Mine Development and Operations Plan

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June, 2014

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1 Introduction

This document serves as the Mine Development and Operations Plan (MDOP) for the surface mining component of Minto Mine's Phase V/VI development.

The scope of Phase V/VI is mainly the addition of new open-pit and underground reserves and their associated waste rock dumps and tailings deposits. The content of this MDOP is derived from the Plan Requirement Guidance for Quartz Mining Projects (Yukon Government, 2013); this document describes the designs and methods employed to access and mine the new reserves.

Phase V/VI adds the following open-pit mining to Minto's reserves:

1. Minto North
2. Area 2 Stage 3
3. Ridgetop South
4. Ridgetop North

The underground mining component of Phase V/VI is described in a separate Underground Mine Development and Operations Plan (UMDOP).

2 Design Criteria – Surface Mining

The depth and extents of the four pits were determined in the Phase VI Pre-Feasibility Study by a Lerchs-Grossman pit optimization of the mine's resource model with the following parameters:

Item	Unit	Value
Metal Prices and Exchange Rate		
Copper	US$ / lb	2.50
Gold	US$ / oz	300.00
Silver	US$ / oz	3.90
Exchange rate	US$ / C$	0.90
Processing		
Copper recovery to concentrate	%	91.0
Sulphide Gold recovery to concentrate	%	70.0
Sulphide Silver recovery to concentrate	%	78.0
Copper grade in concentrate	%	40.0
Gold grade in concentrate	g/t	variable with Cu
Silver grade in concentrate	g/t	variable with Cu
Concentrate moisture content	%	8.0
Smelter Payables		
Payable copper in concentrate	%	96.75
Payable gold in concentrate	%	Per MRI contract
Silver deduction	g/t in conc.	Per MRI contract
Remaining payable silver in concentrate	%	Per MRI contract
Other Parameters		
Pit slope angles		
Minto North	°	52
Area 2 Stage 3 Rock	°	53
Area 2 Stage 3 Overburden	°	30
Ridgetop North	°	53
Ridgetop South	°	53
Dilution	%	6.0
Mining recovery	%	100
Mill throughput	t / year	1,370,000
Costs		
Mining cost	C$ / t mined	3.12
Processing cost	C$ / t milled	16.50
G&A cost	C$ / t milled	11.90
Royalties	%	1.0%
Conc. transportation, marketing, insurance	US$ / dmt conc.	169.54

Table 1: Input parameters used in pit optimization.

The optimum pit shell was selected as the basis for each pit design.

Haul road criteria are detailed in Section 5.1.6.3, and a discussion of wall angles in the final pit designs is presented in Section 2.2.

2.1 Ore Quantities

The four pits to be mined as part of Phase V/VI share similar geology to the deposits previously mined at Minto: copper mineralization is contained in a series of subhorizontal stacked lenses of foliated granodiorite. These lenses are characterized by sharp contacts with the surrounding host rock.

The foliated granodiorite zones themselves are highly variable in the content of their mineralization: copper grade ranges from undetectable to the highest recorded assay value of 39.6% over 1.0m of core.

The following table summarizes Phase V/VI open-pit ore reserves at the mine's cutoff grade of 0.50%.

Phase V/VI Open Pit		2014	2015	2016	2017	2018	Total
Minto North	Ore (Tonnes)	1,084	1,602,932	-	-	-	1,604,016
	Cu Grade (%)	0.96	2.26	-	-	-	2.26
	Au Grade (g/t)	0.12	1.21	-	-	-	1.21
	Ag Grade (g/t)	2.44	8.12	-	-	-	8.12
	Cu Mlb, undiluted	0.02	79.75	-	-	-	79.77
Area 2 Stage 3	Ore (Tonnes)	-	121,385	1,268,020	-	-	1,389,405
	Cu Grade (%)	-	0.79	1.07	-	-	1.05
	Au Grade (g/t)	-	0.18	0.31	-	-	0.30
	Ag Grade (g/t)	-	1.72	3.72	-	-	3.54
	Cu Mlb, undiluted	-	2.10	29.99	-	-	32.09
Ridgetop South	Ore (Tonnes)	-	-	280,591	-	-	280,591
	Cu Grade (%)	-	-	1.29	-	-	1.29
	Au Grade (g/t)	-	-	0.70	-	-	0.70
	Ag Grade (g/t)	-	-	6.31	-	-	6.31
	Cu Mlb, undiluted	-	-	7.95	-	-	7.95
Ridgetop North	Ore (Tonnes)	-	-	251,474	775,540	806,550	1,833,564
	Cu Grade (%)	-	-	0.91	0.86	1.07	0.96
	Au Grade (g/t)	-	-	0.06	0.13	0.30	0.20
	Ag Grade (g/t)	-	-	1.62	1.59	2.37	1.94
	Cu Mlb, undiluted	-	-	5.04	14.68	18.99	38.71
Phase V/VI OP Subtotal	Ore (Tonnes)	1,084	1,724,318	1,800,085	775,540	806,550	5,107,576
	Cu Grade (%)	0.96	2.15	1.08	0.86	1.07	1.41
	Au Grade (g/t)	0.12	1.14	0.33	0.13	0.30	
	Ag Grade (g/t)	2.44	7.67	3.83	1.59	2.37	
	Cu Mlb, undiluted	0.02	81.85	42.98	14.68	18.99	158.53

Table 2: Open-pit reserves in Phase V/VI.

Phase V/VI mining is scheduled to begin in August 2014 with stripping in Minto North; however, only a negligible quantity of ore will be released in 2014.

2.2 Slope Stability and Geotechnical Assessments

The slope angles of Area 2, Area 118, Minto North, and the Rigetop pits were evaluated in 2009 as part of a report authored by SRK in support of the Phase IV Pre-Feasibility Study.

2.2.1 Minto North

The evaluation of Minto North is based on an analysis of two oriented-core holes drilled in 2009. These holes, 09SWC495 and 09SWC497, intersect the planned south and northeast sections of the highwall, respectively. The holes were inclined at 60° below horizontal to increase the likelihood of intersecting geologic structures such as joints and fracture systems which, if present, would influence slope stability.

Based on the results of the two geotechnical holes, Minto North is not expected to have a significant weathered zone beneath the relatively shallow overburden layer. The pit was therefore characterized as one domain, as opposed to the other pits on the property, which are characterized by separate domains of weathered and unweathered rock.

SRK's geotechnical report recommends a 52° interramp angle with 72° bench face angles. The report assumed 18.0m high bench faces, which would require 8m catch benches to achieve the desired interramp and bench face angles. In order to provide wider and safer catch benches, and to match past practice in other pits, a 24.0m bench face height was selected, with 10.95m catch benches.

2.2.2 Area 2 Stage 3

A relatively deep soil overburden deposit exists under the South portion of the proposed Area 2 Stage 3 pit, consisting primarily of transported silt and fine sand with occasional lenses of clay and coarse sand to gravel. The soil is high in organic content and is known to contain permafrost. Previous geotechnical work done by SRK and others have indicated that the material contains permafrost down to near the bedrock contact at its deepest portions and is most likely frozen down to the bedrock contact in shallower portions.

In April 2013, an inclinometer and a thermistor string were installed at the southeast corner of the proposed pit. The inclinometer has thus far shown no movement, indicating that the overburden layer around the pit is not affected by the creep movement of the nearby Dry Stack Tailings Storage Facility.

The pit is designed with a 30° slope in the overburden zone, bench face angles of 72° (except for those of West and South walls that are recommended to be at 64°), and a 47° to 53° interramp angle in waste rock, based on the recommendations of SRK's report.

2.2.3 Ridgetop North / South

The western portion of the proposed Ridgetop pits are anticipated to contain 1 to 5m of soil overburden deepening to the east to generally about 5 to 15m at the eastern edge, with a maximum depth of 21m at the far northeast portion of Ridgetop North and at the far east portion of Ridgetop South. The bedrock at Ridgetop is generally weathered to a depth of approximately 45 to 70m below ground surface.

The Ridgetop pits share Area 2's recommended 30° slope in the overburden zone and a 53° interramp angle in waste rock, based on the recommendations of SRK's report.

3 Design and Construction

3.1 Site Preparation

The organic-rich topsoil layer from each pit will be stripped using the mine's dozer fleet and stockpiled separately in a dedicated area of the Reclamation Overburden Dump. Access roads will be built to the site's standard road building practices, which are described in Section 5.1.7.

3.2 Construction QA/QC

The new infrastructure planned for the site as part of Phase V/VI consists primarily of the following:

- Main Dam;
- Spillway between Main and Area 2 pits;
- Tailings Diversion Ditch.

The designs and construction QA/QC programs for these structures are described the Tailings Management Plan and the design documents for these structures.

Geotechnical monitoring of pit highwalls is described in Section 5.1.5, and the monitoring and quality control of waste rock dispatching is described in the site's Waste Rock and Overburden Management Plan (WROMP).

3.3 Stability Analyses

This Mine Development and Operations Plan does not describe any stability analysis results other than the pit highwall stability reports and monitoring practices summarized in sections 2.2 and 5.1.5, respectively.

3.4 Construction Schedule

The mining sequence is shown in the following figure.

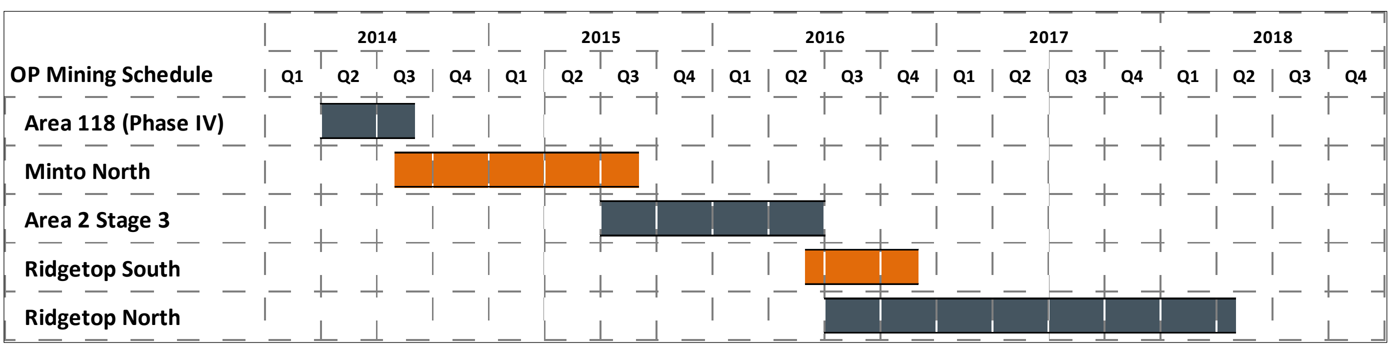


Figure 1: Mining sequence and timeline for Phase V/VI pits.

Each individual pit in Phase V/VI will be actively mined for a relatively short period of time. The following table summarizes pit lifetimes at the planned mining rates of 12,000 BCM/d (Minto North and Area 2 Stage 3) and 7,200 BCM/d (Ridgetop North and South).

Pit	Start Date	Completion Date	Duration of Mining
Minto North	August 2014	August 2015	13 months
Area 2 Stage 3	July 2015	June 2016	12 months
Ridgetop South	June 2016	November 2016	6 months
Ridgetop North	July 2016	April 2018	22 months

Table 3: Start and completion dates for Phase V/VI open-pit mining.

3.5 Material Release Schedule

The following figure shows the material releases for the life of the open-pit mine.

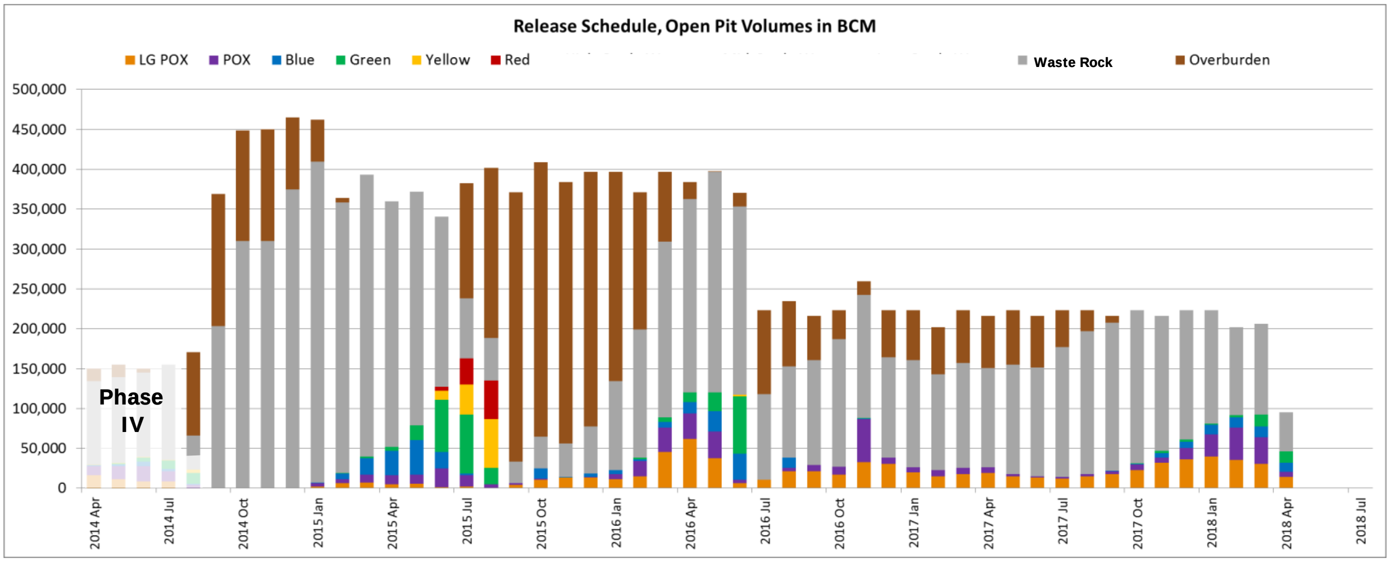


Figure 2: Material release by month.

Of note is the large quantity of overburden released in late 2015 and early 2016 as part of Area 2 Stage 3 mining: this overburden will be used in progressive reclamation projects such as covering the Southwest Dump.

3.6 Ore Handling Procedures

Ore handling practices are unchanged relative to previous phases of mining. Ore will be classified, based on copper grade, into the material types presented in the table below.

Material Type	Copper Grade Range	Soluble Copper
Blue Ore	0.50 – 1.00% Cu	<15.0%
Green Ore	1.00 – 2.00% Cu	<15.0%
Yellow Ore	2.00 – 4.00% Cu	<15.0%
Red Ore	>4.00% Cu	<15.0%
Partially Oxidized Ore	>1.00% Cu	>15.0%
Low-Grade Partially Oxidized Ore	0.50 – 1.00% Cu	>15.0%

Table 4: Classification of ore by copper grade.

Classification of material as one of the six types of ore (or as waste) is based on blasthole assays. The following is a description of the process.

1. Drill cuttings from every blast hole are sampled, tagged, and sent for assay at the on-site lab prior to blasting;
2. Representative samples of the cuttings are assayed using atomic absorption (AA) to determine the copper and silver content. A separate sample is acid-leached and assayed for copper grade, allowing for a determination of soluble copper;
3. The environmental assay lab tests representative samples for total sulfur and total inorganic carbon content, which are used to calculate an NP/AP ratio;
4. The assay results are sent to the geology department for interpretation;

5. The geology department plots the results spatially, then draws polygons enclosing holes with similar assay results to identify regions of similar average grade (for ore) or similar waste class (for waste);
6. After blasting, the aforementioned polygons are laid out in the field by the mine surveyor working with the production geologist, using stakes and flags of various predefined colours;
7. Mine operations personnel, under the supervision of the pit foreman, excavate and haul material to the destination designated for the material type. Destinations are communicated to foremen and operators by the production geologist.

Material containing more than 15% soluble copper content is classified as partially oxidized.

Waste rock having an NP:AP ratio greater than 3.0 is classified as bulk waste and deposited to one of several rock dumps, while material with a ratio less than 3.0 is deposited either below the final flooded levels of the Area 2 or Main pits, once mined-out, or in mined-out stopes underground.

Stockpile inventory will peak in April 2018 with the completion of Ridgetop North pit and therefore all open-pit mining. Stockpiles will be drawn down over approximately three years, supplemented by ongoing feed from underground operations.

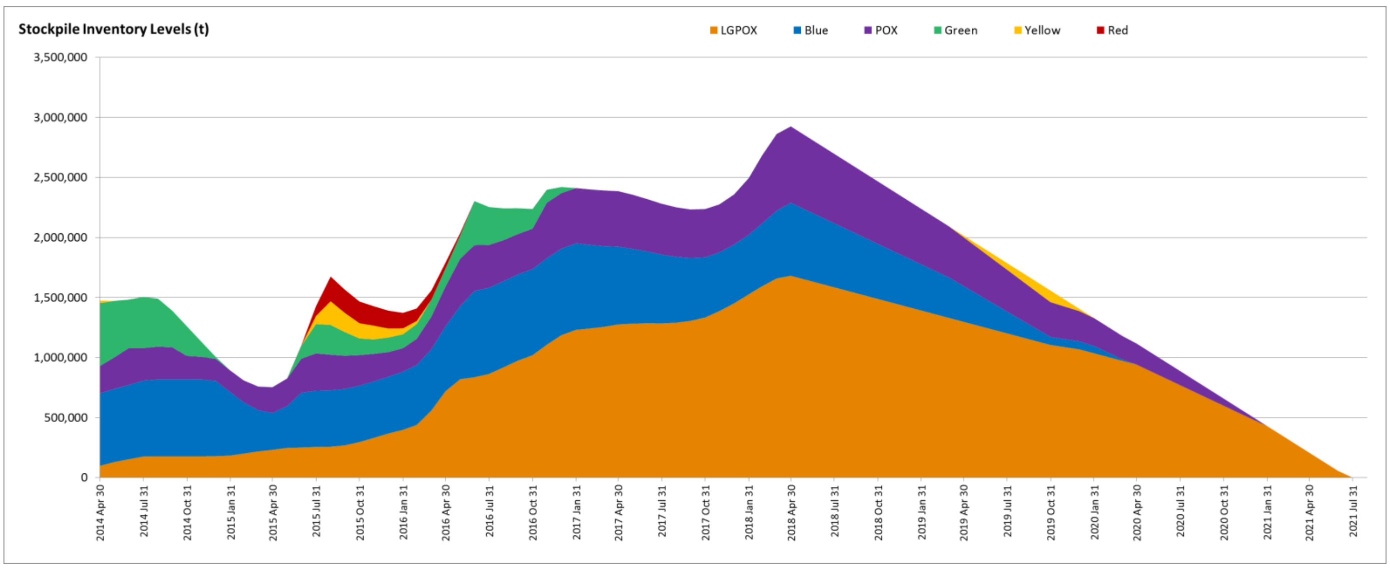


Figure 3: Life-of-mine stockpile inventory levels.

4 Associated Mine Services and Infrastructure

4.1 Ancillary Infrastructure

The surface mining fleet will continue to be diesel-powered. No new electrical infrastructure will be created for the open-pit mine.

Two-way VHF radios will continue to be used for communication with the mining fleet. Sixteen channels are available on site, with three available everywhere on the property: one channel dedicated to routine pit traffic, one to extended conversations or other uses, and the site emergency channel.

4.2 Waste Rock, Ore, and Tailings Management

A detailed description of waste and overburden dumps, as well as material segregation practices, is presented in the Waste Rock and Overburden Management Plan.

Briefly, four new waste rock dumps are to be created: the Main Pit Dump, the Mill Valley Fill Extension Stage 2, the Main Waste Dump Expansion, and the Ridgetop Waste Dump. These dumps will receive all run-of-mine waste rock that meets requirements for long-term stability and metal leaching potential. Approximately 20% of the waste rock from Area 2 Stage 3 and the Ridgetop pits is projected to have an NP:AP ratio less than 3.0 and will be stored under saturated conditions: this rock will be co-disposed with tailings in either the Main or Area 2 Pit Tailings Management Facilities.

Two new overburden dumps will be created: the Area 118 Backfill Dump and the Ridgetop South Backfill Dump, and a significant portion of the overburden released from Area 2 Stage 3 will be hauled directly to Phase IV dumps for use in progressive reclamation.

4.3 Industrial Complex

Minto's site infrastructure consists of a primary crusher, secondary crusher, coarse ore stacker/conveyor, mill, concentrate storage shed, tailings filtration building, water treatment plant, propane tanks, camp complex, warehouse, and laydown area. No changes to the locations of these structures are planned as part of Phase V/VI.

4.4 Fuel Storage

Diesel fuel is stored in a diesel storage facility located north of the process plant. Six large diesel tanks have a combined storage capacity of approximately 3.2 million litres (L). These tanks were sized to store sufficient fuel for two months of operation, under generator power, during the Yukon River freeze and thaw periods when vehicle access to the site is not possible. The mine's connection to the electrical grid has reduced fuel use and the tanks, if filled, now represent a four-month fuel supply. A fuel tank inventory, including the types of products and volumes is presented in the table that follows.

Number of Storage Tanks (#)	Product Type	Volume (L)
6	Diesel	3,267,668
1	Gasoline	8,000
6	Propane	911,000

Table 5: Fuel storage capacity.

5 Mine Design and Methods

5.1 Mine Design

5.1.1 Minto North

The Minto North pit has been designed to a 52° interramp wall angle, with bench face angles of 72° and 24m between catch benches, which are 10.95m in width.

Due to the relatively small size of the pit (4.5 MBCM) and short duration of mining (13 months), the pit is mined in a single stage. The copper mineralization is contained in a single zone of foliated granodiorite at the bottom of the pit (see Figure 5).

The large contiguous zone of waste rock presents an opportunity to mine approximately 70% of the pit's total volume in 12.0m benches, switching to 6.0m benches only once the ore contact is reached. Minto's mining contractor, Pelly Construction, will use a Hitachi EX2500 front shovel to mine 12.0m benches in a single pass.

To reduce strip ratio, the main ramp in the pit has been strategically placed along the north wall which, due to the topography of the original ground in the area, is shorter than the south highwall. The south wall measures 85m at its highest point; the north highwall measures 127m. The bottom of the pit is the 834m elevation.

To further reduce strip ratio, the main ramp is reduced to single-lane haulage at the 867m elevation, after the second of the ramp's three switchbacks. By this point, approximately 90% of the pit's volume will have been mined; the disruption to haul productivity will therefore be minimal.

The access road enters the pit at the 905m elevation, at the low point of the surrounding topography. Once mining is completed, if the pit fills with water, this will serve as its spill point.

5.1.2 Area 2 Stage 3

The Area 2 Stage 3 pit pushes back the South wall of the pit with an additional 4.4M BCM of mining. The first two stages of Area 2, for comparison, mined 12.0M BCM. Figure 10 shows a typical long section through the entire Area 2 pit.

Approximately 2.3M BCM of the material to be mined from the pit is soil overburden, sloped at 30°. The maximum height of the overburden slope is 55m.

The main access ramp is independent of the ramp for Stage 2 and is designed with a 26m width. The pit transitions to single lane haulage at the 760m elevation, by which point approximately 91% of the pit's volume will have been mined. The pit finishes at 730m elevation, as compared to the 680m reached in Stage 2.

5.1.3 Ridgetop North / South

The Ridgetop pits share common wall design parameters: a 53° interramp angle with a 72° bench face angle.

Ridgetop South is designed with a single-lane ramp, as the pit is only mined six months and with only half of the open-pit mining fleet, the remainder of which will either be finishing Area 2 or starting on Ridgetop North. The productivity loss associated with single-lane haulage is therefore accepted; the pit's strip ratio is significantly reduced.

Ridgetop North features double-lane haulage until the 837m elevation, by which point 82% of the pit's total volume will have been mined. The ramp is routed along the north highwall; the high entry point is less efficient in terms of haulage, but this ramp alignment serves to push back the wall such that more ore is recovered and the stripping ratio is reduced.

The bottom of the Ridgetop South pit is at the 841m elevation, while Ridgetop North reaches 784m. The maximum highwall heights are 77m and 148m, respectively.

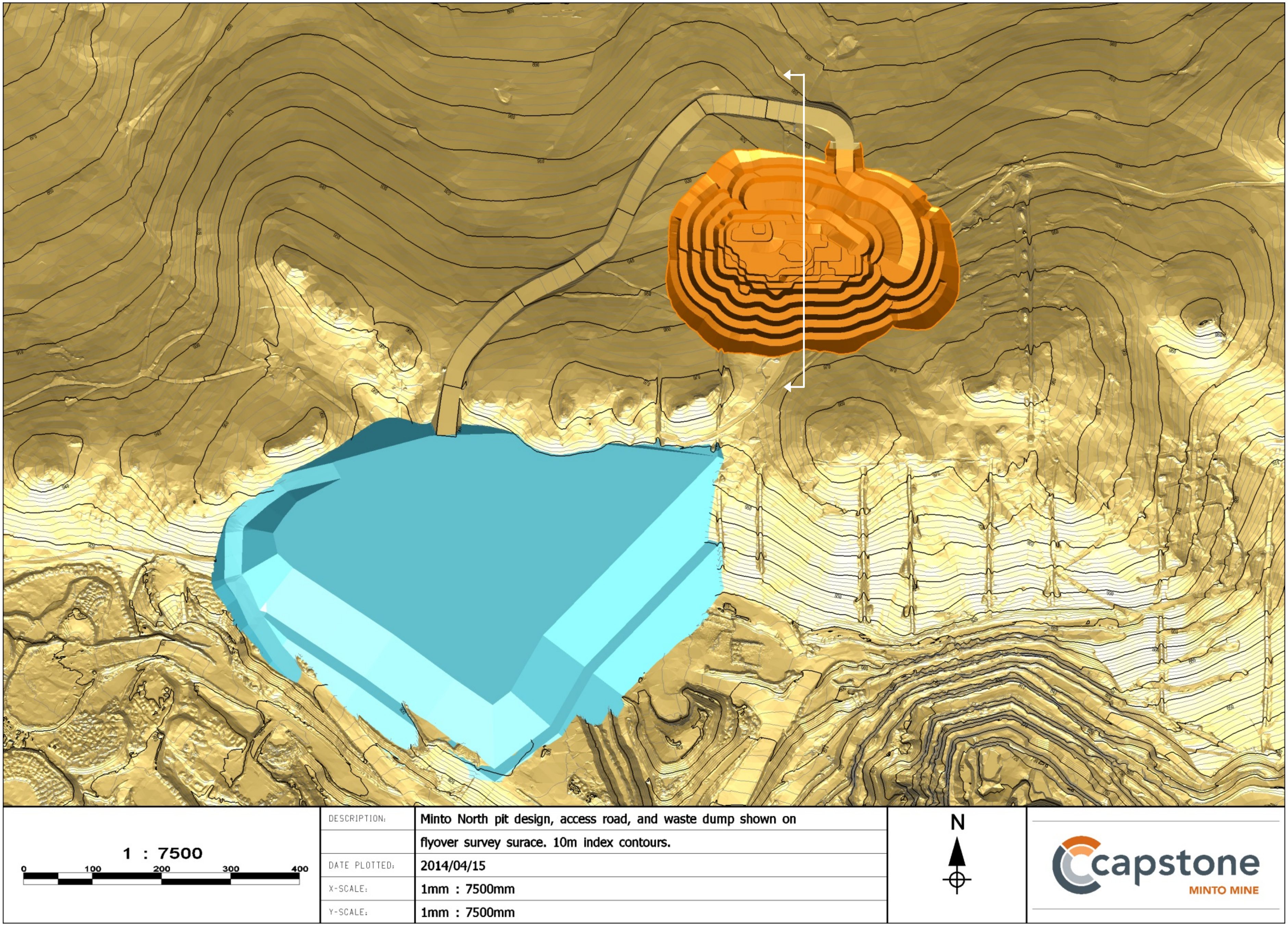


Figure 4: Minto North, plan view.

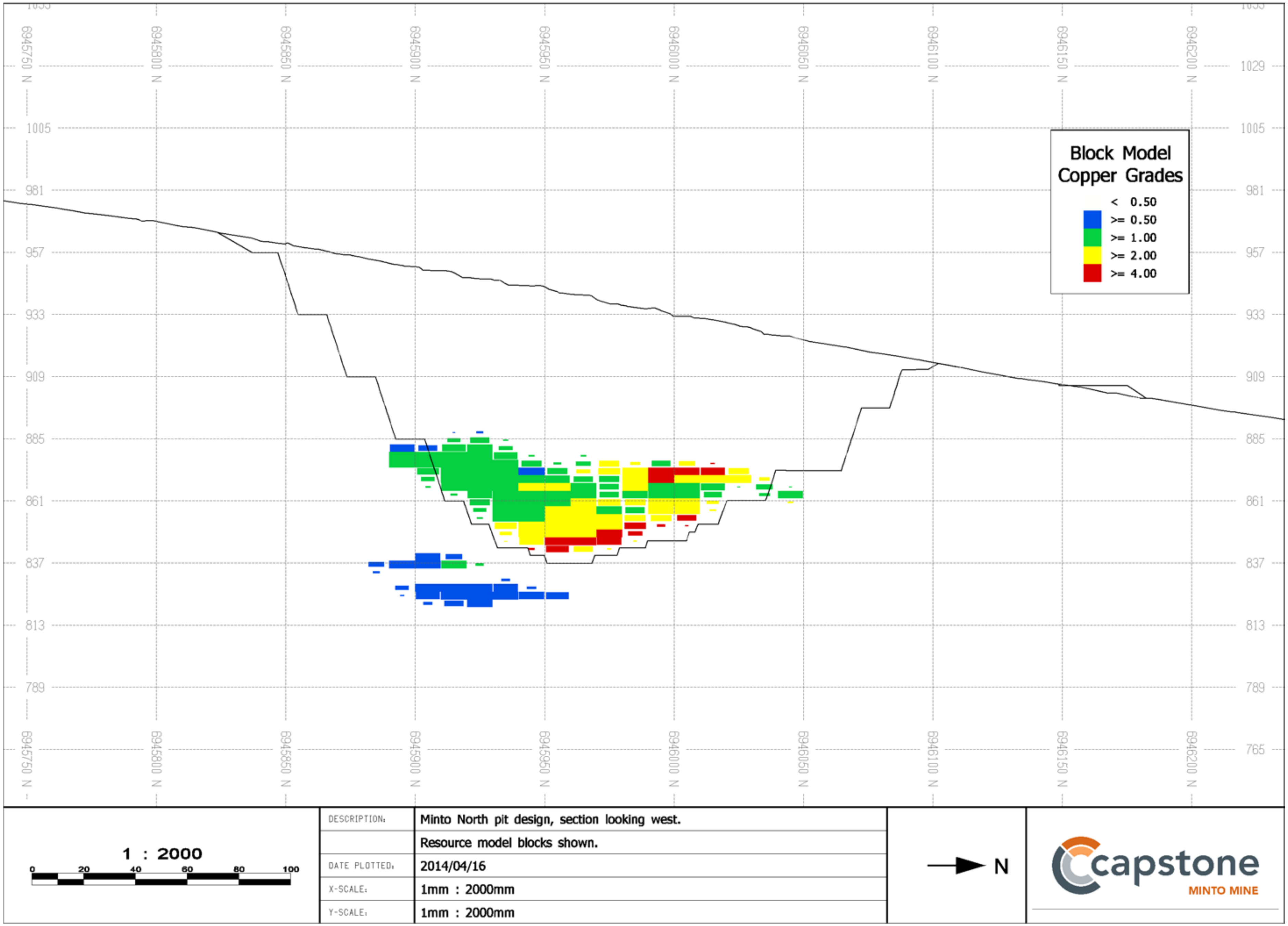


Figure 5: Minto North, section view.

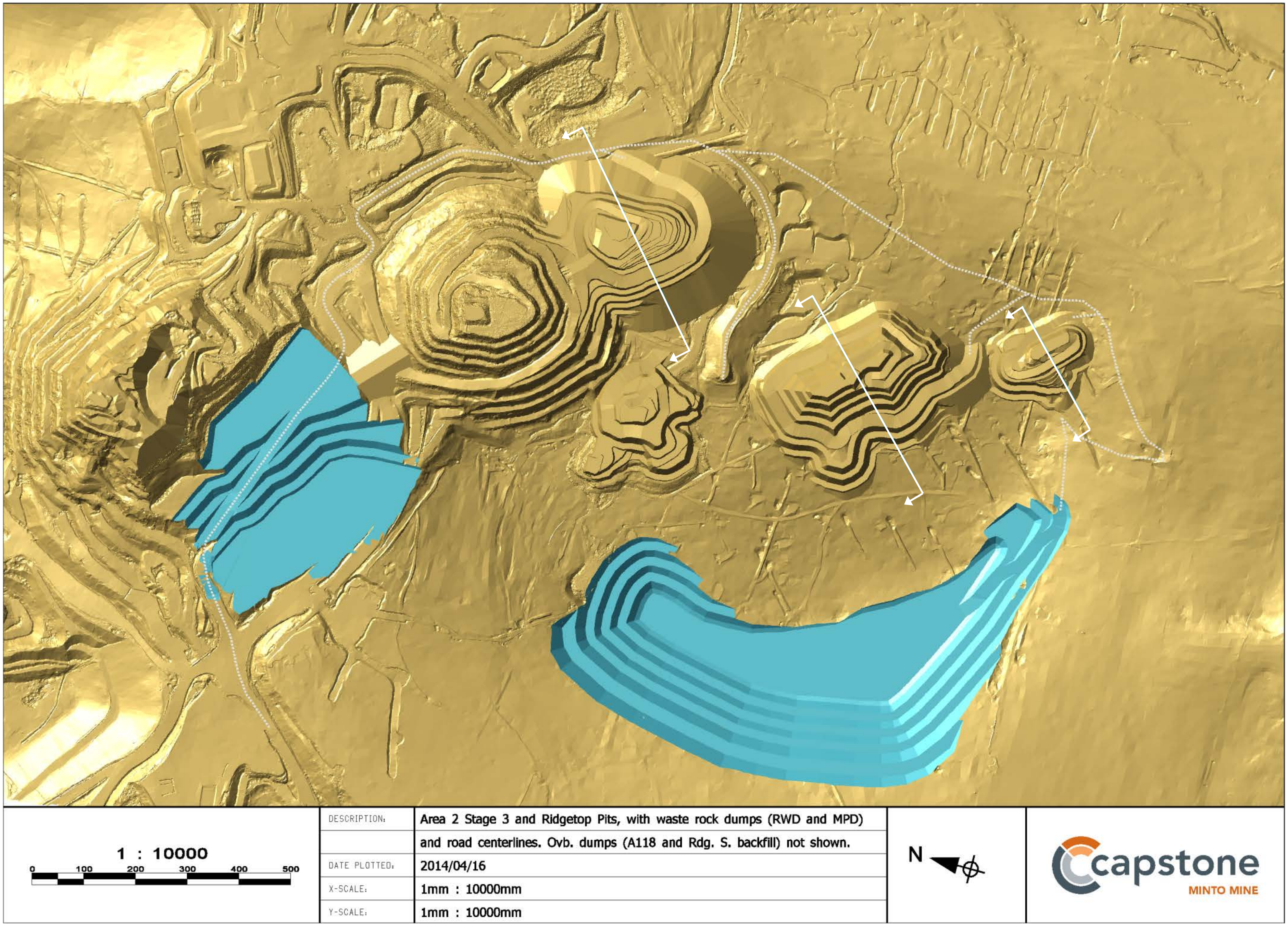


Figure 6: Area 2 Stage 3, Ridgetop North, and Ridgetop South pits.

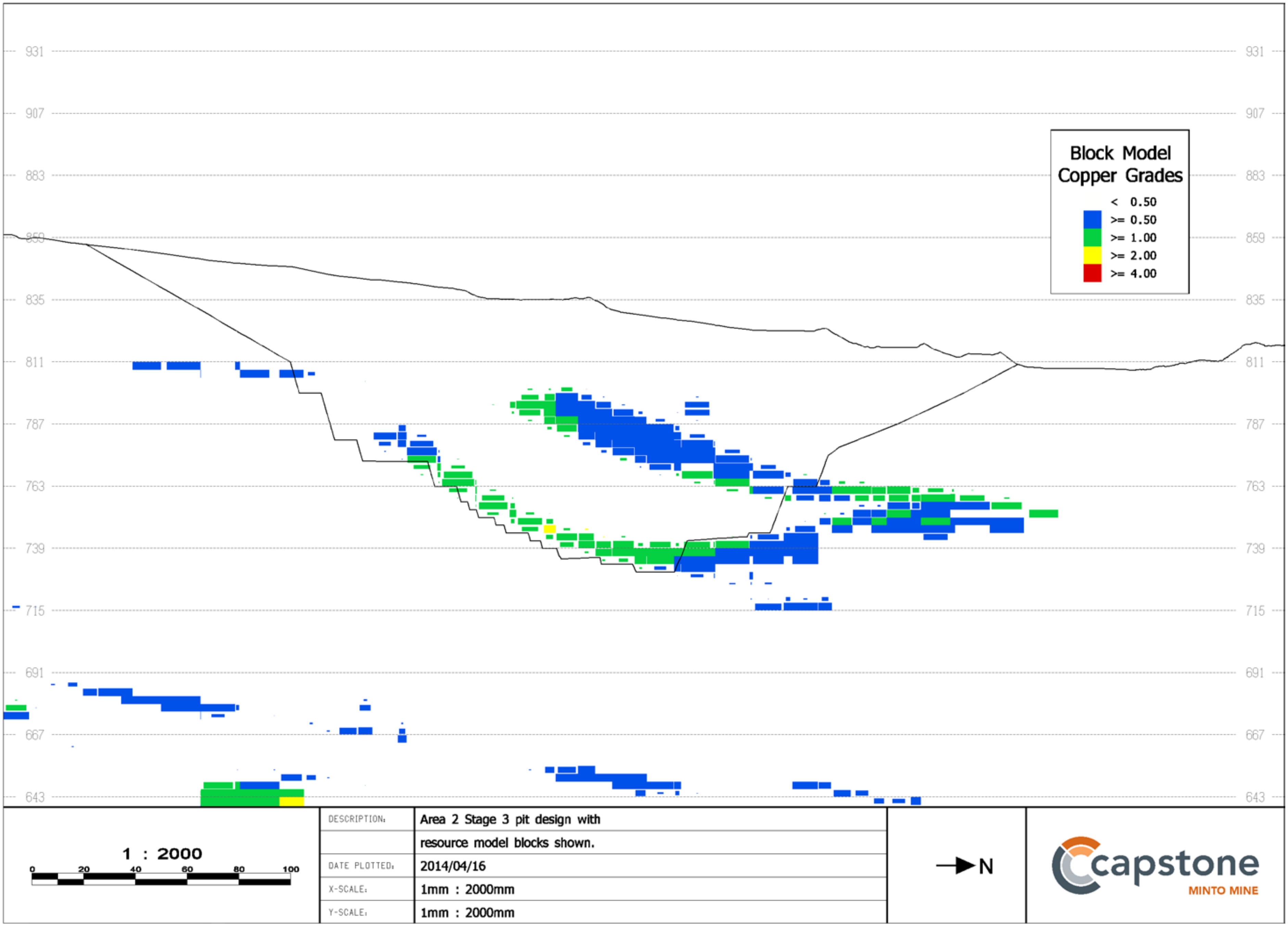


Figure 7: Area 2 Stage 3 section.

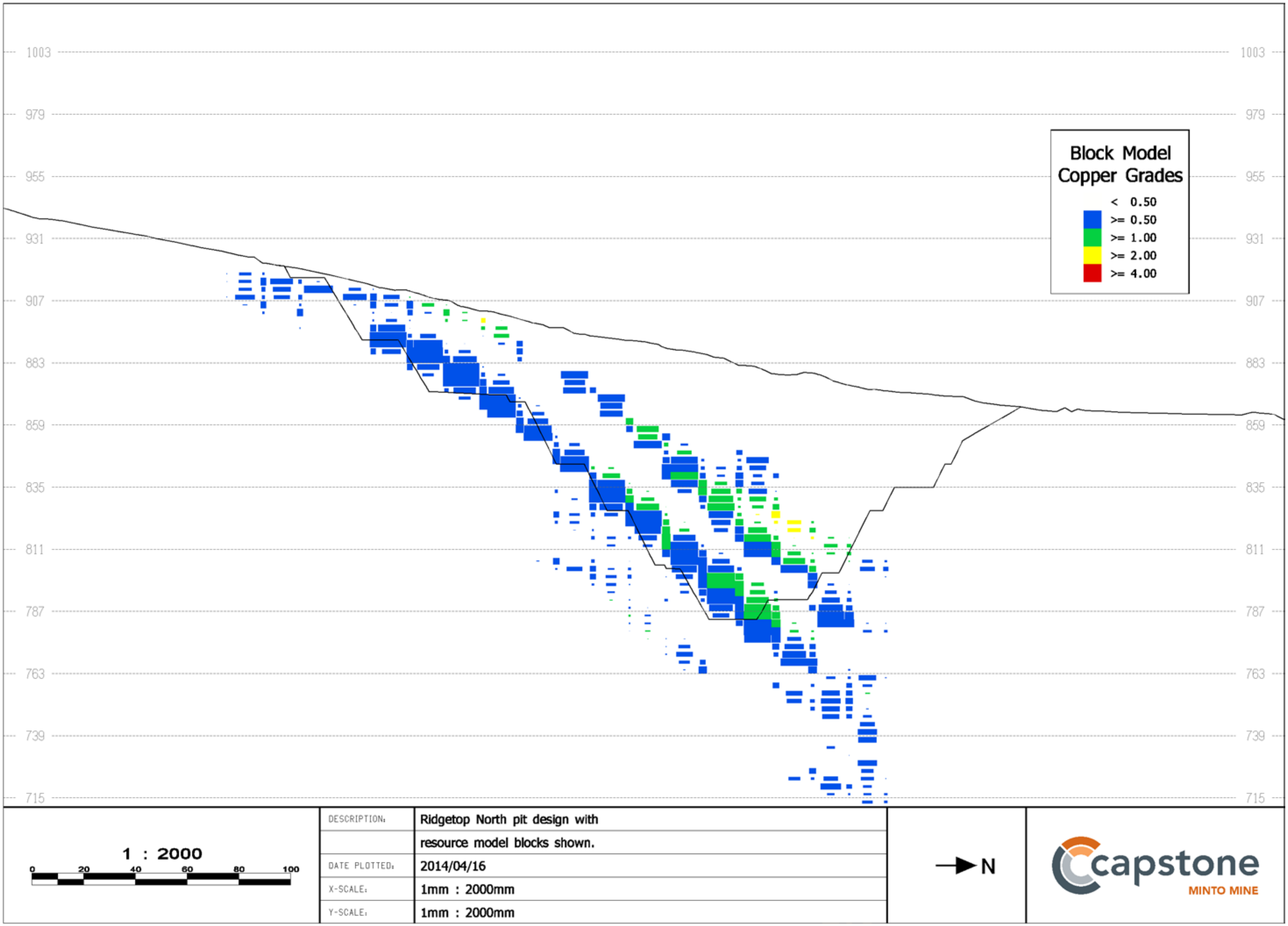


Figure 8: Ridgetop North section.

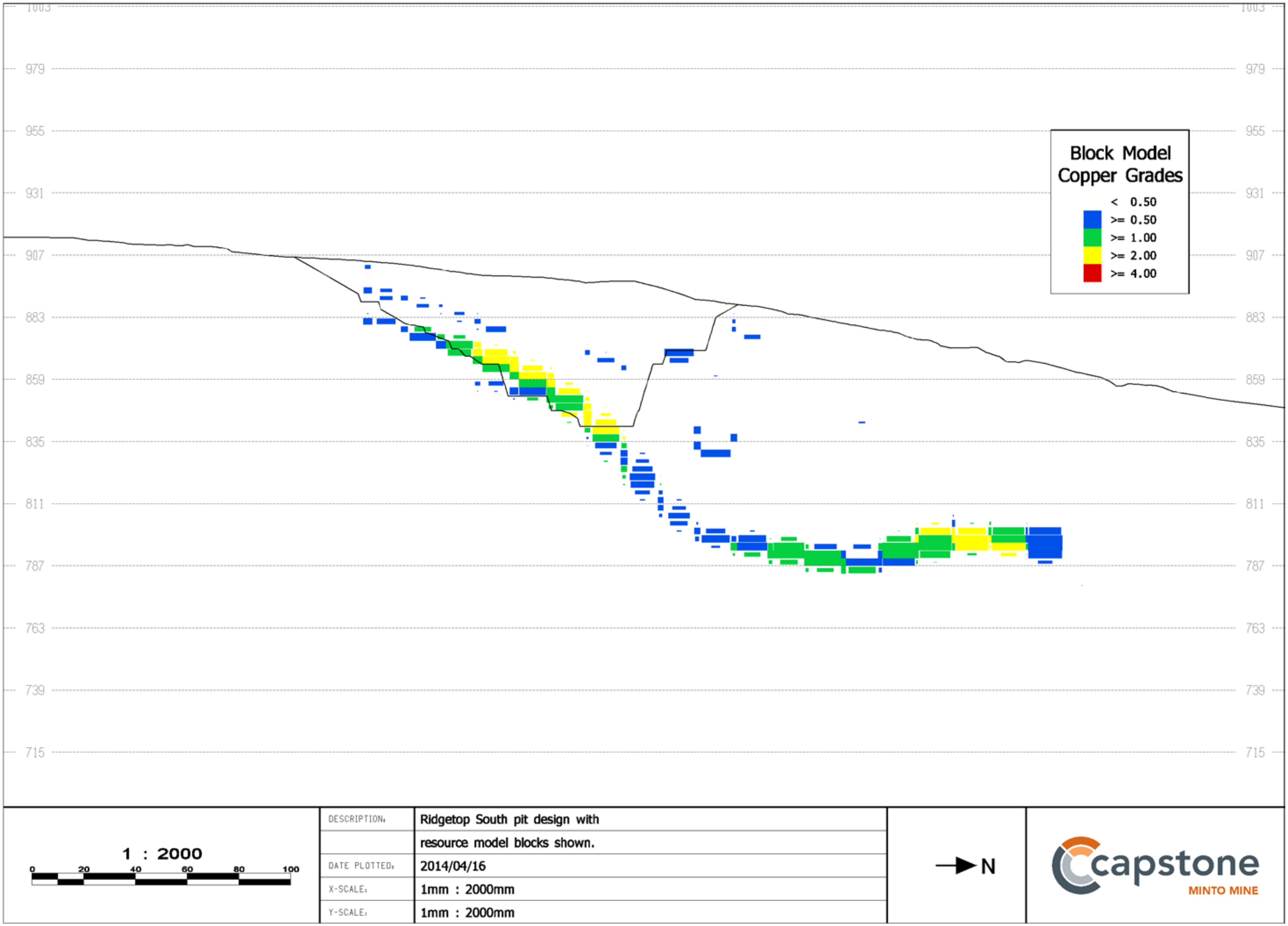


Figure 9: Ridgetop South section.

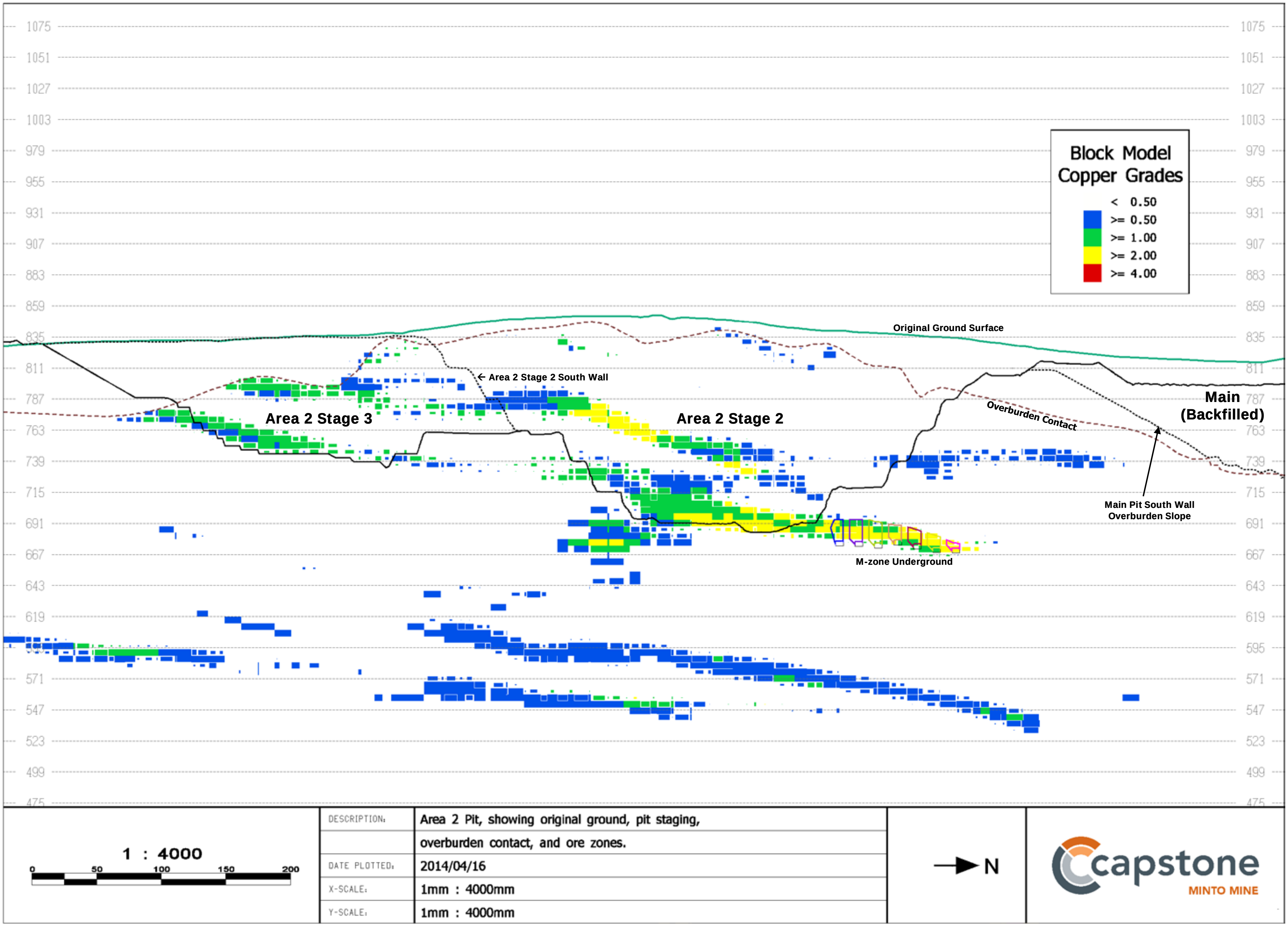


Figure 10: Long section through Area 2 pit.

5.1.4 Wall Design and Overburden Stability

Wall design and stability assessments are summarized in Section 2.2.

5.1.5 Ground Movement Monitoring

Minto uses a radar-based slope monitoring device manufactured and supported by Ground Probe. This provides continuous realtime monitoring of an entire highwall with sub-millimeter accuracy. The device is limited to scanning the portions of the wall visible from its setup point; therefore, it is typically placed such that it monitors the highest or most critical wall under which personnel are actively working. At the time of writing, this is the Area 2 west highwall. During Phase V/VI, the radar will monitor the Minto North north highwall, then the Stage 3 west overburden slope, and finally the Ridgetop North west highwall, as each is mined.

In the event of a movement rate increase, the radar issues automated alerts to the mill control room operator, as this position is staffed continuously. The control room operator will communicate with the pit foreman, operation supervisor, or geotechnical engineer to address the alarm or cease work in the affected area.

Other sections of wall are monitored by weekly visual inspections, performed by two technical personnel, typically the ground control engineer, geologist, or the drill / blast engineer. These inspections check for raveling, crack formation, overhangs, and unfavorably oriented structures such as wedges. The reports issue guidelines for safe work and can order corrective actions, if required.

5.1.6 Blasting and Wall Control

Wall control is achieved by means of trim blasting and pre-shear.

Trim blasting is the practice of firing dedicated wall control blasts along the perimeter of the pit, no more than five rows deep. This allows material to move freely away from the wall, minimizing the amount of energy transferred into the wall itself. Wall blasts are always fired independently of production blasts and are always shot to free faces; that is, all previously blasted material is mined out along the perimeter of a trim blast. To further minimize the amount of energy transferred into the wall, blasts are tied-in such that the direction of movement is parallel to the wall instead of perpendicular to it.

Minto continues to use pre-shear drilling to further enhance wall control. Pre-shear drilling has been very effective assisting Minto to achieve designed wall angles. This is a technique in which closely-spaced small diameter holes, drilled to follow the final contour of the wall, are loaded with decoupled charges. Groups of holes are fired simultaneously, encouraging the formation of a fracture plane between them. Much of the strain energy from production / buffer blastholes, upon meeting this discontinuity, will be reflected back, instead of continuing into the wall where it would result in back-break.

The decoupled charge – that is, one in which the charge diameter is substantially smaller than the hole diameter – is meant to reduce the magnitude of the peak strain around the blasthole, preventing damage to the wall in its immediate vicinity. 4.5” holes loaded are with 1.25” continuous column charges. Spacing is generally 1.5m.

5.1.6.1 Explosives

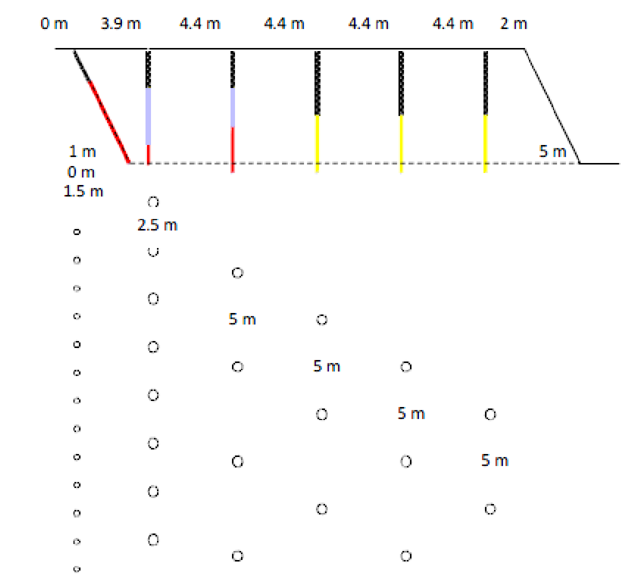
For production blasts, the mine uses mini-prill ANFO with a bulk density of 1050 kg/m^3 as its default product; it is used wherever ground conditions are dry or holes can be dewatered and lined. Failing that, a water-resistant 70/30 emulsion/prill product is used. The decision to switch to an emulsion blend is at the blaster’s discretion in the field.

Dry product is preferred; however, groundwater conditions are variable and, when high influx of water is encountered, emulsion use can increase to 100% of total bulk product.

5.1.6.2 Typical Wall Loading

The following figures show Minto's wall loading standards for 6.0m benches. All of Minto's pit designs have catch benches at 24m intervals. Every fourth bench is therefore shot above a catch bench, and the standards are modified to prevent damage to the crest by eliminating subgrade and laying out the holes such that they do not fall directly over the crest.

Minto Mine 6 m Upper Lift - West Wall Initial Design 28-Oct-12



Face Confinement Analysis	
Top of Charge (m):	3.7
Charge Diameters:	21.6
Bottom of Charge (m):	5.0
Charge Diameters:	29.2

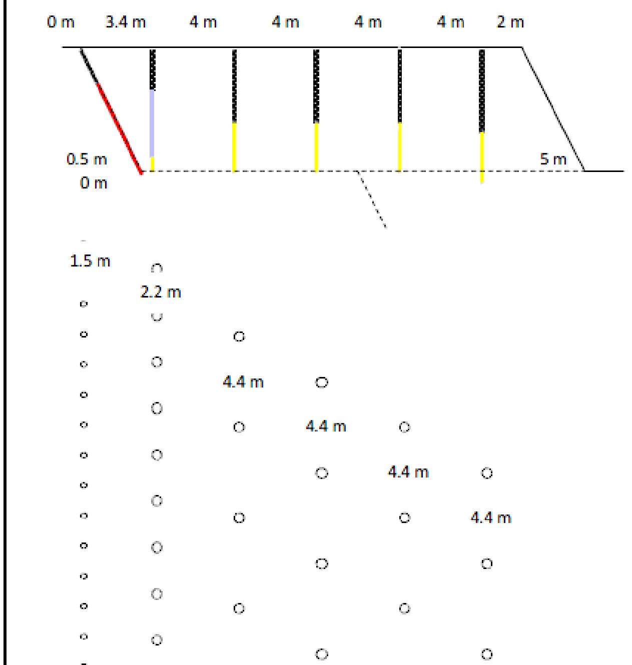
Displacement Analysis	
Estimated Face Velocity	
Top of Charge (m/s):	15.1
Bottom of Charge (m/s):	10.6
Estimated Face Displacement *	
Displacement Correction:	100%
Top of Charge (m):	23.9
Bottom of Charge (m):	9.9

* Note:
The estimated displacement does not consider the "rolling" of the material once it hits the ground. This rolling can extend the muckpile well beyond the estimated displacement.

Design Data	Presplit Row	1st Buffer Row	2nd Buffer Row	1st Modified Production Row	2nd Modified Production Row	3rd Modified Production Row	
Hole Diameter (mm):	102	171	171	171	171	171	
Hole Depth (m):	6.7	6.0	6.5	6.5	6.5	6.5	
Hole Angle (deg):	26						
Burden (m):	3.9	4.4	4.4	4.4	4.4	3.5	
Spacing (m):	1.5	2.5	5.0	5.0	5.0	5.0	
Stemming (m):	1.8	2.0	2.0	3.4	3.4	3.4	
Airdeck (m):							
Subdrill or Standoff (m):			0.5	0.5	0.5	0.5	
Offset from Slope (m):		1.0	5.1	9.5	13.9	18.3	
Main Charge Type:	None	None	None	ANFO 171	ANFO 171	ANFO 171	
Main Charge Weight (kg):				75	75	75	
Mid Inert or Air Deck (m):		3.0	2.0				
Bottom Charge Type:	Presplit 37	ANFO 171	ANFO 171				
Bottom Charge Weight (kg):	6	25	60				Average
Powder Factor (kg/bcm):	0.18	0.38	0.45	0.57	0.57	0.71	0.53
Energy Factor (kcal/tonne):	53	122	147	183	183	230	152
Comments:							

Figure 11: Loading standards for the top three 6m benches along a 24m section of highwall.

Minto Mine 6 m Lower Lift - West Wall Initial Design 28-Oct-12



Face Confinement Analysis

Top of Charge (m):	4.0
Charge Diameters:	23.4
Bottom of Charge (m):	5.0
Charge Diameters:	29.2

Displacement Analysis

Estimated Face Velocity	
Top of Charge (m/s):	13.8
Bottom of Charge (m/s):	10.6
Estimated Face Displacement *	
Displacement Correction:	100%
Top of Charge (m):	19.7
Bottom of Charge (m):	9.9

* **Note:** The estimated displacement does not consider the "rolling" of the material once it hits the ground. This rolling can extend the muckpile well beyond the estimated displacement.

Design Data	Presplit Row	1st Buffer Row	2nd Buffer Row	1st Modified Production Row	2nd Modified Production Row	Crest Row	
Hole Diameter (mm):	102	171	171	171	171	171	
Hole Depth (m):	6.7	6.0	6.0	6.0	6.0	6.5	
Hole Angle (deg):	26						
Burden (m):	3.4	4.0	4.0	4.0	4.0	3.5	
Spacing (m):	1.5	2.2	4.4	4.4	4.4	4.4	
Stemming (m):	1.8	2.0	3.5	3.5	3.5	4.0	
Airdeck (m):		3					
Subdrill or Standoff (m):						0.5	
Offset from Slope (m):		0.5	4.5	8.5	12.5	16.2	
Main Charge Type:	None	ANFO 171	ANFO 171	ANFO 171	ANFO 171	ANFO 171	
Main Charge Weight (kg):		20	60	60	60	60	
Mid Inert or Air Deck (m):							
Bottom Charge Type:	Presplit 37						
Bottom Charge Weight (kg):	6						Average
Powder Factor (kg/bcm):	0.21	0.38	0.57	0.57	0.57	0.65	0.54
Energy Factor (kcal/tonne):	60	122	183	183	183	209	158
Comments:							

Figure 12: Loading standards for the bottom 6m bench along a 24m section of highwall.

5.1.6.3 Interaction with Underground Blasting

Due the presence of ungrouted diamond drill holes running from the active pits to active underground workings in Area 2, and due to the proximity of Ridgetop North to the Minto South Underground portal, both open-pit and underground blasts will be scheduled as such that safety of workers is fully considered.

5.1.7 Haul Roads

Haul roads at Minto are typically designed to accommodate Cat 777 haul trucks in a dual lane configuration. Road widths are based on the requirements of Yukon WCB regulation 15.43(1)(a): they are three times the width of the truck, measured between the mirrors.

Berms are designed to be 75% of the trucks' tire height, as per Yukon WCB regulation 15.43(1)(b). Berms are constructed with 45° side slopes.

Allowance is made for a ditch on one side of the road, one meter wide.

These factors yield the following road design characteristics:

Truck width	6.05 m
Road surface width	18.3 m
Tire height	2.70 m
Berm height	2.0 m
Berm width	4.1 m
Total road width, against highwall (one berm, one ditch)	23.4 m
Total road width, two berms, one ditch	25.0 m

Table 6: Haul road design parameters.

Design grade is 10%. Grade limits are applied to the inside corner of a turn.

A speed limit of 50 km/h is in effect on mine roads. Minto also has a light-vehicle training and sign-off program intended to ensure that personnel are familiarized with the mine site prior to driving. All personnel and all types of vehicles are required to announce their presence at certain call points, which are marked with roadside signs: these are typically busy intersections or areas with limited visibility.

Minto's Safe Work Procedure for vehicle operation specifies the following priorities for right-of-way:

1. Emergency vehicles;
2. Explosive trucks;
3. Crew busses;
4. Loaded haul trucks;
5. Empty haul trucks;
6. Service equipment (fuel, water, and heavy maintenance trucks);
7. Light vehicles.

Passing of haul trucks is not permitted.

5.2 Fleet

Minto's fleet is largely contractor-owned and -operated, with the exception of a blasthole drill used for both production and pre-shear drilling. The following table summarizes the available equipment.

Equipment Type	No. of units
Hitachi EX2500 front shovel	1
Hydraulic Excavators, Hitachi EX1200 or similar	3
100-ton Haul Trucks, Cat 777	10
60-ton Haul Trucks, Cat 773	4
Front-end loaders, Cat 990 / Cat 992	2
Small Hydraulic Excavators, Cat 330 or similar	2
D11-class dozer	2
D10-class dozers	2
Graders, 16' blade	2
Contractor blast hole drills, 9 7/8" hole diameter	2
Contractor blast hole drills, 6 ¾" hole diameter	2
Minto blast hole drill, Sandvik DR560, 4 to7.5" hole diameter	1

Table 7: Open-pit equipment fleet for Phase V/VI mining.