



Revision 2017-1
Tailings Management Plan
Minto Mine, YT

Prepared by:
Minto Explorations Ltd.
Minto Mine
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Minto Mine Tailings Management Plan

First Issue: January 2007

REVISION INFORMATION

Rev. Number	Issue Date	Description of Revisions Made
-	January 2011	Updated for Phase IV mine plan.
-	June 2013	Updated for Phase V/VI mine plan.
1	June 2014	Revised storage capacities.
Supplement	February 2015	Updated tailings/water balance and mine schedule.
2017-1	February 2017	Main Pit tailings dam removed from the mine plan. In-situ tailings density revised based on measured density to date.

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1 Introduction

The objectives of the Tailings Management Plan (TMP) are to summarize the quantities of mine tailings that require management under the remaining Phase IV and Phase V/VI mine plans, and to outline Minto Explorations Ltd.'s (Minto) plan for managing the tailings.

Remaining mining included in the Phase IV and Phase V/VI mine plans consists of open pit mining from three separate pits as well as underground mining of multiple separate ore bodies. Ore released will be processed using the same milling infrastructure used in previous phases of mining, at a processing rate not exceeding 4200 tonnes per day, based on a 12 month average.

Where relevant, supporting engineering designs and plans for management of water, waste rock, and overburden are referred to in the document.

2 Mine Plan and Facilities Overview

2.1 Mine Plan Overview

Minto Mine has been operating since 2007. Mining is currently taking place as part of the Phase IV and Phase V/VI mining plans, approved under QML-0001. Components of the mining phases, including their current status, are listed below.

- Phase IV
 - Area 2 Stage 1 and 2 open pit – completed in 2015
 - Area 118 pit – completed in 2014
 - Area 2 underground – underway
 - Area 118 underground – completed in 2016
- Phase V/VI
 - Area 2 Stage 3 open pit – underway
 - Minto North open pit – completed in 2016
 - Ridgetop North and South open pits
 - Minto East underground
 - Copper Keel underground

2.2 Tailings Management Facilities Overview

Facilities relevant to tailings management at Minto are briefly described below and shown in Figure 2-1. Previous versions of the Tailings Management Plan included the construction of a dam on the east side of the Main Pit to increase storage capacity. Based on placed tailings densities achieved to date, the dam is not required for the current mine plans and has been excluded from this plan.

- Mill - Located on the north side of the Minto Creek valley east of Main Pit and west of the camp. The mill processes stockpiled and run-of-mine ore at a nominal rate of 4200 tonnes per day and produces slurry tailings that are discharged to either the Main Pit Tailings Management Facility or the Area 2 Pit Tailings Management Facility.
- Dry Stack Tailings Storage Facility (DSTSF) - Construction of the DSTSF with filtered tailings placement was carried out from 2007 to 2012. The facility is now closed and is managed under the DSTSF Operations, Maintenance and Surveillance (OMS) Manual (Minto, 2014a).
- Main Pit Tailings Management Facility (MPTMF) - Centered in the Minto Creek valley west of the mill area, the Main Pit was the first deposit mined at Minto Mine; with mining operations ending in April 2011. The pit then transitioned to a tailings management facility, with slurry tailings deposition starting in November 2012. Operations of the facility are managed under the MPTMF Operations, Maintenance and Surveillance (OMS) Manual (Minto, 2015a).

- Area 2 Pit Tailings Management Facility (A2PTMF) - Located south of the mill area and southeast of Main Pit. The Area 2 pit was mined in two stages starting in April 2011. The second stage, Area 2 Stage 2 (A2S2) pushed back the walls and deepened the pit and was completed in 2014. Underground mining of one of the Area 2 ore lenses, known as the M-Zone, via a portal in the base of the pit commenced following completion of A2S2. The pit then transitioned to a tailings management facility, with slurry tailings deposition starting in March 2015. Operations of the facility are managed under the A2PTMF Operations, Maintenance and Surveillance (OMS) Manual (Minto, 2015b). Area 2 Stage 3 (A2S3), located to the southeast of A2S2, commenced in Q1 2017 and will mine partially into the south wall of the A2S2 pit, forming a saddle between the two pits. As tailings continue to be deposited in A2S2, they will eventually flow over the saddle into A2S3 and it will be managed as part of the A2PTMF.
- Ridgetop North and South Pits – Located to the south of Area 2 Stage 2 and 3 pits. Mining has not commenced. Once mining is completed, the Ridgetop North pit will transition to a tailings management facility. The Ridgetop pits are not currently included as official reserves, however they are approved under QML-0001 and have been included here for future planning purposes.



Figure 2-1: Existing and Planned Tailings Management and Surface Facilities

3 Tailings Storage Requirements

3.1 Tailings

Estimated ore release and tailings production through the remainder of Phase IV and Phase V/VI mining are presented in Table 3-1. Tailings production estimates are based on 96.3% mass pull to the tailings stream (average from 2012 to 2016), with the balance reporting to concentrate. The placed density of deposited tailings used for the analysis is 1.33 t/m³. Bathymetry surveys conducted in 2016 indicated densities of 1.33 t/m³ in Area 2 Pit Tailings Management Facility, and 1.35 t/m³ in Main Pit Tailings Management Facility. These densities are based on >5 Mt of placed tailings and are considered reliable for planning purposes.

Table 3-1: Estimated Ore Release and Tailings Storage Requirements as of January 1, 2017

Mining Area	Ore Release (Tonnes)	Tailings Mass (Tonnes)	Tailings Volume (m ³)
Area 2 Pit	1,390,000	1,340,000	1,010,000
Ridgetop North Pit	1,830,000	1,770,000	1,330,000
Ridgetop South Pit	280,000	270,000	200,000
Area 2 Underground	380,000	370,000	280,000
Minto East Underground	630,000	600,000	450,000
Copper Keel Underground	1,620,000	1,560,000	1,170,000
Stockpiles	490,000	470,000	350,000
Sub-Total	6,620,000	6,370,000	4,790,000
Slurry Tailings Produced to Jan.1, 2017	5,920,000	5,700,000	4,240,000
Total Slurry Tailings Storage Requirement	12,540,000	12,070,000	9,030,000

3.2 NP:AP<3 Waste Rock

The Phase V/VI geochemical characterization report (SRK 2013a) and the Minto Waste Rock and Overburden Management Plan (WROMP) (Minto 2014b) describe how NP:AP<3 waste rock was estimated and will be managed. For planning purposes, 20% of all future waste rock mined is assumed to be NP:AP<3 requiring closure in saturated conditions. This is considered a conservative estimate; previous estimates based on blastholes from Area 2 Stages 1 and 2, and from block model estimates, were between 13% and 17%.

An additional 0.7M BCM (1.0M m³) of NP:AP<3 material has also been included to account for material currently on the Main Pit south wall buttress which may be relocated as part of closure activities.

Estimated waste rock and NP:AP<3 waste rock release for each mining area are presented in Table 3-2. Storage requirements are based on bank cubic meters (BCM); swell factor is not applied as pore space will be filled with water/tailings once the rock is placed in a tailings management facility.

Table 3-2: Estimated NP:AP<3 Waste Rock Storage Requirements as of January 1, 2017

Mining Area	Total Waste Rock Volume (BCM)	NP:AP<3 Waste Rock Volume (BCM)
Area 2 Pit	1,460,000	290,000
Ridgetop North Pit	3,420,000	680,000
Ridgetop South Pit	630,000	130,000
Area 2 Underground	-	-
Minto East Underground	40,000	10,000
Copper Keel Underground	60,000	10,000
NP:AP<3 Dispatched to Main Pit ¹ to Jan.1, 2017	70,000	70,000
NP:AP<3 on Main Pit South Wall Buttress	740,000	740,000
Total NP:AP<3 Storage Requirement	6,420,000	1,930,000

3.3 Water

Plans for water management during operations are detailed in the Water Management Plan (WMP) (Minto 2016). A surge capacity of 1M m³ must be available as of October 31 of each year, as per Water Licence QZ14-031. Process water for milling operations is drawn from water stored in A2PTMF and MPTMF; a minimum excess water volume of 600,000 m³ must be maintained for operational demand. Water is transferred between tailings management facilities as required to meet operational water volume and quality requirements. Estimates and methodology for runoff, water conveyance, and water treatment are discussed in the WMP.

3.4 Total Storage Requirements

Table 3-3 summarizes the total tailings management facility storage requirements, including tailings, water and NP:AP<3 waste rock.

Table 3-3: Life-of-Mine Tailings Management Facility Storage Requirements

Component	Required Storage Volume (m ³)
Tailings	9,030,000
NP:AP<3 Waste Rock	1,930,000
Operational Water	600,000
Surge Capacity	1,000,000
Total Volume Required	12,560,000

4 Tailings Storage Capacity

Current tailings management facilities for slurry tailings include the Main Pit Tailings Management Facility (MPTMF) and the Area 2 Pit Tailings Management Facility (A2PTMF). As part of Phase V/VI mining, the Ridgetop North Pit will be added as a tailings management facility once mining of the pit is complete. The Dry Stack Tailings Storage Facility (DSTS) is a closed facility, no further tailings will be dispatched there. The following sections describe the facilities and their storage capacities.

4.1 Main Pit Tailings Management Facility

The total storage capacity of the MPTMF was calculated up to elevation 786 masl for planning purposes. This is below the original ground surface spill point of 791 masl, but leaves contingency for historic road and ditch work around the eastern rim of the pit. The total storage capacity of the MPTMF up to 786 masl is 3.2M m³. The storage curve, showing capacity at each elevation, is shown in Figure 4-1.

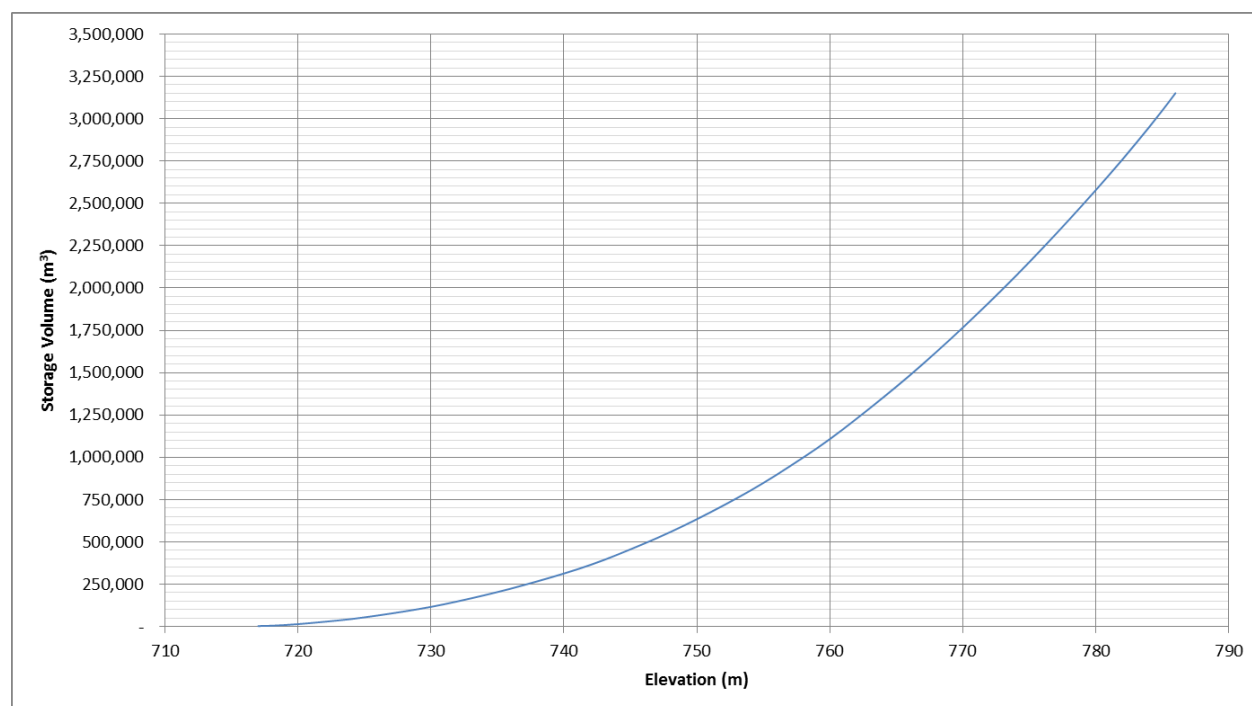


Figure 4-1: Main Pit Tailings Management Facility Storage Capacity Curve

The MPTMF will be operated such that a tailings beach is developed along the east side of the facility, minimizing the potential for seepage to the east. Details on closure plans for the facility are contained in the Reclamation and Closure Plan (Minto, 2016b).

4.2 Area 2 Pit Tailings Management Facility

The final A2PTMF will consist of two intersecting pits, Area 2 Stage 2 and Area 2 Stage 3, separated by a saddle at approximate elevation 770 masl. The total storage capacity was calculated up to the original ground spill point of 799 masl on the east rim of the Area 2 Stage 2 pit. The total storage capacity of the A2PTMF up to 799 masl is 7.7 Mm³. The storage curve, showing capacity at each elevation, is shown in Figure 4-2.

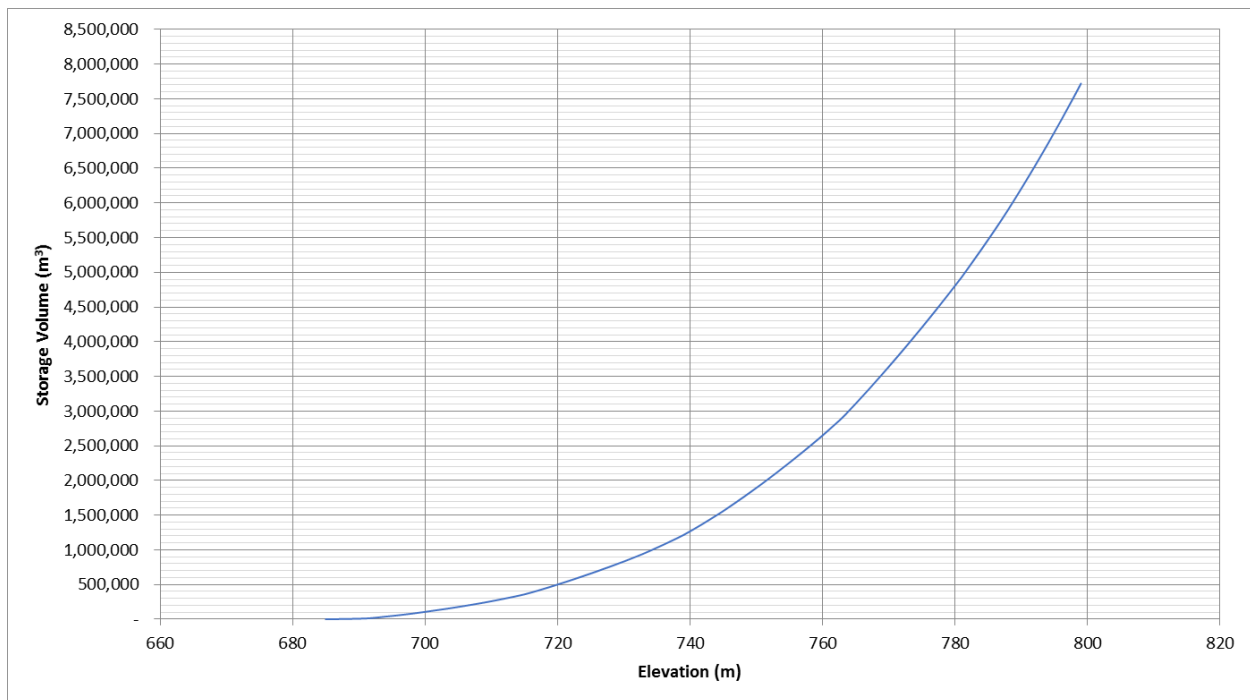


Figure 4-2: Area 2 Pit Tailings Management Facility Storage Capacity Curve

Details on closure plans for the facility are contained in the Reclamation and Closure Plan (Minto, 2016b).

4.3 Ridgetop North Pit Tailings Management Facility

Upon completion of mining of the Ridgetop North Pit it will be transitioned to a tailings management facility. The total storage capacity was calculated up to the natural spill elevation of 862 masl. The total storage volume based on the current design is 1.9M m³. The storage curve, showing capacity at each elevation, is shown in Figure 4-3.

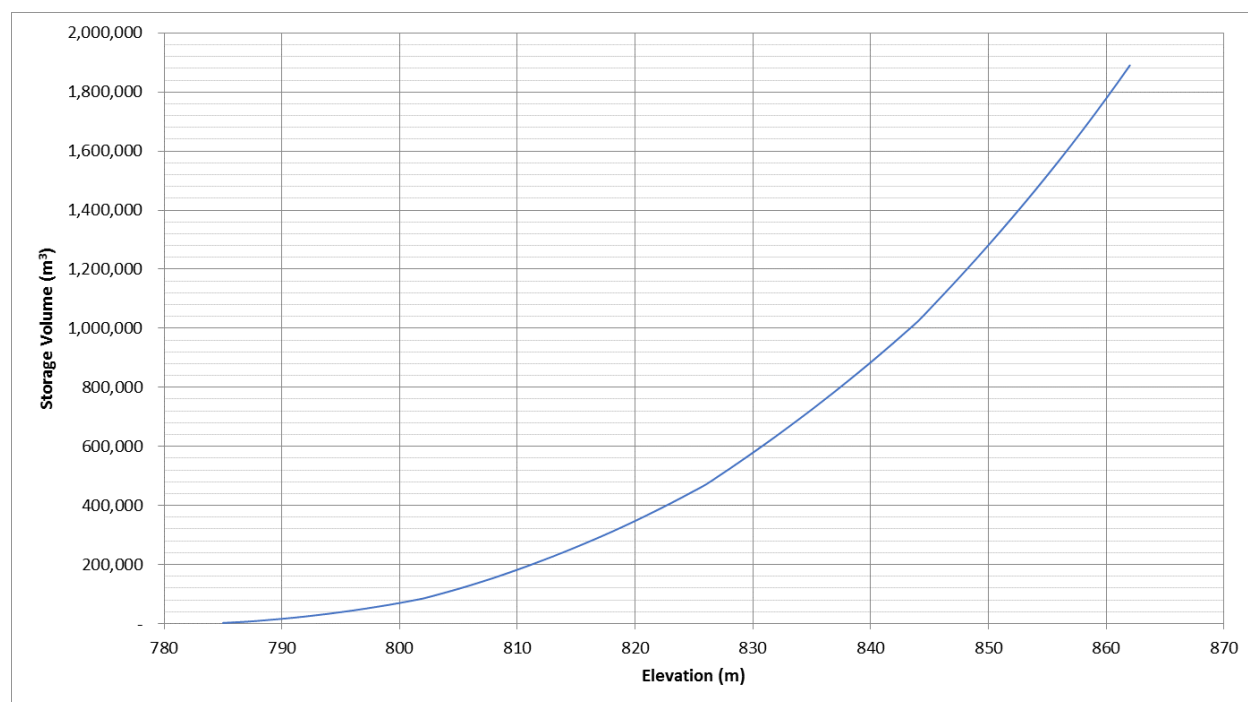


Figure 4-3: Ridgetop North Pit Tailings Management Facility Storage Capacity Curve

4.4 Total Storage Capacity

Table 4-1 summarizes the total storage capacity, based on the facilities described above, and includes the total estimated storage requirement (Table 3-3) for comparison. The underground workings are approved for tailings storage and the total volume of the mined out underground production workings at closure has been included as additional contingency capacity.

Table 4-1: Storage Capacity

Facility	Approximate Spill Elevation (masl)	Volume Below Spill Elevation (m³)
Main Pit Tailings Management Facility	786	3,150,000
Area 2 Pit Tailings Management Facility	799	7,720,000
Ridgetop North Pit Tailings Management Facility	862	1,900,000
Total Surface Storage Capacity	-	12,770,000
Total Underground Storage Capacity	-	1,250,000
Total Storage Capacity	-	14,020,000
Total Storage Requirement (Table 3-3)	-	12,560,000
Total Excess Storage Capacity	-	1,450,000

5 Deposition Schedule

Minto intends to use the three tailings management facilities as required to store tailings solids and NP:AP<3 rock, and to manage water; the precise deposition schedule will be subject to operational decisions based on water levels, achieved tailings density, and mill throughput. The current deposition plan is summarized below:

- Tailings are currently being deposited in the A2PTMF. Deposition to A2PTMF will continue for the remainder of Area 2 Stage 3 open pit, Area 2 underground, Minto East underground, and initial mining in Copper Keel underground.
- Storage capacity in MPTMF will be maintained as a source for mill processing water feed.
- Once Ridgetop North pit is complete, tailings deposition will switch from the A2PTMF to the transitioned Ridgetop North tailings management facility.

6 References

- Minto Explorations Ltd. 2014a. Operation, Maintenance, and Surveillance Manual – Dry Stack Tailings Storage Facility, Rev 2014-1.
- Minto Explorations Ltd. 2014b. Minto Mine Phase V/VI Expansion, Waste Rock and Overburden Management Plan.
- Minto Explorations Ltd. 2015a. Operation, Maintenance, and Surveillance Manual – Main Pit Tailings Management Facility, Rev 2015-2.
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- Minto Explorations Ltd. 2016a. Minto Mine Water Management Plan.
- Minto Explorations Ltd. 2016b. Minto Reclamation and Closure Plan, Rev 2016-01.
- SRK Consulting (Canada) Inc. 2013a. Minto Mine Phase V/VI Expansion, ML/ARD Assessment and Inputs to Water Quality Predictions. Report prepared for Minto Explorations Ltd.
- SRK Consulting (Canada) Inc. 2013b. Minto Mine Phase V/VI Waste Storage Alternatives Assessment. Memorandum prepared for Minto Explorations Ltd.