Phase V/VI Ridgetop South & Area 118 Backfill Dumps Physical Stability Assessment

Prepared for

Minto Explorations Ltd.

Prepared by

SRK Consulting (Canada) Inc.
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1 Introduction

1.1 Background

The Minto Mine, owned and operated by Minto Explorations Ltd. (a wholly-owned subsidiary of Capstone Mining Corporation), is located 240 km north of Whitehorse in central Yukon, Canada. Mine production started in 2007 and has since expanded through several phases of reserve expansion and licensing. Currently, the Minto Mine is operating under the Phase IV mine plan.

During the next phases of mining (Minto Phase V/VI), additional storage capacity will be needed for waste rock and overburden. More information on the Phase V/VI mining activities and planned disposal strategies are detailed in the Minto (2013a) “Waste Rock and Overburden Management Plan”.

1.2 Scope of Work

SRK Consulting (Canada) Inc. has been retained by Minto to complete an assessment of the physical stability of five proposed waste dumps (i.e., Ridgetop Waste Dump, Area 118 Backfill, Ridgetop South Backfill, Main Pit Dump, and Main Waste Dump Expansion) in support of the Phase V/VI licensing process. This report presents the physical stability assessment for the proposed Ridgetop South and Area 118 Backfill Dumps.

2 Site Description

The locations of the proposed Ridgetop South Backfill Dump (RSBD) and Area 118 Backfill Dump are provided on Figure RS118-1. The RSBD will be located within and over the mined out Ridgetop South Pit, and the Area 118 dump will be located within and over the mined out Area 118 Pit.

2.1 Surface Hydrology

Minto Mine is situated in the headwaters of Minto Creek, which follows a moderately steep-sided east-northeast–trending, V-shaped valley before reporting to the Yukon River. The existing mine facilities and all but one of the proposed Phase V/VI facilities (Minto North Pit) are located within the upper Minto Creek watershed (Figure RS118-1).

The RSBD and Area 118 Backfill Dump are located in the W35 catchment (Figure RS118-1).

2.2 Physiography and Foundation Conditions

Local topography around the RSBD and the Area 118 backfill site consists of rounded rolling hills and ridges up to approximately elevation of 930 m above sea level. For comparison, the elevation of the valley floor in the vicinity of the mine facilities, i.e. east of the mill area, is approximately 760m. Slopes at these overburden backfill dump areas are relatively gentle and do not present any notable accessibility problems or notable avalanche risks (Minto 2012). Vegetation in the area is comprised of a subarctic boreal forest made up of largely spruce and poplar trees.

The area has experienced several wildfires over the years and has no old-growth trees remaining (Minto 2012).

No field investigation has been completed for the RSBD and Area 118 dump as they will be located in mined out pits and founded primarily on bedrock. Field investigation programs (EBA 1996, 2011b; SRK 2013a, 2013e) have been completed in adjacent areas encountered primarily shallow overburden soils (typically less than 10 m) consisting of sand and gravel to sandy silt soils or weathered bedrock. Locations of past investigation points (e.g. drill holes and test pits) can be found on Figure RS118-3.

Most of the RSBD and Area 118 dump footprints are located in areas identified to contain limited to no significant permafrost, or are located directly in mined out pits. Figure RS118-2 shows estimated zones of permafrost and/or ice rich soils and historic overburden investigations on the Minto property (ConeTec 2010; EBA 1994, 1995, 1997, 1998a, 2006, 2007, 2008a, 2008b, 2011c, 2011d, 2012; Golder 1976; SRK 1994, 2008, 2010, 2012a, and 2012b).

2.3 Seismic Hazard

The tectonics and seismicity of southwestern Yukon are influenced primarily by the Pacific and North American lithospheric plate margins. In Yukon's St. Elias region, northwest British Columbia and southeast Alaska, the boundary of the two lithospheric plates changes from right lateral transform to subductive. Instead of sliding past each other, the Pacific Plate is forced beneath the stable North American plate resulting in the St. Elias region being uplifted. This transfer of force along the fault into uplift or mountain building dissipates tectonic energy, reducing seismic effects on the region northeast of and across the fault (SRK 2013c).

An assessment of peak ground acceleration was performed for the Minto project area using the 2010 National Building Code Seismic Hazard Calculation (Appendix A). The BC Mine Waste Rock Pile Research Committee 1991 outlined that a 10% probability of exceedance in 50 years or the 1:475 event is appropriate for dump design. This peak ground acceleration in the Minto project area is approximately 0.057 g.

3 Backfill Dump Design Overview

3.1 Ridgetop South Backfill Dump

The RSBD will be located primarily within the mined out Phase V/VI Ridgetop South Pit, with a small portion of the toe and south side of the final surface mounded above the pre-mining surface topography. The RSBD will be constructed of overburden sourced primarily from the Ridgetop North Pit. Overburden backfill that is ice-rich and/or thaw-stable will be deposited (either individually or co-disposed) at elevations below the lowest point in the Ridgetop South Pit rim (approximate elevation 882 m). Thaw-stable overburden will be placed at elevations above the pit rim.

The RSBD dump is designed with an average slope of 3H:1V (horizontal to vertical), measured from the bottom toe to the top crest. The top bench daylights into the adjacent pit wall and is typically greater than 70 m in width, the central and lower benches are about 15 m to 26 m in width, depending on whether the access ramp is intersected or not (Figure RS118-3). These widths allow the dump catchment to be smoothed with a dozer to an average slope angle on the order of 3H:1V at closure.

The bench face angles of the dump are assumed to be at slopes no greater than 1.5H:1V, approximately 34°, or at slopes near the maximum expected angle of repose for the coarser overburden soils. Typically average dump bench heights are 10 m or less and the maximum total depth of overburden below the pit rim is approximately 43 m. The ultimate crest of the RSBD will be approximately 10 m below the top rim of the pit, which is approximately elevation 909 m. The RSBD would have a capacity of 0.8 Mm^3 (approx.), based on the current mining schedule (Minto 2013a). A plan layout for the RSBD and an associated section are provided in Figure RS118-3.

3.2 Area 118 Backfill Dump

The Area 118 Backfill Dump will be located at the Phase IV Area 118 pit. The pit will first be backfilled and then the dump construction will extend on and around the footprint of the pit; approximately 3.6 ha of the dump footprint (or approximately 45%) will be outside of the pit. The Area 118 Backfill Dump will be constructed of overburden sourced primarily from the Phase V/VI Area 2 Stage 3 Pit. Similar to the RSBD, a combination of overburden backfill that is ice-rich and/or thaw-stable will be deposited (either individually or co-disposed) at elevations below the lowest point in the pit rim, approximate elevation 862 m.

The Area 118 dump is designed with an average slope of 3H:1V (horizontal to vertical), measured from the bottom toe to the top crest, with the top bench tying into the adjacent natural ground ridge. The top bench of the dump is typically greater than 90 m in width, the central and upper benches are typically about 20 to 26 m in width, and the lower benches are about 15 m in width. These bench widths again allow the dump catchment to be smoothed with a dozer to an average slope angle on the order of 3H:1V at closure.

Similar to the RSBD, the bench face angles of the dump are assumed to be at slopes no greater than 1.5H:1V, approximately 34°, and the typically average dump bench heights are 10 m or less. The maximum total depth of overburden below the pit rim is approximately 37 m for this dump. The ultimate crest of the dump will be at approximately elevation 915 m, and the dump will have a capacity of 1.3 Mm^3 (Minto 2013a). A plan layout for the Area 118 dump and two associated sections (one through the section on the natural ground and one through one of the deeper areas of the pit) are provided in Figure RS118-3.

4 Physical Stability Analysis

4.1 Assessment Methods

For the physical stability assessment of the RSBD and Area 118 Backfill Dump, factor of safety (FOS) values were utilized as the primary indices for evaluating performance. The assessment focused on mechanisms that drive overall slope failure, i.e. more towards toe, large skin and deep seated failures, and ignored small skin or surficial bench face failures (less than 5-6 m in depth).

The following commercially available software packages were utilized to complete this stability analysis:

- **Slide 6.0** limit equilibrium slope stability software package (Rocscience 2012a) was used as the primary assessment program.
- **Slope/W 8.1**, Geostudio 2012 limit equilibrium software package (Geo-Slope 2012) was used to confirm results and perform the sensitivity analysis on material strength properties. Slip surfaces were evaluated using the Spencer method with periodic checks completed using the Morgenstern-Price method. Slip surface searches (auto-locate, entry and exit, and grid and radius) were completed for each model section to ensure the lowest and most representative FOS were being identified in the models.
- **Phase^2 8.0** finite element software package (Rocscience 2012b) was used to perform shear strength reduction model runs to further investigate and predict the development of stresses and deformations in the dumps. This analysis assisted in investigating stiffness interactions and behaviours that are not assessed in the limit equilibrium analysis.

4.2 Design Criteria

Per Yukon requirements, design criteria are based on the recommended FOS listed in the “Mined Rock and Overburden Piles Investigation and Design Manual” (BC Mine Waste Rock Pile Research Committee 1991) and are provided in Table 4.1.

Table 4.1: BC Mined Rock and Overburden Pile Minimum Factor of Safety Guidelines

Stability Condition	Suggested Minimum Design Values for FOS	
	Case A	**Case B**
Stability of Dump Surface		
Short-term (during construction)	1.0	1.0
Long-term (reclamation – abandonment)	1.2	1.1
Overall Stability (Deep Seated Stability)		
Short-term (static)	1.3 – 1.5	1.1 – 1.3
Long-term (static)	1.5	1.3
Pseudo-static (earthquake)	1.1 – 1.3	1.0
1. Case A • Low level of confidence in critical analysis parameters • Possibly unconservative interpretation of conditions or assumptions • Severe consequence of failure • Simplified stability analysis method (charts, simplified method of slices, etc...) • Stability analysis method poorly simulates physical conditions • Poor understanding of potential failure mechanism(s)		
2. Case B • High level of confidence in critical analysis parameters • Conservative interpretation of conditions, assumptions • Minimal consequence of failure • Rigorous stability analysis method • Stability analysis method simulates physical conditions well • High level of confidence in critical failure mechanism(s)		

Ranges of suggested minimum design values are presented in the Table 4.1 guidelines to reflect different levels of confidence in understanding site conditions, material parameters, and consequences of instability. As these overburden backfill dumps will be constructed primarily within mined out pits, Case B is considered to be appropriate for the RSBD and Area 118 Backfill Dumps and its design criteria were used to guide the analyses. Sensitivity analyses (Section 5) were completed to gain a further understanding of the critical stability parameters, and to confirm the suitability of the Case B design criteria.

For pseudo-static (earthquake) analyses, BC Mine Waste Rock Pile Research Committee (1991) specifies peak ground accelerations with a 10% probability of exceedance in 50 years.
As mentioned in Section 2.3, the peak ground acceleration of 0.057 g was used in this analysis.

4.3 Geometry

One critical section for the RSBD and two critical sections for the Area 118 Backfill Dump were selected for analysis. These sections are taken at locations with less favourable dump geometries or foundation conditions. One of the two sections for each dump are located in areas with larger pit backfill and ultimate dump heights, and the other Area 118 Backfill Dump section is located though the portion of the dump where the dump is built outside the pit, i.e. directly over the overburden foundation.

4.4 Material Properties

4.4.1 Strength Parameters

Material properties used in the analysis were based primarily on strength parameters from previous overburden investigations, lab testing and past engineering analyses (EBA 1998a, 1998b, 2008a, 2008b, 2011a, 2011d, and SRK 2013a, 2013d). Table 4.2 summarizes the conservative case material properties used in the stability analysis.

Table 4.2: Material Properties Used In Stability Analyses

Case	Unit	Unit Weight (kN/m^3)	Friction Angle (°)	Cohesion (kPa)
1	Ice-rich Overburden *(fine grained soils - silt to silt w. clay)*	18	25	0
2	Ice-rich Overburden *(ice-rich permafrost clay)*	18.5	0	60 *Undrained Shear Strength (S_u)*
3	Ice-rich Overburden *(ice-rich clay)*	18.5	12.5	19
1, 2	Thaw-stable Overburden *(sand/gravel)*	18	28	0
3	Thaw-stable Overburden *(sand/silty sand till)*	20	33	10
All	Weathered Bedrock	19.5	32	0
All	Bedrock / Open Pit	Infinite Strength Material		

To better evaluate the potential expected ranges and properties for the ice-rich and thaw-stable overburden, three separate cases, or combinations of conservative material properties (as outlined in Table 4.2 above), were assessed. In general, the values listed in Table 4.2 above are on the lower range, to slightly below, what might be expected to be encountered in the field.

Ice–Rich Overburden

Three sets of material properties were used to represent the ice-rich overburden, to obtain a better understanding of the potential dump failure mechanisms.

For the Case 1 runs, ice-rich overburden was assumed to be fined grained soils similar to what are present near the Southwest and Main Waste Dump areas. The friction angle was based on a direct shear test completed on a silty clay sample from test pit 97-TP02, located near the Main Waste Dump and was selected based on a comparison of soil index test results from past field investigation programs (SRK 2008, 2013d). This test resulted in a peak friction angle of 30° and a residual friction angle of 25°. Residual friction angle values were used in these conservative case stability analyses.

For the Case 2 runs, the ice-rich overburden was assumed to be similar to what was utilized in the EBA Area 1 South Wall Buttress Design (EBA 2011b). These material properties are based on undrained shear strength values obtained from a direct shear test on sample number Shel 02A/B, from back analysis results of long-term frozen creep strength of ice-rich permafrost clays (EBA 2011b), and from book/ research values from the Norwegian Geotechnical Institute on Greenland Svea clay (Berggren, 1983), which appears to have similar depositional characteristics. By using undrained shear strength parameters, a worst case scenario for the loading of soft clay-rich soils, that do not have a chance for excess pore pressures to drain, was investigated.

For the Case 3 runs, the ice-rich overburden was conservatively assumed from literature values for a weak ice-rich clay. The parameters were then compared against values estimated according to methods used for slope stability assessments in alpine permafrost soils (Nater et al., 2008). This follows the concept that drained loading of a completely dry or fully saturated soil will lead to a state where no cohesion appears (i.e. Case 1). For the Case 3 runs, conservative values similar to residual direct shear tests results from sample SHEL-01 and SHEL-02A/B (2009 shelby tube samples pushed into sloughed ice-rich clays from the South Wall Area 1 pit failure) in were used. Case 1 cohesion values were therefore increased and the overburden friction angles were conservatively reduced by half. Case 3 values are seen as very conservative as they do not take into account the mixing of the overburden as part of loading, hauling and deposition into the dump; which is expected to results in less frequent continuous and/or parallel ice layering.

Thaw-stable Overburden

Two sets of thaw-stable overburden material properties were prepared to represent the range of potential overburden properties.

For the Case 1 and 2 runs, thaw-stable overburden strength parameters are the same as those used for the “unfrozen foundation soils” used in the Southwest Waste Dump stability assessment (EBA 2008b). Those materials properties were obtained from a direct shear test from a silty sand material obtained from test pit 97-TP01 located near the Main Waste Dump with an average particle diameter (D_{50}) of 0.2 mm. The shear test resulted in a peak friction angle of 35° and a residual friction angle of 28° (EBA 1998b). The 28° friction angle was selected as a conservative value to represent the sand/gravel material properties as this material will be disturbed before hauling and placement in the backfill dumps.

For the Case 3 runs, thaw-stable overburden strength parameters are the same as those used for the sand/silt till unit in the EBA South Wall Buttress design report (EBA 2011b). These material properties were obtained primarily from 2010 cone penetration testing completed by ConeTec Investigation Ltd. around the DSTSF area (ConeTec 2010).

Weathered Bedrock

The weathered bedrock was assumed to consist of broken bedrock that is highly friable and readily breaks down to sand and gravel. The material properties were estimated based on literature values (Rondon, et al. 2007) and engineering judgement.

4.4.2 Elastic Properties

Additional elastic material properties are required to solve the finite element boundary value problem/equations. For the shear strength reduction runs, isotropic elastic properties were used. Based on engineering judgement a Young's Modulus (tensile or elastic modulus) of 50,000 kPa and a Poisson's Ratio (negative ratio of transverse to axial strain) of 0.3 to 0.4 were assumed for all materials.

4.5 Pore Water Pressures

A groundwater table and/or free flowing water were not identified in the January 2013 test pit program in the Ridgetop Waste Dump Area (SRK 2013a). The conditions upgradient of both backfill dumps are expected to be similar. This being noted, a temporary perched groundwater table could develop for a short period during freshet. There is also the potential for the pit to become fully saturated (from infiltration or melt water etc.) and for water to exist up to the low point in the pit rim. Water is not expected to significantly build up within the thaw stable overburden as it will be placed in a loose state which will allow for any free water to drain, and if required, diversion berms will be constructed upstream of the dump to control surface run-on. A sensitivity analysis was completed on the pore water pressures at both dumps, as described in Section 5.

5 Stability Sensitivity Analysis

A detailed sensitivity analysis was performed to assist with making recommendations and to better examine the relationships between the model inputs and outputs, reduce inherent model uncertainty, search for errors in the models, and gain confidence in the robustness of the RSBD and Area 118 Backfill dump stability assessment models. Sensitivity analyses were performed on the following parameters:

- Ice-rich and thaw-stable overburden material properties
  - In addition to completing the three material properties run cases (Section 4.1), additional sensitivity analysis was completed by varying friction angle and cohesion values, primary on the Case 1 runs.
    - Icre-rich cohesion values were typically varied between 0 and 10 kPa and the friction angle was varied between 20 and 30^o
    - Thaw stable cohesion values were typically varied between 0 and 10 kPa and the friction angle was varied between 24 and 34^o.
- Pore water pressures
  - Pore water pressures inputted and varied in the stability models through the use of a piezometric lines
  - Piezometric lines or water levels varied from the base of the pit up to the pit rim (i.e. to the point at which water would be expected to spill from the backfilled pit).

- Additional runs were completed by assuming a mounded water level within the dump, which exited at the overburden dump toe (i.e. by the pit rim).
- Runs to assist with developing monitoring recommendations were completed. This was done by assuming an unexpected worst case scenario with a mounded water table within the dump which exits the dump at the toe of the middle bench.

- Depth of failure / slip surface
  - Completed by utilizing various slip search methods on each modelled section and by forcing failure surfaces to progress deeper into the dump and foundation. Provided a better understanding of the overall failure mechanisms and the progression of failures from shallow skin failures, to smaller bench and toe failures, and finally to deep seated failures.

6 Physical Stability Analysis Results

6.1 Stability Analysis Results

Results from the RSBD and Area 118 Backfill Dump slope stability assessment are summarized in Table 6.1 and presented in Appendix B. All stability results meet or exceed the minimum required FOS. These results are complemented by the finite element shear strength reduction runs showing FOS values (or strength reduction factors) greater than 1.0. Based on the conservative design assumptions and material properties used to calculate the FOS, the stability of the overburden pit backfill dumps meet the specified FOS criteria.

Table 6.1: Summary of Slope Stability Results

Condition	Description	Required Factor of Safety	Minimum Calculated FOS	
			RSBD	Area 118 Dump
1	Short-term (construction) – bench failure	1.0	1.0	1.0
2	Short-term (construction) – deep seated failure	1.1-1.3	1.1	1.1
3	Long-term – bench failure	1.1	1.1	1.1
4	Long-term – deep seated failure	1.3	1.4	1.5
5	Pseudo-static (earthquake) – deep seated failure	1.0	1.0	1.0

The FOS for the interim end-dumped overburden benches, at 34° (approx.), are slightly above the required FOS of 1.0 (i.e., short-term, during construction case), however, some tension cracking and minor sloughing near the bench crest can be expected.

A comparison of the results for the three ice-rich overburden materials (Case 1-3, see Section 4.4) shows that the lower strength material properties result in deeper failure surfaces. With greater ice-rich overburden content in the pit, specifically between the top of the bedrock and the top rim of the pit (i.e. top portion of the pit that daylights in the in-situ overburden), slightly lower FOS values in the range of 1.0-1.1 (as reported in Table 6.1) were noted. When the ice-rich overburden content in the pit was maintained to no higher than the top of the bedrock, increases in the FOS by approximately 0.1-0.3 were noted (i.e. FOS of 1.2-1.4 or greater).

As the overburden backfill dump stability models progressed from dump surface failures to more deep seated or overall stability failures, higher FOS in the range of 1.4-1.8 were noted (Appendix C). Under seismic conditions, the FOS in the pseudo-static analysis for overall dump stability was found to be above 1.0.

Additional stability models were completed with uniform dump slopes of 2.5H:1V to assess stability at closure. These runs resulted in FOS values of 1.4-1.5 or greater. As the backfill dumps are designed to have final slopes of approximately 3H:1V, the 2.5H:1V slopes represent a conservative case.

6.2 Sensitivity Analyses

Appendix C presents a summary of the completed sensitivity analyses.

Overall the stability models were found to be moderately sensitive to changes in the thaw-stable and ice-rich overburden material properties, while the models were relatively insensitive to changes in material cohesion. As the material properties for the overburden and waste rock are conservative, no notable cause for concern was identified in the stability models if small variations from the modelled material strength values are encountered in the field.

For the pore water pressure sensitivity analysis, the Phase V/VI Hydrogeological Characterization report (SRK 2013b) was consulted. For these analyses the water level was assumed to be at the base of the pit and then varied up to the top of the bedrock in the pit (i.e. pit near full saturated state) to see effect. FOS of 1.0 or greater was found for all model runs. In addition, a mounded water table within the overburden dump was assessed. Even in these unexpected conditions, FOS in the range of 1.0-1.1 were noted in the models. The monitoring plan (Section ☐) has proactively incorporated further consideration to monitor water levels in the pit backfill and around these overburden backfill dump toes.

7 Recommendations

7.1 General Construction

General conservative construction recommendations to enhance the RSBD and Area 118 Backfill Dump stability are summarized below:

- Ice-rich overburden below the elevation of the pit rim is to be placed towards the back pit wall (i.e. away from low point in the pit rim or the final toe of the backfill dump). The ice-rich material is to be co-disposed with thaw-stable overburden or surrounded by thaw-stable overburden. Ice-rich overburden is to be placed only up to the top of the bedrock/ overburden contact, a few meters below the top rim of the pits.
- No notable quantity of ice-rich overburden will be stored above the elevation of the pit rims at these overburden backfill dumps. However, if small volumes of ice-rich

overburden are encountered, it is to be spread and surrounded by thaw-stable overburden. Any ice-rich overburden placed abovethe pit rim will be placed away from the toe of the dump and towards the back pit wall.

- The portions of the RSBD and Area 118 dump that are above the elevation of the pit rim should be constructed in an ascending (or upward) construction methodology, where possible (i.e. subsequent lifts/ benches should be supported on previously constructed lifts to ensure better dump compaction).
- Interim bench heights larger than 10 m should be avoided to minimize the risk of increased bench face sloughing and/or deeper skin failure surfaces developing.
- Similar to the waste rock dump construction, it is recommended construction proceed in a manner that maximizes the length of the dump crest. The longer crest length acts to slow the rate of loading on the foundation, minimizes potential pore water pressure development, and allows the dump materials to consolidate and gain frictional strength (BC Mine Waste Rock Pile Research Committee 1991).
- Some tolerance for snow accumulation is expected to be allowed for when backfill is placed below the rim of the mined out pit. For the lifts constructed above the pit rim, notable snow accumulation should not build-up on or between lifts. If larger snow accumulation (greater than 0.3-0.5 m) is apparent, then it should be removed before additional overburden is placed over that area.
- For increased safety, trucks should end dump loads inwards of the advancing crests (ideally within a few meters of the advancing crest). A dozer should then spread this material over the crest (onto the slope). As the overburden dump crests are expected to slough/ naturally shallow within the first 5-6m of the crest, any areas where tension cracks are noted within the first 5-6m of the ultimate dump crest (of a given bench) should not be travelled over by any heavy equipment.
- During Phase V/VI reclamation activities, the RSBD and Area 118 Backfill Dump will be used as a source of cover material for the Ridgetop area facilities, and other areas of site. Overburden sourced from the backfill dumps for progressive reclamation should be sourced from the top of the dump. For the Area 118 backfill dump, the areas of the dump that are outside of the Area 118 pit footprint should be preferentially used. Cuts into the ultimate toe of the dump should not be completed and cuts into the toes of benches should be minimized wherever possible.

7.2 Surface Water Management

Site grading design and the surface drainage system for the RSBD and Area 118 Backfill dump will be part of the site surface water management plans (Minto 2013b). Further surface water management recommendations, outlined below, can be considered to better mitigate water influences and minimize possible pore water pressure development within the dump.

- In general, the overburden placed above the pit rim is expected to be end-dumped and rough graded using a dozer for access and grade control prior to placement of the next lift. For areas of the backfill pit below the pit rim larger end-dump heights are expected, as grade control prior to placement of the next lift is not as critical. The rough surface grade, of the lifts above the pit rim, should have a minimum 0.5% overall grade sloped toward the outside of the dump to promote runoff and avoid surface ponding. Any ponded water should be monitored and noted as part of routine inspections. Further as part of the routine inspections any seeps are exiting the backfilled pit or if any flow above the pit rim if apparent then it should be noted.

- As the backfill dumps are expected to settle over time, some surface depression may result. Any ponding water within 10 m of the intermediate bench crests should be removed / re-graded to promote drainage.
- Localized erosion of the dump slope is expected and is not a concern for the overall stability of the dump. Any areas of consistent and notable localized erosion above the elevation of the pit rim, specifically those that cause significant material transport or are greater than 1 to 2 m in depth, should be remediated. Remediation activities are likely to consist of pushing coarser rock into the erosion gullies and trying to reduce / divert flow paths from this area. To assist with long-term erosion control, the final dump reclamation surface is recommended to be re-graded to at slopes of 2.5H:1V or gentler (final grading addressed in current plans, Minto 2013a).
- The use of upstream diversion ditches to limit the volume of run-on water to the dumps should be re-evaluated during construction. If run-on water is noted during the early stages of construction, diversion ditches should be considered.
- The backfill dumps should be tied-in at the top of the dump, with the natural ground or mined out pit walls, in a manner that avoids water accumulation.

7.3 Performance Monitoring

7.3.1 Visual Inspections

Consistent with the visual physical inspection requirements for the other site waste facilities, an annual site inspection of the RSBD and Area 118 Backfill Dump must be completed by a qualified geotechnical engineer. Following this inspection, the preparation of an annual site inspection report should be completed to outline any findings and observations, to include recommendations for maintenance, and to modify the monitoring program or the design if/as needed.

Routine monitoring on a monthly basis should also be completed by Minto staff and should include regular inspection of:

- External slopes for any signs of distress;
- Crest of the dump for any signs of cracking (note that cracking and minor sloughing near the dump crests is expected);
- The top dump surface (especially of fills placed over deeper areas of the pit) to note area of surface depressions that might result from settling of backfill or differential settlements;

- Dump and bench toes for any signs of sloughing, deformation, or seepage (noting if seepage clear or dirty); and
  - All observed seepage or seeps should be noted and monitored. Potential seeps or seepage is expected to be most apparent around freshet.
  - The existence of potential bulges in the toe areas downstream of the dump toe should also be checked.

Equipment should be avoid the dump crests and generally maintain an offset of 7 m. When not actively dumping, small berms, waste rock boulders, or jersey barriers should be placed at this offset to avoid equipment trafficking near the crest.

Equipment operators should inspect the crest of the bench they working on as part of their field level risk assessment at the start of each shift and inspect for any signs of cracking at or near the dump crest or look for any areas where toes appear to be ‘bulging’.

Any areas of concern or areas with notable apparent changes should be brought to the attention of the site engineer and engineer-of-record for further evaluation.

7.3.2 Surveying Requirements

The crest and toes of the overburden backfill dumps should be surveyed at the completion of each construction phase to compare the as-built geometry to the design surface, and to monitor deformations. In addition, the top surface of the backfill dumps should be surveyed. The latter may assist with constraining areas where increased settlement is occurring. As material is expected to be sourced from the backfill dumps for reclamation activities, after a phase of material removal is completed at the backfill dumps it should be resurveyed. Displacements or areas where settlements greater than a meter are apparent, can then be monitored more intently and can then be used as early warning for dump instabilities. To ensure early warnings or areas of slow movement are not missed, the crests and toes should be resurveyed and reviewed annually, or at the discretion of the inspecting engineer.

If any areas of continued movement are noted, then additional slope stability monitoring instrumentation (e.g., inclinometers or fixed survey monument) should be installed to better estimate rates of deformation and to ensure repeatability of the data.

7.3.3 Instrumentation Monitoring

Two piezometers (vibrating wire or standpipe) are recommended to be installed at each of the RSBD and Area 118 Backfill dumps (four total). One piezometer should be installed (at each dump) in the overburden, just above the bedrock and overburden contact in the natural ground immediately beyond the toe of the respective proposed backfill dump (i.e. outside / past the low point of the pit rim). A second piezometer should be installed through the lower overburden bench, above the pit rim, and should progress down into the backfill but terminate above the base of the mined out pit. These piezometers would be a precautionary measure to allow for monitoring of water levels near the dump toes and within the backfilled pit. The final locations of the piezometers should be determined in consultation with the managing engineer following inspection of the initial bench constructed above the elevation of the pit rim.

Piezometer readings should be taken monthly between freshet to the end of the summer season. The threshold warning level (triggers for action) should be determined following completion of the instrumentation installation.

This report, ***"Phase V/VI Ridgetop South & Area 118 Backfill Dumps - Physical Stability"*** was prepared by

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and reviewed by

PROFESSIONAL ENGINEER
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Nov. 14/13

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Practice Leader

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

8 References

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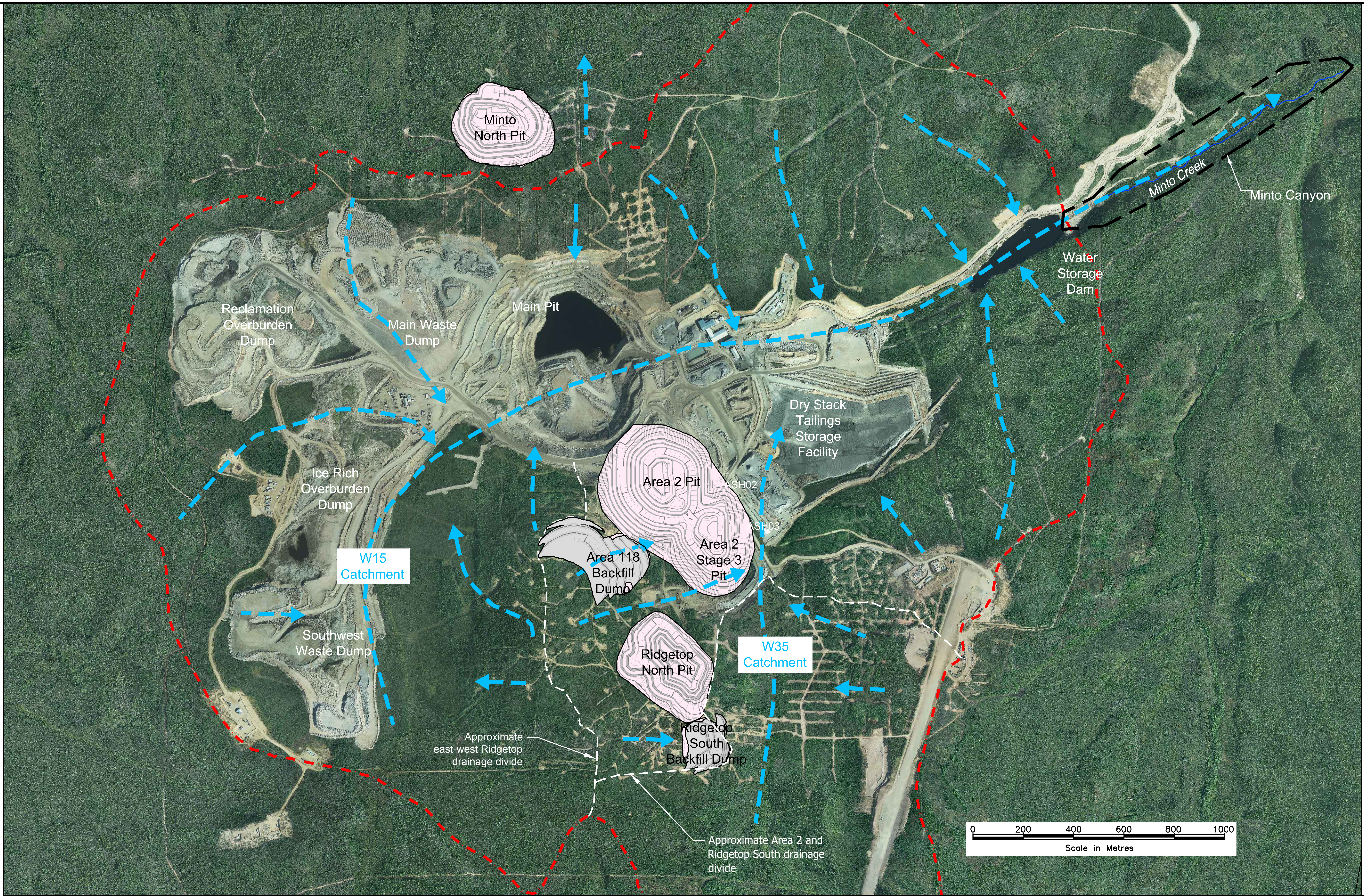
Figures



NOTES

1. Data presented in NAD 1983 UTM Zone 8N
2. Base Orthophoto provided by Minto Mine, August 2012
3. Phase V/VI pit shells provided by Minto Mine, March 2013
4. Phase V/VI 118 Backfill Dump design provided by Minto Mine, March 2013
5. Phase V/VI Ridgetop South Backfill Dump design provided by Minto Mine, August 2013
6. Only two of the proposed Phase V/VI waste rock and overburden dumps are shown on this figure .

LEGEND

- Upper Minto Creek Catchment Boundary
- Groundwater Flow Direction (Inferred)
- Phase V/VI Pit Shell
- Phase V/VI Backfill Dump

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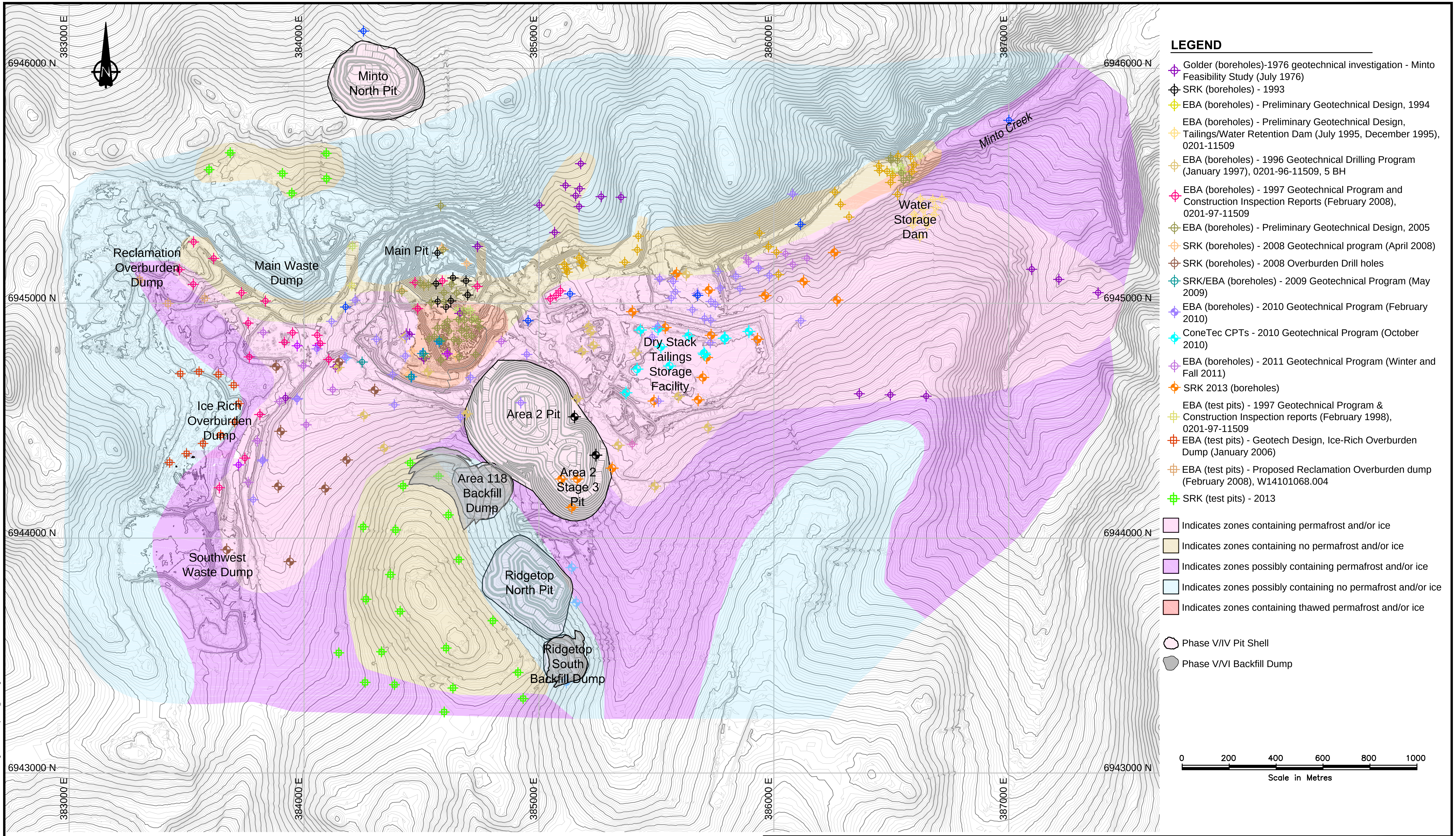
Phase V-VI Dump Stability Assessment

Site Layout and Existing Catchment / Groundwater Flow Directions

SRK JOB NO.: 1CM002.012.012
FILE NAME: Site Layout–RdgS Backfill Dump.dwg

Minto Mine

DATE: September 2013 | APPROVED: JBK | FIGURE: RS118-1



NOTES

1. Data presented in NAD 1983 UTM Zone 8N
2. Base Orthophoto provided by Minto Mine, August 2012
3. Phase V/VI pit shells provided by Minto Mine, March 2013
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5. Phase V/VI Ridgetop South Backfill Dump design provided by Minto Mine, August 2013
6. Only two of the proposed Phase V/VI waste rock and overburden dumps are shown on this figure .

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Phase V-VI Dump Stability Assessment

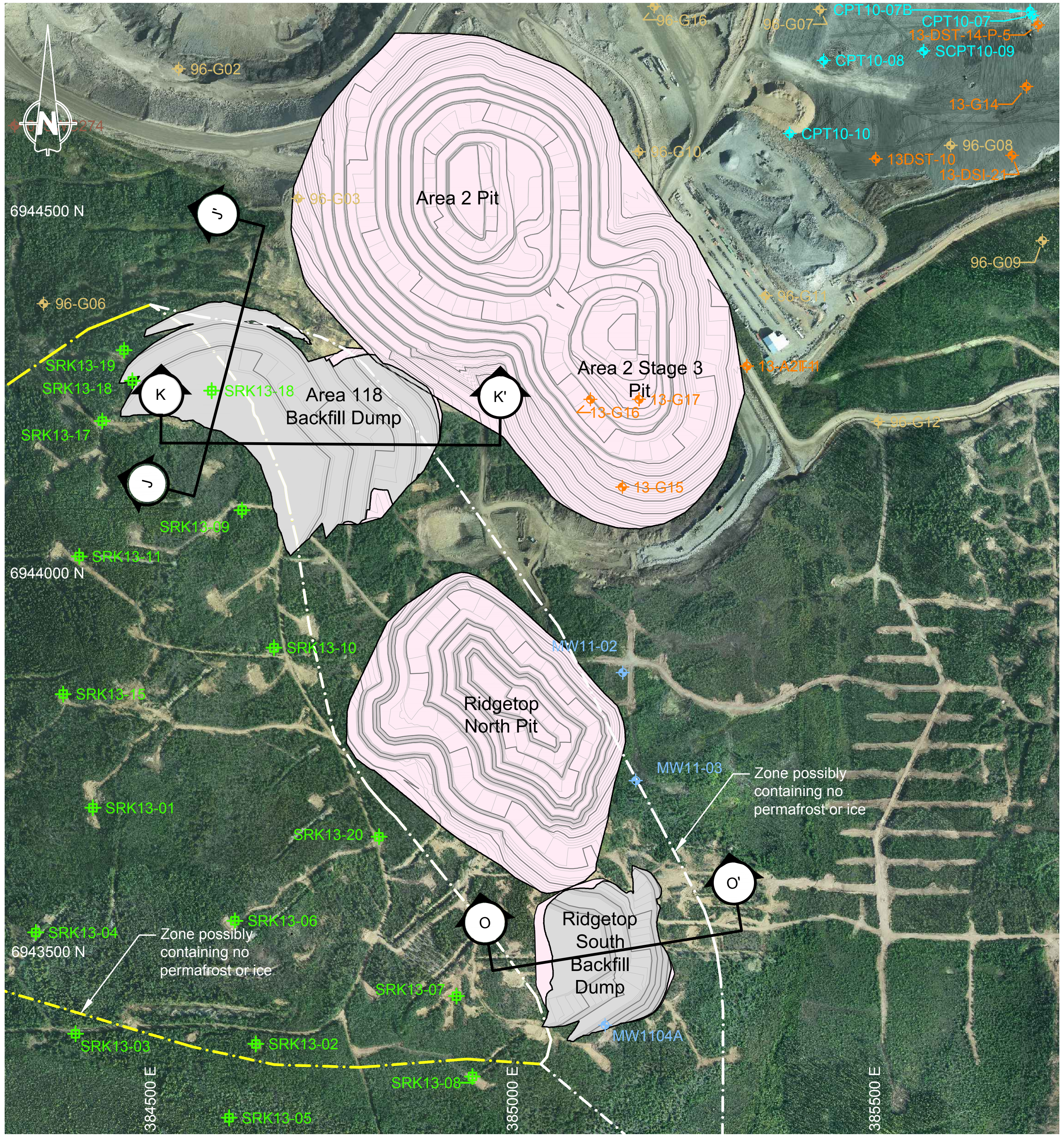
Permafrost Extent, and Historic Overburden Investigations

SRK JOB NO.: 1CM002.012.012

FILE NAME: Historic-overburden-Investigations-MWD Expansion_Rev1.dwg

Minto Mine

DATE:	APPROVED:	FIGURE:
September 2013	JBK	RS118-2



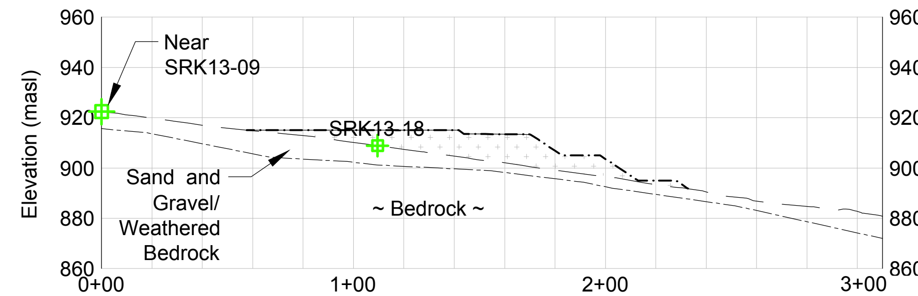
PLAN

0 50 100 150 200 250

Scale in Metres

LEGEND

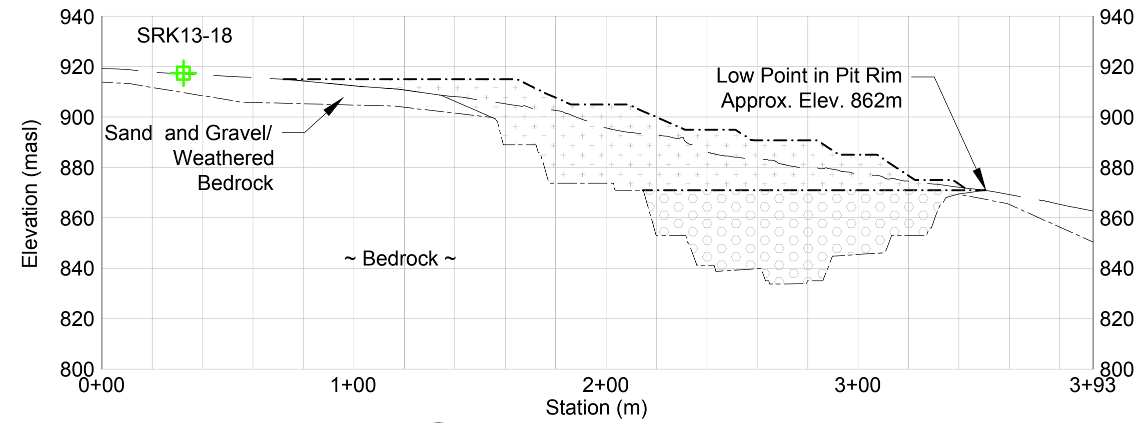
- Phase IV/V Pit Shell
- Phase IV/V Backfill Dump
- Original Ground
- Competent Bedrock
- Zone containing no permafrost and /or Ice
- Zone possibly containing no permafrost and /or Ice
- Thaw-Stable Overburden
- Ice-Rich Overburden and thaw-stable overburden



J **Profile J - J'**
Area 118

0 30 60 90 120 150

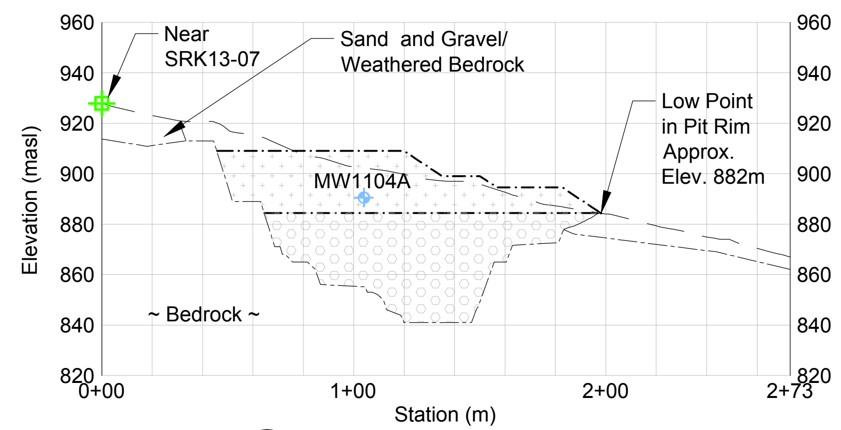
Scale in Metres



K **Profile K - K'**
Area 118 Dump

0 30 60 90 120 150

Scale in Metres



O **Profile O - O'**
Ridgetop South Dump

0 30 60 90 120 150

Scale in Metres

NOTES

1. Data presented in NAD 1983 UTM Zone 8N
2. Base Orthophoto provided by Minto Mine, August 2012
3. Phase V/VI pit shells provided by Minto Mine, March 2013
4. Phase V/VI 118 Backfill Dump design provided by Minto Mine, March 2013
5. Phase V/VI Ridgetop South Backfill Dump design provided by Minto Mine, August 2013
6. See drawings RS118-02 for more detailed test pit and borehole descriptions.

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SRK JOB NO.:	1CM002.012.012
FILE NAME:	Site Layout-RdgS Backfill Dump.dwg

Minto Mine

Main Dam Conceptual Design

Ridgetop South and Area 118 Backfill Dumps Plan and Sections

DATE:	APPROVED:	FIGURE:
September 2013	JBK	RS118-3

Appendix A: Site Seismic Hazard

2010 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Requested by: , SRK Consulting

August 02, 2013

Site Coordinates: 62.6064 North 137.2523 West

User File Reference: Minto Mine

National Building Code ground motions:
2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.213	**0.132**	**0.077**	**0.048**	**0.110**

Notes. Spectral and peak hazard values are determined for firm ground (NBCC 2010 soil class C - average shear wave velocity 360-750 m/s). Median (50th percentile) values are given in units of g. 5% damped spectral acceleration (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are tabulated. Only 2 significant figures are to be used. ***These values have been interpolated from a 10 km spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the calculated values.***

Ground motions for other probabilities:

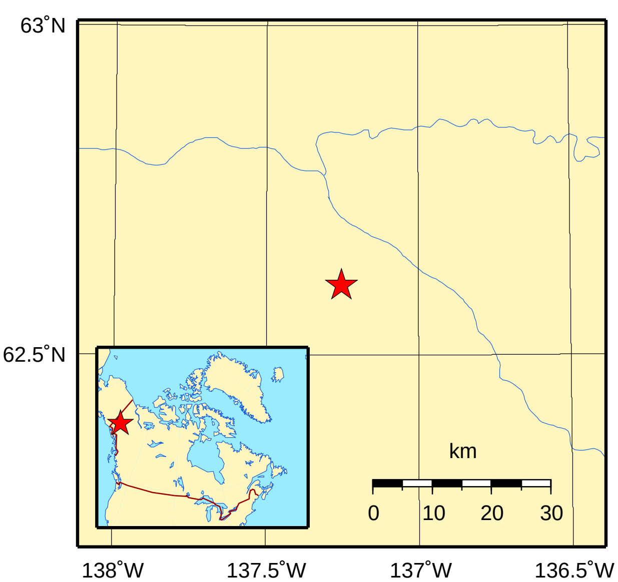
Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.2)	0.051	0.104	0.144
Sa(0.5)	0.037	0.070	0.093
Sa(1.0)	0.025	0.045	0.057
Sa(2.0)	0.017	0.029	0.036
PGA	0.028	0.057	0.077

References

National Building Code of Canada 2010 NRCC no. 53301; sections 4.1.8, 9.20.1.2, 9.23.10.2, 9.31.6.2, and 6.2.1.3
Appendix C: Climatic Information for Building Design in Canada - table in Appendix C starting on page C-11 of Division B, volume 2

User's Guide - NBC 2010, Structural Commentaries NRCC no. 53543 (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File xxxx
Fourth generation seismic hazard maps of Canada: Maps and grid values to be used with the 2010 National Building Code of Canada (in preparation)



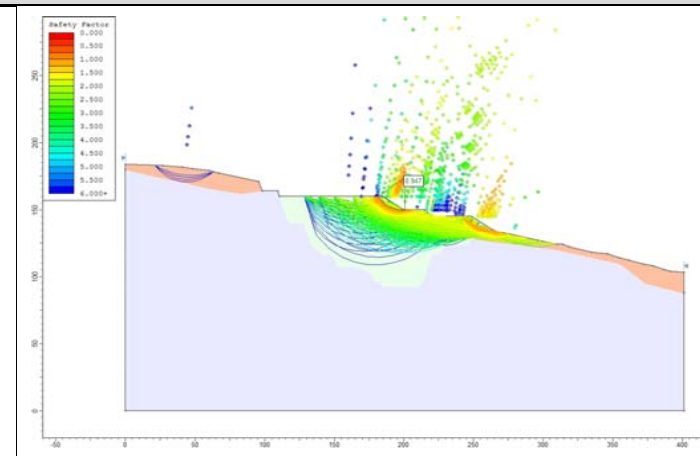
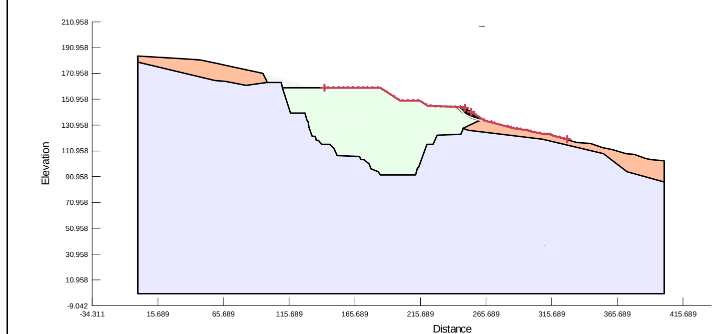
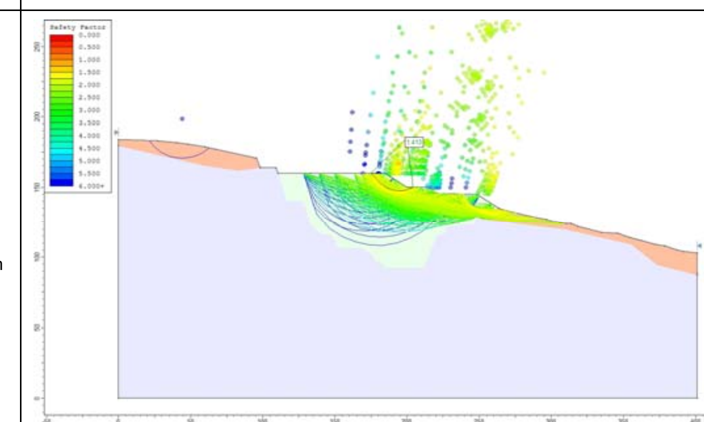
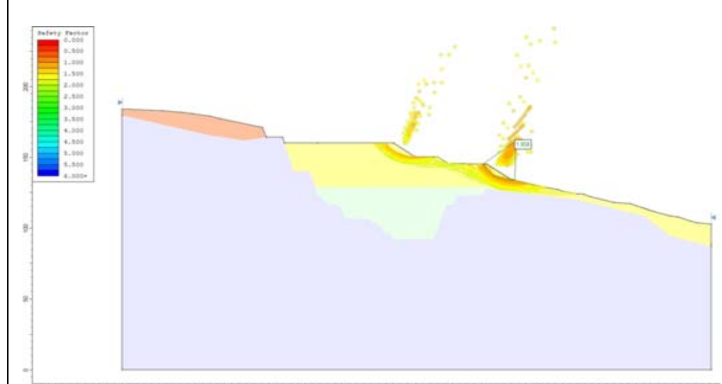
See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information

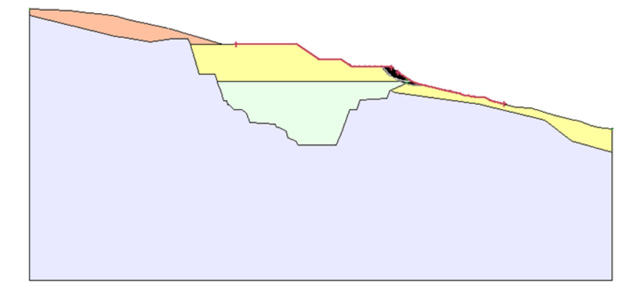
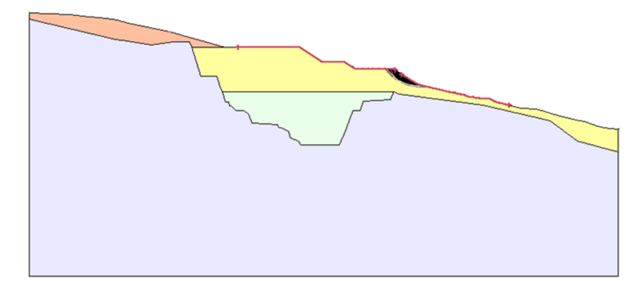
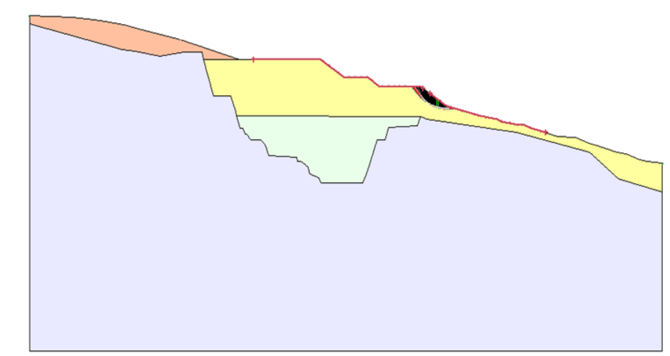
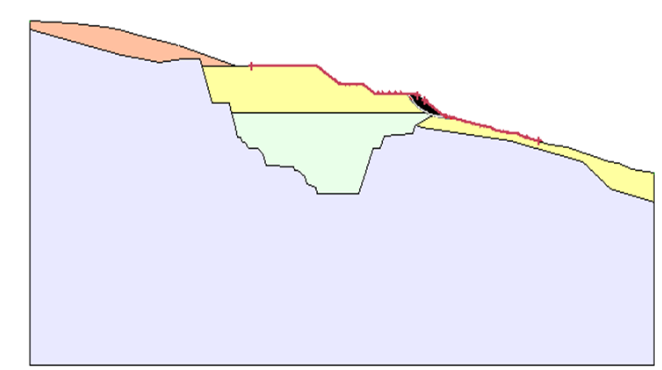
Aussi disponible en français

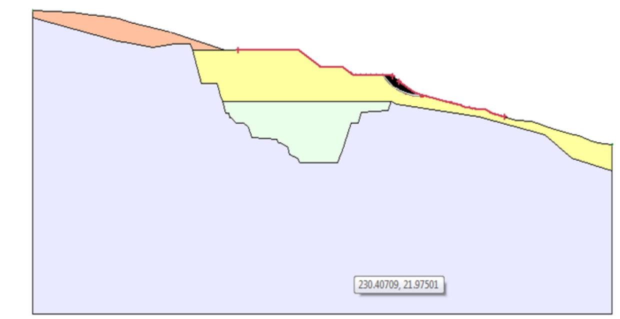
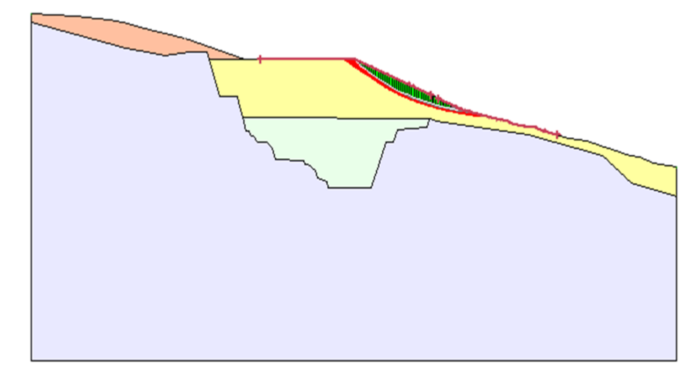
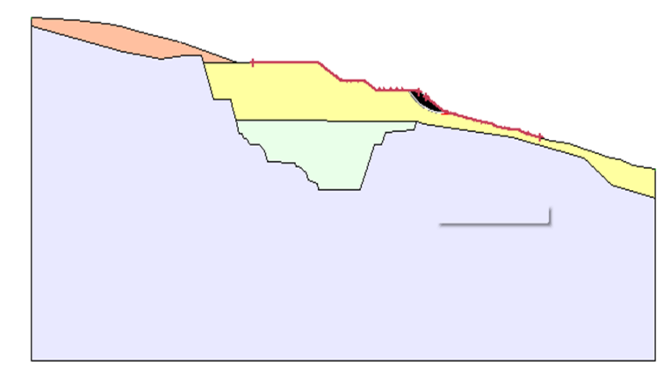
Appendix B: Stability Model Runs

Appendix B1: Ridgetop South Backfill Dump Stability

Ridgetop South Backfill Dump

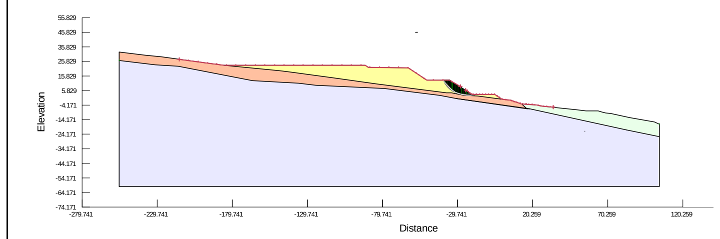
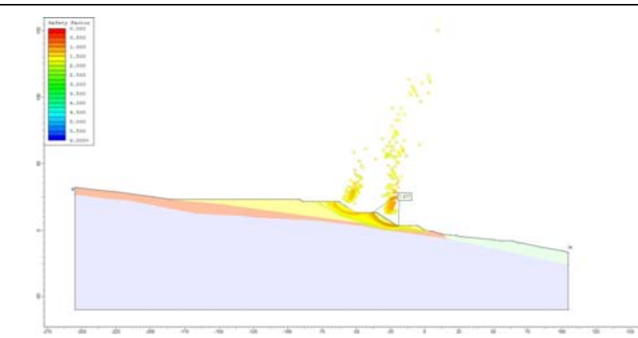
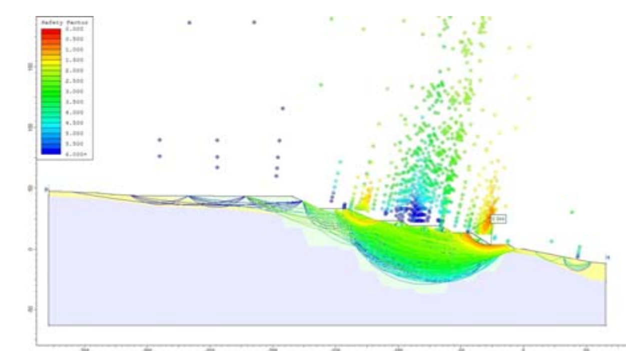
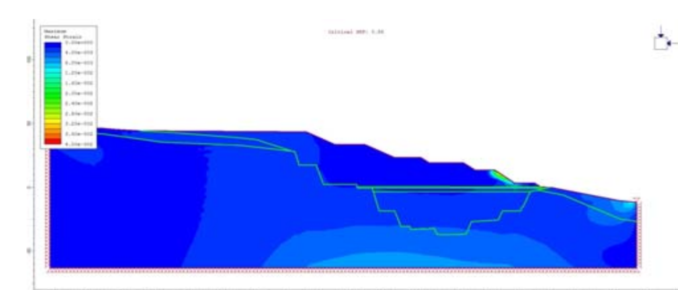
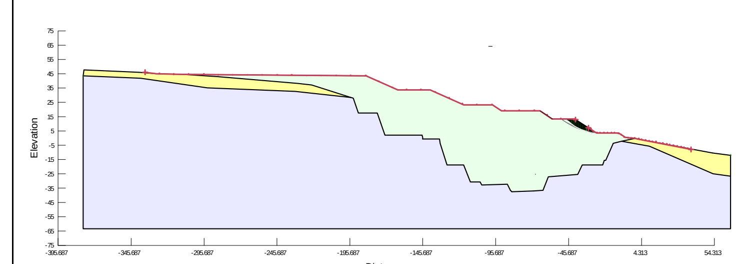
Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments
1	O-O'	**0 Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate	No	No	0.9	Assumed entire dump weak material (UNREALISTIC Case). Small scale bench failure in overburden bench. Sloughing within 5m of the bench face expected with bench faces angles of 1.5H:1V. When failures forces deeper into dump FOSs notably increase. Large scale / global FOSs in acceptable ranges. 
2	O-O'	**0 Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	No	1.0	Assumed entire dump weak material (unrealistic). Compliment run to run #1 
3	O-O'	**0 Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate Forced 10m Min Deep Failure	No	No	1.4	Assumed entire dump weak material (unrealistic). Large bench to transition failure (i.e. between skin and medium depth failure surface). Forced min 10m deep failure surface. 
4	O-O'	**1 (General Material Properties)**	Slide 6.0	Optimized Auto-locate	No	No	1.1	Small scale failure near toe of dump. 

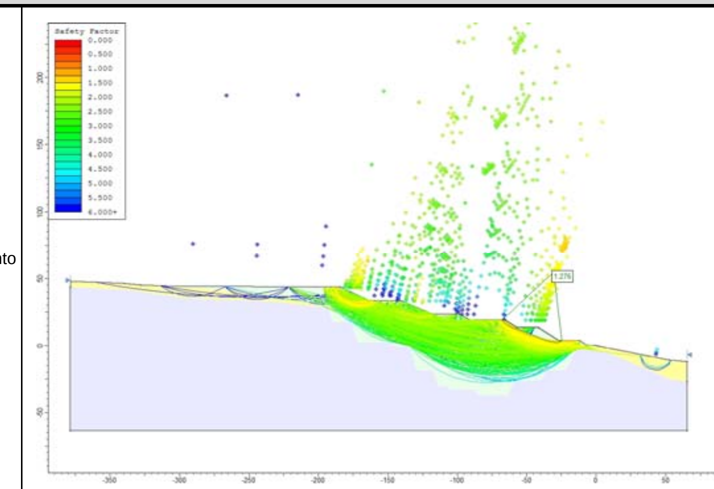
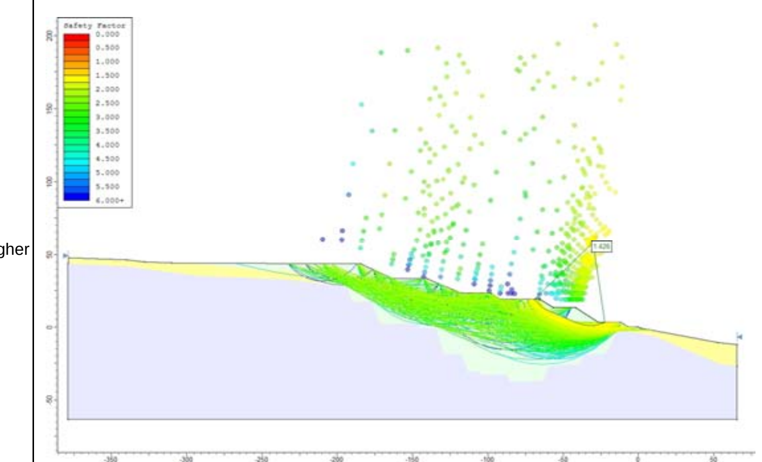
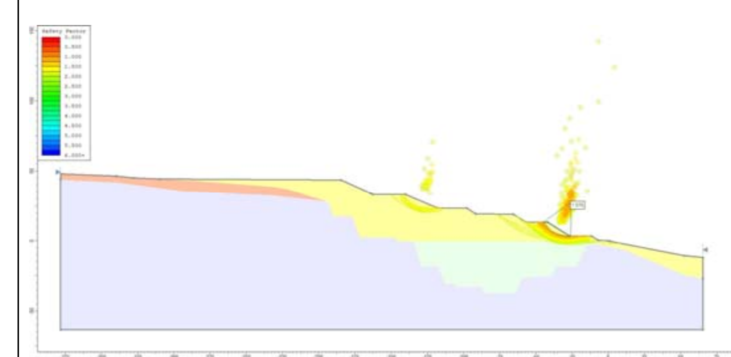
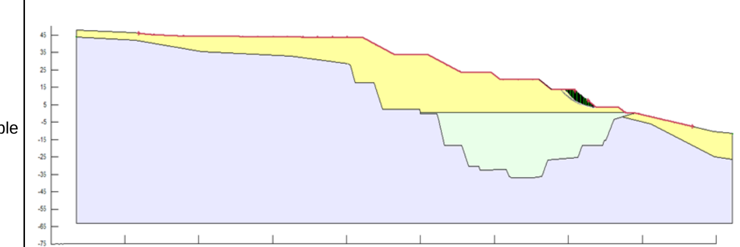
Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
5	**O-O'**	**1 (General Material Properties)**	Slope/W	Entry & Exit	No	No	1.2	Small scale bench failure in overburden bench.	
6	**O-O'**	**2 (Undrained, Ice-Rich with no friction only Su)**	Slope/W	Entry & Exit	No	No	1.1	Small scale bench failure in overburden bench.	
7	**O-O'**	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	No	No	1.8	Small scale bench failure in thaw-stable overburden bench	
8	**O-O'**	**1 Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	Yes	1.0	Small scale bench failure in thaw-stable overburden bench	

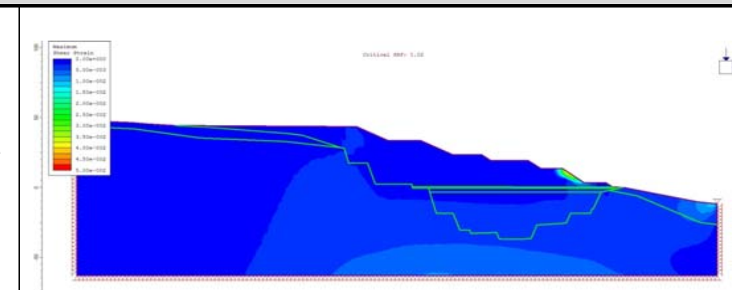
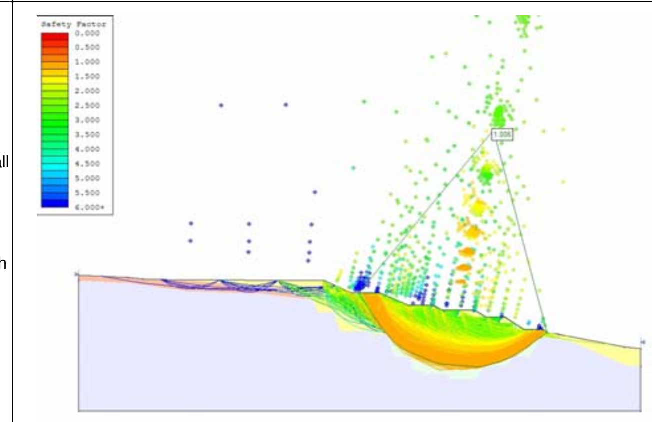
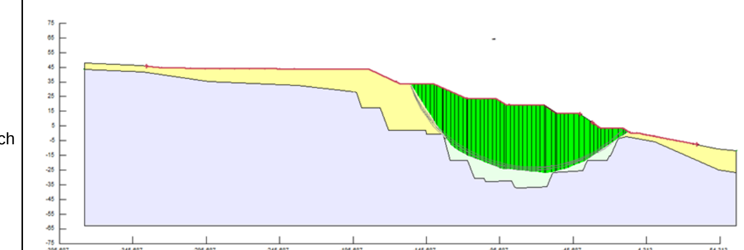
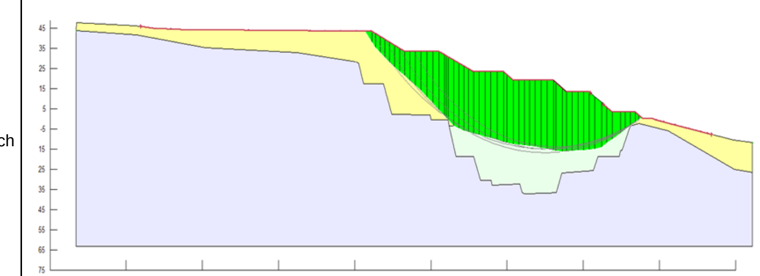
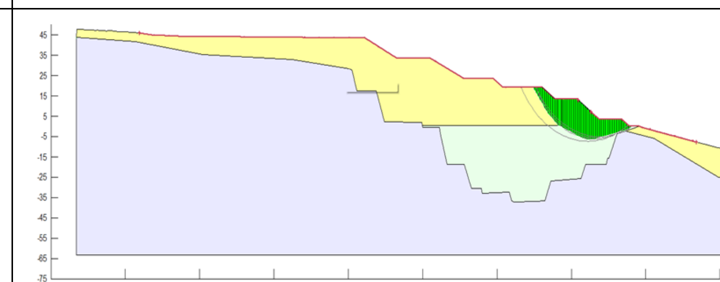
Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
9	**O-O'**	**2 (Undrained, Ice-Rich with no friction only Su)**	Slope/W	Entry & Exit	No	Yes	1.0	Small scale bench failure in thaw-stable overburden bench	
10	**O-O'**	**1 (General Material Properties)**	Slope/W	Entry & Exit	No	Yes	1.2	CLOSURE CASE (2.5H:1V) with seismic. Long shallow failure along slope in thaw-stable overburden	
11	**O-O'**	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	No	Yes	1.6	Small scale bench failure in thaw-stable overburden bench	

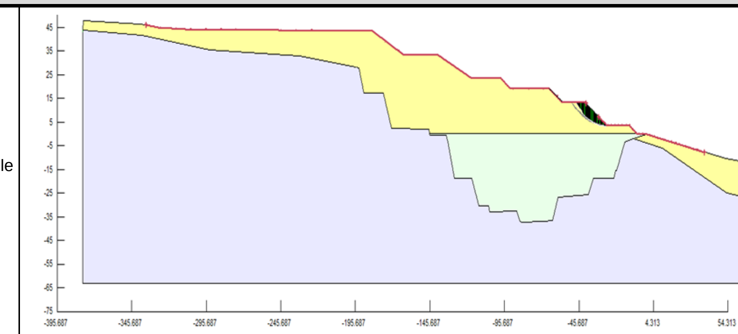
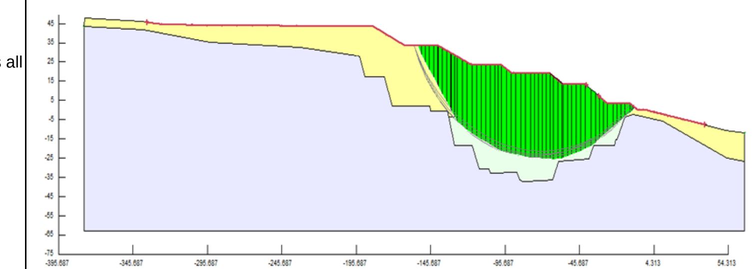
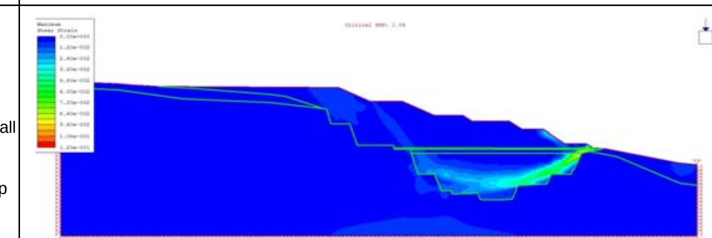
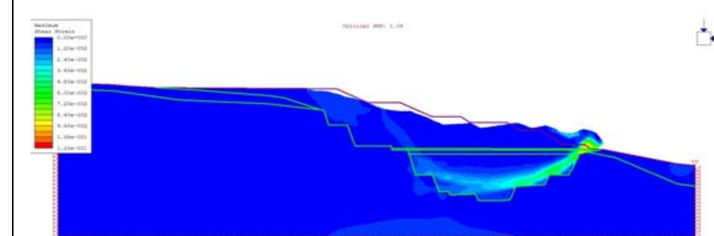
Note: FOS = Calculated Factor of Safety (or Strength Reduction Factor for finite element Shear Strength Reduction runs).

Appendix B2: Area 118 Backfill Dump Stability

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
1	J-J'	0 **Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	No	1.2	Small scale bench failure	
2	J-J'	1 **Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate	No	No	1.1	Small to medium bench failure. FOSs slightly greater than 1.5 have slight failures into foundation.	
3	K-K'	0 **Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate	No	No	0.9	Small scale bench failure in overburden bench. Sloughing within 5m of the bench face expected with bench faces angles of 1.5H:1V. When failures forces deeper into dump FOSs notably increase. Large scale FOSs in acceptable ranges.	
4	K-K'	0 **Fatal Flaw Review (General Material Properties)**	$Phase^2$ 8.0	Shear Strength Reduction	No	No	0.9	Inputs based on Slide 6.0 model. Shear strain contours shown in screenshot. Lighter / hotter (more red) colours indicate areas with higher shear strain. See slightly higher strains within ~5m of bench crests. Note for operation mainly; as overall dump stability / deep seated failures have higher FOS. If reduce sloughing is desired then shallower bench face angles (i.e. on the order of 2H:1V or shallower) should be used.	
5	K-K'	0 **Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	No	1.0	Compliment run to run #2. Small scale bench failure within first ~5-6m from crest.	

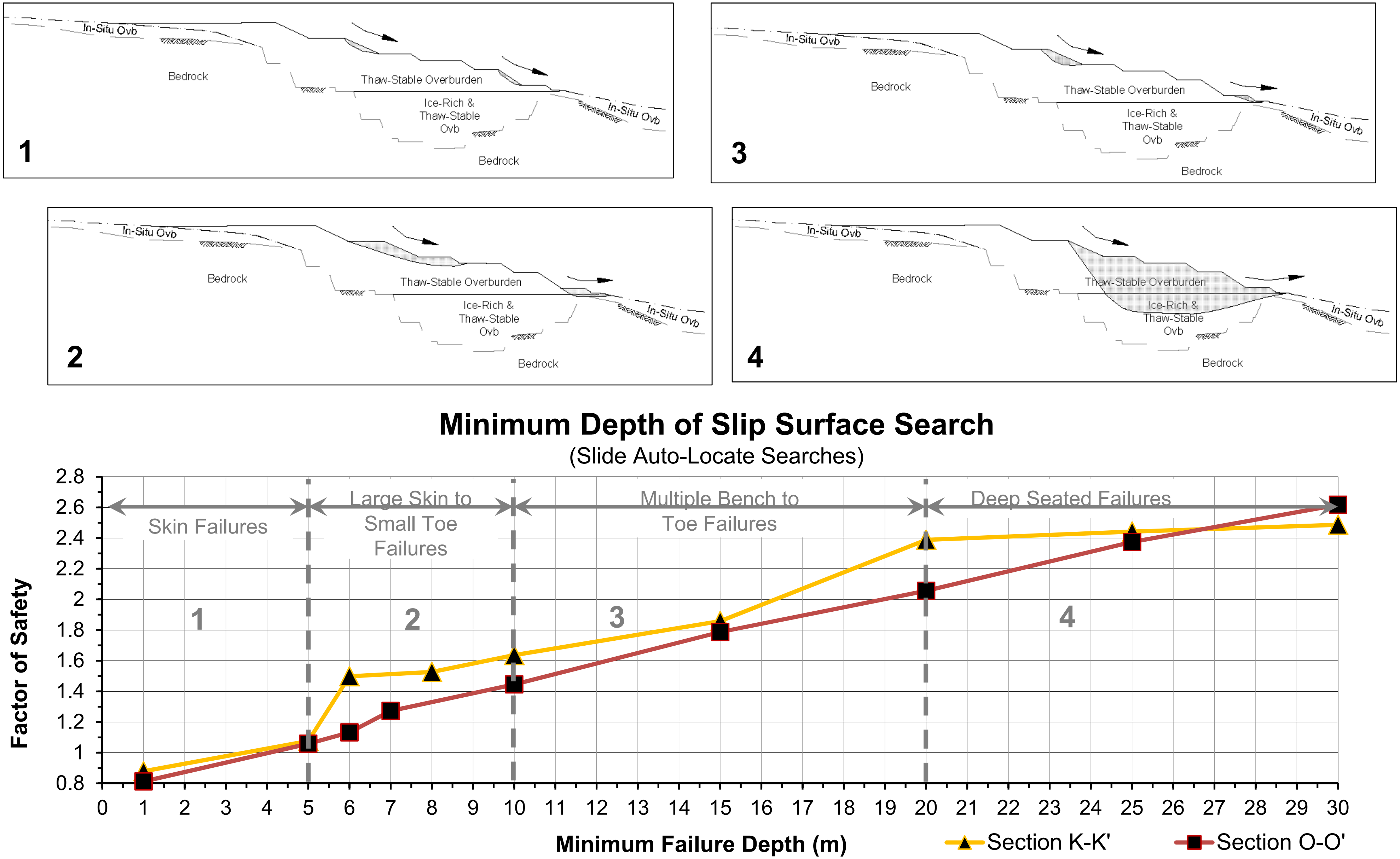
Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments
6	K-K'	**0 Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate Forced 7m Min Deep Failure	No	No	1.3	FOSs notably increase when failures forced to 7m or greater into the dump. Larger multiple bench failure surface. 
7	K-K'	**0 Fatal Flaw Review (General Material Properties)**	Slide 6.0	Optimized Auto-locate Forced 10m Min Deep Failure	No	No	1.4	FOSs further increase when failures forced to min 10m or greater into the dump. Again higher FOS and larger failure surfaces resulting. 
8	K-K'	**1**	Slide 6.0	Optimized Auto-locate Forced 7m Min Deep Failure	No	No	1.1	Small bench failure. Start to see deeper failures closer to ice-rich overburden at FOS closer to 2. 
9	K-K'	**1 Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	No	1.4	Shallow failure through thaw-stable overburden bench 

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
10	**K-K'**	**1 Fatal Flaw Review (General Material Properties)**	Phase^2 8.0	Shear Strength Reduction	No	No	1.0	Inputs based on Slide 6.0 model. Shear strain contours shown in screenshot. Lighter / hotter (more red) colours indicate areas with higher shear strain. Shear strain development support smaller bench failure models.	
11	**K-K'**	**2 (Undrained, Ice-Rich with no friction only Su)**	Slide 6.0	Optimized Auto-locate	No	No	1.0	UNEXPECTED CASE. Assumes all material below pit is ice-rich material with low material properties. Ice-rich material to top of pit rim (i.e. above rock in pit). Deep-seated / global failure though week ice-rich pit backfill.	
12	**K-K'**	**2 (Undrained, Ice-Rich with no friction only Su)**	Slope/W	Entry & Exit	No	No	1.0	UNEXPECTED CASE. Global failure through to bottom of ice-rich material	
13	**K-K'**	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	No	No	2.0	Deep global failure through ice-rich material starting at top of pit and through to toe of slope above pit	
14	**K-K'**	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	No	No	1.6	Multi-bench failure through both thaw-stable and ice-rich overburden	

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments
15	K-K'	**1** **Fatal Flaw Review (General Material Properties)**	Slope/W	Entry & Exit	No	Yes	1.2	Shallow failure through thaw-stable overburden bench 
16	K-K'	**2** **(Undrained, Ice-Rich with no friction only Su)**	Slope/W	Entry & Exit	No	Yes	0.8	UNEXPECTED CASE. Assumes all material below pit is ice-rich material with low material properties. Deep seated failure through ice-rich material all the way through slope. 
17	K-K'	**2** **(Undrained, Ice-Rich with no friction only Su)**	Phase^2 8.0	Shear Strength Reduction	No	No	1.0	UNEXPECTED CASE. Assumes all material below pit is ice-rich material with low material properties. Ice-rich material to top of bedrock in pit. Inputs based on Slide 6.0 model. Shear strain contours shown in screenshot. Lighter / hotter (more red) colours indicate areas with higher shear strain. Deep seated failure through ice-rich material all the way through slope.  

Note: FOS = Calculated Factor of Safety (or Strength Reduction Factor for finite element Shear Strength Reduction runs).

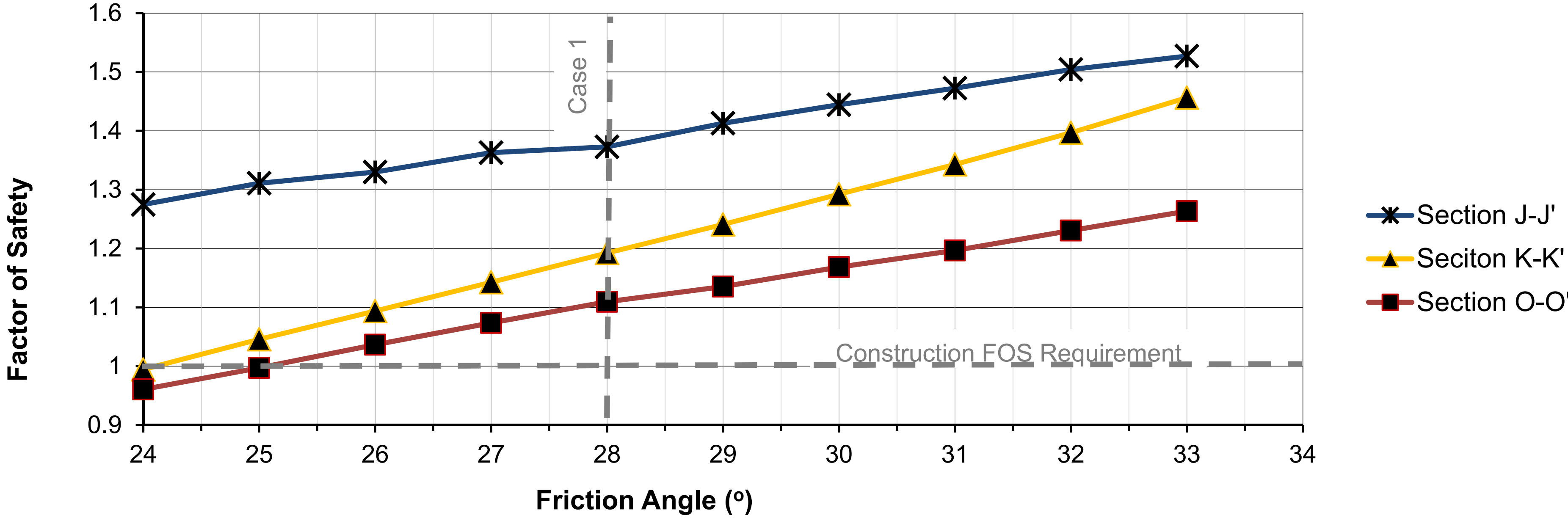
Appendix C: Sensitivity Analysis

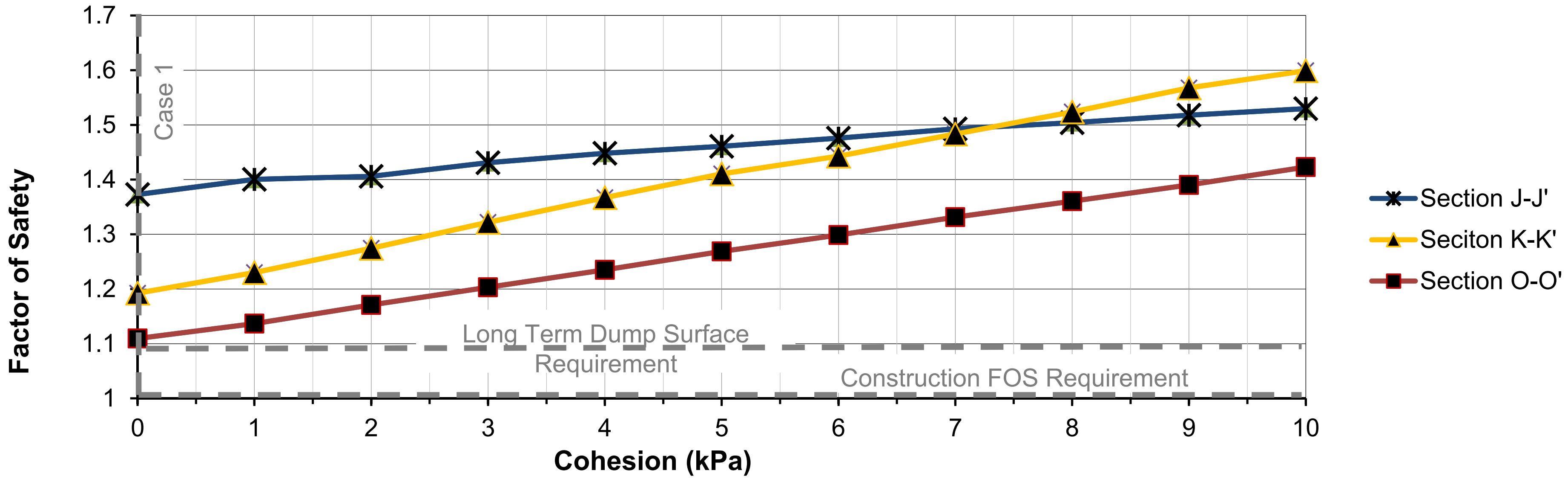


Note: Overburden backfill dump sensitivity analysis results run on Case 1 model set-up.

srk consulting	CAPSTONE MINING CORP. MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	Phase V-VI - Dump Stability Assessment **Ridgetop South and Area 118 Backfill Dumps – Sensitivity Runs**
Job No: 1CM002.012 Filename: MintoRidgetopDumps_StabilitySensitivity	Minto Mine	Date: 2013/09/20 · Approved: JBK · Figure: **C1**

Thaw-Stable Overburden





Note: Steeper sloped lines indicate greater sensitivity to changes in material strength properties. Failure more though dump and less large deep failures though foundation, thus relatively insensitive.

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Phase V-VI - Dump Stability Assessment

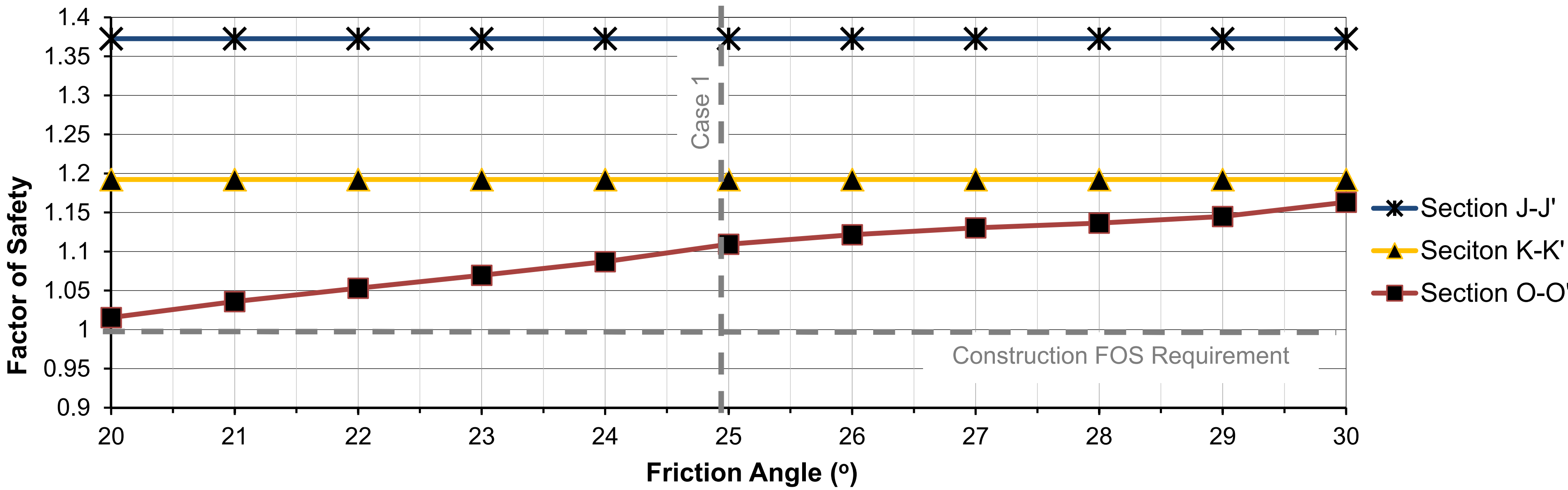
Ridgetop South and Area 118 Backfill Dumps – Sensitivity Runs

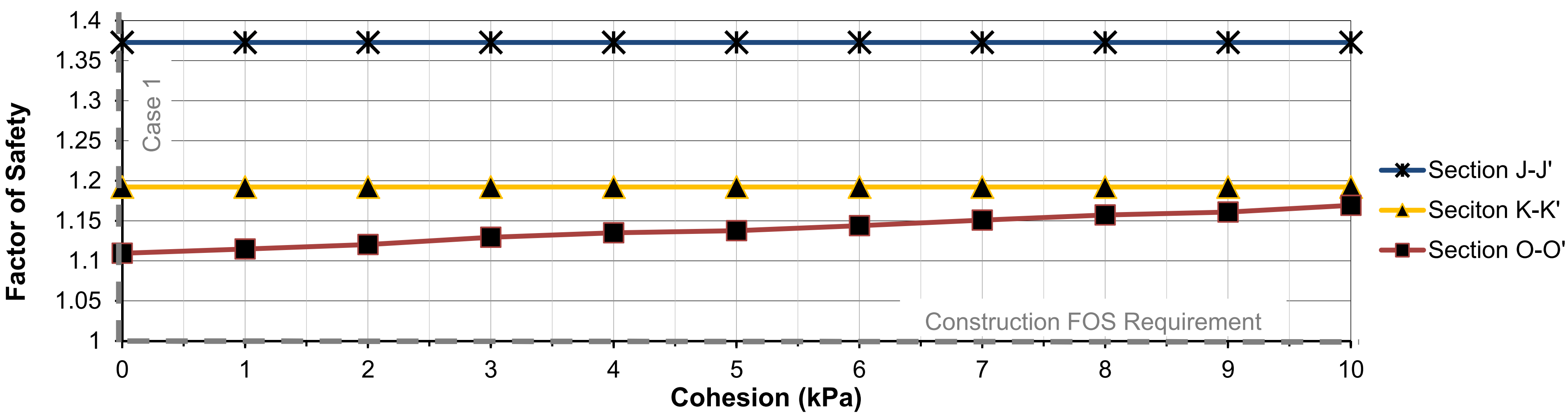
Job No: 1CM002.012
Filename: MintoRidgetopDumps_StabilitySensitivity

Minto Mine

Date: 2013/09/20
Approved: JBK
Figure: **C2**

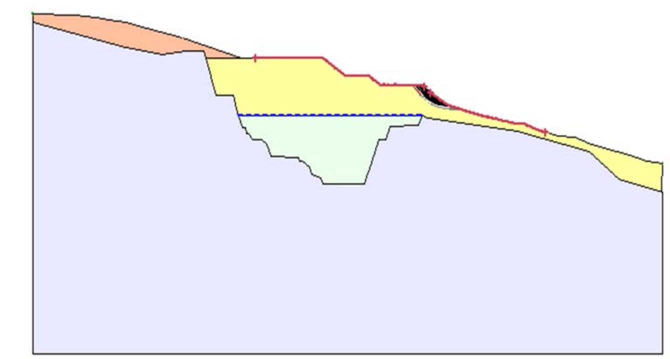
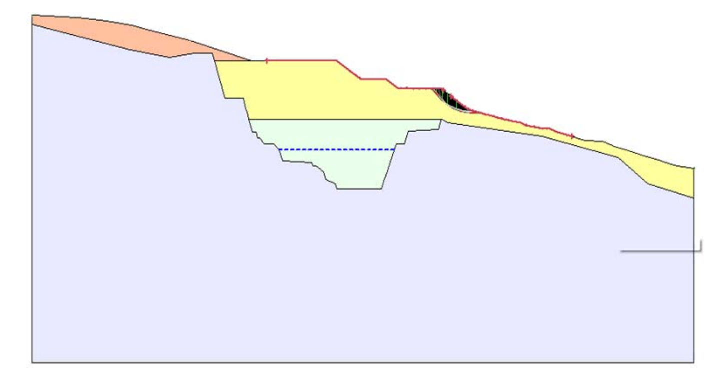
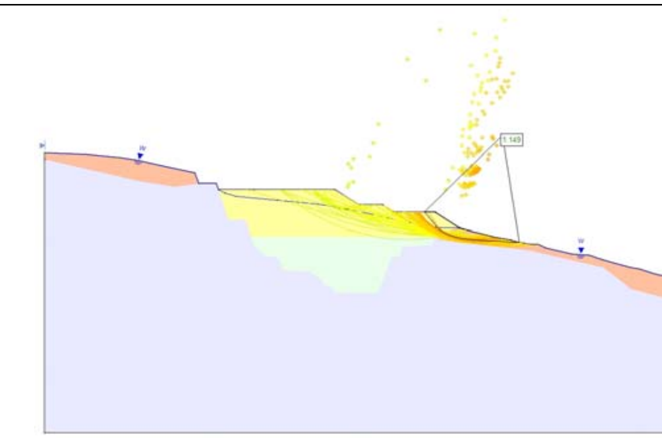
Ice-Rich Overburden

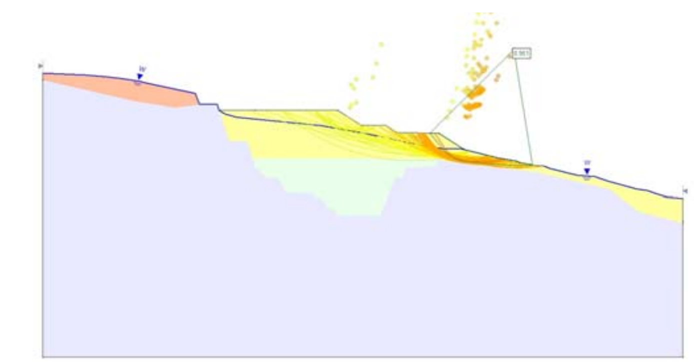
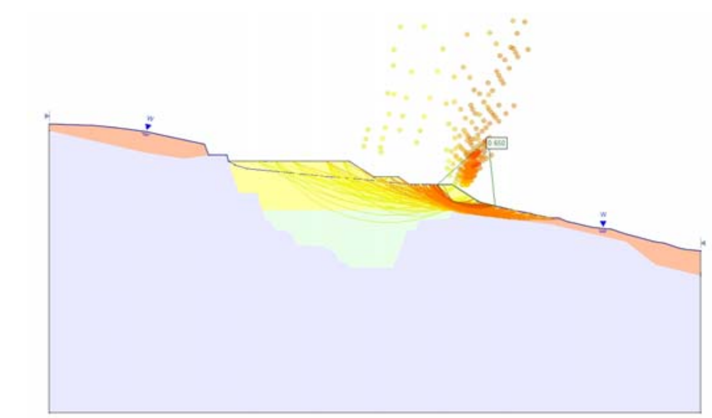
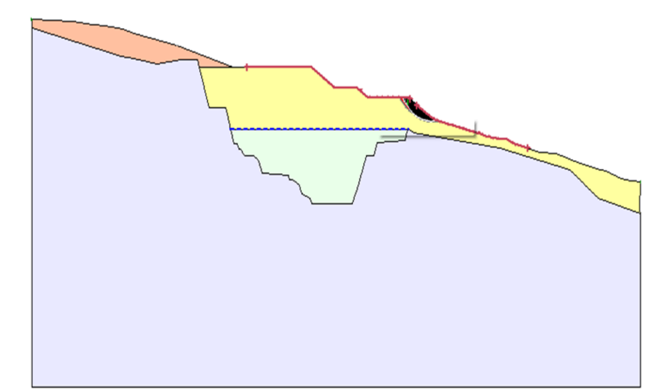


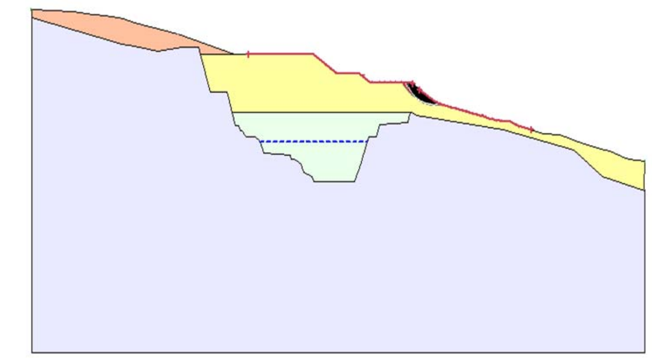


Note: Steeper sloped lines indicate greater sensitivity to changes in material strength properties. Failure more though dump and less large deep failures though foundation, thus relatively insensitive.

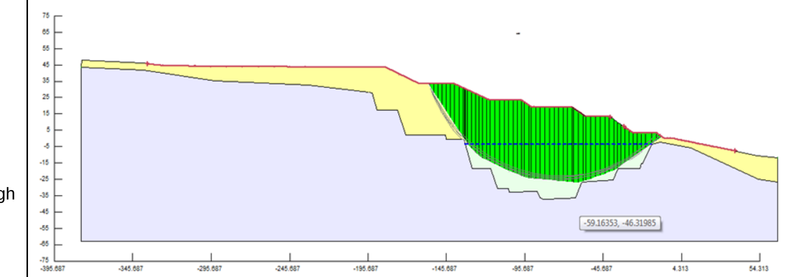
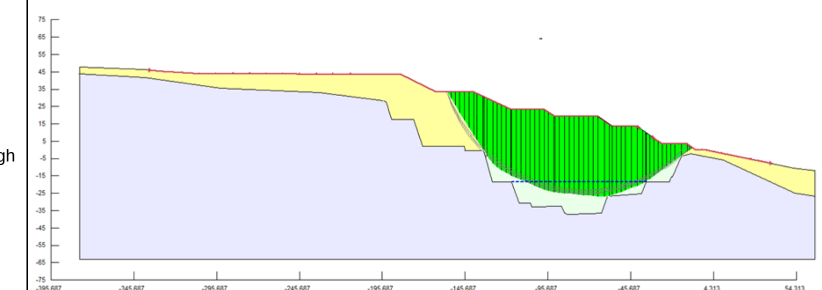
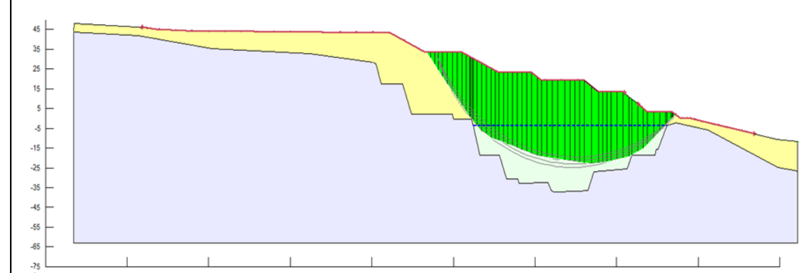
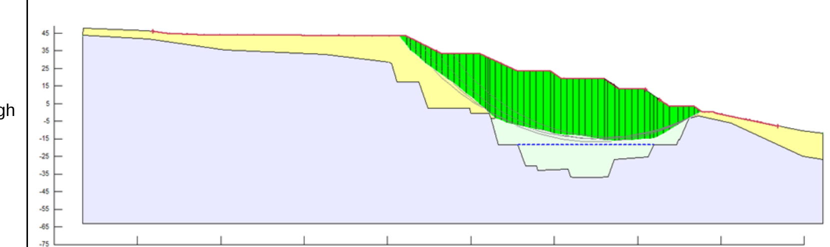
srk consulting	CAPSTONE MINING CORP. MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	Phase V-VI - Dump Stability Assessment
		Ridgetop South and Area 118 Backfill Dumps – Sensitivity Runs
Job No: 1CM002.012 Filename: MintoRidgetopDumps_StabilitySensitivity	Minto Mine	Date: 2013/08/06 · Approved: JBK · Figure: **C3**

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
1	**O-O'**	**1 (General Material Properties)**	Slope/W	Entry & Exit	Yes Fully Saturated up to Top of Pit	No	1.1	Small scale bench failure in overburden bench.	
2	**O-O'**	**1 (General Material Properties)**	Slope/W	Entry & Exit	Yes Saturated Halfway up Pit	No	1.1	Small scale bench failure in overburden bench.	
3	**O-O'**	**1 (General Material Properties)**	Slide 6.0	Optimized Auto-locate	Yes Mounded water table though dump, exits at toe of dump	No	1.1	Toe failure though overburden dump, progressing though natural / in-situ overburden. Assume weathered bedrock to sand and gravel foundation properties near pit rim. Water table along surface then though dump and back along top of surface.	

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
4	O-O'	**1 (General Material Properties)**	Slide 6.0	Optimized Auto-locate	Yes Mounded water table though dump, exits at toe of dump	No	1.0	Toe failure though overburden dump, progressing though natural / in-situ overburden. Assume conservatively low material properties near pit rim in natural ground. Water table along surface then though dump and back along top of surface.	
5	O-O'	**1 (General Material Properties)**	Slide 6.0	Optimized Auto-locate	Yes Mounded water table though dump, exits at toe to middle bench	No	0.7	NOT EXPECTED. Used to assist with developing monitoring recommendations. Part of monitoring to look for seepage exiting above the toe of dump and inform the engineer. Result sin toe failure, through lower bench of the dump and exiting natural ground overburden outside of pit,	
6	O-O'	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	Yes Fully Saturated up to Top of Pit	No	1.8	Small scale bench failure in thaw-stable overburden bench	

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
7	**O-O'**	**3 (Semi frozen ice-rich material)**	Slope/W	Entry & Exit	Yes Saturated Halfway up Pit	No	1.8	Small scale bench failure in thaw-stable overburden bench	

Note: FOS = Calculated Factor of Safety (or Strength Reduction Factor for finite element Shear Strength Reduction runs).

Run	Section	Case	Software Used	Search	Pore Water Pressures	Seismic	Minimum FOS	Comments	
1	K-K'	1 (General Material Properties)	Slope/W	Entry & Exit	Fully Saturated up to end of Pit	No	1.0	Deep seated global failure through saturated pit, ice-rich materials.	
2	K-K'	1 (General Material Properties)	Slope/W	Entry & Exit	Saturated Halfway up Pit	No	1.0	Deep seated global failure through saturated pit, ice-rich materials.	
3	K-K'	3 (Semi frozen ice-rich material)	Slope/W	Entry & Exit	Fully Saturated up to end of Pit	No	1.8	Deep seated global failure through saturated pit, ice-rich materials.	
4	K-K'	3 (Semi frozen ice-rich material)	Slope/W	Entry & Exit	Saturated Halfway up Pit	No	2.0	Deep seated global failure through ice-rich material but not under water table	

Note: FOS = Calculated Factor of Safety (or Strength Reduction Factor for finite element Shear Strength Reduction runs).