costs. This section details the projected expenditures for each of those components, reported in constant 2025 dollars. Cost estimates were prepared by G Mining Services and are drawn from the NI 43-101 Feasibility Study for the Shaakichiuwaanaan Project (G Mining Services Inc., 2025). Totals may not sum due to rounding.

## 3.1 Construction Expenditures

Construction is separated by phase; The open pit operation is developed first, with Phase 1 providing an initial production capacity of ~400,000 tpa spodumene concentrate. The underground mine comes online second as Phase 2 and provides an additional production capacity of ~400,000 tpa spodumene concentrate, resulting in ~800,000 tpa nameplate capacity for the Project. The two construction phases have been analyzed separately as they each have their own capital expenditures, spending structure, and expected schedule. For the purposes of the economic impact modelling, only the portion of costs explicitly identified as internal payroll are treated as primary labour income in MISQ; the labour embedded in contractor prices is captured indirectly through supplier sectors.

### *3.1.1 Phase 1 – Open Pit*

Phase 1 construction is planned over 41 months from January 2027 to May 2030, with a total capital budget of $1,349.4 million (including $130.7 million contingency) based on the estimates from the NI 43-101 Feasibility Study for the Shaakichiuwaanaan Project prepared by G Mining Services Inc. (2025) and presented here in constant 2025 dollars. For reporting and MISQ mapping, contingency was prorated across cost categories. Table 1 summarizes the Phase 1 capital by cost category. Detailed cost lines underlie the sector mapping; only the aggregated cost categories are presented here for concision.

**Table 1 Phase 1 Capital Expenditures Summary, Open Pit Construction (M$)**

| Cost Categories | Capital Expenditures | Contingency | Total |
|---|---|---|---|
| Infrastructure | 124.9 | 13.4 | 138.3 |
| Power & Electrical | 173.8 | 18.6 | 192.5 |
| Water & Tailings Management | 128.2 | 13.7 | 141.9 |
| Surface Operations | 18.6 | 2.0 | 20.6 |
| Mining | 120.0 | 12.9 | 132.8 |
| Process Plant | 217.3 | 23.3 | 240.6 |
| Construction Indirect | 262.8 | 28.2 | 291.0 |
| General Services - Owner's Costs | 99.8 | 10.7 | 110.5 |
| Pre-Prod, Start-up, Commissioning & Contingency | 73.3 | 7.9 | 81.2 |
| **Total** | **1,218.7** | **130.7** | **1,349.4** |

Source: NI 43-101 Feasibility Study (G Mining Services, 2025).

Table 2 shows the corresponding allocation by MISQ productive sectors, distinguishing $1,220.8 million in purchases of goods and services from $128.6 million in salaries, consistent with the MISQ sectoral classification.

**Table 2 Phase 1 Capital Expenditures Breakdown by Productive Sector ($million)**

| Sectors | Goods and Services | Salaries[1] |
|---|---|---|
| Other engineering construction | 319.4 | 128.6 |
| Electric power engineering construction | 186.7 | - |
| Agricultural, construction and mining machinery manufacturing | 172.9 | - |
| Other activities of the construction industry | 157.9 | - |
| Architectural, engineering and related services | 149.0 | - |
| Non-residential building construction | 62.6 | - |
| Petroleum refineries | 57.8 | - |
| Office administrative services | 41.7 | - |
| Truck transportation | 34.5 | - |
| Transportation engineering construction | 29.2 | - |
| Communication engineering construction | 5.8 | - |
| Insurance carriers | 2.4 | - |
| Other professional, scientific and technical services | 0.9 | - |
| **Total (1,349.4 $million)** | **1,220.8** | **128.6** |

Source: WSP sectoral reclassification to MISQ productive sectors based on NI 43-101 Feasibility Study (G Mining Services, 2025).

### 3.1.2 Phase 2 – Underground

Construction of the underground portion of the mine is planned over 43 months, with capital expenses scheduled from September 2028 to March 2032. This timeline overlaps with the construction of Phase 1 and extends 22 months into the open pit operations period. Estimated capital expenditures for the construction of Phase 2 are $628.8 million. Consistent with Phase 1, contingency was allocated pro rata across cost categories. Table 3 summarizes Phase 2 capital by cost category.

[1] Payroll assumption: 95% of compensation accrues to Québec residents. For goods and services, the MISQ estimates Québec content endogenously; imports and other leakages represent the portion of demand met outside Québec.

**Table 3 Phase 2 Capital Expenditures Summary, Underground Construction ($million)**

| Cost Categories | Capital Expenditures | Contingency | Total |
|---|---|---|---|
| Infrastructure | 24.8 | 2.8 | 27.6 |
| Power & Electrical | 46.2 | 5.2 | 51.4 |
| Water & Tailings Management | 18.7 | 2.1 | 20.8 |
| Surface Operations | - | - | - |
| Mining | 135.5 | 15.3 | 150.8 |
| Process Plant | 187.1 | 21.1 | 208.2 |
| Construction Indirect | 123.9 | 14.0 | 137.9 |
| General Services - Owner's Costs | 18.1 | 2.0 | 20.2 |
| Pre-Prod, Start-up, Commissioning & Contingency | 10.8 | 1.2 | 12.0 |
| **Total** | **565.1** | **63.7** | **628.8** |

Source: NI 43-101 Feasibility Study (G Mining Services, 2025).

Table 4 maps these outlays to MISQ productive sectors, distinguishing $628.8 million in purchases of goods and services by sector. During Phase 2 construction (September 2028 to March 2032), salaries are allocated either to Phase 1 construction or to operations.

**Table 4 Phase 2 Capital Expenditures Breakdown by Productive Sector ($million)**

| Sectors | Goods and Services |
|---|---|
| Other engineering construction | 316.6 |
| Architectural, engineering and related services | 149.6 |
| Agricultural, construction and mining machinery manufacturing | 75.7 |
| Electric power engineering construction | 44.7 |
| Truck transportation | 18.8 |
| Non-residential building construction | 15.0 |
| Communication engineering construction | 6.7 |
| Insurance carriers | 1.3 |
| Transportation engineering construction | 0.3 |
| Other activities of the construction industry | 0.1 |
| **Total** | **628.8** |

Source: WSP sectoral reclassification to MISQ productive sectors based on NI 43-101 Feasibility Study (G Mining Services, 2025).

## 3.2 Operating Period Expenditures

### 3.2.1 Operating Expenditures

Operating expenditures (OPEX) cover mining, processing, general & administrative, and concentrate transport & logistics over the 19-year life of mine (LOM). Annual production varies materially, from 5.1Mt ore processed in the July 2035–June 2036 operating year to 1.5 Mt of ore processed in the final year. To reflect this variability in annual production levels and the resulting year-to-year fluctuations in operating costs and associated economic effects, Table 5 presents operating expenditures for (i) the full LOM and (ii) the 2035–2036 peak operating year, by aggregate category.

**Table 5 Operating Expenditures Summary, Total Period and Operation Peak ($million)**

| Cost Categories | LOM | |
|---|---|---|
| | (June 2030 - June 2049) | July 2035 - June 2036 |
| Open Pit | 1,390.4 | 106.5 |
| Underground | 2,852.2 | 162.1 |
| Processing | 1,208.3 | 69.5 |
| G&A | 1,334.7 | 75.5 |
| Concentrate Transport & Logistics | 2,878.8 | 175.2 |
| **Total** | **9,664.3** | **588.9** |

Source: NI 43-101 Feasibility Study (G Mining Services, 2025).

These expenditures include labour costs associated with ongoing operational activities. A portion of internal salaries incurred during 2030 is reflected in the operating-phase salary expenditures, as these activities are operational in nature despite occurring during the construction period. Table 6 presents the life of mine operating expenditures reclassified to MISQ productive sectors, separating purchases of goods and services from salaries in a manner consistent with MISQ's primary-factor treatment.

**Table 6 LOM Operating Expenditures Breakdown by Productive Sector ($million)**

| Sectors | Goods and Services | Salaries[2] |
|---|---|---|
| Other metal ore mining | - | 2,306.2 |
| Office administrative services | - | 478.0 |
| Non-ferrous metal (except aluminum) production and processing | - | 260.8 |
| Truck transportation | 1,065.2 | 315.7 |
| Support activities for mining | 1,121.8 | - |
| Rail transportation | 894.8 | - |
| Repair and maintenance (except automotive) | 453.2 | - |
| Water transportation | 433.9 | - |
| Electric power generation, transmission and distribution | 416.1 | - |
| Other transit and ground passenger transportation and scenic and sightseeing transportation | 381.1 | - |
| Food services and drinking places | 280.9 | - |
| Architectural, engineering and related services | 246.1 | - |
| Support activities for transportation | 235.3 | - |
| Water, sewage and other systems | 131.7 | - |
| Services to buildings and dwellings | 126.9 | - |
| Coating, engraving, cold and heat treating and allied activities | 112.8 | - |
| Resin, synthetic rubber, and artificial and synthetic fibres and filaments manufacturing | 88.8 | - |
| Rental and leasing services (except automotive equipment) | 57.6 | - |
| Miscellaneous ambulatory health care services | 43.0 | - |
| Employment services | 36.3 | - |
| Computer systems design and related services | 33.4 | - |
| Insurance carriers | 28.6 | - |
| Automotive equipment rental and leasing | 27.3 | - |
| Accounting, tax preparation, bookkeeping and payroll services | 18.9 | - |
| Investigation and security services | 15.1 | - |
| *Sub-Total (MISQ inputs)* | *6,248.8* | *3,360.7* |
| Local Taxes[3] ($54.7 million) | - | - |
| **Total** | **9,664.3** | |

Source: WSP sectoral reclassification to MISQ productive sectors based on NI 43-101 Feasibility Study (G Mining Services, 2025).

[2] Payroll assumption: 95% of compensation accrues to Québec residents. For goods and services, the MISQ estimates Québec content endogenously; imports and other leakages represent the portion of demand met outside Québec.

[3] Local taxes are included in Table 6 to reconcile total operating expenditures but are not treated as purchases of goods and services or as labour income in the MISQ framework.

### 3.2.2 Sustaining Capital Expenditures

Sustaining operations over the life of mine require periodic reinvestment in assets and infrastructure to maintain safe and reliable production at design capacity. The Project sustaining capital costs include all costs related to continuing and maintaining the operation through the life of mine. It includes stockpile expansion, purchasing mining equipment for both open pit and underground, development underground and their related and indirect costs and contingencies. It also covers the major repairs for the mine equipment. Unlike initial CAPEX, sustaining outlays preserve capacity rather than expand it. Sustaining capital totals $936.4 million, comprising $531.9 million for the open pit and $404.6 million for the underground. Table 7 summarizes the project's sustaining capital by phase and by major cost category.

**Table 7 Sustaining Capital Expenditures Summary ($million)**

| Cost Categories | Total |
|---|---|
| Infrastructure | 30.8 |
| Power & Electrical | 25.0 |
| Water & Tailings Management | 100.5 |
| Surface Operations | 11.9 |
| Mining | 550.5 |
| General Services / Owner's Costs | 31.6 |
| Pre-production, Start-up, Comm. | 186.1 |
| **Total** | **936.4** |

Source: NI 43-101 Feasibility Study (G Mining Services, 2025).

Sustaining capital is reclassified from cost categories to productive sectors. For the sustaining capital period, salaries are allocated to operations. Table 8 presents the sectoral allocation of sustaining capital expenditures based on the MISQ productive sector classification.

**Table 8 Sustaining Capital Expenditures Breakdown by Productive Sector ($million)**

| Sectors | Goods and Services |
|---|---|
| Other engineering construction | 369.8 |
| Agricultural, construction and mining machinery manufacturing | 323.9 |
| Repair construction | 186.1 |
| Electric power engineering construction | 25.0 |
| Truck transportation | 17.8 |
| Management, scientific and technical consulting services | 13.8 |
| **Total (936.4 $million)** | **936.4** |

Source: WSP sectoral reclassification to MISQ productive sectors based on NI 43-101 Feasibility Study (G Mining Services, 2025).

## 3.3 Closure and Rehabilitation Expenditures

Although the provincial EIA Directive focuses on the construction and operating periods, the closure and rehabilitation program also represents a meaningful, project-driven stream of spending covering activities such as site security, dismantling/demobilization, restoration of industrial areas and access roads, restoration of stockpiles and water-management systems, contaminated-soil management, and post-closure monitoring, with associated indirect costs. The total closure program is estimated at $248.3 million, comprising $211.0 million for open-pit areas and $37.3 million for underground works, as presented in Table 9.

**Table 9 Closure Expenditures Summary ($million)**

| Cost Categories | Closure Expenditures | Contingency | Total |
|---|---|---|---|
| Site Security | 1.1 | 0.2 | 1.3 |
| Dismantling, Demolition, and Demobilization of Surface Infrastructure | 10.7 | 1.9 | 12.6 |
| Restoration of the Industrial Area and Access Roads | 5.2 | 0.9 | 6.1 |
| Restoration of Stockpiles | 102.5 | 18.1 | 120.6 |
| Restoration of the Water Management System | 9.5 | 1.7 | 11.2 |
| Management of Contaminated Soils | 12.3 | 2.2 | 14.5 |
| Monitoring Costs | 15.0 | 2.7 | 17.7 |
| Indirect Costs | 54.7 | 9.7 | 64.4 |
| **Total** | **211.0** | **37.3** | **248.3** |

Source: NI 43-101 Feasibility Study (G Mining Services, 2025)

For the impact analysis, these expenditures are reclassified to productive sectors consistent with the input–output framework used in this study and split between purchases of goods and services and salaries, the latter treated as primary factors in the modeling. For the closure period, salaries are allocated to operations. Table 10 presents the allocation of closure and rehabilitation expenditures by MISQ productive sector.

**Table 10 Closure Expenditures Breakdown by Productive Sector ($million)**

| Cost Categories | Goods and Services |
|---|---|
| Other engineering construction | 131.8 |
| Architectural, engineering and related services | 64.4 |
| Office administrative services | 17.7 |
| Waste management and remediation services | 14.5 |
| Other activities of the construction industry | 12.6 |
| Transportation engineering construction | 6.1 |
| Investigation and security services | 1.3 |
| **Total (248.3 $million)** | **248.3** |

Source: WSP sectoral reclassification to MISQ productive sectors based on NI 43-101 Feasibility Study (G Mining Services, 2025).

# 4 Results

## 4.1 Provincial Results

Provincial results are organized by lifecycle phase: construction (Phase 1 and Phase 2 separately), operations (both life of mine and the July 2035–June 2036 operating year), sustaining capital, and the closure & rehabilitation phase. Unless otherwise noted, employment results are presented both as total person-years over the relevant period and as annual averages, which reflect the average number of jobs supported per year over the duration of the phase.

In the MISQ framework, direct effects capture the economic impacts generated by the Project itself and by Québec-based suppliers providing goods and services directly to the Project ; indirect effects reflect the upstream supply-chain activity generated as these first-tier suppliers purchase inputs from other Québec industries; and induced effects represent the additional economic activity generated by household spending supported by labour income earned through direct and indirect activity (see Section 2.1). Provincial results reflect the portion of project expenditures retained within Québec's economy as estimated by the MISQ; spending not captured in Québec results corresponds to imports and other leakages. Totals may not sum due to rounding.

### *4.1.1 Construction*

Phase 1 construction generates Québec-wide impacts through a concentrated period of capital spending and the associated supply-chain response. Over the 41-month construction period, Phase 1 is estimated to support 7,545 person-years of employment, equivalent to an average of 2,208 jobs per year over the phase (Table 11). The corresponding economic activity is estimated at $989.2 million in value added, including $571.9 million in wages and salaries, over the construction period.

**Table 11 Provincial Economic Impacts of the Construction of Phase 1**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 41 months) |
|---|---|---|---|---|---|
| | | | *person-years* | | |
| **1- Jobs** | **3,418** | **2,576** | **1,550** | **7,545** | **2,208** |
| Employees | 3,358 | 2,358 | 1,400 | **7,117** | **2,083** |
| Other workers | 60 | 218 | 150 | **428** | **125** |
| | | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **473.9** | **320.1** | **195.2** | **989.2** | **289.5** |
| Wages and salaries before tax | 313.3 | 182.6 | 76.0 | **571.9** | **167.4** |
| Gross mixed income | 13.8 | 16.6 | 43.8 | **74.1** | **21.7** |
| Other gross income before tax | 146.8 | 120.9 | 75.4 | **343.2** | **100.4** |
| **3- Taxes on products** | 11.2 | 4.4 | 39.9 | **55.5** | **16.2** |
| **4- Subsidies on products** | – | -1.6 | -3.8 | **-5.5** | **-1.6** |
| **5- Imports** | 134.0 | 401.8 | 126.8 | **662.7** | **193.9** |
| **6- Withdrawals from inventories and other leakages** | – | 2.4 | 3.3 | **5.8** | **1.7** |

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 41 months) |
|---|---|---|---|---|---|
| **7- Québec government revenues** | **39.5** | **20.4** | **32.1** | **92.0** | **26.9** |
| Taxes on wages and salaries | 33.3 | 17.3 | 5.3 | **55.9** | **16.4** |
| Sales taxes (QST) | 0.0 | 0.5 | 16.9 | **17.3** | **5.1** |
| Specific taxes | 6.2 | 2.6 | 9.9 | **18.7** | **5.5** |
| **8- Federal government revenues** | **27.6** | **13.9** | **16.6** | **58.0** | **17.0** |
| Taxes on wages and salaries | 24.6 | 12.5 | 3.5 | **40.6** | **11.9** |
| Sales taxes (GST) | 0.0 | 0.4 | 8.8 | **9.2** | **2.7** |
| Excise taxes and duties | 2.6 | 0.8 | 3.0 | **6.4** | **1.9** |
| Customs duties | 0.3 | 0.1 | 1.3 | **1.8** | **0.5** |
| **9- Local government revenues:** | | | | | |
| Municipal taxes | 2.0 | – | 2.2 | **4.2** | **1.2** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 59.9 | 30.6 | 13.3 | **103.8** | **30.4** |
| Federal (Employment Insurance) | 6.9 | 4.5 | 2.1 | **13.6** | **4.0** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

Table 12 presents the Québec - wide impacts associated with Phase 2 (underground) construction, driven by $628.8 million in capital outlays over September 2028–March 2032, an interval that overlaps the open-pit operating period by roughly 22 months. Over the 43-month construction schedule, Phase 2 is estimated to support 3,629 person-years of employment, equivalent to an average of 1,013 jobs per year. Phase 2 construction is estimated to generate $483.6 million in value added, including $285.3 million in wages and salaries, over the construction period.

**Table 12 Provincial Economic Impacts of the Construction of Phase 2**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 43 months) |
|---|---|---|---|---|---|
| | | | *person-years* | | |
| **1- Jobs** | **1,411** | **1,444** | **773** | **3,629** | **1,013** |
| Employees | 1,403 | 1,334 | 699 | **3,436** | **959** |
| Other workers | 7 | 110 | 75 | **193** | **54** |
| | | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **202.0** | **184.3** | **97.4** | **483.6** | **135.0** |
| Wages and salaries before tax | 137.7 | 109.6 | 37.9 | **285.3** | **79.6** |
| Gross mixed income | 1.9 | 9.4 | 21.8 | **33.1** | **9.2** |
| Other gross income before tax | 62.3 | 65.3 | 37.6 | **165.2** | **46.1** |
| **3- Taxes on products** | 1.8 | 2.2 | 19.9 | **23.9** | **6.7** |
| **4- Subsidies on products** | – | -1.0 | -1.9 | **-2.9** | **-0.8** |
| **5- Imports** | 58.6 | 178.6 | 63.3 | **300.5** | **83.9** |

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 43 months) |
|---|---|---|---|---|---|
| **6- Withdrawals from inventories and other leakages** | – | 1.0 | 1.7 | **2.7** | **0.7** |
| **7- Québec government revenues** | **16.5** | **12.4** | **16.0** | **44.9** | **12.5** |
| Taxes on wages and salaries | 15.5 | 10.8 | 2.6 | **29.0** | **8.1** |
| Sales taxes (QST) | 0.0 | 0.2 | 8.4 | **8.7** | **2.4** |
| Specific taxes | 1.0 | 1.3 | 5.0 | **7.2** | **2.0** |
| **8- Federal government revenues** | **12.3** | **8.6** | **8.3** | **29.2** | **8.2** |
| Taxes on wages and salaries | 12.0 | 7.9 | 1.7 | **21.7** | **6.0** |
| Sales taxes (GST) | 0.0 | 0.2 | 4.4 | **4.6** | **1.3** |
| Excise taxes and duties | 0.2 | 0.4 | 1.5 | **2.1** | **0.6** |
| Customs duties | 0.1 | 0.1 | 0.7 | **0.8** | **0.2** |
| **9- Local government revenues:** | | | | | |
| Municipal taxes | 0.5 | – | 0.5 | **1.0** | **0.3** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 25.5 | 17.8 | 6.6 | **50.0** | **13.9** |
| Federal (Employment Insurance) | 2.9 | 2.6 | 1.1 | **6.6** | **1.8** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

### 4.1.2 Operations Phase

Table 13 presents the provincial economic effects attributable to the Project's operations over the full 19-year life of mine period, driven by total operating expenditures of $9,664.3 million covering open-pit and underground mining, processing, general and administrative activities, and concentrate transport and logistics. In aggregate, the model estimates that operations support 61,711 person-years of employment in Québec, equivalent to an average of 3,248 jobs per year, and generate $8,227.2 million in value added at basic price, corresponding to annual averages of $433.0 million in value added and $258.9 million in wages and salaries over the operating period. This includes $4,918.5 million in wages and salaries (before tax), with the balance of value added comprised of gross mixed income and other gross income. The corresponding totals for net taxes on products, public-sector revenues, parafiscal charges, and leakages are reported in Table 13.

**Table 13 Provincial Economic Impacts of the Operations – Total Period**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 19 years) |
|---|---|---|---|---|---|
| | | | *person-years* | | |
| **1- Jobs** | **41,197** | **7,180** | **13,334** | **61,711** | **3,248** |
| Employees | 39,524 | 6,507 | 12,044 | **58,075** | **3,057** |
| Other workers | 1,673 | 673 | 1,290 | **3,636** | **191** |
| | | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **5,663.4** | **885.1** | **1,678.7** | **8,227.2** | **433.0** |
| Wages and salaries before tax | 3,822.6 | 442.6 | 653.3 | **4,918.5** | **258.9** |
| Gross mixed income | 100.2 | 61.6 | 376.6 | **538.5** | **28.3** |
| Other gross income before tax | 1,740.5 | 380.9 | 648.7 | **2,770.2** | **145.8** |
| **3- Taxes on products** | 91.9 | 17.1 | 343.3 | **452.2** | **23.8** |
| **4- Subsidies on products** | -50.9 | -7.9 | -32.9 | **-91.7** | **-4.8** |
| **5- Imports** | 1,629.5 | 973.6 | 1,090.9 | **3,694.0** | **194.4** |
| **6- Withdrawals from inventories and other leakages** | 1.4 | 5.5 | 28.5 | **35.5** | **1.9** |
| **7- Québec government revenues** | **492.9** | **49.8** | **276.2** | **818.9** | **43.1** |
| Taxes on wages and salaries | 423.5 | 37.9 | 45.5 | **506.9** | **26.7** |
| Sales taxes (QST) | 11.8 | 2.9 | 145.1 | **159.8** | **8.4** |
| Specific taxes | 57.6 | 9.0 | 85.6 | **152.2** | **8.0** |
| **8- Federal government revenues** | **344.0** | **31.6** | **142.7** | **518.3** | **27.3** |
| Taxes on wages and salaries | 321.6 | 26.4 | 30.1 | **378.1** | **19.9** |
| Sales taxes (GST) | 6.4 | 2.2 | 75.5 | **84.2** | **4.4** |
| Excise taxes and duties | 15.0 | 2.5 | 25.8 | **43.3** | **2.3** |
| Customs duties | 1.0 | 0.4 | 11.3 | **12.8** | **0.7** |
| **9- Local government revenues:** | | | | | |
| Municipal taxes | – | – | – | **–** | **–** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 576.5 | 76.9 | 114.0 | **767.4** | **40.4** |
| Federal (Employment Insurance) | 73.3 | 11.9 | 18.3 | **103.5** | **5.4** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

### 4.1.2.1 Direct Fiscal Revenues from the Project

In addition to the fiscal effects estimated using the MISQ framework, which capture only the taxes associated with project payroll and operating expenditures, the Feasibility Study also provides estimates of direct taxes paid by PMET during the operating period, including corporate income taxes, mining taxes, applicable tax credits, and GHG-related taxes. Over the operating period, these direct fiscal effects are estimated at $3,357.4 million in total. Of this amount, the provincial government is expected to receive $2,164.5 million in corporate income and mining taxes, while the federal government is expected to receive $1,192.9 million in corporate income and GHG-related taxes. Local authorities are expected to receive $54.7 million in municipal and school taxes. All amounts are presented on a gross basis, prior to the application of any tax credits, as eligibility for such credits (including the

Clean Technology Manufacturing Investment Tax Credit and the Tax Credit Relating to Resources) remains uncertain at the current stage of the Project.

The July 2035–June 2036 operating year provides a useful point-in-time reference for the scale of annual effects during high-throughput production. For that year, the model estimates 3,658 person-years of employment and $485.8 million in value added, including $290.3 million in wages and salaries (Table 14).

**Table 14 Provincial Economic Impacts of the Operations – 2035-2036**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total |
|---|---|---|---|---|
| | | *person-years* | | |
| **1- Jobs** | **2,428** | **443** | **787** | **3,658** |
| Employees | 2,331 | 403 | 711 | **3,444** |
| Other workers | 97 | 41 | 76 | **214** |
| | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **331.9** | **54.9** | **99.1** | **485.8** |
| Wages and salaries before tax | 224.1 | 27.7 | 38.6 | **290.3** |
| Gross mixed income | 6.1 | 3.7 | 22.2 | **32.1** |
| Other gross income before tax | 101.7 | 23.5 | 38.3 | **163.4** |
| **3- Taxes on products** | 5.5 | 1.0 | 20.3 | **26.8** |
| **4- Subsidies on products** | -3.0 | -0.5 | -1.9 | **-5.5** |
| **5- Imports** | 111.8 | 60.9 | 64.4 | **237.1** |
| **6- Withdrawals from inventories and other leakages** | 0.1 | 0.3 | 1.7 | **2.1** |
| **7- Québec government revenues** | **28.9** | **3.1** | **16.3** | **48.3** |
| Taxes on wages and salaries | 24.7 | 2.4 | 2.7 | **29.8** |
| Sales taxes (QST) | 0.6 | 0.2 | 8.6 | **9.4** |
| Specific taxes | 3.5 | 0.6 | 5.1 | **9.1** |
| **8- Federal government revenues** | **20.1** | **2.0** | **8.4** | **30.5** |
| Taxes on wages and salaries | 18.8 | 1.7 | 1.8 | **22.2** |
| Sales taxes (GST) | 0.4 | 0.1 | 4.5 | **5.0** |
| Excise taxes and duties | 0.9 | 0.2 | 1.5 | **2.6** |
| Customs duties | 0.1 | 0.0 | 0.7 | **0.8** |
| **9- Local government revenues:** | | | | |
| Municipal taxes | – | – | – | **–** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 34.2 | 4.8 | 6.7 | **45.7** |
| Federal (Employment Insurance) | 4.3 | 0.7 | 1.1 | **6.2** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

For the Shaakichiuwaanaan Project, sustaining capital expenditures total $936.4 million over the operating period. The MISQ results for this sustaining capital program are summarized in Table 15, which shows that these reinvestments support 4,571 person-years of employment in Québec, equivalent to an average of 241 jobs per year over the operating period. Sustaining capital is estimated to generate $588.0 million in value added, including $330.4 million in wages and salaries (before tax), with the associated fiscal effects and leakages reported in the table.

**Table 15 Provincial Economic Impacts of the Sustaining Capital Expenditures**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 19 years) |
|---|---|---|---|---|---|
| | | | *person-years* | | |
| **1- Jobs** | **2,372** | **1,303** | **896** | **4,571** | **241** |
| Employees | 2,321 | 1,181 | 809 | **4,310** | **227** |
| Other workers | 51 | 122 | 87 | **260** | **14** |
| | | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **322.5** | **152.7** | **112.8** | **588.0** | **30.9** |
| Wages and salaries before tax | 201.7 | 84.8 | 43.9 | **330.4** | **17.4** |
| Gross mixed income | 11.8 | 7.8 | 25.3 | **44.8** | **2.4** |
| Other gross income before tax | 109.0 | 60.1 | 43.6 | **212.8** | **11.2** |
| **3- Taxes on products** | 1.9 | 2.4 | 23.1 | **27.4** | **1.4** |
| **4- Subsidies on products** | – | -0.7 | -2.2 | **-2.9** | **-0.2** |
| **5- Imports** | 251.0 | 204.2 | 73.3 | **528.4** | **27.8** |
| **6- Withdrawals from inventories and other leakages** | – | 1.7 | 1.9 | **3.6** | **0.2** |
| **7- Québec government revenues** | **21.8** | **9.3** | **18.6** | **49.7** | **2.6** |
| Taxes on wages and salaries | 20.5 | 7.6 | 3.1 | **31.2** | **1.6** |
| Sales taxes (QST) | 0.0 | 0.2 | 9.7 | **10.0** | **0.5** |
| Specific taxes | 1.3 | 1.4 | 5.7 | **8.5** | **0.4** |
| **8- Federal government revenues** | **15.8** | **6.1** | **9.6** | **31.5** | **1.7** |
| Taxes on wages and salaries | 15.2 | 5.4 | 2.0 | **22.6** | **1.2** |
| Sales taxes (GST) | 0.0 | 0.2 | 5.1 | **5.3** | **0.3** |
| Excise taxes and duties | 0.3 | 0.4 | 1.7 | **2.5** | **0.1** |
| Customs duties | 0.2 | 0.1 | 0.8 | **1.1** | **0.1** |
| **9- Local government revenues:** | | | | | |
| Municipal taxes | – | – | – | **–** | **–** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 40.1 | 14.8 | 7.7 | **62.6** | **3.3** |
| Federal (Employment Insurance) | 4.8 | 2.2 | 1.2 | **8.2** | **0.4** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

### 4.1.3 Closure

The closure and rehabilitation of the mine is estimated at $248.3 million in total project expenditures, starting at the end of the extraction operations. The modelling indicates that the closure phase supports 1,537 person-years of employment, equivalent to an average of 615 jobs per year over the 30-month closure period (Table 16). Closure and rehabilitation activities are estimated to generate $200.6 million in value added, including $115.2 million in wages and salaries, corresponding to annual averages of $80.3 million in value added and $46.1 million in wages and salaries over the closure period.

From a fiscal perspective, the closure expenditures also translate into public-sector revenues primarily through taxes linked to labour income and related consumption. In aggregate, the results in Table 16 indicate $17.5 million in Québec government revenues and $11.2 million in federal government revenues. As with the other phases, a portion of spending is estimated to leak outside Québec through imports and other leakages, reflecting supply-chain capacity and sourcing patterns captured by the model.

**Table 16 Provincial Economic Impacts of the Closure Phase**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 30 months) |
|---|---|---|---|---|---|
| | | | *person-years* | | |
| **1- Jobs** | **548** | **677** | **312** | **1,537** | **615** |
| Employees | 542 | 627 | 282 | **1,452** | **581** |
| Other workers | 5 | 50 | 30 | **85** | **34** |
| | | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **74.5** | **86.9** | **39.3** | **200.6** | **80.3** |
| Wages and salaries before tax | 49.4 | 50.5 | 15.3 | **115.2** | **46.1** |
| Gross mixed income | 1.2 | 4.3 | 8.8 | **14.3** | **5.7** |
| Other gross income before tax | 23.8 | 32.1 | 15.2 | **71.1** | **28.4** |
| **3- Taxes on products** | 0.5 | 0.9 | 8.0 | **9.4** | **3.8** |
| **4- Subsidies on products** | – | -0.5 | -0.8 | **-1.3** | **-0.5** |
| **5- Imports** | – | 85.5 | 25.6 | **111.1** | **44.4** |
| **6- Withdrawals from inventories and other leakages** | – | 0.4 | 0.7 | **1.1** | **0.4** |
| **7- Québec government revenues** | **5.5** | **5.5** | **6.5** | **17.5** | **7.0** |
| Taxes on wages and salaries | 5.2 | 4.9 | 1.1 | **11.2** | **4.5** |
| Sales taxes (QST) | 0.0 | 0.2 | 3.4 | **3.6** | **1.4** |
| Specific taxes | 0.4 | 0.4 | 2.0 | **2.8** | **1.1** |
| **8- Federal government revenues** | **4.0** | **3.9** | **3.3** | **11.2** | **4.5** |
| Taxes on wages and salaries | 3.9 | 3.6 | 0.7 | **8.2** | **3.3** |
| Sales taxes (GST) | 0.0 | 0.1 | 1.8 | **1.9** | **0.7** |
| Excise taxes and duties | 0.1 | 0.1 | 0.6 | **0.8** | **0.3** |
| Customs duties | 0.0 | 0.0 | 0.3 | **0.3** | **0.1** |
| **9- Local government revenues:** | | | | | |
| Municipal taxes | – | – | – | **–** | **–** |

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 30 months) |
|---|---|---|---|---|---|
| **10- Parafiscal charges (employer and employee contributions)** | | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 9.8 | 8.3 | 2.7 | **20.8** | **8.3** |
| Federal (Employment Insurance) | 1.1 | 1.2 | 0.4 | **2.8** | **1.1** |

Source: Institut de la statistique du Québec (ISQ) (2026), Simulation d'impact économique pour le Québec (study for WSP).

## 4.2 Regional Results

Regional impacts presented below are derived by allocating provincial MISQ results using the assumptions and sector-specific allocation method described in Section 2.2. They should be interpreted as indicative estimates of the share of Québec-wide impacts that could occur in the Nord-du-Québec region rather than as outputs from a stand-alone regional input–output model. The regional tables below focus on the portion of employment and value-added effects that are expected to accrue locally under the stated assumptions and should be interpreted alongside the provincial results.

As part of the modelling assumptions, PMET estimates that approximately 15 % of the workforce required during the construction phase and 20 % during the operating phase would be sourced from the region. These proportions apply to direct employment associated with the Project itself. The regional results generally show lower overall regional shares when expressed as a proportion of total (direct, indirect, and induced) impacts, reflecting the inclusion of indirect and induced effects, which are more geographically dispersed across Québec supply chains and household spending than the Project's direct effects.

### *4.2.1 Construction*

Construction-phase regional impacts are estimated separately for Phase 1 (open pit) and Phase 2 (underground) to reflect their distinct schedules and spending profiles. For Phase 1, the regional allocation suggests 620 person-years of employment and $58.2 million in value added in Nord-du-Québec, or 181 person-years and $17 million on an annual basis (Table 17). This corresponds to 8% of the Québec-wide construction employment impact and about 6% of value added for that phase.

**Table 17 Regional Economic Impacts of the Construction of Phase 1**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 41 months) | Regional Impacts Proportion of Total |
|---|---|---|---|---|---|---|
| *person-years* | | | | | | |
| **1- Jobs** | **513** | **67** | **40** | **620** | **181** | **8%** |
| Employees | 504 | 65 | 39 | **607** | **178** | 9% |
| Other workers | 9 | 2 | 1 | **12** | **4** | 3% |
| *$million (in 2025 prices)* | | | | | | |
| **2- Value added at basic prices** | **49.1** | **5.8** | **3.4** | **58.2** | **17.0** | **6%** |
| Wages and salaries before tax | 47.0 | 5.3 | 2.2 | **54.6** | **16.0** | 10% |
| Gross mixed income | 2.1 | 0.4 | 1.1 | **3.6** | **1.1** | 5% |
| Other gross income before tax | 22.7 | 3.3 | 2.2 | **28.2** | **8.2** | 8% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

For Phase 2, the corresponding regional effects are estimated at 267 person-years of employment, corresponding to approximately 75 jobs on average per year over the duration of this phase, and $25.6 million in value added, equivalent to about 7% of Phase 2 employment impacts and about 5% of value added at the Québec scale (Table 18). The lower overall regional shares (relative to direct labour assumptions) reflect the fact that indirect and induced effects are more geographically dispersed across Québec's supplier base under the allocation method described in Section 2.2.

**Table 18 Regional Economic Impacts of the Construction of Phase 2**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 43 months) | Regional Impacts Proportion of Total |
|---|---|---|---|---|---|---|
| *person-years* | | | | | | |
| **1- Jobs** | **212** | **36** | **19** | **267** | **75** | **7%** |
| Employees | 211 | 35 | 19 | **264** | **74** | 8% |
| Other workers | 1 | 1 | 1 | **3** | **1** | 1% |
| *$million (in 2025 prices)* | | | | | | |
| **2- Value added at basic prices** | **20.9** | **3.1** | **1.5** | **25.6** | **7.2** | **5%** |
| Wages and salaries before tax | 20.7 | 2.9 | 1.0 | **24.6** | **6.9** | 9% |
| Gross mixed income | 0.3 | 0.2 | 0.5 | **1.0** | **0.3** | 3% |
| Other gross income before tax | 9.6 | 1.6 | 0.9 | **12.1** | **3.4** | 7% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

### 4.2.2 Operation

Regional impacts during operations reflect both the sustained workforce requirements over the life of mine and the degree to which upstream supply-chain activity is expected to be anchored in Nord-du-Québec. Over the full operating period, the regional allocation indicates 8,951 person-years of employment, corresponding to an average of approximately 471 jobs per year over the operating life of the Project, and $835.5 million in value added in the region, equivalent to about 15% of Québec-wide operating employment impacts and about 10% of value added (Table 19). In addition, the Feasibility Study estimates that PMET will contribute $54.7 million in municipal and school taxes over the life of mine, which would accrue locally and therefore adds to the Project's direct fiscal impacts in the region.

**Table 19 Regional Economic Impacts of the Operations – Total Period**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 19 years) | Regional Impacts Proportion of Total |
|---|---|---|---|---|---|---|
| *person-years* | | | | | | |
| **1- Jobs** | **8,239** | **249** | **462** | **8,951** | **471** | **15%** |
| Employees | 7,905 | 234 | 433 | **8,571** | **451** | 15% |
| Other workers | 335 | 15 | 29 | **379** | **20** | 10% |
| *$million (in 2025 prices)* | | | | | | |
| **2- Value added at basic prices** | **784.6** | **16.3** | **34.7** | **835.5** | **44.0** | **10%** |
| Wages and salaries before tax | 764.5 | 14.0 | 20.6 | **799.1** | **42.1** | 16% |
| Gross mixed income | 20.0 | 2.3 | 14.0 | **36.4** | **1.9** | 7% |
| Other gross income before tax | 231.5 | 14.5 | 23.7 | **269.7** | **14.2** | 10% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

The peak year of extraction (2035–2036) follows a similar pattern at an annual scale, with an estimated 527 person-years of employment and $49.0 million in value added occurring in the region, corresponding to approximately 14% of employment impacts and 10% of value added for that year (Table 20).

**Table 20 Regional Economic Impacts of the Operations – 2035-2036**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Regional Impacts Proportion |
|---|---|---|---|---|---|
| *person-years* | | | | | |
| **1- Jobs** | **486** | **15** | **26** | **527** | **14%** |
| Employees | 466 | 14 | **25** | **505** | 15% |
| Other workers | 19 | 1 | **2** | **22** | 10% |
| *$million (in 2025 prices)* | | | | | |
| **2- Value added at basic prices** | **46.0** | **1.0** | **2.0** | **49.0** | **10%** |
| Wages and salaries before tax | 44.8 | 0.8 | **1.2** | **46.8** | 16% |
| Gross mixed income | 1.2 | 0.1 | **0.8** | **2.2** | 7% |
| Other gross income before tax | 13.7 | 0.9 | **1.3** | **15.9** | 10% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

In addition, sustaining capital expenditures required to maintain equipment and infrastructure throughout operations are estimated to support 427 person-years of employment in Nord-du-Québec over the operating period, corresponding to an average of approximately 23 jobs per year (Table 21). These activities are also estimated to generate and $38.4 million in value added at the regional level. This represents 9% of the corresponding Québec-wide employment impacts and 7% of value added.

**Table 21 Regional Economic Impacts of the Sustaining Capital Expenditures**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 19 years) | Regional Impacts Proportion of Total |
|---|---|---|---|---|---|---|
| *person-years* | | | | | | |
| **1- Jobs** | **356** | **42** | **29** | **427** | **23** | **9%** |
| Employees | 348 | 41 | 28 | **417** | **22** | 10% |
| Other workers | 8 | 1 | 1 | **10** | **1** | 4% |
| *$million (in 2025 prices)* | | | | | | |
| **2- Value added at basic prices** | **32.0** | **3.7** | **2.7** | **38.4** | **2.0** | **7%** |
| Wages and salaries before tax | 30.3 | 3.4 | 1.8 | **35.5** | **1.9** | 11% |
| Gross mixed income | 1.8 | 0.3 | 0.9 | **2.9** | **0.2** | 6% |
| Other gross income before tax | 14.8 | 2.1 | 1.6 | **18.6** | **1.0** | 9% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

### 4.2.3 Closure

Closure and rehabilitation activities are expected to generate more modest regional effects than the operating period, reflecting both the shorter duration and the nature of the work program. The regional allocation indicates 115 person-years of employment, which corresponds to an average of approximately 45 jobs per year, and $10.1 million in value added in Nord-du-Québec, corresponding to about 7% of Québec-wide closure employment impacts and about 5% of value added (Table 22).

**Table 22 Regional Economic Impacts of the Closure Phase**

| Variables | Direct Effects | Indirect Effects | Induced Effects | Total | Total (annual average, over 30 months) | Regional Impacts Proportion of Total |
|---|---|---|---|---|---|---|
| *person-years* | | | | | | |
| **1- Jobs** | **82** | **22** | **10** | **115** | **46** | **7%** |
| Employees | 81 | 22 | 10 | **113** | **45** | 8% |
| Other workers | 1 | 1 | 0 | **2** | **1** | 2% |
| *$million (in 2025 prices)* | | | | | | |
| **2- Value added at basic prices** | **7.6** | **1.8** | **0.7** | **10.1** | **4.0** | **5%** |
| Wages and salaries before tax | 7.4 | 1.7 | 0.5 | **9.6** | **3.8** | 8% |
| Gross mixed income | 0.2 | 0.1 | 0.2 | **0.5** | **0.2** | 4% |
| Other gross income before tax | 3.7 | 1.3 | 0.7 | **5.7** | **2.3** | 8% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

## 4.3 Summary Results

This section consolidates the results across the Project lifecycle, grouping construction as the combined effects of the open-pit (Phase 1) and underground (Phase 2) construction periods, operations as the combined effects of life of mine operating expenditures and sustaining capital, and closure as described in Section 4.1.3. At the Québec scale, the combined effects across all phases are estimated at 78,992 person-years of employment and $10,488.6 million in value added, of which $6,221.3 million in wages and salaries (before tax), with the remainder comprised of mixed income and other gross income. Table 23 also reports the associated Québec and federal government revenues and parafiscal contributions captured within the MISQ results, as well as the leakages identified by the model. In addition, the Project is expected to generate direct fiscal revenues during the operating period such as corporate income taxes, mining taxes, and other statutory payments, which are estimated separately based on the Feasibility Study and are not reflected in the MISQ results (see Section 4.1.2.1).

**Table 23 Provincial Economic Impacts – Summary**

| Variables | Construction Phases | Operations Phase | Closure | Total |
|---|---|---|---|---|
| | | *person-years* | | |
| **1- Jobs** | **11,173** | **66,282** | **1,537** | **78,992** |
| Employees | 10,553 | 62,385 | 1,452 | **74,390** |
| Other workers | 620 | 3,896 | 85 | **4,602** |
| | | *$million (in 2025 prices)* | | |
| **2- Value added at basic prices** | **1,472.8** | **8,815.2** | **200.6** | **10,488.6** |
| Wages and salaries before tax | 857.2 | 5,248.9 | 115.2 | **6,221.3** |
| Gross mixed income | 107.2 | 583.3 | 14.3 | **704.9** |
| Other gross income before tax | 508.4 | 2,983.0 | 71.1 | **3,562.5** |
| **3- Taxes on products** | 79.4 | 479.6 | 9.4 | **568.4** |
| **4- Subsidies on products** | -8.4 | -94.6 | -1.3 | **-104.3** |
| **5- Imports** | 963.2 | 4,222.4 | 111.1 | **5,296.7** |
| **6- Withdrawals from inventories and other leakages** | 8.4 | 39.0 | 1.1 | **48.5** |
| **7- Québec government revenues** | **136.9** | **868.5** | **17.5** | **1,023.0** |
| Taxes on wages and salaries | 84.9 | 538.0 | 11.2 | **634.1** |
| Sales taxes (QST) | 26.0 | 169.8 | 3.6 | **199.4** |
| Specific taxes | 26.0 | 160.7 | 2.8 | **189.5** |
| **8- Federal government revenues** | **87.3** | **549.8** | **11.2** | **648.3** |
| Taxes on wages and salaries | 62.3 | 400.7 | 8.2 | **471.2** |
| Sales taxes (GST) | 13.8 | 89.5 | 1.9 | **105.2** |
| Excise taxes and duties | 8.5 | 45.8 | 0.8 | **55.1** |
| Customs duties | 2.6 | 13.9 | 0.3 | **16.8** |
| **9- Local government revenues:** | | | | |
| Municipal taxes | 5.2 | – | – | **5.2** |
| **10- Parafiscal charges (employer and employee contributions)** | | | | |
| Québec (QPP, HSF, CNESST, QPIP) | 153.7 | 830.0 | 20.8 | **1,004.5** |
| Federal (Employment Insurance) | 20.2 | 111.7 | 2.8 | **134.7** |

Source: ISQ (2026) provincial results, aggregated by WSP.

Regional totals are shown separately to indicate the portion of these effects that could occur in Nord-du-Québec under the allocation assumptions set out in Section 2.2. Across the full Project, regional impacts are estimated at 10,379 person-years of employment and $1,302.1 million in value added in Nord-du-Québec, representing approximately 13% of total Québec employment impacts and 12% of total value added (Table 24). Wages and salaries accruing in the region are estimated at $923.4 million, or about 15% of the Québec total. These values are indicative and should be interpreted as approximate shares of the provincial results rather than as outputs from a stand-alone regional input-output model.

**Table 24 Regional Economic Impacts – Summary**

| Variables | Construction Phases | Operations Phase | Closure | Total | Regional Impacts Proportion |
|---|---|---|---|---|---|
| *person-years* | | | | | |
| **1- Jobs** | **887** | **9,377** | **115** | **10,379** | **13%** |
| Employees | 872 | 8,988 | 113 | **9,973** | 13% |
| Other workers | 15 | 389 | 2 | **406** | 9% |
| *$million (in 2025 prices)* | | | | | |
| **2- Value added at basic prices** | **124.1** | **1,162.2** | **57.0** | **1,343.3** | **12%** |
| Wages and salaries before tax | 79.1 | 834.6 | 35.5 | **949.2** | 15% |
| Gross mixed income | 4.7 | 39.3 | 2.9 | **46.9** | 6% |
| Other gross income before tax | 40.3 | 288.3 | 18.6 | **347.2** | 9% |

Source: WSP, derived from ISQ (2026) provincial results using the regional allocation method described in Section 2.2.

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