



# 2017 Geotechnical Annual Review, Minto Mine, YT

Prepared for

Minto Explorations Ltd.



Prepared by



SRK Consulting (Canada) Inc.  
1CM002.059  
August 2017

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# 1 Introduction

On June 26-28, 2017, SRK Consulting (Canada) Inc. completed a geotechnical inspection of the Minto Mine site. The purpose of the inspection was to document the physical condition of the site based on visual observations and to provide geotechnical assessment, noting potential signs of physical instability such as erosion, differential settlement, sloughing or bulging of material, seepage, etc. The inspection is documented in the photographic compilation provided in Appendix A. This report summarizes the findings and recommendations.

This is the sixth year of geotechnical inspections of the site completed by SRK, with the first inspection completed in September 2012 (SRK 2012a). Previous inspections were completed by EBA Engineering Consultants Ltd.

This report is in partial fulfillment of the requirements of Minto Explorations Ltd.'s existing Water License QZ14-031 Clause 100 and Quartz Licence QML-001 Paragraph 13.2 that require the physical stability of all engineered structures, works and installations be inspected by an engineer after the spring thaw of each year (by June).

# 2 Conditions

The geotechnical inspection was completed by Peter Mikes, PEng, of SRK. Dale Heffernan, EIT, of Minto accompanied Mr. Mikes during the inspection and was SRK's primary contact for information about the activities during the past year.

Weather during the site inspection was mostly sunny with a brief rain showers in the afternoons of the June 26 and 27. Temperatures were estimated at approximately 10 °C in the morning, and up to approximately 20 °C in the afternoon. The site was generally dry throughout the inspection period.

# 3 Scope

The following engineered structures, works, and installations were inspected during the site visit:

- Big Creek Bridge;
- Mill and camp site;
- Dry Stack Tailings Storage Facility and Mill Valley Fill Extension (Stage 1 and 2);
- Fuel containment facility;
- Main Waste Dump;
- Ore stockpiles;
- Reclamation Overburden Dump;
- Ice Rich Overburden Dump;
- South Diversion Ditch;

- Tailings Diversion Ditch
- Southwest Waste Dump;
- Main Pit including South Wall Buttress, In-Pit Dump, and SAT Dump;
- Water Storage Dam;
- Area 118 and Area 2 Pit; and,
- Minto North Pit.

During the inspection, previous year's reports, instrumentation data, design reports and monitoring guidance documents were reviewed as required to guide the inspections. The instrumentation data was reviewed to check for indications of unusual performance or change in trends. Section 4 of this report presents a list of data reviewed, including the last data collection date.

## **4 Monitoring and Instrumentation Data**

Table 4.1 lists instrumentation data reviewed as part of the inspection, with the date of the most recent data. Changes to the list of instrumentation compared to the last inspection are listed below the table in the notes.

Instrumentation plots are provided in the appendices. Data that has not been updated since the last geotechnical inspection is not included in the appendices. Appendix B provides a site-wide summary of the survey hub data including the direction of movement for each hub.

**Table 4.1: Summary of Instrumentation Data**

Facility	Instrumentation Type	List of Reviewed Instrumentation	Last Reading Date
Area 2 Pit	Inclinometers	A2I-1	May 2017
	Ground Temperature Cables	A2T-1	May 2017
Dry Stack Tailings Storage Facility and Mill Valley Fill Extension (DSTSF and MVFE)	Survey Hubs	<b>Active:</b> DSSH06, DSSH10, DSSH12, DSSH14, DSSH15, DSSH17, DSSH18, DSSH19, DSSH20, DSSH24, <i>DSSH26, DSSH27, DSSH29, DSSH31, MV1, MV2.</i> <b>Destroyed in past year:</b> DSSH28, DSSH30	June 2017
	Inclinometers	<b>Active:</b> DSI-22, DSI-24 <b>Destroyed in past year:</b> DSI-23	May 2017
	Piezometers	<b>Active:</b> DSP-05 (A and B), DSP-06 (A and B), <i>DSP-07 (1 to 6), DSP-08 (1 to 6), DSP-10</i>	June 2017
	Ground Temperature Cables	DST-10, DST-11, DST-13, DST-14, DST-15	May 2017
Main Waste Rock Dump (MWD)	Inclinometers	MDI-2	May 2017
Southwest Waste Dump (SWD)	Survey Hubs <sup>1</sup>	<b>Active:</b> SWD-01, SWD-02A, SWD-04A, SWD-05A, SWD-06, <i>SWD-07, SWD-08, SWD-09</i> <b>Destroyed in past year:</b> SWD-01A, SWD-02, SWD-04A	June 2017
	Inclinometers	SDI-3	March 2017
	Piezometers	SDP-2 (A and B), SDP-3 (A and B), SDP-4 (A and B)	June 2017
	Ground Temperature Cables	SDT-1, SDT-2, SDT-3, SDT-4	April 2017
Main Pit	Survey Hubs <sup>2</sup>	<b>Active:</b> M73, M75, M79, M80, M81, M82, M83, M84, <i>M85, M86, M87</i> <b>Destroyed in past year:</b> M76	May 2017
Water Storage Pond Dam	Survey Hubs	WSP-1, WSP-3, WSP-4, WSP-5	June 2017
	Piezometers	WDP-2, WDP-3, WDP-3A, WDP-4, WDP-5, WDP-6, WDP-7, WDP-8, WDP-9, WDP-10, WDP-11, WDP-12, WDP-13	June 2017
	Ground Temperature Cables	WDT-1, WDT-2, WDT-3, WDT-4, WDT-5, WDT-6, WDT-7, WDT-8	June 2017

**Note(s):**

- (1) Instrumentation in italics are new instrumentation installed since the previous inspection.
- (2) Survey hub SWD-07 has replaced SWD-02A, survey hub SWD-08 has replaced SWD-02, and survey hub SWD-09 has replaced SWD-04A.

## 4.1 Area 2 Pit

Area 2 Pit instrumentation data is provided in Appendix C and includes a ground temperature cable (A2T-1) and an inclinometer (A2I-1) were installed in 2013 in the southeast corner of the planned Area 2 Stage 3 Pit.

The inclinometer data is shown in Figure 1 of Appendix C. The data shows a shear occurred within the waste rock fill near the surface during the initial year of data collection, along with some minor displacement at lower depths with no significant movement prior to 2017. The reading collected in March 2017, indicates some movement towards the pit (most visible on the polar plot in Figure 1), which may be related to the excavation of the Area 2 Stage 3 Pit. Additional readings are required to confirm the trends.

The ground temperature data indicates permafrost conditions down to an elevation of approximately 767 m. The bottom two sensors at elevations 765 m and 762m are consistently above 0 degrees and are situated in clay material.

## 4.2 Dry Stack Tailings Storage Facility

Instrumentation data for the Dry Stack Tailings Storage Facility (DSTSF) and Mill Valley Fill Extension (MVFE) are provided in Appendix D.

Movements in the Dry Stack Tailings Storage Facility (DSTSF) were first identified in early 2009. The Mill Valley Fill Extension (MVFE) Stage 1 was designed to mitigate the movement and construction of the facility, which began in January 2012 and was completed in 2013. The survey hubs used to monitor rates of the DSTSF showed a deceleration ranging from 20 to 60 percent since the start of the MVFE Stage 1 placement. Construction of a second extension (MVFE Stage 2) began in late 2015 was completed in the summer of 2016. The MVFE Stage 2 doubled the size of the Stage 1 buttress.

### Survey Hubs

Survey hub movement data are presented in Figure 1 to 19 of Appendix D. All survey hubs show a decelerating trend<sup>1</sup>, except for survey hubs DSSH20 and DSSH24, where additional data is needed to evaluate the trends. These hubs are located on cover soils and movement may be due to seasonal freeze/thaw effects.

Two additional hubs (ASH05 and ASH06) are located further to the south of the DSTSF on the airport access road (Appendix D, Figure 20). ASH05 shows no significant movement trend. ASH06 shows a slight increase to the movement rates, which may be related to disturbance as a result of a nearby pipeline installation. Additional data is needed to confirm the trend.

### Piezometers

Piezometric data from the DSTSF are presented in Figures 21 to 24 in Appendix D.

<sup>1</sup> Based on a comparison of June 2016 and June 2017 movement rates.

DSP-05B (Figure 21, Appendix D) shows an increase in pore pressure in the past year. The cause of the pore pressure increase is unclear. The temperature at the sensor is approximately at the freezing point of water ( $-0.5^{\circ}\text{C}$ ) and the excess pore pressure as a result of an increase in the unfrozen water being unable to dissipate are a result of unfrozen conditions in the surround soils. As the survey hubs in the vicinity of the sensor shows decelerating movement, no additional action is recommended at this time.

During construction of the MVFE Stage 2, excess pore pressures were generated at DSP-09 and DSP-10 (Figure 24, Appendix D), with pressures beginning to dissipate following construction. These sensors are located at the base of the Minto Creek Valley where the MVFE Stage 2 fill thickness is the largest and are located approximately 5 m below the original ground surface. Flow meter readings for the MVFE Stage 2 collection sump indicate that the drainage blanket at the base of the MVFE Stage 2 is functional. The high pore pressures are believed to be the result of winter construction and the preservation of frozen ground conditions within the foundation resulting in impeded dissipation of the generated pore pressure. Discussion on the remaining piezometers are provided in Appendix D.

### **Ground Temperature Cables**

Ground temperature profiles are provided in Figures 25 to 29 of Appendix D. The temperature readings below the active layer in the instrumentation installed in 2013 are generally in equilibrium with the surrounding soils, or continue to show a slight cooling trend. The profiles indicate that warm permafrost is present at all locations, except in the lower portions of DST-11 and DST-13. DST-11 is located near the crest of the DSTSF, while DST-13 is located approximately 300 m east of the DSTSF in an undisturbed location.

### **Inclinometers**

Three inclinometer were installed between December 2016 and February 2017 in the eastern portion of the MVFES2. The inclinometer data are presented in Figures 30 to 32 of Appendix D.

- DSI-22 is located at the toe of the MVFES2 and shows no significant movement (Figure 30, Appendix D).
- DSI-23 is located on the lowest tier of the MVFES2 (Figure 31, Appendix D). The inclinometer is blocked within the waste rock at an depth of 14 m with the last reading obtained in April 2017. The previous readings have shown a shear zone in the soft organic layer immediately below the waste rock fill with a movement rate of 0.7 mm/day with a decelerating trend.
- DSI-24 is located between the MVFES2 and the DSTSF (Figure 32, Appendix D). As a result of the ice within the inclinometer casing, no readings were able to be obtained until July 2017, with 4 sets of readings collected at the time of writing. The data obtained has been inconsistent with high check-sum values indicating the readings are of poor quality. Plots of the B-axis indicate a potential shear zone at a depth of 53 m, however as the data from the A-axis is of poor quality, the magnitude of the movement along the shear zone is unable to be determined.



### 4.3 Main Waste Dump

Instrumentation data for the Main Waste Dump (MWD) are provided in Appendix E. Two inclinometers, MDI-1 and MDI-2, have been installed at the MWD. Of the two, only MDI-2 is functional. The last reading of MDI-1 was obtained in November 2012.

There has been no significant movement trend detected in MDI-2 since 2012. The past movement at MDI-2 occurred primarily within rock fill and was determined to have been the result of the removal of the rock fill placed between the instrument location and the Main Pit (EBA 2011).

### 4.4 Southwest Waste Dump

Instrumentation data for the Southwest Dump (SWD) are provided in Appendix F.

Survey hub movement data are presented in Figure 1 to 11 of Appendix F. All hubs show either no significant changes in horizontal movement, or a decelerating movement trend.

Three of the four active hubs located along the two of the SWD have been replaced.

- SWD-06 has replaced SWD-01A
- SWD-07 has replaced SWD-02A
- SWD-09 has replaced SWD-04A

These hubs were disturbed due to heaving caused by frost action as evidenced by exposed concrete and as a result the movement rates obtained from the surveys were questionable. This frost action is also evidenced by the seasonal variability in the movement data. SWD-05A has yet to be replaced. The replacement hubs have been mounted on standard lock-blocks or large boulders. The replacement hubs are expected to show seasonable variability as a result of ground freezing and thawing, but horizontal movement rates are expected to be indicative of any ground movement.

Inclinometer data from SDI-3 is presented in Figure 12 of Appendix F. The displacement profile indicates an upper and lower shear zone with both shear zones having the same direction of movement orientated parallel to the slope of the bedrock surface. Movement rates in both shear zones are similar to those in 2016 with the upper shear zone moving approximately 0.4 mm/day and the lower zone moving approximately 0.07 mm/day. The upper shear zone shows a jump in the displacement rate between May and June 2016, which may be due to resloping of the dump.

The upper shear zone movement is suspected to be related to thawing of the permafrost colluvium with potentially high excess pore water pressures, which is supported by the slight warming trend in temperature data at SDT-2 and SDT-3. The movement rate of the upper shear zone is expected to decrease as the pore water pressure dissipates. The upper shear zone shows a jump in the displacement rate between May and June 2016, which may be due to cover placement on the dump during the winter.

The lower shear zone is located 7 to 10 m above the bedrock contact in an ice-rich zone consisting of stratified ice (frequent 5 to 75 mm thick ice lenses). The conditions at this shear zone are similar to other movement zones observed at the DSTSF and south wall of the Main Pit believed to be caused by ice creep and/or plastic deformations.

Ground temperature data for the Southwest Dump are presented in Figures 13 to 16 of Appendix F, with the temperature cable location shown in Figure 1. The profiles indicate that warm permafrost is present at all locations with time graphs generally indicating a warming trend at all locations.

Piezometric data for the Southwest Dump are presented in Figure 17 of Appendix F. The pore pressures for all piezometers show a decreasing trend.

## 4.5 Main Pit

Instrumentation data for the Main Pit are provided in Appendix G.

The initial indication of movement in the Main Pit south wall was observed in April 2009. A waste rock buttress was subsequently designed and constructed. Substantial completion of the buttress (South Wall Buttress) was completed in 2013. A detailed assessment and history of the physical stability associated with the Main Pit south wall is provided in the letter report "Detailed Review of Foundation Performance at Select Mine Waste Facilities and Main Pit South Wall" (SRK 2012b).

The Main Pit is a disposal location for waste rock with an NP:AP ratio less than 3 (SAT) with the material to be placed below the final water elevation of the pit. In addition to the South Wall Buttress, several In-Pit Dumps have been constructed in the pit at various times that did not have the same stringent compaction requirements. The In-Pit Dump noted in Appendix A was end-dumped into the pit water with a high dump height and significant cracking and settlement has been observed since. In April 2015, construction of a new dump (SAT Dump) began that will be constructed on top of the tailings and will also buttress the In-Pit Dump. In February 2017, construction of the Main Pit Dump (MPD) began over areas of the south wall of the Main Pit that do not contain SAT. Footprints of the South Wall Buttress, In-Pit Dump, SAT Dump, and MPD are provided in Figure 15 of Appendix A.

Survey hub movement data for the Main Pit are presented in Figures 1 to 15 of Appendix G. All hubs show no significant changes in horizontal movement rates or decelerating movement rates, except for M82, M83, and M86. Details of the movement at each hub is described below. During the 2016 instrumentation review, the movement rate at M84, located near the crest of the In-Pit Dump had increased from 0.2mm/day to 0.7 mm/day. The increase was believed to be the result of the SAT Dump construction. The movement rate at M84 has since decreased significantly, likely as a result of the SAT Dump acting as a buttress to the In-Pit Dump.

- M82 (Figure 8, Appendix G) was relocated in March 2017 to be located outside of the MPD footprint, with 3 months of data collected since the time of writing. The survey hub is mounted on a lock-block set on surface. The data indicates a horizontal movement rate of 2 mm/day. The movement may be the result of MPD construction. However, the as the ground upon which it was set was not cleared/leveled, and as a result some of the

measured movement may be due to shifting or rocks beneath the lock-block (see Figure 14, Appendix A).

- M83 is located along the crest of the In-pit Dump. The movement rate increased from approximately 0.2 mm/day to 0.7 mm/day beginning in the spring of 2017. Additional readings are needed to determine if the increase in movement is due to seasonal effects, SAT dump or MPD construction, or large scale ground movement. The survey frequency at the Main Pit has increased to weekly since the construction of the MPD began, and this frequency is recommended to continue for the remainder of the dump construction.
- M86 is located along the south rim of the Main Pit. The hub was a replacement for M75, and was removed in February 2017 due to construction of the MPD, and reinstalled in April 2017. Movement rates at the new hub are similar as during the 2016 inspection.

#### **4.6 Water Storage Pond Dam**

Instrumentation data for the Water Storage Pond Dam are provided in Appendix H and consists of eight ground temperature cables, 13 vibrating wire piezometers, and five survey hubs.

Survey hub movement data are presented in Figure 1 and 2 of Appendix H. No significant movement was observed.

Ground temperature data are presented in Figures 3 to 10 of Appendix H. All temperature sensors are above zero and show an increasing trend. WDT-5 shows an approximate 2 degree increase in temperatures in the two deepest sensors located in bedrock. The temperatures are within the range of observed groundwater temperatures in Westbays MW-12-05 and MW-12-06

Piezometric data are presented in Figures 11 to 14 of Appendix H. In general, pressures continue to follow historical patterns and fluctuate with the pond water elevation.

## 5 Results and Recommendations

Findings of the inspection are documented in the photographic compilation of figures in Appendix A. Fifteen figures provide a record of observations across the site.

A summary of the recommendations is provided in Table 5.1. Where appropriate, each recommendation includes a priority classification of low, medium, or high that should be addressed in 3, 1, and 0.5 years respectively.

**Table 5.1: Summary of Recommendations**

Area	Recommendations
Instrumentation	<ul style="list-style-type: none"> <li>• <b>(High Priority) More attention needs to be paid to the stability of the inclinometer readings during collection to ensure quality data is collected. Data should be reviewed following collection and new readings should be taken if data is of poor quality.</b></li> <li>• <b>(High Priority) All survey hubs mounted on lock-blocks should be inspected to determine if readings may be affected by uneven ground conditions. The ground should be level and clear of all debris/loose rocks.</b></li> </ul>
DSTSF	<ul style="list-style-type: none"> <li>• <b>(High Priority): Two readings should be collected from DSI-24 on the same day confirm accuracy of the readings, and readings collected on a weekly basis until the quality of inclinometer data can be confirmed.</b></li> <li>• <b>(Medium Priority): Additional fill should be placed in the pooled depression at the south end of the facility to prevent ponding.</b></li> <li>• Continue to monitor the exposed slope south of the Minto Creek Seepage Collection System for signs of retrogressive failure to determine if any slope stabilization measures are required.</li> </ul>
Tailings Diversion Ditch	<ul style="list-style-type: none"> <li>• <b>(High Priority): The vegetation in the western portion of the channel should be removed prior to the planned diversion of the South Diversion Ditch into the Tailings Diversion Ditch.</b></li> </ul>
Camp Site	<ul style="list-style-type: none"> <li>• Continue to monitor the slough at the west end of the camp area and the erosion channels below the camp pad following large rainfall events.</li> </ul>
South Diversion Ditch	<ul style="list-style-type: none"> <li>• No actions are required provided the SDD is decommissioned in August 2017, as planned. However, should the SDD not be decommissioned the followings actions are recommended:               <ul style="list-style-type: none"> <li>○ <b>(High Priority): Clean the overflow spillway on both sides of the access road and clear the inlet to the culverts.</b></li> <li>○ <b>(High Priority) Clear the vegetation within the SDD prior to 2018 freshet.</b></li> </ul> </li> </ul>
South Wall Buttress / In-Pit Dump / SAT Dump	<ul style="list-style-type: none"> <li>• <b>(High Priority):</b> <ul style="list-style-type: none"> <li>○ <b>Clear the loose rocks beneath M82</b></li> <li>○ <b>During SAT material placement, truck traffic is to be maintained a minimum of 5 meters away from the dump face, or a spotter is to be present.</b></li> </ul> </li> <li>• Continue to limit access to the In-Pit Dump area near M84.</li> </ul>
Area 2 Pit	<ul style="list-style-type: none"> <li>• <b>(High Priority): Review radar data of the Area 2 Stage 3 Pit to confirm any areas of movement and the rate of movement. Based on the results, establish a survey hub(s) to monitor displacement.</b></li> </ul>

**Note(s):**

- (1) High and medium priority actions are highlighted in **bold**.
- (2) Low, medium, and high priority recommendations should be addressed in 3, 1, and 0.5 years respectively.

This report, "2017 Geotechnical Annual Review, Minto Mine, YT", was prepared by SRK Consulting (Canada) Inc.

*Original signed and stamped by*

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Senior Consultant

and reviewed by

*Original signed by*

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Senior Consultant

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.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

## 6 References

EBA 2011. Main Waste Dump – 2011 Annual Review, Minto Mine, YT. EBA File Number: W14101068.037. September 30.

SRK, 2012a. 2012 Geotechnical Annual Review, Minto Mine, YT. Prepared for Minto Explorations Ltd. SRK Project Number: 1CM002.006.400. November.

SRK 2012b. Letter Report: Detailed Review of Foundation Performance at the South Waste Dump and Stability of the Main Pit South Wall. Prepared for Minto Explorations, Ltd. SRK Project Number: 219500.050. November 19.

## Appendix A: Photographic Report

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Inspection Area		Figures
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2014 Orthophoto.

## Inspection Area Number

		2017 Geotechnical Inspection		
		<b>Site Overview</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>1</b>

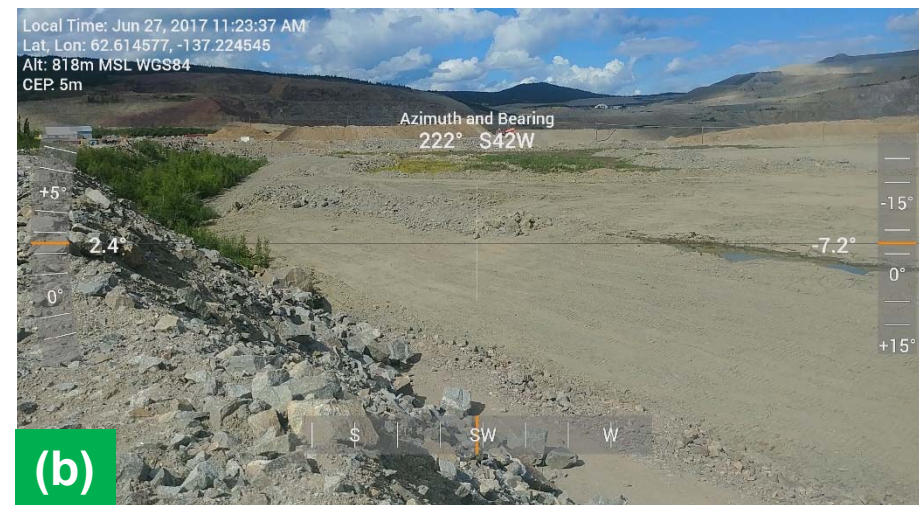


# 1 Dry Stack Tailings Storage Facility

- Since the 2016 inspection, the implementation of closure measures has begun at the DSTSF and are currently on-going. The waste rock shell has been regraded, bulk landform regrading of the DSTSF surface has been completed, unsuitable cover soils have been removed and replaced with suitable cover soil, and overburden was placed on the south slope of the DSTSF to cover all exposed tailings and to provide positive drainage of the area between the Tailings Diversion Ditch and the DSTSF.
- Additional 'fine tuning' regrading of the cover surface and placement of cover soils over the waste rock shell remains to be completed.
- No signs of instability observed. Due to the placement of cover materials, the cracking noted in the 2016 inspection were unable to be observed.
- Photo (a) shows cover at the south end of the DSTSF and fill placed at the south slope of the DSTSF.
- Photos (b) and (c) shows the south slope fill and a strip of pooled water in a surface depression that is believed to be located near (but outside of) the former crest of the DSTSF. The pooled water is suspected to be due to settlement of the recently placed south slope fill.
- Photo (d) shows the eastern end of the south slope fill and the former TDD.
- Photo (e) shows the north side of the waste rock shell. Cover soil has been stockpiled at the crest of the waste rock shell.

## Recommendations

- Additional fill should be placed in the pooled depression to prevent ponding and provide positive drainage.



		2017 Geotechnical Inspection		
		<b>Dry Stack Tailings Storage Facility</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>2</b>

# 1 Dry Stack Tailings Storage Facility - Mill Valley Fill Extension

Waste rock placement at the MVFE Stage 2 began in late 2015 and was completed in the summer of 2016. Since 2016, the slopes of the MVFE Stage 2 were regraded to 3H:1V or flatter, cover soils were spread on the flat surfaces and were in the process of being spread on the slopes (photo (a)).

No major signs of instability were observed at the time of the inspection.

- Photo (a) shows cover soils being spread on the north slopes of the MVFE Stage 2.
- Photo (b) shows the Minto Creek Seepage Collection System. The system appears to be functioning as per design, no signs of seepage immediately downstream of the system.
- Photo (c) shows the slope south of the Minto Creek Seepage Collection System. Minor sloughing of the slope has occurred as a result of permafrost thaw.
- Photo (d): View of the down-valley slope of the MVFE Stage 2.
- Photo (e): View of one of three new inclinometers installed (DSI-22) to monitor movement rates on the east side of the DSTSF and MVFE Stage 2.

## Recommendations

- Continue to monitor the slope to the south of the Minto Creek Seepage Collection System for signs of retrogressive sloughing to determine if any slope stabilization measures are required.



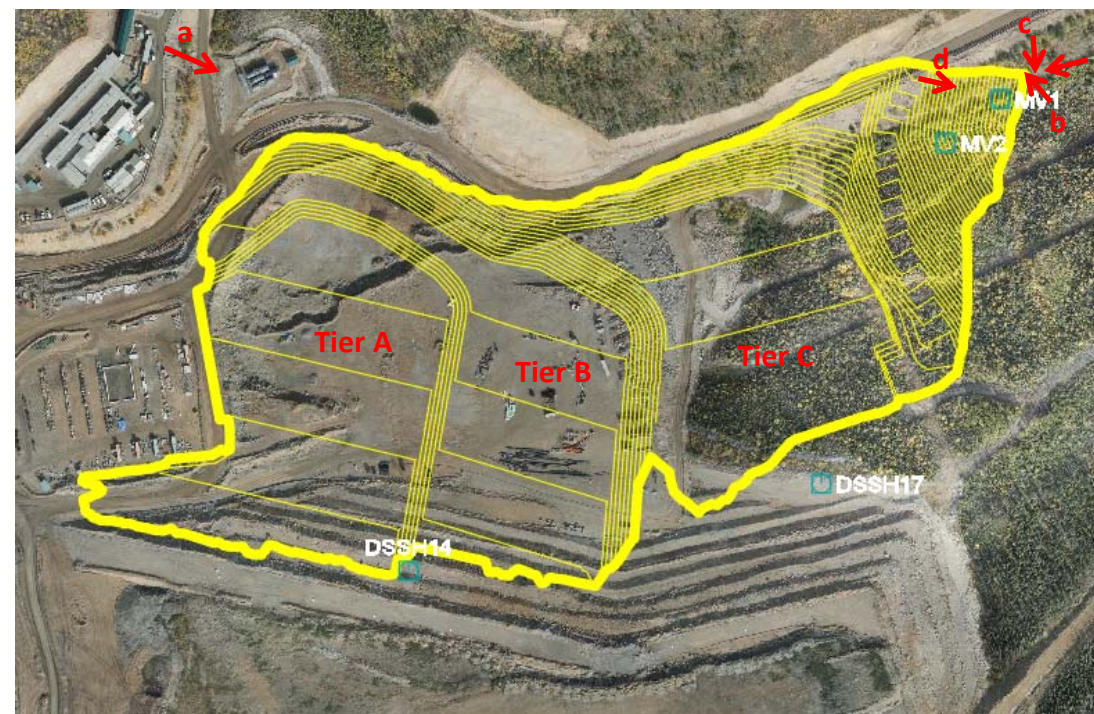
(a)



(b)



(c)



2014 Orthophoto with the MVFE Stage 2 design surface



(d)



(e)

		2017 Geotechnical Inspection		
		<b>Dry Stack Tailings Storage Facility – Mill Valley Fill Extension</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>3</b>

# 1 Dry Stack Tailings Storage Facility - Tailings Diversion Ditch

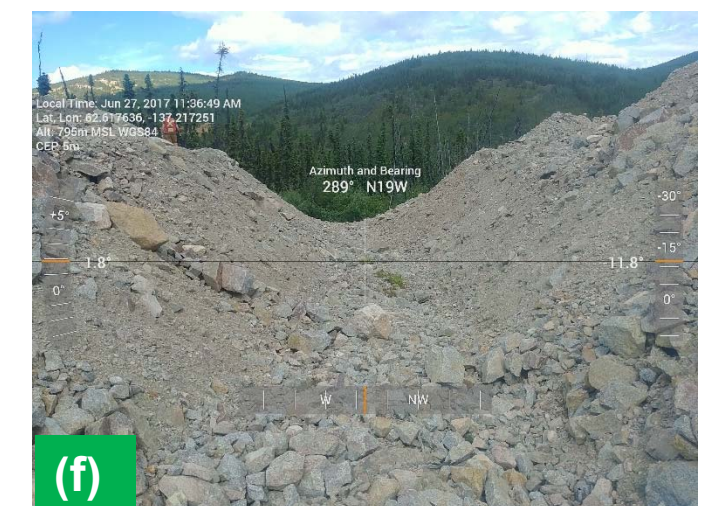
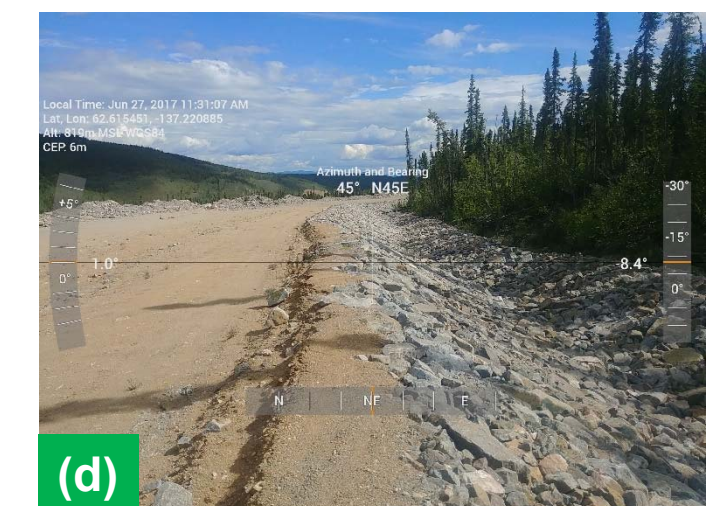
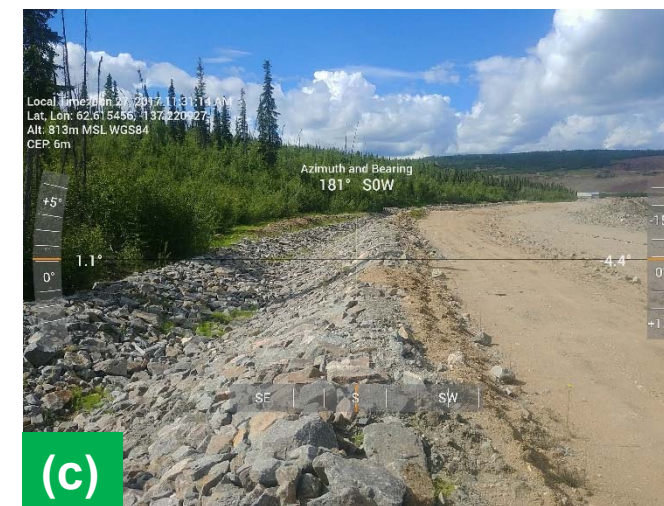
- In general, the berm and ditch appeared functional, with conditions the same as those in observed in previous inspections. No signs of instability or ditch obstructions were noted along the ditch alignment.
- Photos (a) and (b): View of the upper, unarmored portion of the diversion ditch. Vegetation growth is significant over a small portion of the ditch, but is not believed to be impacting the flow capacity due to the excess design capacity of the ditch. However, as the South Diversion Ditch is planned to be diverted into the Tailings Diversion Ditch, the vegetation is recommended to be removed.
- Photos (c) and (d): View of the middle armored portion of the diversion ditch. Rip-rap is well placed, and compacted, and the ditch is free of debris.
- Photos (e) and (f): View of the lower portion of the ditch and outlet. The ditch outlet was excavated through placed waste rock. The slopes were steep, and a high amount of finer material was noted along the excavated slopes. This may be susceptible to erosion during large flow events.

## Recommendations

- Prior to the diversion of the South Diversion Ditch into the Tailings Diversion Ditch, the vegetation in the western portion of the channel should be cleared.



2014 Orthophoto



2017 Geotechnical Inspection

**Dry Stack Tailings Storage Facility – TDD**

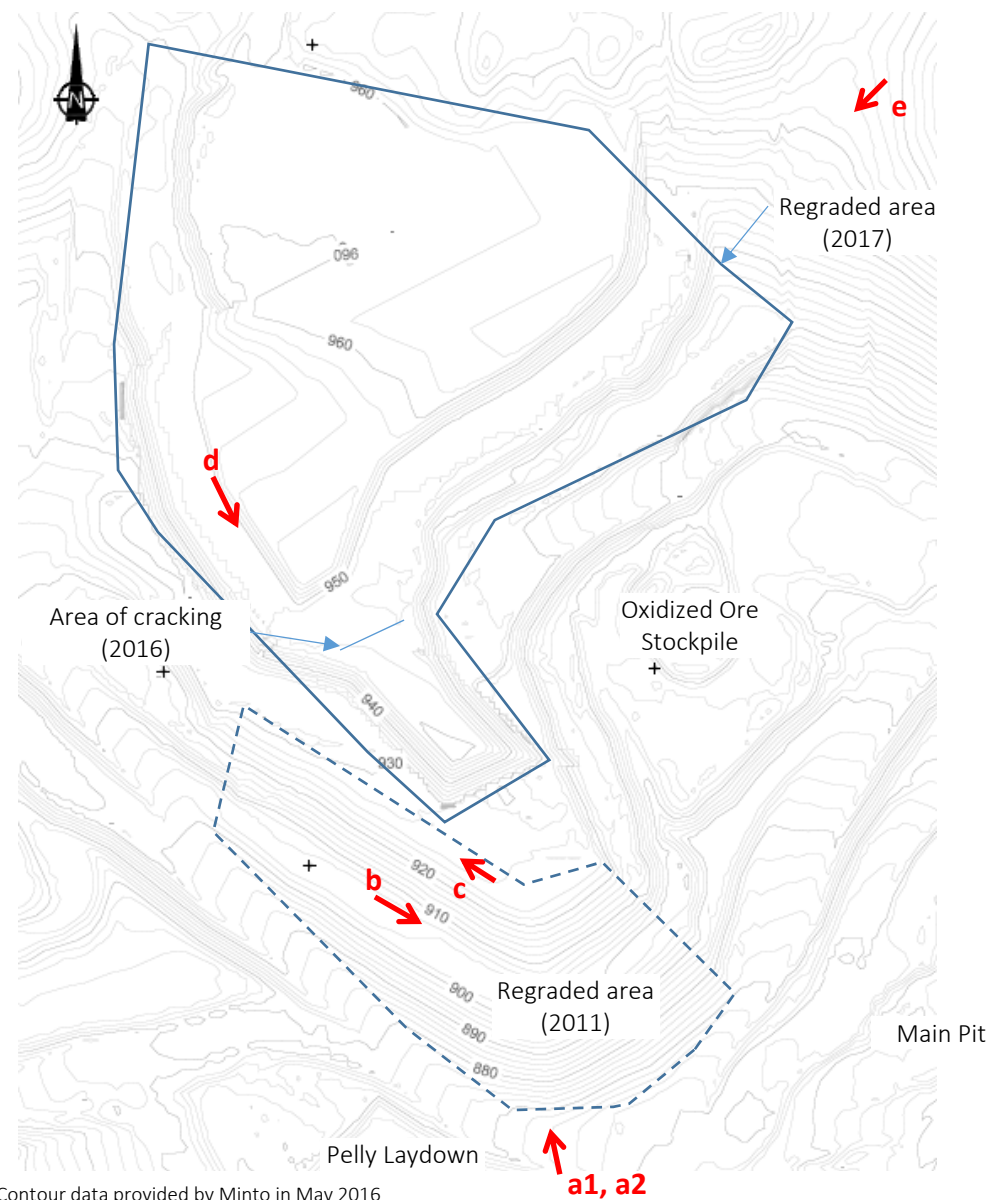
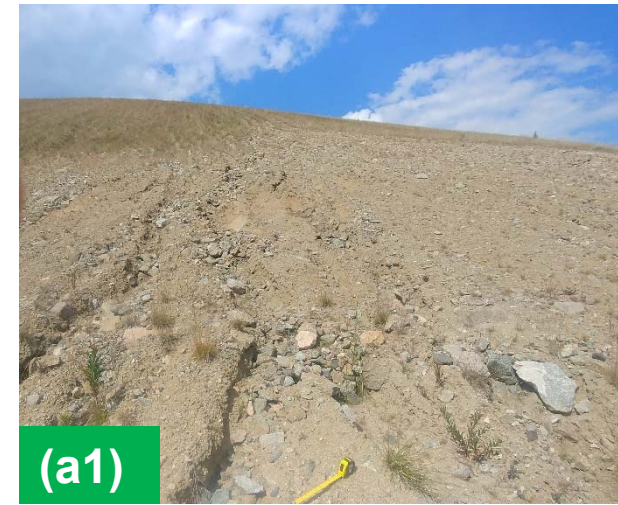
Job No: 1CM002.059  
Filename: AppA\_2017InspectionPhoto.pptx

Minto Mine

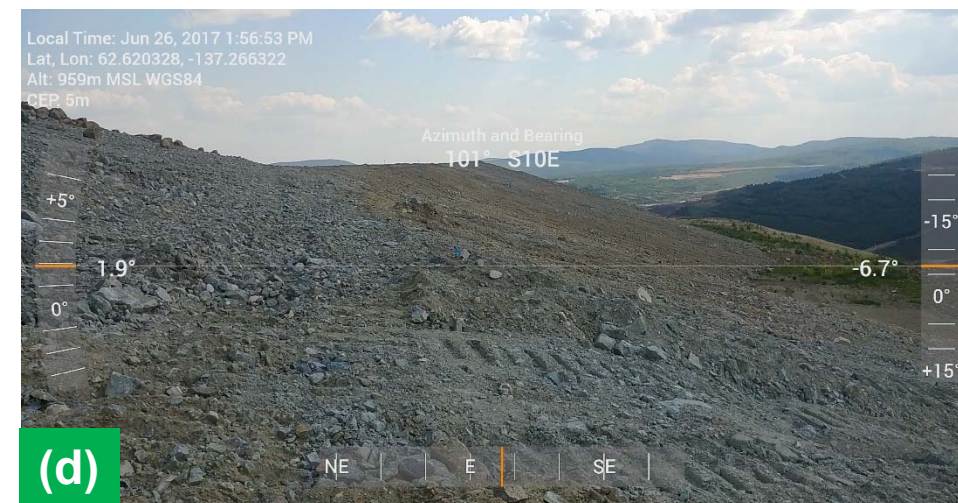
Date: August 2017  
Approved: PHM  
Figure: **4**

## 2 Main Waste Dump and Main Waste Dump Expansion

- No waste rock has been placed at the Main Waste Dump (MWD) or Main Waste Dump Expansion (MWDE) in the past year. The majority of the MWDE slopes have been regraded. Overburden was placed over the top surface of the MWDE and stockpiled along the dump crests for future cover placement on the dump slopes.
- Cover material spread on the top surface was generally undulating with significant random cracking as a result of the winter placement. It is understood additional 'fine-tune' grading is to be completed on the top surface.
- No major signs of instability were observed. The minor cracking observed in the 2016 geotechnical inspection was unable to be observed as a result of the overburden placement. The cracking was located at the location noted in the plan below and was believed to be due to differential settlement of the waste rock as a result of differences in the fill height on either side of the cracks.
- The gully erosion at the south end of the regraded MWD appears to be ongoing with evidence of deepening gullies and fresh sediments at the base of the slope (photos a1 and a2)
- Photo (b): View of the 2011 regraded slope taken from the mid-bench toe.
- Photo (c): View of the animal burrow (fox?) at the top of the MWD. The burrow diameter is approximately 15-20 cm.
- Photo (d): View of the 2016 regraded MWDE slope
- Photo (e): View of the stockpiled cover material on the MWDE to be placed on the slopes as cover.



Contour data provided by Minto in May 2016



		2017 Geotechnical Inspection		
		<b>Main Waste Dump</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>5</b>

# 3 Southwest Waste Dump

- Since, the 2016 inspection, additional regraded of the dump area has been completed, overburden cover soil from the Area 2 Stage 3 Pit has been spread on the flat dump surfaces and stockpiled along the crest of the slope. Cracks and depressions noted in the 2015 and 2016 inspections were unable to be observed as a result of the cover placement.
- The majority of the dump surfaces where cover soils were spread during the winter show differential settlement and cracking as a result of the winter placement. It is understood that additional 'fine-tune' grading of the cover soil surfaces is planned to be completed at a later date.
- Photo (a): View of regraded slope on the east side of the dump and stockpiled overburden along the crest of the slope.
- Photo (b): View of the north end of the Southwest dump taken from the Main Waste Dump. The photo shows the stockpiling of overburden along the regraded crests of the dump.
- Photos (c) and (d) show depressions, areas of differential settlement, and cracking of the overburden slope that was placed during the winter.



- Photo (e): Survey hub SWD-06 has been installed to replace SWD-01A that was impacted by frost heave. The remainder of the hubs that have experienced frost heave (SWD-02A, -03A, -04A, and -05A) have also been replaced with hubs mounted on lock-blocks or large boulders.
- Photo (f) shows the outlet of the culvert below the Pelly Laydown area. The appearance of the waste rock rip-rap below the culvert appears the same as in previous years inspection photos.



## 4 Reclamation Overburden Dump

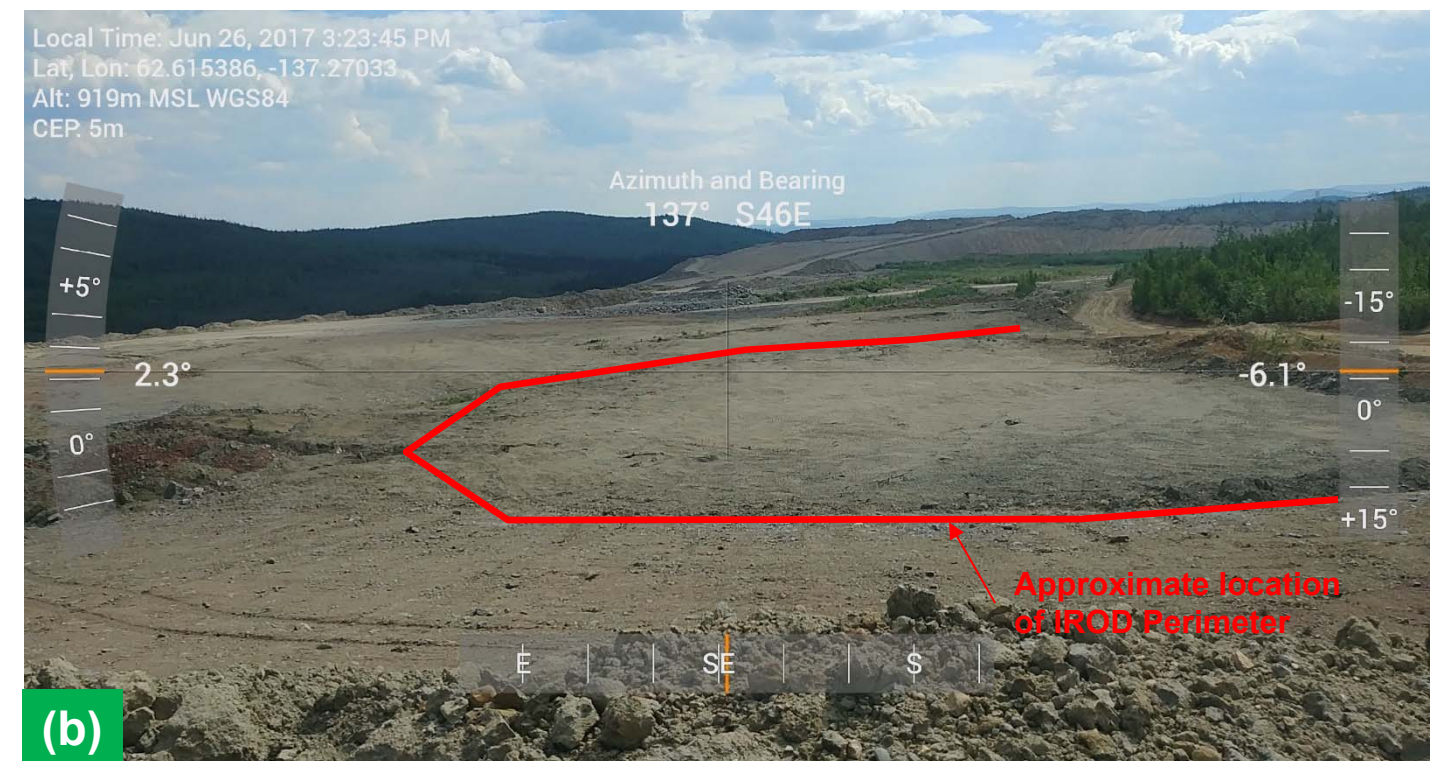
- Conditions at the Reclamation Overburden dump (ROD) remain the same as noted in previous years' inspections:
  - Slumping, settlement and tension cracks are expected in the dump as it is constructed with frozen overburden with thawing expected.
  - Discontinuous tension cracks and differential settlement observed along the perimeter crest.
  - Ground undulation is typically 0.3 m and is prevalent throughout the facility.
- The dashed yellow line in Photo (a) shows the small slope failure first observed in 2014. Vegetation has firmly been established within its footprint. The failure has not compromised the overall dump slope angle and as a result, the failure is not expected to reduce the overall stability of the dump.



(a)

## 5 Ice Rich Overburden Dump

- The IROD is completely contained by the Southwest Dump. Since the previous years' inspection, additional overburden has been placed over the IROD location to provide positive drainage and prevent pooling.



(b)

		2017 Geotechnical Inspection		
		<b>Reclamation and Ice Rich Overburden Dumps</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>7</b>

# 6 Mill Site

Conditions of the mill area are similar to those observed in previous inspections with minor ongoing erosion of the slope to the north of the mill.

Since the 2016 inspection a larger 'falling rocks' warning sign has been placed, and fallen rocks/cobbles have been cleaned from the base of the slope and from behind the concrete barriers (photo d).



# 7 Ore Stockpiles

- The ore stockpiles were investigated briefly in passing. All slopes appeared in good condition: no slumping, bulges, cracks, or other signs of instability were observed.



		2017 Geotechnical Inspection		
		Mill Site and Ore Stockpiles		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: 8

# 8 Camp Site

**Photo (a):** Slope above the main camp site appears stable, with some minor erosion of sands and gravels observed. Eroded sand/gravel is generally present at the base of the slope with occasional cobbles/boulders up to 300 mm.

**Photo (b):** A small slump was observed at the west end of the slope above the camp area. There is evidence of channelized surface flow above the slump area indicating that the slump may have occurred during a high rainfall event.

**Photo (c):** View of the channel to the north of the camp area. There is minor sloughing in the ditch in areas, but flow is not impeded. No water was observed in the upper diversion ditch.

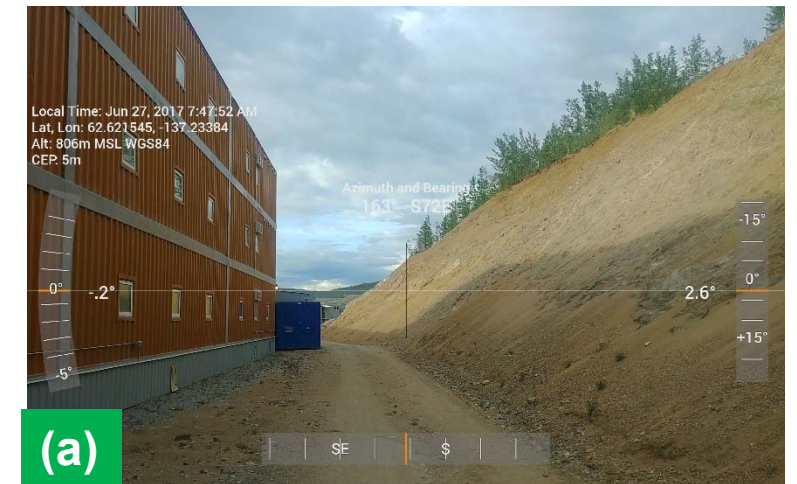
**Photo (d):** View of the regraded camp pad south of the site services trailer. In 2016, the area was regraded to prevent flow of the slope and to direct flow into a sump with a pipe outlet that discharges at the base of the slope. These mitigation measures to minimize erosion of the slope below the camp pad appear to have been effective.

**Photo (e):** View of the camp pad crest looking south.



## Recommendations

- Continue to monitor the slough at the west end of the camp area and the erosion channels below the camp pad following larger rainfall events.



(a)



(b)



(c)



(d)



(e)

		2017 Geotechnical Inspection		
		<b>Camp Site</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>9</b>



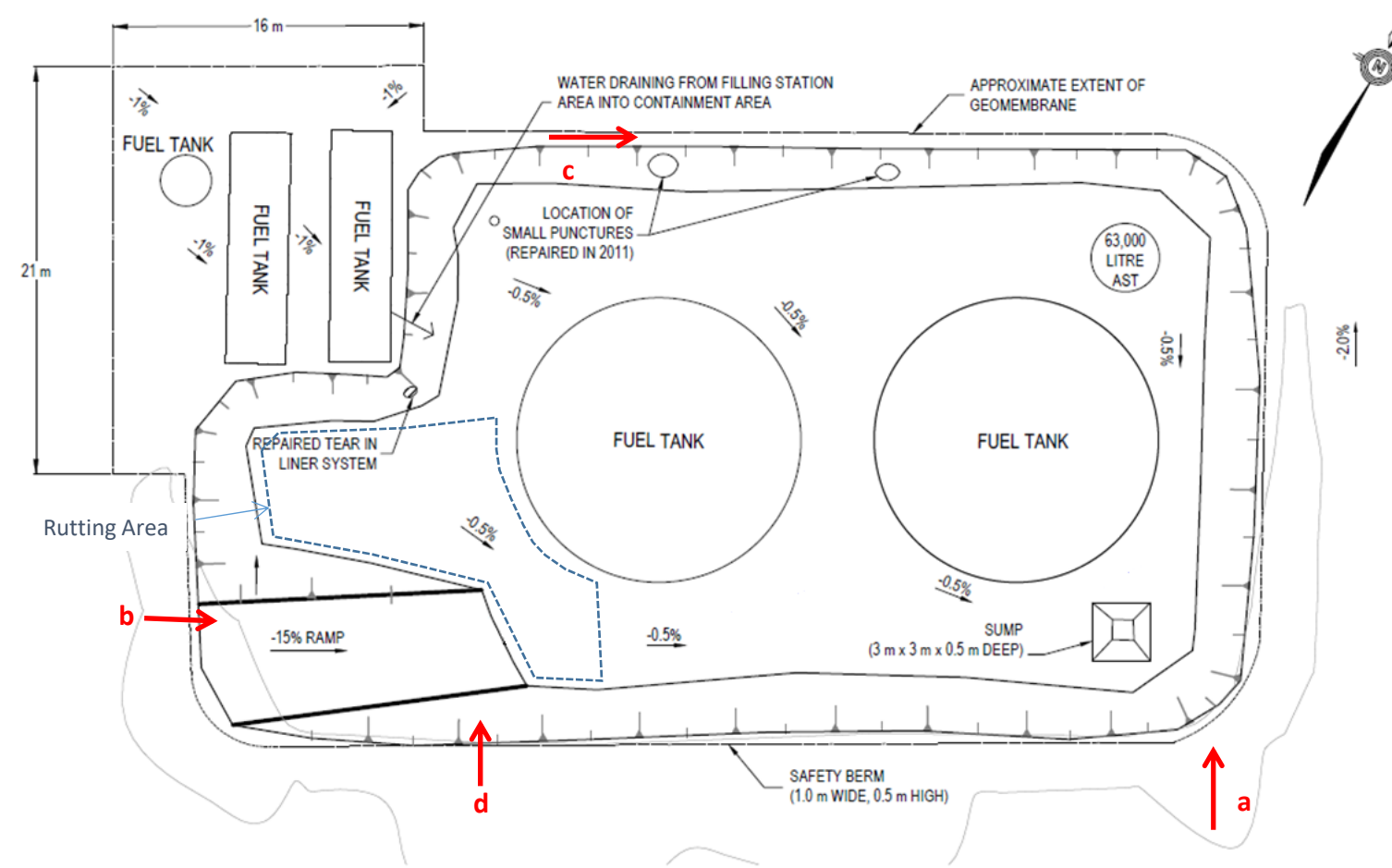
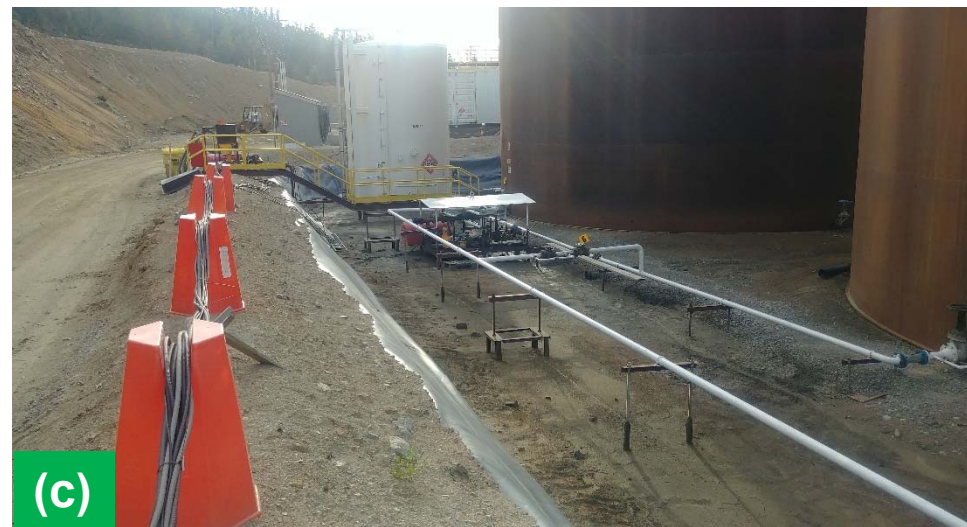
# 9 Fuel Containment Facility

## Observations

- Conditions at the fuel containment facility are unchanged from the previous inspection in June 2016.
- Photos (a) to (d) show the condition of the liner on each side of the facility.
- The erosion gully along the access ramp (Photos (b) and (d)) appears to be unchanged compared to the June 2016 photos.
- Photos (b) and (d) also show two areas of folding of the liner. No tears or defects in the liner were observed.
- Minor pooling was observed. The facility appears to drain into containment area as per design.
- No new rutting observed. Ruts are present in the southern half of the facility. Rutting is significant (approximate 2-3 inches deep) between the two tanks where equipment was turning. No liner is exposed as a result of the trafficking.

## Recommendations

- The bedding layer over the geomembrane (150 mm thick) was not meant for heavy equipment. Vehicle access should be limited to the occasional visit with low ground pressure equipment.
- No actions required.



Source: Figure 1, EBA letter "Fuel Containment Facility – 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

→ Photograph vantage point

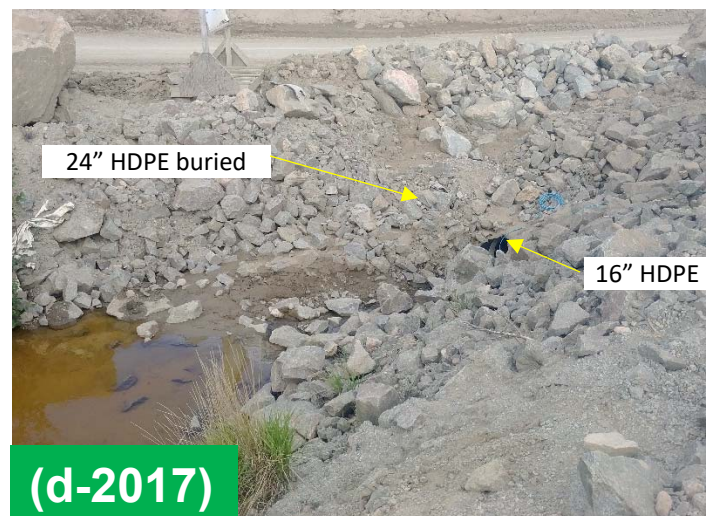
		2017 Geotechnical Inspection		
		<b>Fuel Containment Facility</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>10</b>

# 10 South Diversion Ditch



Source: 2014 Orthophoto

Photograph vantage point



- The South Diversion Ditch was inspected between the overflow spillway and the intake structure. The ditch along the Airport Access road was also inspected. The pipeline alignment between the overflow spillway and the Main Pit Confluence area was not inspected during the site visit.
- No signs of instability were noted along the side-slopes.
- Due to the future development of the Area 2 Stage 3 Pit, the SDD is to be decommissioned with water at the SDD Intake Structure is to be diverted to the Tailings Diversion Ditch (TDD), with any flow that exceeds the TDD capacity, directed into the Area 2 Pit. It is understood that these works will start in August 2017 and be completed prior to the 2018 freshet.
- Photo (a): The inlet structure at the upstream end of the ditch is unobstructed.
- Photo (b): Vegetation growth in the channel is likely impacting the flow capacity of the ditch and overtopping is possible during extreme events.
- Photo (c): Routine grading of the UG Portal Access Road has resulted in the creation of berms on both sides of the road that is blocking the overflow spillway. Should the capacity of the HDPE pipes be exceeded and the ditch overtopped, flow would enter the Airport Laydown Area.
- Photo (d): View of the HDPE pipe intake area in 2017 and 2014. The grading of the UG Portal Access Road has also resulted in the larger 24" HDPE pipe being buried. This greatly reduces the capacity of the piping, and with the current blockage of the overflow spillway, there is a significant risk of overtopping of the SDD. of the west bank. Conditions the same as noted in previous inspections.

## Recommendations

No actions are required as the SDD is to be decommissioned in August 2017. However, if the SDD is not decommissioned:

- **High Priority:**
  - the overflow spillway and HDPE pipe intake area should be cleaned as soon as possible, and the area surveyed to ensure that the spillway meets the design requirements (minimum channel width and depth are met).
  - The vegetation within the South Diversion Ditch should be cleared.

		2017 Geotechnical Inspection		
		<b>South Diversion Ditch</b>		
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# 11 Water Storage Pond Dam

The June 2015 geotechnical inspection reported a large area of erosion on the left (north) abutment of the dam that was exposed as a result of the water level being lower than the normal operating level. The area was repaired in July 2015 by placing additional rip-rap as protection after consulting with the Engineer of Record for the dam, TetraTech EBA. The repaired area could not be observed during in 2016 inspection, as the pond water level was within normal range, but was visible during the 2017 inspection (e).

- Pond elevation during the inspection was approximately 709.5 m (spillway elevation 716.2m)
- No signs of instability along the dam, or at the abutments.
- Seepage water downstream of the dam was clear and no accumulation of sediments was observed.
- The weir present downstream of the dam had an estimated flow rate of <1 L/s. Condition of the seepage water appears unchanged compared to the 2016 inspection. Water flow could not be heard in the rockfill adjacent to the seep. The water was clear with no turbidity.

Photo (a): View of the downstream slope taken from the ponded seepage water area looking towards the right abutment.

Photo (b) View of the ponded seepage pond at the toe of the dam.

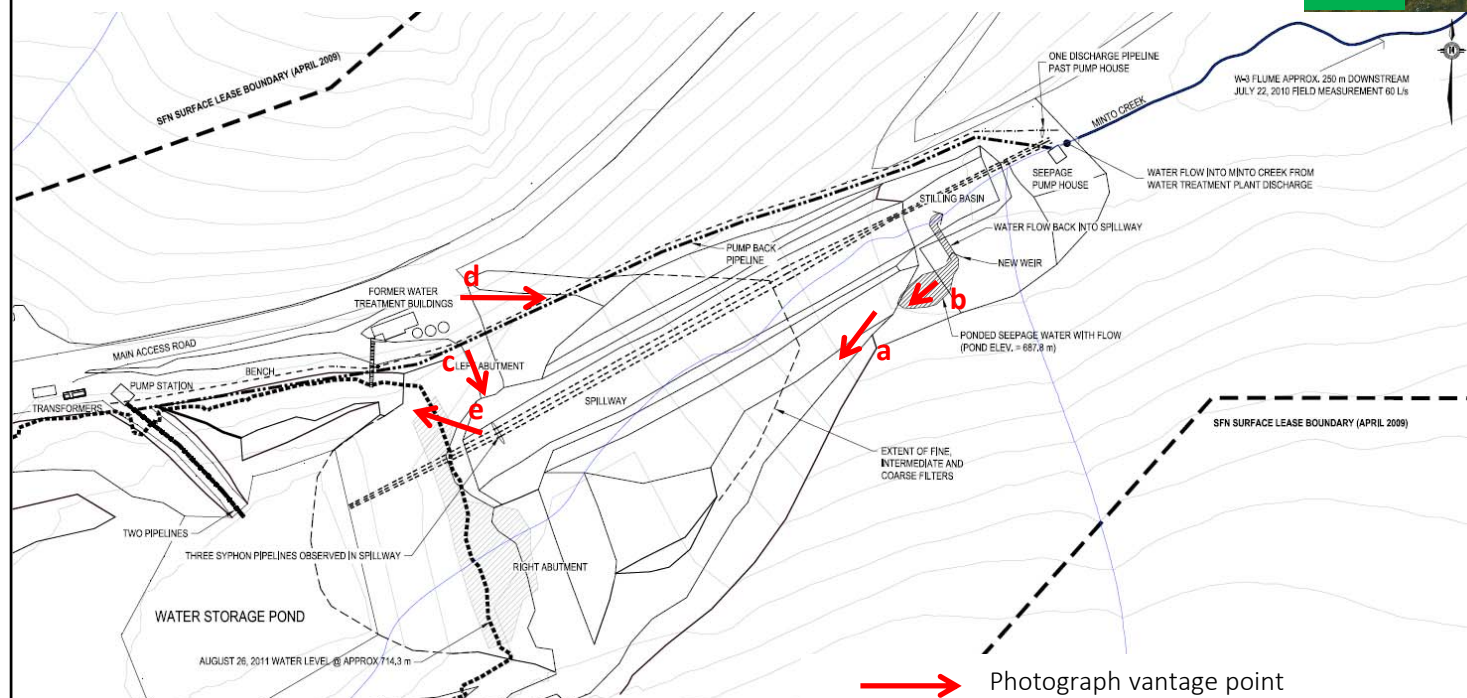
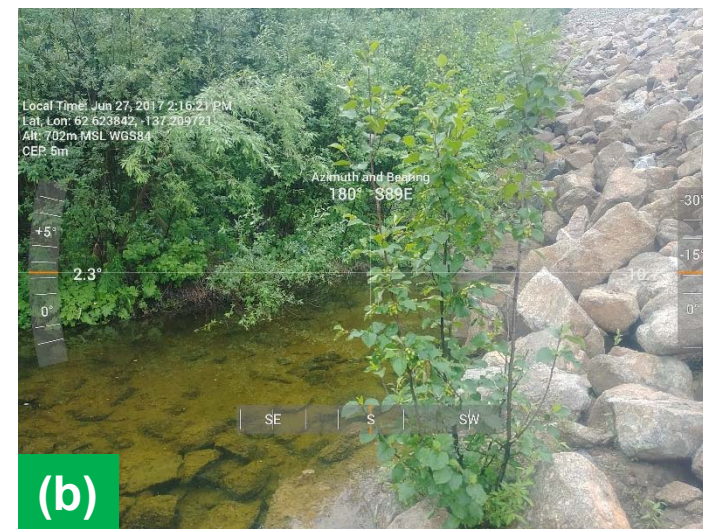
Photo (c): View of the crest of the dam

Photo (d): View of the downstream slope of the dam taken from the left abutment.

Photo (e): View of the upstream slope at the right abutment.

## Recommendations

- Continue regular monitoring of the dam as per the OMS Manual.



Source: Figure 1, EBA letter "Water Storage Pond Dam– 2011 Physical Observation Report, Minto Mine, YT", dated September 30, 2011.

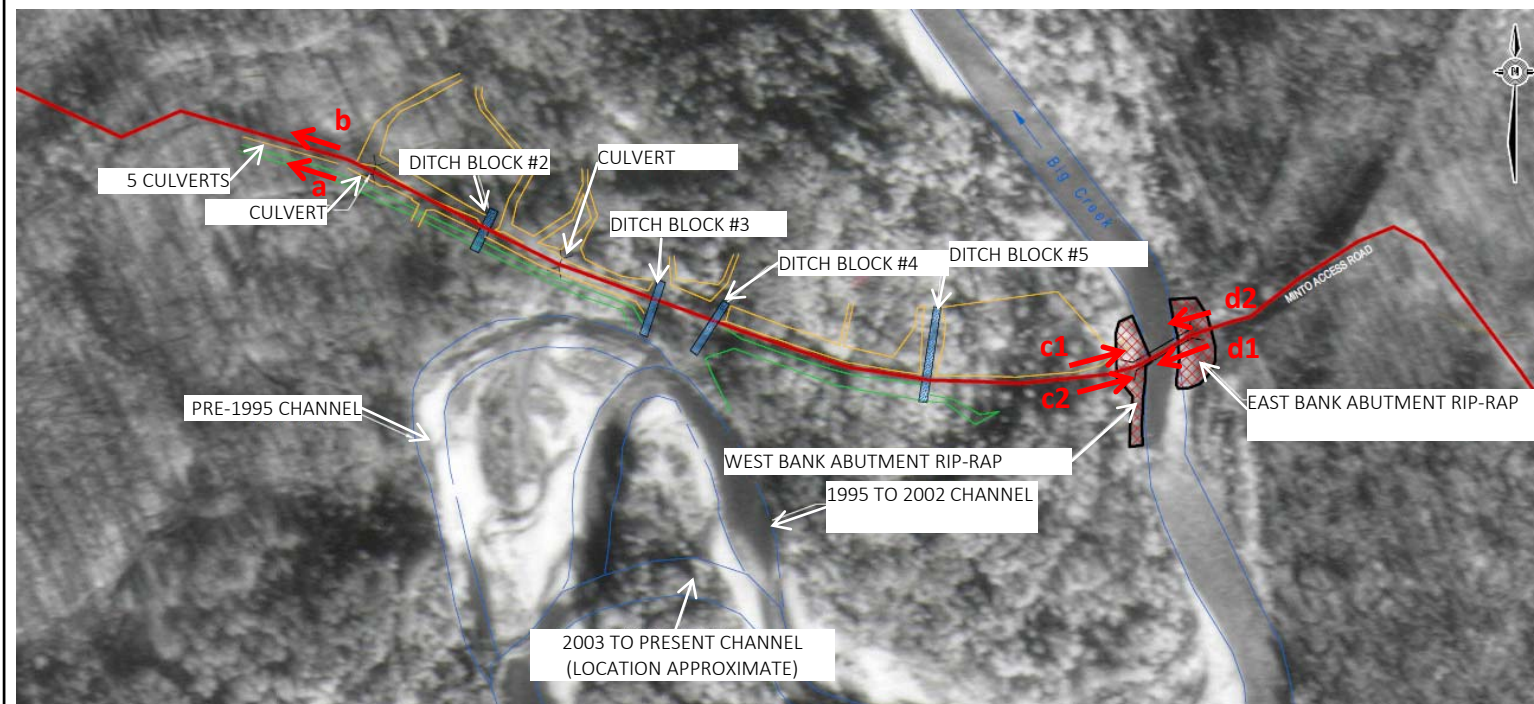
		2017 Geotechnical Inspection		
		<b>Water Storage Pond Dam</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>12</b>

# 12 Big Creek Bridge

- Conditions of the culverts are unchanged since the previous June 2016 inspection. All culverts are in satisfactory conditions with no major blockages or sediment accumulation at either end of the culverts. The first culvert west of the bridge is in satisfactory condition.
- Photos (a) and (b) show the upstream and downstream ends of the group of 5 culverts, each with diameter of 1.1 m. The culverts are in satisfactory condition, with no blockages at either end. Small portions of geotextile are exposed at either end, but is not impacting the culvert performance.
- Ditch Blocks #2 to #5 are unchanged from previous inspections and are in satisfactory condition. Ditch Block #1 has not been constructed.
- Photos (c) and (d) show the east and west abutments, respectively. The bridge abutments and road approaches are in good condition, with no signs of instability observed.

## Recommendations

- Continue regular annual monitoring of sediment accumulation in the culverts, and clean out if sediments continue to accumulate.



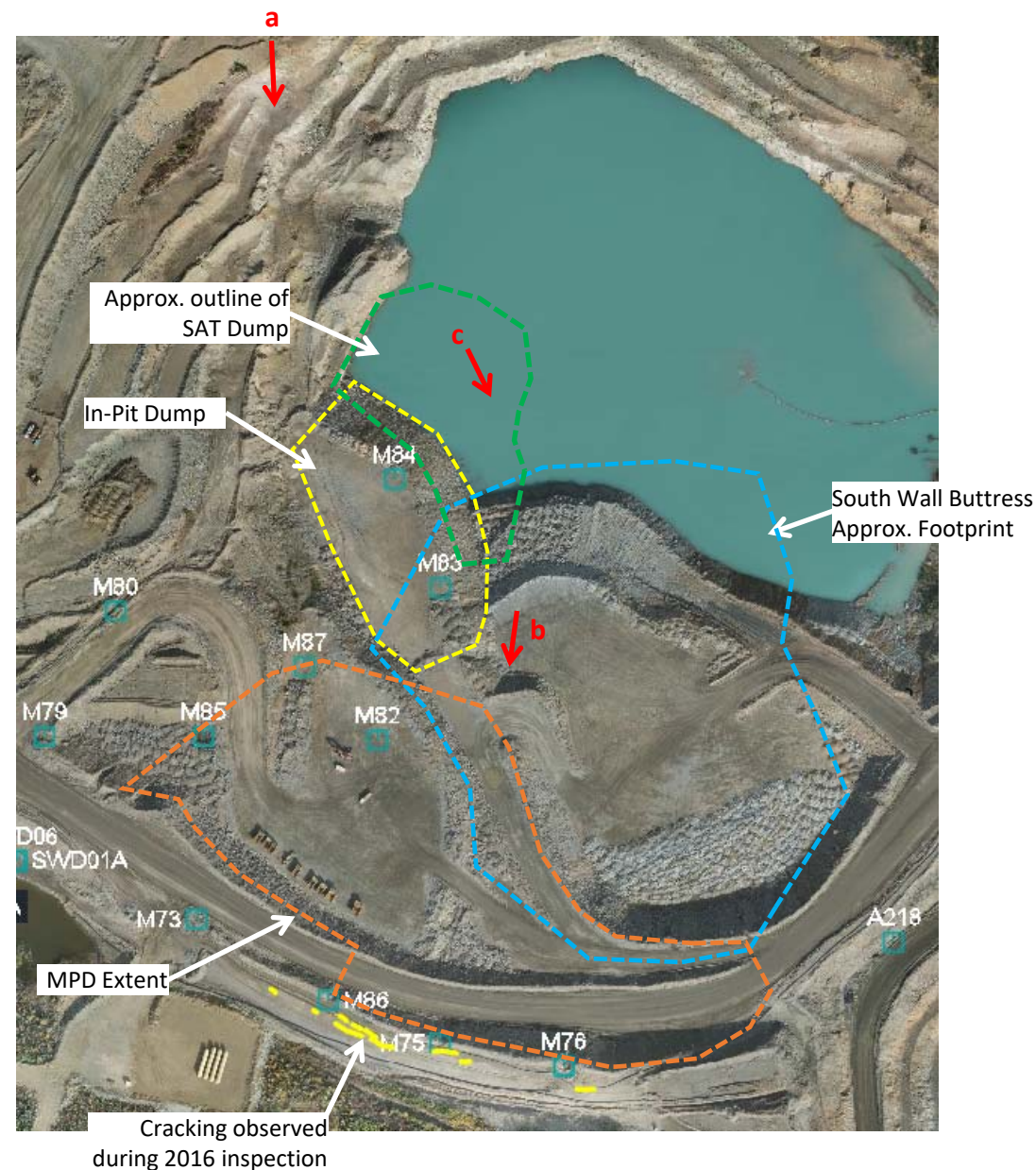
Source: Figure 1, EBA letter "Big Creek Bridge- 2011 Annual Review, Minto Mine, YT", dated September 30, 2011.

		2017 Geotechnical Inspection		
		<b>Big Creek Bridge</b>		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: <b>13</b>

# 13 Main Pit Dump, SAT Dump, & In-Pit Dumps

Since the 2016 inspection, construction of dump continued periodically as SAT material was produced, and construction of the Main Pit Dump began in February 2017. At the time of the inspection, the MPD was nearing completion at an elevation of 835 m.

- No waste rock was placed on the 'in-pit dump' (photo (a)) and no visible changes of the cracking were observed in the with no change in the condition of the cracking observed.
- The cracks noted during the 2016 inspection parallel to the pit wall at the south end of the pit was not observed during the 2017 inspection as a result of construction of an access road over the cracking location. The 2016 cracking was believed to be due to settlement of the waste rock within Main Pit.
- Survey hub M82 (Photo (b)) was observed with rocks underneath its lock block, which is likely the cause of the variability in the survey hub readings.

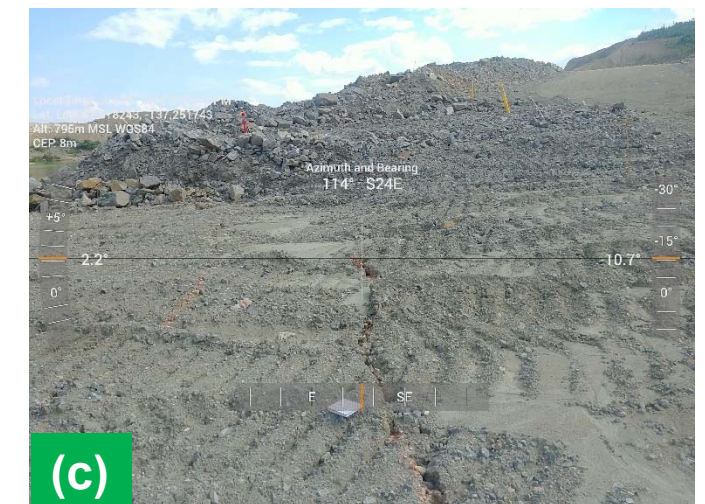


## SAT Dump

- Minor cracks were observed parallel to the advancing face of the SAT dump (Photo (c)). The maximum crack width observed was 3 cm. The SAT dump is being advanced in a controlled manner with the dump face advanced 5m, followed by a minimum 7 day tailings consolidation period, and as a result, cracking is to be expected as a result of consolidation of the underlying tailings. The cracks are routinely monitored by Minto staff and spray painted to monitor propagation.
- Tracks from haul trucks were observed close to the dump face – truck traffic should be maintained a minimum of 5 meters away from the dump face, or a spotter should be present.

## Recommendations:

- **High Priority:** Clear the loose rocks beneath M82
- Continue to limit access to the In-Pit Dump area near M84.
- During SAT material placement, truck traffic should be maintained a minimum of 5 meters away from the dump face, or a spotter should be present.

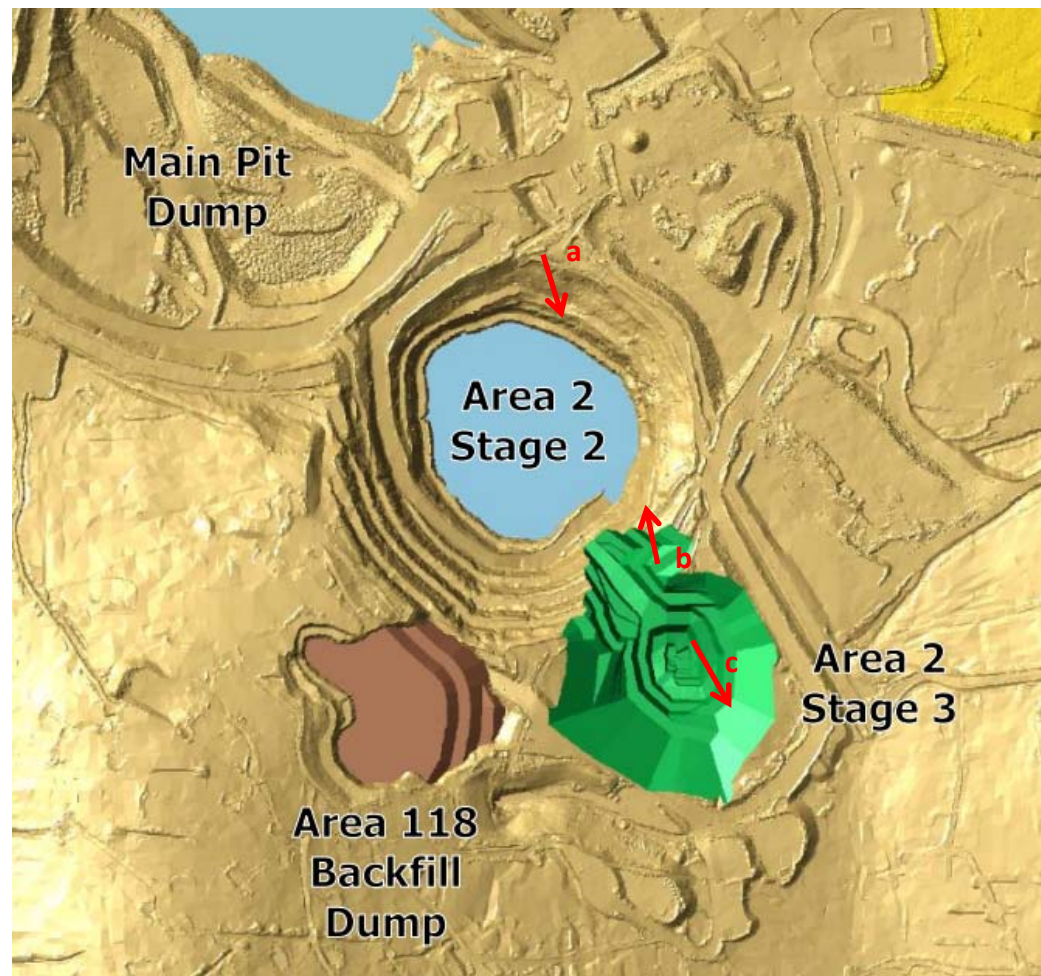


		2017 Geotechnical Inspection		
		Main Pit, South Wall Buttress, and In-pit Dumps		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: 14

# 14 Area 2 Pit

Since the 2016 Inspection, mining of the Area 2 Stage 3 Pit started with most of the overburden removed at the time of the 2017 inspection.

- Photo (a): View of the Area 2 Stage 2 Pit taken from the north side looking south.
- Photo (b): View of the Area 2 Stage 2 Pit looking north.
- Photo (c): View of the Area 2 Stage 3 overburden slope in the south east corner of the pit. The photo notes a layer of wet, fine grained silts and clays that was thawed at the surface, with melt water draining onto the pit floor. No ice or ice lenses were observed, but the zone likely contains excess ice. The area is likely to be subject to localized instability and sloughing as a result of the melting ice similar to that experienced on the east wall of the Area 2 Stage 2 Pit (photo b), but large scale movement of the slope is a possibility. The area should be closely monitored, and it is recommended that a survey prism be established above the zone to monitor displacement.



Source: Figure 4, Minto Explorations, 2016. Area 2 Stage 3 Pit – Mine Development and Operations Plan 2016-01, October.

→ Photograph vantage point

- Recommendations:**
- **High Priority:** Review displacement of the slope based on radar (or l-site scanner) data to confirm any areas of movement and the rate of movement. Based on the results of the review, establish a survey prism/hub to monitor displacement of the south wall of the Area 2 Stage 3 Pit.



		2017 Geotechnical Inspection		
		Area 2 Pit		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: 15

# 15 Area 118 Pit

Since the previous inspection, the Area 118 Pit has been backfilled with coarse grained overburden from the Area 2 Stage 3 pit expansion that is unsuitable for reclamation covers (fines content < 10%). The pit is nearly backfilled to the invert pit elevation.

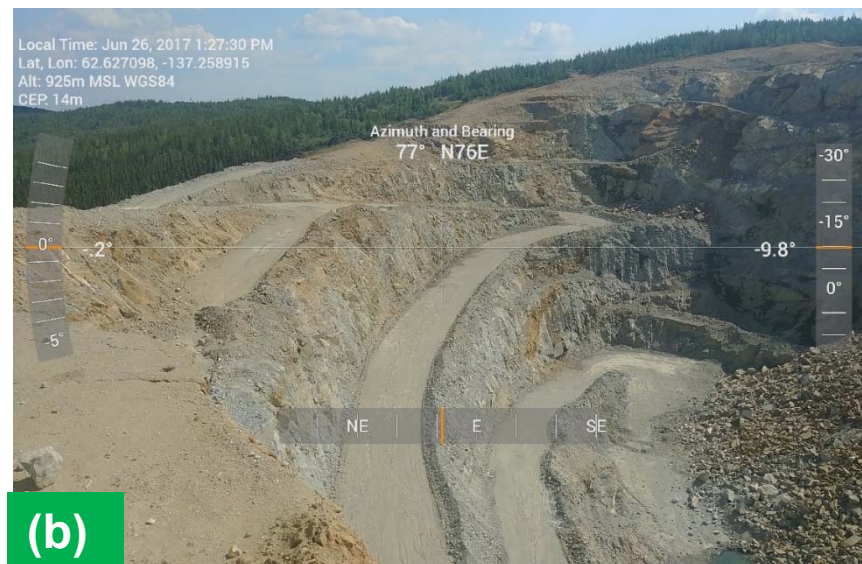
Photo a: View of the Area 118 Pit looking west..



# 16 Minto North Pit

The Minto North Pit was visually observed from the rim at the north side of the pit. Mining at the pit was completed in October 1, 2016 with no additional mining operations planned at Minto North at this time.

The failure of the south pit wall (debris shown in photos (b) and (d)) occurred one day following completion of the pit and removal of all equipment and personnel, as was predicted based on pit wall monitoring. No additional pit slopes failures have occurred since.

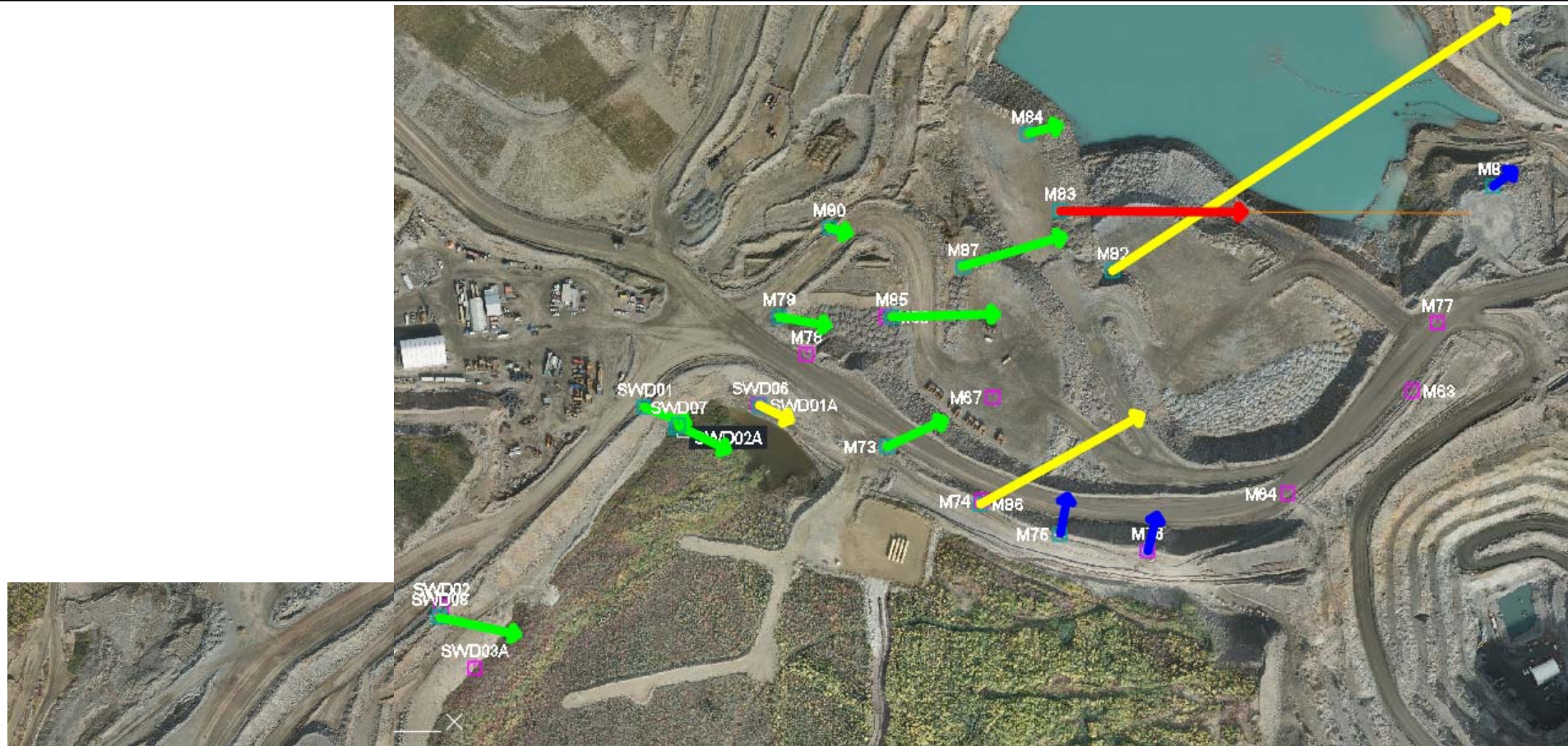


		2017 Geotechnical Inspection		
		Area 2, Area 118, and Minto North Pits		
Job No: 1CM002.059 Filename: AppA_2017InspectionPhoto.pptx	Minto Mine	Date: August 2017	Approved: PHM	Figure: 16

## Appendix B: Survey Hub Summary

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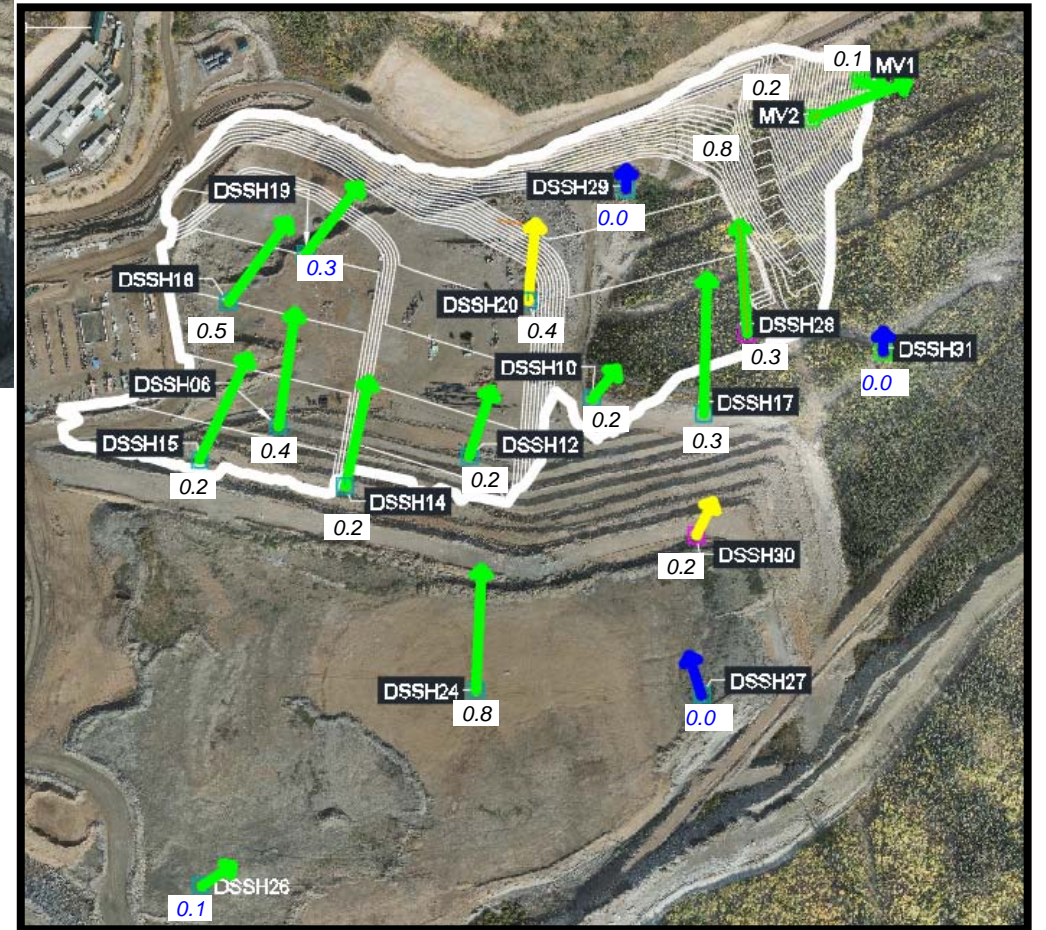




a) Southwest Dump and Main Pit Areas

**LEGEND**

- Survey Hubs - Active
- Survey Hubs - Destroyed
- 0.5 Total Movement Rate (mm/day)
- 0.5 Horizontal Movement Rate (mm/day)
- Movement Vector - No Current Movement
- Movement Vector - Decelerating Movement
- Movement Vector - Steady Movement
- Movement Vector - Accelerating Movement



b) Dry Stack Tailings Storage Facility

**Notes:**

1. Movement vectors have been scaled by a factor of 250 (i.e. length equals 250 times the current velocity in mm/day) except for the blue vectors where no current movement is observed. The length of the blue vectors is arbitrary, but is included to show the direction of past movement.
2. The orthophoto was taken in 2014.
3. Survey hub M82 in the Main Pit has a limited data set, and the readings are suspect at this time due to rocks underneath the lock-block that this survey hub is mounted on (See Figure 14, Appendix A).

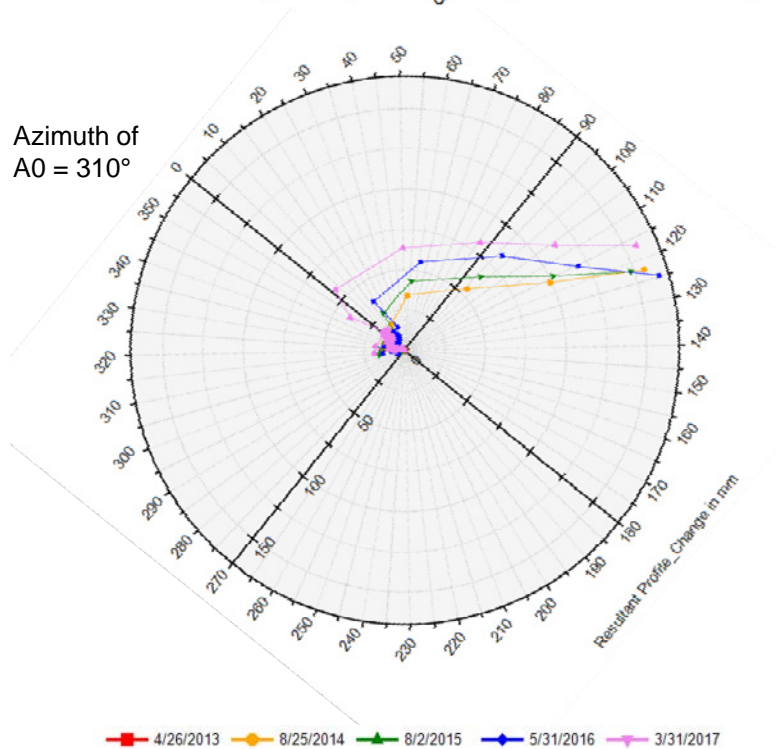
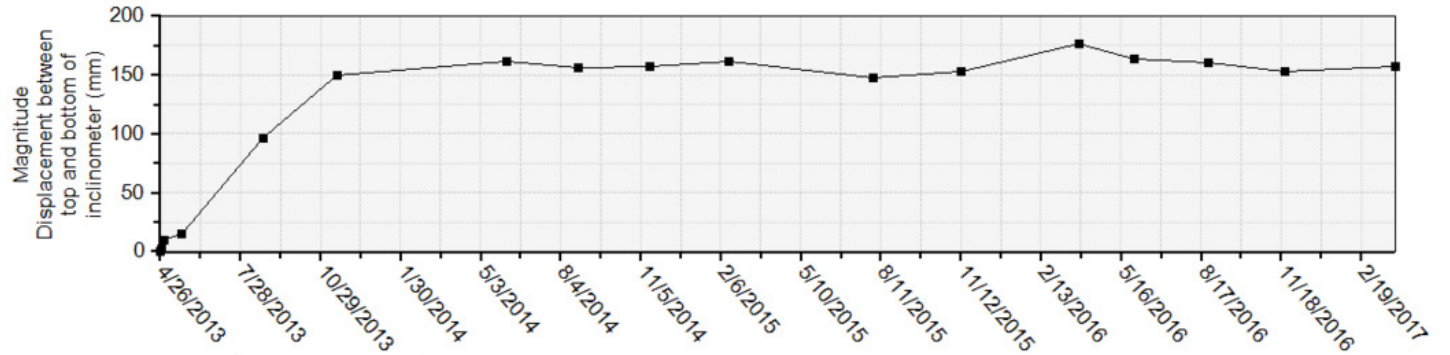
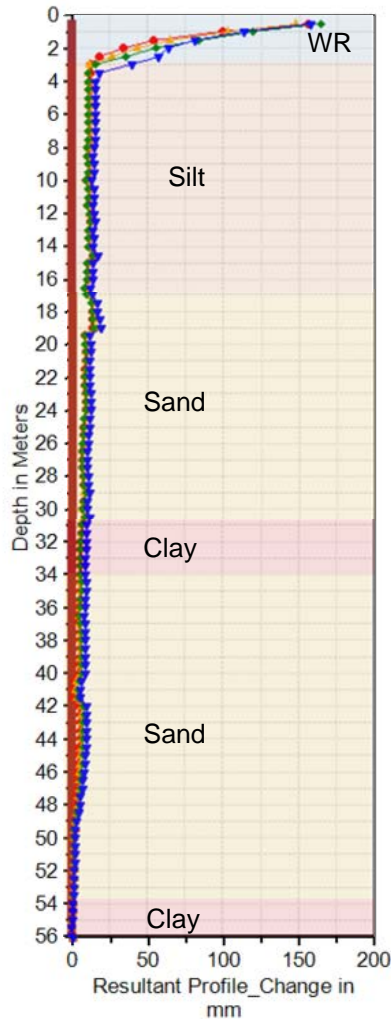
		2017 Survey Hub Data		
		<b>Survey Hub Summary</b>		
Job No: 1CM002.059 Filename: MintoSurveySummary11x17.pptx	Minto Mine	Date: August 2017	Prepared by: PHM	Figure: <b>1</b>

Appendix C: Area 2 Pit Instrumentation Data

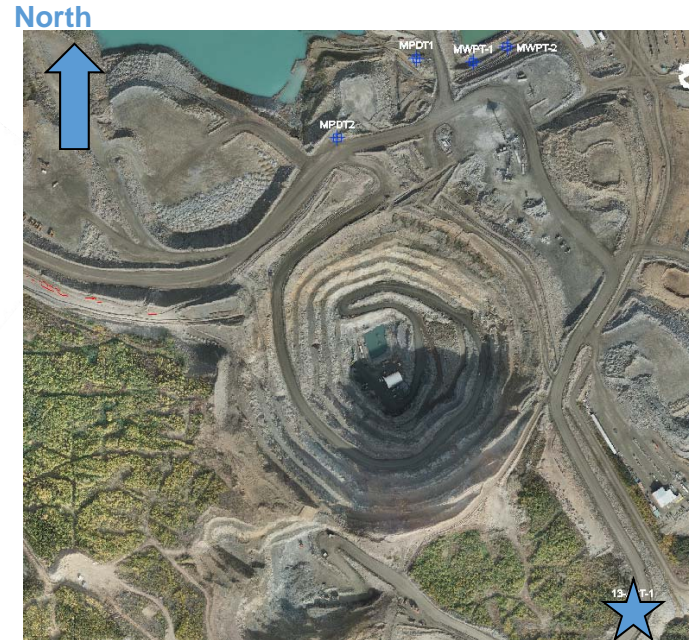
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### MINTO A2I-1 Magnitude

■ 4/26/2013    ● 8/25/2014    ▲ 8/2/2015  
◆ 5/31/2016    ▼ 3/31/2017



Note: Inclinometer software (DigiPro2 v2.12.4) plots A0 as 0 degrees. The plot above has been rotated such that the orientation matches the plan (north is up).

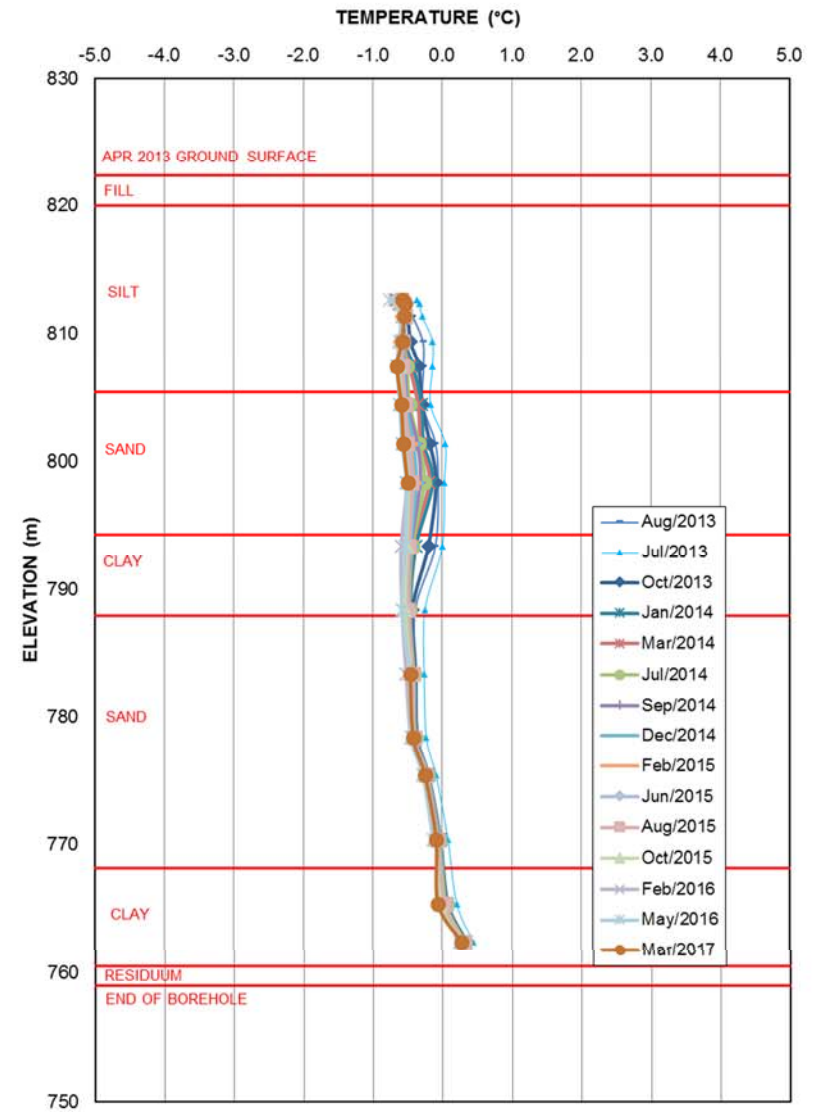
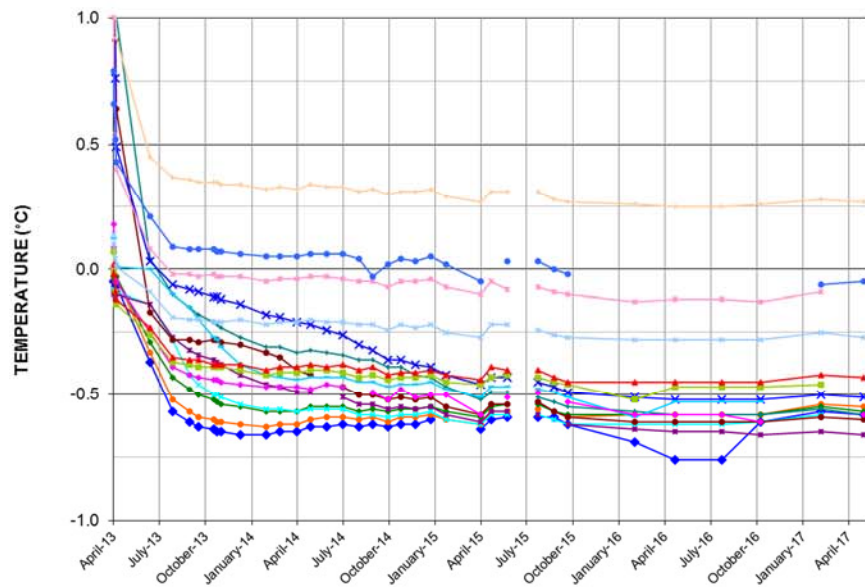


Inclinometer location

Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

	 MINTO MINE <small>OPERATED BY MINTO EXPLORATIONS LTD.</small>	Area 2 Pit Instrumentation Data		
		<b>Inclinometer A2I-1</b>		
Job No: 1CM002.059 Filename: ApC_2017Area2Pit.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>1</b>



Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - Area 2 Pit\_SRK\_.xlsm



Job No: 1CM002.059  
Filename: ApC\_2017Area2Pit.pptx



Minto Mine

Area 2 Pit Instrumentation Data

**Ground Temperature Cable – A2T-1**

Date: August 2017	Prepared by PHM	Figure: 2
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Appendix D: Dry Stack Tailings Storage Facility Instrumentation Data

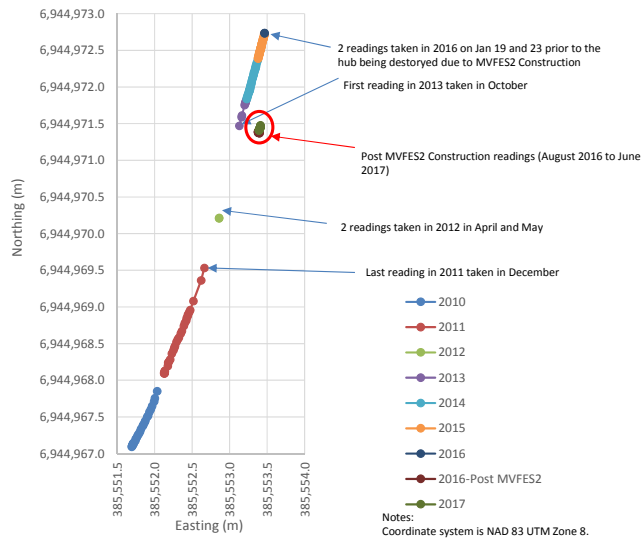
---

Active Survey Hubs					
Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		June 16	June 17		
DSSH06	6/24/2017	n/a	0.4	8	<b>Decelerating.</b> Hub was removed in January 2016 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 1.0 mm/day.
DSSH10	6/25/2017	n/a	0.2	40	<b>Decelerating.</b> Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 0.9mm/day.
DSSH12	6/24/2017	n/a	0.2	18	<b>Decelerating.</b> Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 1.1mm/day.
DSSH14	6/24/2017	0.5	0.2	13	<b>Decelerating.</b>
DSSH15	6/24/2017	n/a	0.2	25	<b>Decelerating.</b> Hub was removed in February 2016 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 0.6 mm/day.
DSSH17	6/25/2017	0.4	0.3	16	<b>Horizontal movement is decelerating</b> and the upward vertical movement is steady. The increase in upward trajectory of the movement indicates the MVSE2 is having a positive effect on slowing the movement.
DSSH18	6/25/2017	0.6	0.5	36	<b>Decelerating.</b> Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 0.5 mm/day.
DSSH19	6/25/2017	0.5	0.3	38	<b>Decelerating.</b> Horizontal rates listed. Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 0.5 mm/day.
DSSH20	6/25/2017	0.1	0.4	5	<b>Additional data needed</b> to evaluate trend. Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2017. The movement rate prior to MVFES2 construction was 0.1 mm/day. Since reinstallation movement primarily appears to be due to settlement of the hub on the fill.
DSSH24	6/25/2017	0.8	0.8	3	<b>Additional data needed</b> to evaluate trend. Most movement is appears to be related to freeze-thaw cycle of the cover.
DSSH26	6/25/2017	0.2	0.1	56	<b>Slight deceleration trend observable,</b> horizontal movement rates listed.
DSSH27	6/18/2017	0.0	0.0	276	<b>No significant horizontal movement trend</b>
DSSH29	6/25/2017	n/a	0.0	88	<b>No significant horizontal movement trend</b>
DSSH31	6/25/2017	n/a	0.0	343	<b>No significant horizontal movement trend</b>
MV1	6/25/2017	0.3	0.1	111	<b>Decelerating</b>
MV2	6/25/2017	0.8	0.2	61	<b>Decelerating</b>
Destroyed in past year					
Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		June 15	At last reading		
DSSH28	1/22/2017	n/a	0.3	356	<b>Decelerating</b>
DSSH30	4/2/2017	n/a	0.2	13	<b>Additional data needed,</b> limited data set (5 months)

Notes:  
1. Blue text indicates horizontal movement rates.

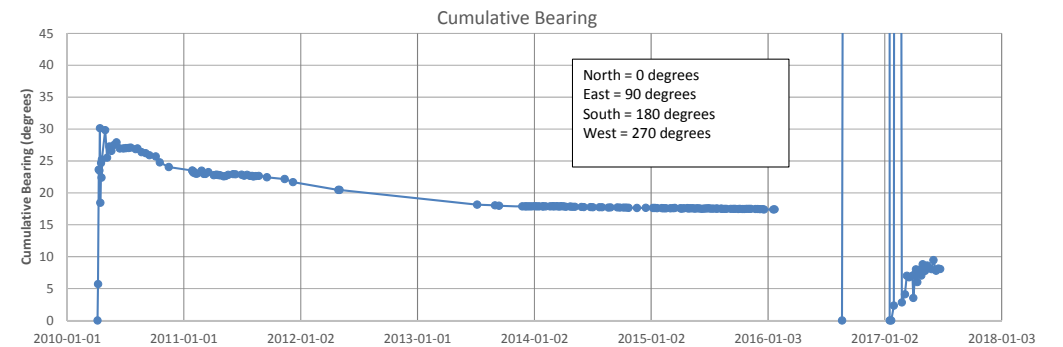
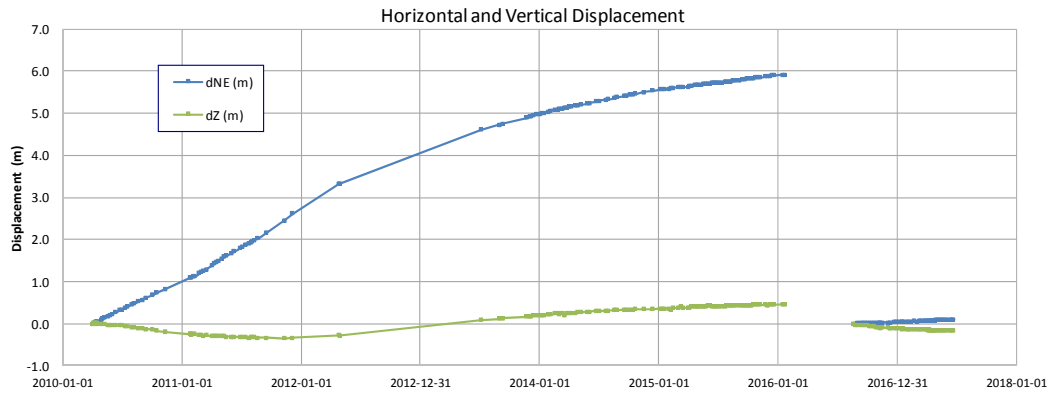
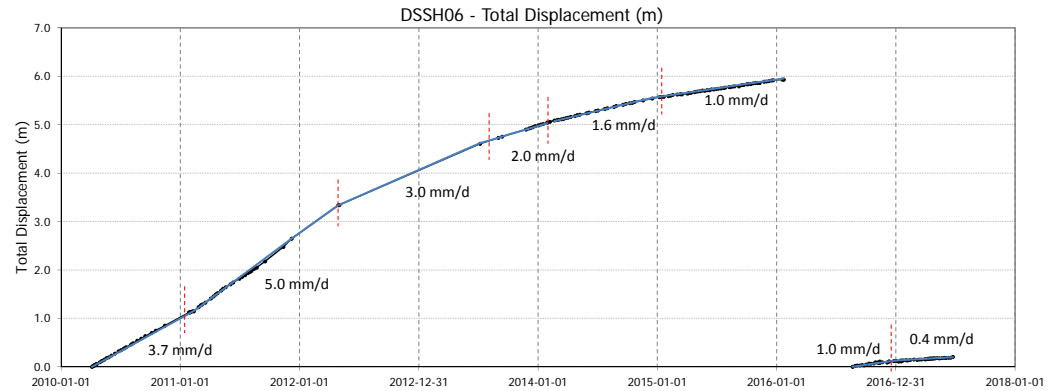
		DSTSF Instrumentation Data		
		<b>DSTSF Survey Hub Summary</b>		
Job No: 1CM002.059 Filename: ApD_DSTSFPort.pptx	Minto Mine	Date: August 2017	Prepared by: PHM	Figure: 1

**DSSH06 - Northing Vs. Easting Movement Plot**



**Note:**

- The survey hub was removed in January 2016 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.

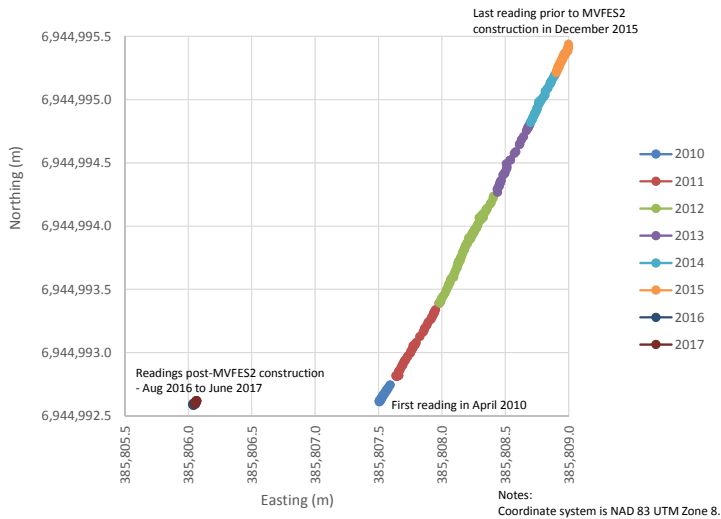


**Source files:**

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

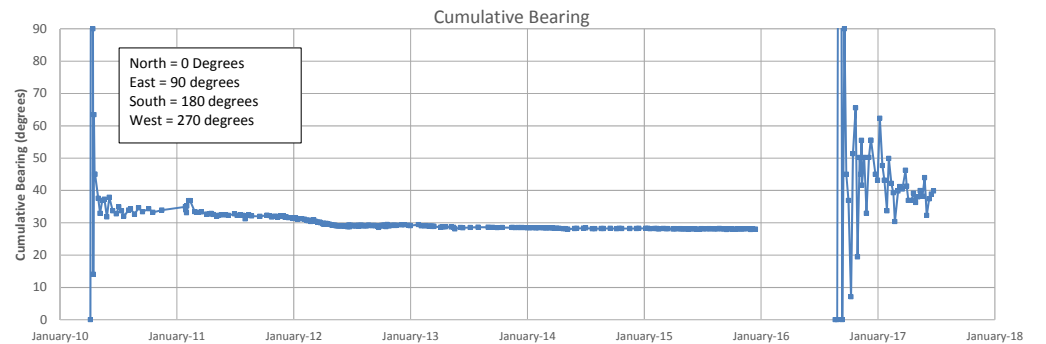
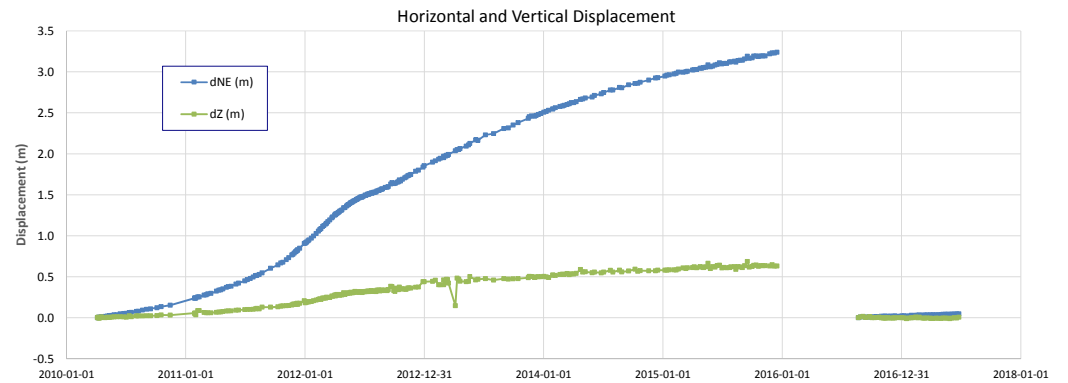
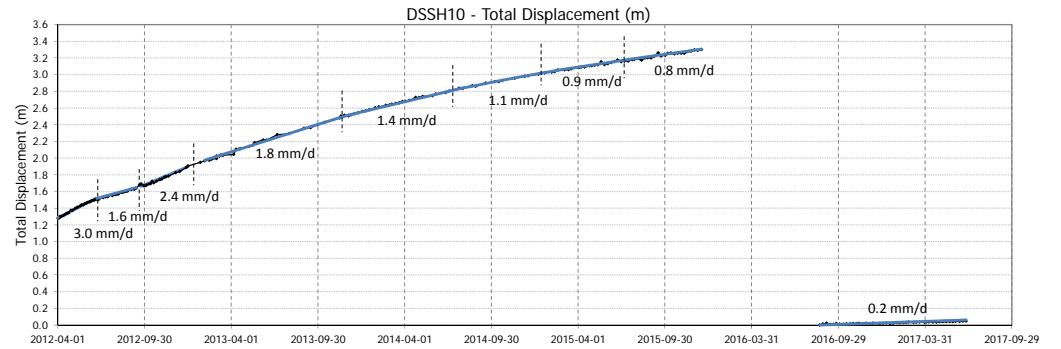
	 MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	DSTSF Instrumentation Data		
		<b>DSTSF – DSSH06</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>2</b>

### DSSH10 - Northing Vs. Easting Movement Plot



**Note:**

- The survey hub was removed in December prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.



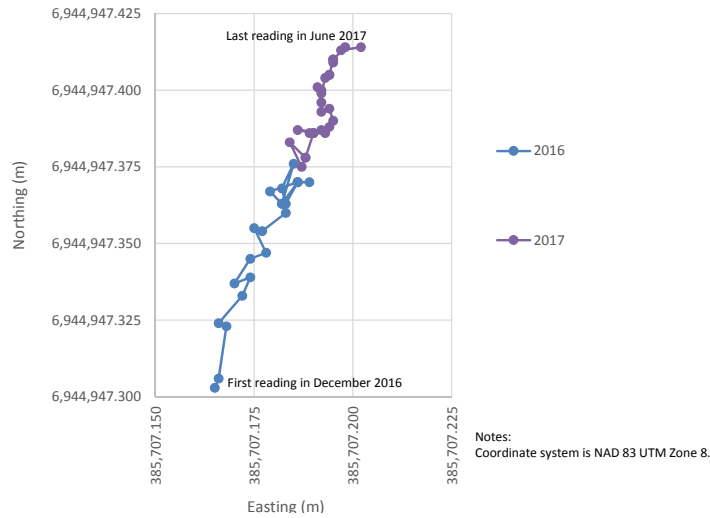
**Source files:**

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

 Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	 Minto Mine	DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH10</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>3</b>

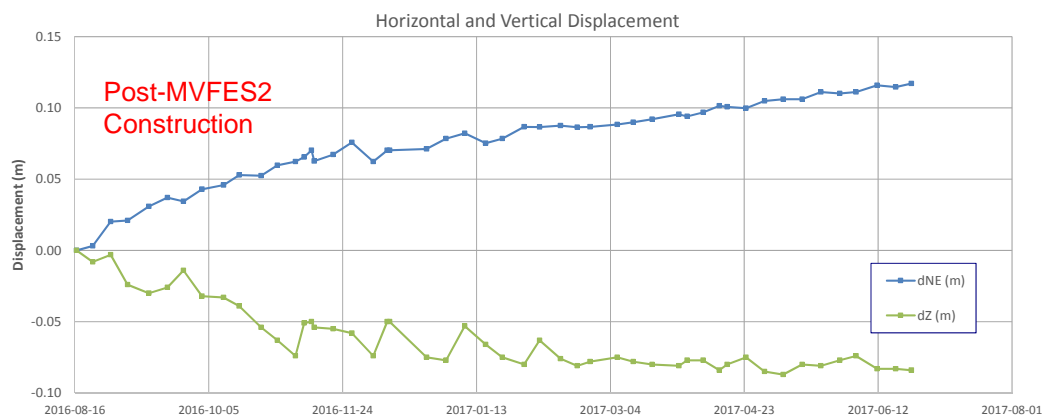
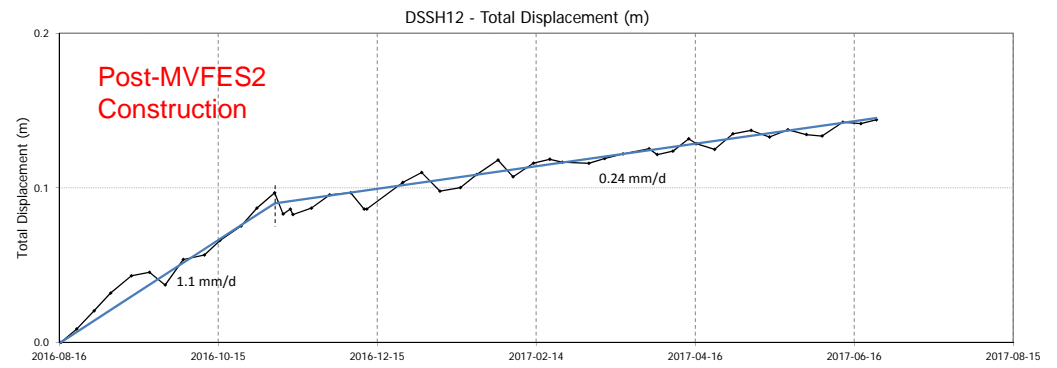
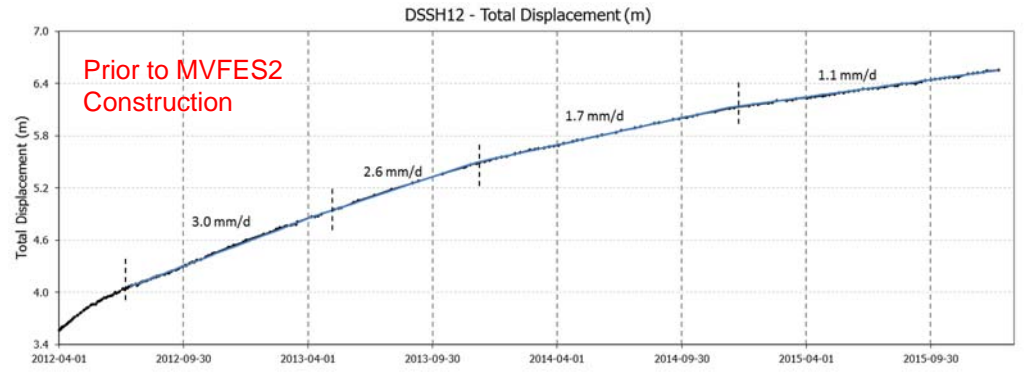


### DSSH12 - Northing Vs. Easting Movement Plot



Note:

- The survey hub was removed in January 2016 prior to MVFES2 construction. The hub was reinstalled in December 2016 following completion of construction.

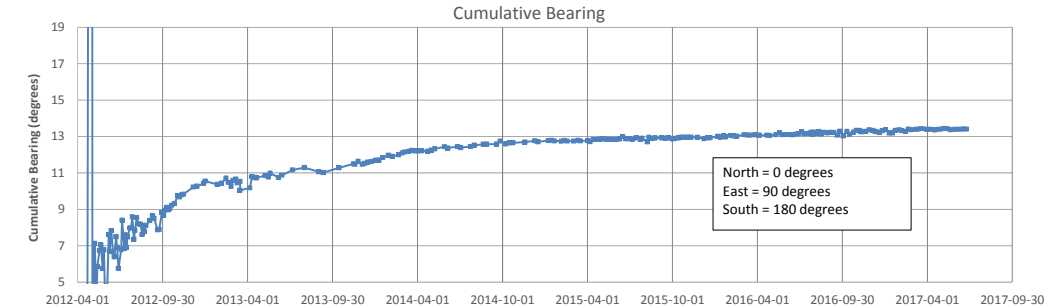
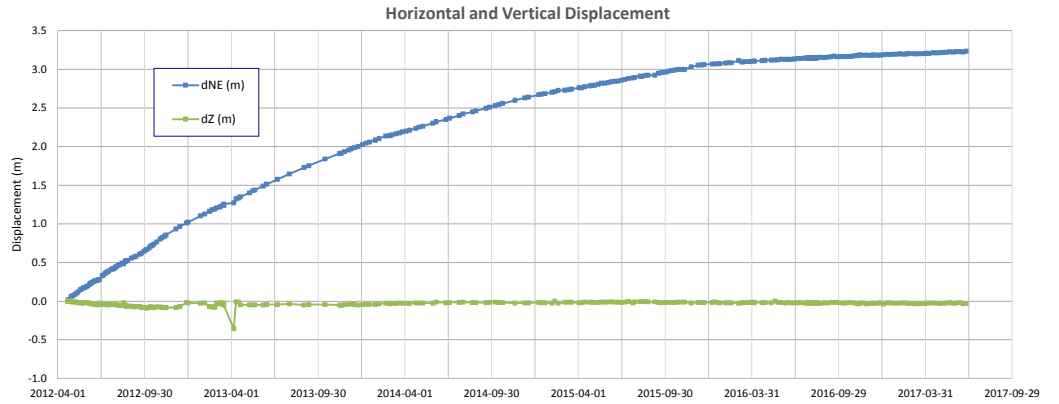
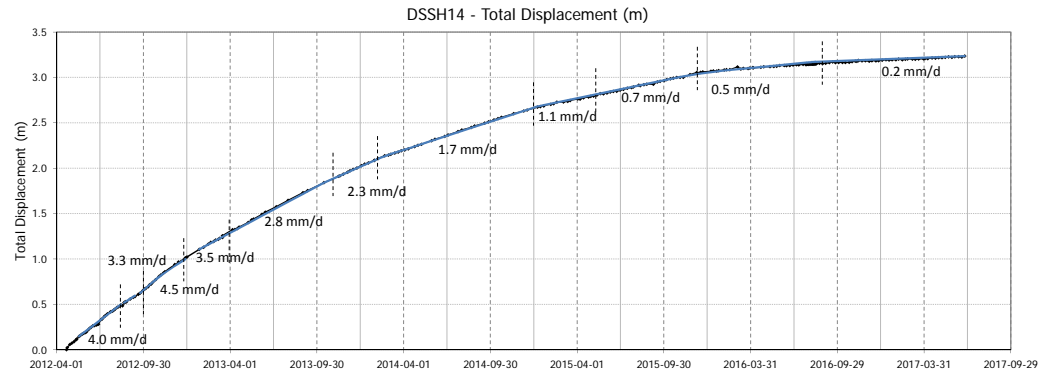
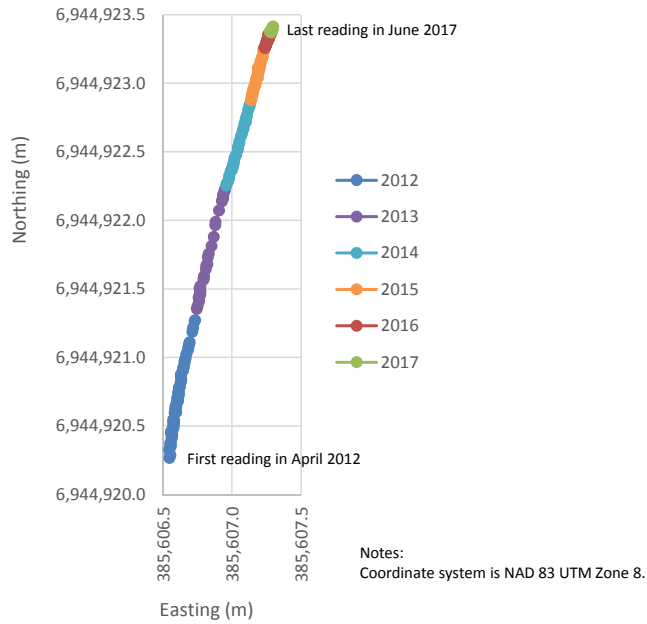


Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH12</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>4</b>

### DSSH14 - Northing Vs. Easting Movement Plot

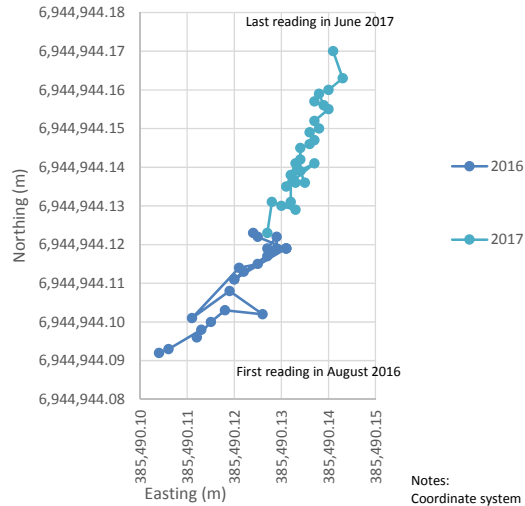


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH14</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>5</b>

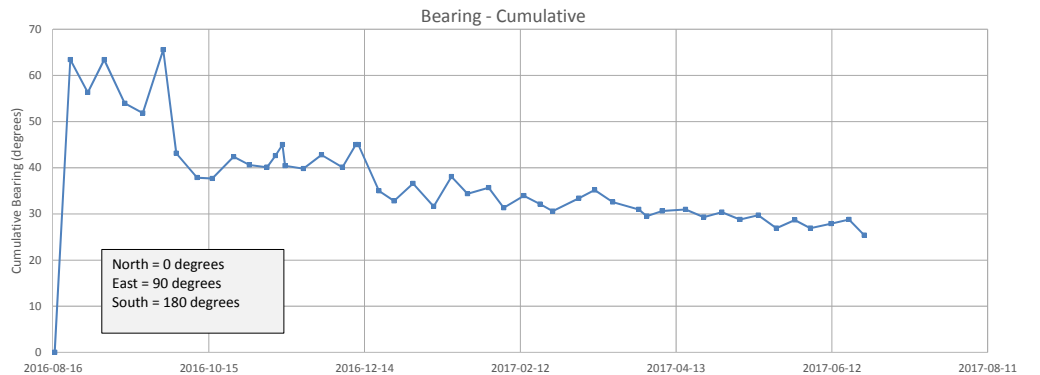
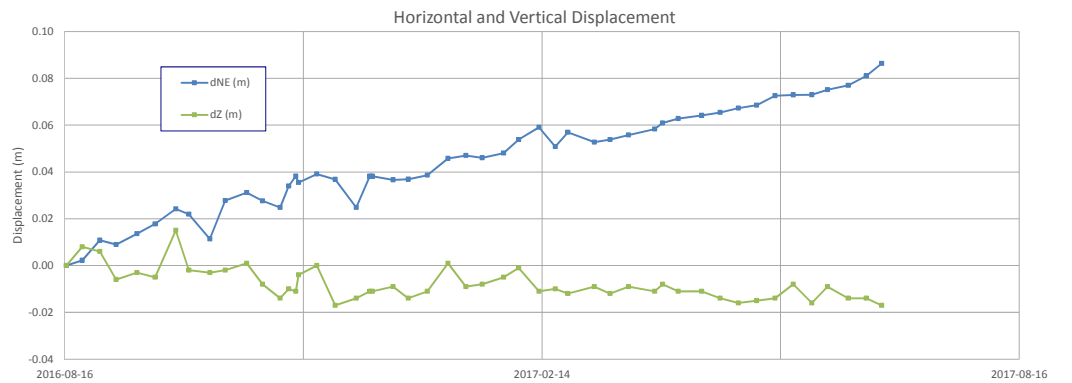
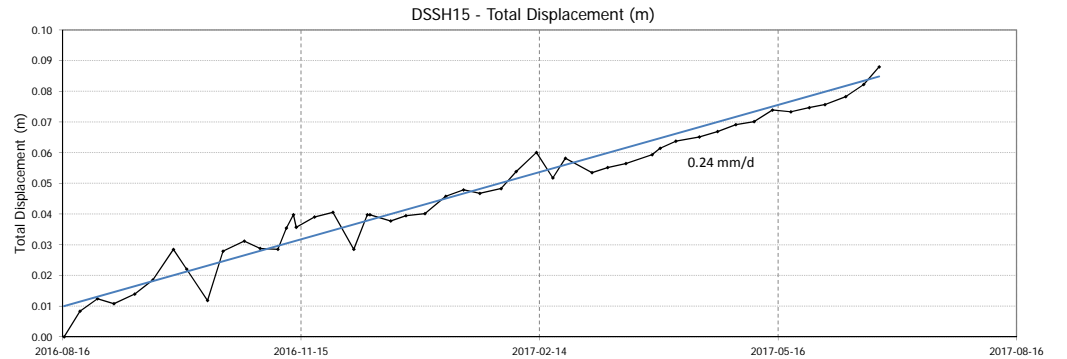
### DSSH15 - Northing Vs. Easting Movement Plot



Notes:  
Coordinate system is NAD 83 UTM Zone 8.

**Note:**

- The survey hub was removed in February 2016 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.

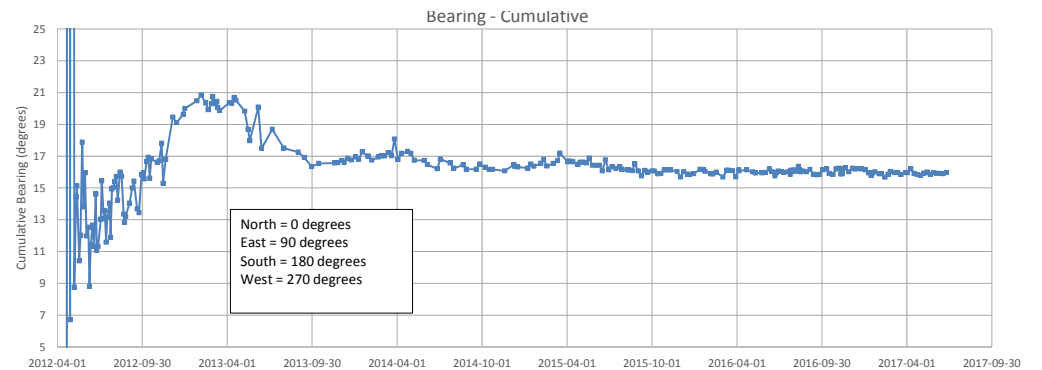
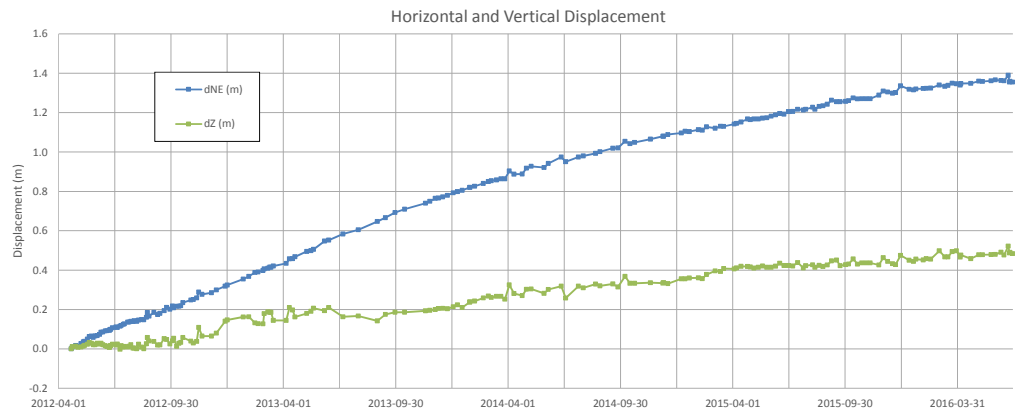
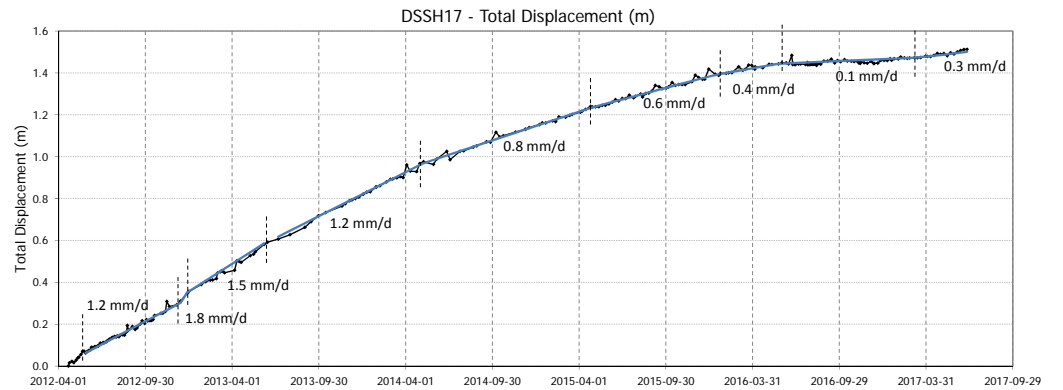
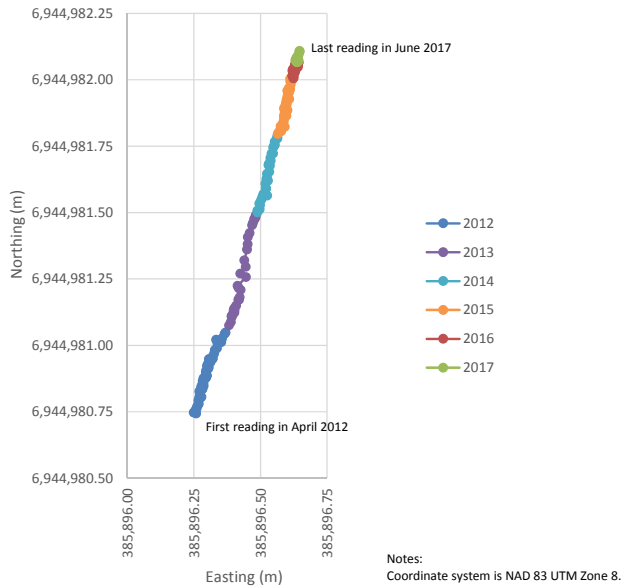


**Source files:**

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH15</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>6</b>

### DSSH17 - Northing Vs. Easting Movement Plot

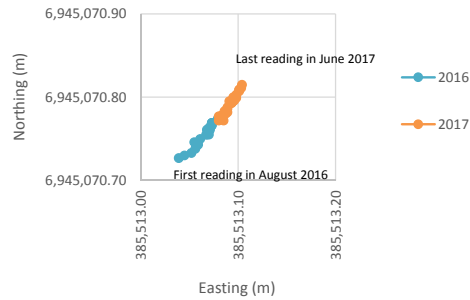


Source files:

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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH17</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.ptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: 7

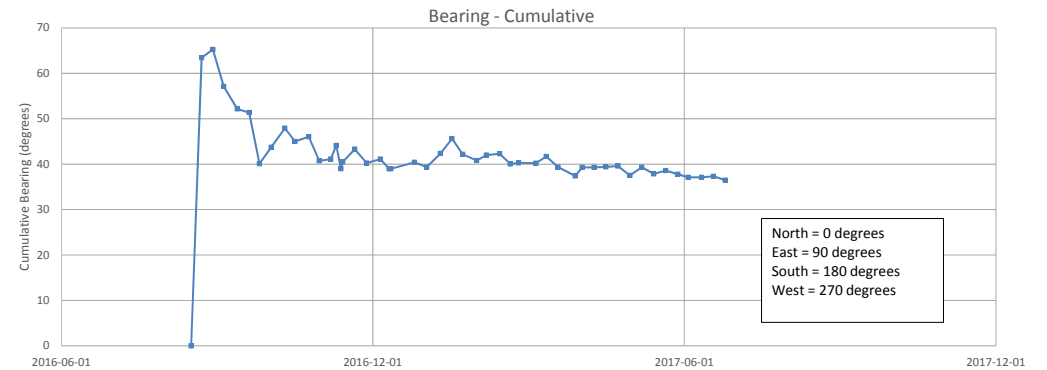
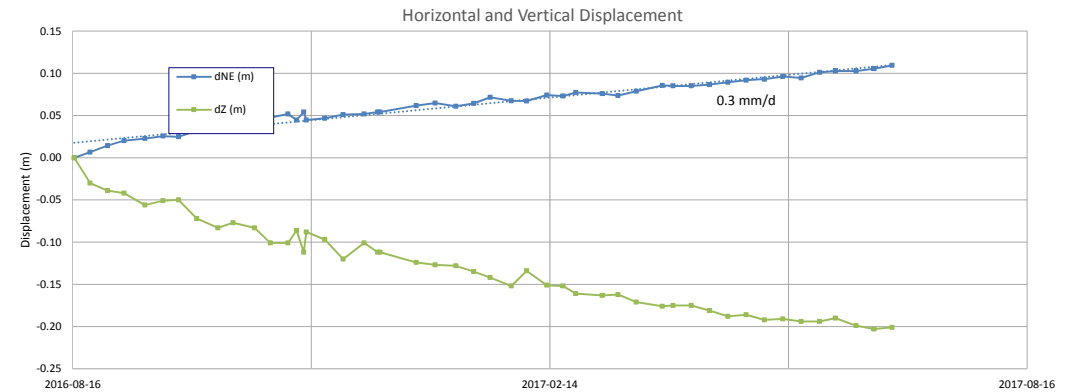
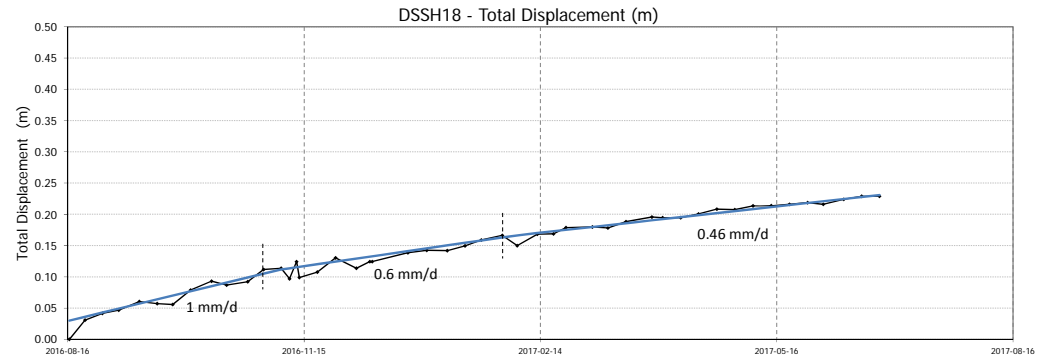
### DSSH18 - Northing Vs. Easting Movement Plot



Notes:  
Coordinate system is NAD 83 UTM Zone 8.

**Note:**

- The survey hub was removed in December 2015 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.

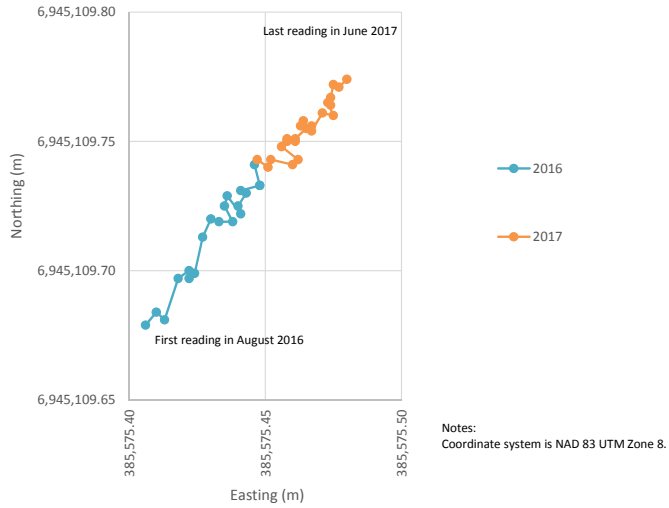


**Source files:**

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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

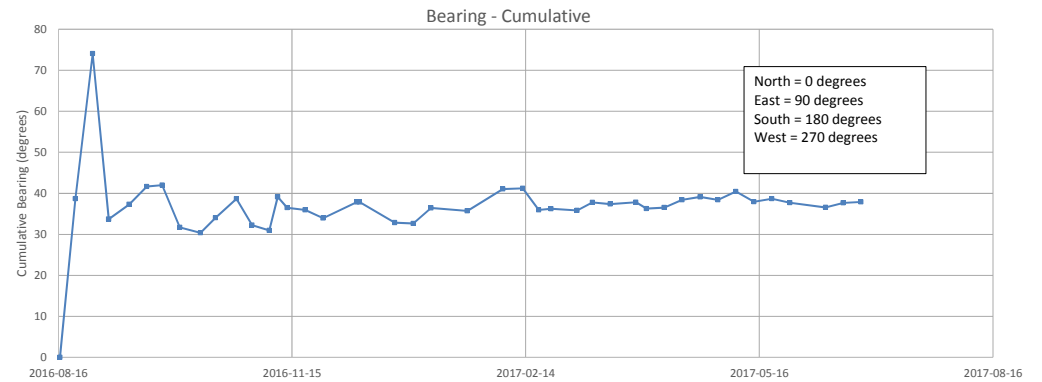
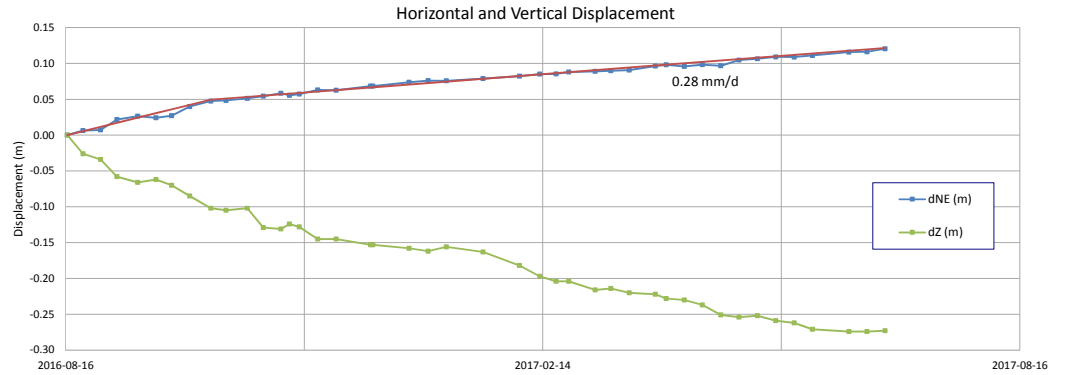
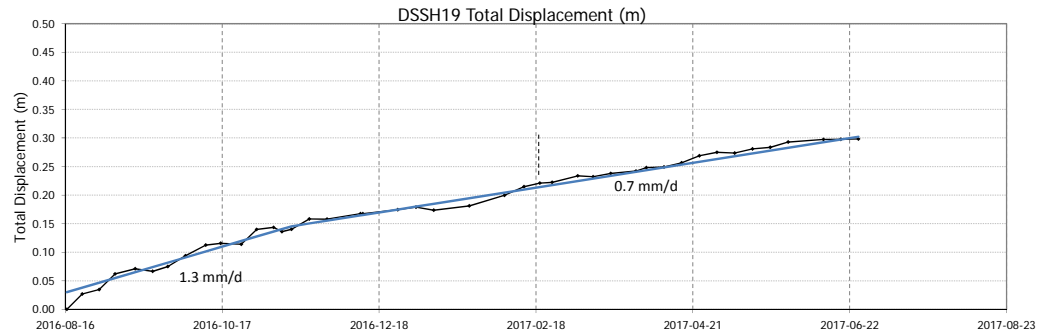
 Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	 Minto Mine	DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH18</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>8</b>

### DSSH19 - Northing Vs. Easting Movement Plot



**Note:**

- The survey hub was removed in December 2015 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.

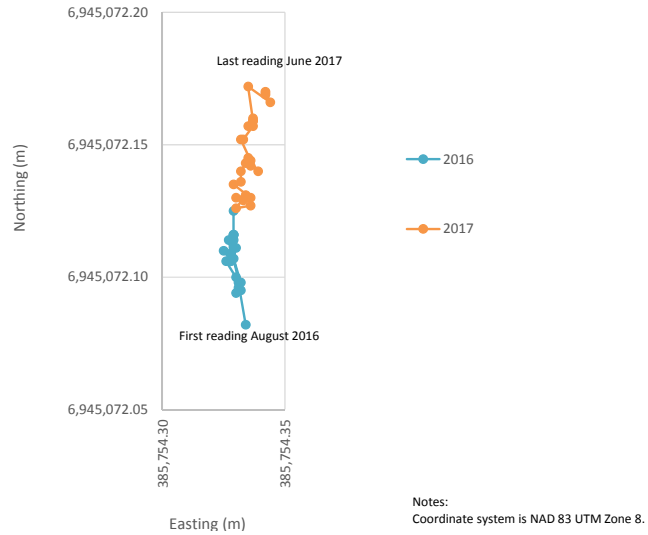


**Source files:**

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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

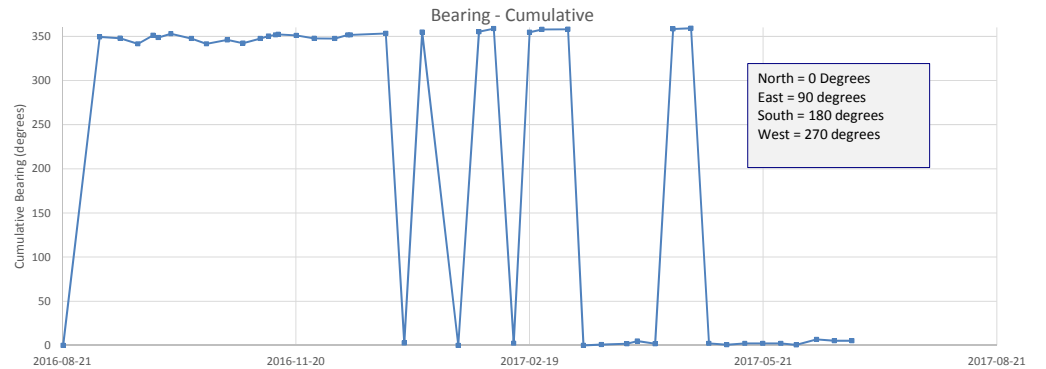
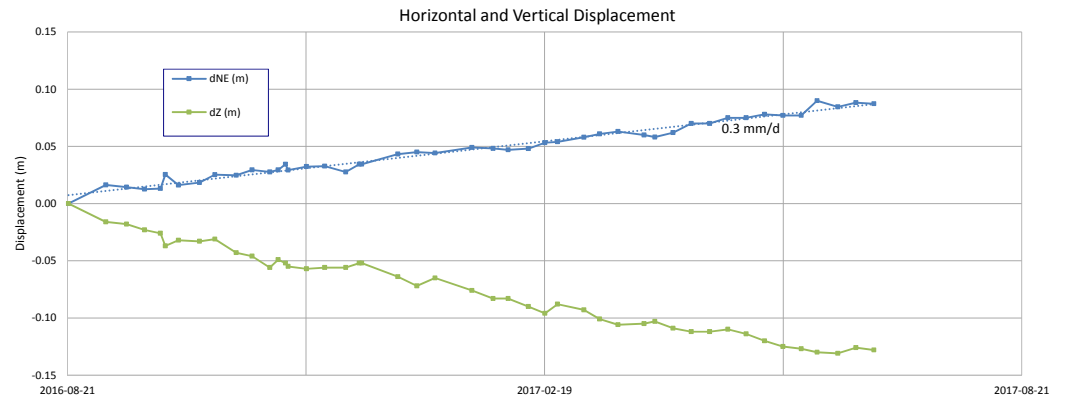
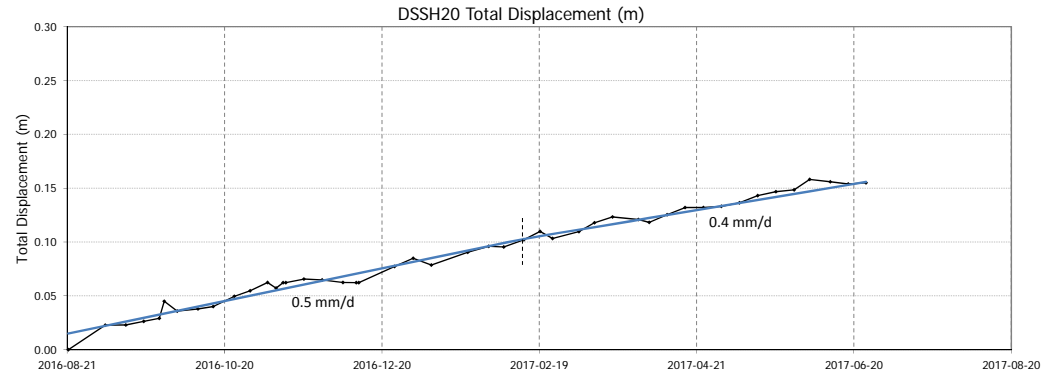
		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH19</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by PHM	Figure: <b>9</b>

### DSSH20 - Northing Vs. Easting Movement Plot



Note:

- The survey hub was removed in December 2015 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction.

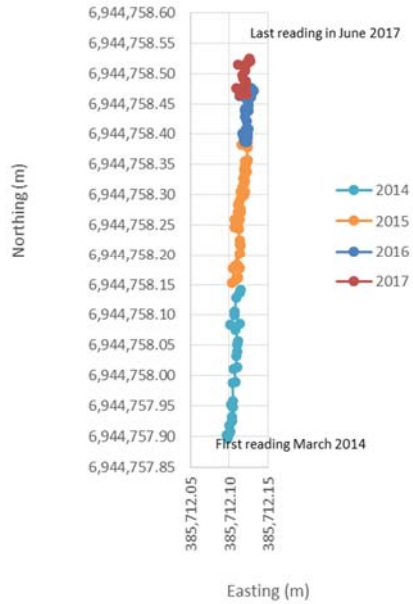


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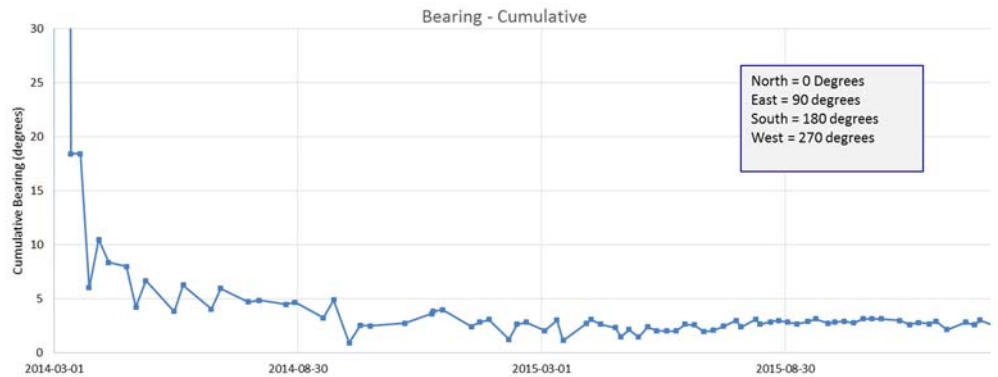
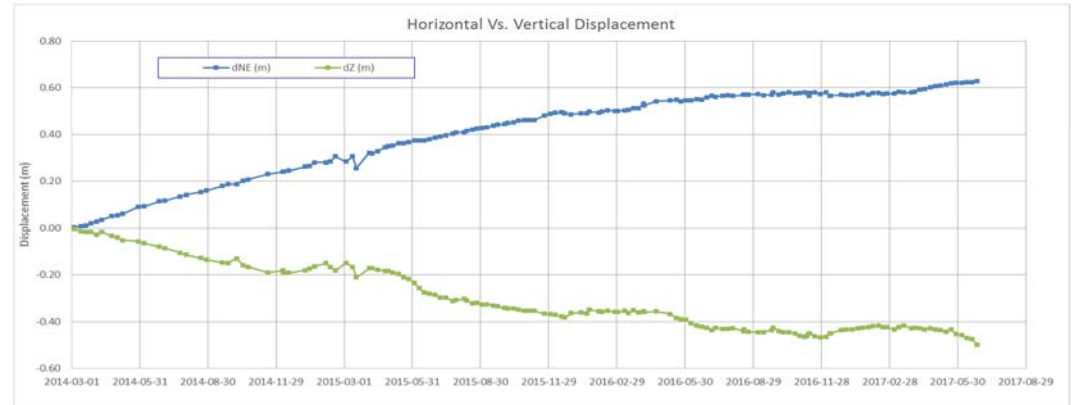
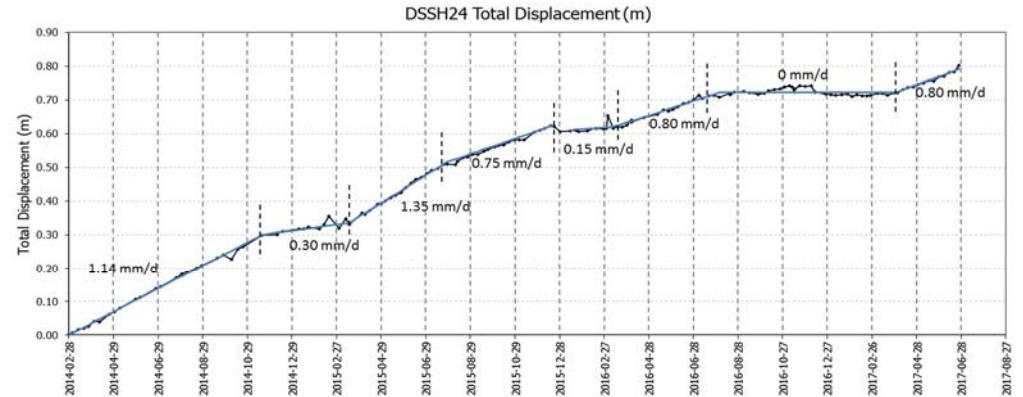
- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTFSurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH20</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>10</b>

### DSSH24 - Northing Vs. Easting Movement Plot



Notes:  
Coordinate system is NAD 83 UTM Zone 8.



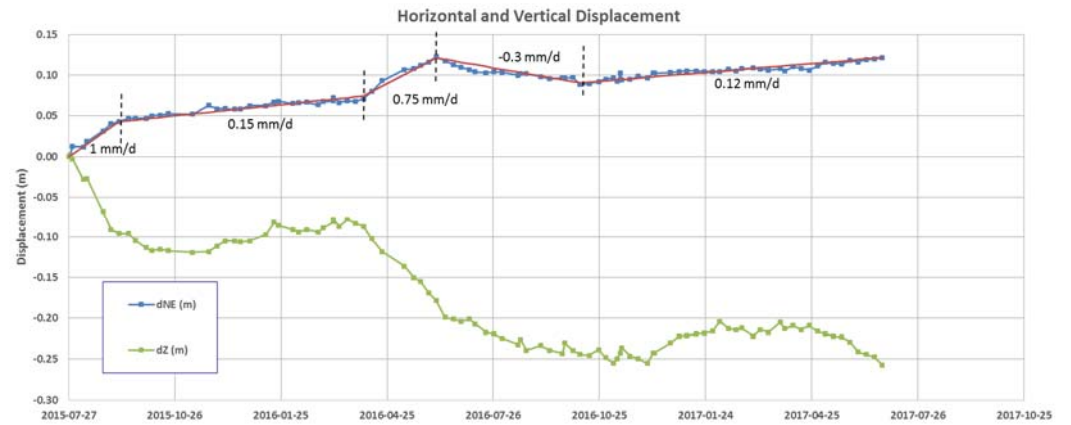
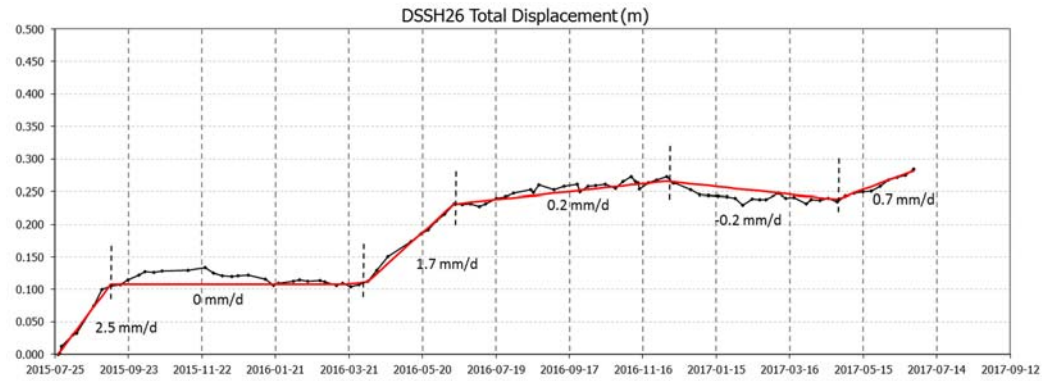
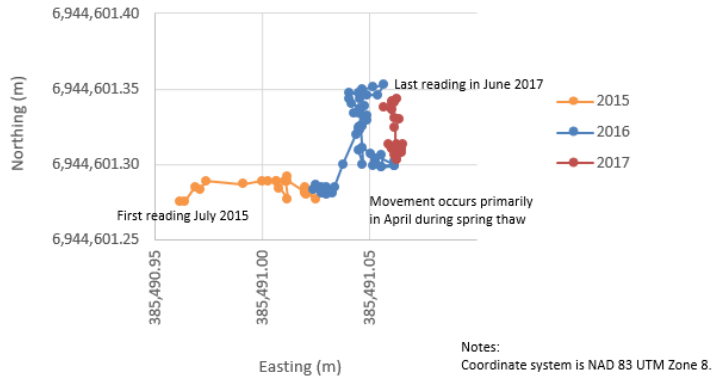
Source files:

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2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH24</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>11</b>



### DSSH26 - Northing Vs. Easting Movement Plot

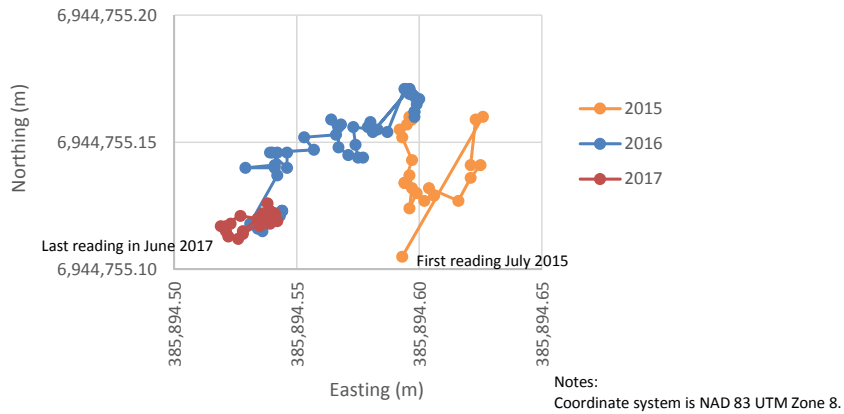


Source files:

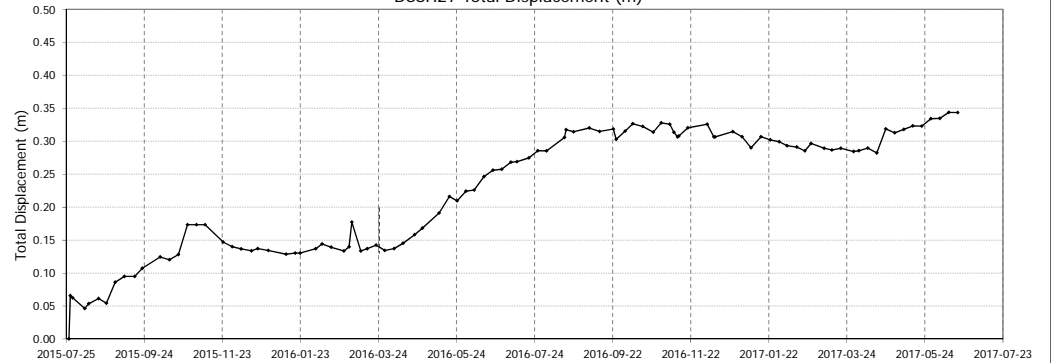
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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH26</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>12</b>

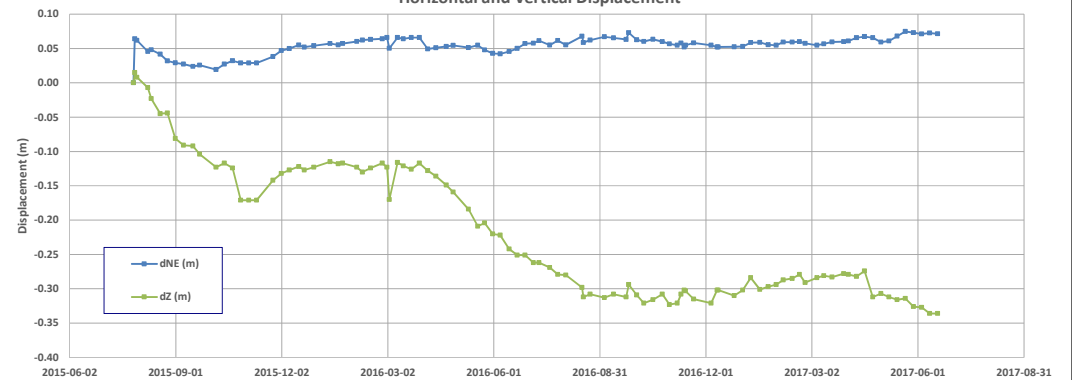
### DSSH27 - Northing Vs. Easting Movement Plot



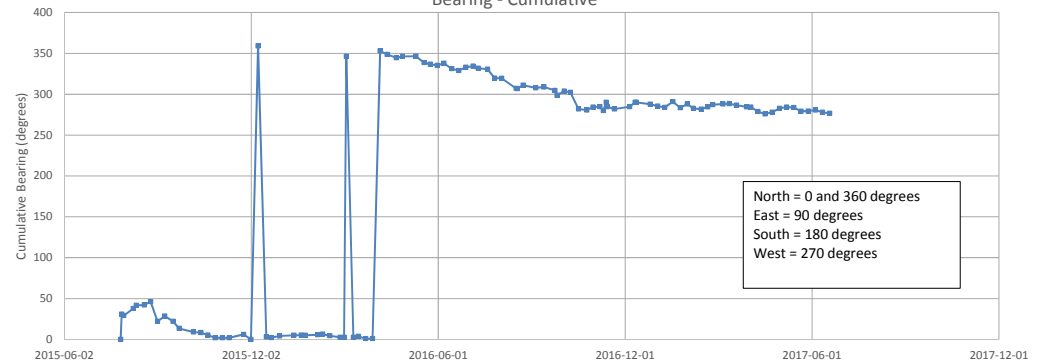
DSSH27 Total Displacement (m)



Horizontal and Vertical Displacement



Bearing - Cumulative

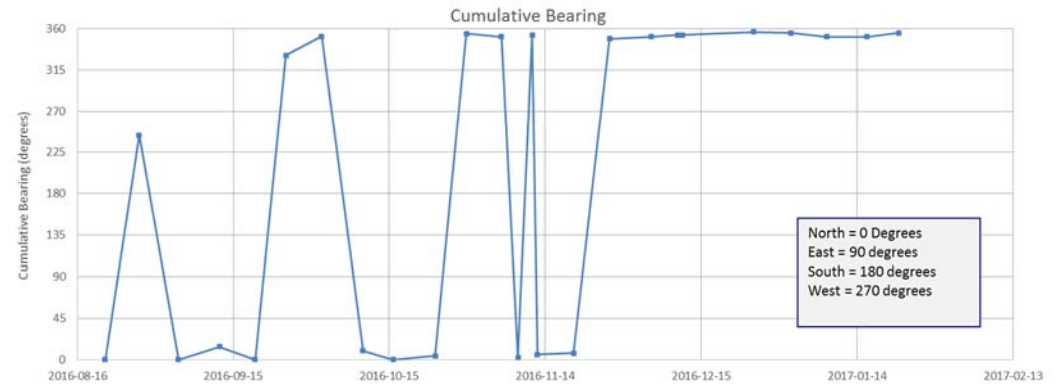
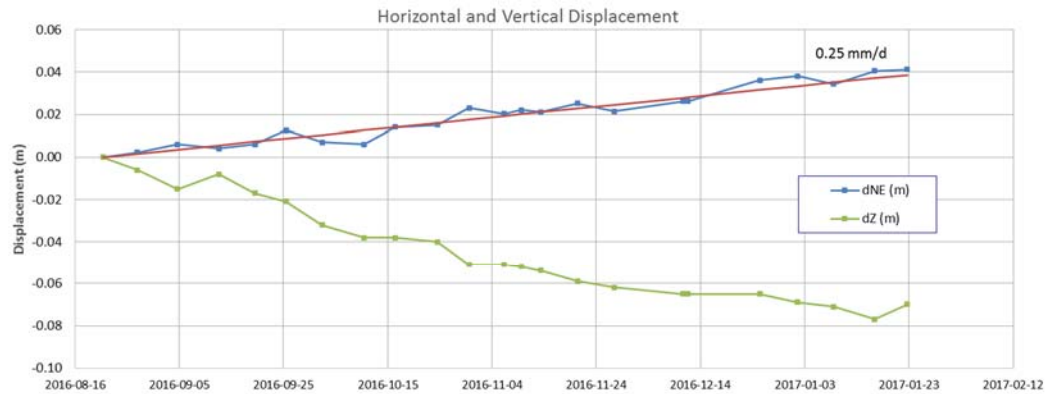
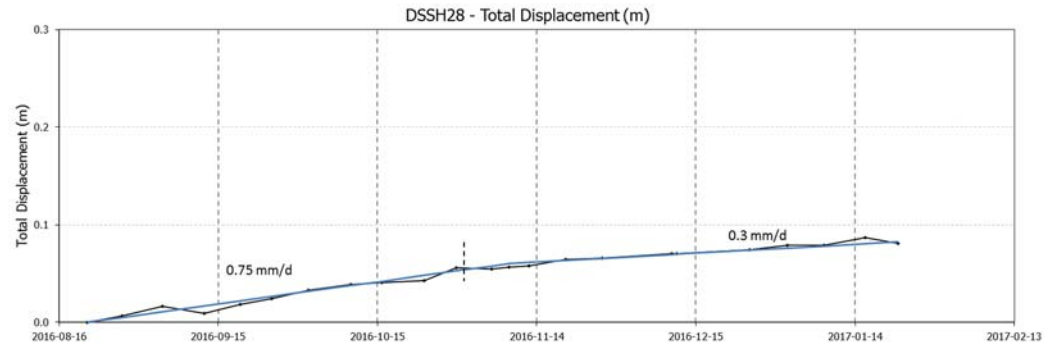
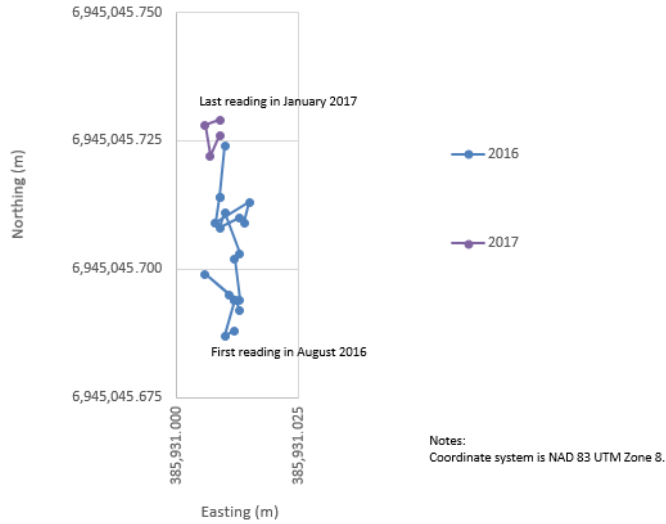


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTF Instrumentation Data		
		<b>Survey Hub – DSSH27</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>13</b>

### DSSH28 - Northing Vs. Easting Movement Plot

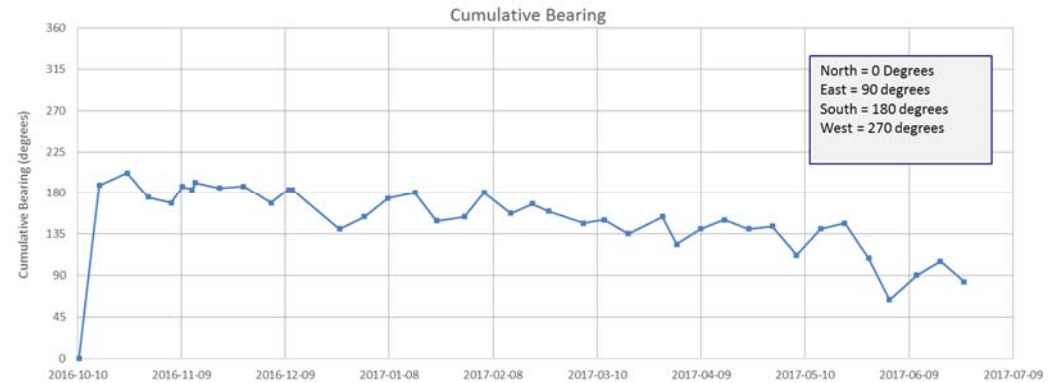
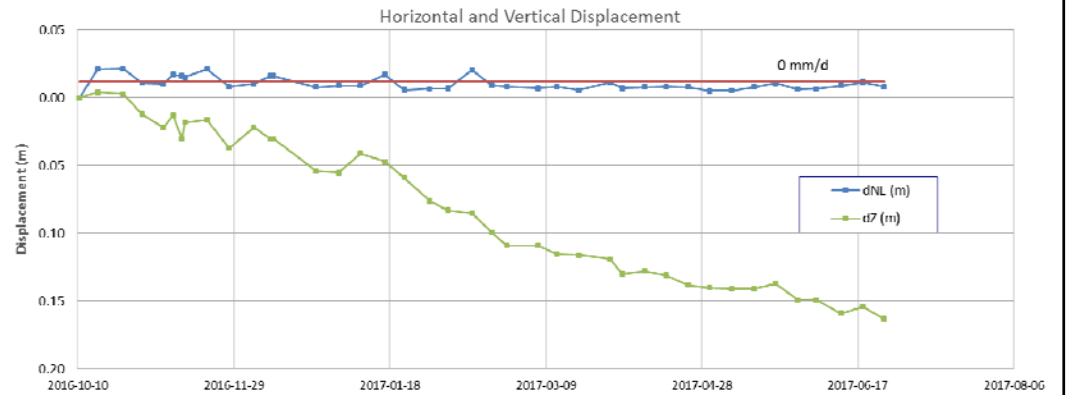
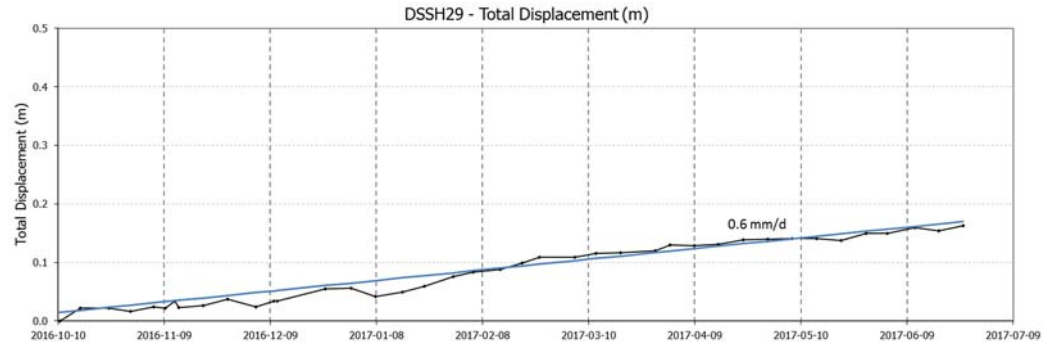
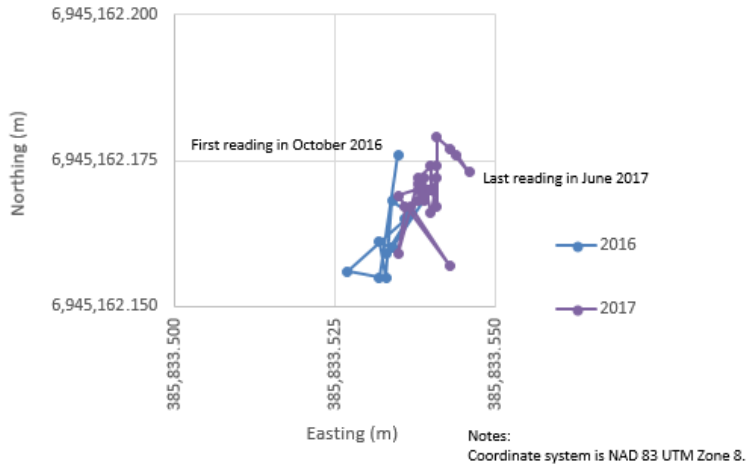


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

	 MINTO MINE <small>OPERATED BY MINTO EXPLORATIONS LTD.</small>	DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH28</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>14</b>

### DSSH29 - Northing Vs. Easting Movement Plot



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx



DSTF Instrumentation Data

**Survey Hub – DSSH29**

Job No: 1CM002.059  
Filename: ApD\_2017DSTFLandscape.pptx

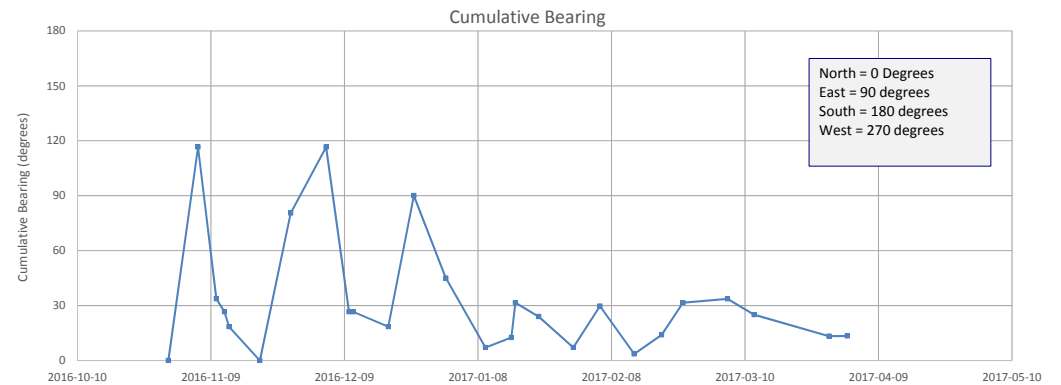
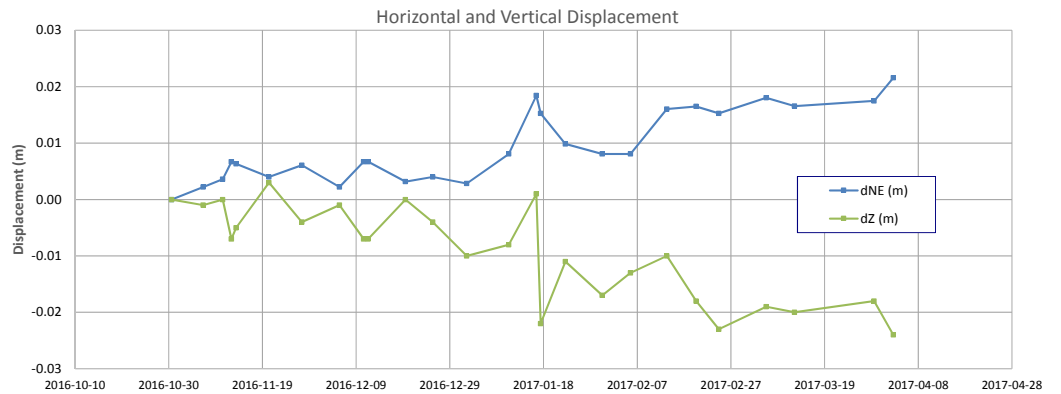
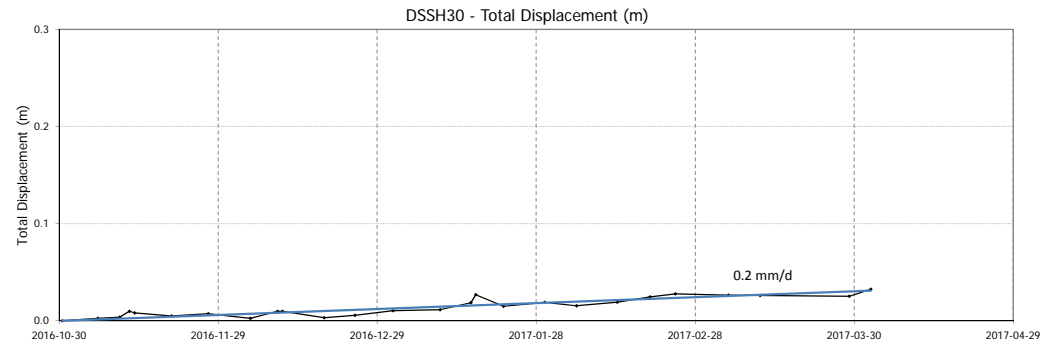
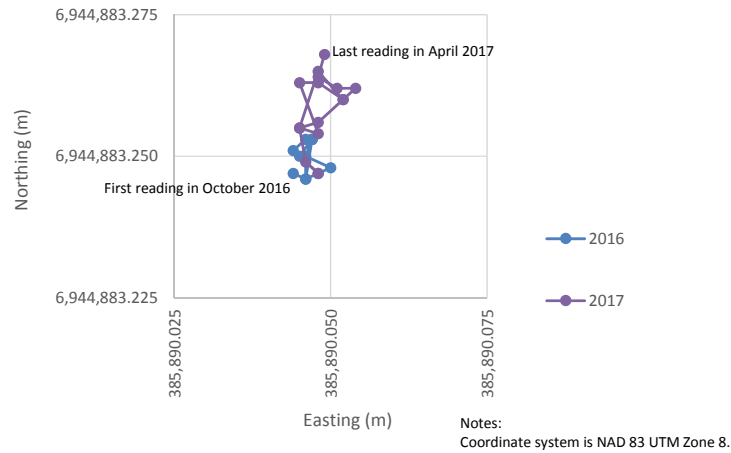
Minto Mine

Date:  
August 2017

Prepared by  
PHM

Figure:  
**15**

### DSSH30 - Northing Vs. Easting Movement Plot

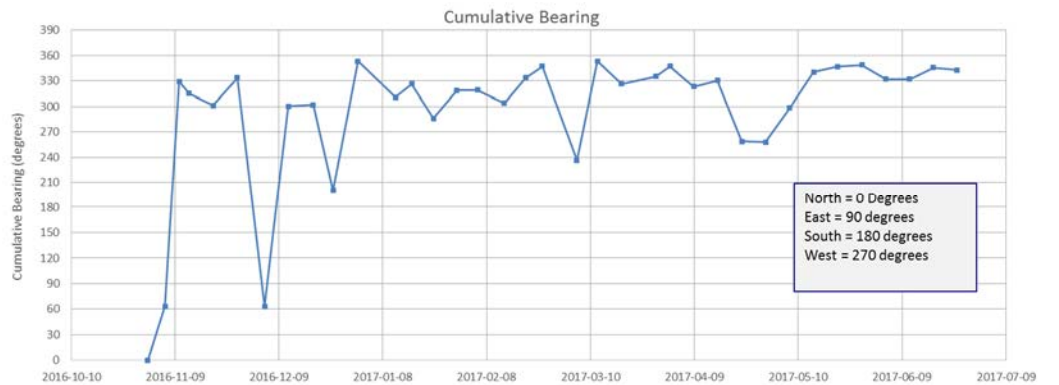
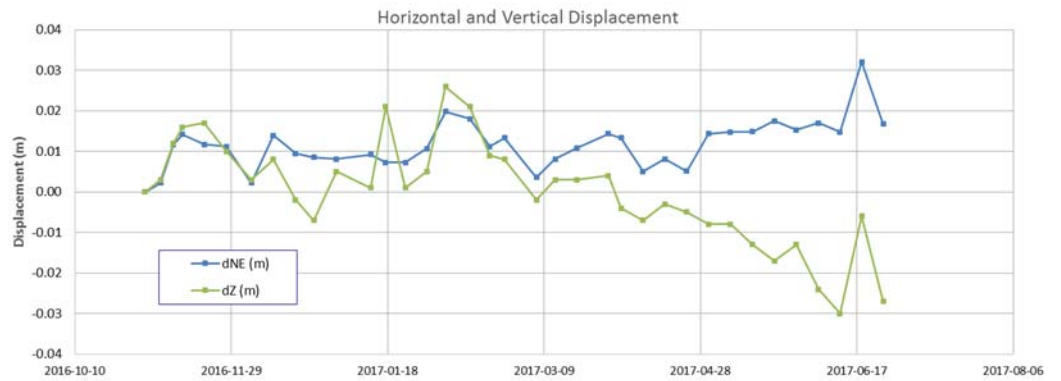
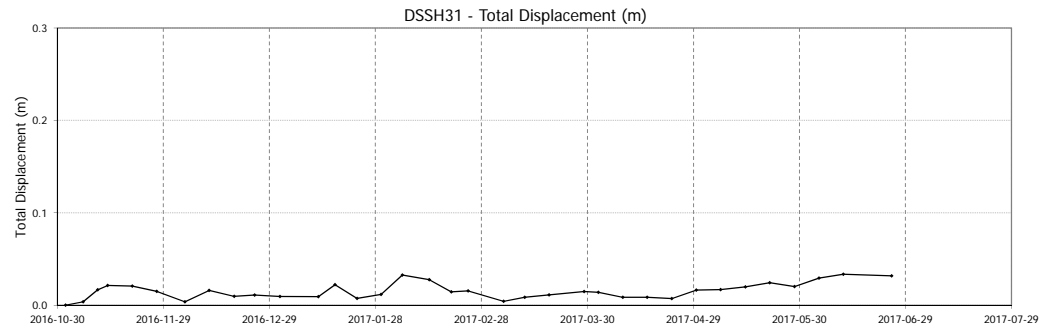
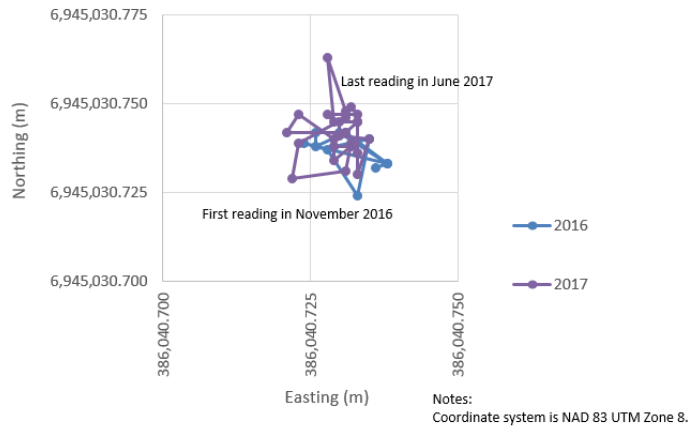


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

	 OPERATED BY MINTO EXPLORATIONS LTD.	DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH30</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by PHM	Figure: <b>16</b>

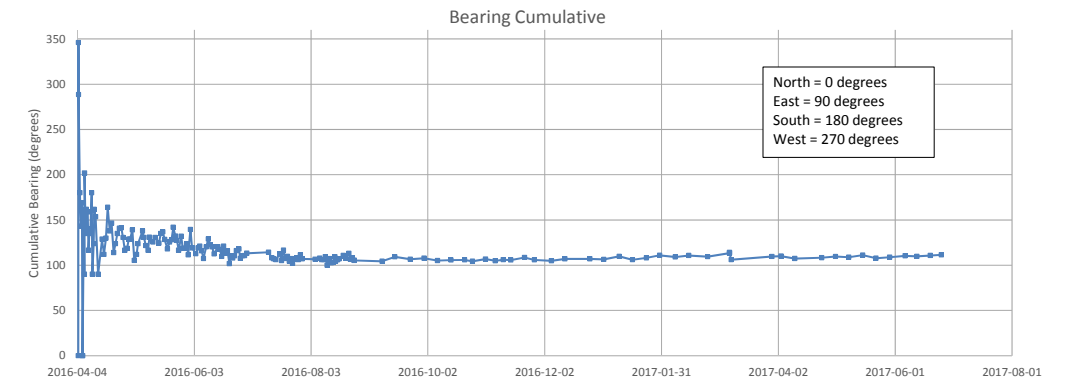
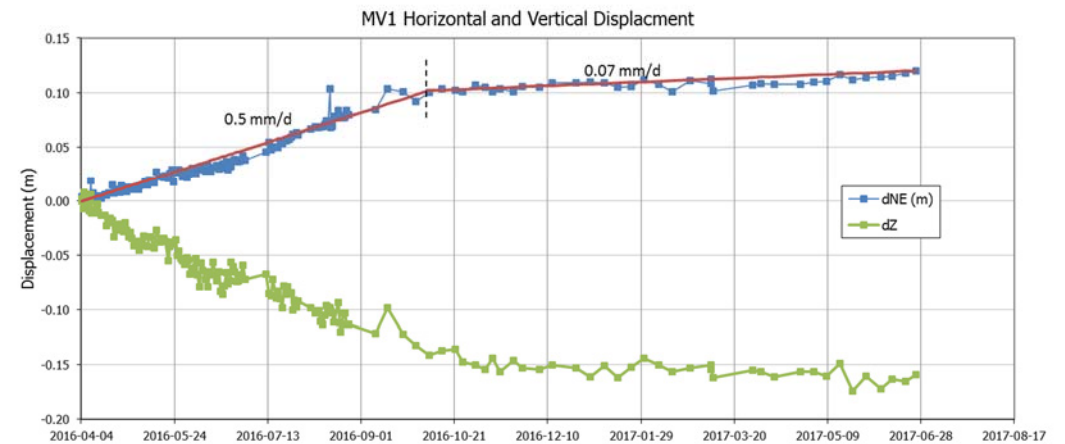
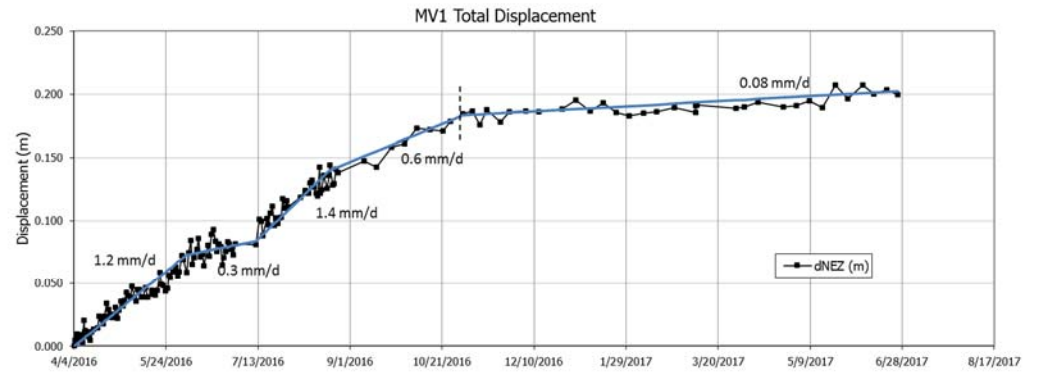
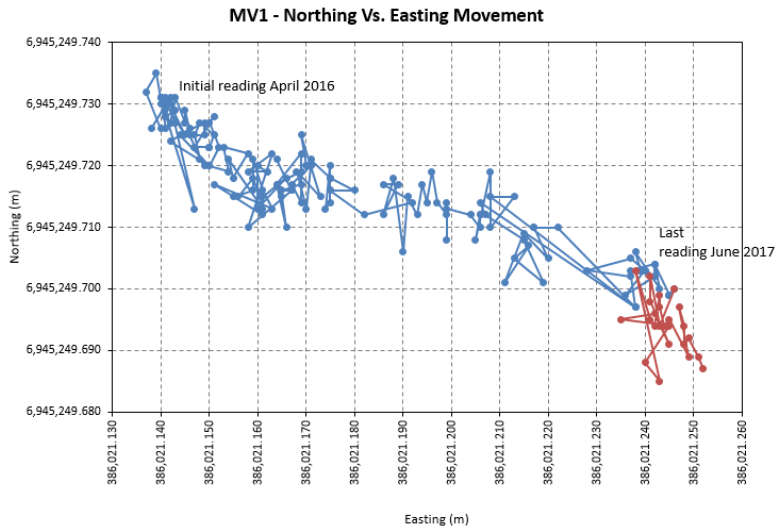
### DSSH31 - Northing Vs. Easting Movement Plot



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

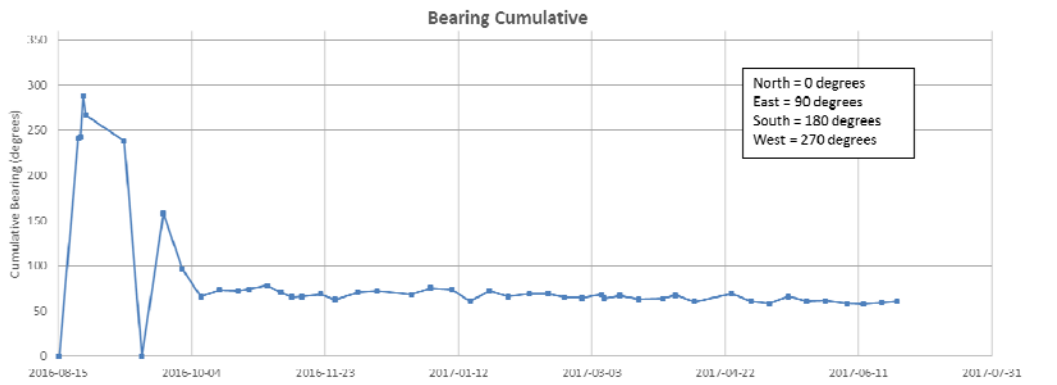
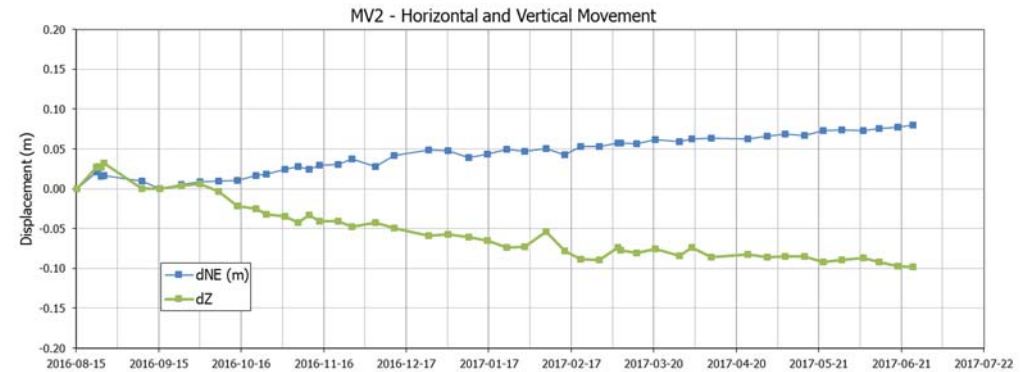
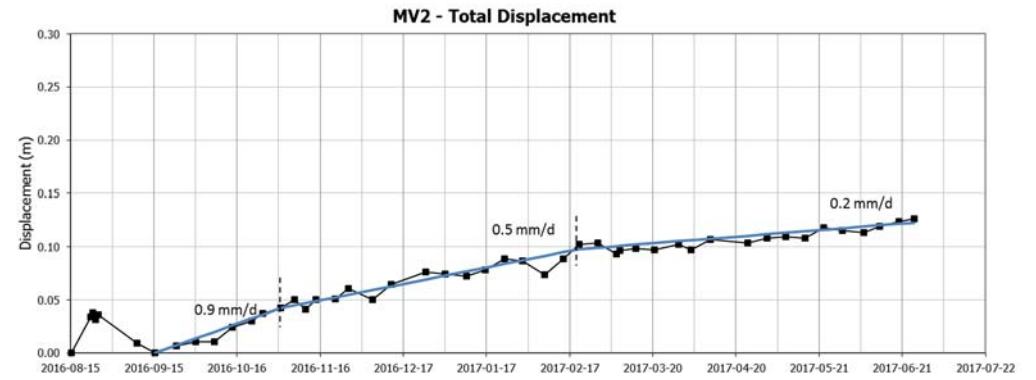
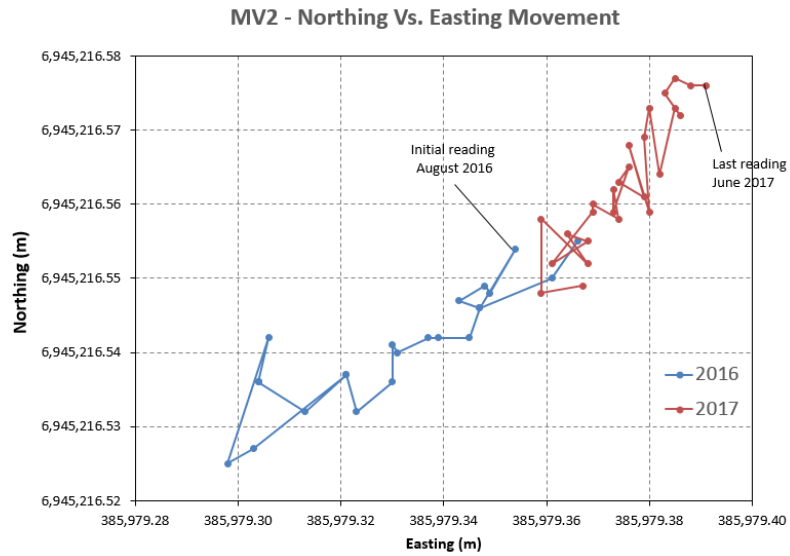
		DSTSF Instrumentation Data		
		<b>Survey Hub – DSSH31</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>17</b>



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF\SurveyHubMonitoring\_SRK.xlsx

		DSTSF Instrumentation Data		
		<b>Survey Hub – MV1</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by PHM	Figure: <b>18</b>



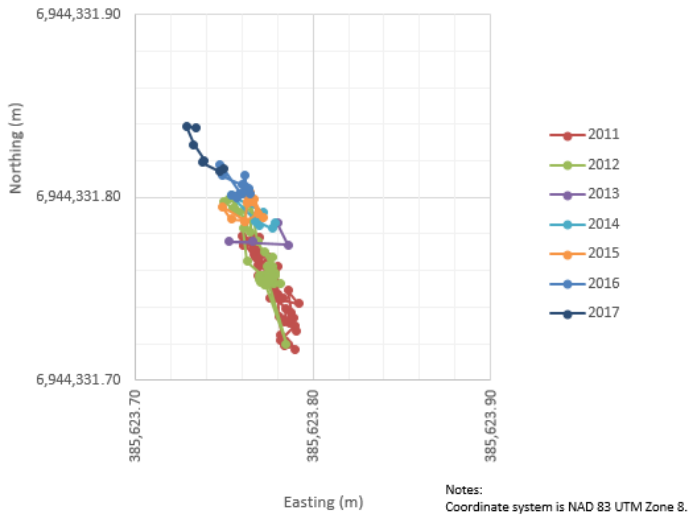
Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTFSurveyHubMonitoring\_SRK.xlsx

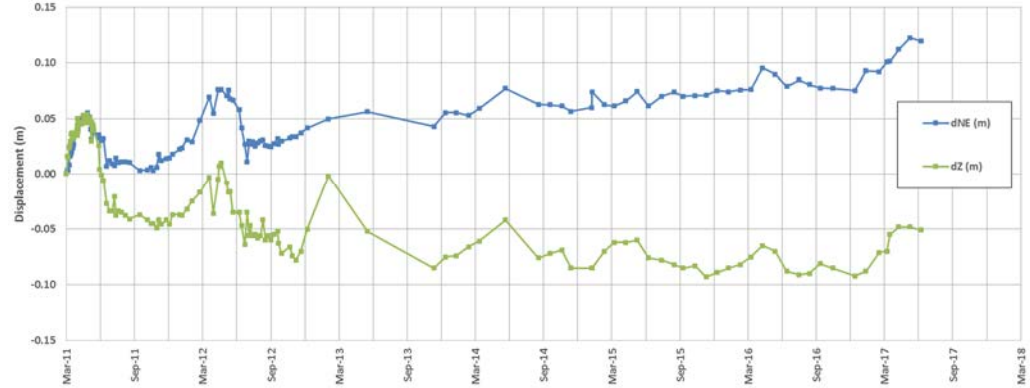
		DSTSF Instrumentation Data		
		<b>Survey Hub – MV2</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>19</b>



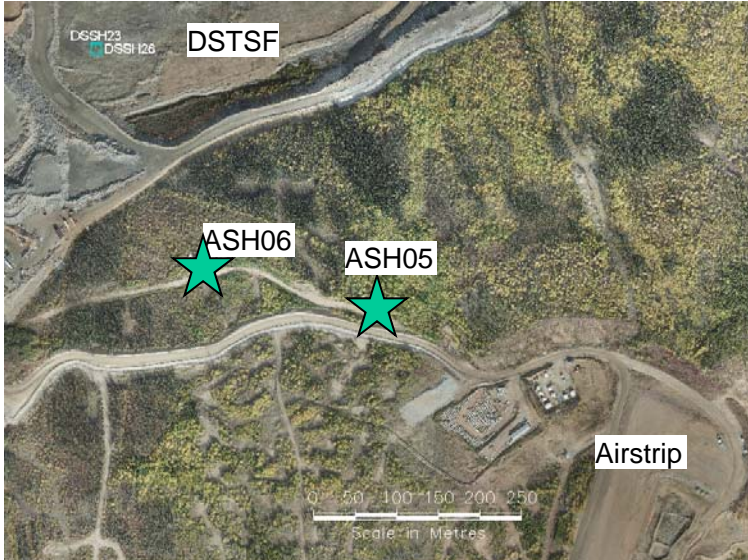
**ASH06 - Northing Vs. Easting Movement Plot**



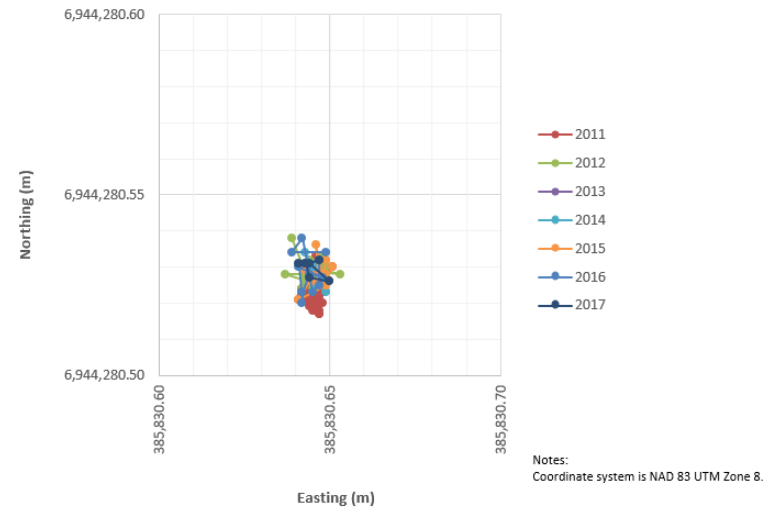
**ASH06 - Horizontal and Vertical Displacement**



- Notes:
1. Minto's survey reading comments on January 14, 2017 notes ASH06 may have been disturbed as a result of a pipeline installation.



**ASH05 - Northing Vs. Easting Movement Plot**



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\DSTF, SWD, ASH and WSP Survey Hub Monitoring\_PM\_2016\Geotech\Insp.xlsx



Job No: 1CM002.059  
 Filename: ApD\_2017DSTFLandscape.pptx



Minto Mine

DSTF Instrumentation Data

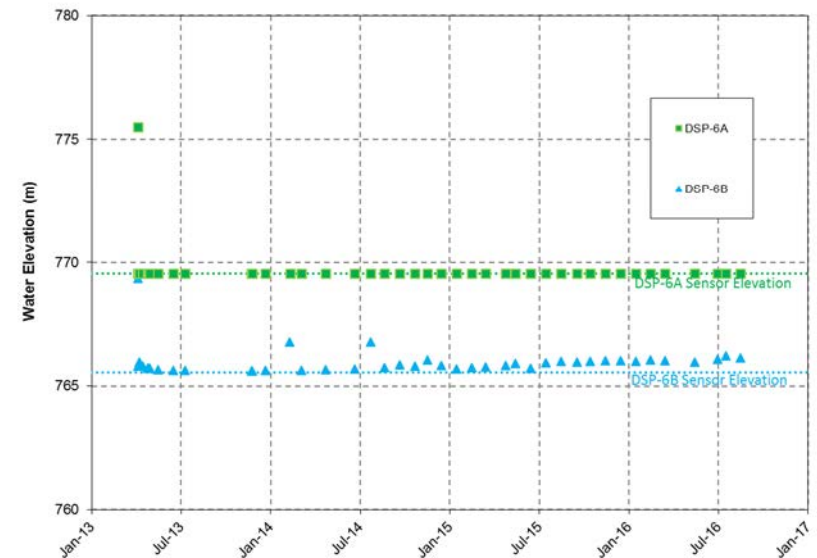
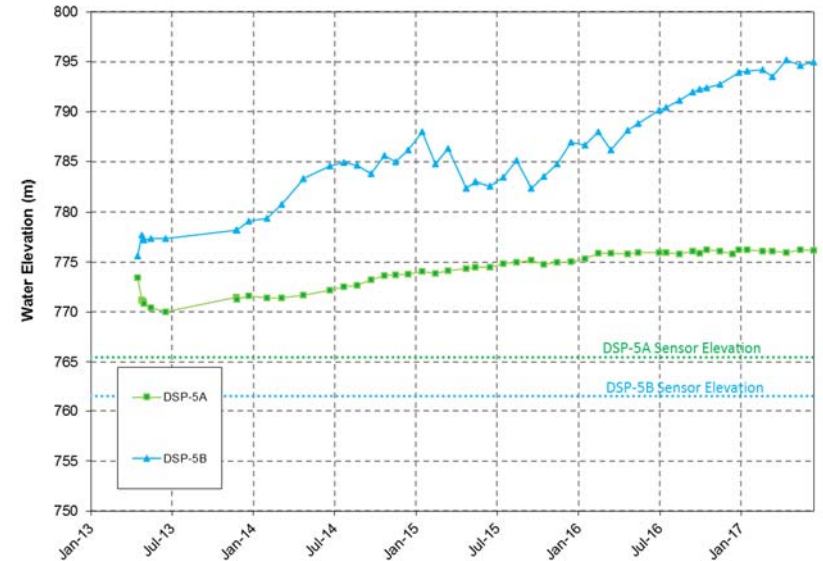
**Survey Hubs – ASH05 and ASH06**

Date: August 2017	Prepared by PHM	Figure: <b>20</b>
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**Notes:**

1. The pore pressure sensors at DSP-05 and 06 are located approximately 2 m above original ground in tailings (A) and 2 m below original ground.
2. Sensors at DSP-06 and the top sensor DSP-05A show no significant change in pore pressure in the past year.
3. The bottom sensor at DSP-05 (B) shows an increase in pore pressure. Temperature at the sensor is at the freezing point of water  $-0.5^{\circ}$ . The sensor is located in an area of silt with stratified ice lenses.



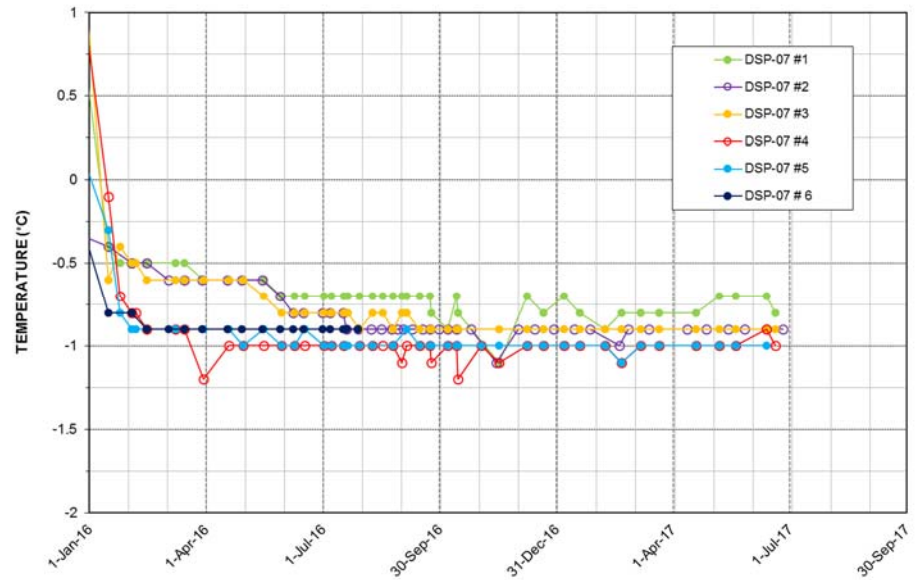
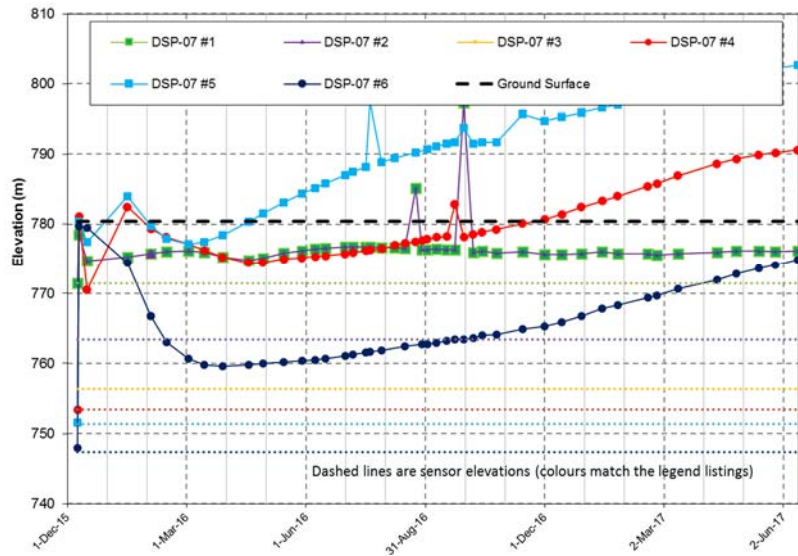
Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC\_PiezometerInstrumentation\_DSTSF\_2016\_SRK.xlsm

		DSTSF Instrumentation Data		
		<b>Piezometers – DSP-05 and DSP-06</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSLandscape.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by PHM	Figure: <b>21</b>



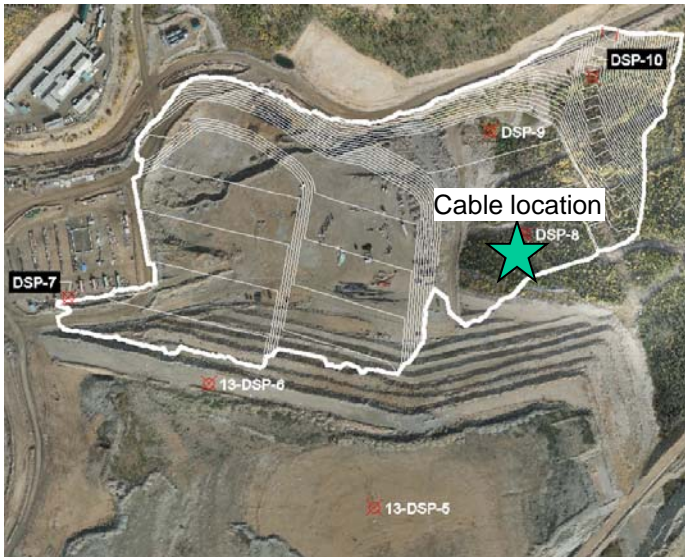
Sens or #	Stratigraphy, Ice Description	Ice Description	Comment
1	Silt. Some clay, little sand, trace gravel, soft, wet, medium plastic, varved.	Vr, Ice/moisture content up to 50%.	
2	Sand, few gravel, loose, unrounded, no fines.	Vr. Mostly no visible ice, some small random ice lenses up to 1.5 cm thick.	
3	Clay, some silt, trace gravel and sand, wet, high plastic. (MC=50%)	Vr; Approx. 50% ice, lenses between 2 and 20 mm thick, parallel and nearly horizontal, interbedded with clay.	A shear zone at DSI-20 was identified in 2013-14 at an elevation of 752.5 -730m. The higher pore pressure observed at in the three sensors in the clay unit may be related to pore pressure induced by on going movement.
4			
5			
6	Weathered Bedrock; Highly weathered granite. Rust staining. Friable.	Nbn. No excess ice.	Sensor 6 is believed to have a lower pore pressure due to the coarser sand/gravel material.



Source files:

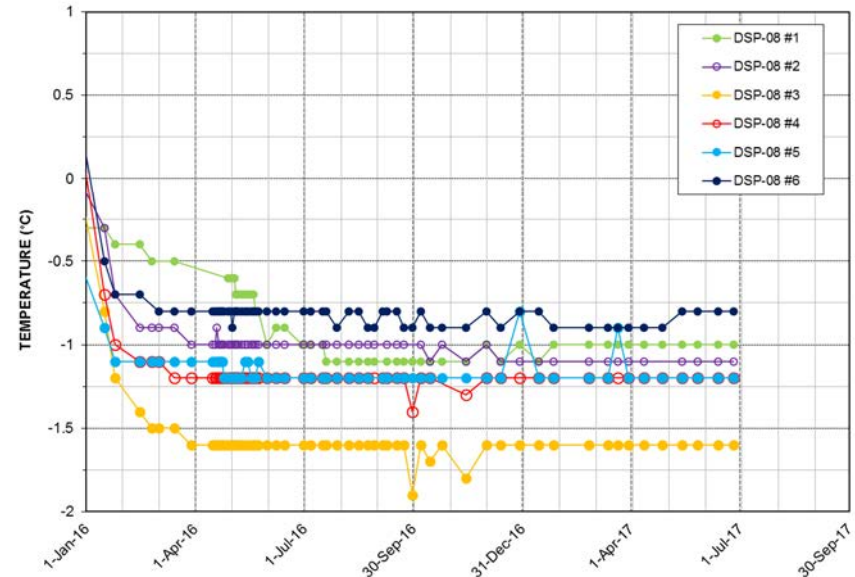
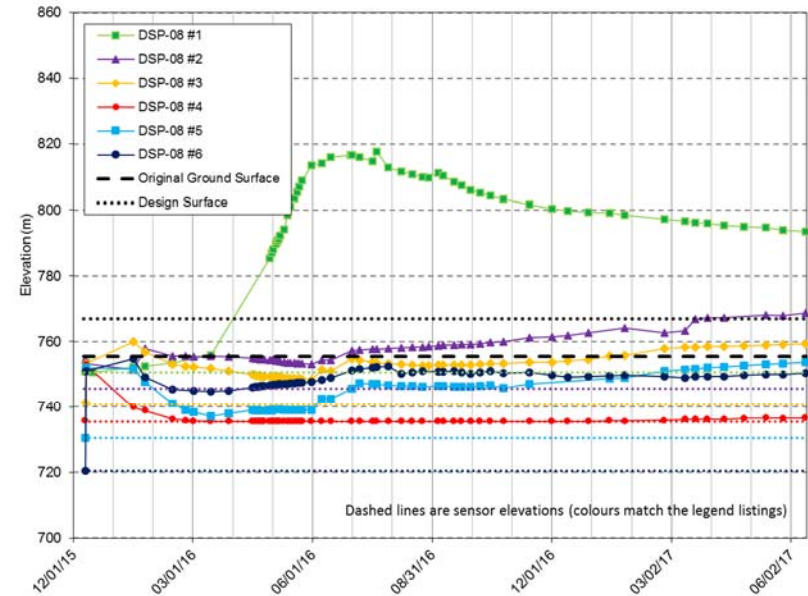
1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm

		DSTSF Instrumentation Data		
		<b>Piezometer – DSP-07</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSF\landscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>22</b>



**Notes:**

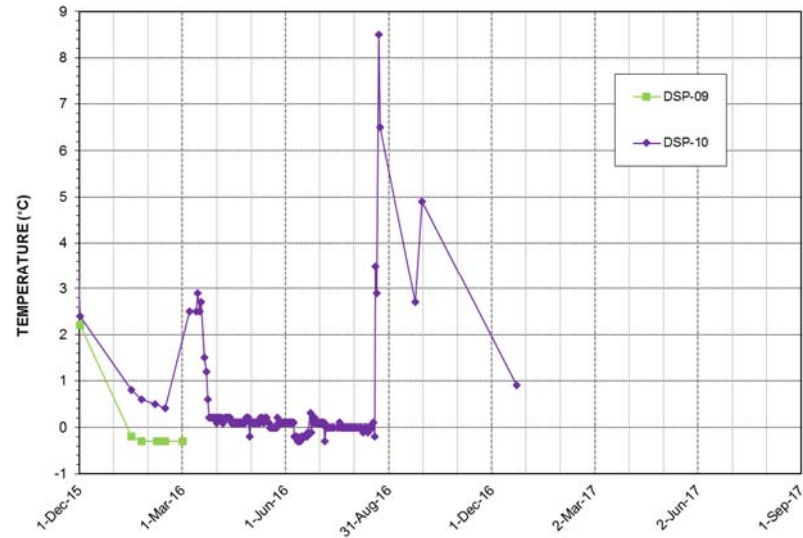
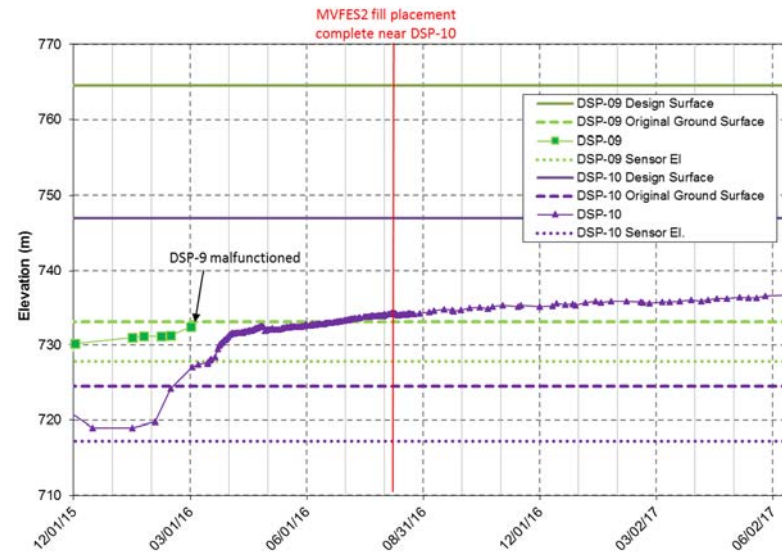
1. Negative pressure readings are plotted at the elevation of the sensor in order to indicate dates readings were taken.
2. The pore pressure in Sensor 1 has increased by approx. 700 kPa (700 m of water). This sensor is located closest to surface (depth of 5m). Since the construction was completed, the readings have dissipated. The temperature at Sensor 1 has also dropped significantly compared to the other sensors at DSP-08. The higher pore pressures at Sensor 1 may be the result of freezing and the expansion of pore water into ice.



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC\_PiezometerInstrumentation\_DSTSFSRK.xlsm

 Job No: 1CM002.059 Filename: ApD_2017DSTSFLandscape.pptx	 Minto Mine	DSTSFS Instrumentation Data		
		<b>Piezometer – DSP-08</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>23</b>



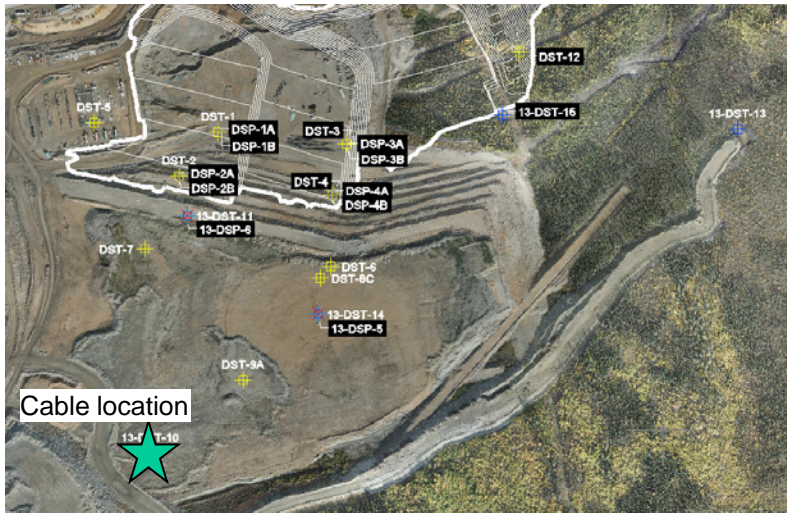
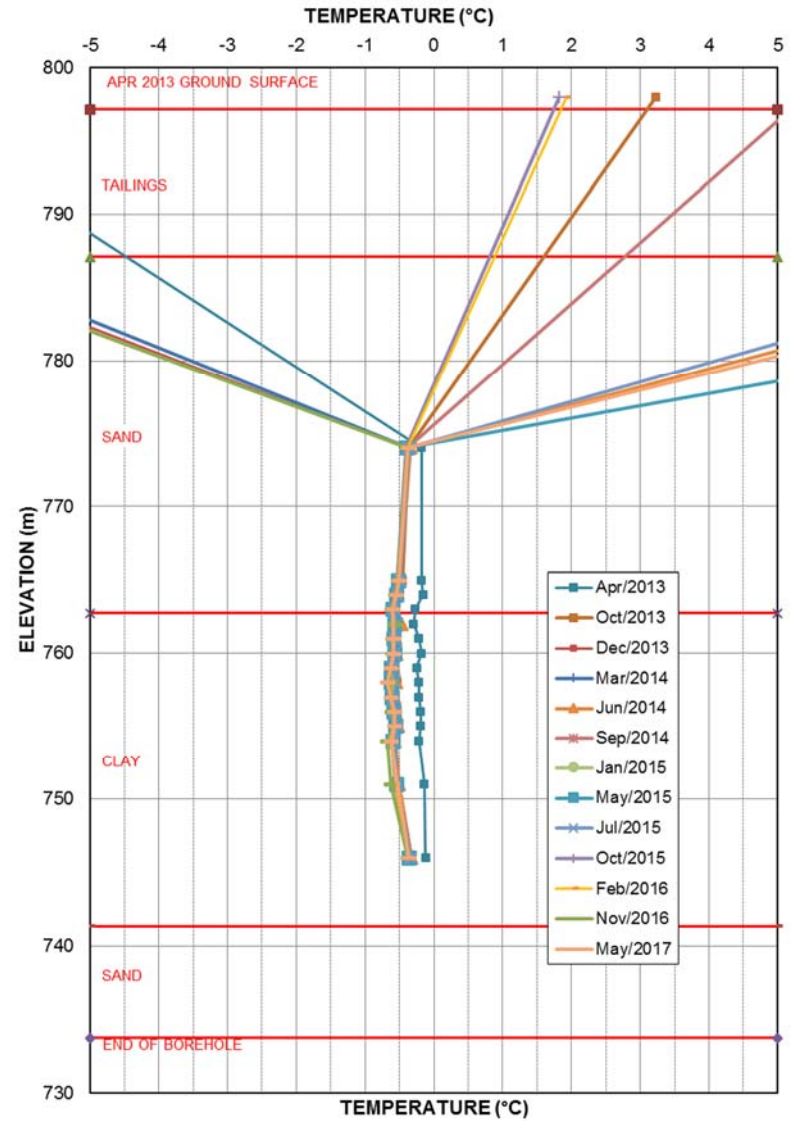
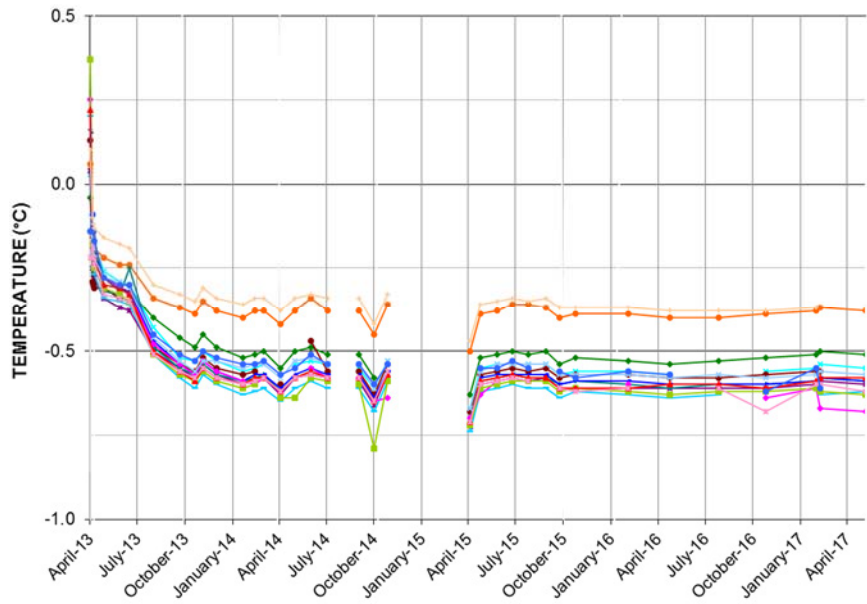
**Notes:**

1. The pore pressure sensors at DSP-9 and 10 are located approximately 5 m below original ground.
2. DSP-09 malfunctioned with the last reading on March 1, 2016
3. The large increase in pore pressure at DSP-10 is related to the fill placement over the sensor (approximately 23 m thick).
4. Since fill placement has been completed, the rate of increase in pore pressure is low, but is ongoing.
5. Flow meter readings at the Minto Creek Detention Sump indicate that the blanket drain is functional and no water is building-up at the base of MVFE Stage 2.
6. The temperature readings at DSP-10 show a slight cooling trend up to July 2017. Since July 2017, temperature readings have been infrequently collected and highly variable. The higher temperature may be indicative of the groundwater.

Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm

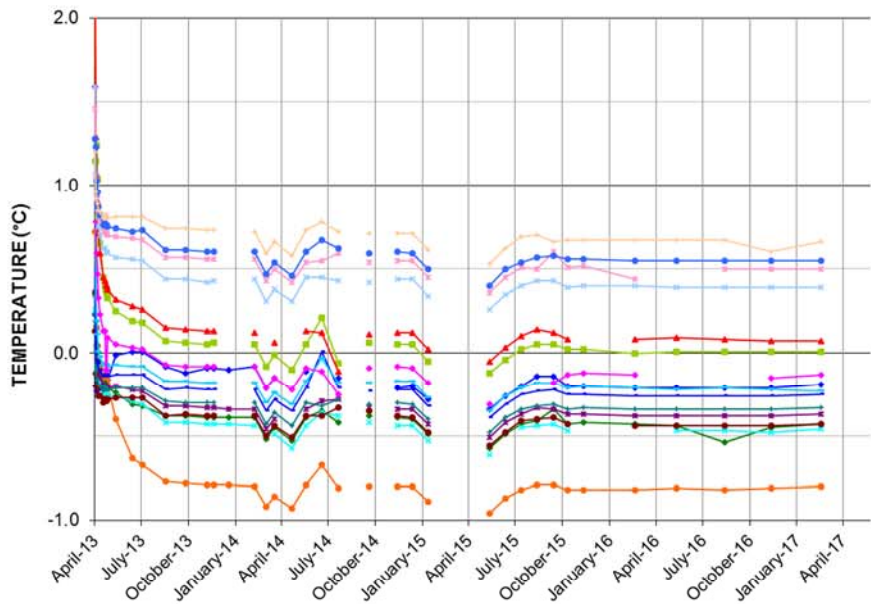
 Job No: 1CM002.059 Filename: ApD_2017DSTSF_Landscape.pptx	 Minto Mine	DSTSF Instrumentation Data		
		<b>Piezometers – DSP-09 and DSP-10</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>24</b>



Source files:

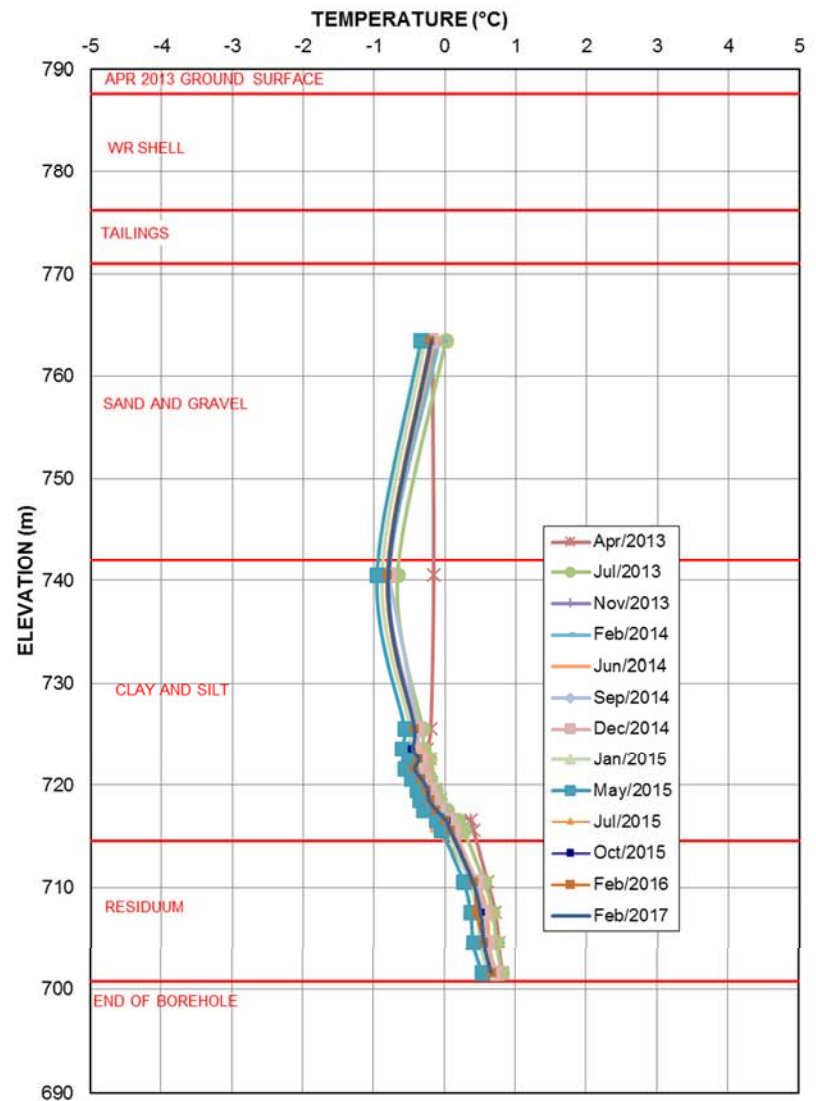
1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm

		DSTSF Instrumentation Data		
		<b>Temperature Cable – DST-10</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSF_Landscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>25</b>



**Sensor El. and Stratigraphy**

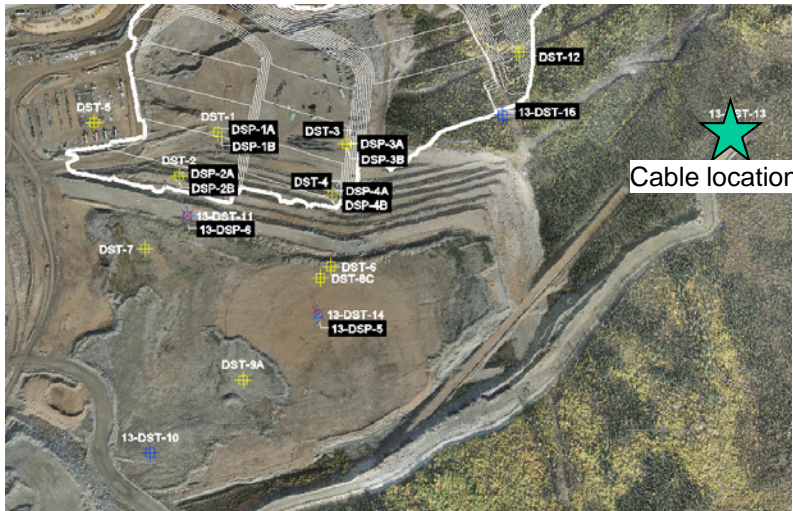
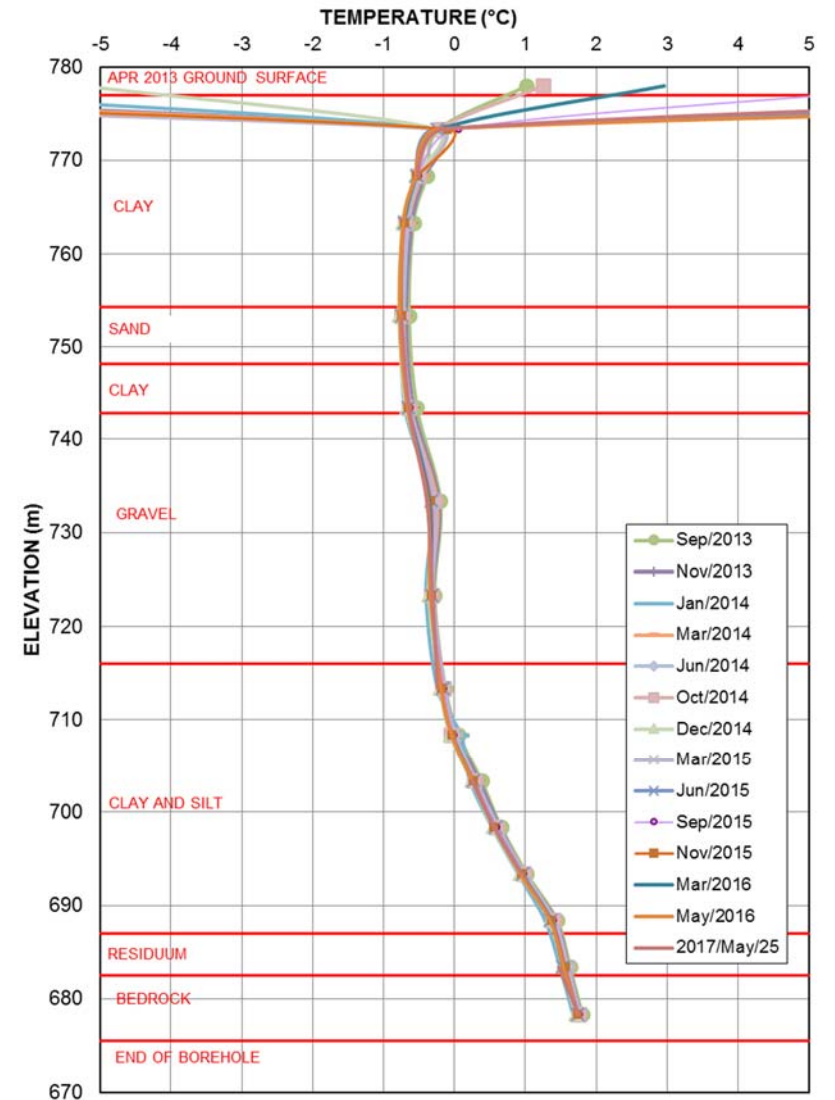
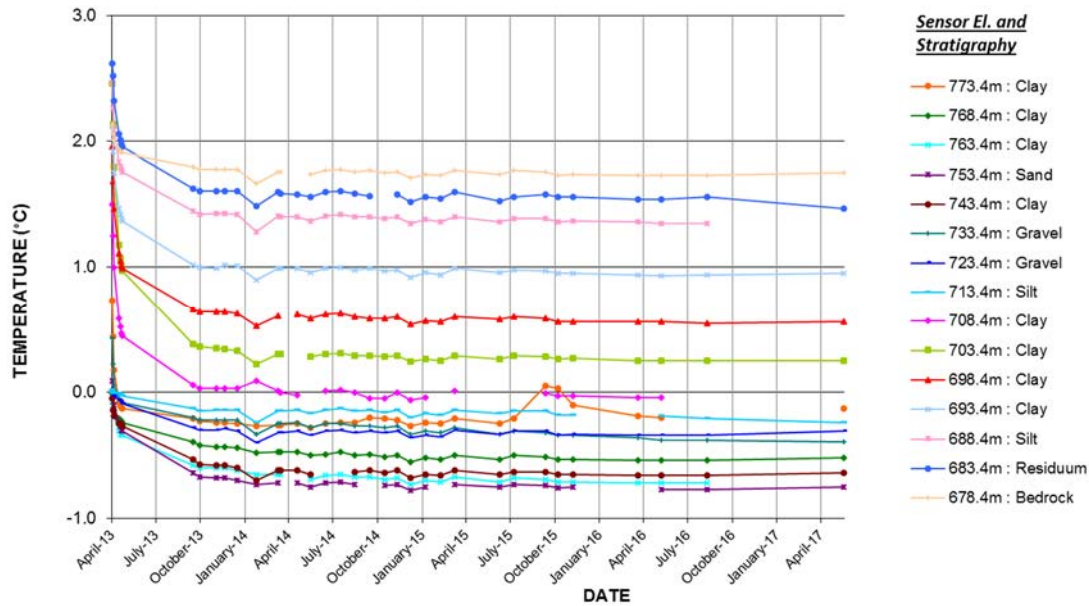
- 763.6m: Sand
- 740.6m: Clay
- 725.6m: Clay
- 723.6m: Clay
- 722.6m: Clay
- 721.6m: Clay
- 720.6m: Clay
- 719.6m: Clay
- 718.6m: Clay
- 717.6m: Clay
- 716.6m: Silt
- 715.6m: Silt
- 710.6m: Residuum
- 707.6m: Residuum
- 704.6m: Residuum
- 701.6m: Residuum



**Source files:**

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm

		DSTSF Instrumentation Data		
		<b>Temperature Cable – DST-11</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSF_Landscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>26</b>



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm



DSTSF Instrumentation Data

**Temperature Cable – DST-13**

Job No: 1CM002.059  
 Filename: ApD\_2017DSTSF\_Landscape.pptx

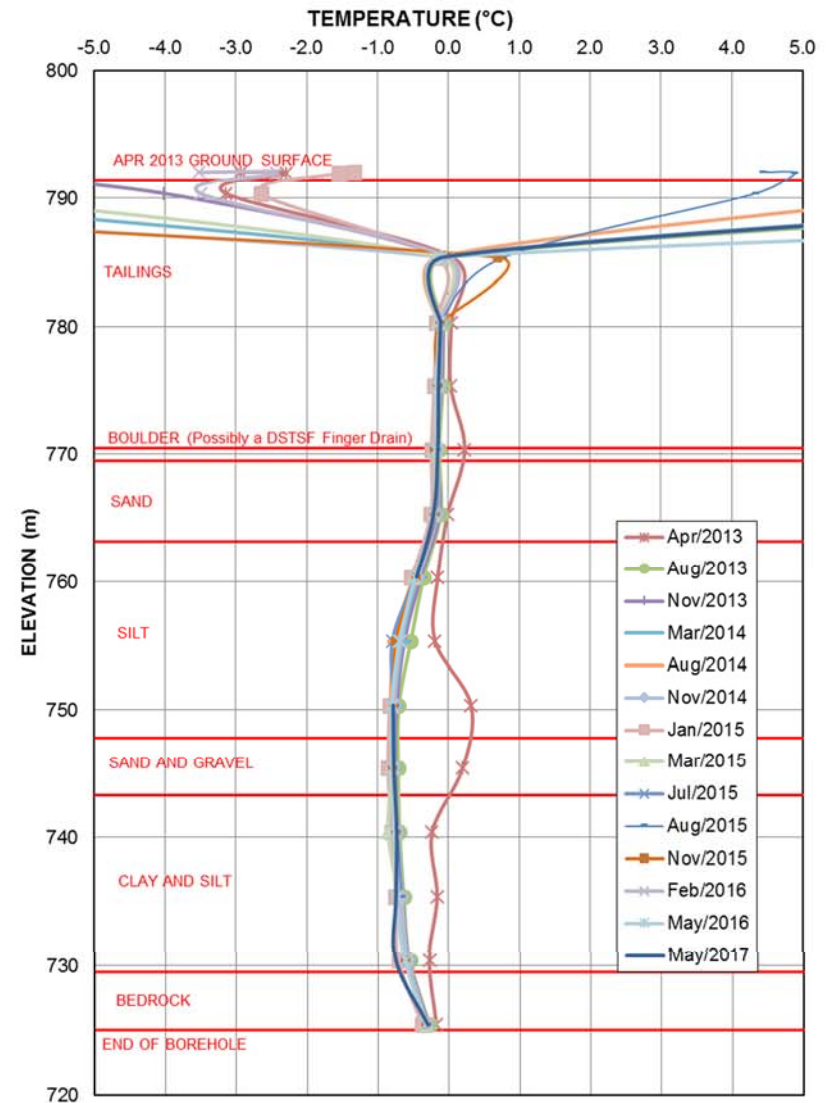
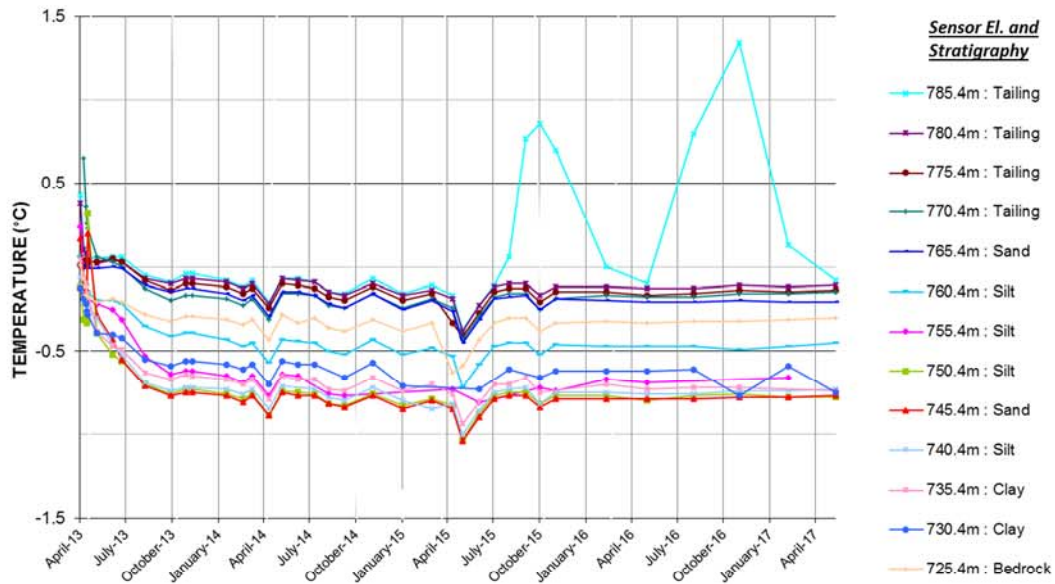
Minto Mine

Date: August 2017

Prepared by PHM

Figure: 27

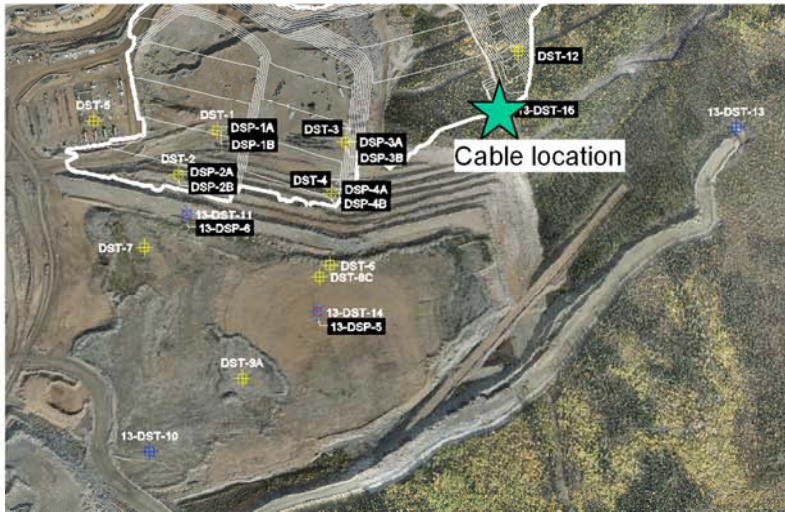
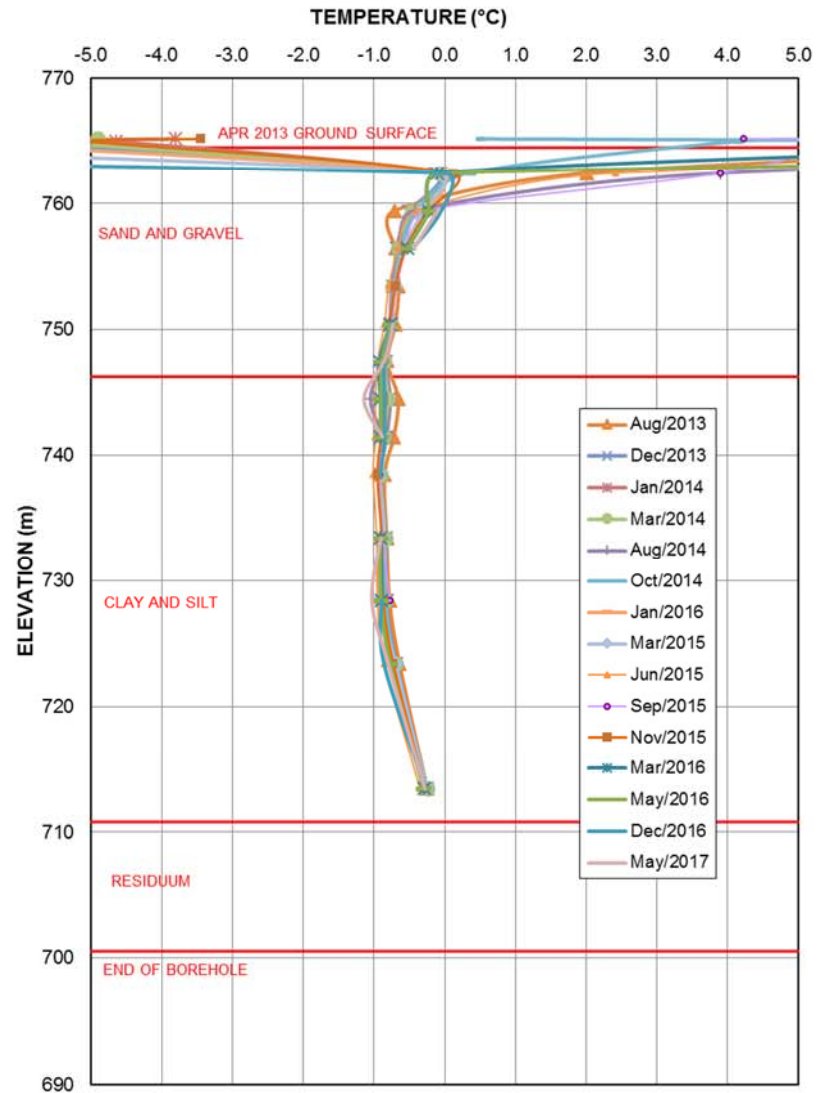
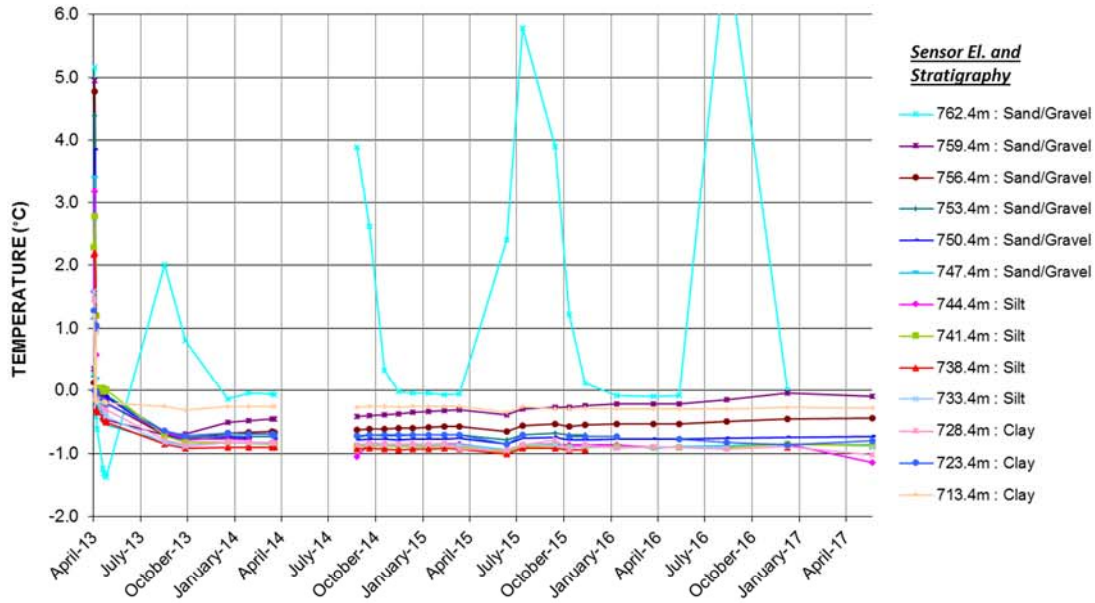




Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsm

		DSTSF Instrumentation Data		
		<b>Temperature Cable- DST-14</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTFSLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>28</b>



Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation - DSTSF\_2016-Geotech.xlsx



Job No: 1CM002.059  
Filename: ApD\_2017DSTSF\_Landscape.pptx



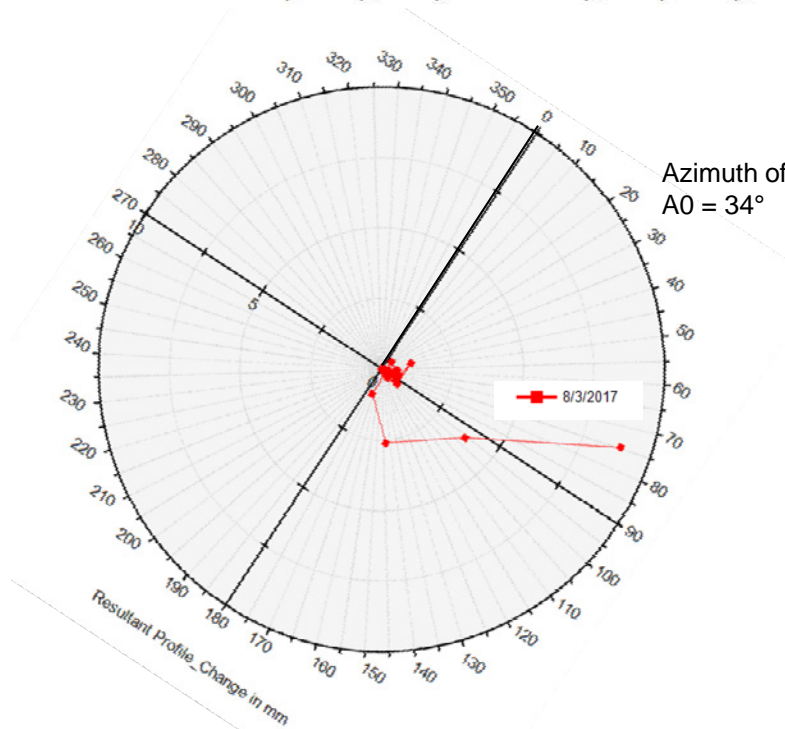
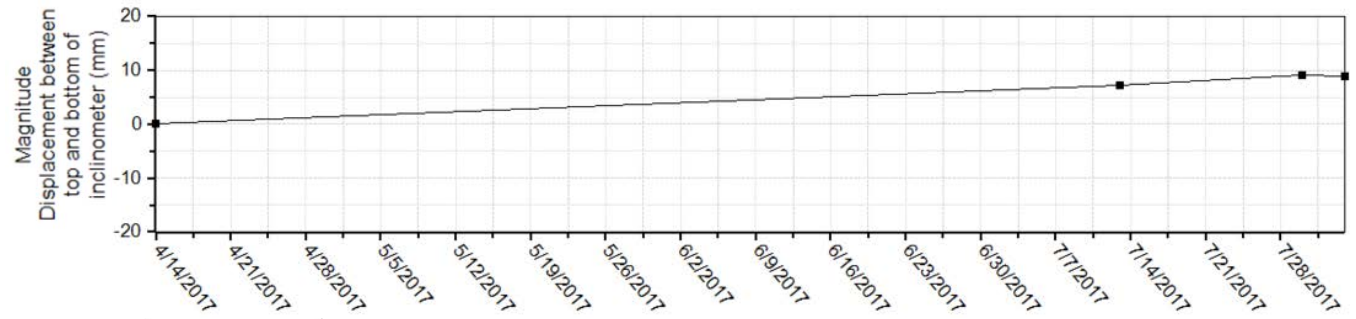
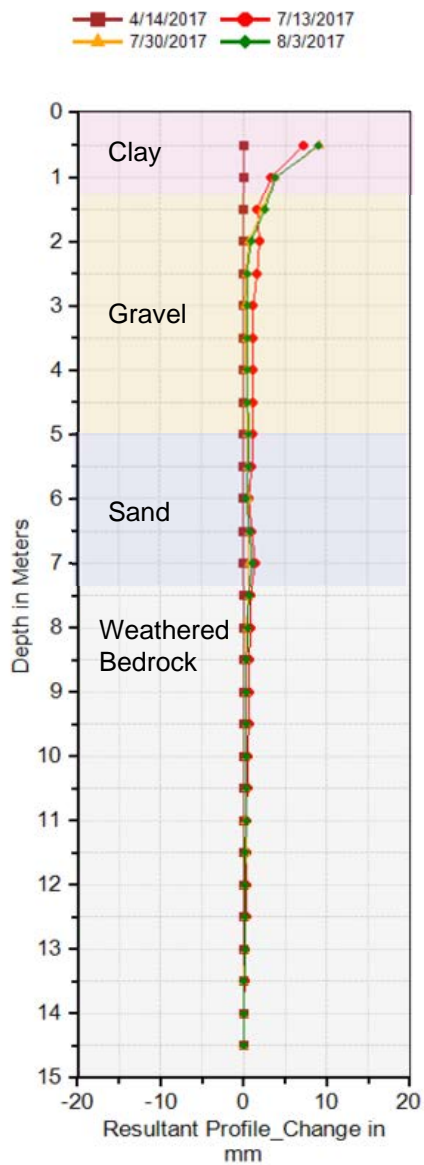
Minto Mine

DSTSF Instrumentation Data

**Temperature Cable – DST-15**

Date: August 2017	Prepared by PHM	Figure: <b>29</b>
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### MINTO DSI-22 Magnitude



Note: Inclinometer software (DigiPro2 v2.12.4) plots A0 as 0 degrees. The plot above has been rotated such that the orientation matches the plan (north is up).

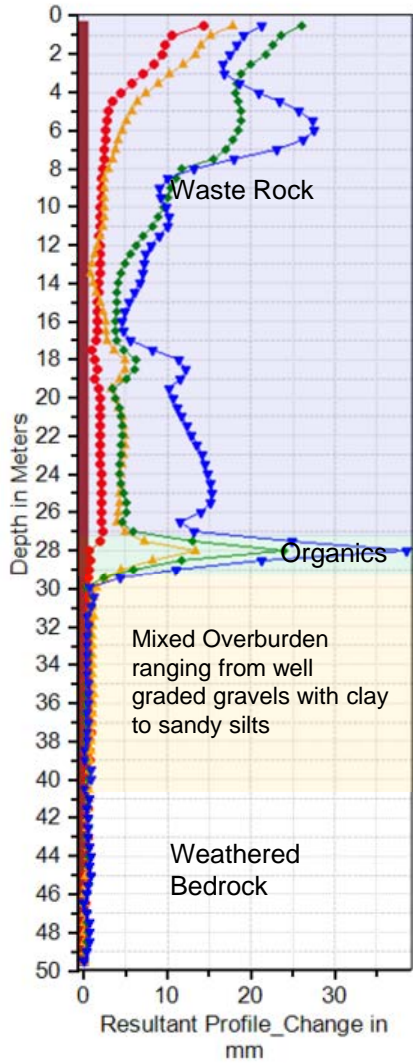
Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

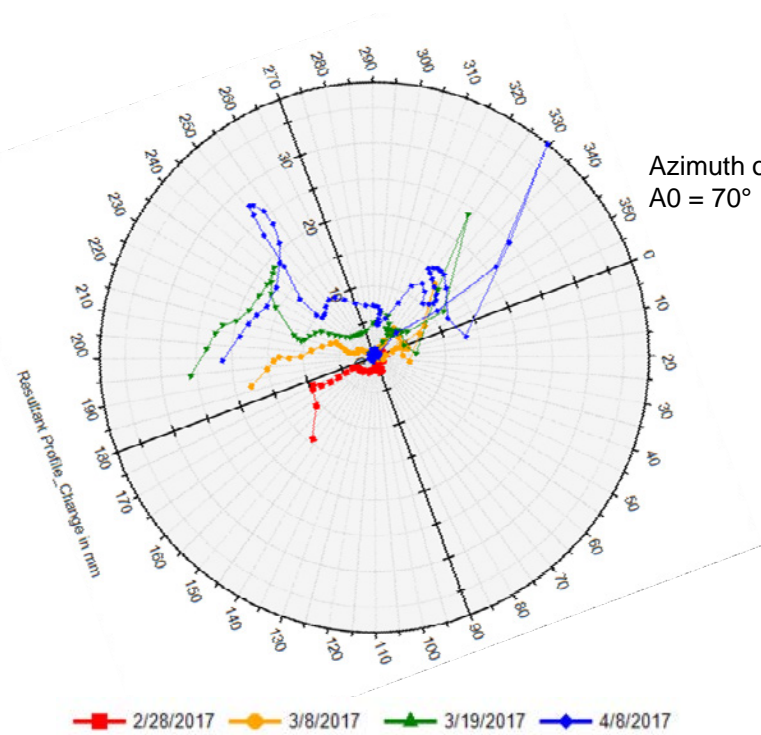
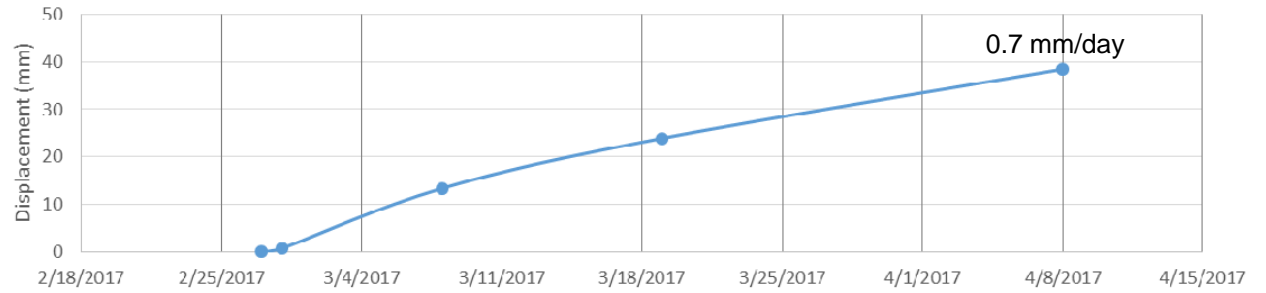
	<p>MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.</p>	DSTSF Instrumentation Data		
		<b>Inclinometer – DSI-22</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>30</b>

# MINTO DSI-23 Magnitude

■ 2/27/2017    ● 2/28/2017    ▲ 3/8/2017  
◆ 3/19/2017    ▼ 4/8/2017

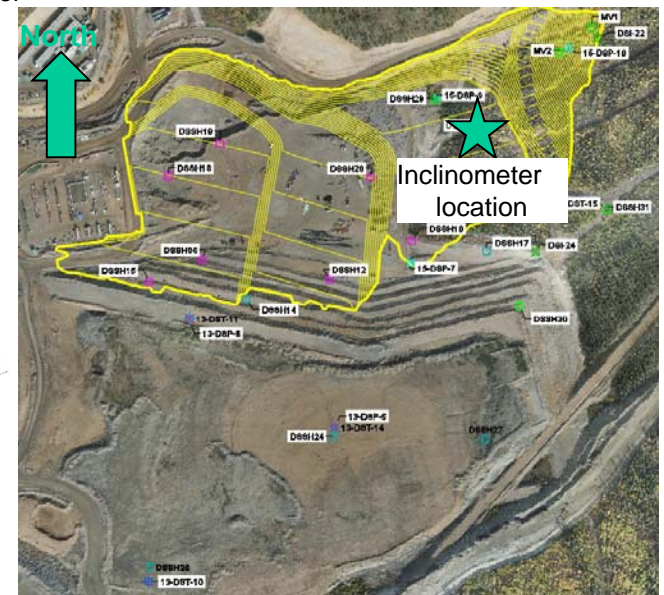


## Total Displacement at 28m Depth



■ 2/28/2017    ▲ 3/8/2017    ◆ 3/19/2017    ▼ 4/8/2017

Note: Incliner software (DigiPro2 v2.12.4) plots A0 as 0 degrees. The plot above has been rotated such that the orientation matches the plan (north is up).



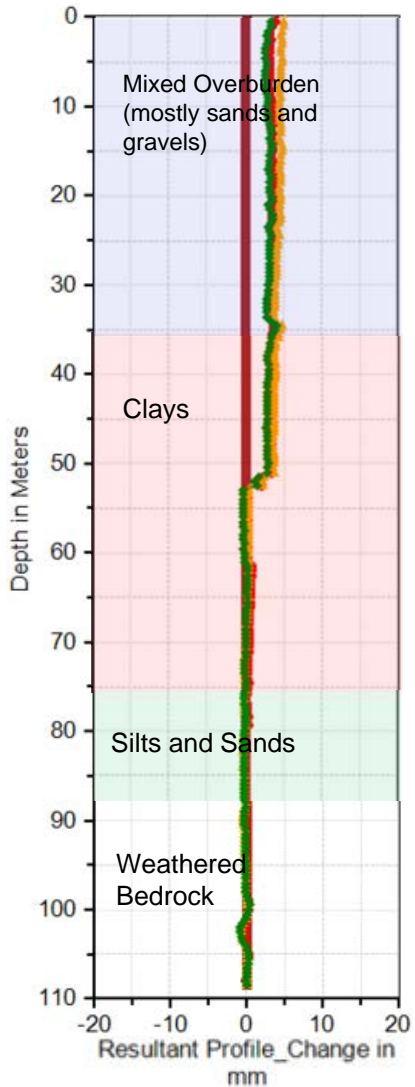
### Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

		DSTSF Instrumentation Data		
		<b>Inclinometer – DSI-23</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>31</b>

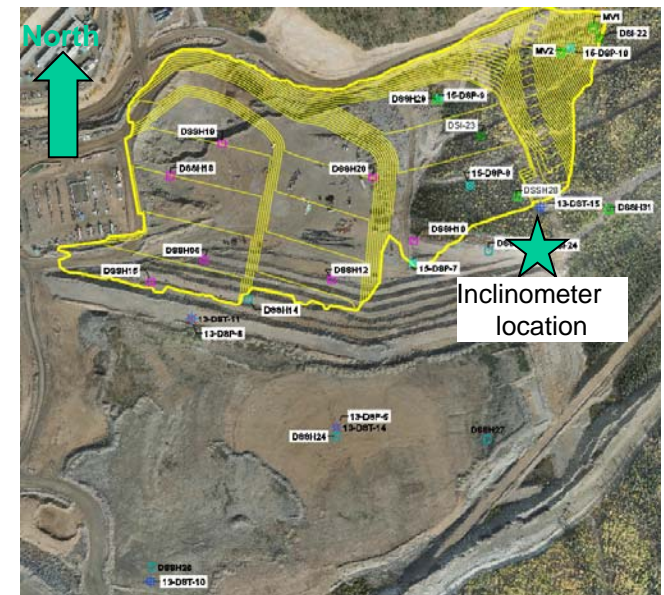
# MINTO DSI-24 B

■ 7/6/2017    ● 7/13/2017  
▲ 7/21/2017    ◆ 7/27/2017



### Notes:

1. Water/glycol inside the inclinometer casing froze following installation in January 2017 and thawed by the start of July.
2. Four sets readings of readings have been collected in July; however, the data from the A-axis has been inconsistent, with only the readings on July 13 and 27 providing good agreement. These two readings show no significant movement.
3. The profile provided in this figure plots results from the B-axis only.
4. No movement rate plot has been provided as insufficient data has been collected to date.



Azimuth of A0 = 5°

### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

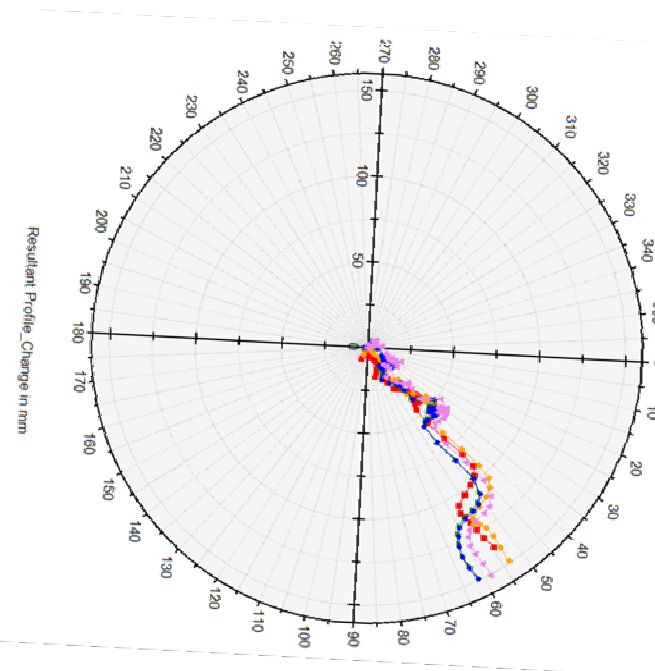
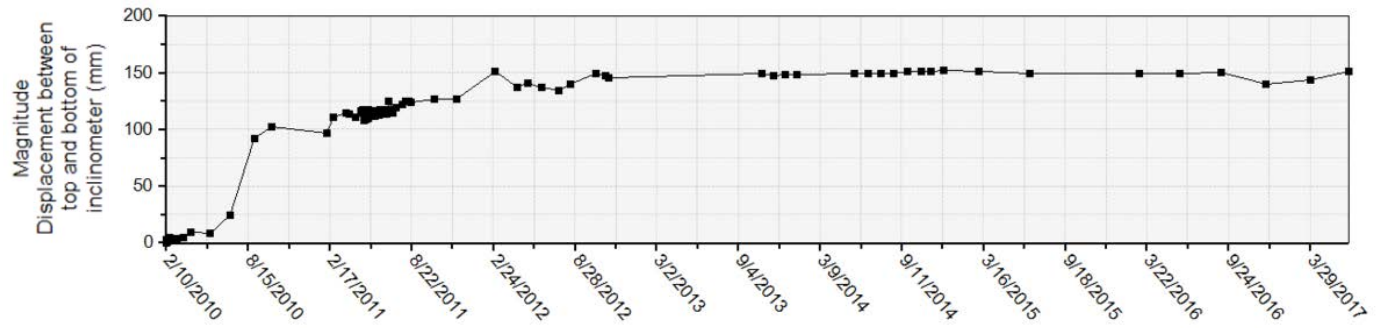
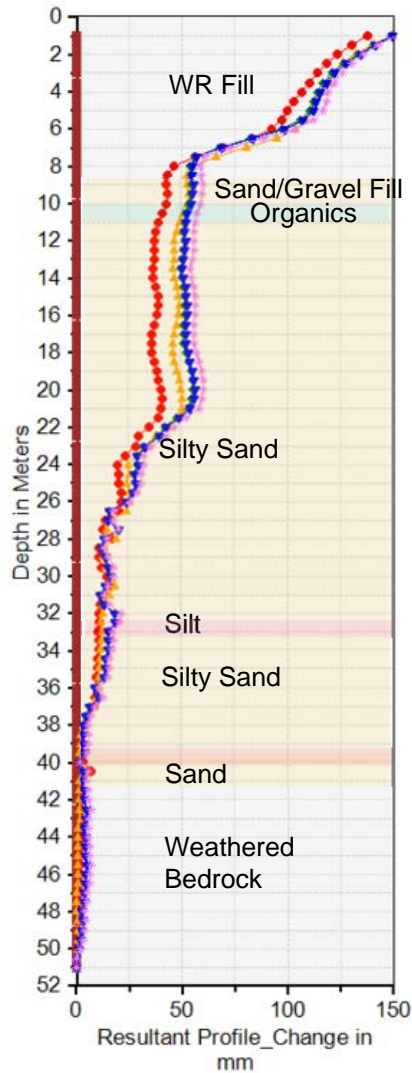
		DSTSF Instrumentation Data		
		<b>Inclinometer – DSI-24</b>		
Job No: 1CM002.059 Filename: ApD_2017DSTSLandscape.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>32</b>

Appendix E: Main Waste Dump Instrumentation Data

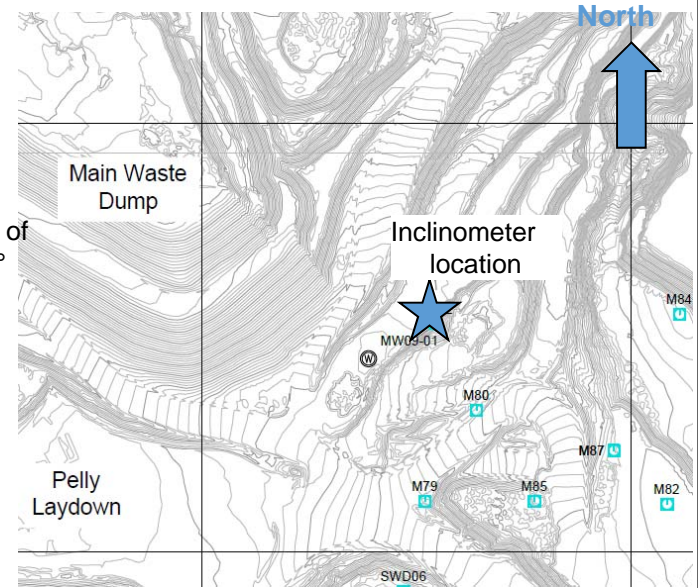
---

### MINTO MDI2 Magnitude

■ 2/10/2010    ● 6/13/2012    ▲ 6/27/2014  
◆ 6/30/2015    ▼ 6/5/2016    ◇ 6/25/2017



Azimuth of A0 = 93°



Note: Inclinometer software (DigiPro2 v2.12.4) plots A0 as 0 degrees. The plot above has been rotated such that the orientation matches the plan (north is up).

Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

		MWD Instrumentation Data		
		<b>Inclinometer – MDI-2</b>		
Job No: 1CM002.059 Filename: ApE_2017MWDInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>1</b>

Appendix F: Southwest Dump Instrumentation Data

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**Legend/Notes**

1. Values in black are total movement rates in units of mm/day
2. Values in blue are horizontal movement rates in mm/day.
3. Survey hubs in cyan color are active.
4. Survey hubs in magenta area destroyed.
5. Survey hubs with no movement rates listed have been inactive for over one year.

**South West Dump Active Survey Hubs**

Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		June 16	June 17		
SWD-01	6/9/2017	0.23	0.18	100	
SWD-02A	5/9/2017	0.35	0.25	114	Instrument is disturbed due to frost heave.
SWD-04A	4/10/2017	0	0	95	Horizontal movement rates listed. Instrument is disturbed due to frost heave.
SWD-05A	5/9/2017	0.1	0	78	Instrument is disturbed due to frost heave.
SWD-06	6/9/2017	0.16 (SWD01A)	0.20	125	<ul style="list-style-type: none"> <li>• SWD-06 is a replacement hub for SWD-01A.</li> <li>• The last reading of SWD-01A was in Dec. 2016.</li> <li>• Horizontal rate provided.</li> </ul>
SWD-07	6/9/2017	-	0.21		Hub is a replacement for SWD-02A
SWD-08	6/9/2017	0.45 (SWD-02)	0.30	100	Replacement hub for SWD-02 that was destroyed as a result of regrading of the SWD.
SWD-09	6/9/2017	-	0.40		Hub is a replacement for SWD-04a Limited data set, additional data needed to evaluate trend.

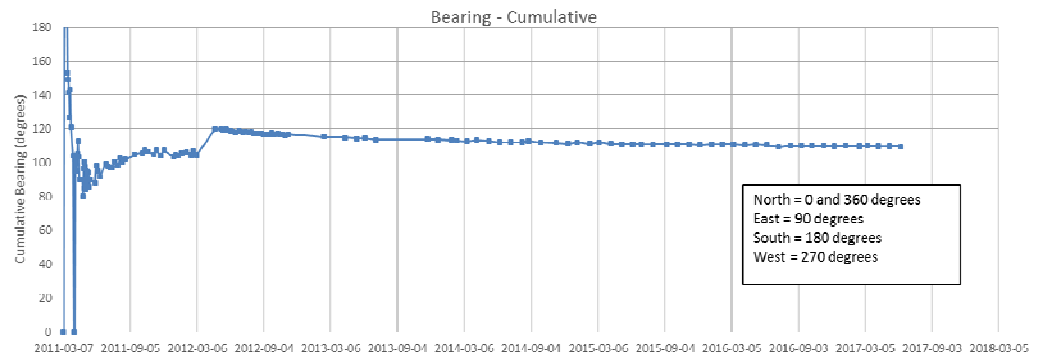
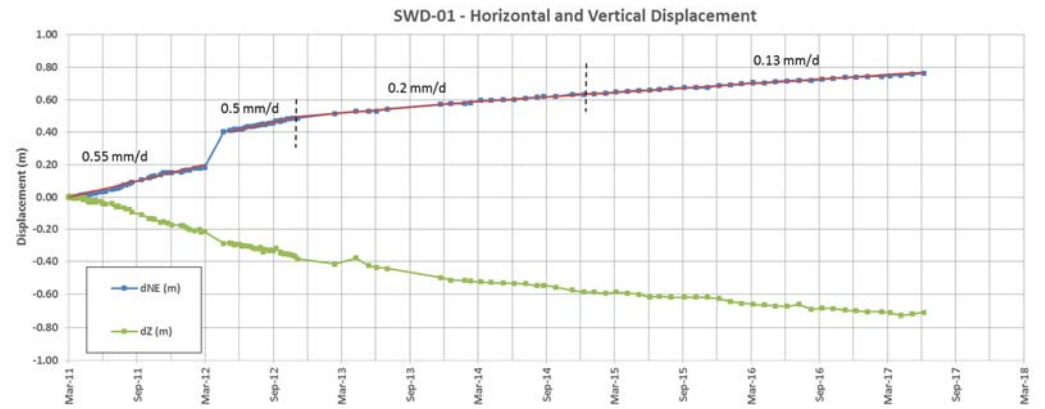
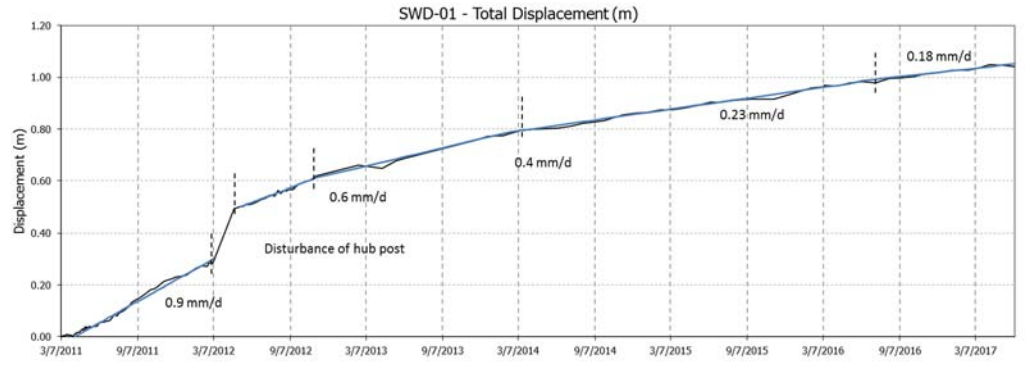
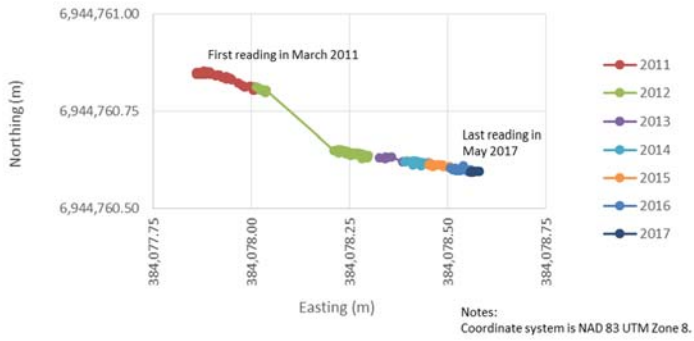


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

		SWD Instrumentation Data		
		<b>Southwest Dump Survey Hub Summary</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>1</b>

**SWD01 - Northing Vs. Easting Movement Plot**

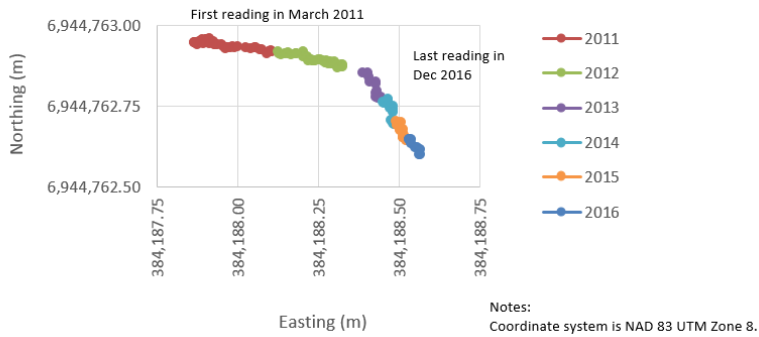


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

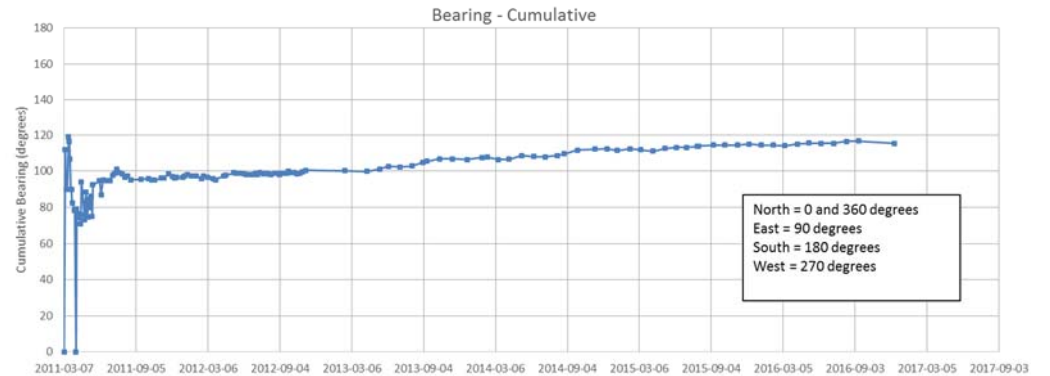
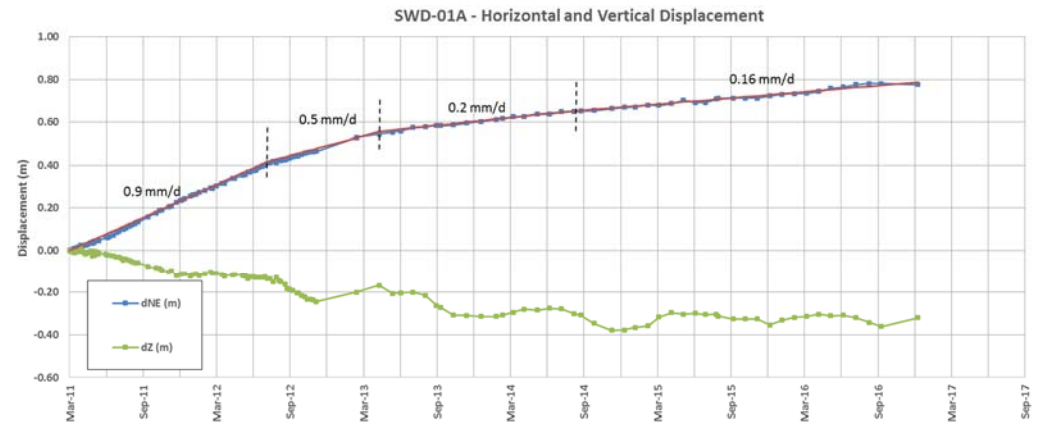
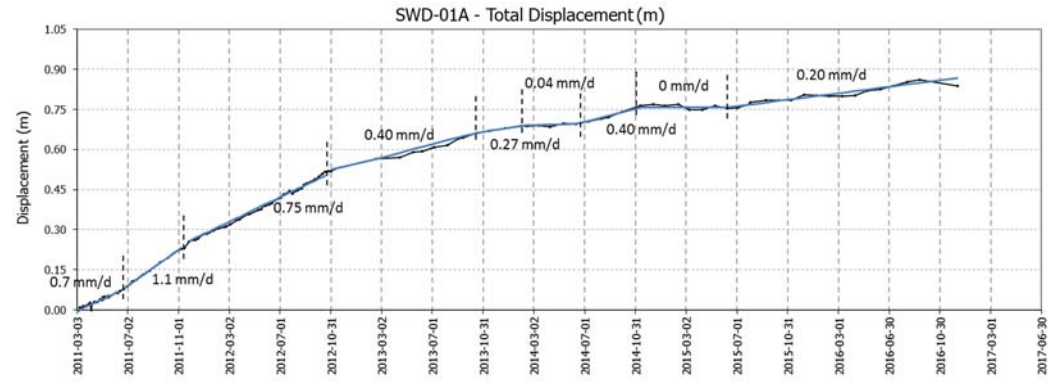
		SWD Instrumentation Data		
		<b>Survey Hub – SWD-01</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>2</b>

### SWD01A - Northing Vs. Easting Movement Plot



#### Notes

1. Last reading of hub in December 2016. Hub is replaced by SWD-06.



#### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm



SWD Instrumentation Data

Survey Hub – SWD-01A

Job No: 1CM002.059  
Filename: ApF\_2017SWD Instrumentation.pptx

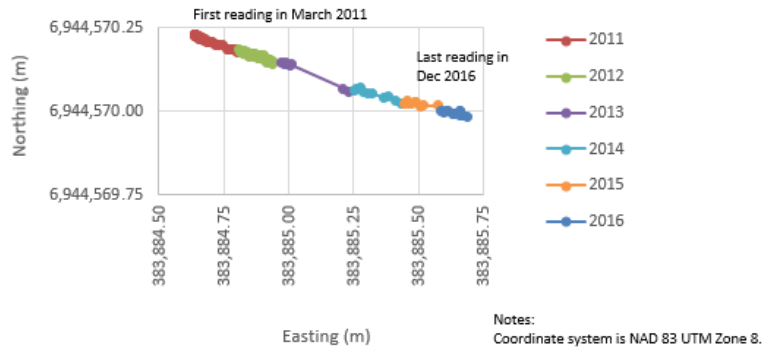
Minto Mine

Date:  
August 2017

Prepared by  
PHM

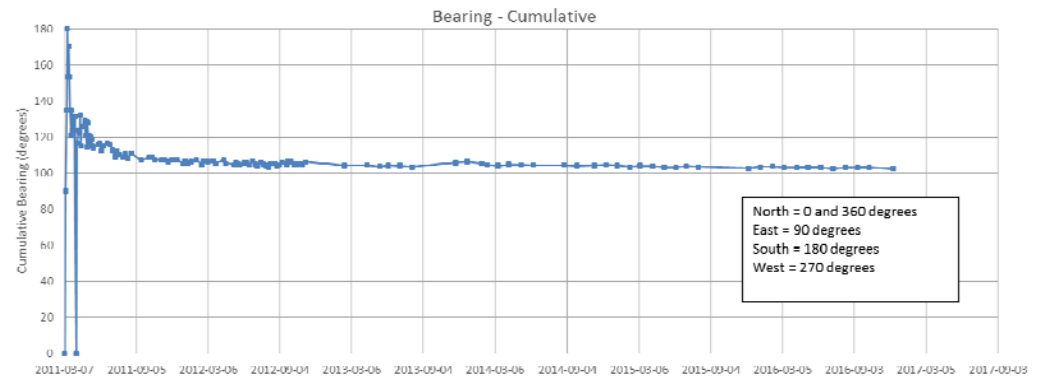
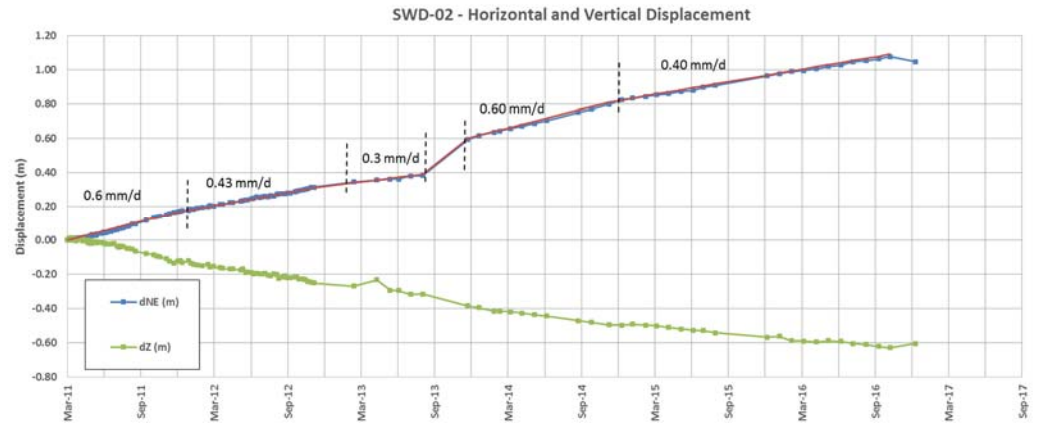
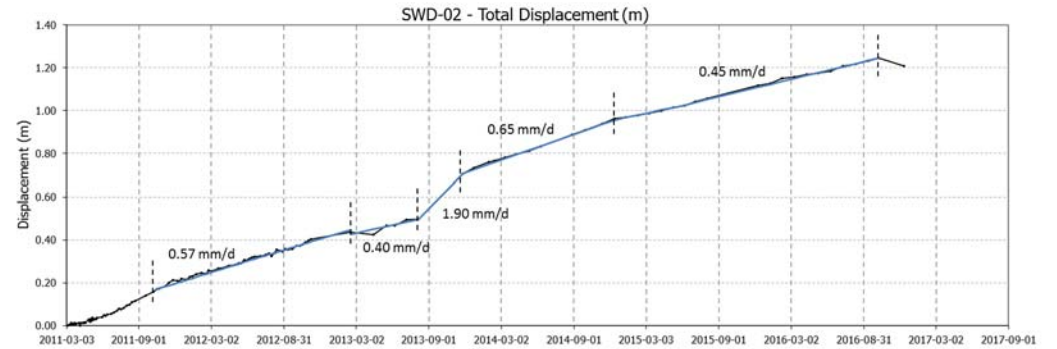
Figure:  
**3**

### SWD02 - Northing Vs. Easting Movement Plot



#### Notes

1. Last reading of hub in December 2016. Hub is replaced by SWD-08.



#### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm



SWD Instrumentation Data

Survey Hub – SWD-02

Job No: 1CM002.059  
Filename: ApF\_2017SWD Instrumentation.pptx

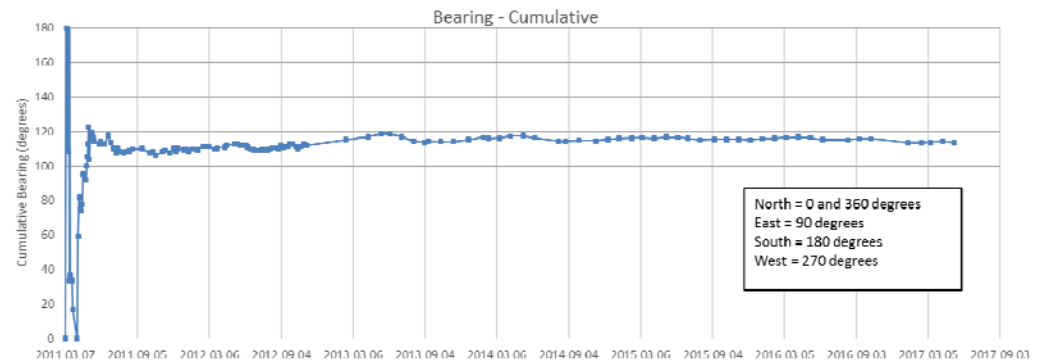
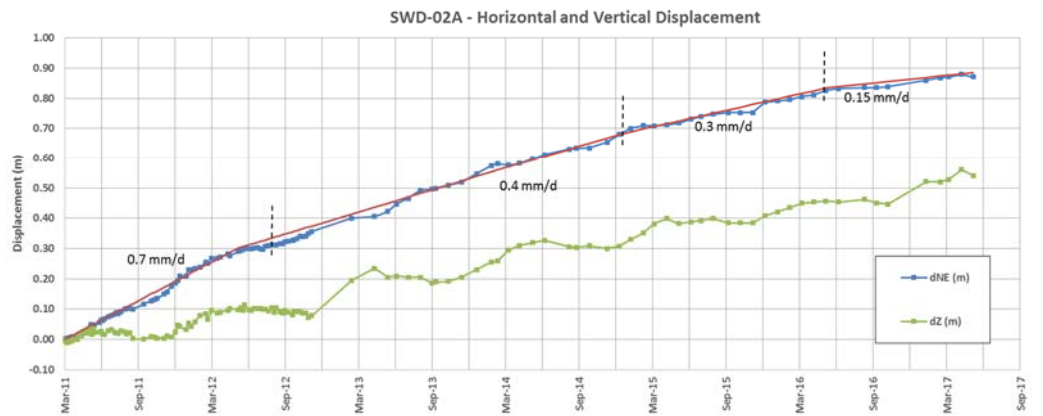
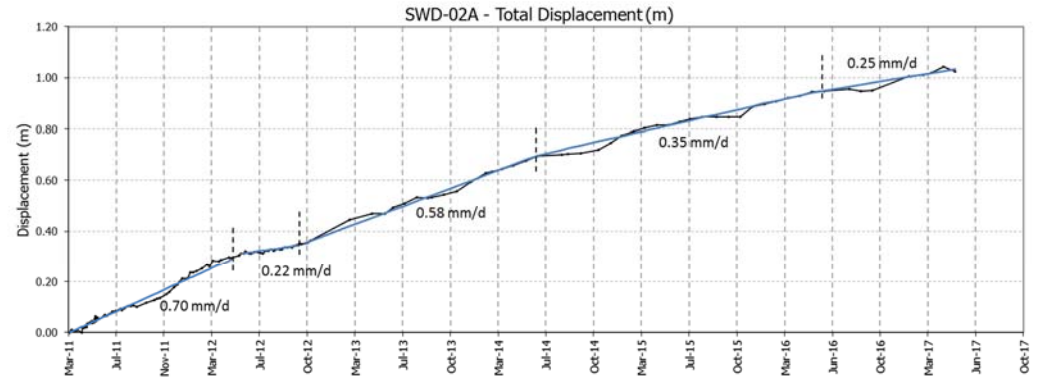
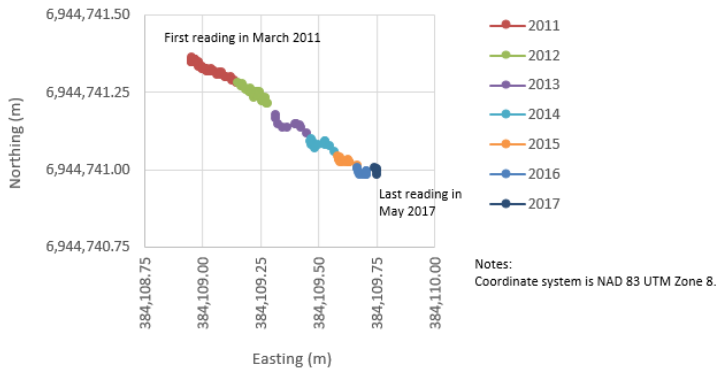
Minto Mine

Date: August 2017

Prepared by PHM

Figure: 4

### SWD02A - Northing Vs. Easting Movement Plot

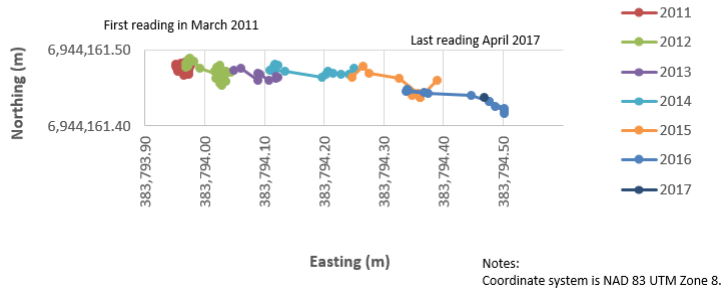


Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

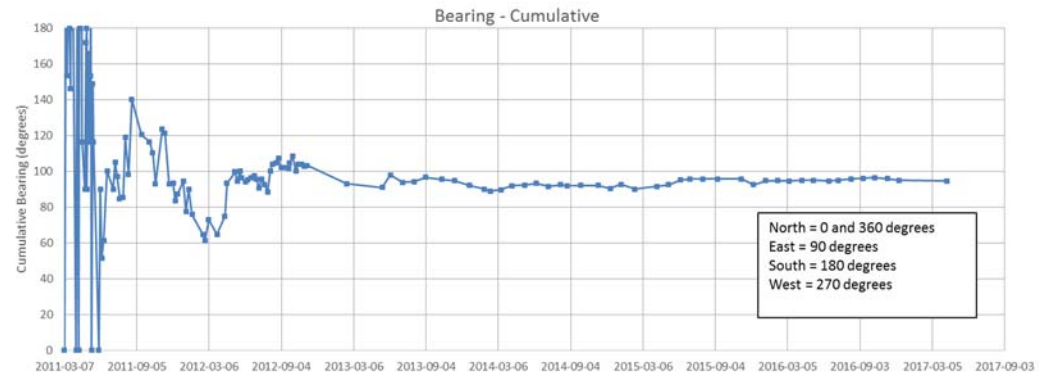
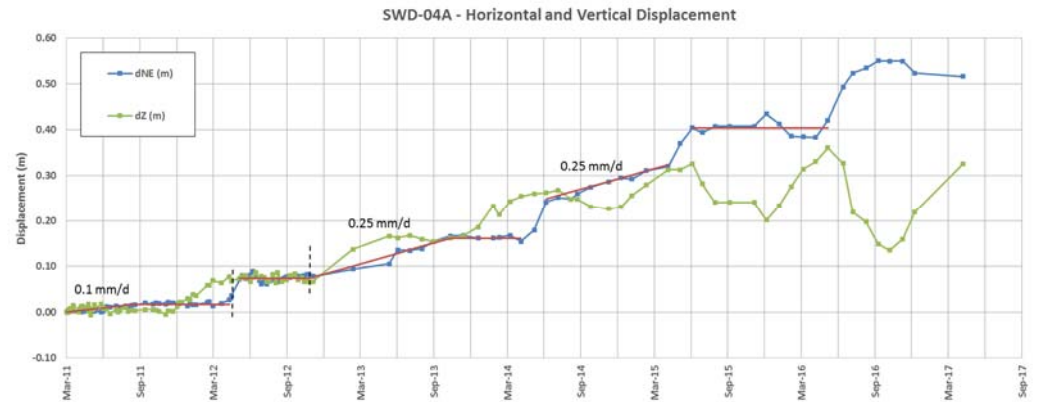
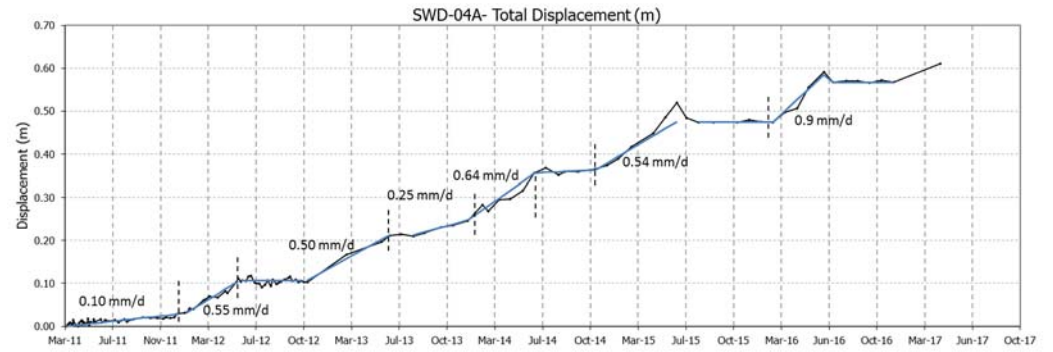
		SWD Instrumentation Data		
		Survey Hub – SWD-02A		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: 5

### SWD04A - Northing Vs. Easting Movement Plot



#### Notes

1. Movement of this survey hub is primary due to frost heave. Hub is replaced by SWD-09.

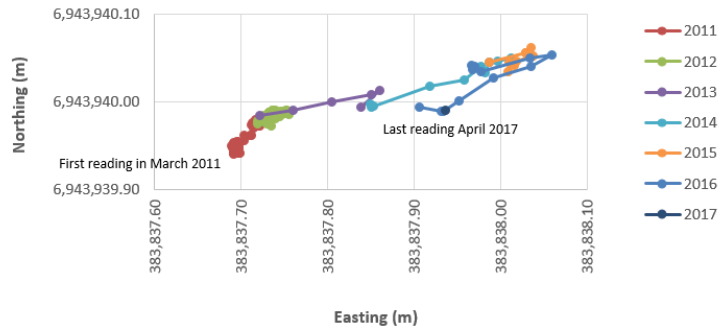


#### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

		SWD Instrumentation Data		
		<b>Survey Hub – SWD-04A</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>6</b>

### SWD05A - Northing Vs. Easting Movement Plot



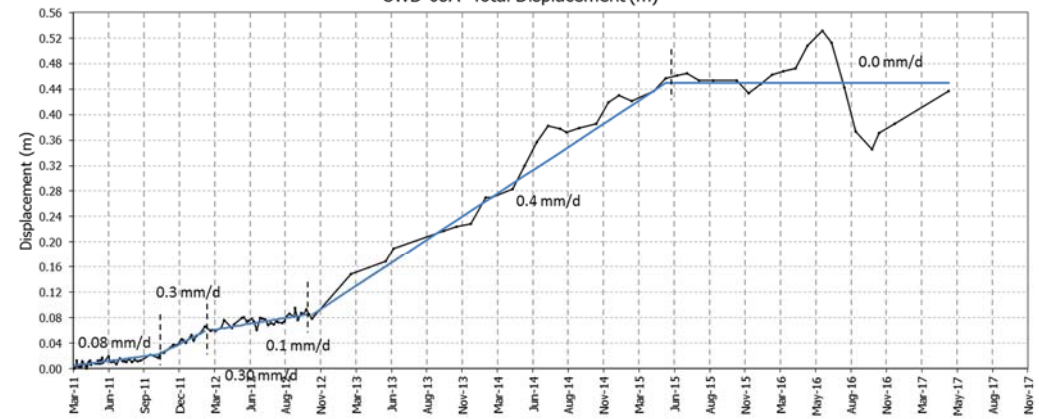
Notes:  
Coordinate system is NAD 83 UTM Zone 8.

### Notes

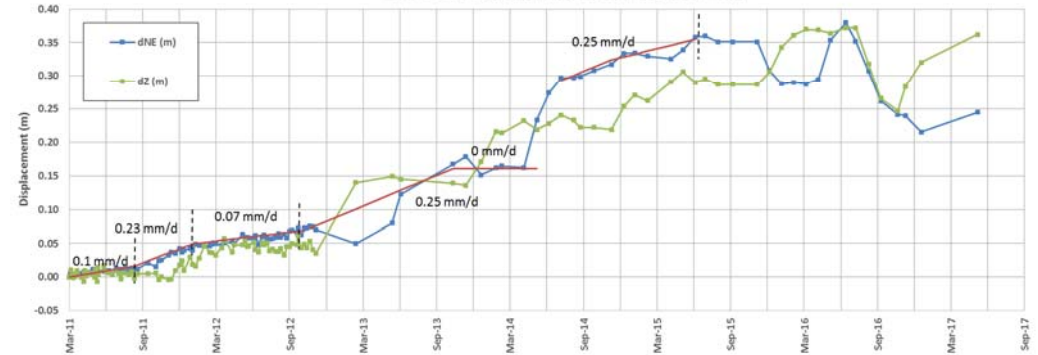
1. Movement of this survey hub is primary due to frost heave.



### SWD-05A- Total Displacement (m)



### SWD-05A - Horizontal and Vertical Displacement



### Bearing - Cumulative



### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm



SWD Instrumentation Data

**Survey Hub – SWD-05A**

Job No: 1CM002.059  
Filename: ApF\_2017SWD Instrumentation.pptx

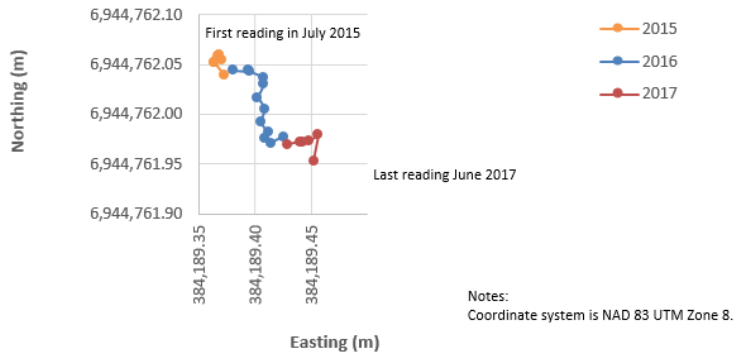
Minto Mine

Date:  
August 2017

Prepared by  
PHM

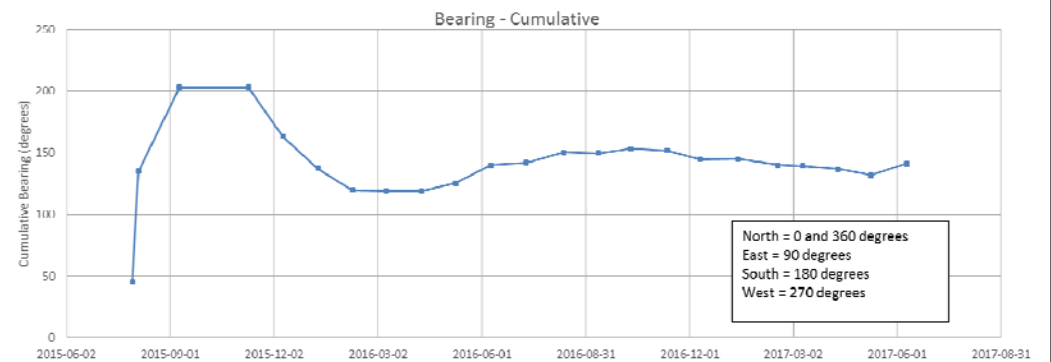
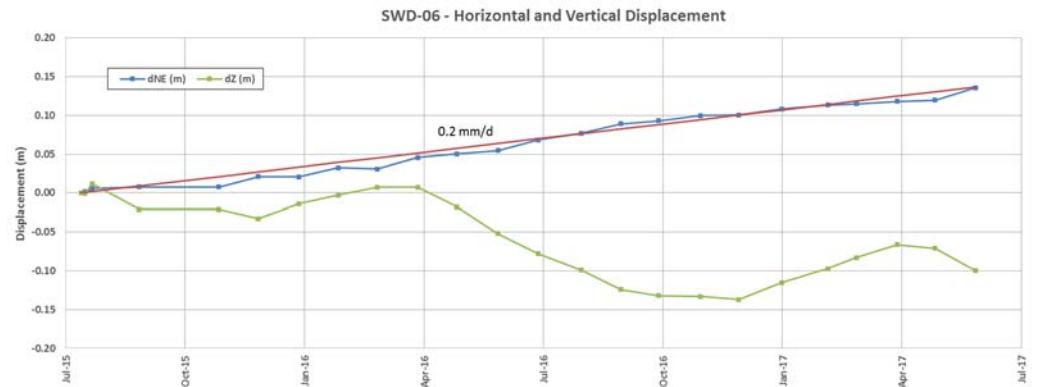
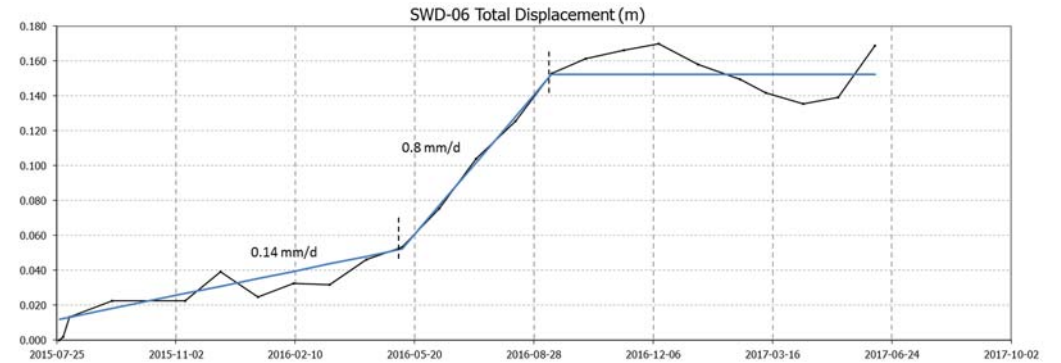
Figure:  
**7**

### SWD06 - Northing Vs. Easting Movement Plot



#### Notes

1. Hub is a replacement for SWD-01A that was disturbed by frost heave.
2. The hub consists of a lock-block on surface, and as a result, seasonal ground movement as a result freeze/thaw cycles may occur that is not indicative of large-scale ground movement. As a result, the horizontal displacement plot is likely to be the most useful plot for monitoring movement.



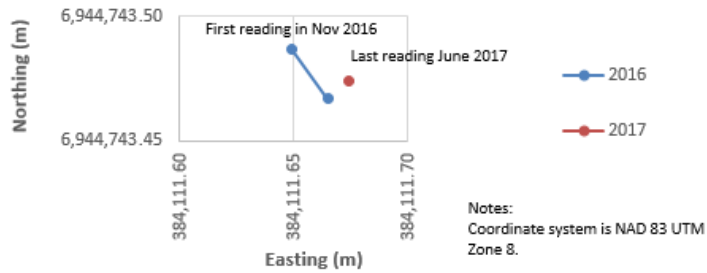
#### Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

		SWD Instrumentation Data		
		<b>Survey Hub – SWD-06</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by: PHM	Figure: <b>8</b>

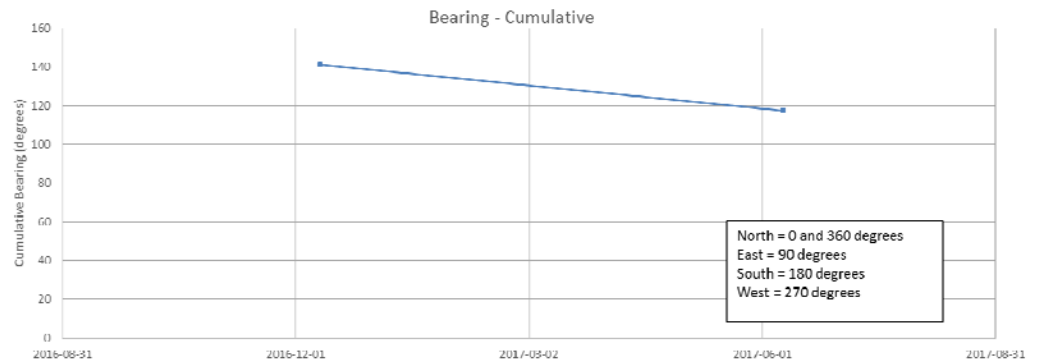
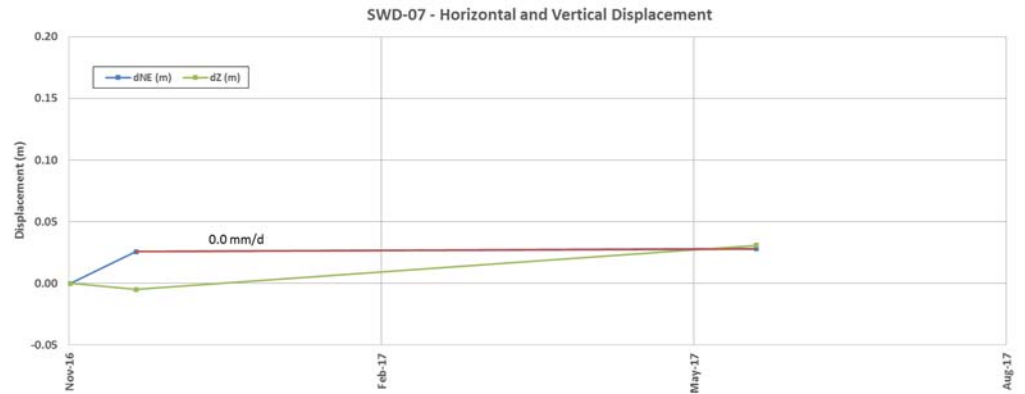
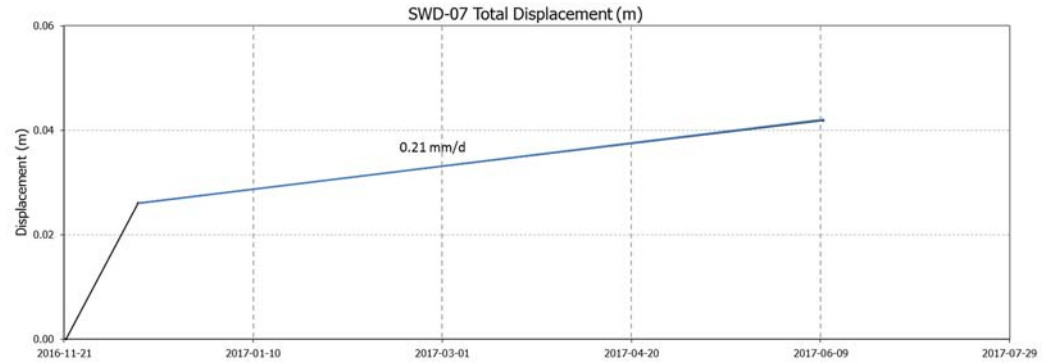


### SWD07 - Northing Vs. Easting Movement Plot



#### Notes

- Hub is a replacement for SWD-02A that was disturbed by frost heave.

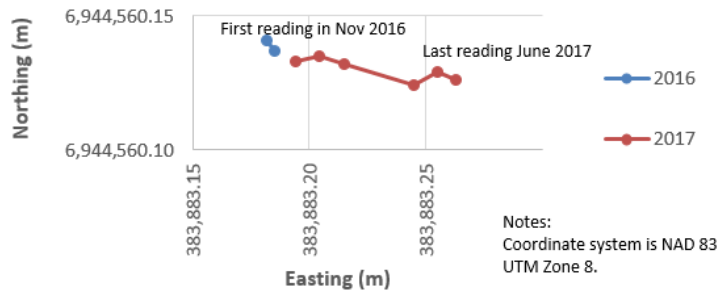


#### Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

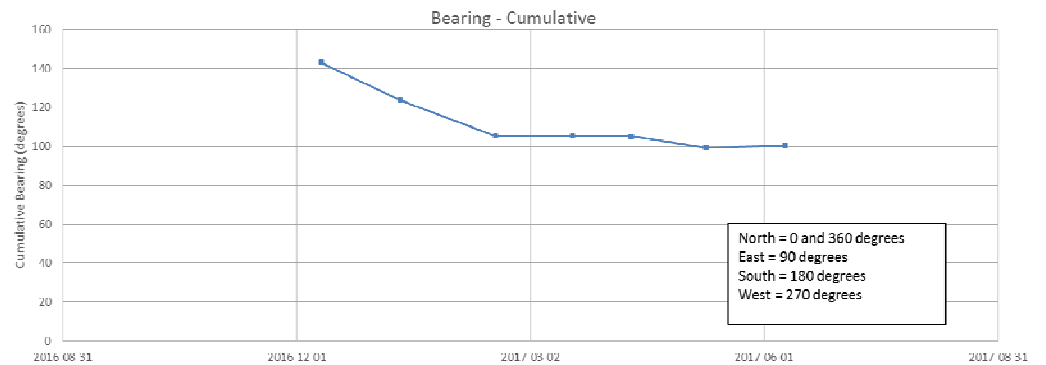
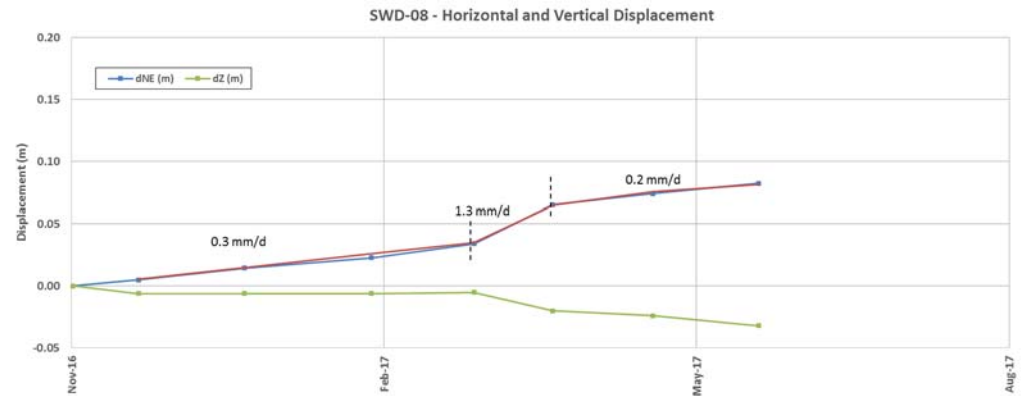
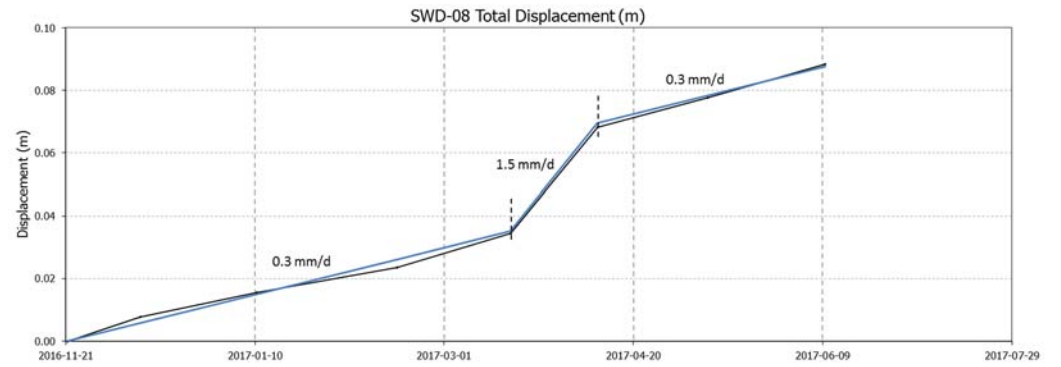
	 MINTO MINE OPERATED BY MINTO EXPLORATIONS LTD.	SWD Instrumentation Data		
		Survey Hub – SWD-07		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: 9

### SWD08 - Northing Vs. Easting Movement Plot



**Notes**

1. Hub is a replacement for SWD-02 that was disturbed as a result of regrading of the SWD.

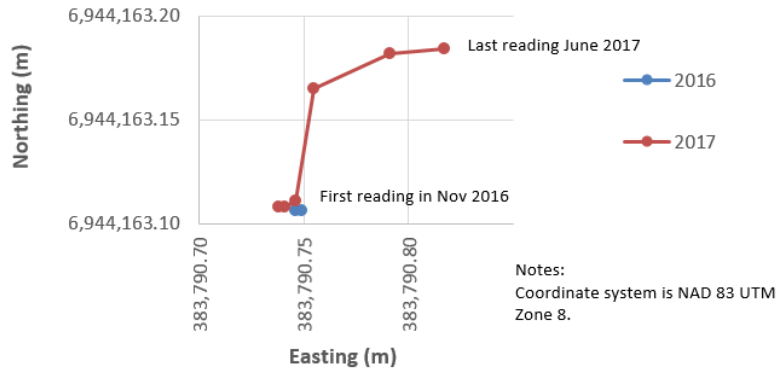


Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

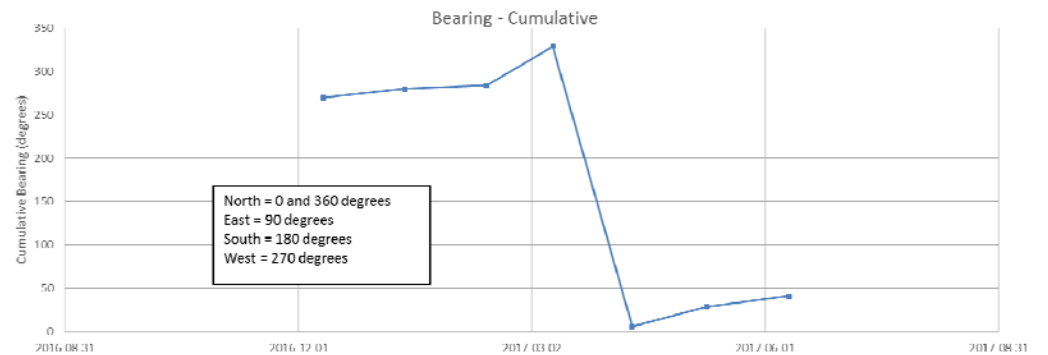
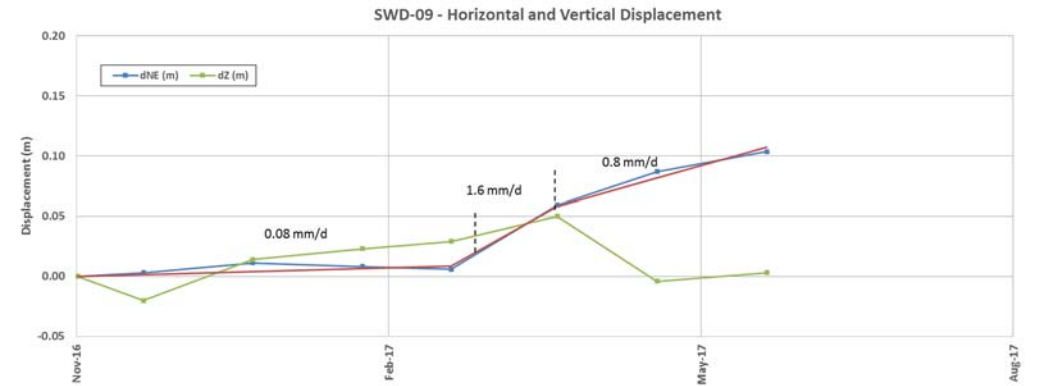
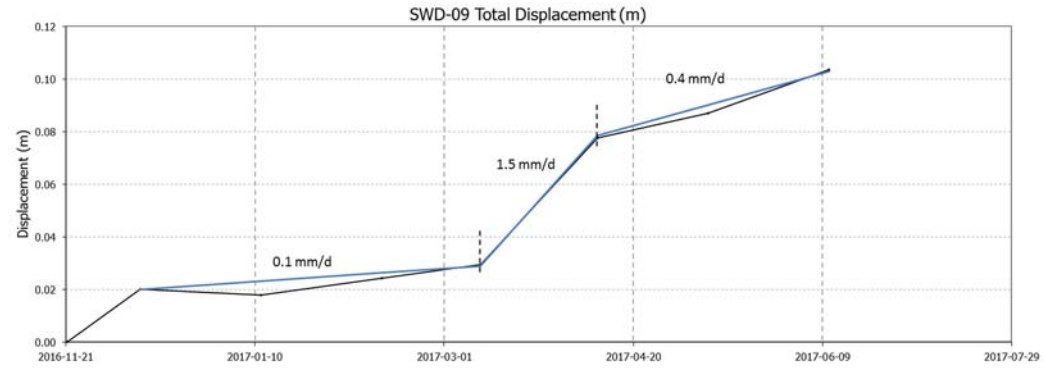
		SWD Instrumentation Data		
		<b>Survey Hub – SWD-08</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by: PHM	Figure: <b>10</b>

### SWD09 - Northing Vs. Easting Movement Plot



#### Notes

- Hub is a replacement for SWD-04A that was disturbed by frost heave.
- The hub consists of a lock-block on surface, and as a result, seasonal ground movement as a result freeze/thaw cycles may occur that is not indicative of large-scale ground movement. As a result, the horizontal displacement plot is likely to be the most useful plot for monitoring movement.



#### Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm



SWD Instrumentation Data

Survey Hub – SWD-09

Job No: 1CM002.059  
Filename: ApF\_2017SWD Instrumentation.pptx

Minto Mine

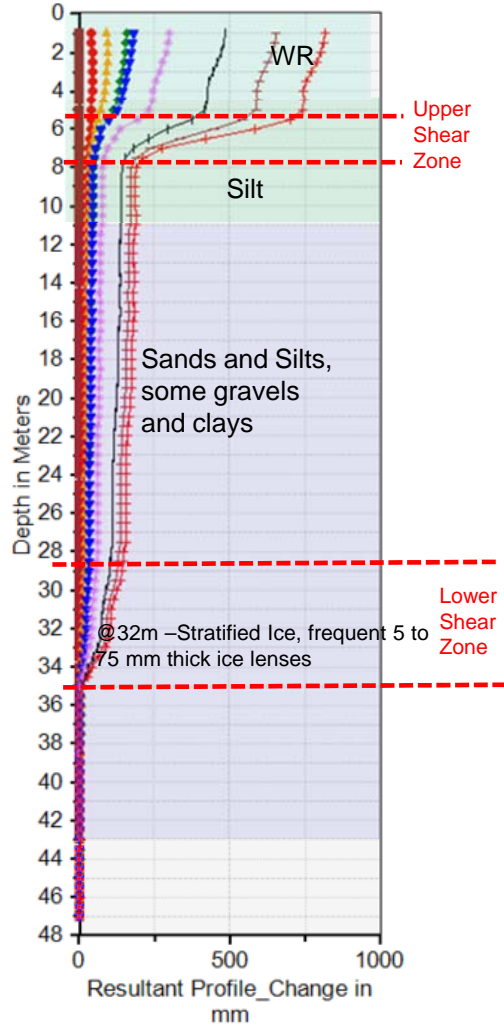
Date:  
August 2017

Prepared by  
PHM

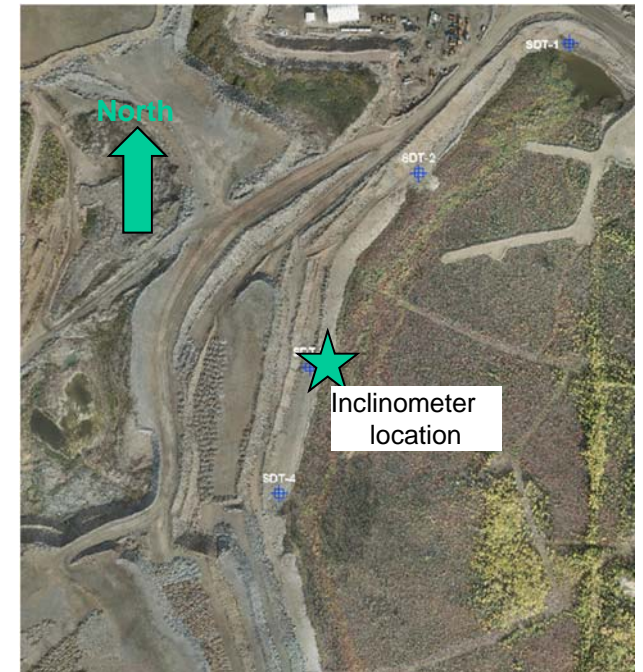
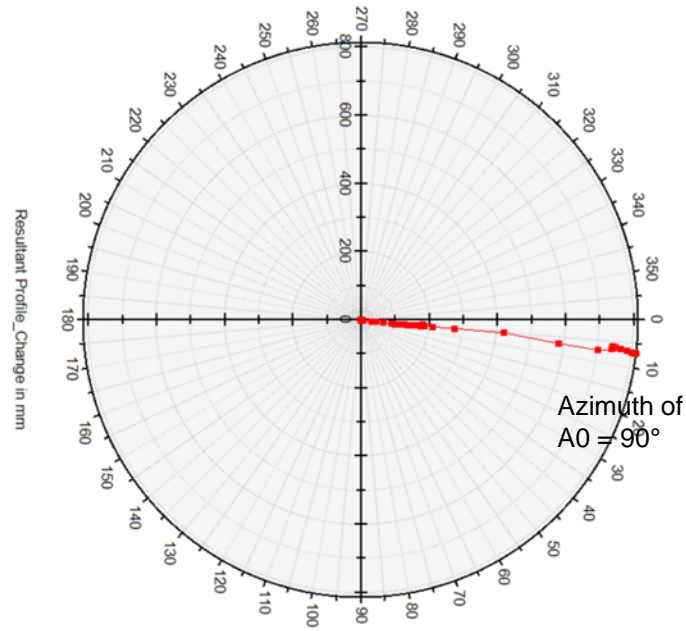
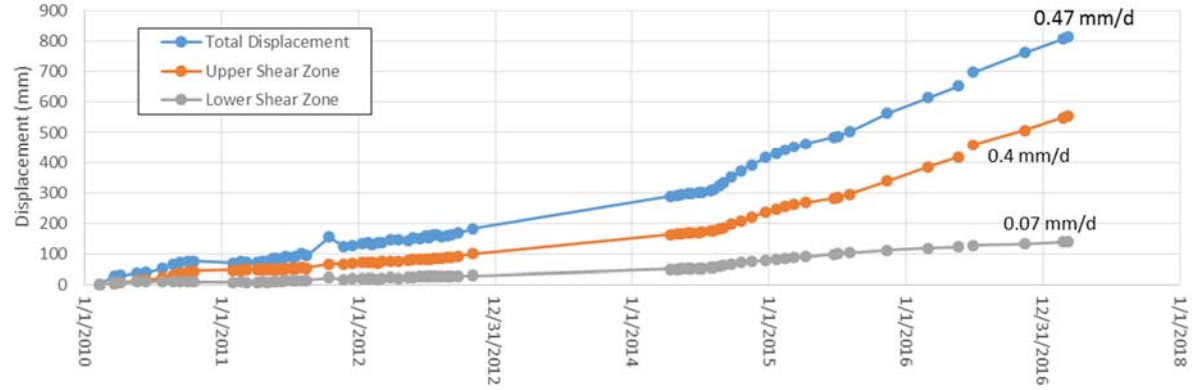
Figure:  
11

### MINTO SDI3 Magnitude

- 2/11/2010    6/13/2010    6/23/2011
- 6/28/2012    11/2/2012    6/27/2014
- 6/24/2015    5/20/2016    3/8/2017



### Displacement

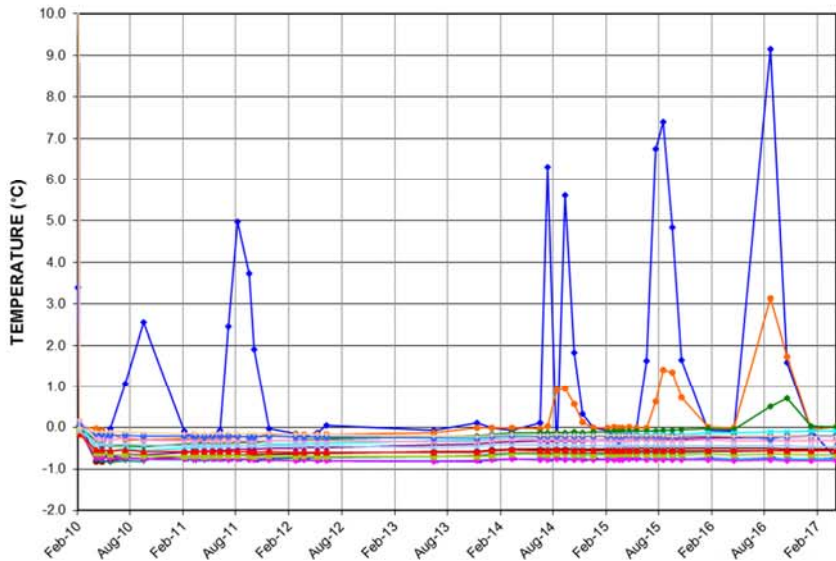


Note: Inclinometer software (DigiPro2 v2.12.4) plots A0 as 0 degrees. The plot above has been rotated such that the orientation matches the plan (north is up).

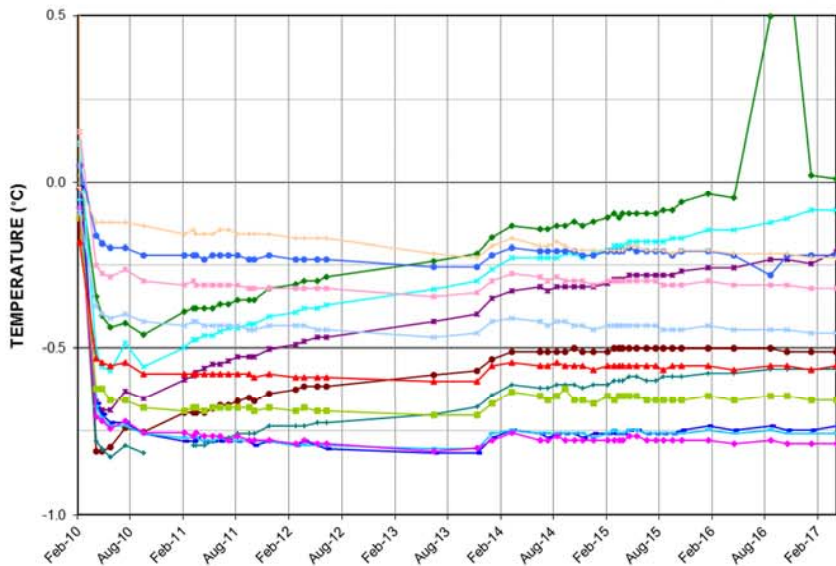
Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
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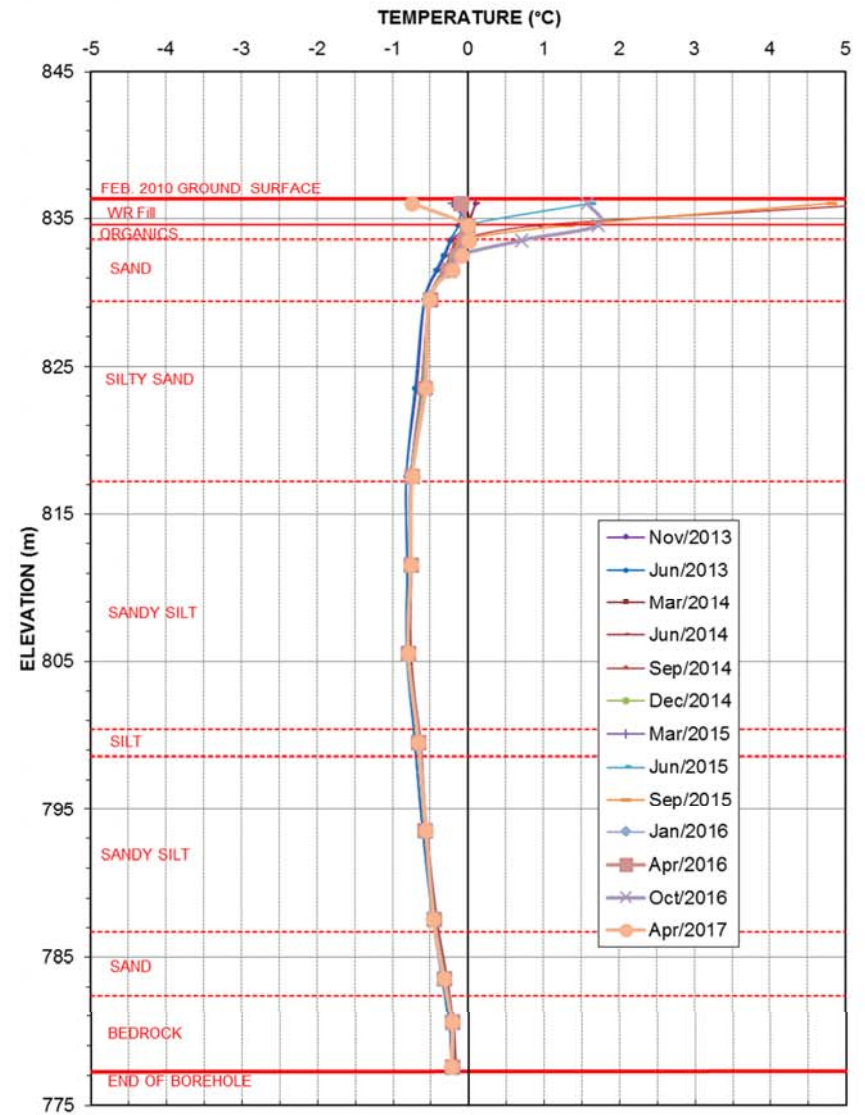
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		<b>Inclinometer – SDI-3</b>		
Job No: 1CM002.059 Filename: ApF_2017SWD Instrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>12</b>



- Sensor El. and Stratigraphy**
- 836.1m: WR Fill
  - 834.6m: Organics
  - 833.6m: Sand
  - 832.6m: Sand
  - 831.6m: Sand
  - 829.6m: Sand
  - 823.6m: Silty sand
  - 817.6m: Silty Sand
  - 811.6m: Sandy Silt
  - 805.6m: Sandy Silt
  - 799.6m: Silt
  - 793.6m: Sandy Silt
  - 787.6m: Sandy Silt
  - 783.6m: Sand
  - 780.6m: Bedrock
  - 777.6m: Bedrock



- Sensor El. and Stratigraphy**
- 833.6m: Sand
  - 832.6m: Sand
  - 831.6m: Sand
  - 829.6m: Sand
  - 823.6m: Silty sand
  - 817.6m: Silty Sand
  - 811.6m: Sandy Silt
  - 805.6m: Sandy Silt
  - 799.6m: Silt
  - 793.6m: Sandy Silt
  - 787.6m: Sandy Silt
  - 783.6m: Sand
  - 780.6m: Bedrock
  - 777.6m: Bedrock



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_SRK.xlsm



Job No: 1CM002.059  
 Filename: ApF\_2017SWD Instrumentation.pptx

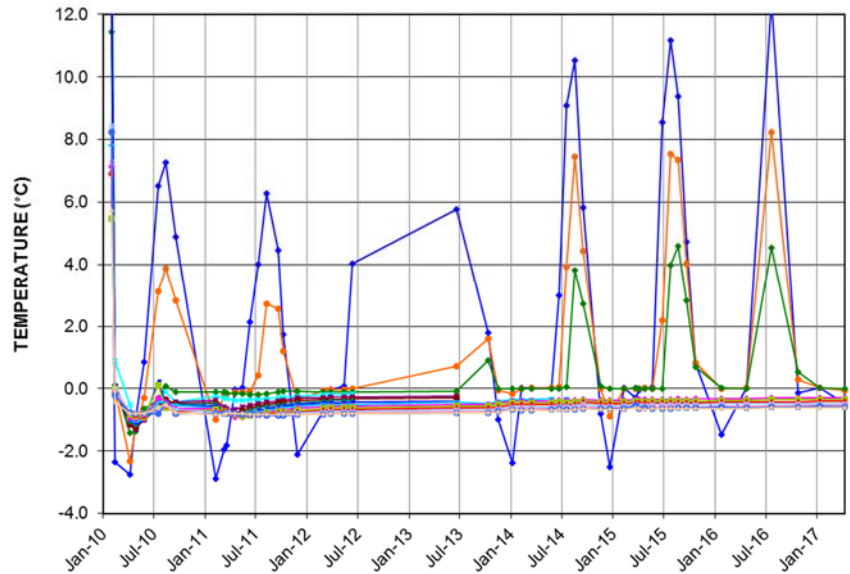


Minto Mine

SWD Instrumentation Data

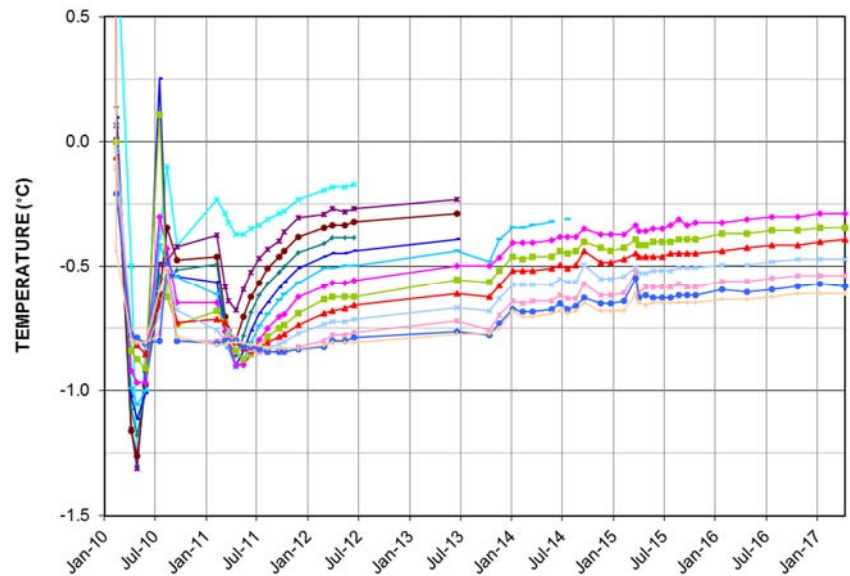
**Temperature Cable – SDT-1**

Date: August 2017	Prepared by PHM	Figure: <b>13</b>
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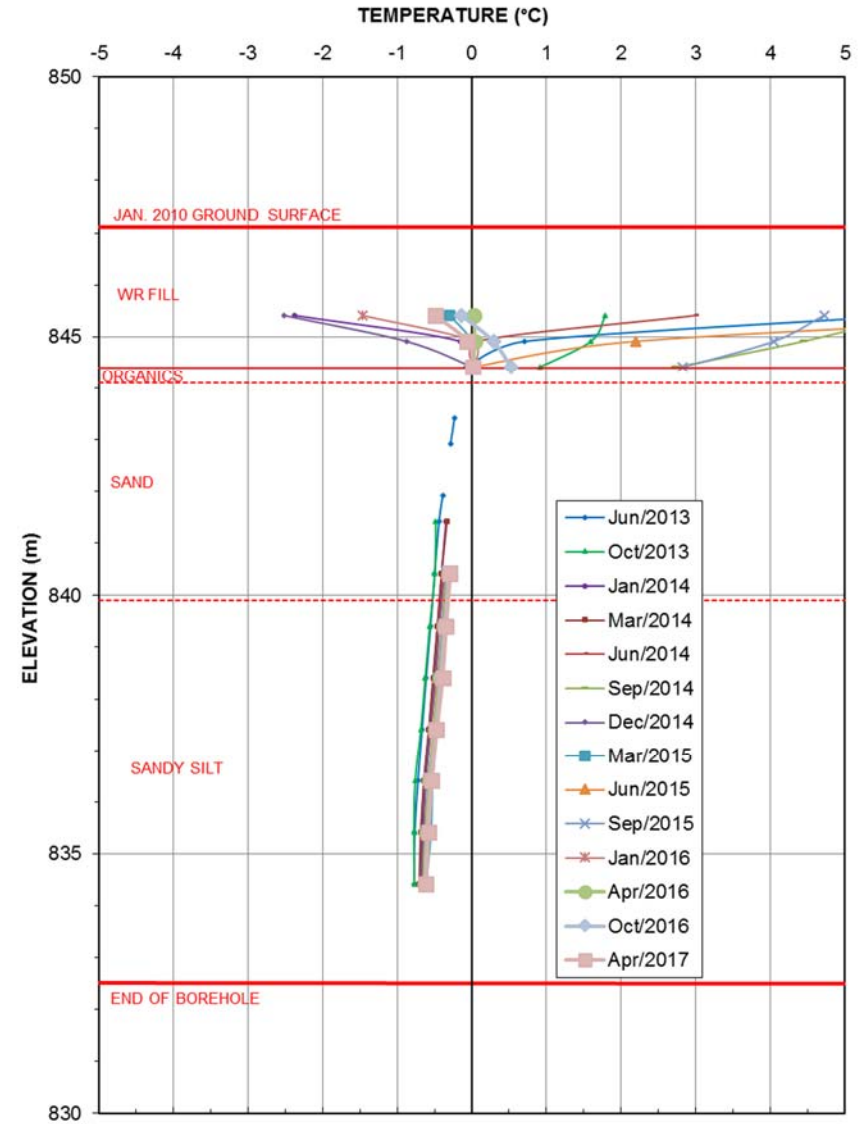
**Sensor El. and Stratigraphy**

- 845.1m: WR Fill
- 844.9m: WR Fill
- 844.4m: Organics
- 843.9m: Sand
- 843.4m: Sand
- 842.9m: Sand
- 842.4m: Sand
- 841.9m: Sand
- 841.4m: Sand
- 840.4m: Sand
- 839.4m: Sandy Silt
- 838.4m: Sandy Silt
- 837.4m: Sandy Silt
- 836.4m: Sandy Silt
- 835.4m: Sandy Silt
- 834.4m: Sandy Silt



**Sensor El. and Stratigraphy**

- 843.9m: Sand
- 843.4m: Sand
- 842.9m: Sand
- 842.4m: Sand
- 841.9m: Sand
- 841.4m: Sand
- 840.4m: Sand
- 839.4m: Sandy Silt
- 838.4m: Sandy Silt
- 837.4m: Sandy Silt
- 836.4m: Sandy Silt
- 835.4m: Sandy Silt
- 834.4m: Sandy Silt



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_SRK.xlsm



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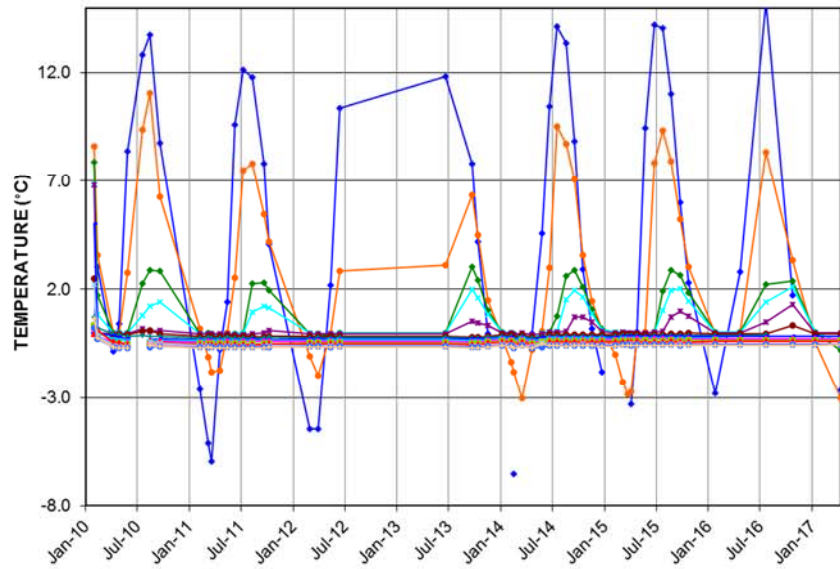


Minto Mine

SWD Instrumentation Data

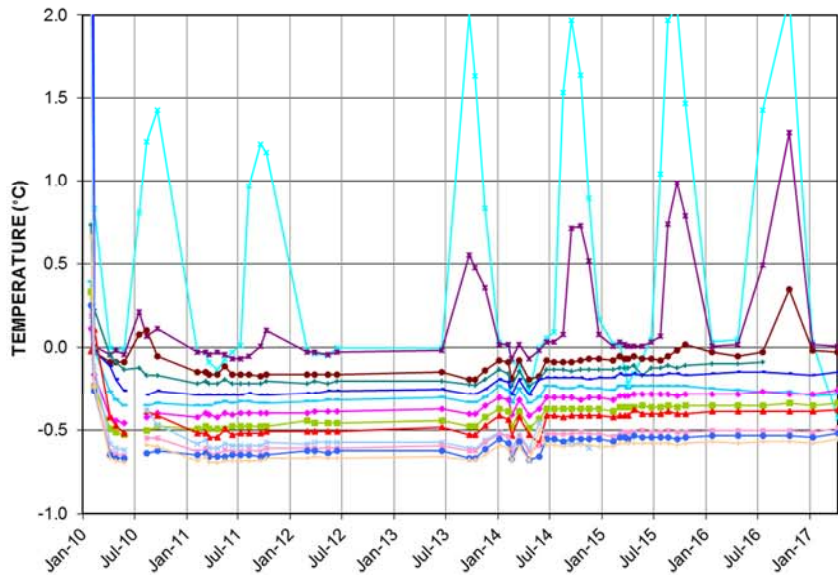
**Temperature Cable – SDT-2**

Date: August 2017	Prepared by PHM	Figure: <b>14</b>
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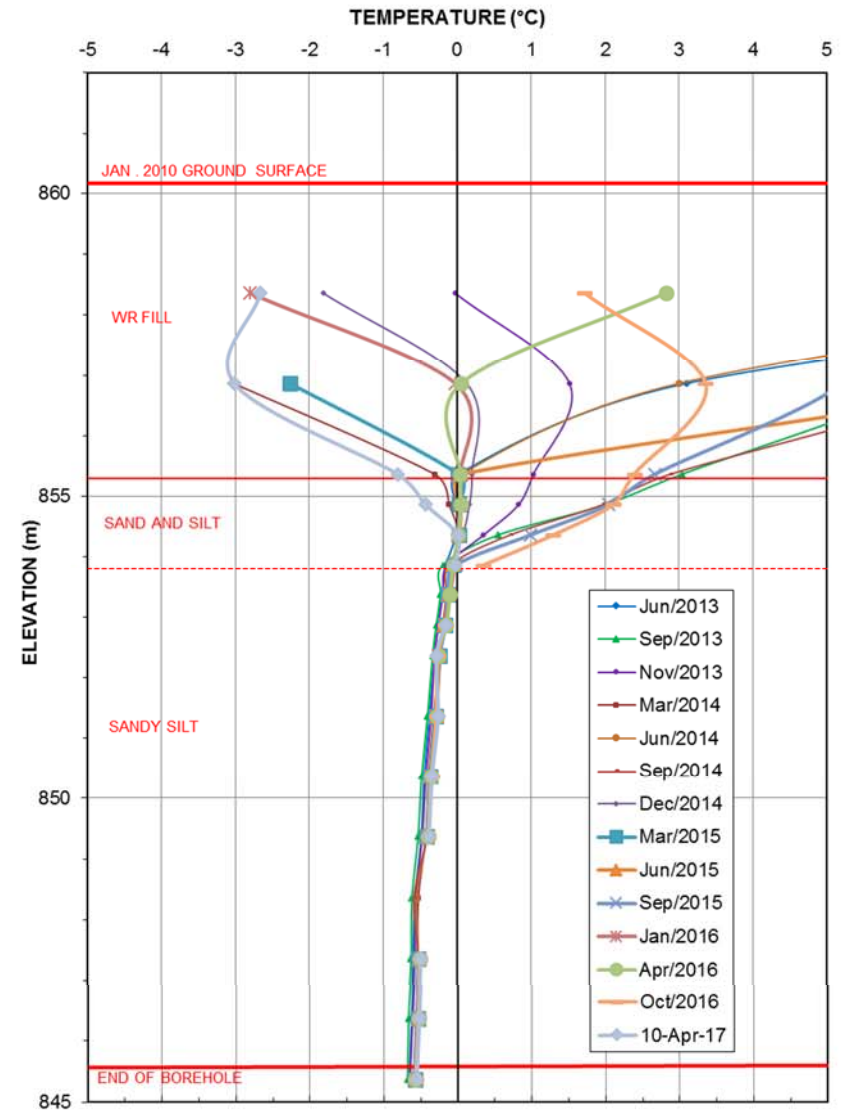
**Sensor El. and Stratigraphy**

- 858.4m: Above Ground
- 856.9m: WR Fill
- 855.4m: WR Fill
- 854.9m: Sand and Silt
- 854.4m: Sand and Silt
- 853.9m: Sand and Silt
- 853.4m: Silty Sand
- 852.9m: Silty Sand
- 852.4m: Silty Sand
- 851.4m: Silty Sand
- 850.4m: Silty Sand
- 849.4m: Silty Sand
- 848.4m: Silty Sand
- 847.4m: Silty Sand
- 846.4m: Silty Sand
- 845.4m: Silty Sand



**Sensor El. and Stratigraphy**

- 854.9m: Sand and Silt
- 854.4m: Sand and Silt
- 853.9m: Sand and Silt
- 853.4m: Silty Sand
- 852.9m: Silty Sand
- 852.4m: Silty Sand
- 851.4m: Silty Sand
- 850.4m: Silty Sand
- 849.4m: Silty Sand
- 848.4m: Silty Sand
- 847.4m: Silty Sand
- 846.4m: Silty Sand
- 845.4m: Silty Sand



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_SRK.xlsm



Job No: 1CM002.059  
 Filename: ApF\_2017SWD Instrumentation.pptx

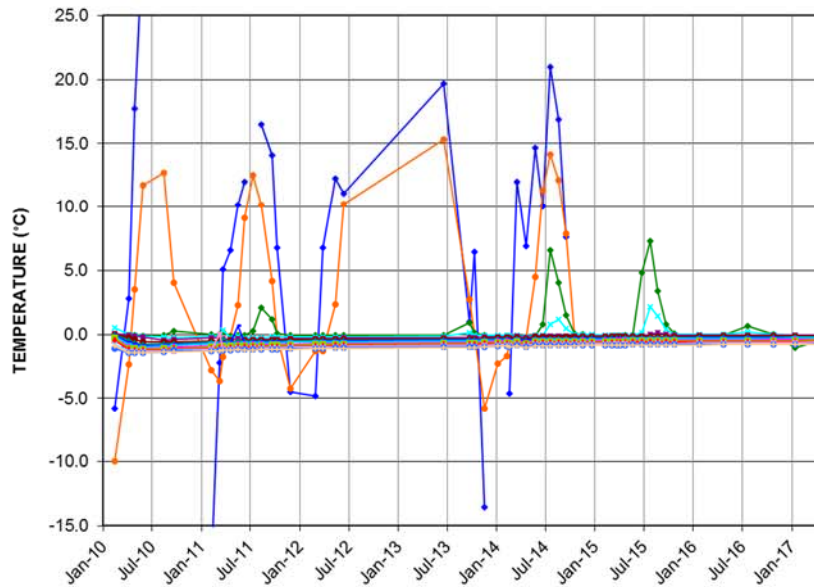


Minto Mine

SWD Instrumentation Data

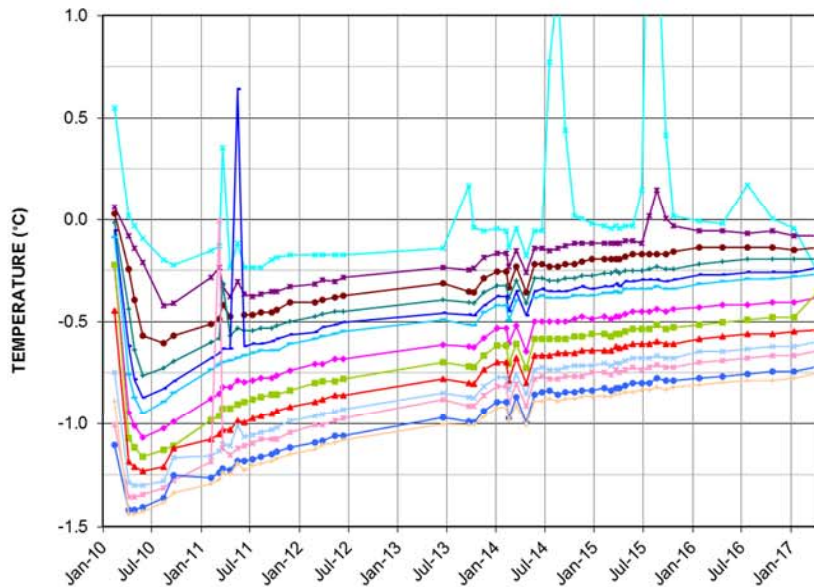
**Temperature Cable – SDT-3**

Date: August 2017	Prepared by PHM	Figure: <b>15</b>
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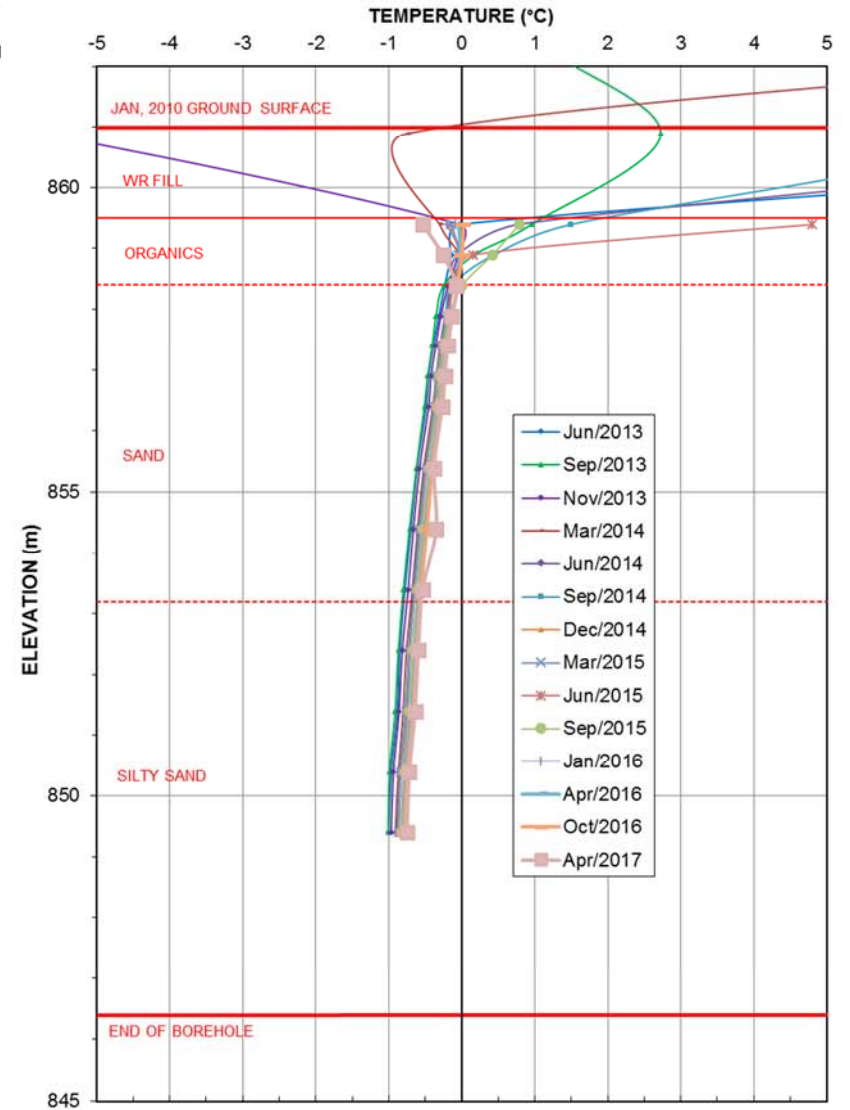
**Sensor El. and Stratigraphy**

- 862.4m: Above Ground
- 860.9m: WR Fill
- 859.4m: WR Fill
- 858.9m: Organics
- 858.4m: Organics
- 857.9m: Sand
- 857.4m: Sand
- 856.9m: Sand
- 856.4m: Sand
- 855.4m: Sand
- 854.4m: Sand
- 853.4m: Sand
- 852.4m: Silty Sand
- 851.4m: Silty Sand
- 850.4m: Silty Sand
- 849.4m: Silty Sand



**Sensor El. and Stratigraphy**

- 858.9m: Organics
- 858.4m: Organics
- 857.9m: Sand
- 857.4m: Sand
- 856.9m: Sand
- 856.4m: Sand
- 855.4m: Sand
- 854.4m: Sand
- 853.4m: Sand
- 852.4m: Silty Sand
- 851.4m: Silty Sand
- 850.4m: Silty Sand
- 849.4m: Silty Sand



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_SRK.xlsm



Job No: 1CM002.059  
 Filename: ApF\_2017SWD Instrumentation.pptx



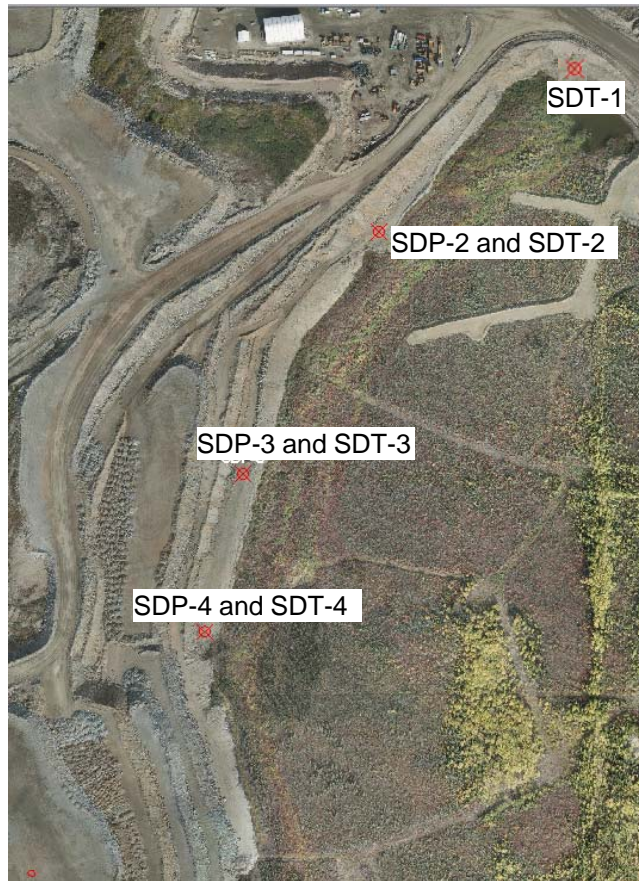
Minto Mine

SWD Instrumentation Data

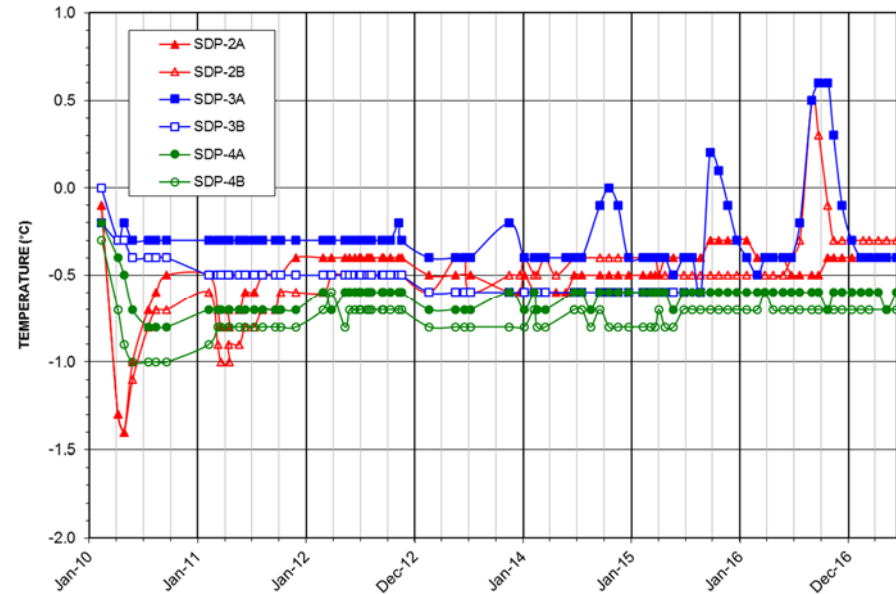
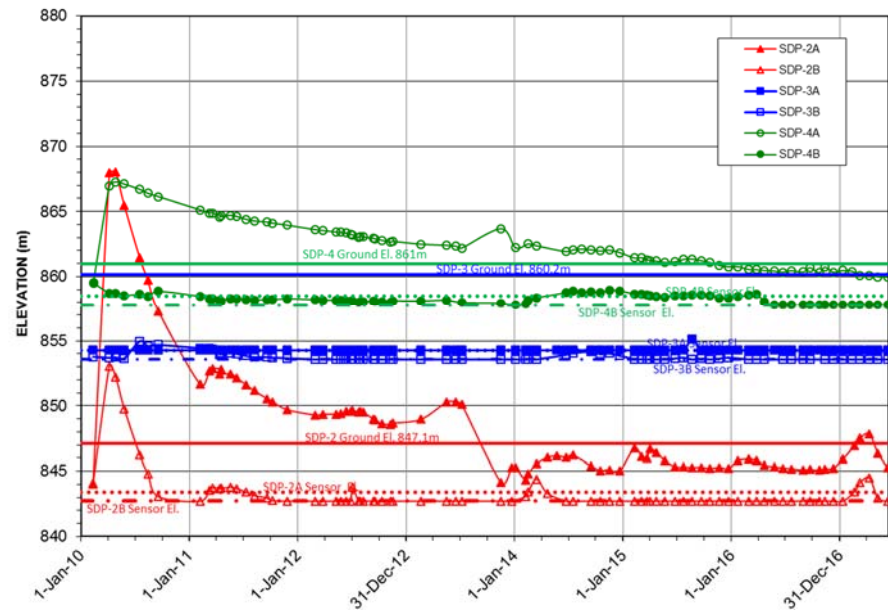
**Temperature Cable – SDT-4**

Date: August 2017	Prepared by PHM	Figure: <b>16</b>
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Southwest Dump Piezometers and Ground Temperature Cables



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
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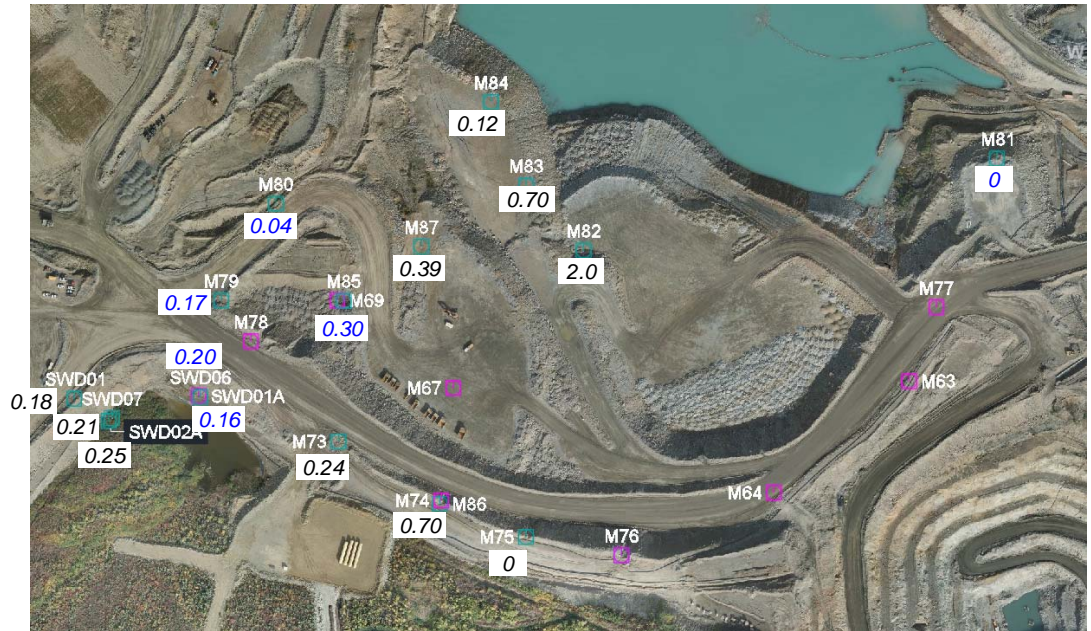
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		<b>Southwest Dump Piezometers</b> Date: August 2017    Prepared by PHM    Figure: 17		

## Appendix G: Main Pit Instrumentation Data

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**Legend/Notes**

1. Values in black are total movement rates in units of mm/day
2. Values in blue are horizontal movement rates in mm/day.
3. Survey hubs in cyan color are active.
4. Survey hubs in magenta area destroyed.
5. Survey hubs with no movement rates listed have been inactive for over one year.



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.059\_2017 Geotech Inspections\1040\_AutoCAD\1CM002.050-ProposedMVVES2Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPrismMonitoring\_SRK.xlsx

**Main Pit Active Survey Hubs**

Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		June 16	June 17		
M73	6/12/2017	0.3	0.2	65	Slight deceleration trend observed on graph of total displacement
M75	6/23/2017	-	-	10	Minor movement and bearing with a very slight deceleration trend observable. Hub is located on fill placed inside of the ultimate Main Pit crest. Observed movement suspected to be related to settlement of fill in the pit.
M79	6/12/2017	0.2	0.2	100	Horizontal Movement Rate listed. Slight deceleration trend can be observed in the total displacement graph.
M80	6/12/2017	0.1	0.1	107	Slight deceleration trend
M81	6/12/2017	0.0	0.0	52	No significant horizontal movement. Observed movement is largely fill settlement.
M82	6/21/2017	0.7	2.0	44	Increase in movement rate, likely the result of MPD construction, and new survey hub installation
M83	6/21/2017	0.3	0.7	72	<b>Increase in movement rate starting in May 2017.</b>
M84	6/21/2017	0.7	0.1	76	Decelerating trend. The increased movement rate in 2016 is believed to be due to construction of the SAT Dump.
M85	5/12/2017	0.4	0.3	74	Slight deceleration trend observable in the horizontal displacement graph.
M86	6/12/2017	0.2	0.6	47	Increase in movement rate. Hub is located on fill placed inside of the ultimate Main Pit crest. Observed movement suspected to be related to settlement of fill in the pit. The hub was replaced in April 2017 - additional data needed to confirm movement trend.
M87	3/15/2017	0.5	0.4	71	Slight deceleration trend observable.

**Main Pit Survey Hubs Destroyed in past year**

Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		June 16	At last reading		
M76	3/12/2017	-	-	14	No significant horizontal movement. Observed movement was likely settlement of fill in Main Pit.



Main Pit Instrumentation Data

**Survey Hub Summary**

Job No: 1CM002.059  
 Filename: ApG\_MainPitPort.pptx

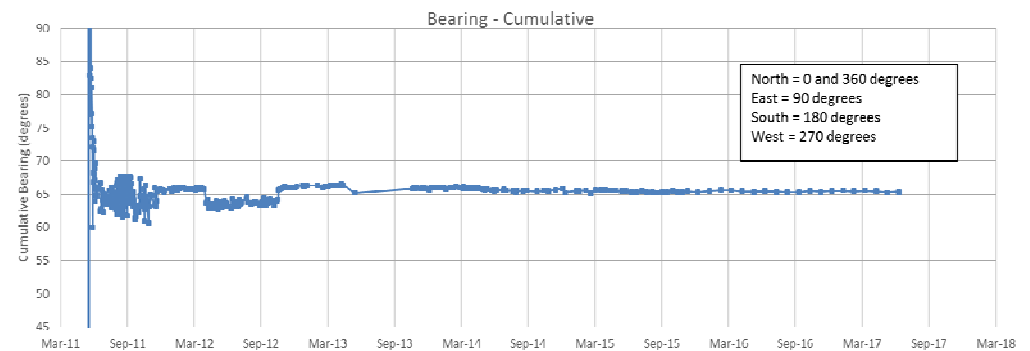
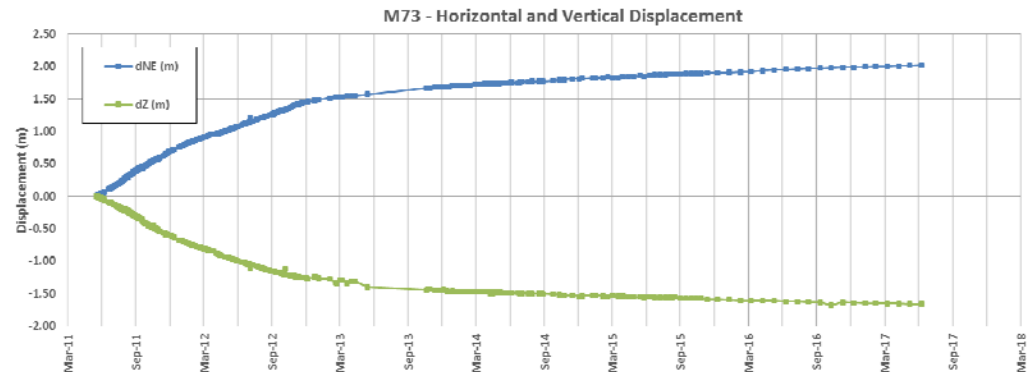
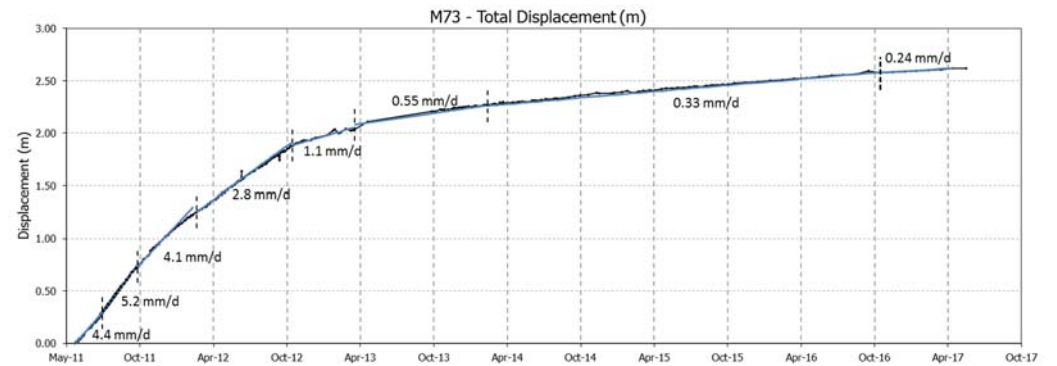
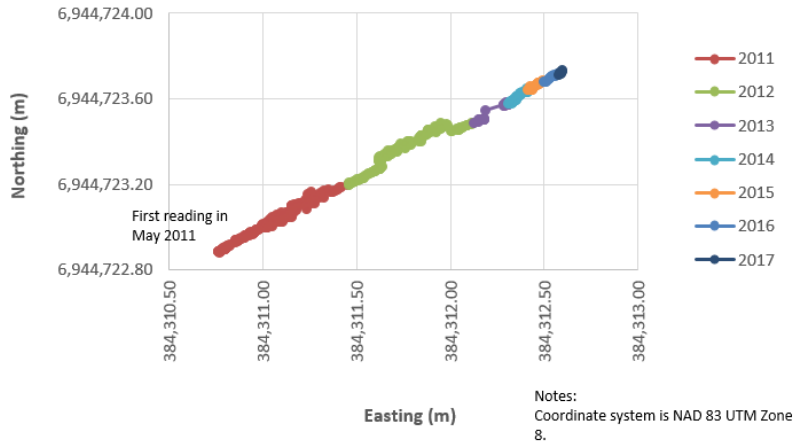
Minto Mine

Date: August 2017

Prepared by: PHM

Figure: 1

### M73 - Northing Vs. Easting Movement Plot

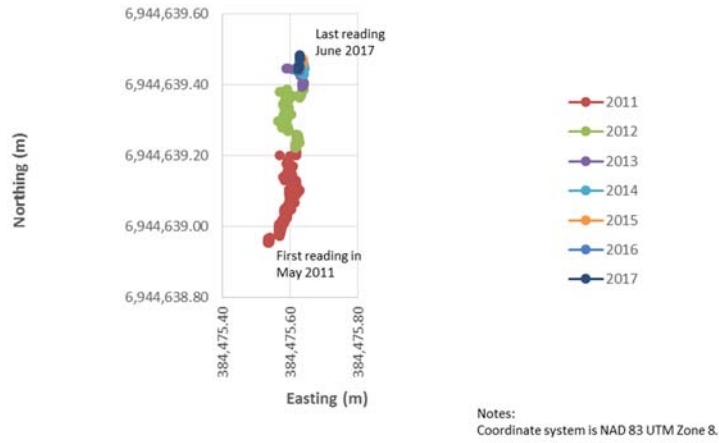


**Source files:**

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2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

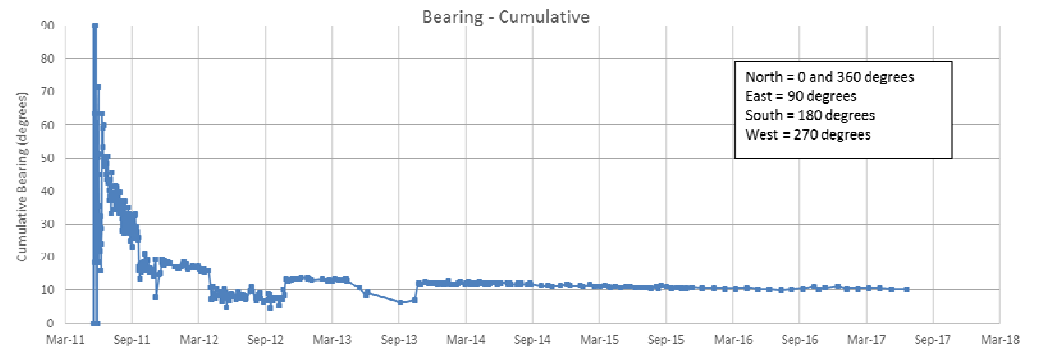
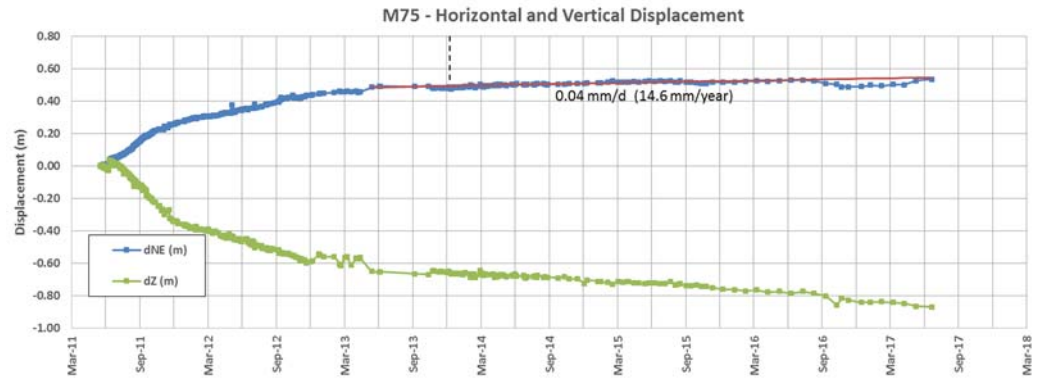
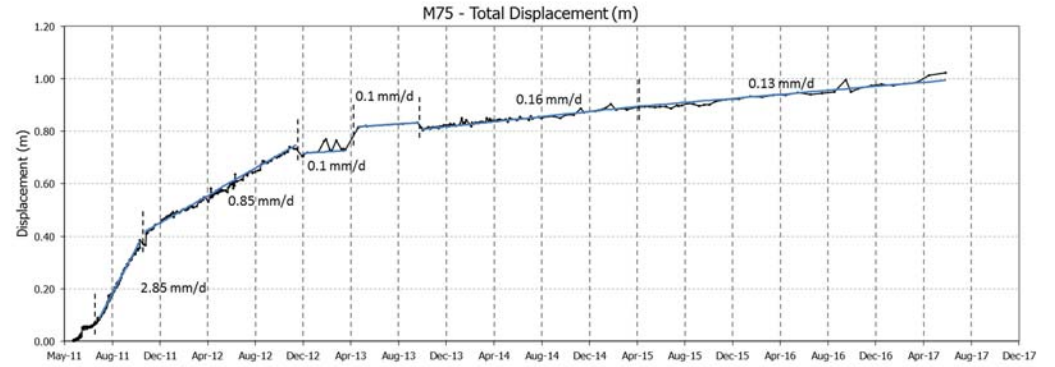
		Main Pit Instrumentation Data		
		<b>Survey Hub – M73</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>2</b>

### M75 - Northing Vs. Easting Movement Plot



#### Notes

- Hub is to be replaced by M86.

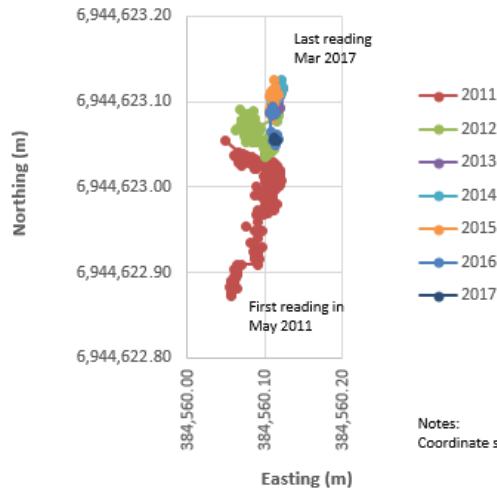


#### Source files:

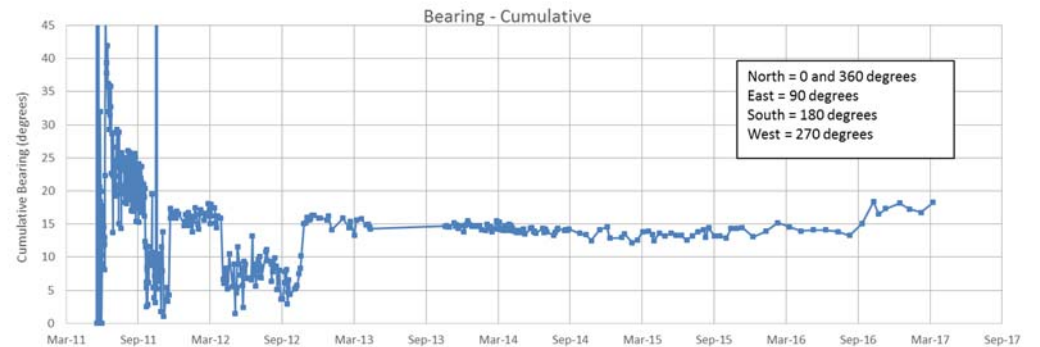
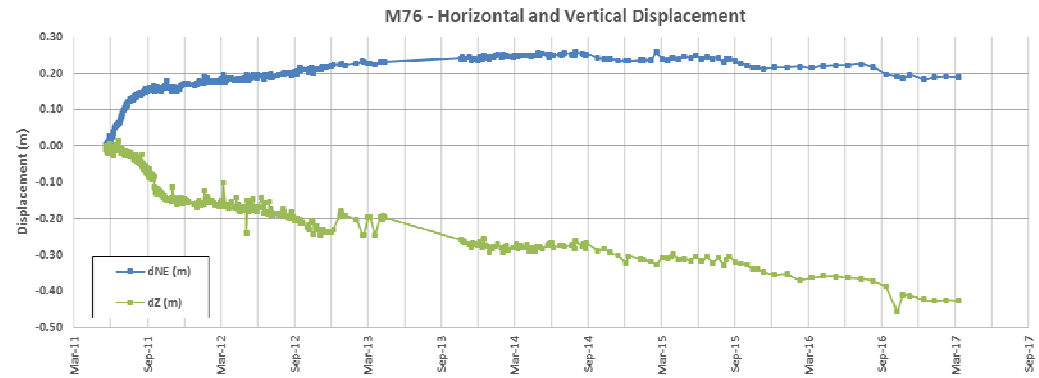
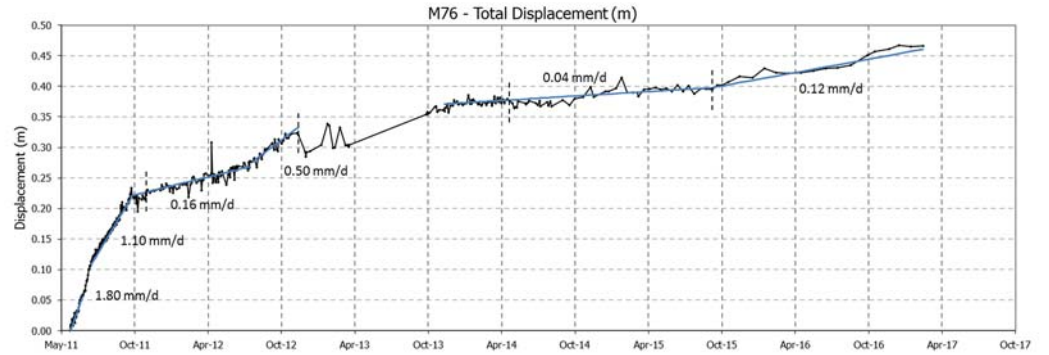
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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

	 MINTO MINE <small>OPERATED BY MINTO EXPLORATIONS LTD.</small>	Main Pit Instrumentation Data		
		<b>Survey Hub – M75</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>3</b>

### M76 - Northing Vs. Easting Movement Plot



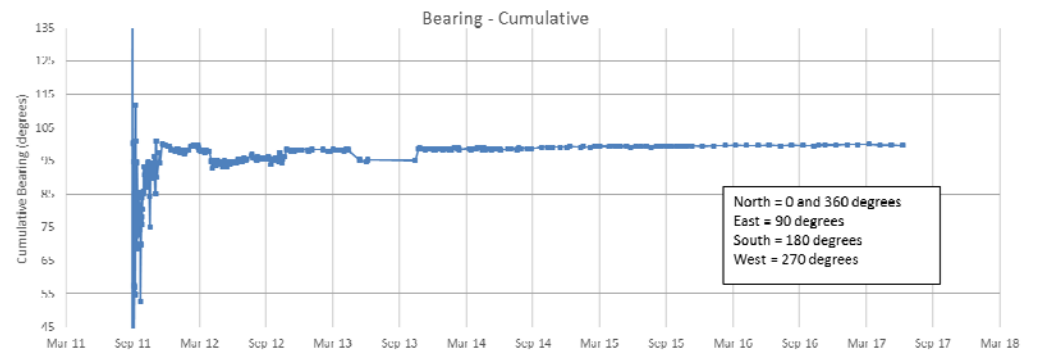
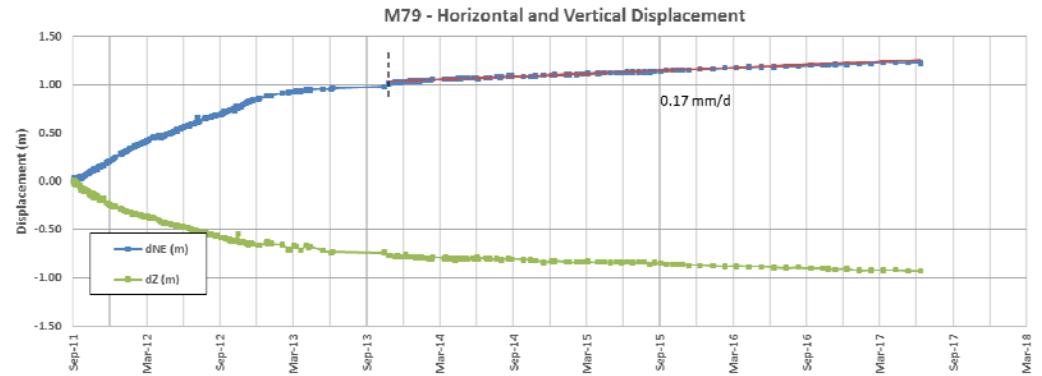
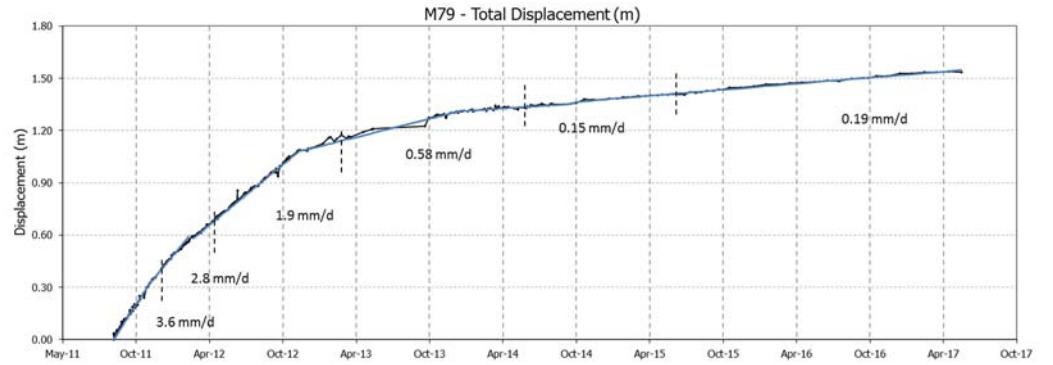
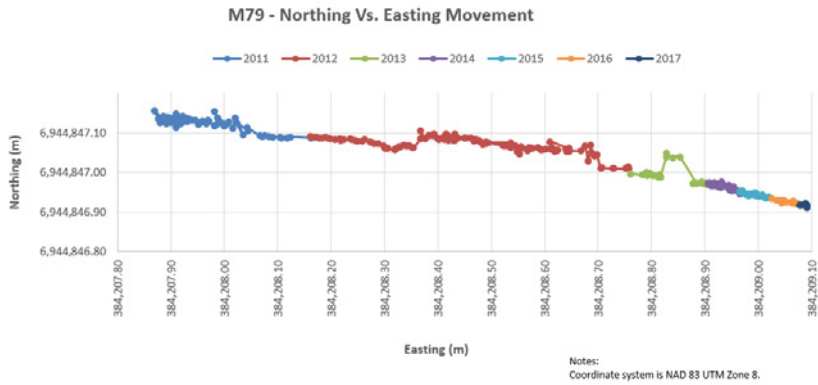
Notes:  
Coordinate system is NAD 83 UTM Zone 8.



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

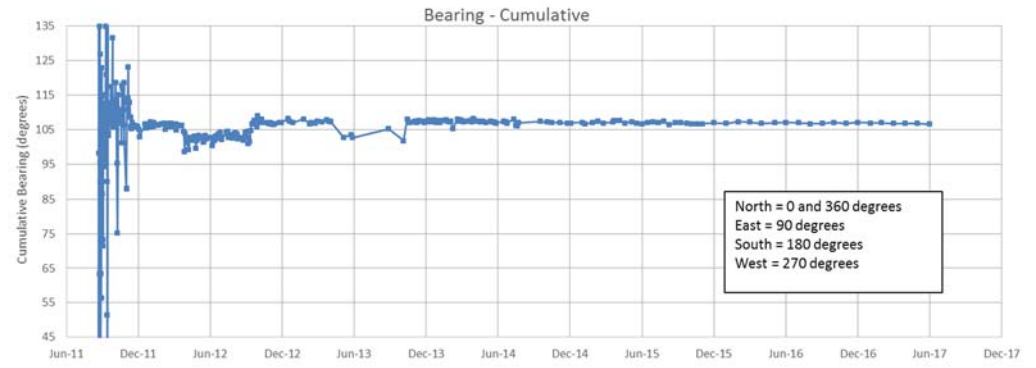
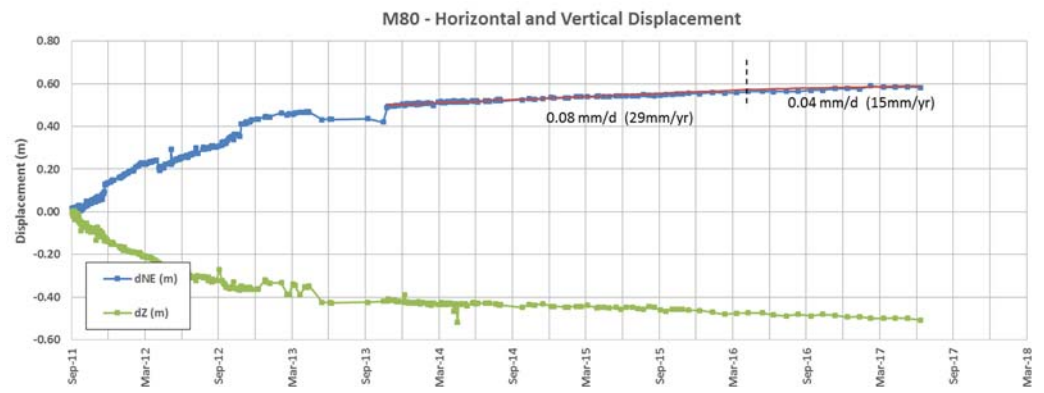
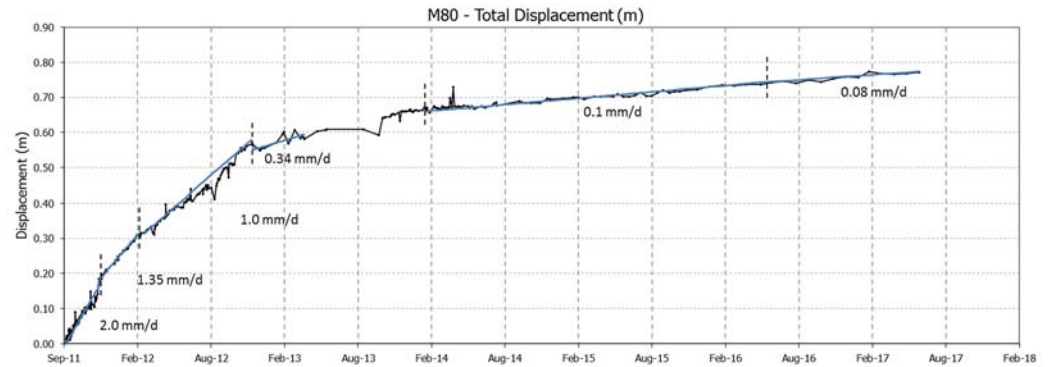
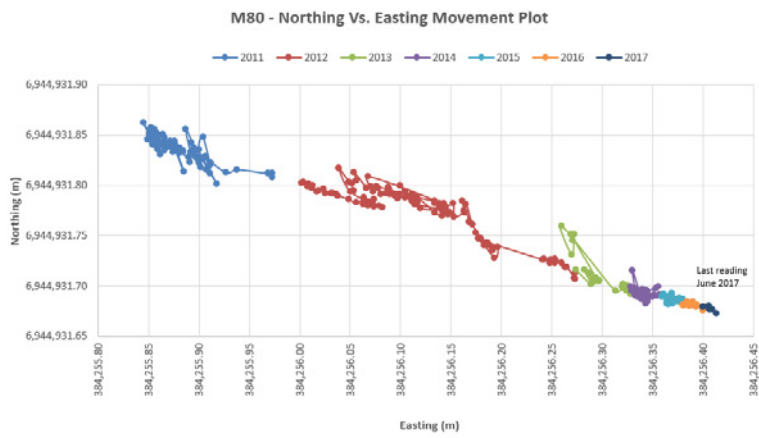
		Main Pit Instrumentation Data		
		<b>Survey Hub – M76</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>4</b>



Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub – M79</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>5</b>



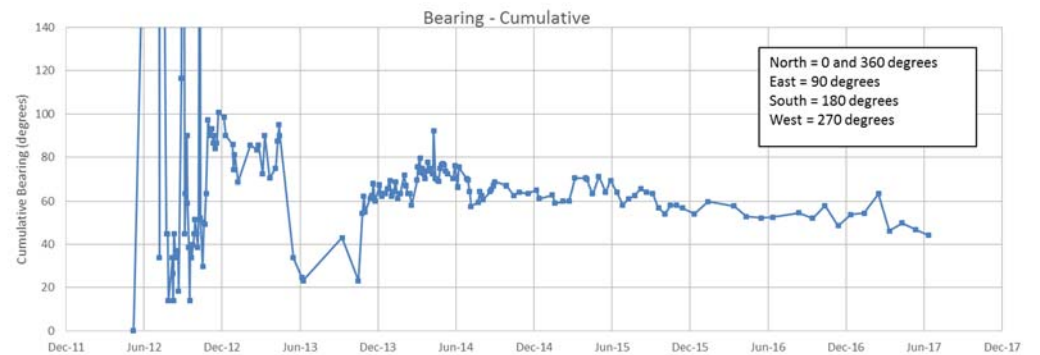
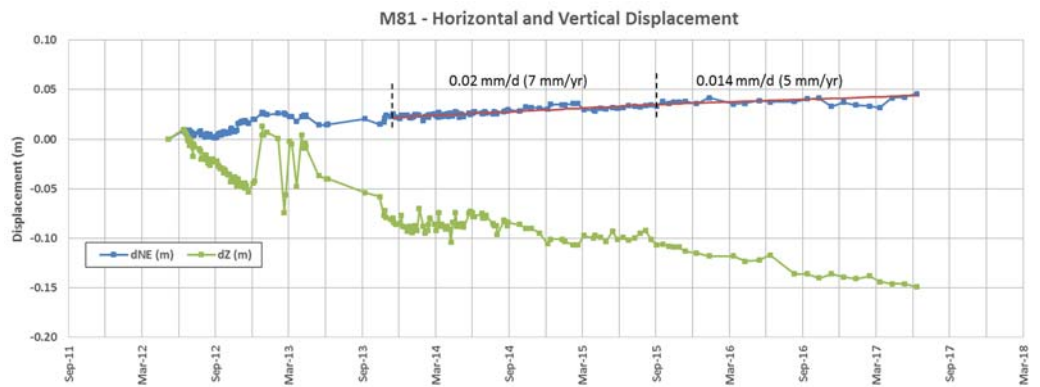
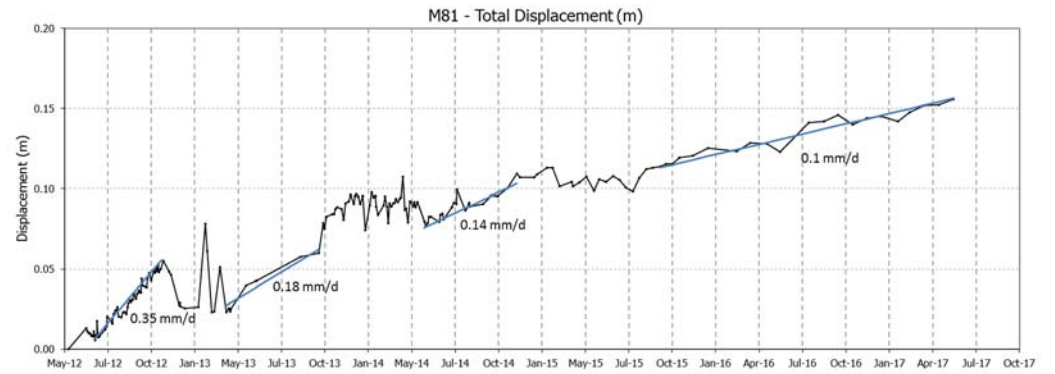
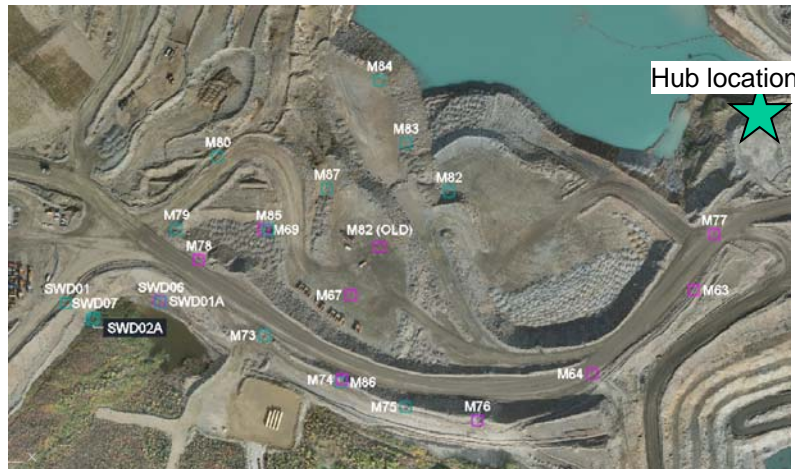
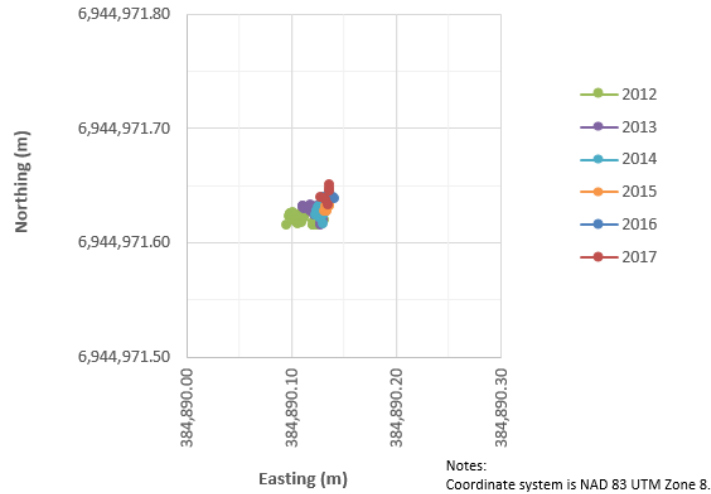
Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

 Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	 Minto Mine	Main Pit Instrumentation Data		
		<b>Survey Hub – M80</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>6</b>



### M81 - Northing Vs. Easting Movement Plot

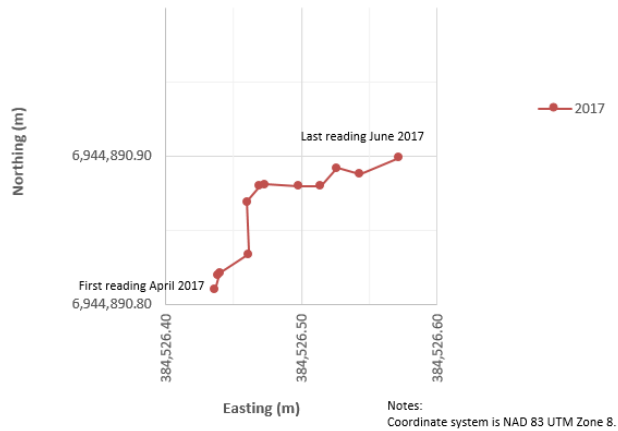


Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub – M81</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>7</b>

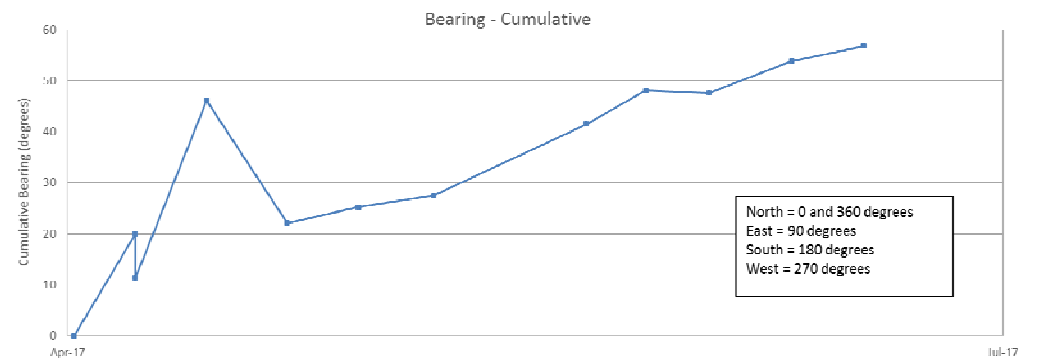
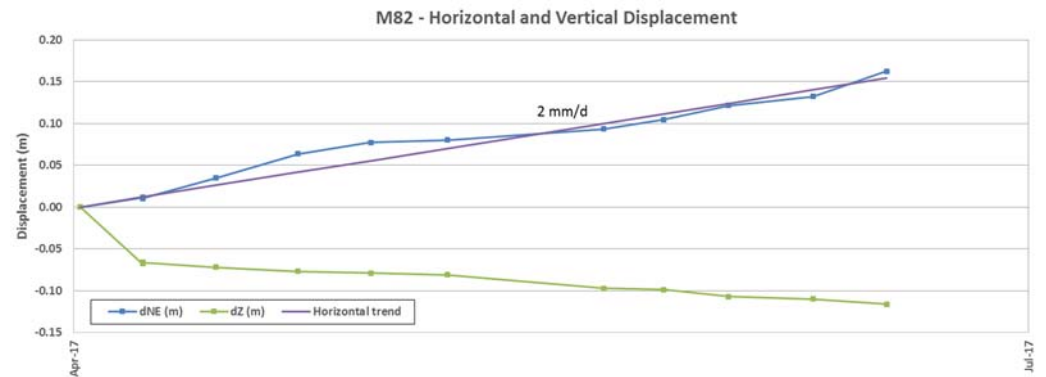
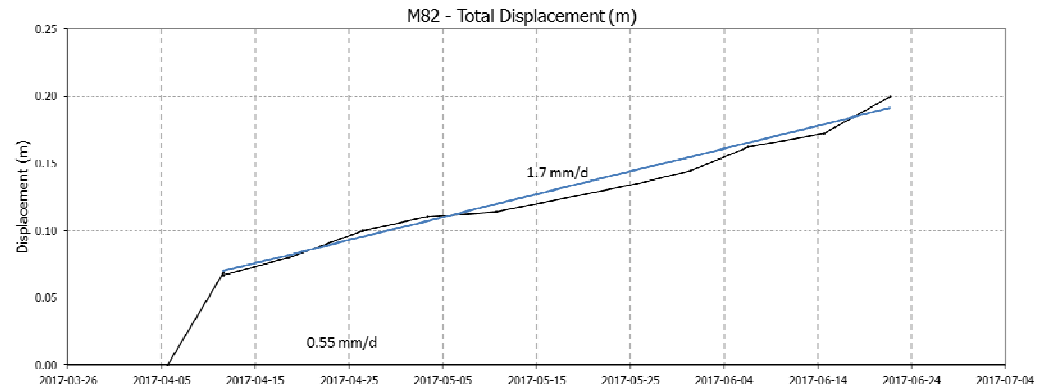
### M82 - Northing Vs. Easting Movement Plot



Notes:  
Coordinate system is NAD 83 UTM Zone 8.

#### Notes

1. M-82 was moved to be located outside of the MPD footprint.
2. The survey hub is mounted on a lock-block set on surface. The site inspection noted there surface was not levelled with rocks removed when the block was set, and some of the observed movement may be due to shifting of rocks beneath the block (See Figure 14, Appendix A).

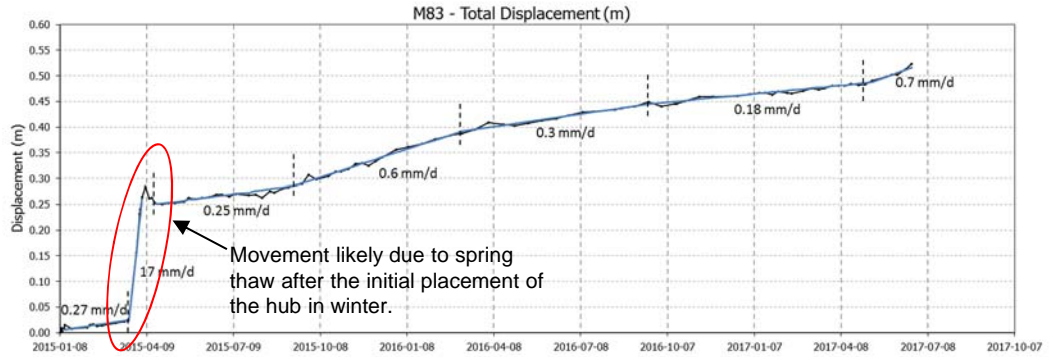
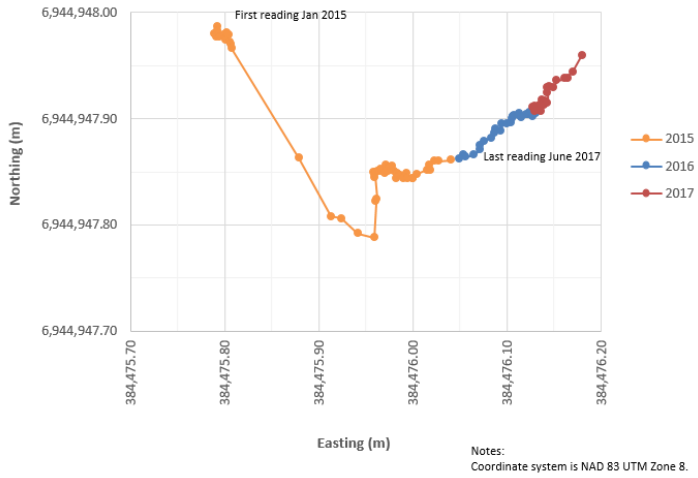


#### Source files:

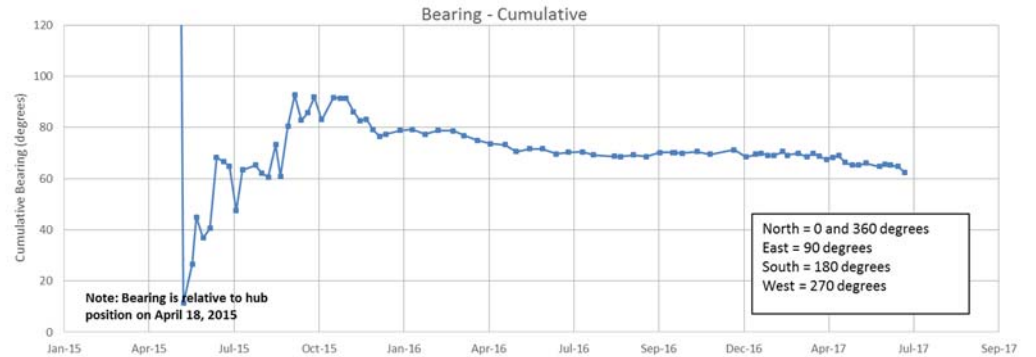
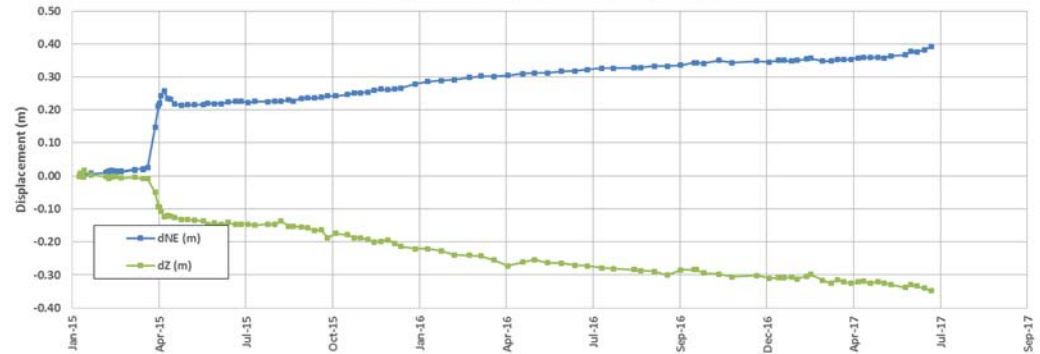
1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\1020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub – M82</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>8</b>

**M83 - Northing Vs. Easting Movement Plot**



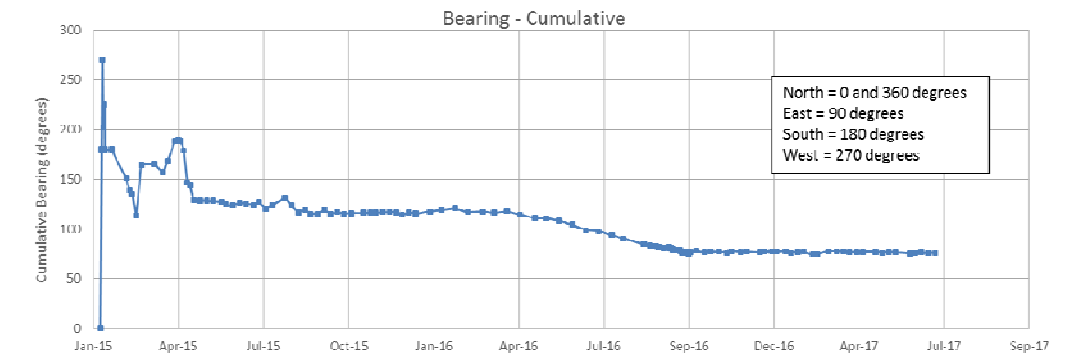
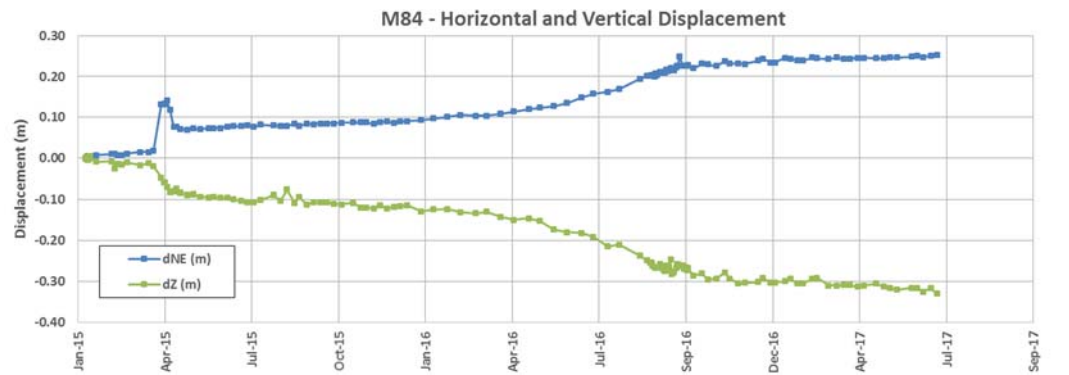
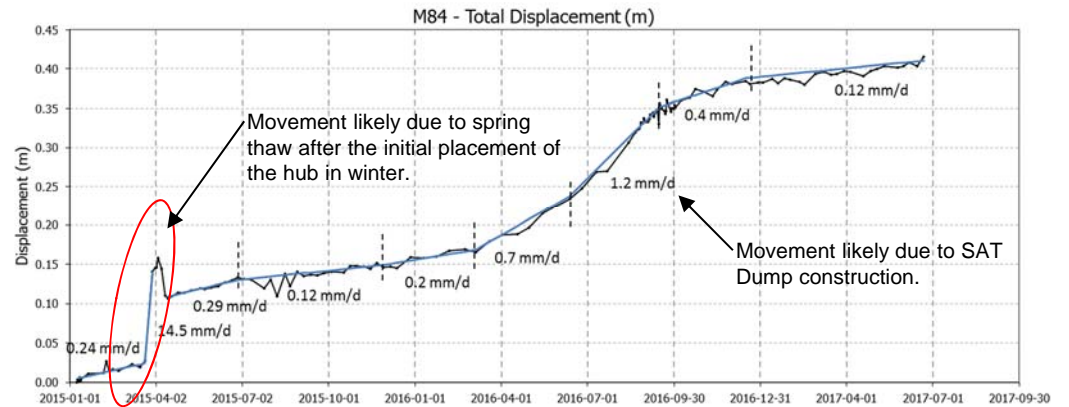
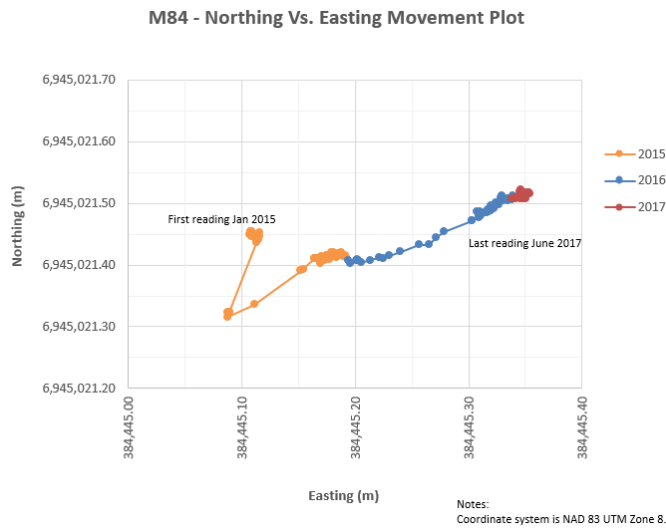
**M83 - Horizontal and Vertical Displacement**



Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub – M83</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>9</b>

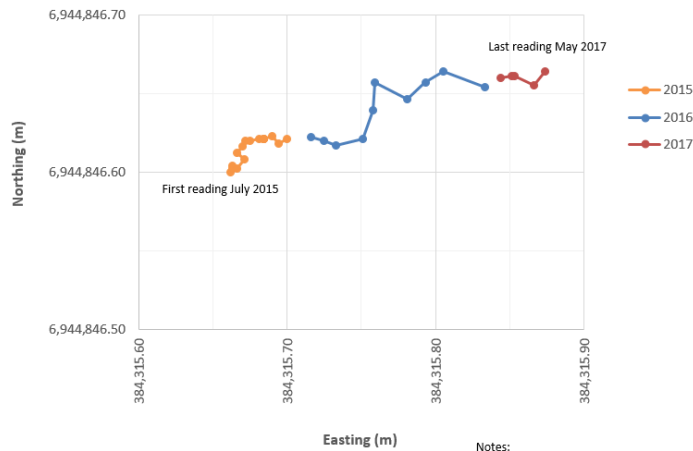


Source files:

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2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

	 <b>MINTO MINE</b> <small>OPERATED BY MINTO EXPLORATIONS LTD.</small>	Main Pit Instrumentation Data		
		<b>Survey Hub – M84</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>10</b>

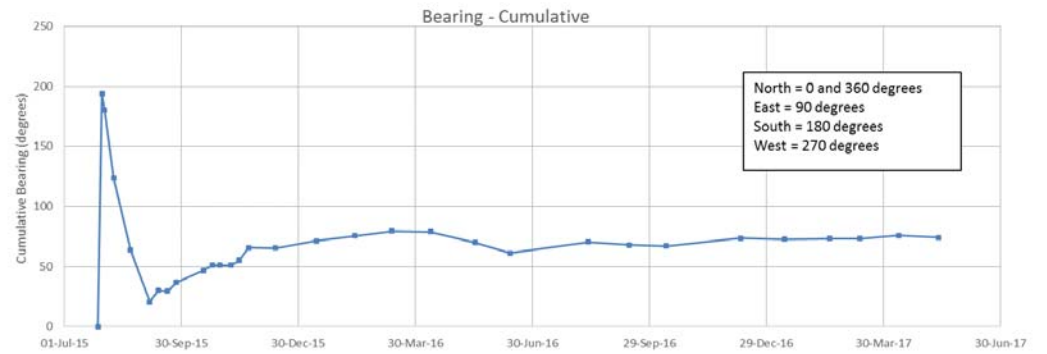
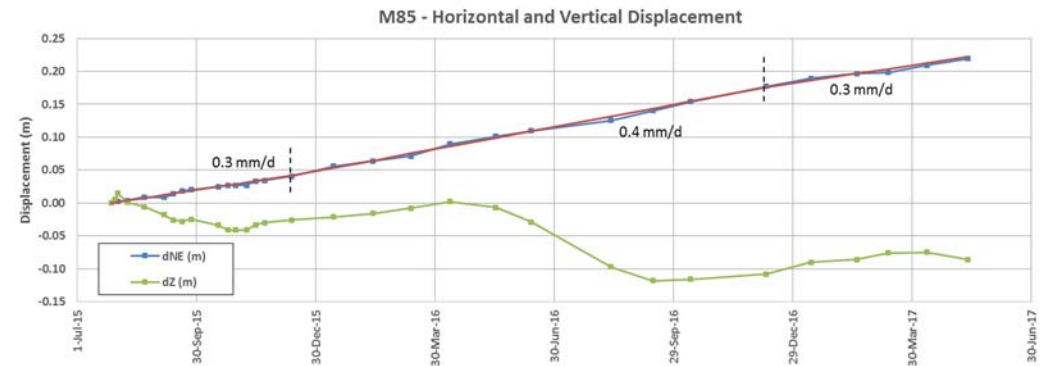
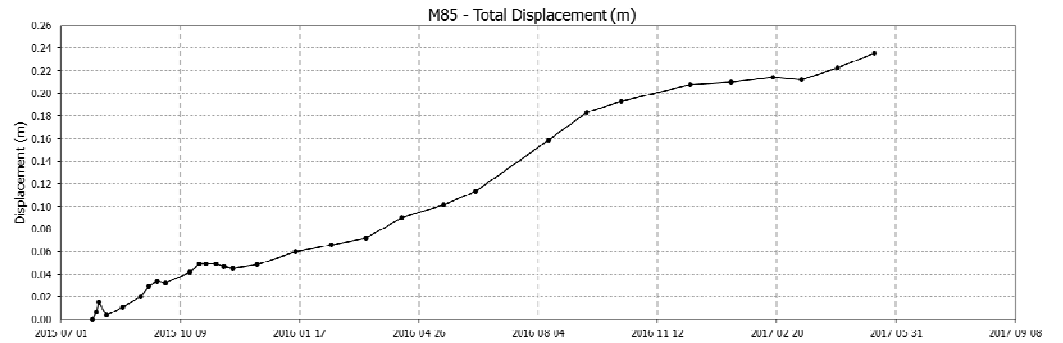
**M85 - Northing Vs. Easting Movement Plot**



**Notes**

- The hub consists of a lock-block on surface, and as a result, seasonal ground movement as a result freeze/thaw cycles may occur that is not indicative of large-scale ground movement. As a result, the horizontal displacement plot is likely to be the most useful for monitoring movement.

Notes:  
Coordinate system is NAD 83 UTM Zone 8.

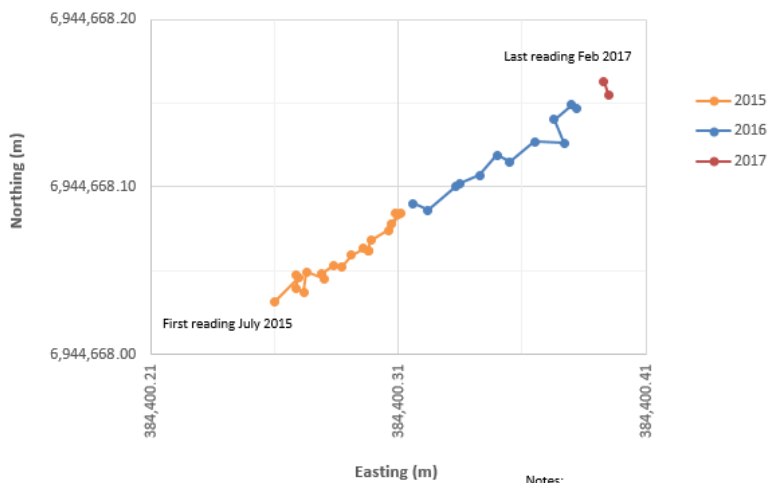


**Source files:**

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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

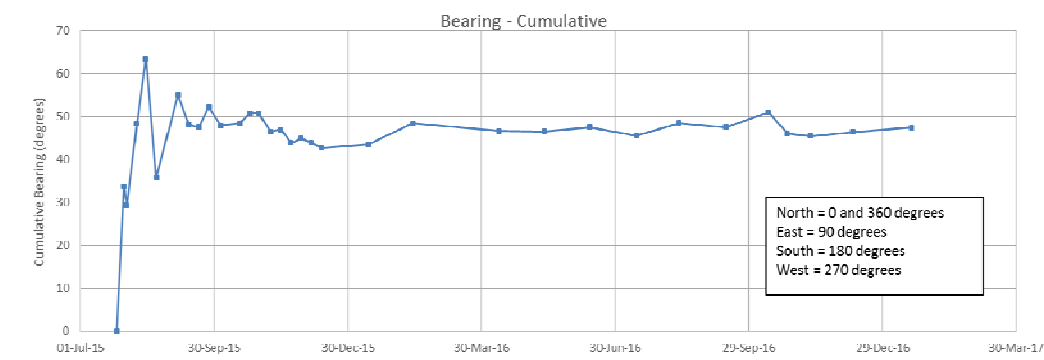
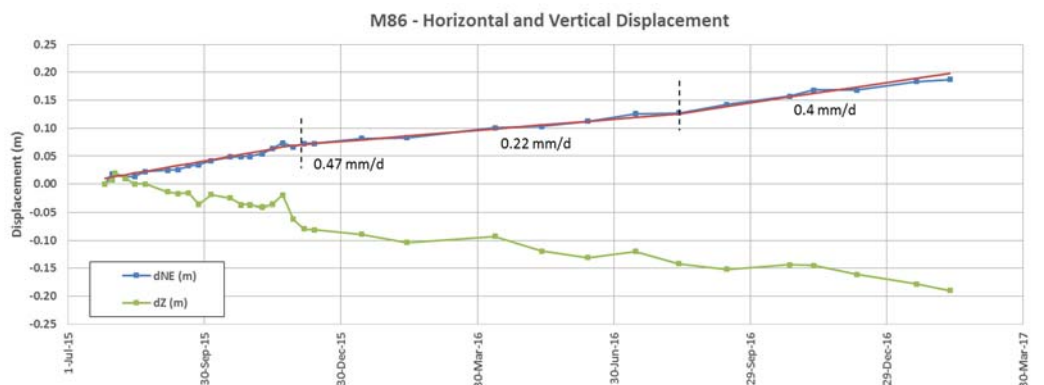
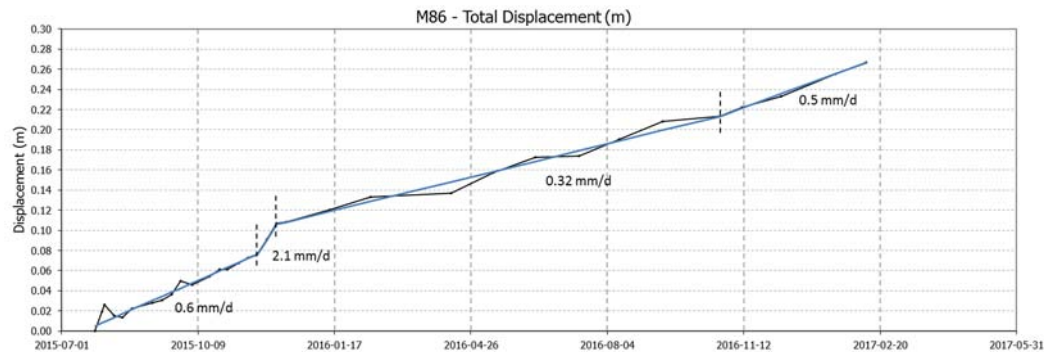
 Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	 Minto Mine	Main Pit Instrumentation Data		
		<b>Survey Hub – M85</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>11</b>

### M86 - Northing Vs. Easting Movement Plot



#### Notes

- Hub is a replacement of M75
- Hub destroyed in February 2017 and re-installed in April 2017.

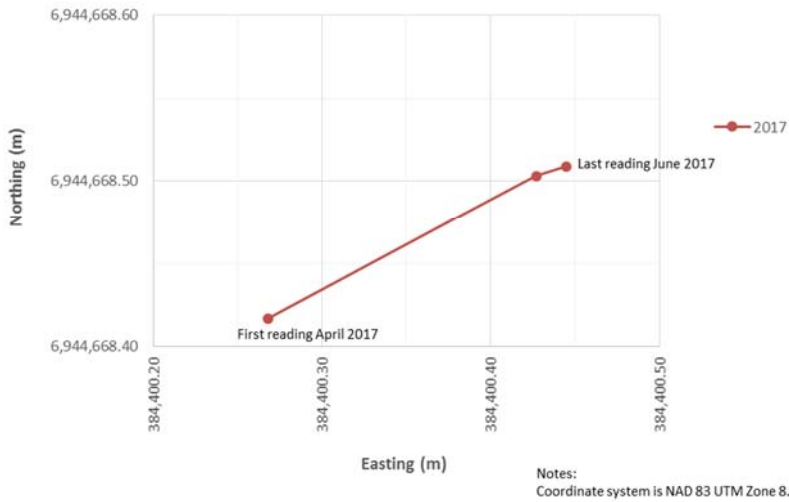


#### Source files:

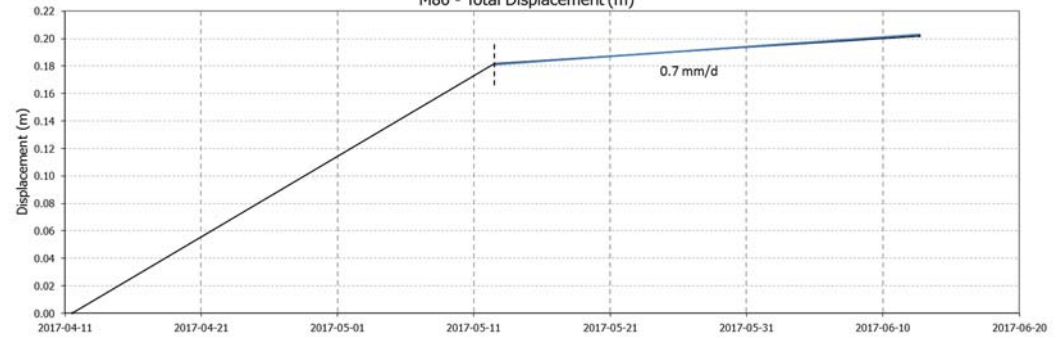
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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub– M86 – Destroyed February 2017</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>12</b>

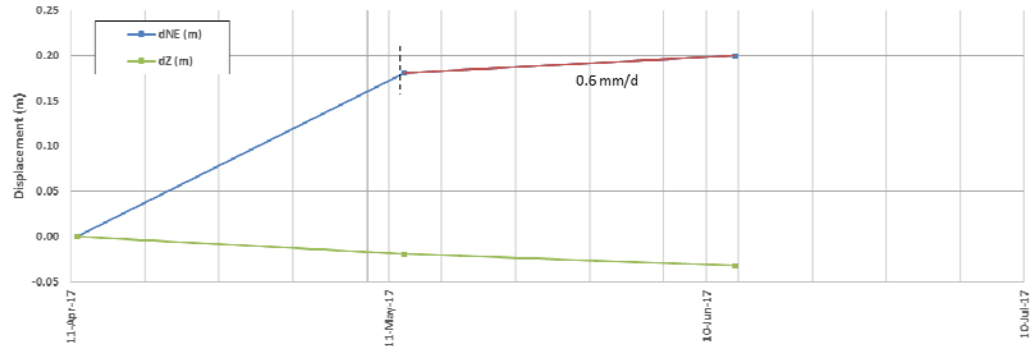
**M86 - Northing Vs. Easting Movement Plot**



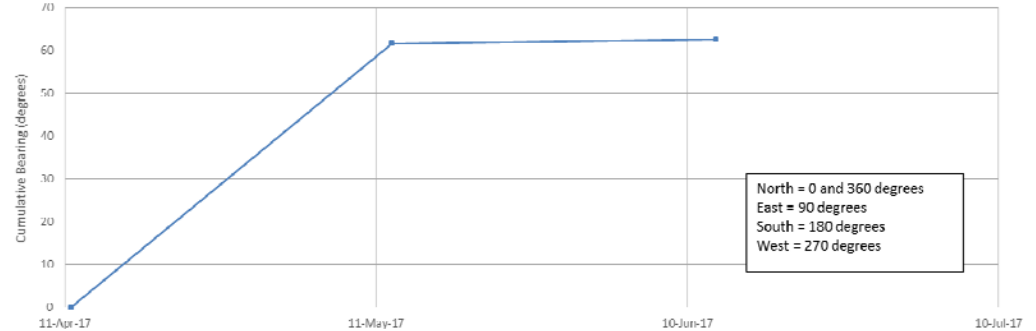
**M86 - Total Displacement (m)**



**M86 - Horizontal and Vertical Displacement**



**Bearing - Cumulative**



Source files:

- AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm



Main Pit Instrumentation Data

**Survey Hub- M86 - Replacement  
Installed April 2017**

Job No: 1CM002.059  
Filename: ApG\_2017MainPitInstrumentation.pptx

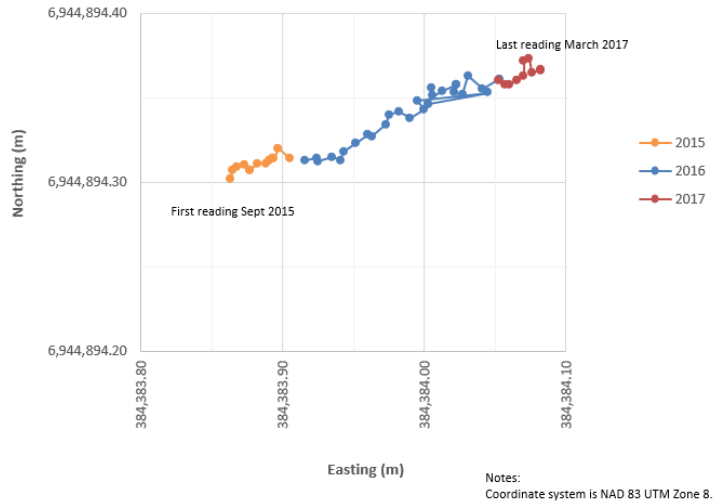
Minto Mine

Date:  
August 2017

Prepared by  
PHM

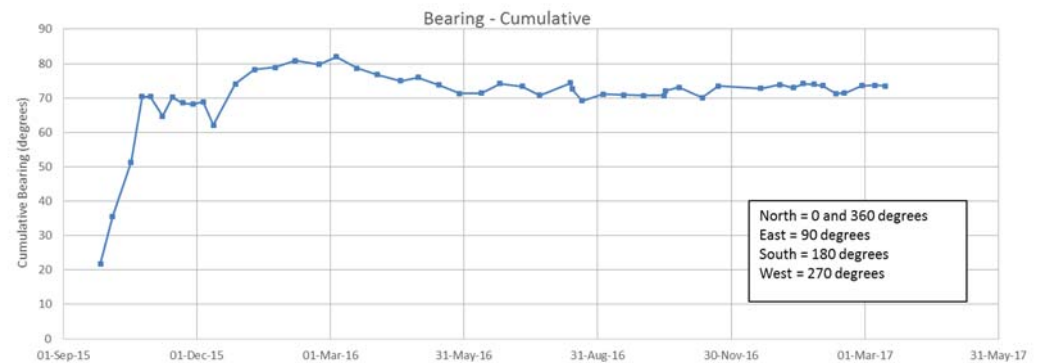
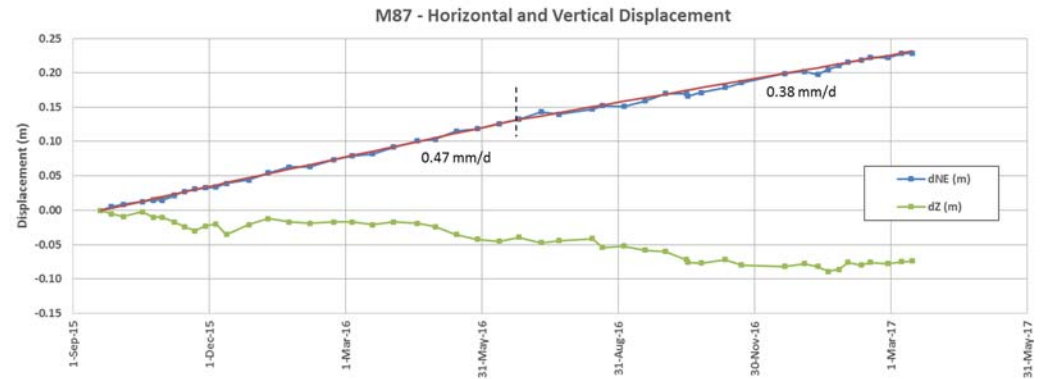
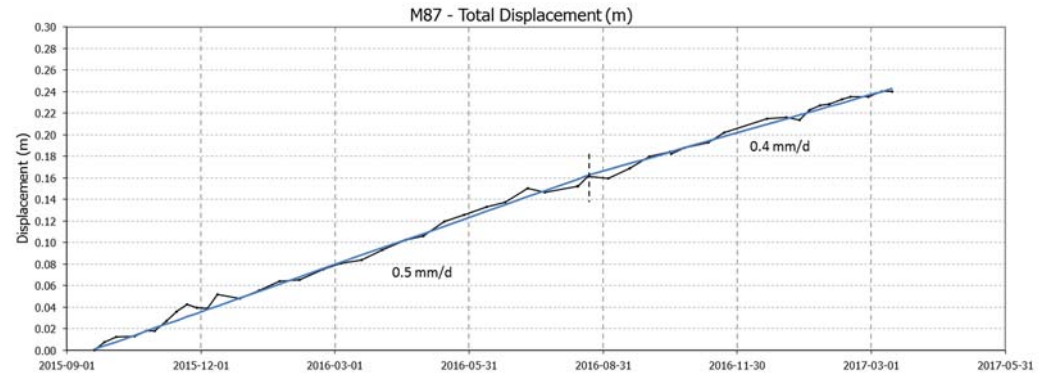
Figure:  
**13**

**M87 - Northing Vs. Easting Movement Plot**



**Notes**

1. Hub destroyed in March 2017.



**Source files:**

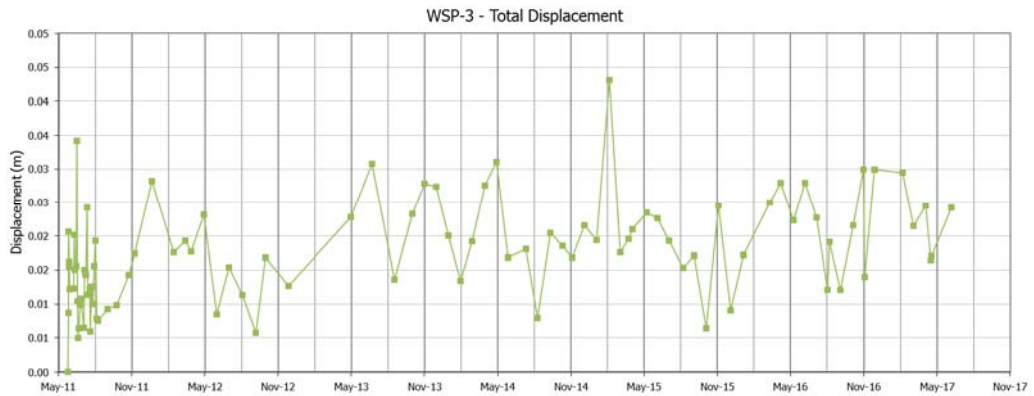
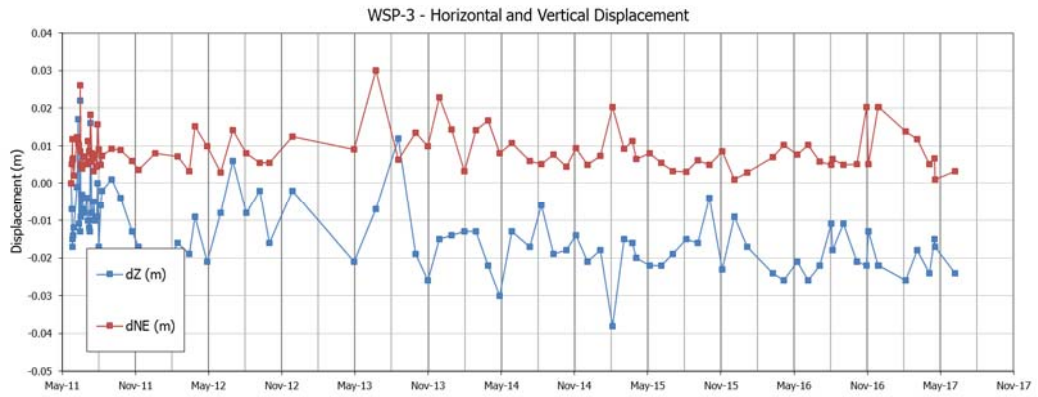
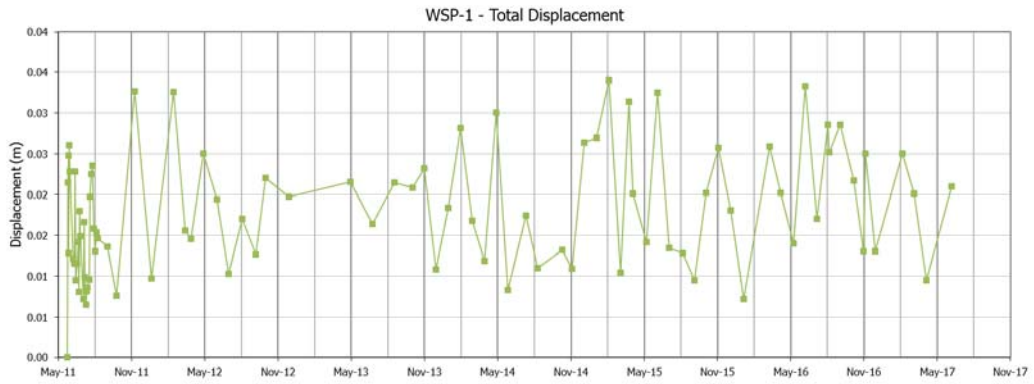
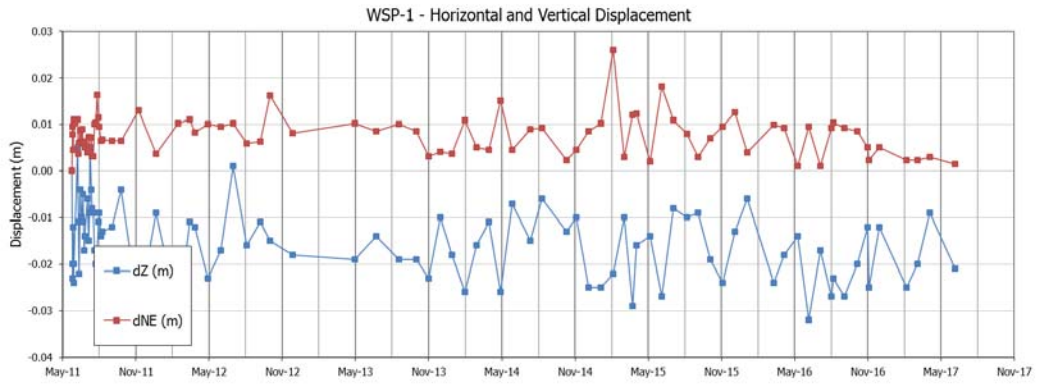
1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMainPitSurveyHubs\_SRK.xlsm

		Main Pit Instrumentation Data		
		<b>Survey Hub – M87</b>		
Job No: 1CM002.059 Filename: ApG_2017MainPitInstrumentation.pptx	Minto Mine	Date: August 2017	Prepared by PHM	Figure: <b>15</b>



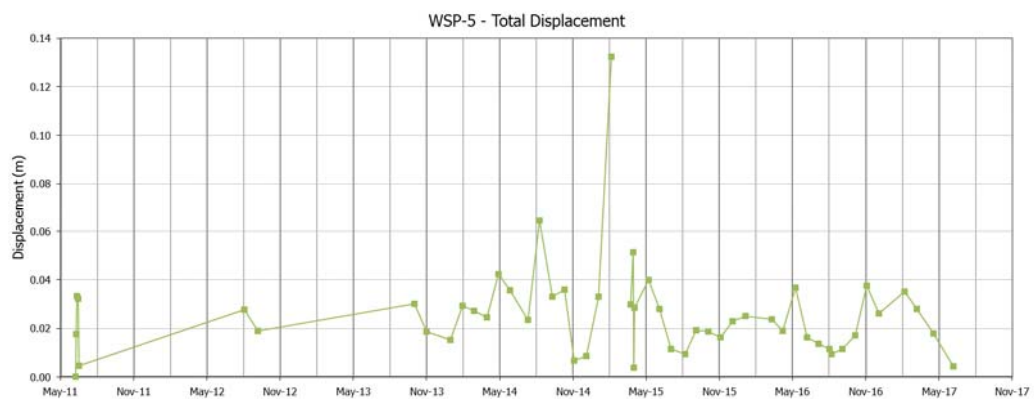
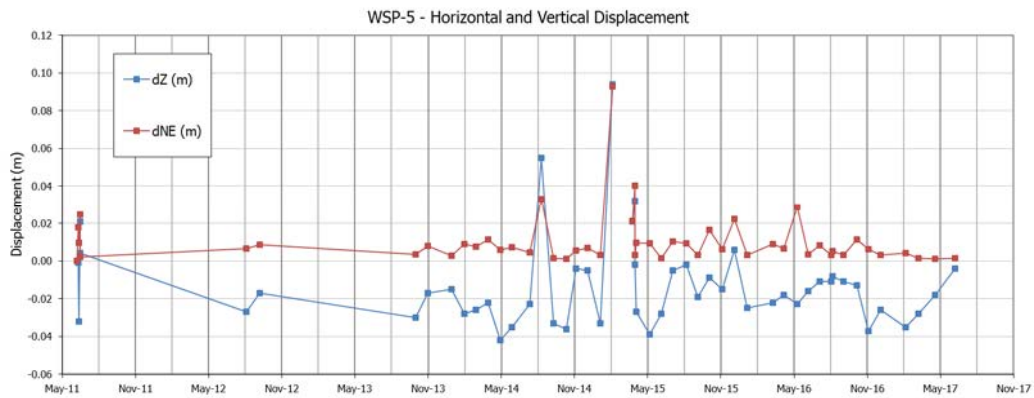
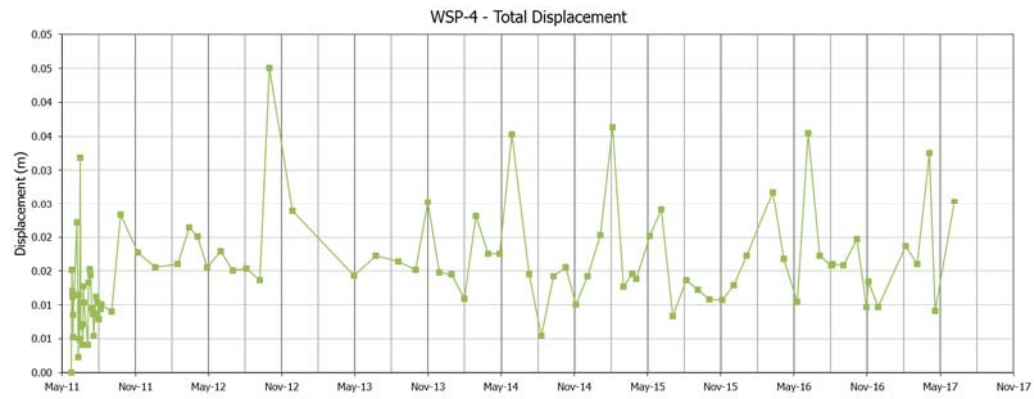
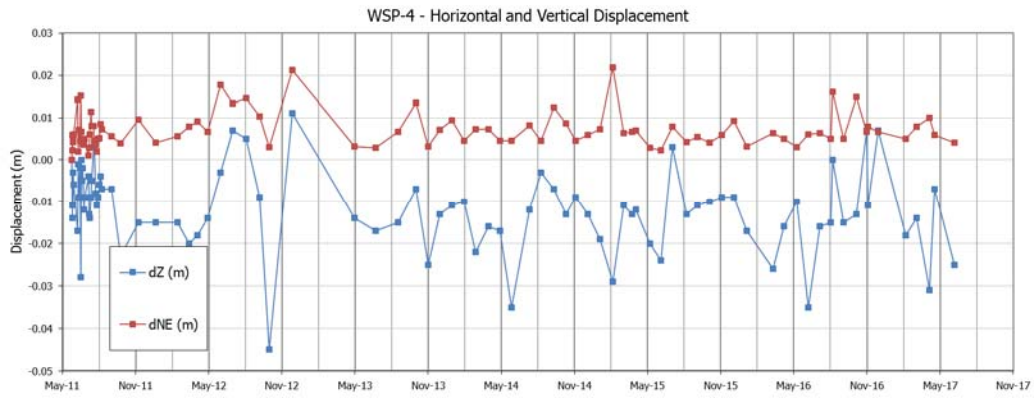
Appendix H: Water Storage Pond Instrumentation Data

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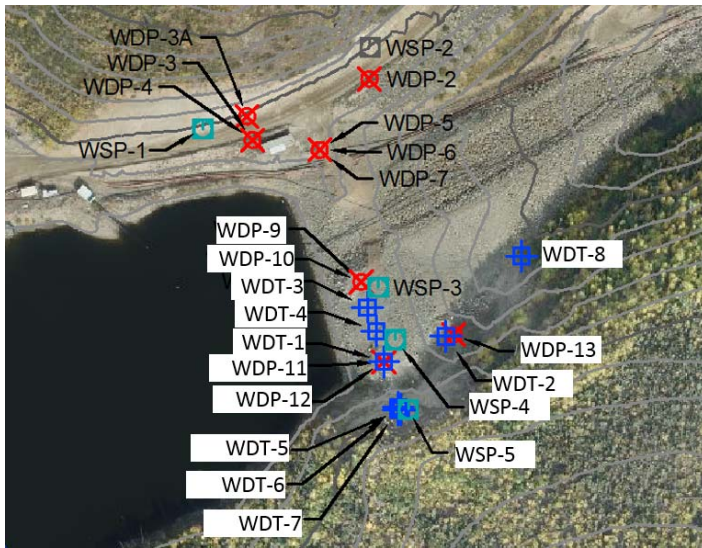
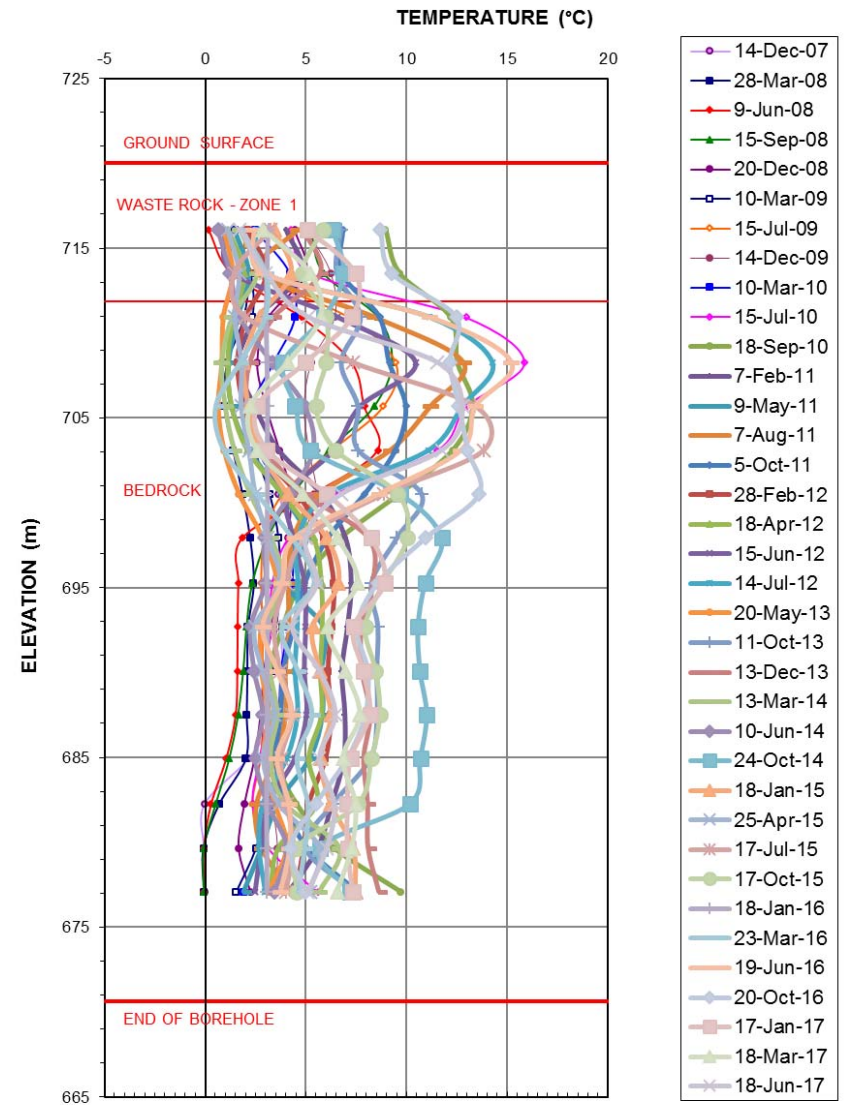
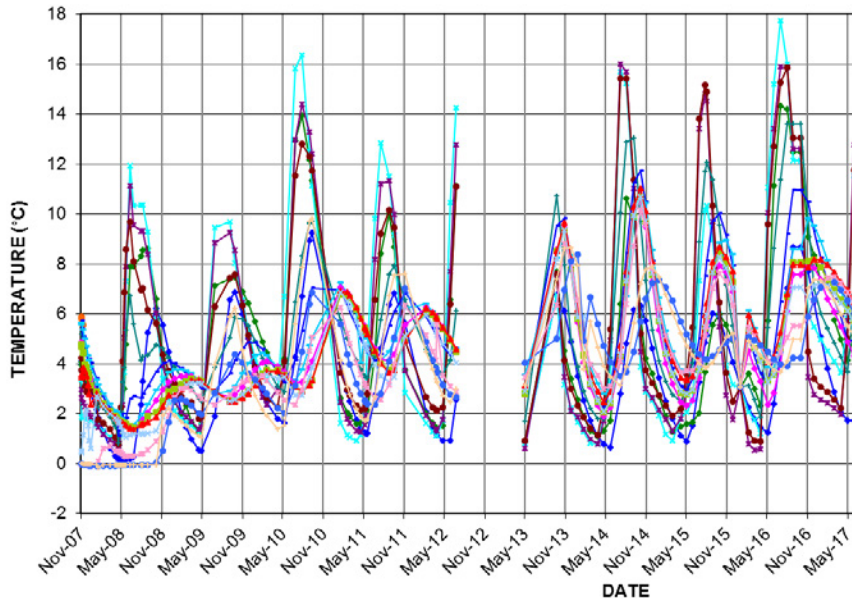
Source file: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRK Data Set\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

		Water Storage Pond Data		
		<b>Survey Hubs – WSP-1 and WSP-3</b>		
Job No: 1CM002.059 Filename: ApH_WaterStoragePondPort2017.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by: PHM	Figure: <b>1</b>



Source file: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRK Data Set\SWD\_ASH\_WSP\_SurveyHubMonitoring\_SRK.xlsm

		Water Storage Pond Data		
		<b>Survey Hubs – WSP-4 and WSP-5</b>		
Job No: 1CM002.059 Filename: ApH_WaterStoragePondPort2017.pptx	<b>Minto Mine</b>	Date: August 2017	Prepared by: PHM	Figure: <b>2</b>



Source files:

- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\MintoWSPDInstrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx



Minto Mine

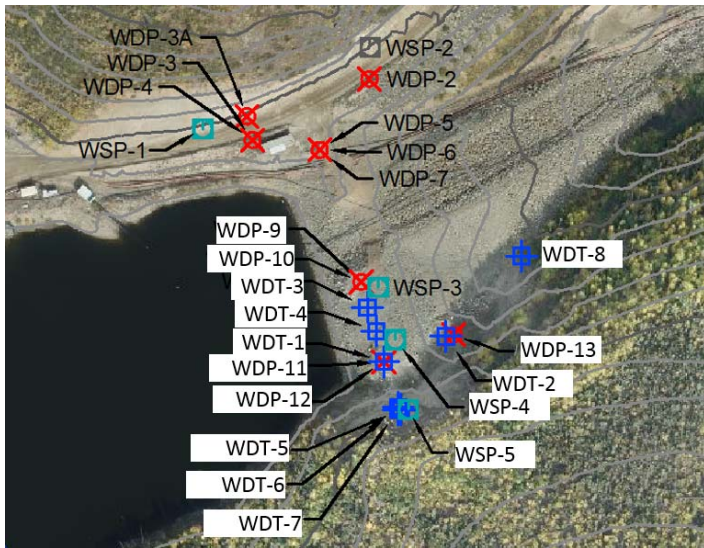
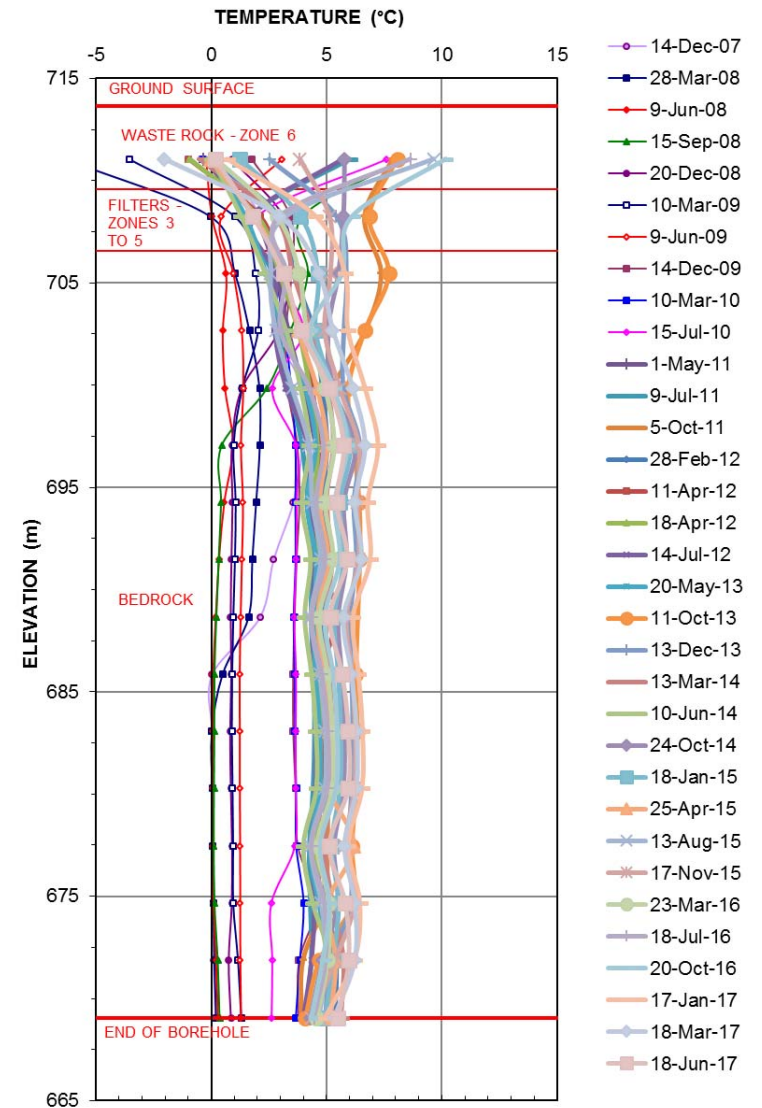
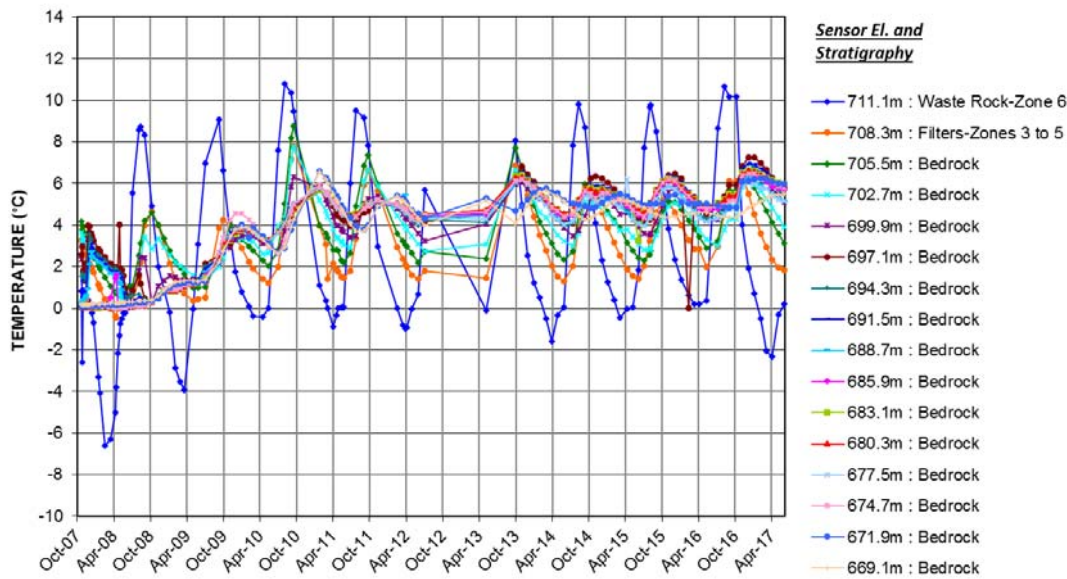
Water Storage Pond Data

Temperature Cable – WDT-1

Date: August 2017

Prepared by PHM

Figure: 3



Source files:

- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\Minto\WSPDInstrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx

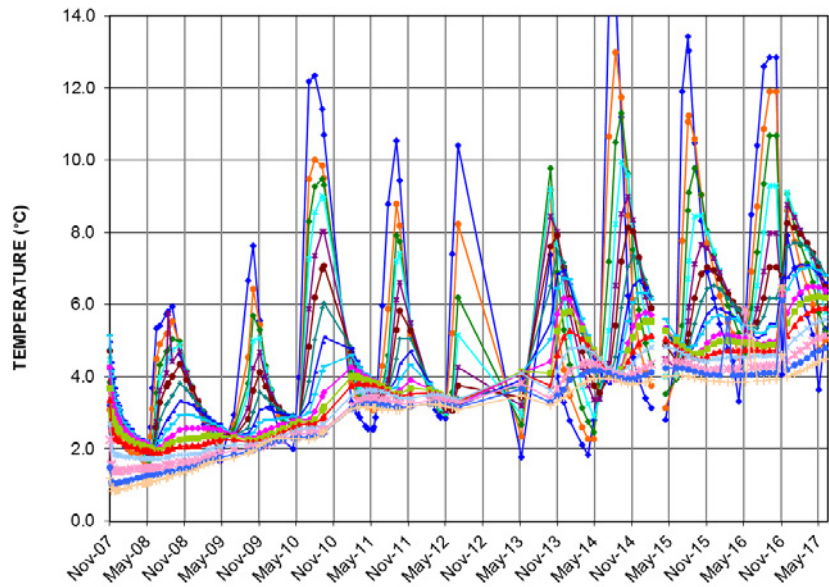


Minto Mine

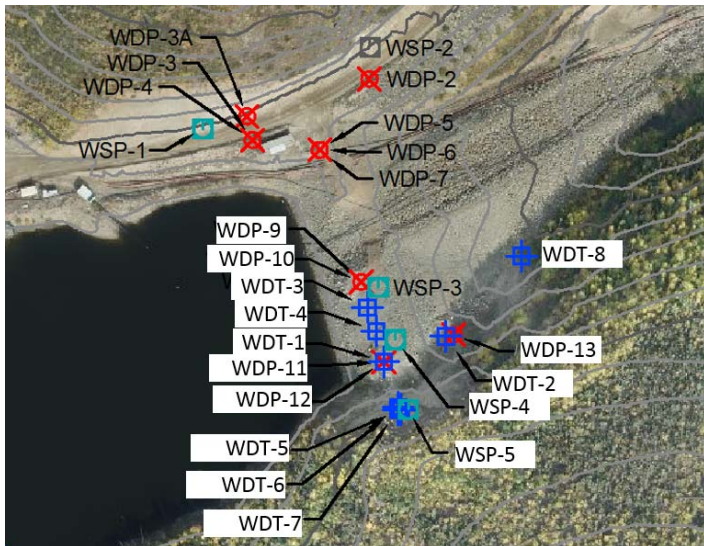
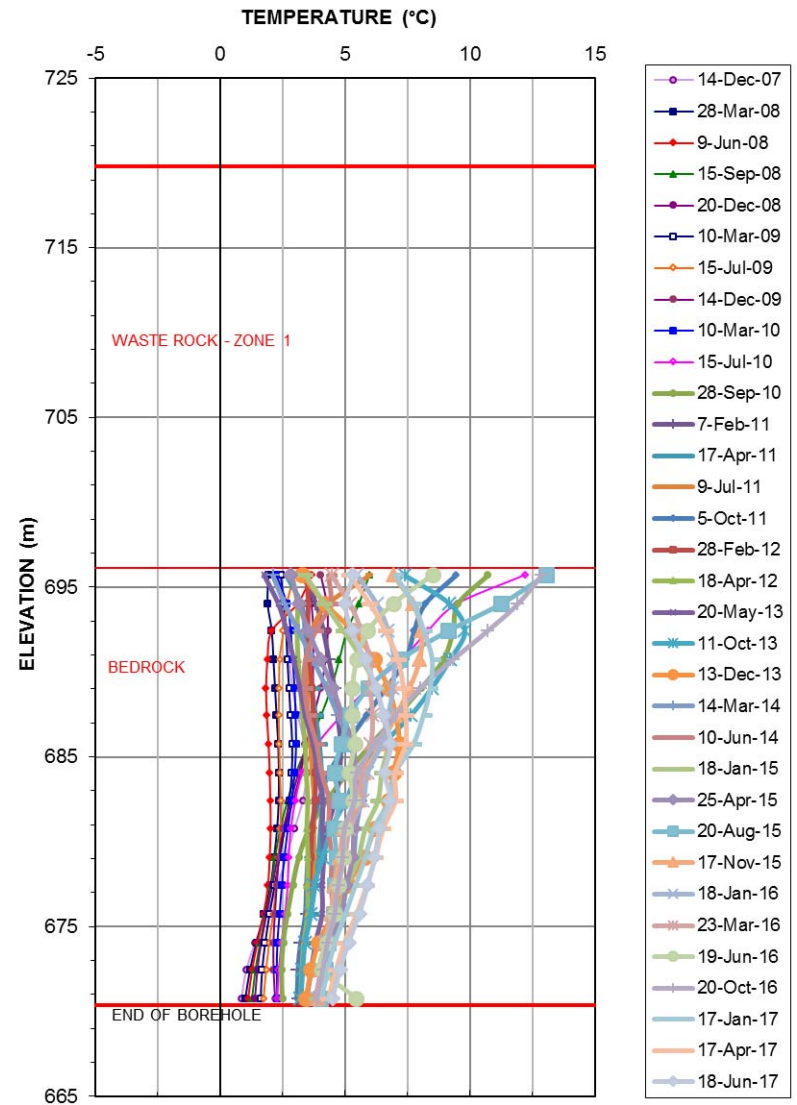
Water Storage Pond Data

**Temperature Cable – WDT-2**

Date: August 2017	Prepared by PHM	Figure: <b>4</b>
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- Sensor El. and Stratigraphy**
- 695.7m : Bedrock
  - 694.0m : Bedrock
  - 692.4m : Bedrock
  - 690.7m : Bedrock
  - 689.0m : Bedrock
  - 687.4m : Bedrock
  - 685.7m : Bedrock
  - 684.1m : Bedrock
  - 682.4m : Bedrock
  - 680.8m : Bedrock
  - 679.1m : Bedrock
  - 677.5m : Bedrock
  - 675.8m : Bedrock
  - 674.1m : Bedrock
  - 672.5m : Bedrock
  - 670.8m : Bedrock



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\Minto\WSPD\Instrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
 Filename: ApH\_WaerStoragePond2017.pptx

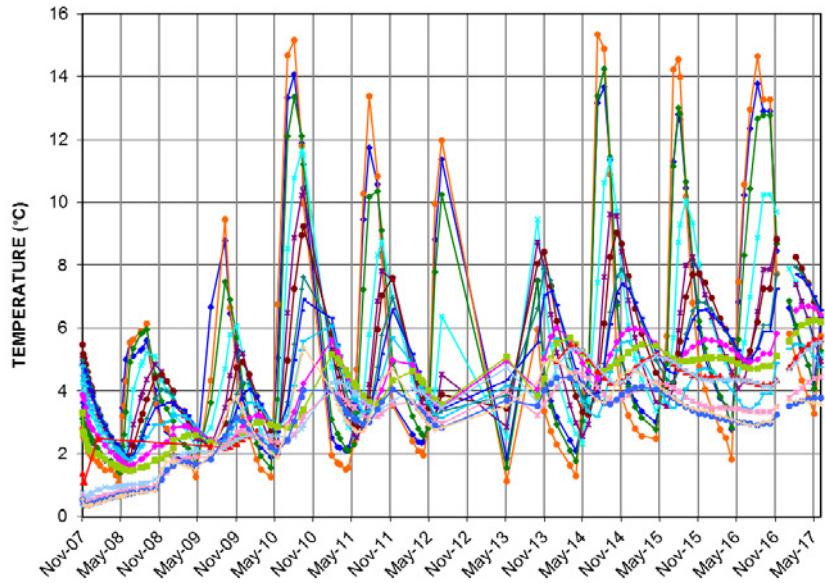


Minto Mine

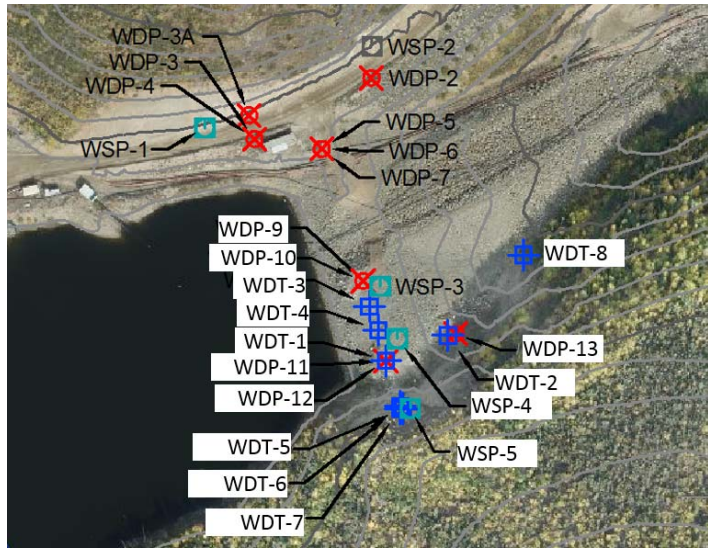
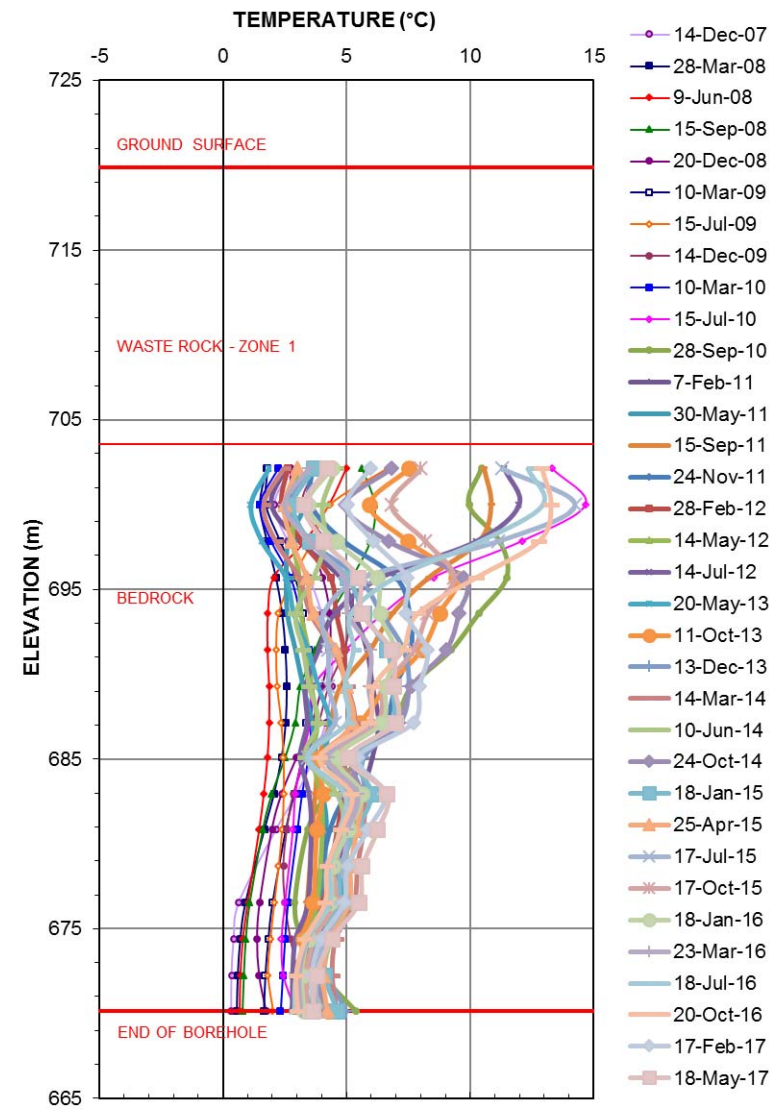
Water Storage Pond Data

**Temperature Cable – WDT-3**

Date: August 2017	Prepared by PHM	Figure: <b>5</b>
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- Sensor El. and Stratigraphy**
- 702.1m : Bedrock
  - 700.0m : Bedrock
  - 697.8m : Bedrock
  - 695.7m : Bedrock
  - 693.6m : Bedrock
  - 691.4m : Bedrock
  - 689.3m : Bedrock
  - 687.2m : Bedrock
  - 685.1m : Bedrock
  - 683.0m : Bedrock
  - 680.8m : Bedrock
  - 678.7m : Bedrock
  - 676.5m : Bedrock
  - 674.4m : Bedrock
  - 672.3m : Bedrock
  - 670.1m : Bedrock



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\Minto\WSPD\Instrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
 Filename: ApH\_WaerStoragePond2017.pptx

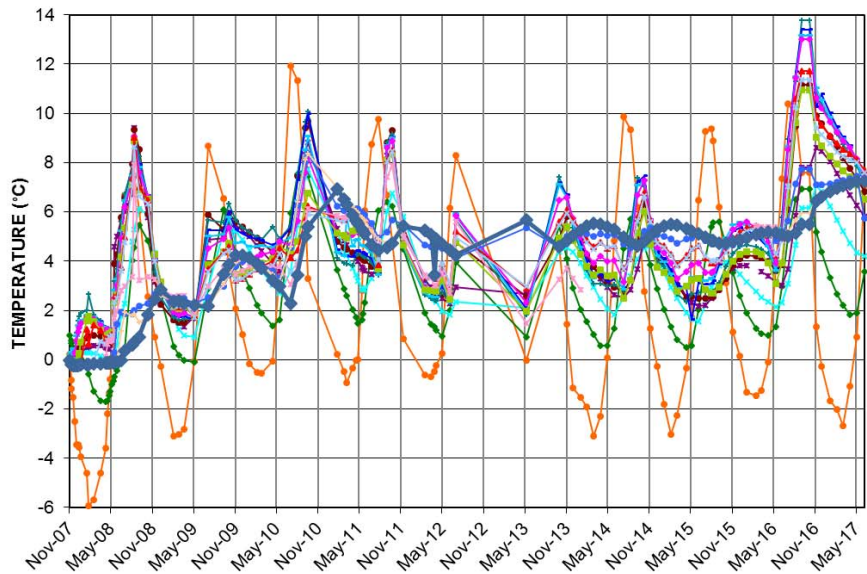


Minto Mine

Water Storage Pond Data

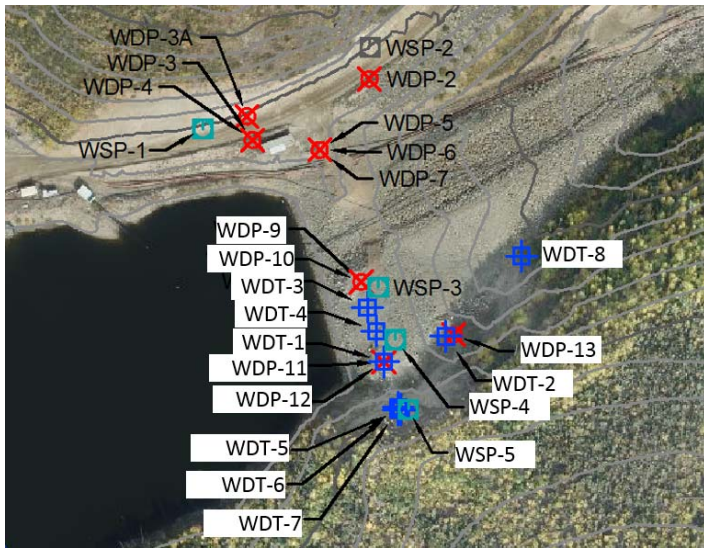
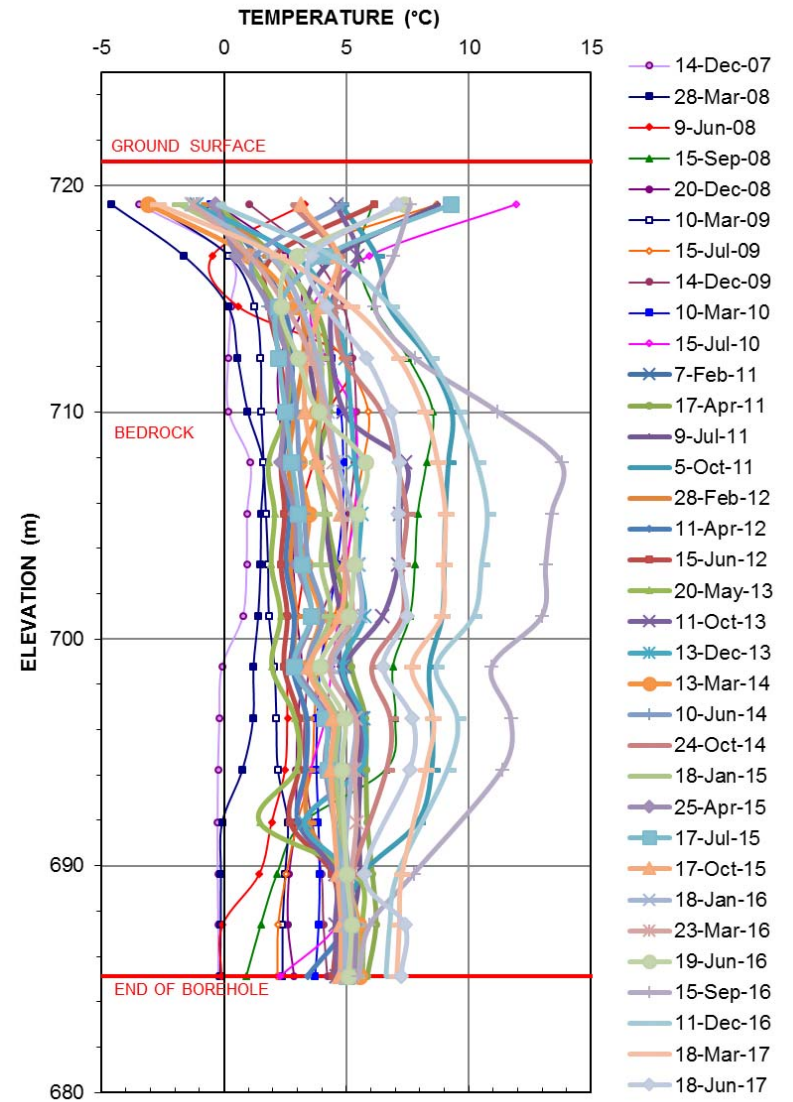
**Temperature Cable – WDT-4**

Date: August 2017	Prepared by PHM	Figure: <b>6</b>
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**Sensor El. and Stratigraphy**

- 719.2m: Bedrock
- 716.9m: Bedrock
- 714.6m: Bedrock
- 712.4m: Bedrock
- 710.0m: Bedrock
- 707.8m: Bedrock
- 705.5m: Bedrock
- 703.3m: Bedrock
- 701.0m: Bedrock
- 698.8m: Bedrock
- 696.5m: Bedrock
- 694.2m: Bedrock
- 691.9m: Bedrock
- 689.6m: Bedrock
- 687.4m: Bedrock
- 685.1m: Bedrock



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\Minto\WSPD\Instrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
 Filename: ApH\_WaerStoragePond2017.pptx



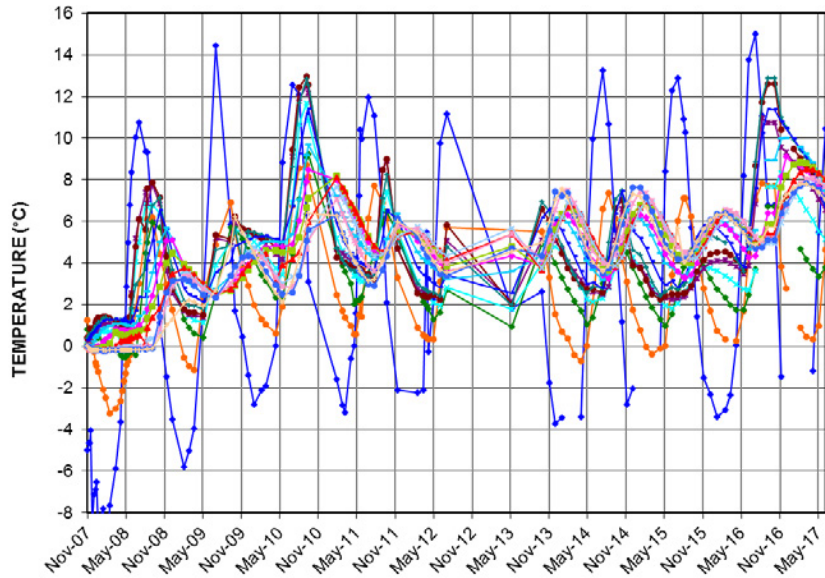
Minto Mine

Water Storage Pond Data

**Temperature Cable – WDT-5**

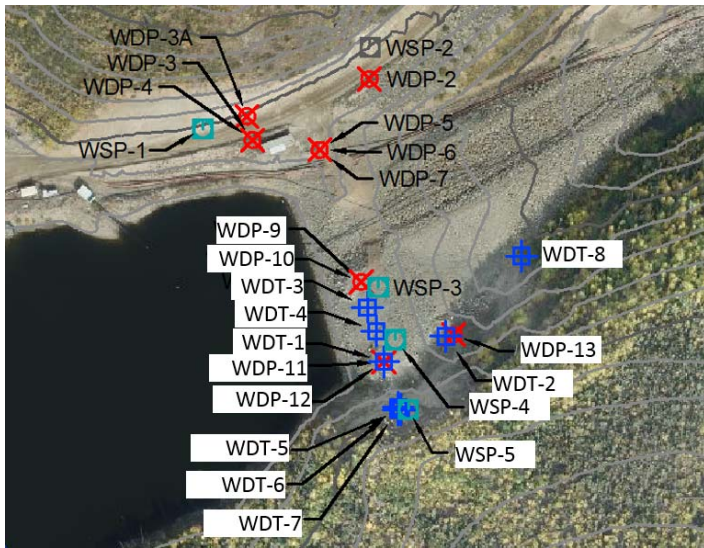
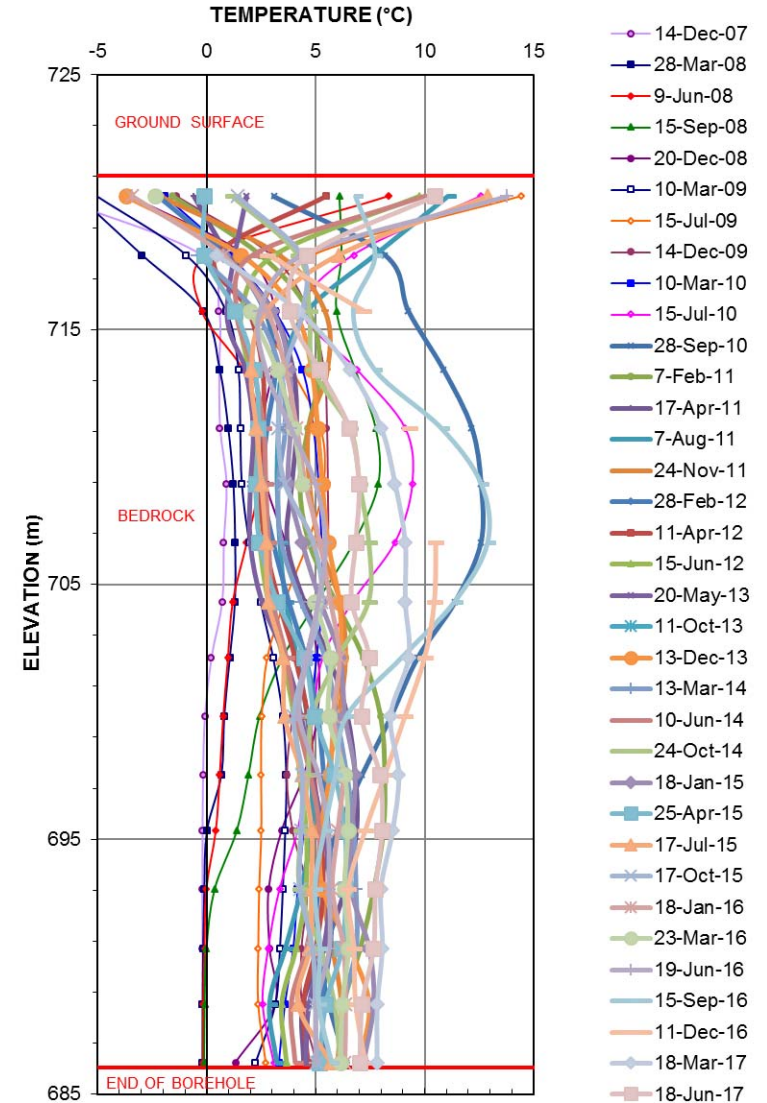
Date: August 2017	Prepared by PHM	Figure: <b>7</b>
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**Sensor El. and Stratigraphy**

- 720.2m : Bedrock
- 717.9m : Bedrock
- 715.7m : Bedrock
- 713.4m : Bedrock
- 711.1m : Bedrock
- 708.9m : Bedrock
- 706.6m : Bedrock
- 704.3m : Bedrock
- 702.1m : Bedrock
- 699.8m : Bedrock
- 697.5m : Bedrock
- 695.3m : Bedrock
- 693.0m : Bedrock
- 690.7m : Bedrock
- 688.5m : Bedrock
- 686.2m : Bedrock



Source files:

1. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKDataSet\MintoWSPDInstrumentation\_SRKSet.xlsm



Job No: 1CM002.059  
 Filename: ApH\_WaerStoragePond2017.pptx

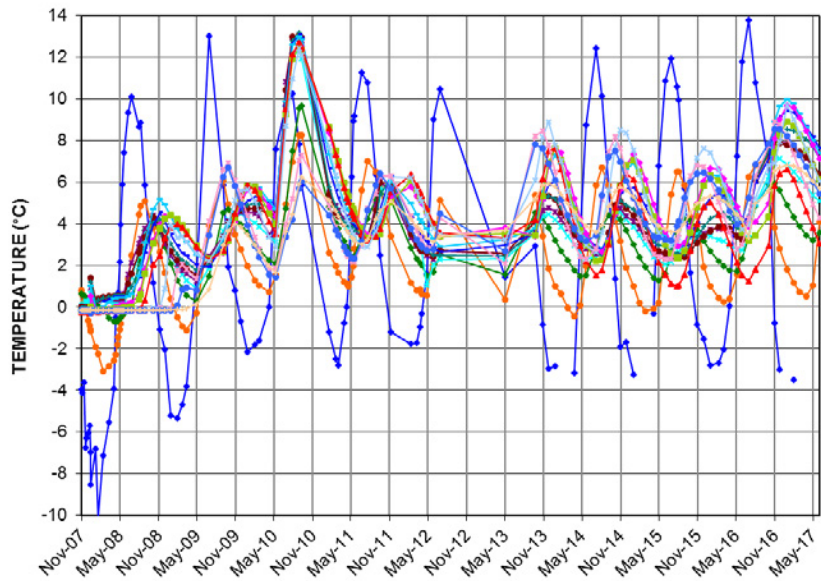


Minto Mine

Water Storage Pond Data

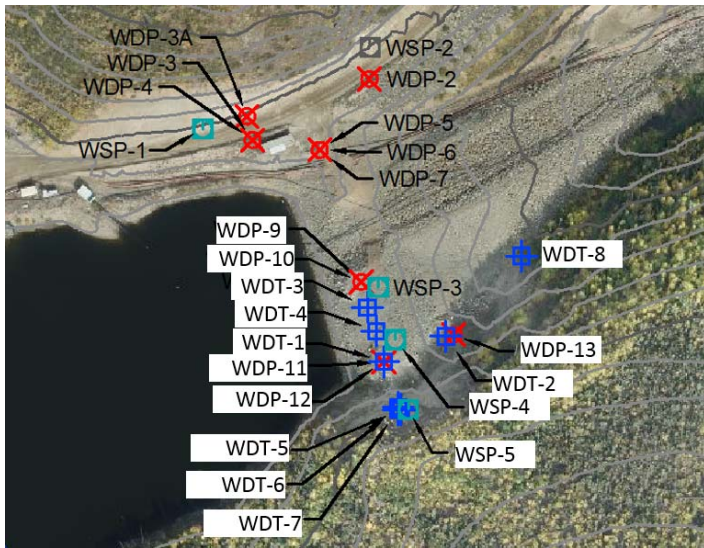
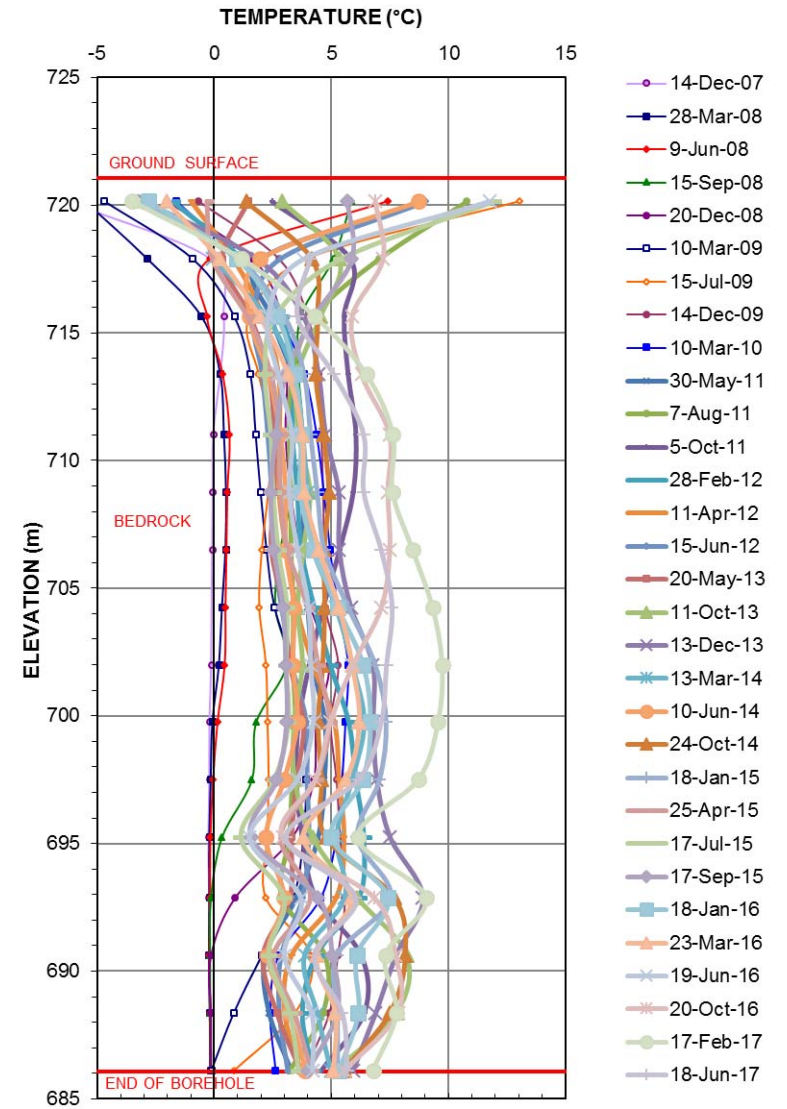
**Temperature Cable – WDT-6**

Date: August 2017	Prepared by PHM	Figure: <b>8</b>
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**Sensor El. and Stratigraphy**

- 720.1m : Bedrock
- 717.9m : Bedrock
- 715.6m : Bedrock
- 713.4m : Bedrock
- 711.0m : Bedrock
- 708.8m : Bedrock
- 706.5m : Bedrock
- 704.3m : Bedrock
- 702.0m : Bedrock
- 699.7m : Bedrock
- 697.5m : Bedrock
- 695.2m : Bedrock
- 692.9m : Bedrock
- 690.6m : Bedrock
- 688.4m : Bedrock
- 686.1m : Bedrock



Water Storage Pond Data

**Temperature Cable – WDT-7**

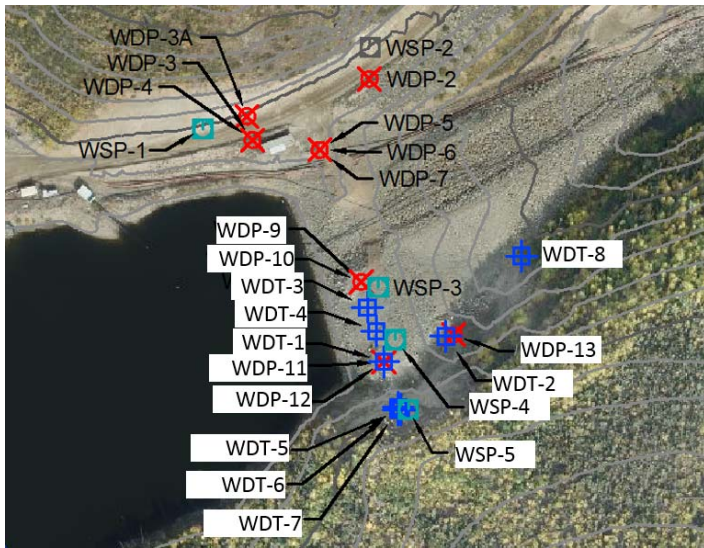
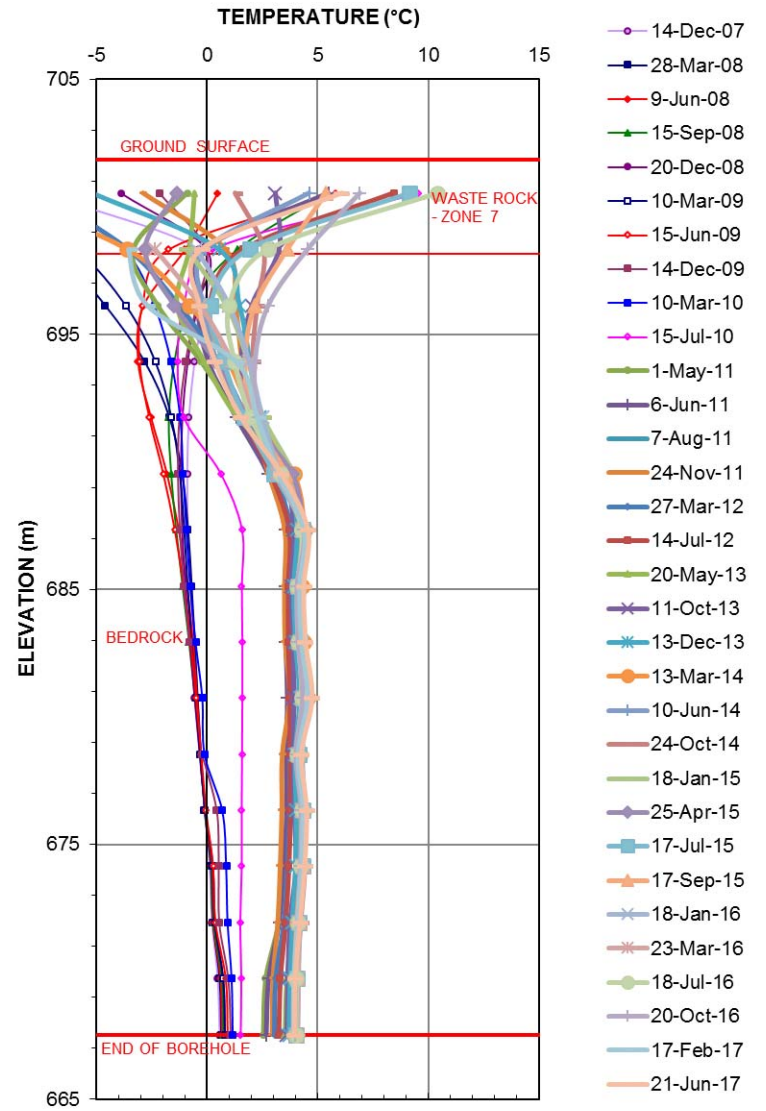
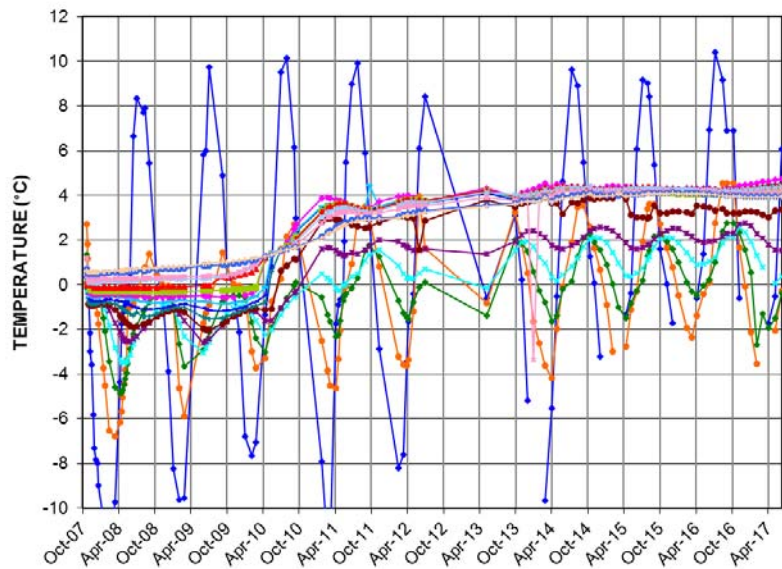
Job No: 1CM002.059  
 Filename: ApH\_WaerStoragePond2017.pptx

Minto Mine

Date: August 2017

Prepared by PHM

Figure: 9



Water Storage Pond Data

**Temperature Cable – WDT-8**

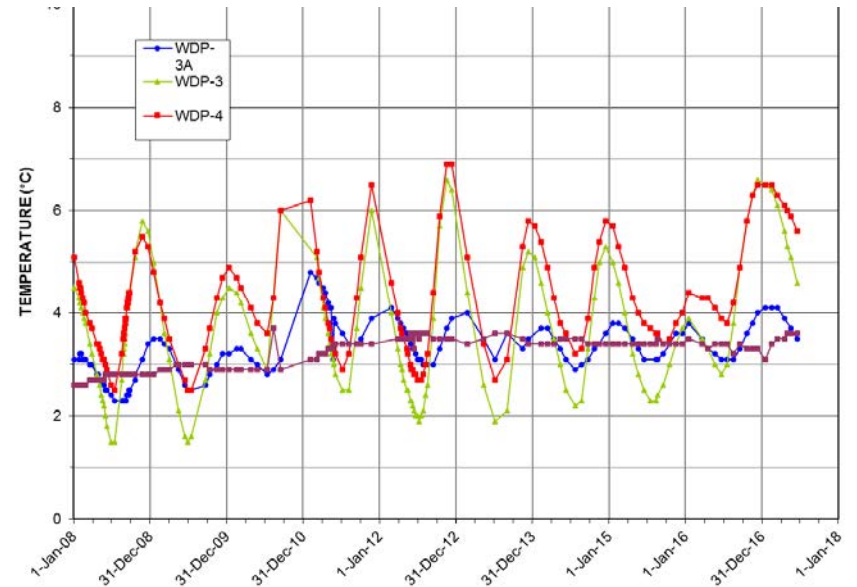
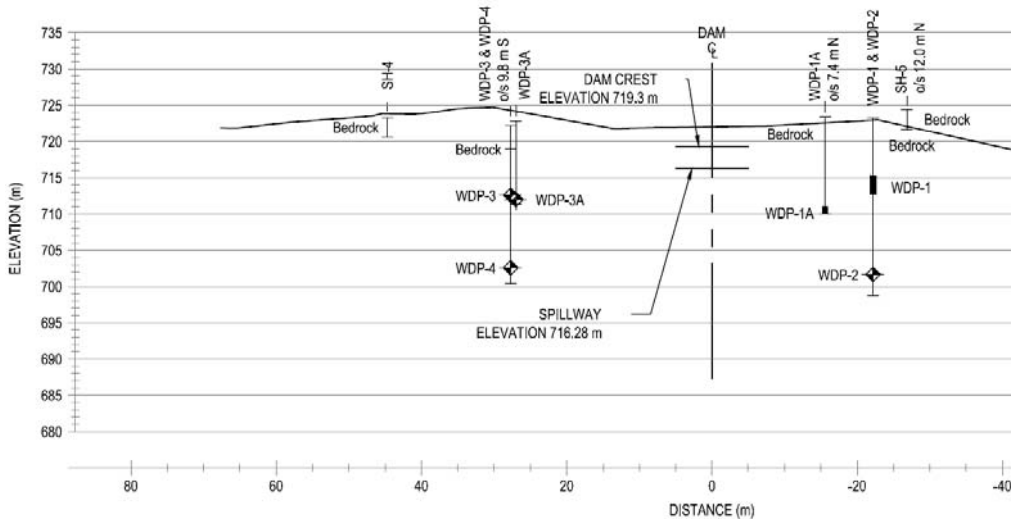
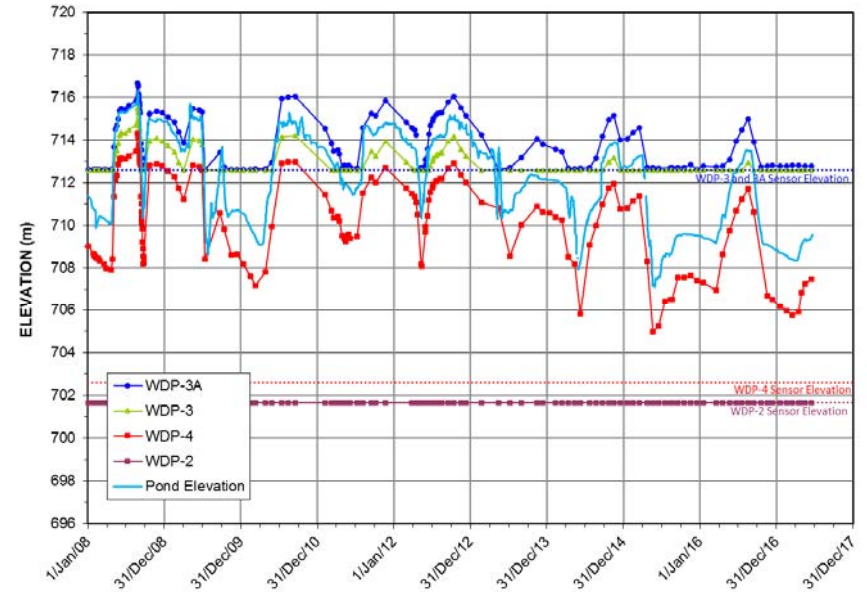
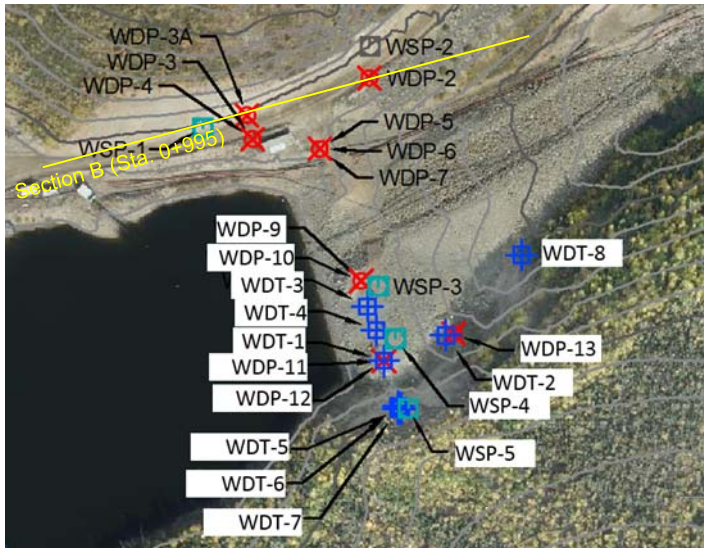
Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx

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Date: August 2017

Prepared by PHM

Figure: 10



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\SRKSet\MintoSWDInstrumentation\_SRKSet.xlsm
3. Cross Section B from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

**B**  
**5** DAM SECTION B (STATION 0+995)



Water Storage Pond Data

**Piezometers – Left Abutment**

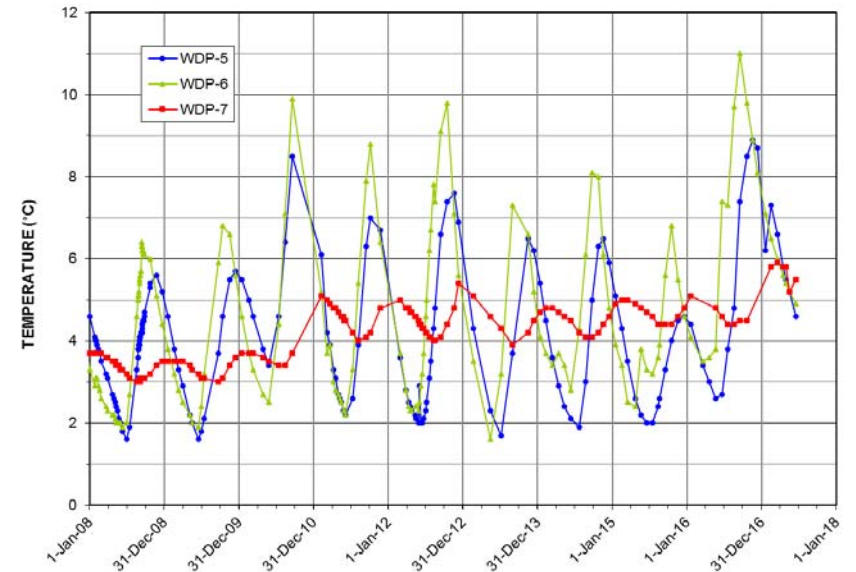
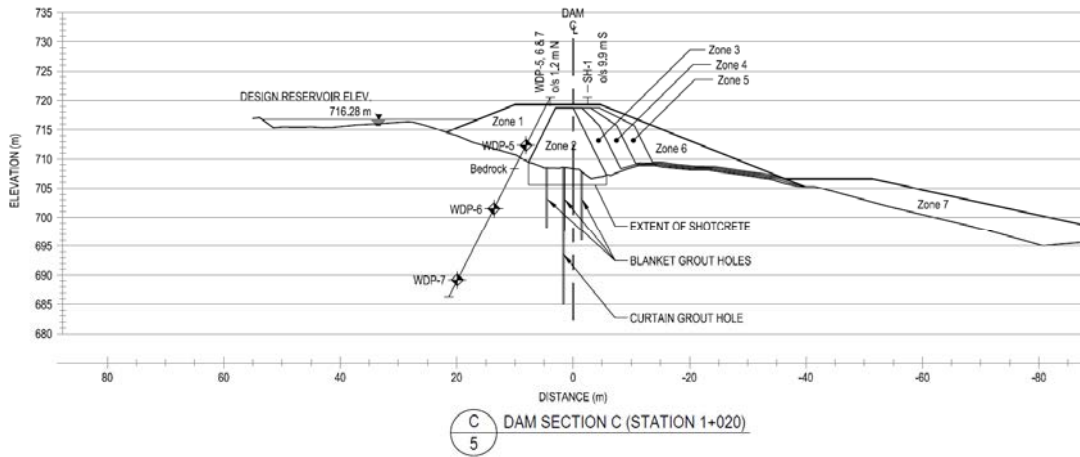
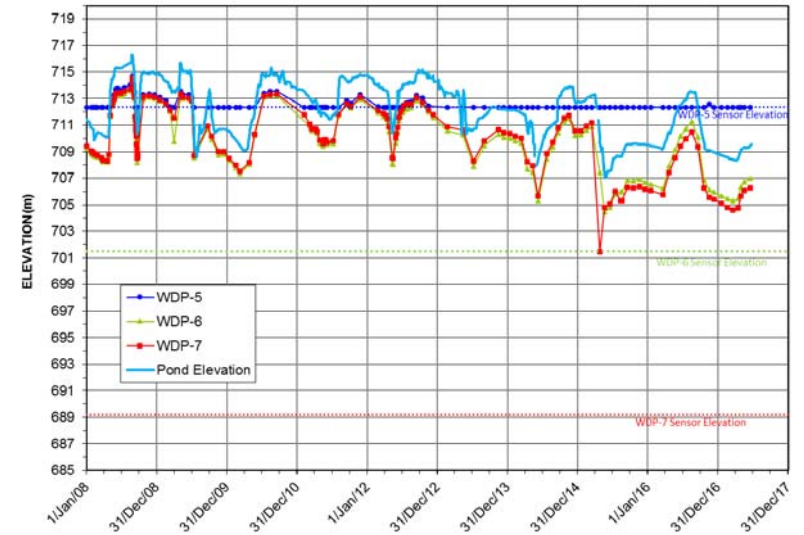
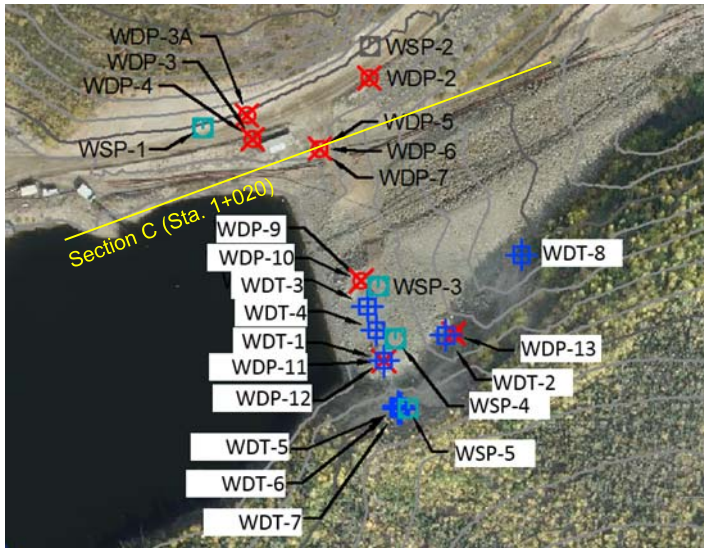
Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx

Minto Mine

Date:  
August 2017

Prepared by  
PHM

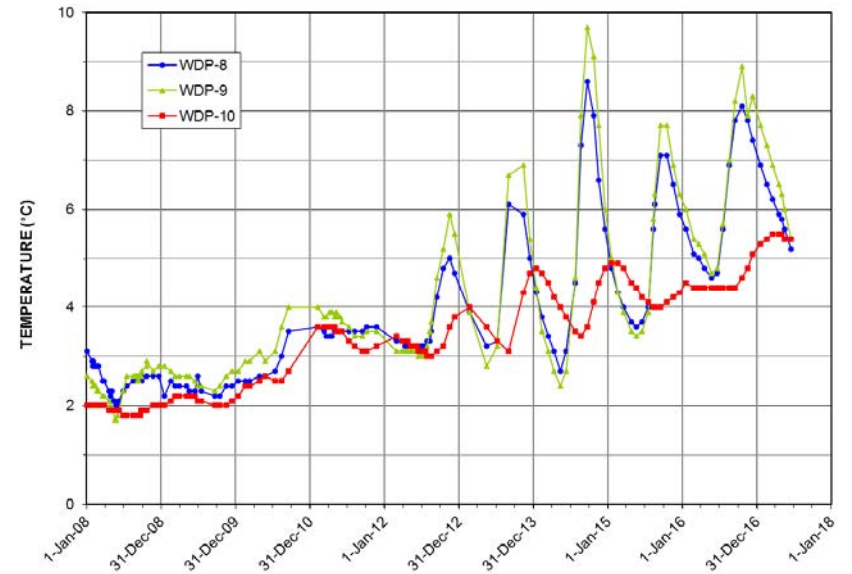
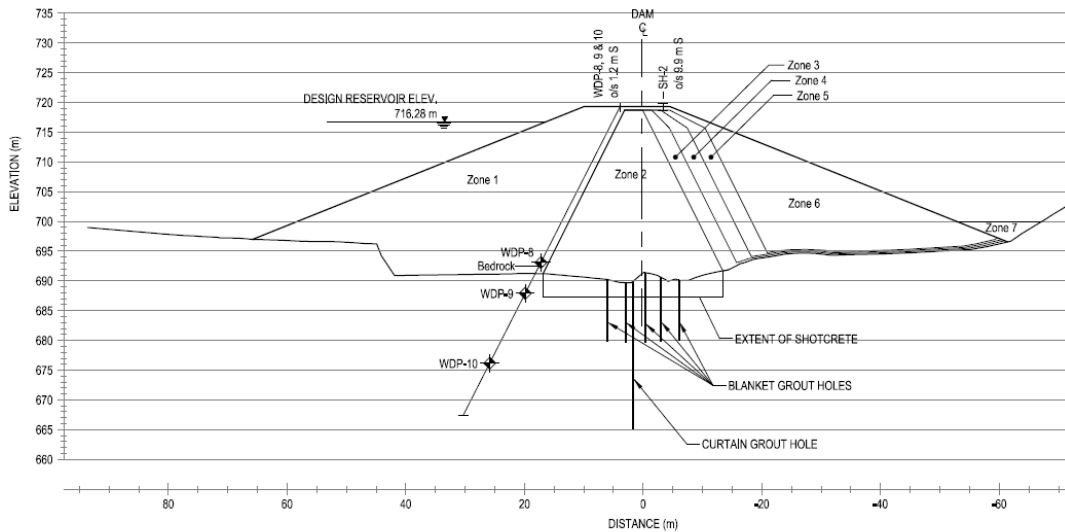
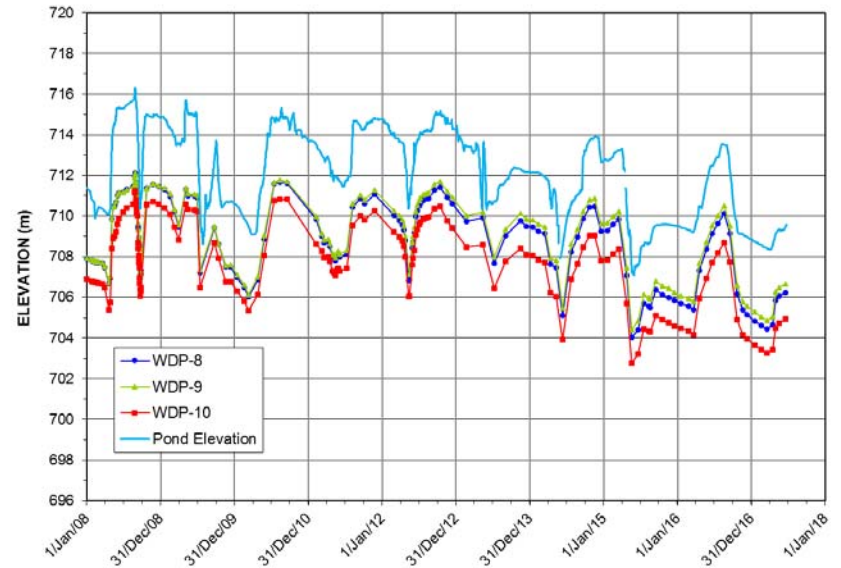
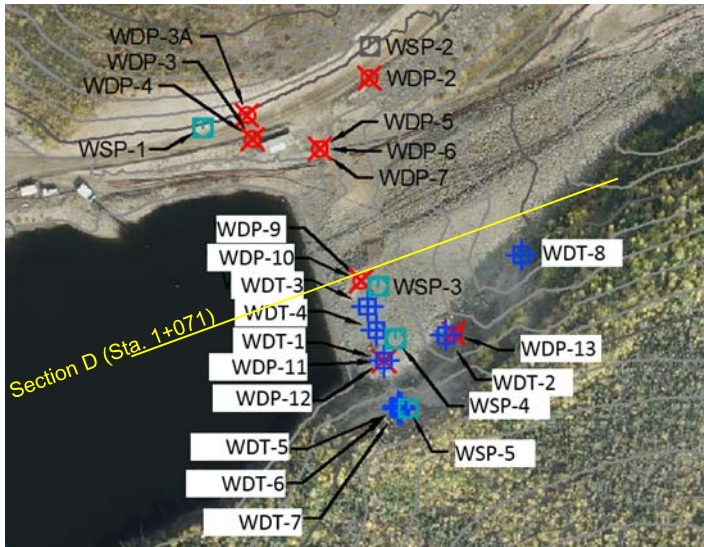
Figure:  
**11**



Source files:

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- Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_2016Geotech.xlsm
- Dam section from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

 Job No: 1CM002.059 Filename: ApH_WaerStoragePond2017.pptx	 Minto Mine	Water Storage Pond Data		
		<b>Piezometers – Section C (Station 1+020)</b>		
		Date: August 2017	Prepared by PHM	Figure: <b>12</b>



Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01\_SITES\Minto\1CM002.050\_2016 Geotech Op Support\1040\_AutoCAD\1CM002.050-Site Plan Showing Instrumentation.dwg
2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site\_Wide\_Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_2016Geotech.xlsm
3. Dam section from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

**D**  
**5** DAM SECTION D (STATION 1+071)

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Water Storage Pond Data

**Piezometers – Section D  
(Station 1+071)**

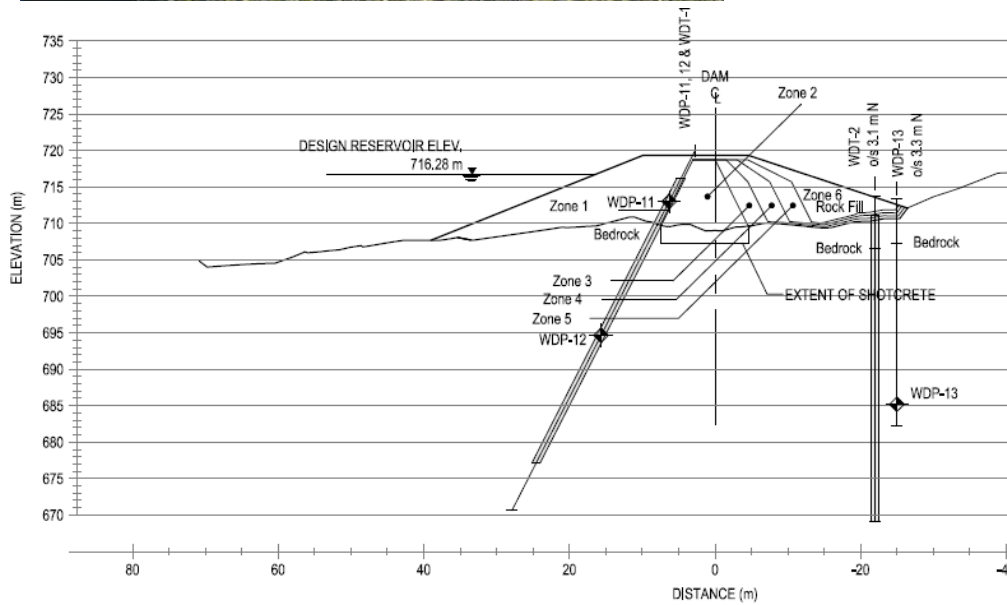
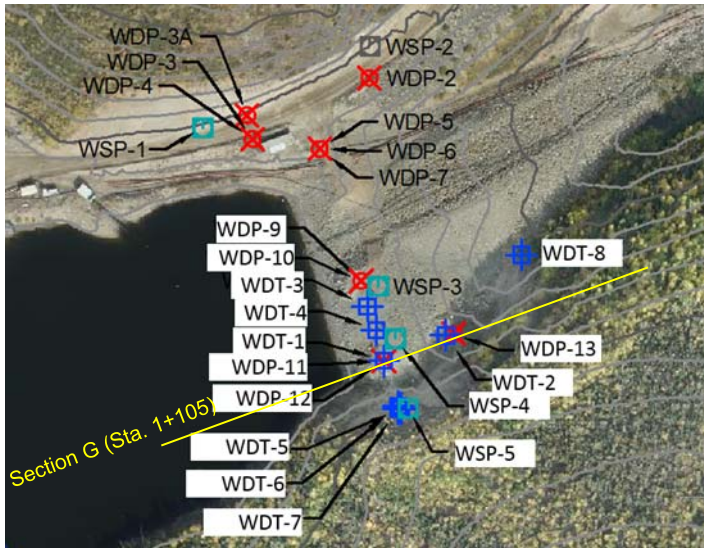
Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx

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Date:  
August 2017

Prepared by  
PHM

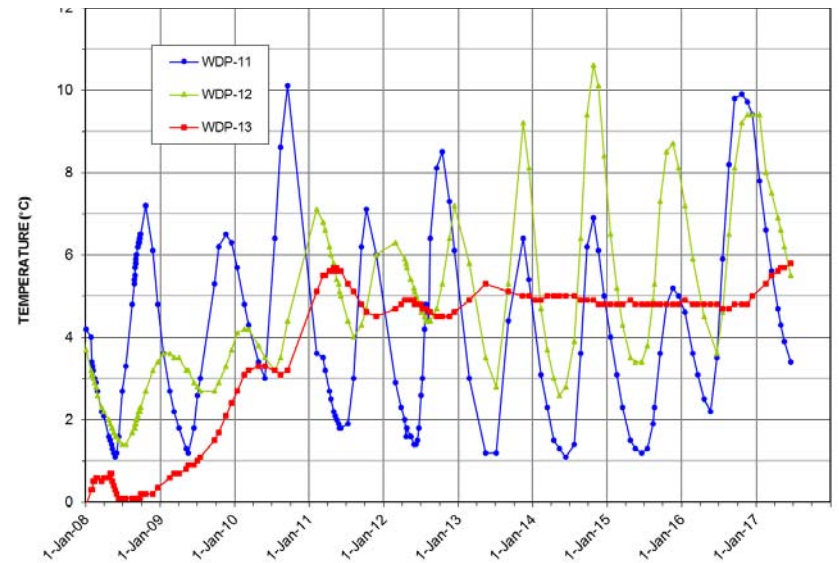
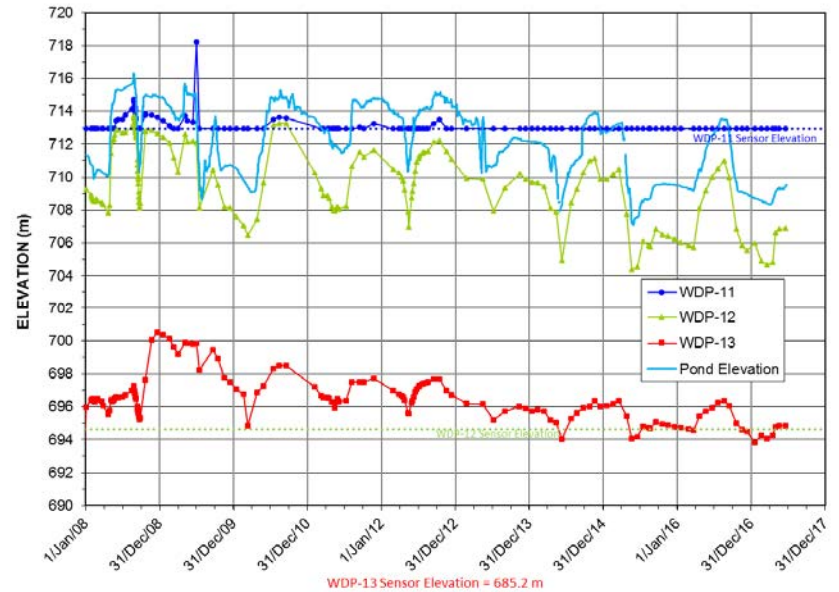
Figure:  
**13**



**G**  
**5** DAM SECTION G (STATION 1+105)

Source files:

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2. Excel instrumentation data: \\VAN-SVR0\Projects\01\_SITES\Minto\020\_Site Wide Data\Geotechnical\Geotech Monitoring Data\MintoMasterSWDInstrumentation\_2016Geotech.xlsx
3. Dam section from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.



**srk consulting**

Job No: 1CM002.059  
Filename: ApH\_WaerStoragePond2017.pptx

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Water Storage Pond Data

**Piezometers – Section G (Station 1+105)**

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Prepared by: PHM  
Figure: **14**