

**DATE** 11 August 2017**REFERENCE No.** 1528754-018-TM-Rev1-11000**TO** Kevin Cymbalisky  
Minto Explorations Ltd.**CC** Heather Friday and Dale Heffernan**FROM** Derek Badner and Darren Kennard**EMAIL** Derek\_Badner@golder.com;  
Darren\_Kennard@golder.com**INSPECTION OF PHYSICAL STABILITY OF UNDERGROUND WORKINGS AT MINTO MINE, YUKON****1.0 INTRODUCTION**

This technical memorandum summarises the results of an underground inspection carried out by Mr. Darren Kennard, P.Eng., and Ms. Juliana Martin, P.Eng. (BC), of Golder Associates Ltd. (Golder) for Minto Explorations Ltd. (Minto) at their underground Minto Mine. The inspection was aimed, in part, to satisfy the terms of Yukon Department of Energy, Mines, and Resources Quartz Mining License QML-001, Section 13.2 which states:

**13.2** *The Licensee must ensure that inspection of the physical stability of all engineered structures, works and installations located at the site is conducted by an independent engineer by 30 June of each year of the terms of the License, including the tailings facilities and related impoundment structures, the waste rock and overburden storage facilities, the open pits, eth underground workings, ore stockpiles, mill site, camp sites, any diversion structures or dams and any other engineered facilities or works associated with the Undertaking.*

The underground site inspection was carried out on 13 June 2017 to assess the physical stability of the engineered structures present in the accessible underground workings of the Minto Mine. The inspection was limited to ground support installations in the underground openings intended for access by mine personnel given the geotechnical engineering expertise of the authors.

As no systematic assessment of all ground support entities (e.g., each individual rockbolt) is feasible, spot inspections of ground support installations and observed ground support performance are compared to the mine's Ground Control Plan – Underground Operations, or GCP (December 2016 version). The GCP is a quality control and quality assurance document integral to occupational health and safety at the mine that describes the mine's approach to ground control. It includes key roles and responsibilities for: ground support design; implementation procedures; and verification of ground support design input and ground support performance processes. The GCP document is an integral part of Golder's assessment of the physical stability of the underground workings at the Minto underground mine.



## 2.0 UNDERGROUND INSPECTION

The inspection was carried out in select accessible portions of the Minto Underground on the date of the site visit. The areas inspected focussed on new areas of the underground which had been excavated since the inspection carried out approximately 1 year ago (2016). Older areas of the underground mine were also inspected to check that the ground support system was still functioning as originally designed and installed. Mr. Kennard and Ms. Martin were accompanied by Ms. Heather Friday, Engineer-In-Training, from the Minto Mine staff on the underground inspection. The accessible areas visited during the inspection included those listed below:

- Area 2 – 650L:
  - access to backfill
  - partially completed W1 stope
- Area 2 – 620L:
  - partially completed stopes B, C, D, and E
  - access to partially completed stopes F and G
- Area 2 decline and Minto East access
- Area 118 accesses to 740L and 710L
- Main Ramp

The portions of the underground visited during the inspection are outlined in Figure 1.

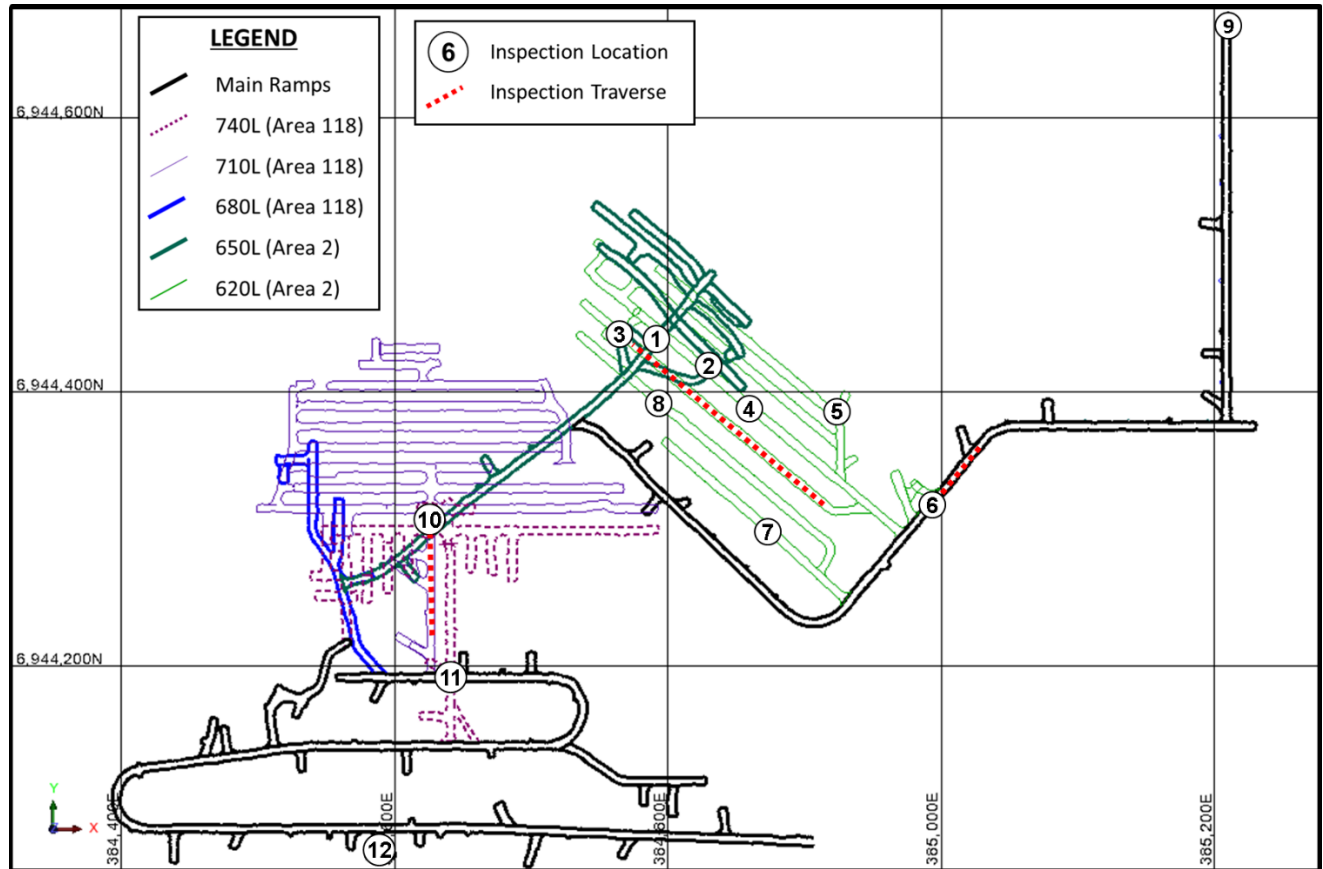


Figure 1: Areas Visited During Inspection

Observations during the inspection included checks of the performance and efficacy of the ground support installed in the underground workings and conformance of the ground support to the direction provided in the GCP document. Golder's main observations include:

- The ground support installed in the underground conforms to the GCP document guidance.
- Main assumptions in the GCP document used to design the ground support system at Minto are valid, including the intact rock strength of the various rock types, the rock mass quality, the in-situ stress, and the character of the rock mass fabric (e.g., joints and faults).
- Ground support performance is suitable for the ground that hosts the accessible underground openings excavated by Minto.
- Ground support rehabilitation implementation conformed to the guidance in the GCP document.
- Little or no corrosion of old (> 2 years) ground support was observed from the surface of excavations.

Golder Associates has previously reviewed the GCP document for Minto and found its content suitable for the purpose and that the implementation and verification of its content and guidance are well executed. As part of this inspection, Golder reviewed the updated December 2016 version of this document and found that it continues to be suitable for the type of ground encountered to date in the Minto underground and the size and purpose of openings excavated.

### 3.0 CONCLUSION

Our assessment of the physical stability of the engineered structures present in the underground workings of the Minto Mine is that the ground control practices implemented in personnel accessible areas are suitable for the type of ground encountered to date in the Minto underground given the size and purpose of openings excavated. Also, the ground control standards and procedures implemented at Minto are commensurate with Canadian underground mining industry practice.

### 4.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or requirements, please contact the undersigned.

**GOLDER ASSOCIATES LTD.**

ORIGINAL SIGNED

ORIGINAL SIGNED AND SEALED

Derek Badner, P.Eng. (BC)  
Geological Engineer

Darren Kennard, P.Eng.  
Principal, Geotechnical Engineer

DTB/DTK/it/cr

\\golder.gds\gal\burnaby\final\2015\3 proj\1528754 capstone\_groundctrlplanreview\_minto\1528754-018-tm-rev1-11000\1528754-018-tm-rev1-11000-2017 site visit for mines inspector 11aug\_17.docx