2019 Geotechnical Annual Review, Minto Mine, YT

Prepared for

Minto Explorations Ltd.

Prepared by

SRK Consulting (Canada) Inc.
1CM002.066
August 2019

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1 Introduction

1.1 Purpose of Review

On June 19–21, 2019, 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 seventh 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).

1.2 Conditions

The geotechnical inspection was completed by Ryan Williams, PEng (YK), and Peter Mikes, PEng (YK), of SRK. SRK staff were accompanied by various Minto staff throughout the visit based on availability. Todd Swenson was SRK's primary contact for information while on-site about the activities during the past year, and provided background and instrumentation support during review of the instrumentation data.

Weather during the site inspection was mostly overcast with brief rain showers in the afternoon of June 19, and was sunny on June 20 and June 21. Temperatures were estimated at approximately 5°C in the morning, and up to approximately 25°C in the afternoon. The site was generally damp throughout the inspection period, with approximately 1 to 5 mm of rain occurring each day during the week prior to the inspection.

1.3 Scope

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

- Dry Stack Tailings Storage Facility (DSTSF) and Mill Valley Fill Extension (MVFE) (Stage 1 and 2);
- Tailings Diversion Ditch (TDD);
- Main Waste Dump (MWD), including Main Waste Dump Expansion, and Main Waste Dump Wrap;
- Southwest Waste Dump (SWD);
- Reclamation Overburden Dump;

- Ore stockpiles;
- Mill and camp site;
- Fuel containment facility;
- Water Storage Pond (WSP) Dam;
- Big Creek Bridge;
- Main Pit Dump;
- Main Pit including South Wall Buttress, In-Pit Dump, and SAT Dump;
- Area 2 Pit;
- Area 118 Pit and Backfill Dump; 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.

2 Site Inspection Observations

A summary of SRK's observations during the site inspection is provided in Table 2-1. Site observations are listed per each inspection area. A photographic record of the observations is provided in Appendix A.

Table 2-1: Site Inspection Observations

Inspection Area Number	Inspection Area Name	SRK Observations
1	Dry Stack Tailings Storage Facility (DSTSF)	• No observations of global instability. • Slump of the cover material observed at the south end, near the grade transition point of the old TDD alignment (see Photo 4, Appendix A). Slump is approx. 25 m wide and there are potentially tailings exposed at the toe at the west end. • Additional vegetation noted on the southern portion of the cover than compared to previous year. • Settlement cracking in southern portion of the cover (orientated parallel to the southern crest) does not appear to be more than observed in the previous year (see Photo 5 and 6, Appendix A). • Multiple erosion gullies observed on the north and east slopes of the cover (see Photo 11 and 12, Appendix A).
2	Mill Valley Fill Extension (MVFE)	• Minor cover placement and regrading completed since previous years' inspection. • No observations of global instability. • Multiple erosion gullies within the cover soil observed on the north and east slopes of the cover where runoff concentrates (see Photo 14 – 17, Appendix A). • The excavated slope to the south of the Minto Creek Seepage Collection System (MCSCS) that is excavated into permafrost soils has no observable changes compared to the previous years inspection. The slope appears to be self-stabilizing with vegetation becoming well established (see Photo 20, Appendix A). • Observed small amount of standing water at the toe of the MVFE at the south side of the valley and upgradient of MCSCS which could indicate seepage (see Photo 22, Appendix A). The MCSCS appears to be functioning as per design, with no signs of seepage below the system.
3	Tailings Diversion Ditch (TDD)	• Observations were consistent with previous years' inspection. • Construction of the TDD Intake Structure and Overflow Spillway into the Area 2 Stage 3 Pit remains incomplete. The flow from the South Diversion Ditch has been diverted to the TDD, but construction of the intake channel side-slopes and riprap remains incomplete. • The road grading along the Overflow Spillway has resulted in berms across the spillway and the flow capacity may not meet the design criteria. • No major obstructions or signs of instability along the TDD were observed. • Vegetation was observed in the upper portion of the unarmoured ditch which may reduce flow capacity (see Photo 23 and 24, Appendix A). • Remaining armoured portion of the ditch was generally free from vegetation (see Photo 25, Appendix A). • TDD outlet showed no signs of instability or obstructions (see Photo 26, Appendix A).

Inspection Area Number	Inspection Area Name	SRK Observations
4	Main Waste Dump (MWD)	• No observations of global instability. • Erosion gullies observed in cover material (see Photo 29, Appendix A) . • Longitudinal cracking observed in the re-sloped area above the former PAG Oxide stockpile (see Photo 30, Appendix A). Cracking is approx. 50 m long. Area below the cracking appears to have been regraded with a concave slope, but the area has likely settled. • Minor vegetation has established on the cover slopes
5	Main Waste Dump (MWD) Wrap	• No observations of global instability. • Observations were consistent with previous years' inspection. • Cracking prevalent on the top bench that appear to follow the alignment of the old crest of the Main Waste Dump (see Photo 32 and 33, Appendix A). • Differential settlement and small sinkholes also prevalent on the top bench, likely attributed to snow within the fill during winter construction (see Photo 34 – 36, Appendix A).
6	Southwest Waste Dump (SWD)	• No observations of global instability. • Observed an eroded portion on the regraded slope, likely due to the 2016 dewatering of ponded water from the area west of the dump and south of the former Ice-rich Overburden Dump (see Photo 43, Appendix A). • Crack approx. 110 m long observed along the access road immediately west (upslope) of areas where overburden stockpiles are present. Crack is up to 25 cm wide and approx. 0.6 m deep. See Photo 45 and 46, Appendix A. The crack should be visually monitored as part of routine inspections for any change in condition. Any large-scale slope deformation would be expected to be detected by SWD012 located downslope of the crack.

7	Reclamation Overburden Dump	• Conditions are the same as noted in previous years' inspections.
		• Vegetation has firmly established across the dump area (see Photo 37 and 38, Appendix A).
		• Previous notes include:
		  o Slumping, settlement and tension cracks are expected in the dump as it is constructed with frozen overburden and thawing is expected
		  o Discontinuous tension cracks and differential settlement have been observed along the perimeter crest
		  o Ground undulation is typically 0.3 m and is prevalent throughout the facility
		• This area was not inspected on foot during the 2019 inspection

Inspection Area Number	Inspection Area Name	SRK Observations
8	Ore Stockpiles	• This ore stockpiles were investigated briefly in passing and appeared to be in good condition. No obvious signs of instability were noted.
9	Mill Site	• No observations of global instability of the highwall north of the mill were observed Minor erosion and spalling of loose rocks is ongoing (see Photo 48, Appendix A). • The rocks appear to have been recently cleared from the road prior to the inspection with concrete jersey barriers currently being installed with chain-linked fences intended to catch loose rocks from the highwall. It was observed that the highwall toe has been over-excavated as part of the installation (see Photo 49, Appendix A). The over-excavation has resulted in steepening of the slope which could lead to instability and increased erosion, weathering, and rock spalling. • The toe of the mill feed stockpile pad was observed to be over-excavated (see Photo 50, Appendix A).
10	Camp Site	• Observations were generally consistent with previous years' inspection. • Minor on-going erosion was observed on the highwall north of the camp (see Photo 53 and 54, Appendix A). • No observations of global instability of the highwall were observed. • The outlet channel from the natural spring north of the Selkirk Towers was observed to be free of blockages (see Photo 55, Appendix A). • Erosion gullies in the slopes of the camp pad (i.e. south of camp) appear to have increased in size since the previous year (see Photo 56 – 58, Appendix A).
11	Fuel Containment Facility	• Observations were generally consistent with previous years' inspection. • No tears or defects in the liner were observed (see Photo 59 – 61, Appendix A). • The facility appears to drain towards the sump and is holding runoff water, indicating that the liner is functioning as designed. • The highwall to the north of the facility did not show signs of global instability (see Photo 62, Appendix A)
12	Water Storage Pond (WSP) Dam	• Observations were generally consistent with previous years' inspection. • No observations of global instability. • The historical area of erosion on the upstream face towards the north abutment of the dam (repaired in 2015) showed no indication of new erosion. • Minor erosion observed upstream of the dam in natural slope close to the north abutment (see Photo 65, Appendix A).

Inspection Area Number	Inspection Area Name	SRK Observations
		• Some of the rip rap used to armour the upstream and downstream slopes was observed to be weak and friable. • A small potential sinkhole was observed in the downstream slope, approximately halfway towards the downstream toe and on the southern edge of the slope. Located 5 m NW of WSPT-8. Dimensions are approximately 0.3 m diameter and was able to lower measuring tape to ~ 1.4m below ground surface. See Photo 72, Appendix A. • Seepage water downstream of the dam was clear and no accumulation of sediments was observed (see Photo 73, Appendix A). • Seepage flow at the V-notch weir outlet was estimated to be less than 1 L/s and was clear with no signs of turbidity (see Photo 74, Appendix A). • Seepage flow was faintly audible through the rockfill close to the seepage collection system (see Photo 75, Appendix A).
13	Big Creek Bridge	• Observations of the bridge and road culverts were generally consistent with previous years' inspection • The bridge abutments and road approaches are in good condition, with no signs of instability observed (see Photo 77 – 79, Appendix A). • In general, all culverts are in satisfactory condition with no major blockages or sediment accumulation at either end of the culverts (see Photo 80 – 82, Appendix A). • Tree growth near the inlet of some of the culverts is continuing and may reduce the capacity of the culvert or lead to a blockage. • One of the culverts in the group of four culverts has been partially damaged and deformed (see Photo 83, Appendix A).
14	Main Pit Dump, SAT Dump & In-Pit Dumps	• Observations were generally consistent with previous years' inspection. • No observations of global instability. • SAT dump did not show signs of cracking or movement (see Photo 86, Appendix A). • Longitudinal cracking was observed on the crest of the In-Pit Dump (see Photo 87, Appendix A). • Erosion gullies observed in the highwall above the In-Pit Dump (see Photo 88, Appendix A). • Settlement cracking was observed in the crest of the dump and is up to 20 cm wide at its widest in the access ramp (see Photo 90, 91 and 93, Appendix A). • Top bench of the Main Pit Dump has an undulating surface with some differential settlement.
15	Area 2 Pit (Stages 2 and 3)	• Observations were generally consistent with previous years' inspection. • No observations of global instability.

Inspection Area Number	Inspection Area Name	SRK Observations
		• Tailings deposition in the Stage 2 part of the pit has increased since the previous year and is approximately at the level of the natural divide between Stage 2 and Stage 3 pits (see Photo 96, Appendix A). • Cracking observed in the access road along the pit rim, and this road has been barricaded from use (see Photo 97 – 99, Appendix A). • The water level in the Stage 3 part of the pit has increased since the previous year (see Photo 100, Appendix A). • The rock failure in the slope of the Stage 3 Pit that was observed in the previous years' inspection does not appear to have increased in size (see Photo 101 and 103, Appendix A). • Slumping of the wall of the Stage 3 Pit was observed, potentially due to thawing of permafrost soils. Cracking is visible at the crown of the slump areas (see Photo 101 – 103, Appendix A). • The erosion gully in the wall of the Stage 3 pit appears to have increased in size (see Photo 104, Appendix A). Erosion appears to be due to runoff from the haul road upstream that bypasses a culvert (see Photo 106 and 107, Appendix A). • The Underground Maintenance Shop adjacent to the Stage 3 pit appears to show signs of differential settlement, likely due to slumping and settling of the adjacent pit wall (see Photo 105, Appendix A).
16	Area 118 Pit and Backfill Dump	• Observations were generally consistent with previous years' inspection. • No observations of global instability. • Slumping and differential settlement was observed in the backfill material (see Photo 110, Appendix A).
17	Minto North Pit	• Observations were generally consistent with previous years' inspection. • Mining at the pit was completed in October 2016. • The failure of the south pit wall (see Photo 112 and 113, Appendix A) occurred one day following completion of mining in the pit and removal of all equipment and personnel and was predicted based on pit wall monitoring. No additional pit slope failures have occurred since.

3 Monitoring and Instrumentation Data

Table 3-1 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. Appendix B provides a site-wide summary of the survey hub data including the direction of movement for each hub.

Table 3-1: Summary of Instrumentation Data

Facility	Instrumentation Type	List of Reviewed Instrumentation [1]	Last Reading Date
Area 2 Pit	Survey Hubs	**Active:** A210, A215, A216, A217, A218, A219, DS3, DS4 **Destroyed in past year:** DS1, DS2	May 2019
	Inclinometers	A2I-1	April 2019
	Ground Temperature Cables	A2T-1	March 2019
DSTSF and MVFE	Survey Hubs [2]	DSSH06, DSSH10, DSSH12, DSSH14, DSSH15, DSSH18, DSSH19, DSSH20, DSSH24, DSSH26, DSSH27, DSSH29, DSSH31, DSSH32, MV1, MV2.	May 2019
	Inclinometers	DSI-24	June 2019
	Piezometers	**Active:** DSP-05A, DSP-06B, DSP-07 (1, 4 to 6), DSP-08 (1, 3, 4, 6), DSP-10 **Non-functional:** DSP-05B, DSP-06A, DSP-07 (2, 3), DSP-08 (2, 5)	May 2019
	Ground Temperature Cables	DST-10, DST-11, DST-13, DST-14, DST-15	May 2019
MWD	Survey Hubs [2]	*MWDH01, MWDH02, MWDH03, MWDH04, MWDH05, MWDH06*	May 2019
	Inclinometers	MDI-2	April 2019
SWD	Survey Hubs[2]	**Active:** SWD-01, SWD-06, SWD-07, SWD-08, SWD-09, SWD-10, SWD-11, SWD-12	April 2019
	Piezometers	SDP-2 (A and B), SDP-3 (A and B), SDP-4 (A and B)	April 2019
	Ground Temperature Cables	SDT-1, SDT-2, SDT-3, SDT-4	April 2019
Main Pit	Survey Hubs [2]	M79, M80, M81, M82, M83, M84, M88, M89, M92, M93, M94, M95, M96, M97, M98	May 2019
WSP Dam	Survey Hubs [2]	WSP-1, WSP-3, WSP-4, WSP-5	May 2019
	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	May 2019
	Ground Temperature Cables	WDT-1, WDT-2, WDT-3, WDT-4, WDT-5, WDT-6, WDT-7, WDT-8	May 2019

Note(s):

(1) Instrumentation in italics are new instrumentation installed since the previous inspection.

(2) In general, the survey hub vertical displacements have been more variable within the past year. The variability appears to be consistent between hubs indicating the variability may be due to poor satellite coverage or insufficient readings. The variability can be observed easily in hubs DSSH12, DSSH19, DSSH20, DSSH24, DSSH26, MWD01, MWD04, MWD05, MWD06, M81, WSP-3, WSP-4, WSP-5. A review of the survey reading methodology should be completed to reduce the variability.

3.1 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) that were installed in 2013 in the southeast corner of the planned Area 2 Stage 3 Pit, as well as eight survey hubs installed at various locations around the perimeter of the pit.

The inclinometer data is shown in Figure 1 of Appendix C. The data shows a shear occurred between depths of 36 m and 50 m starting in the fall of 2017, which corresponds to the mining of the Area 2 Stage 3 Pit. Since the completion of mining of the pit, the movement rate has slowed with a current rate of approximately 0.1 mm/day.

The ground temperature data indicates permafrost conditions are present. The ground temperatures have shown an increased cooling trend in the past year, which is likely related to mining of the Area 2 Stage 3 Pit, with all temperature sensors now indicating frozen conditions.

Survey hub movement data are presented in Figure 3 of Appendix C. Survey hubs DS3 and DS4 located near the Underground Shop along the east crest of the pit show an increase in movement during the summer of 2018, which has subsequently slowed possibly due to freezing ground conditions. Nearby survey hubs DS1 and DS2 were destroyed within the past year showed no significant movement. The movement is likely due to mining of the Area 2 Stage 3 Pit and changes to the thermal ground regime resulting in thawing of permafrost soils. Due to the close proximity between the Underground Shop and the pit crest, the current monthly monitoring frequency of these hubs should be increased should the building be in use.

3.2 Dry Stack Tailings Storage Facility and Mill Valley Fill Extension

Instrumentation data for the DSTSF and MVFE are provided in Appendix D.

Movements in the DSTSF were first identified in early 2009. The MVFE Stage 1 was designed to mitigate the movement and construction of the facility 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 and was completed in the summer of 2016. The MVFE Stage 2 doubled the size of the Stage 1 buttress and resulted in further decreases to the movement rates.

Survey Hubs

Survey hub movement data are presented in Figure 1 to 18 of Appendix D. All survey hubs on the DSTSF and MVFE show a continued decelerating trend or no significant movement. The highest movement rate is located at DSSH19 with an approximate movement rate of 0.3mm/day which is a decrease from the 0.5 mm/day movement rate measured at this hub in June 2018.

Two additional hubs (ASH05 and ASH06) are located further to the south of the DSTSF on the airport access road (Appendix D, Figure 19). ASH05 shows no significant movement trend. ASH06 showed slight movement in the spring of 2017, which may be related to disturbance as a result of a nearby pipeline installation. The hub showed no significant movement in the past year.

Piezometers

Piezometric data from the DSTSF are presented in Figures 20 to 24 in Appendix D.

DSP-05B (Figure 20, Appendix D) showed an increase in pore pressure that appears to have peaked near the beginning of 2018 and has since generally decreased. This sensor is located approximately 2 m below the tailings in the foundation. DSP-05A, located approximately 2 m above the base of the tailings continued to show a gradual increase in pore pressure until November 1018 when the sensor became unresponsive. Readings measured at DSP-05A were significantly less than those at DSP-05B. Temperatures at both sensors are approximately at the freezing point of water (-0.5°C) and the excess pore pressures are believed to be the result of an increase in the unfrozen water being unable to dissipate as a result of unfrozen conditions in the surrounding soils. As the survey hubs in the vicinity of the sensor show decelerating movement, no additional action is recommended.

Similarly, all sensors at DSP-07 (Figure 22, Appendix D) have shown continued increases in pore pressure since their installation in 2015, but the readings appear to be stabilizing in 2019. These sensors are in zones with significant amounts of ground ice with ground temperatures ranging from -1° to -0.6°. Survey hubs in the vicinity of these sensors also show decelerating movement.

During construction of the MVFE Stage 2, excess pore pressures were generated at DSP-08 (Figure 23, Appendix D). Pore Pressures at the top sensor at DSP-08, which showed a significant increase during the construction, dissipated following the end of construction and appear to have stabilized. The underlying sensors at DSP-08 also appear to have stabilized.

DSP-10 (Figure 24, Appendix D) is located at the base of the Minto Creek Valley where the MVFE Stage 2 fill thickness is the largest and is approximately 5 m below the original ground surface. The pore pressures at DSP-10 also appear to have stabilized, with the temperature sensor indicating unfrozen ground conditions. 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.

Ground Temperature Cables

Ground temperature profiles are provided in Figures 25 to 29 of Appendix D. The profiles indicate that warm permafrost is present at all locations, except in the lower portions of DST-11 and DST-13 that are below the depth of permafrost. 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

Inclinometer data from DSI-24 are presented in Figure 30 of Appendix D. The inclinometer is located between the MVFES2 and the DSTSF. The profile plot indicates a main shear zone at a depth of 53 m, with the time plot data indicating a decelerating trend with a current movement rate of approximately 0.07 mm/day.

3.3 Main Waste Dump

The MWD instrumentation data are provided in Appendix E and includes an inclinometer and six survey hubs that were installed in the summer of 2018 following construction of the MWD Wrap.

Displacements in MDI-2 increased during the winter of 2017-18, with a movement rate of approximately 0.07 mm/day primarily occurring between the depths of 22 and 28 m below ground surface. The displacement is likely related to the construction of the MWD Wrap which occurred during the same time period. The movement rate has slowed since completion of the dump, with a rate <0.02 mm/day between June 2018 and April 2019.

Six survey hubs were installed on the MWD Wrap in August 2018. Hubs MWDH01, MWDH02, and MWDH04 have shown no significant movement since installation. The remainder of the hubs showed initial movement in 2018 that is likely related to settlement of the hubs, with no significant movement recorded in 2019.

3.4 Southwest Waste Dump

Instrumentation data for the SWD are provided in Appendix F.

Survey hub movement data are presented in Figure 1 to 9 of Appendix F. All hubs show either no significant changes in horizontal movement, or a decelerating movement trend. The survey hubs are mounted on large boulders and the boulders that are situated over overburden or frost-susceptible soils show some seasonable variability as a result of ground freezing and thawing, but horizontal movement rates are expected to be indicative of ground movement.

Ground temperature data for the SWD are presented in Figures 10 to 13 of Appendix F, with the temperature cable locations shown in Figure 1. The profiles indicate that warm permafrost is present at all locations with time graphs generally indicating a warming trend.

Piezometric data for the SWD are presented in Figure 14 of Appendix F. The pore pressures for all piezometers show a decreasing trend.

3.5 Main Pit and Main Pit Dump

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. Placement of waste in the MPD occurred intermittently throughout the 2017 and 2018, with a large volume of material placed in the fall of 2017 and over the winter of 2017-18. MPD construction stopped following the completion of the Area 2 Stage 3

Pit in the Spring of 2018. Several survey hubs were destroyed as a result of the MPD construction that have been recently replaced in May 2018.

Survey hub movement data for the Main Pit Dump are presented in Figures 1 to 16 of Appendix G, with the footprints of the South Wall Buttress, In-Pit Dump, SAT Dump, and MPD are provided in Figure 1.

All hubs show either no significant changes in horizontal movement, or a decelerating movement trend. The highest movement rate of 2.8 mm/day occurs at hub M97, which is located at the top of the MPD, and has decreased from a rate of 8.5 mm/day in May 2018.

3.6 Water Storage Pond Dam

Instrumentation data for the WSP 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; however, the survey readings have been more variable since the mine transitioned into care and maintenance. It is suspected that the increased variability is due to a change in methodology in collecting survey readings. The WSP is located in a narrow east-west valley and satellite reception may be poor. A review of the survey reading methodology is recommended to reduce the variability, potential changes to consider include longer duration readings and/or use of an extension rod with the GSP receiver.

Ground temperature data are presented in Figures 3 to 10 of Appendix H. All temperature sensors are above zero and have shown an increasing trend since installation that appears to be stabilizing. Temperatures at depth are typically within the range of observed groundwater temperatures in nearby Westbay monitoring wells 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.

4 Recommendations

A summary of the recommendations is provided in Table 4-1. Where appropriate, each recommendation includes a priority classification of low, medium, or high that should be addressed in three years, one year, or six months, respectively.

Table 4-1: Summary of Recommendations

Area	Recommendations
Instrumentation	• **(High Priority) A review of the survey reading methodology for the survey hubs is recommended to reduce reading variability. Potential changes to consider include longer duration readings and/or use of an extension rod with the GSP receiver.**
DSTSF and MVFE	• As part of the routine visual inspections, continue to monitor the following for any changes in condition: – identified slump at the south end of the DSTSF to determine if any slope stabilization measures are required. – the cracking present at the south end of the DSTSF, as well as – erosion gullies observed in the cover material on the northern and eastern slopes.
Tailings Diversion Ditch	• **(High Priority) The vegetation in the western portion of the Tailings Diversion Ditch should be cleared.** • **(High Priority) Obstructions within the Overflow Spillway should be removed to ensure that the flow capacity is not impeded if the spillway is utilized.** • Construction of the Inlet Channel should be completed in a manner that meets all design requirements documented in the SRK design memo that include minimum channel dimensions, grades, rip-rap gradations and thicknesses. During construction, survey and visual inspections of the channel should be implemented to confirm adequate rip-rap gradations. • **(High Priority) Remaining construction should be completed prior to snowfall in order to be in-place by the 2020 freshet. If construction is not able to be completed in 2019, a management plan must be developed to ensure water does not overflow the channel during 2020 freshet, and the construction works must then be completed in 2020. The management plan should ensure that appropriate resources are available during freshet that would be able to manage the freshet flows (pumps, heavy equipment to construct temporary berms or diversions channels) to prevent overtopping of water towards the DSTSF.**
MWD	• Continue to monitor the crests and slopes as part of the monthly visual inspection for signs of worsening cracking and/or increased sinkholes to determine if any slope stabilization measures are required.
SWD	• Continue to monitor the cracking upslope of the overburden stockpiles as part of the routine inspections. Should the crack appear to length or widen, install in extensometer to track the crack width with monthly data readings.
Mill Site	• **(High Priority) Backfill the over-steepened slope at the toe of the highwall immediately north of the mill to ensure that the original design requirements are met (EBA 1994). Continue to place concrete jersey barriers as a protection barrier against minor rockfall.**
Camp Site	• Continue to monitor the erosion channels below the camp pad as part of the routine visual inspections and following larger rainfall events. If erosion continues, implement mitigation measures. Measures to consider include surface regrading, fill placement to direct flow away from the slope, installation of a sump/drainage system.
WSP Dam	• **(High Priority) During routine instrumentation readings, inspect and photograph the identified potential sinkhole located 5 m NW of WSPT-8 (See Photo 72 in Appendix A) to monitor for any change in condition.**

Area	Recommendations
Big Creek Bridge	• Continue regular annual monitoring of sediment accumulation in the culverts and clean out if sediments continue to accumulate. • Limit the material graded from the road at the culvert locations, or muck out some of the gravel buildup, taking care not to damage the culvert. • If the alignment of Big Creek changes and it appears that the culverts may be utilized, tree clearing and sediment removal immediately upstream and downstream of the culverts is recommended.
Main Pit Dump, SAT Dump, & In-Pit Dumps	As part of the routine visual inspections, continue to monitor the extent of the long crack in the Main Pit Dump Ramp for any changes in condition:
Area 2 Pit	Stage 2 • Continue to monitor the crests and slopes as part of the monthly visual inspection for signs of worsening cracking to determine if any slope stabilization measures are required. Stage 3 • **(Medium Priority) Implement measures to redirect runoff from the Underground Access Road away from the erosion gully that has formed into the pit (e.g. re-grade the road). Longer-term, the erosion gully should be stabilized and armored.** • **(High Priority) When the Underground Shop begins to be used again, the inspection frequency of the "Dumas Shop" survey hubs (DS-1 to DS-4) should be increased to weekly. Hubs DS-1 and DS-2 need to be repaired and recommissioned for use.** • **(Medium Priority) The Underground Shop should be inspected by a suitably qualified structural engineer to ensure it remains suitable for use.** • Continue to monitor the pit for any changes i.e. further slumping/cracking due to permafrost thaw and further instability at the area of the historical rockfall.

Note(s):

(1) High and medium priority actions are highlighted in **bold**.

(2) Low, medium, and high priority recommendations should be addressed in three years, one year, or 6 months, respectively.

This report, "2019 Geotechnical Annual Review, Minto Mine, YT", was prepared by SRK Consulting (Canada) Inc.

Ryan Williams, PEng
Senior Consultant

and reviewed by

PROFESSIONAL ENGINEER
YUKON TERRITORY
PETER H. MIKES
Aug 19/19

Peter Mikes, PEng
Principal 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.

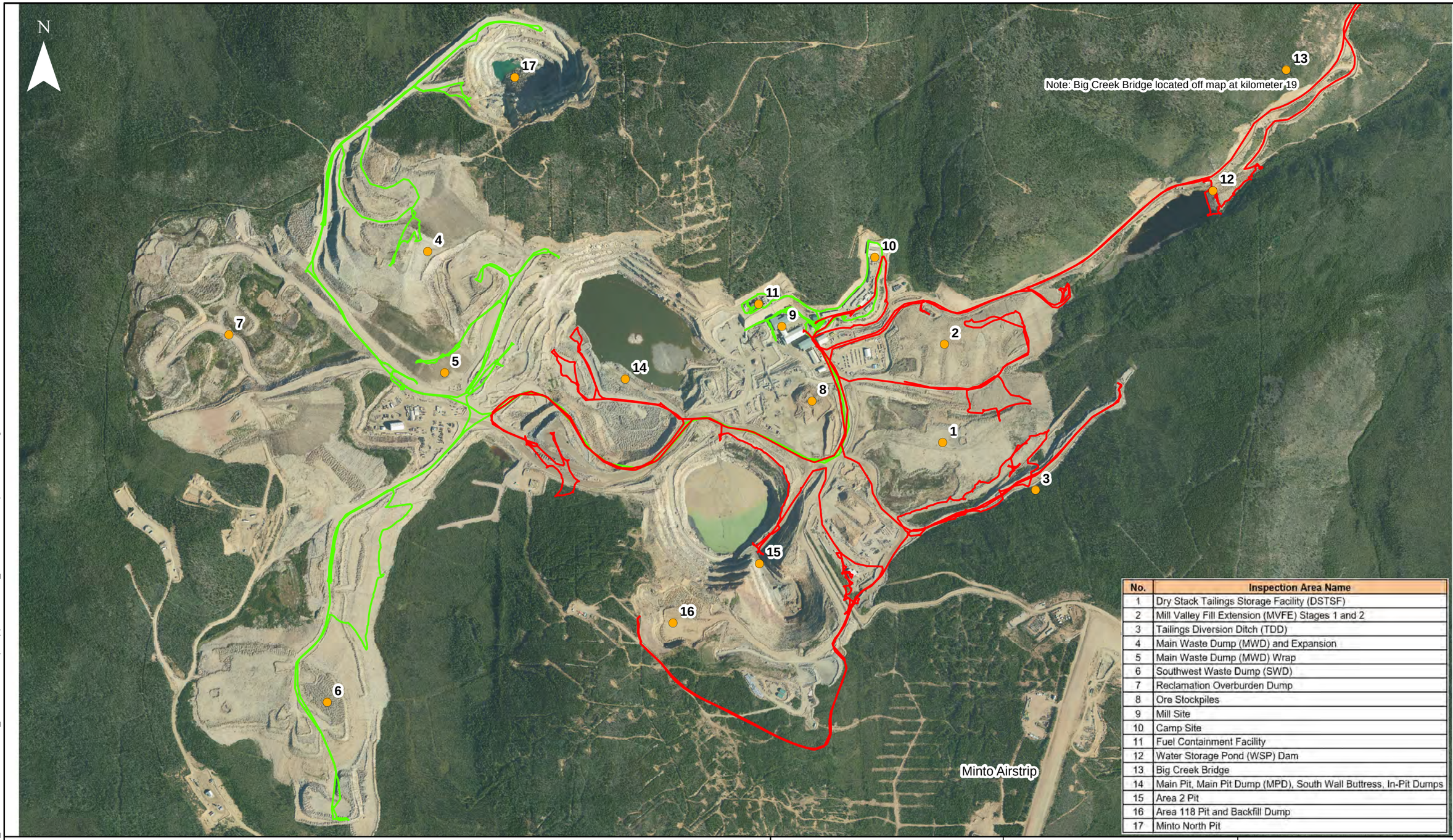
5 References

EBA, 1994. Geotechnical Evaluation for Mill & Camp site (0201-95-11509), Minto Project, Report to Minto Explorations Ltd.

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

SRK Consulting (Canada) Inc., 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



No.	Inspection Area Name
1	Dry Stack Tailings Storage Facility (DSTSF)
2	Mill Valley Fill Extension (MVFE) Stages 1 and 2
3	Tailings Diversion Ditch (TDD)
4	Main Waste Dump (MWD) and Expansion
5	Main Waste Dump (MWD) Wrap
6	Southwest Waste Dump (SWD)
7	Reclamation Overburden Dump
8	Ore Stockpiles
9	Mill Site
10	Camp Site
11	Fuel Containment Facility
12	Water Storage Pond (WSP) Dam
13	Big Creek Bridge
14	Main Pit, Main Pit Dump (MPD), South Wall Buttress, In-Pit Dumps
15	Area 2 Pit
16	Area 118 Pit and Backfill Dump
17	Minto North Pit

Legend

- Inspection Areas
- Inspection Track 2019-06-20
- Inspection Track 2019-06-19

0 125 250 500 750 Meters

Notes: 2017 Orthophoto (supplied by Minto). Coordinate System: NAD 1983 UTM Zone 8N.

srk consulting

Job No: 1CM002.066
Filename: Minto-AGI

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

Inspection Areas and Track Log

Date:	Approved:	Figure:
August 2019	RW	A-1

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Photo Locations

Observed Slump

0 62.5 125 250 m

srk consulting

Job No: 1CM002.066

Filename: Areas 1, 2, 3

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

DSTSF, MVFE and TDD Photo Locations

Date:	Approved:	Figure:
August 2019	RW	**A-2**

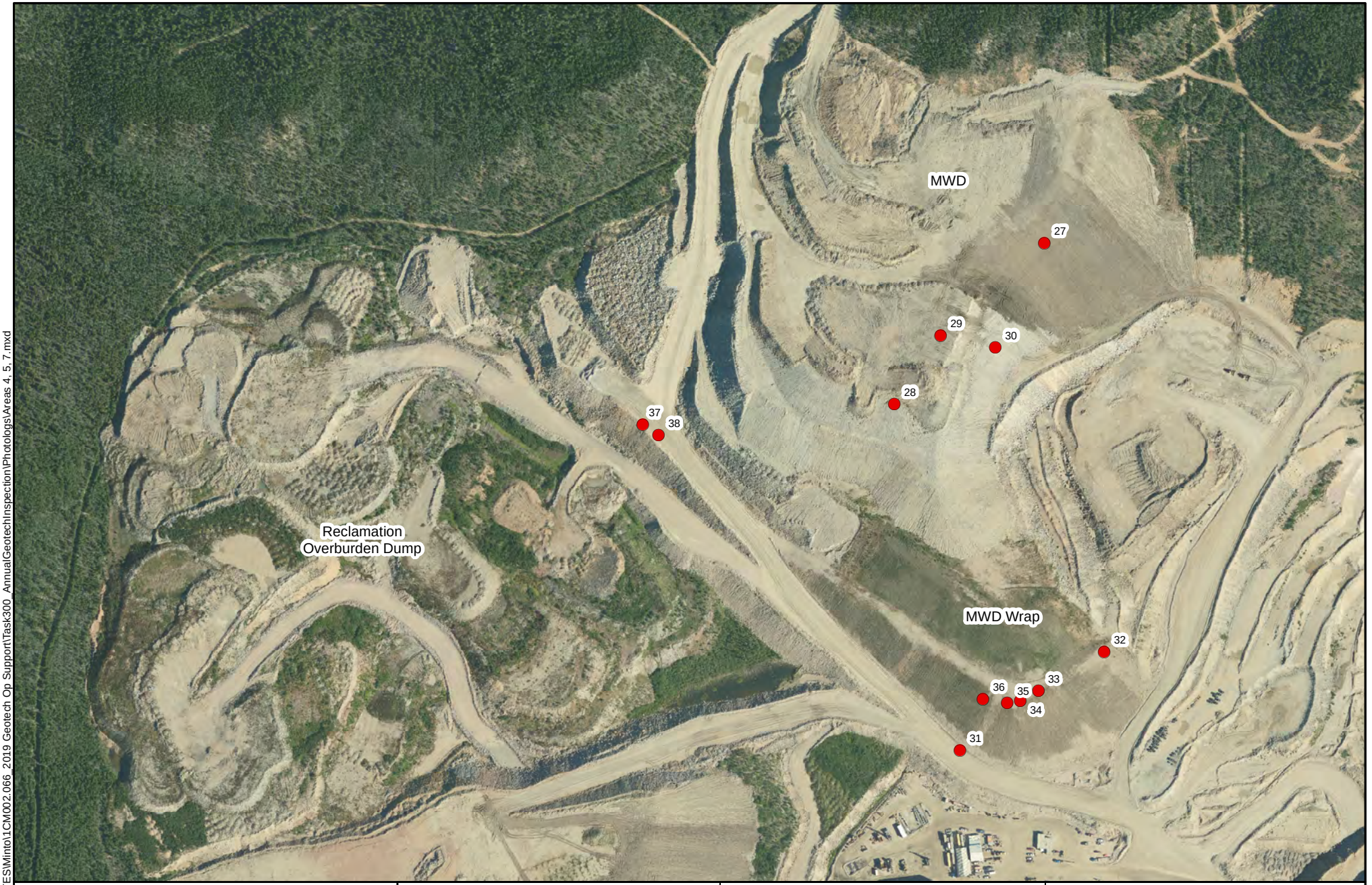

Photo Locations

0 62.5 125 250 m

srk consulting

Minto Explorations Ltd.

Site Inspection Photo Log

Main Waste Dump (MWD),
MWD Wrap &
Reclamation Overburden Dump

Job No: 1CM002.066

Filename: Areas 4, 5, 7

Minto Mine Geotechnical Annual Review

Date:	Approved:	Figure:
August 2019	RW	A-3

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Path: \\VAN-SVR0\Projects\01_SITES\Minto\1CM002.066_2019 Geotech Op Support\Task300_AnnualGeotechInspection\Photologs\Area 6.mxd

srk consulting

Minto Explorations Ltd.

Site Inspection Photo Log

Southwest Waste Dump (SWD)

Job No: 1CM002.066

Filename: Area 6

Minto Mine Geotechnical Annual Review

Date:	Approved:	Figure:
August 2019	RW	A-4

Photo Locations

0 30 60 120 m

srk consulting

Minto Explorations Ltd.

Site Inspection Photo Log

Mill Site, Camp Site & Fuel Containment Facility

Job No: 1CM002.066

Filename: Areas 9,10,11

Minto Mine Geotechnical Annual Review

Date:	Approved:	Figure:
August 2019	RW	A-5

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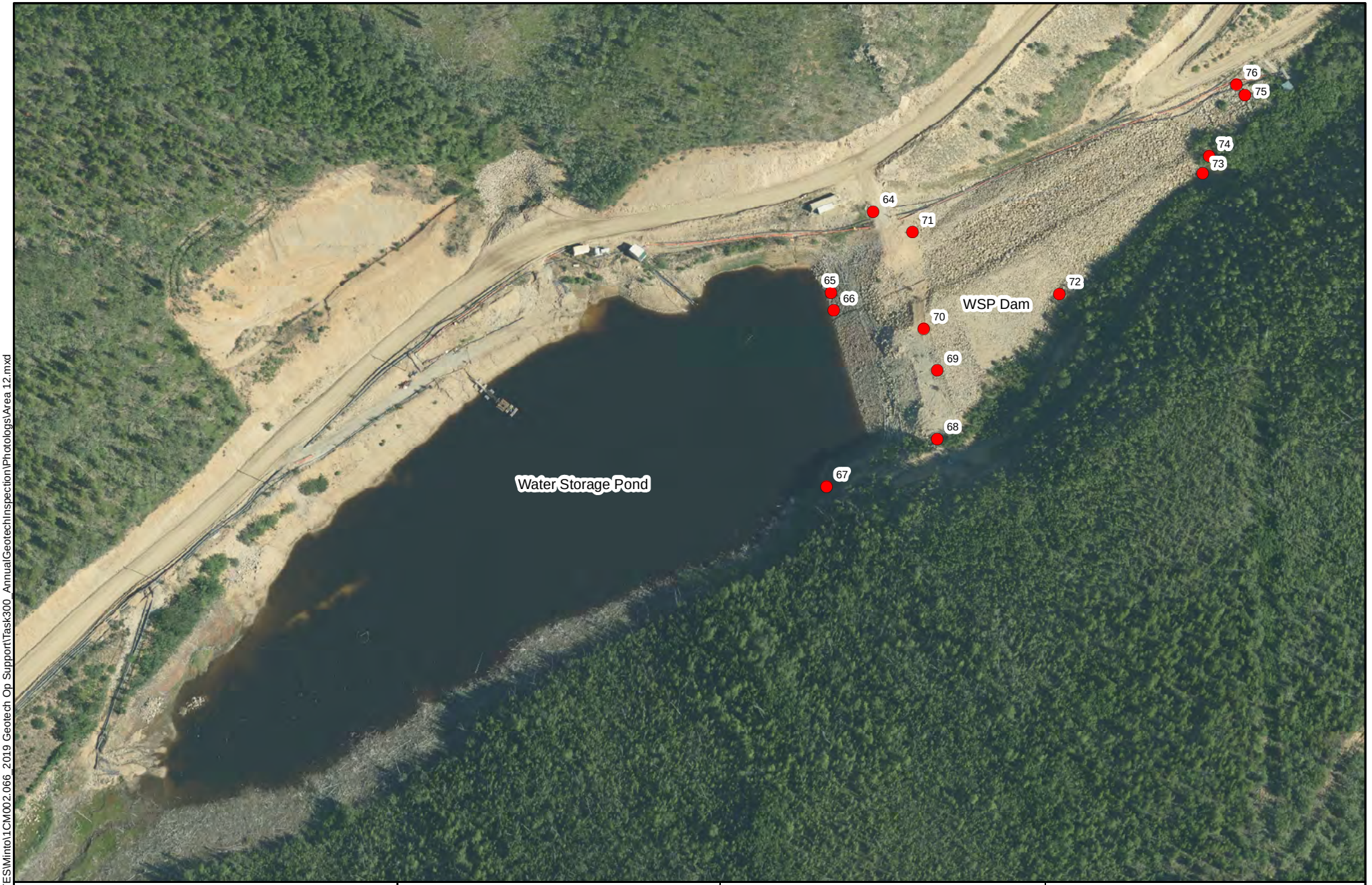

Photo Locations

0 20 40 80 m

srk consulting

Job No: 1CM002.066

Filename: Area 12

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

Water Storage Pond (WSP) Dam

Date:	Approved:	Figure:
August 2019	RW	A-6

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N

• Photo Locations

0 625 1,250 2,500 m

srk consulting

Job No: 1CM002.066

Filename: Area 13

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

Big Creek Bridge

Date:	Approved:	Figure:
August 2019	RW	A-7

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Minto Explorations Ltd.

Site Inspection Photo Log

Main Pit, Main Pit Dump (MPD), South Wall Buttress & In-Pit Dumps

Job No: 1CM002.066

Filename: Area 14

Minto Mine Geotechnical Annual Review

Date:	Approved:	Figure:
August 2019	RW	A-8

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Photo Locations

0 50 100 200 m

srk consulting

Job No: 1CM002.066

Filename: Areas 15,16

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

Area 2 Pit, Area 118 Pit & Backfill Dump

Date:	Approved:	Figure:
August 2019	RW	A-9

Photo Locations

0 30 60 120 m

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Job No: 1CM002.066

Filename: Area 17

Minto Explorations Ltd.

Minto Mine Geotechnical Annual Review

Site Inspection Photo Log

Minto North Pit

Date:	Approved:	Figure:
August 2019	RW	**A-10**

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Photo 1: Eastern corner of DSTSF (looking east)

Photo 2: Top of DSTSF from TDD road (looking west)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-11**

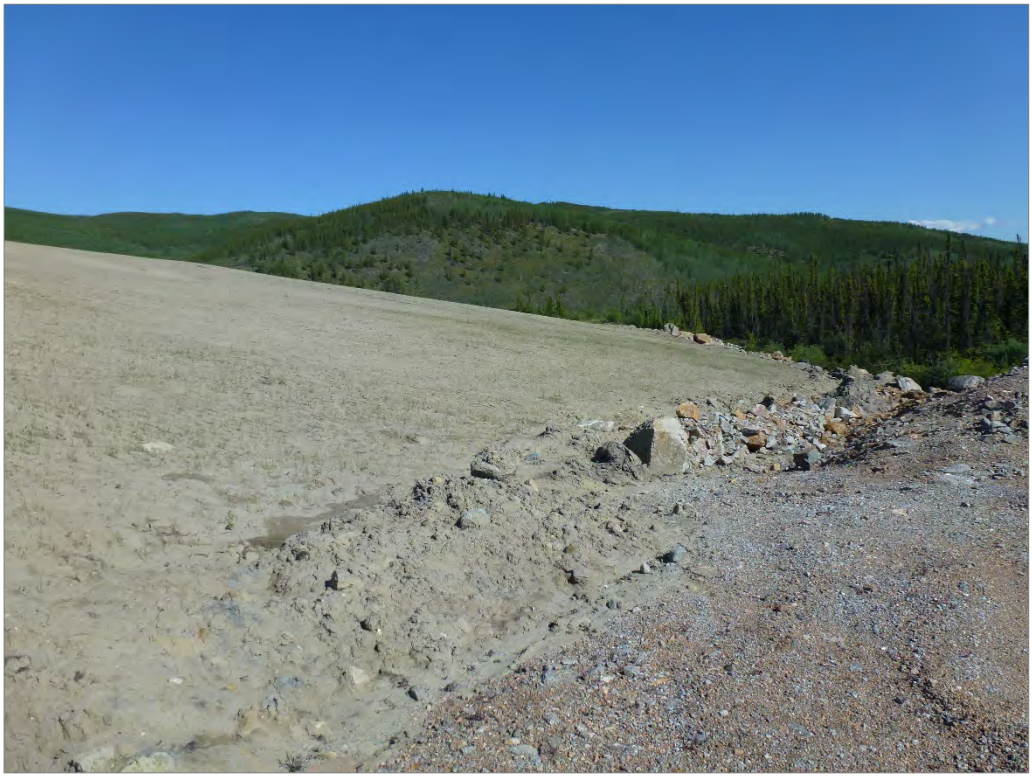


Photo 3: Covered and regraded slope of DSTSF at eastern corner

Photo 4: Observed slump and cracking at the crest (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-12**

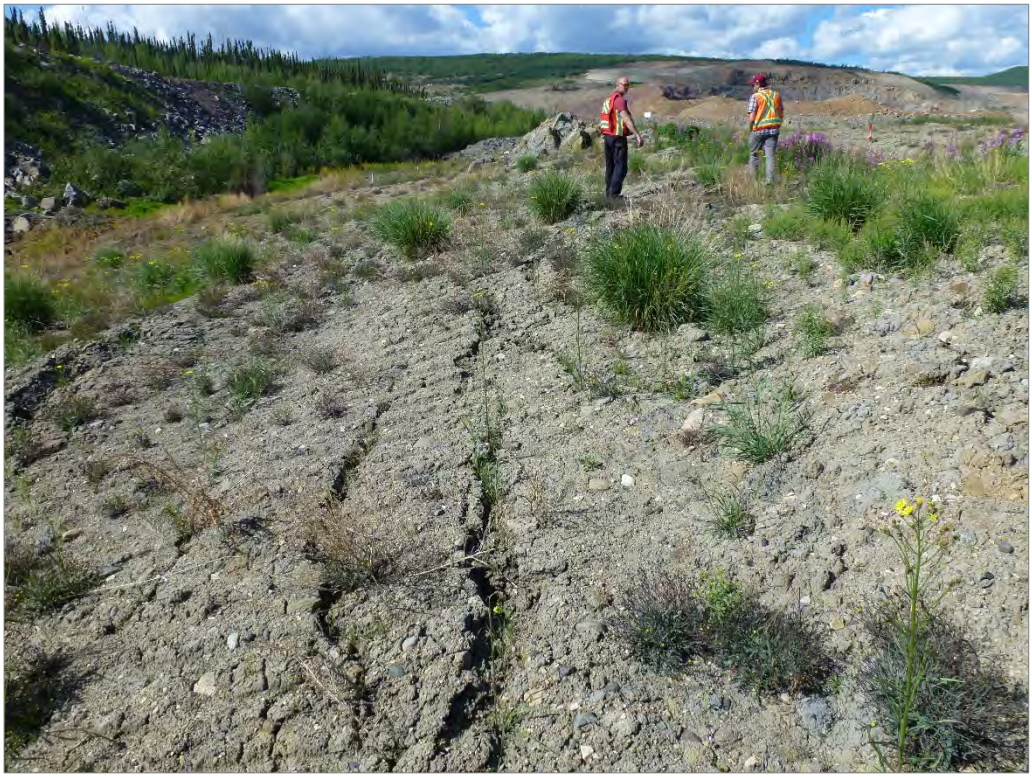


Photo 5: Settlement cracking along crest of placed cover material (looking west)

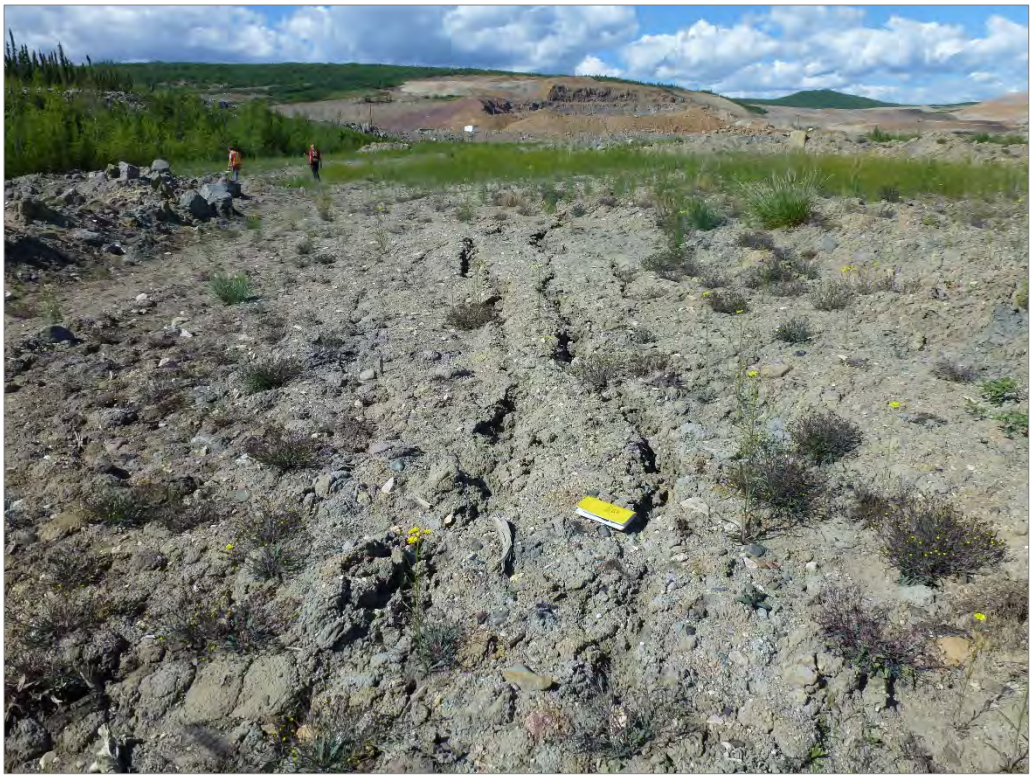


Photo 6: Settlement cracking along crest of placed cover material (looking west)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-13**

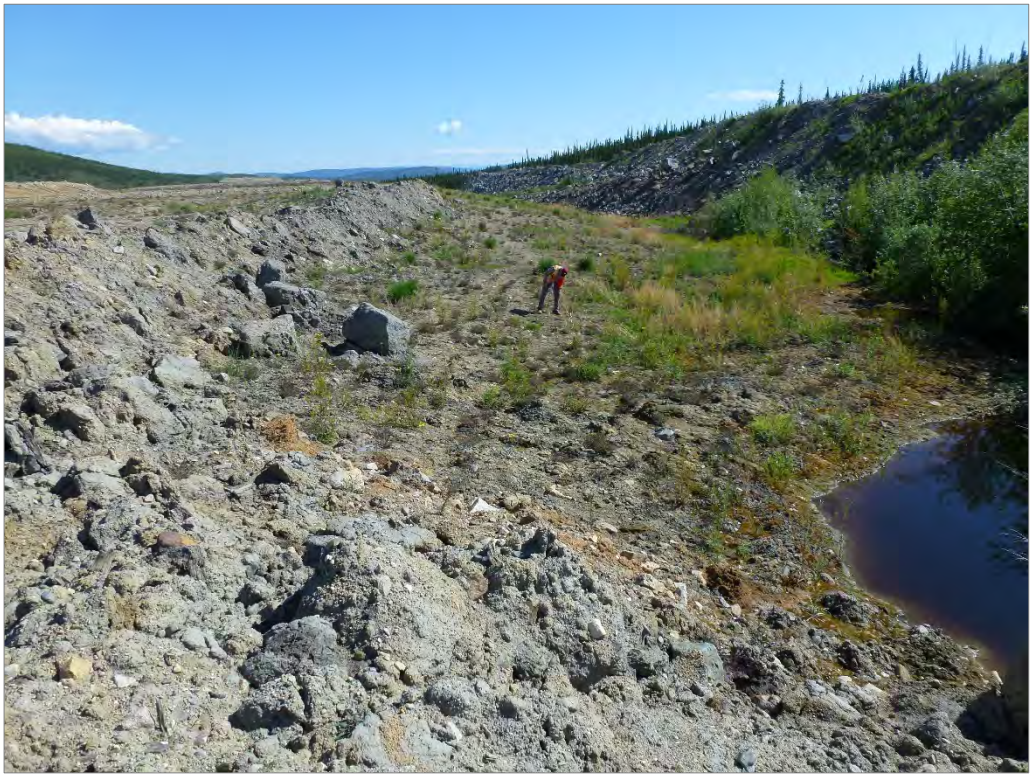


Photo 7: Portion of dry stack requiring regrading to 4H:1V closure slope (looking east)

Photo 8: Settlement cracking along crest of placed cover material (looking west)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-14**

Photo 9: Covered and regraded slope of DSTSF (looking northwest)

Photo 10: Covered and regraded slope of DSTSF (looking northeast)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-15**

Photo 11: Erosion gully forming on closure cover (looking east)

Photo 12: Multiple erosion gullies forming on closure cover (looking northwest)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Dry Stack Tailings Storage Facility (DSTSF)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-16**

Photo 13: Overview of MVFE from the camp site (looking southeast)

Photo 14: Erosion gullies – looking east towards the WSP

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Mill Valley Fill Extension (MVFE)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-17**

Photo 15: Erosion gullies (looking northeast)

Photo 16: Looking across final surface of Tier C (looking west)

Photo 17: Erosion gully (looking north)

Photo 18: Area still to be regraded close to the toe (looking west)

Photo 19: Seepage collection system downstream of the MVFE

Photo 20: Previously excavated slope into permafrost soils (looking south)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Mill Valley Fill Extension (MVFE)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-20**

Photo 21: Downstream slope of the MVFE (looking west)

Photo 22: Potential seepage at the toe of the MVFE (but still upstream of seepage collection system)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Mill Valley Fill Extension (MVFE)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-21**

Photo 23: Vegetation in TDD – looking upstream to the west

Photo 24: Vegetation in TDD – looking downstream to the east

Photo 25: TDD vegetation free – looking upstream to the west

Photo 26: TDD outlet

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Tailings Diversion Ditch (TDD)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-23**

Photo 27: MWD regraded slope (looking southeast)

Photo 28: MWD regraded slope – looking south towards Reclamation Overburden Dump

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Waste Dump (MWD)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-24**

Photo 29: Erosion gully on MWD

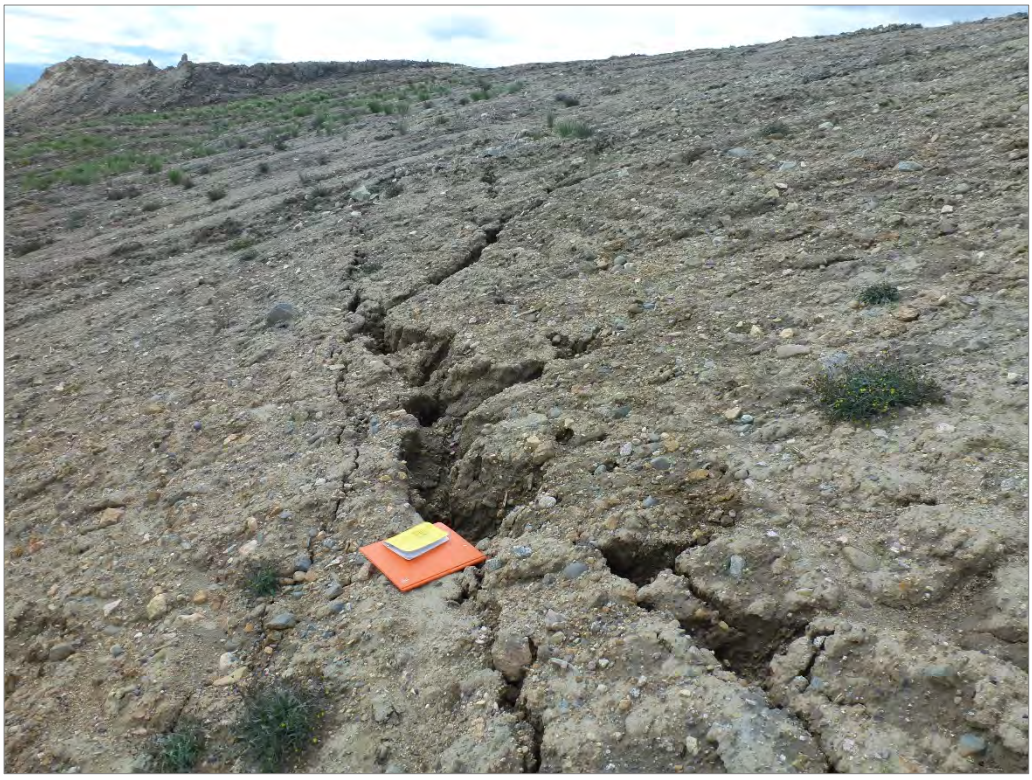


Photo 30: Longitudinal cracking

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log		
		Main Waste Dump (MWD)		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-25**

Photo 31: Toe of the MWD Wrap (looking east)

Photo 32: Cracking on the crest of the MWD Wrap (looking north)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Waste Dump (MWD) Wrap**		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-26**

Photo 33: Cracking on the crest of MWD Wrap and vegetated slope of MWD (looking north)

Photo 34: Area of differential settlement and small sinkholes (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Waste Dump (MWD) Wrap**		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-27**

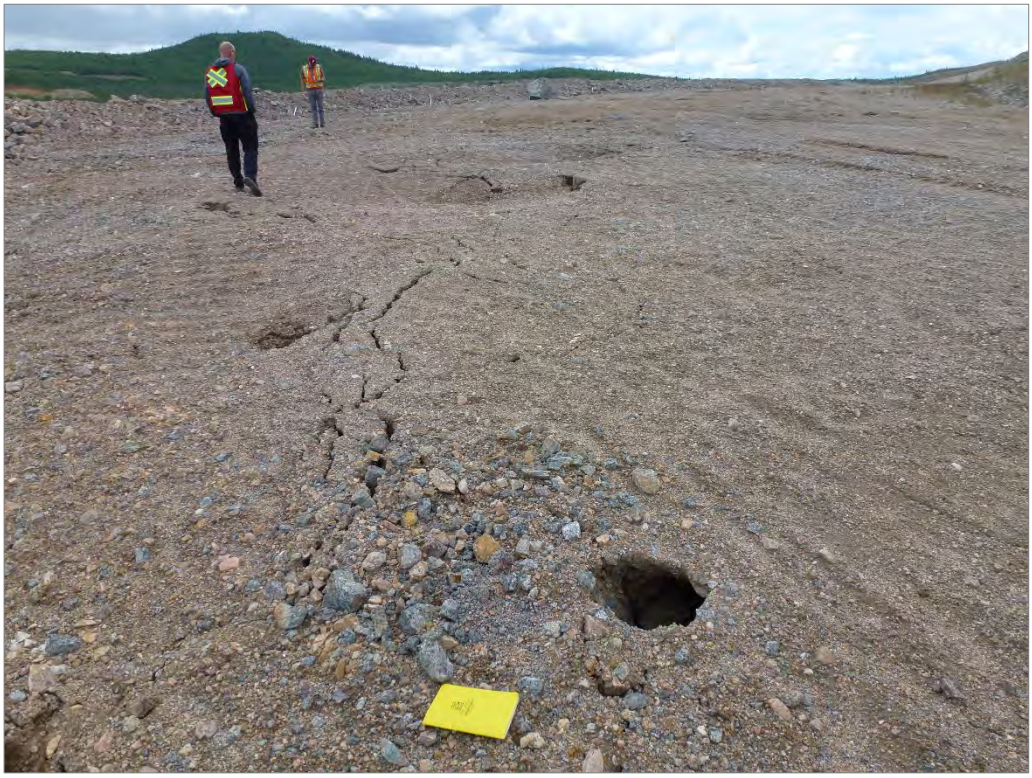


Photo 35: Small sinkholes and cracking on the crest of the MWD Wrap (looking west)

Photo 36: Additional areas of differential settlement and small sinkholes (looking west)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Waste Dump (MWD) Wrap**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-28**

Photo 37: Reclamation Overburden Dump (looking southwest)

Photo 38: Reclamation Overburden Dump (looking southeast)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Reclamation Overburden Dump**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-29**

Photo 39: Southern extent of the SWD (looking north)

Photo 40: Southern extent of the SWD (looking south)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Southwest Waste Dump (SWD)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-30**

Photo 41: Regraded slopes of the SWD (looking south)

Photo 42: Regraded slopes of the SWD (looking north)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Southwest Waste Dump (SWD)**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-31**

Photo 43: Eroded portion of the regraded slope due to the 2016 dewatering of ponded water from the area west of SWD and south of the former Ice-rich Overburden Dump

Photo 44: Looking southwest towards the SWD

Photo 45: Observed longitudinal cracking on the crest

Photo 46: Close-up of longitudinal cracking at the widest point

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log		
		Southwest Waste Dump (SWD)		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-33**

Photo 47: Highwall behind the Mill Site (looking northwest)

Photo 48: Minor slope erosion on the highwall

Photo 49: Newly installed concrete jersey barriers. Note over-excavated highwall toe.

Photo 50: Mill feed stockpile pad

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Mill Site**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-35**

Photo 51: Highwall behind the Mill Site (looking east)

Photo 52: Mill feed stockpile pad (foreground) and ore stockpile (background) – looking south)

Photo 53: Highwall behind Camp Site (looking northeast)

Photo 54: Highwall behind Camp Site (looking north)

Photo 55: Outlet channel from natural spring north of the Selkirk Towers (looking east)

Photo 56: Erosion gullies on the slopes of the Camp Site pad (looking northeast)

Photo 57: Erosion gullies with rockfill armoring on the slopes of the Camp Site pad (looking north)

Photo 58: Erosion gullies on the slopes of the Camp Site pad (looking south)

Photo 59: Fuel Containment Facility from berm crest (looking west)

Photo 60: Inside Fuel Containment Facility (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Fuel Containment Facility**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-40**

Photo 61: Inside Fuel Containment Facility (looking east)

Photo 62: Highwall behind Fuel Containment Facility (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Fuel Containment Facility**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-41**

Photo 63: Overview of the WSP from the MVFE (looking northeast). Note photo location not shown on map.

Photo 64: WSP from the upstream crest (looking southwest)

Photo 65: Minor erosion upstream of the WSP dam close to the north abutment

Photo 66: Upstream face of the WSP Dam (looking south)

Photo 67: Upstream face of the WSP Dam – looking north from the south abutment.

Photo 68: WSP Dam crest – looking north from the south abutment.

Photo 69: WSP Dam downstream slope (looking east)

Photo 70: WSP Dam spillway (looking north)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Water Storage Pond (WSP) Dam**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-45**

Photo 71: WSP Dam downstream slope (looking east)

Photo 72: Potential minor sink hole

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Water Storage Pond (WSP) Dam**		
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019	Approved: RW	Figure: **A-46**

Photo 73: Ponding seepage downstream of WSP Dam – looking back towards the downstream slope.

Photo 74: Outlet of the ponded seepage water

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Water Storage Pond (WSP) Dam**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-47**

Photo 75: Looking downstream towards the seepage collection system

Photo 76: Looking back upslope towards the WSP Dam

Photo 77: Side view of Big Creek Bridge (looking west)

Photo 78: Big Creek Bridge eastern abutment

Photo 79: Top view of Big Creek Bridge (looking west)

Photo 80: Single road culvert

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Big Creek Bridge and Culvert Crossings**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-50**

Photo 81: Single road culvert

Photo 82: Four road culverts

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Big Creek Bridge and Culvert Crossings**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-51**

Photo 83: One of the four road culverts partially deformed

Photo 84: Aerial view of the Main Pit and Area 2 Pit Stage 2. Photo taken when flying into site. Photo location not shown on map.

Photo 85: Main Pit (looking south)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Pit, Main Pit Dump (MPD), South Wall Buttress & In-Pit Dumps**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-53**

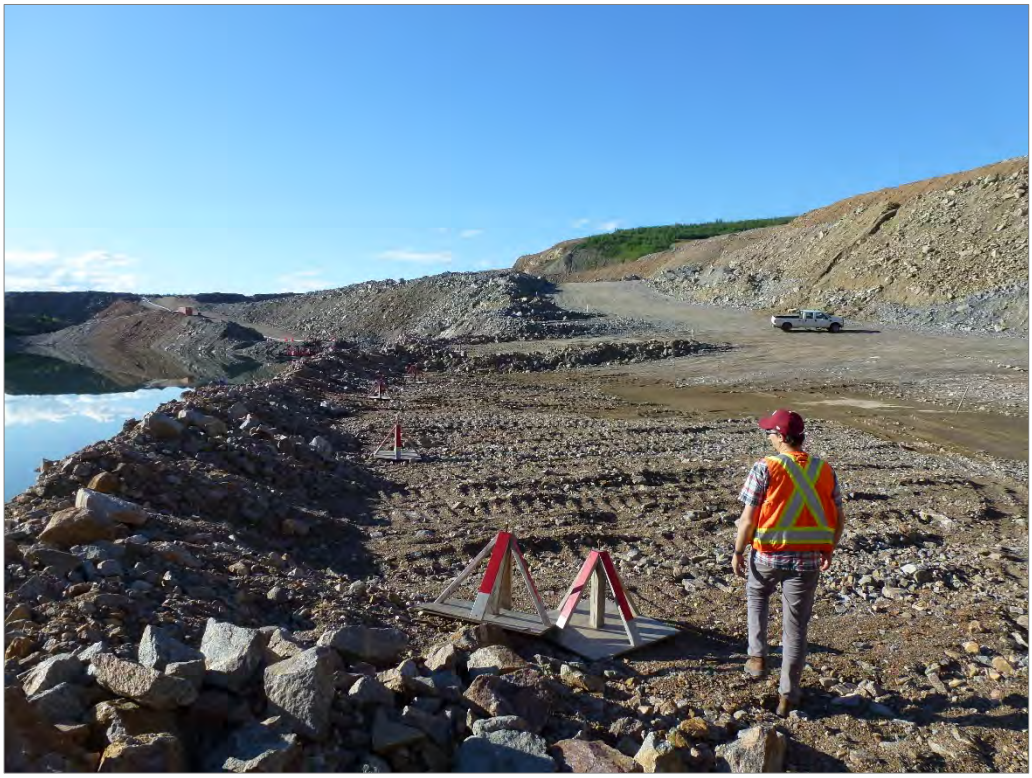


Photo 86: SAT Dump crest (looking southeast)

Photo 87: Longitudinal cracking in In-Pit Dump crest (looking northwest)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Pit, Main Pit Dump (MPD), South Wall Buttress & In-Pit Dumps**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-54**

Photo 88: Highwall above In-Pit Dump with erosion gullies

Photo 89: Crest of In-Pit Dump (looking southeast)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Pit, Main Pit Dump (MPD), South Wall Buttress & In-Pit Dumps**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-55**

Photo 90: Cracking observed where MPD has expanded (looking north)

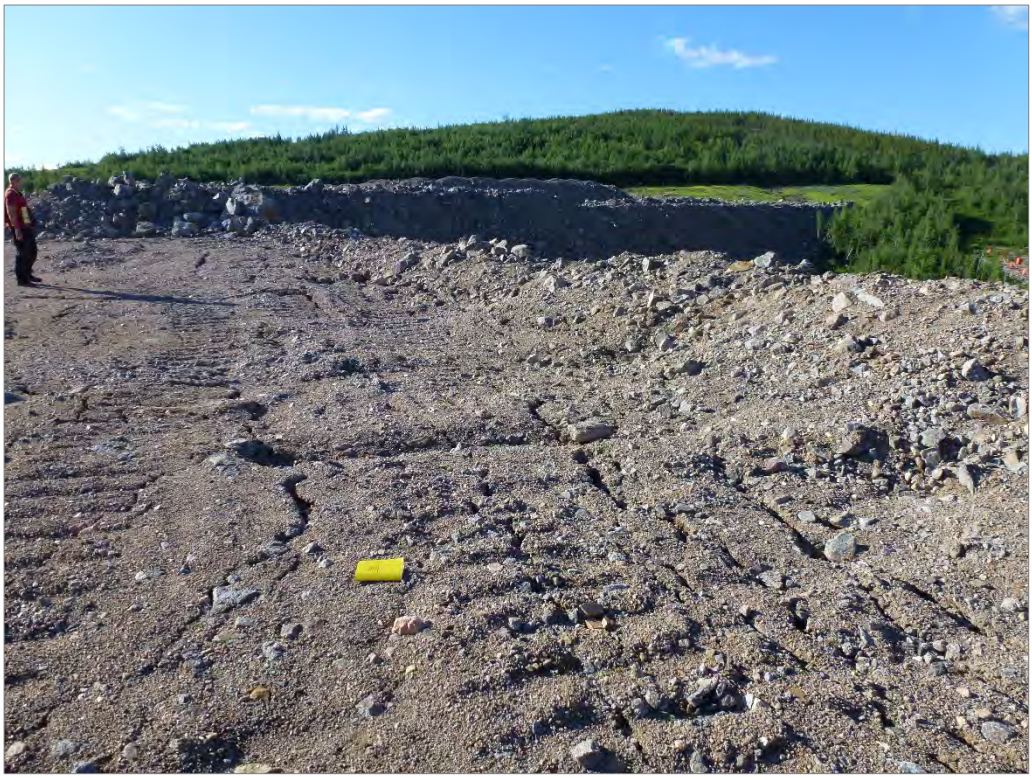


Photo 91: Further cracking in MPD (looking southeast)

Photo 92: Expanded area of MPD (looking south)

Photo 93: Further cracking in MPD crest (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Main Pit, Main Pit Dump (MPD), South Wall Buttress & In-Pit Dumps**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-57**

Photo 94: Cracking MPD (looking north)

Photo 95: View of the South Wall Buttress from the MPD crest (looking north)

Photo 96: Area 2 Pit Stage 2 backfilled with tailings (looking south)

Photo 97: Cracking observed in access road along pit rim

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Area 2 Pit**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-59**

Photo 98: Observed cracking in access road along pit rim

Photo 99: Observed cracking in access road along pit rim

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Area 2 Pit**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-60**

Photo 100: Area 2 Pit Stage 3 (looking south)

Photo 101: Slumping of the permafrost soils in the Area 2 Pit Stage 3 pit wall (looking west)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Area 2 Pit**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-61**

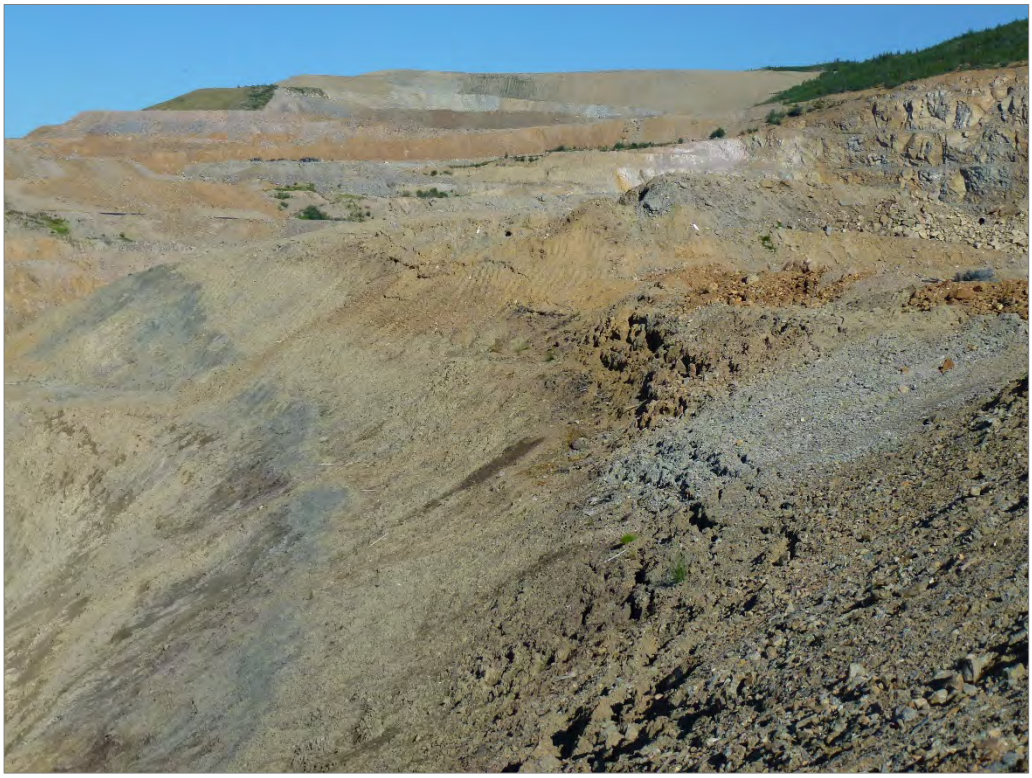


Photo 102: Tension cracking in the Area 2 Pit Stage 3 pit wall caused by slumping of the permafrost soil (looking northwest)

Photo 103: Area 2 Pit Stage 3 pit wall (looking northwest)

Photo 104: Erosion gully caused by surface water flow from upstream catchment

Photo 105: Observed settlements in the Underground Maintenance Shop adjacent to the Area 2 Pit Stage 3

Photo 106: Haul road upstream of Area 2 Pit Stage 3 with surface water diversion berm (looking south)

Photo 107: Looking downstream towards Underground Maintenance Shop. Note culvert underneath haul road.

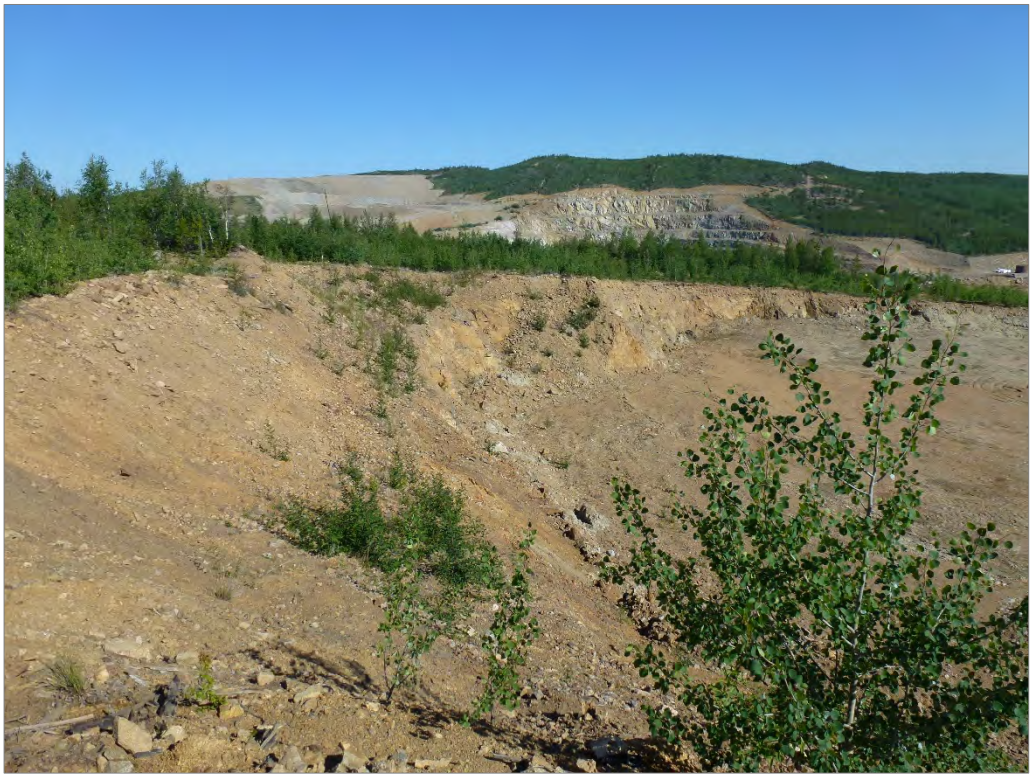


Photo 108: Area 118 Pit (looking northwest)

Photo 109: Area 118 Pit and Backfill Area (looking northeast)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Area 118 Pit and Backfill Dump**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-65**

Photo 110: Slumping observed in Backfill Area

Photo 111: Area 118 Pit and Backfill Area (looking east)

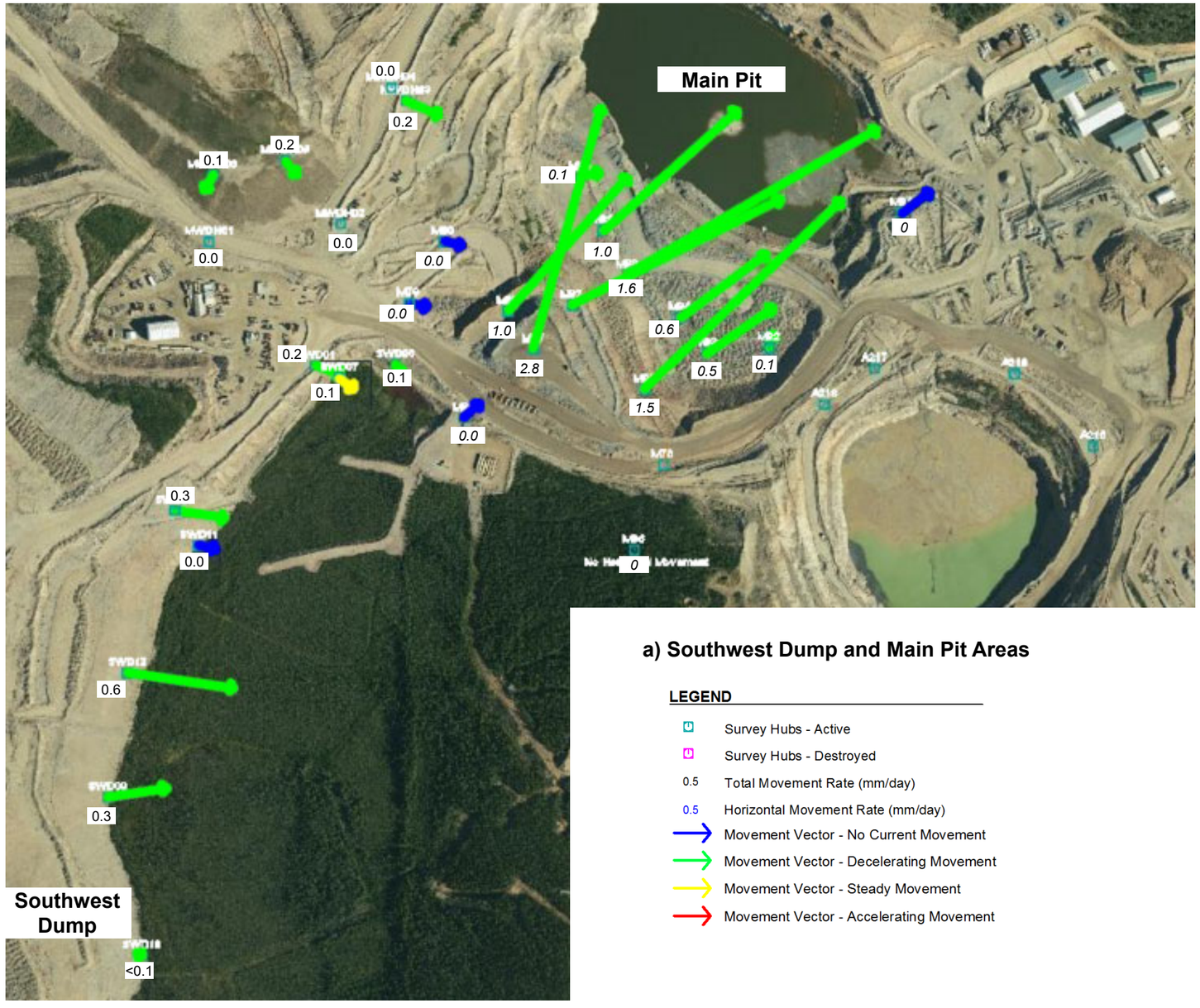
srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Area 118 Pit and Backfill Dump**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-66**

Photo 112: Previous pit wall failure in Minto North Pit (looking southwest)

Photo 113: Minto North Pit (looking east)

srk consulting	Minto Explorations Ltd.	Site Inspection Photo Log **Minto North Pit**
Job No: 1CM002.066 Filename: MintoAGI_Photolog.pptx	Minto Mine Geotechnical Annual Review	Date: August 2019 | Approved: RW | Figure: **A-67**

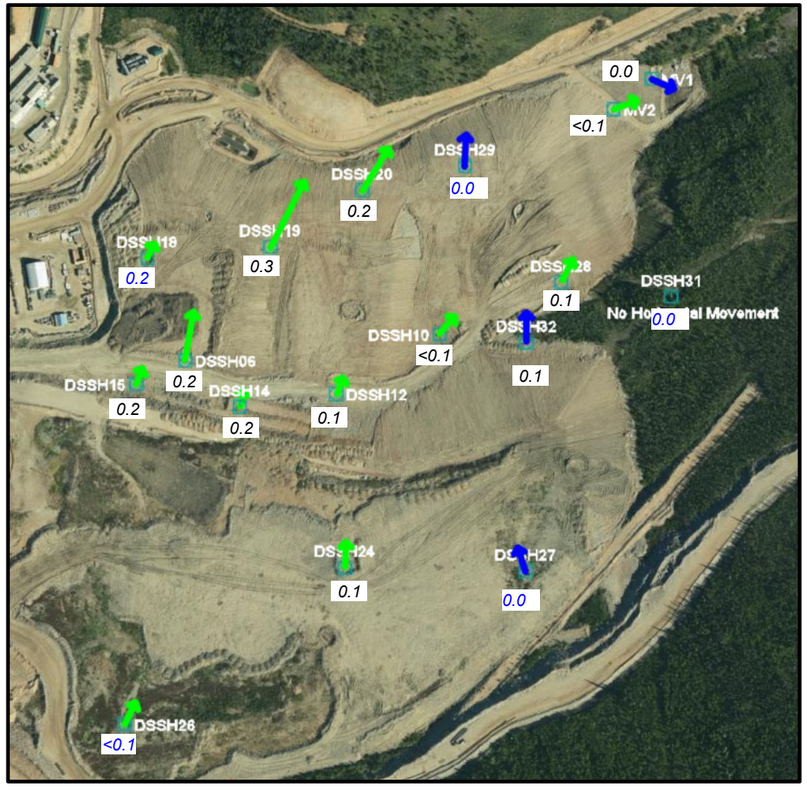
Appendix B: Survey Hub Summary



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



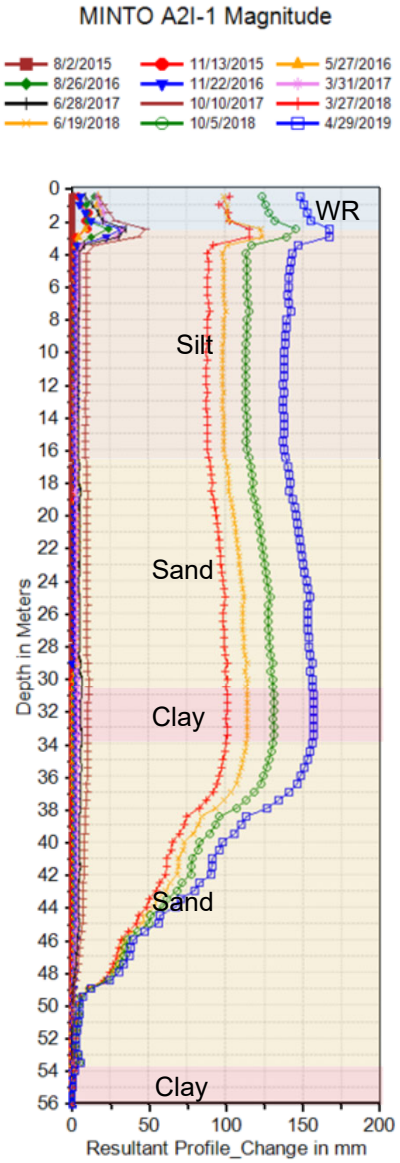
b) Dry Stack Tailings Storage Facility

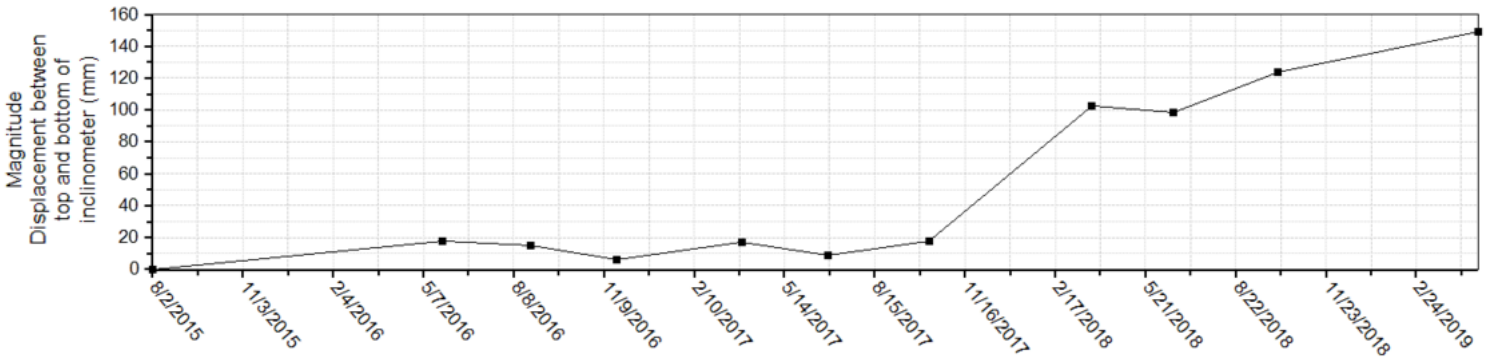
Notes:

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 2017.

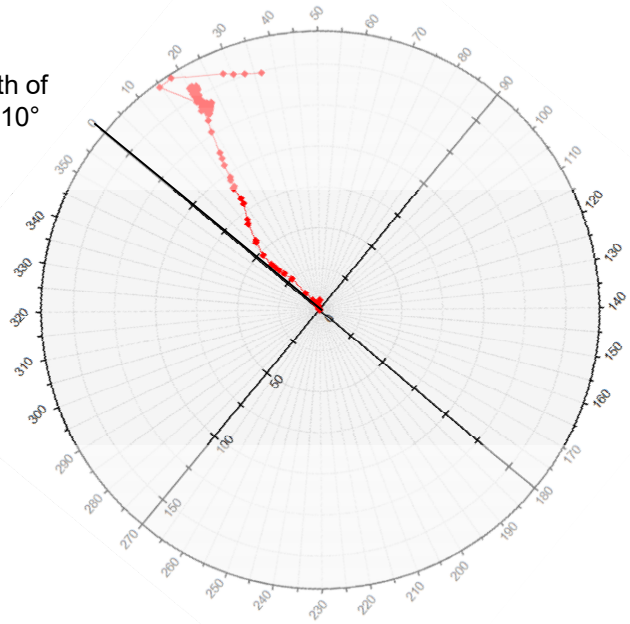
srk consulting	Minto Explorations Ltd.	2019 Survey Hub Data
		Survey Hub Summary
Job No: 1CM002.066 Filename: MintoSurveySummary11x17.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: 1

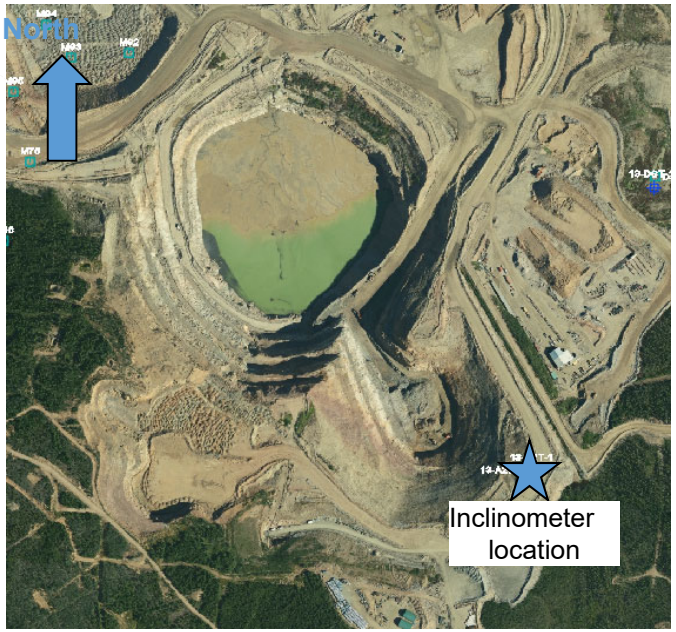
Appendix C: Area 2 Pit Instrumentation Data





Azimuth of
A0 = 310°





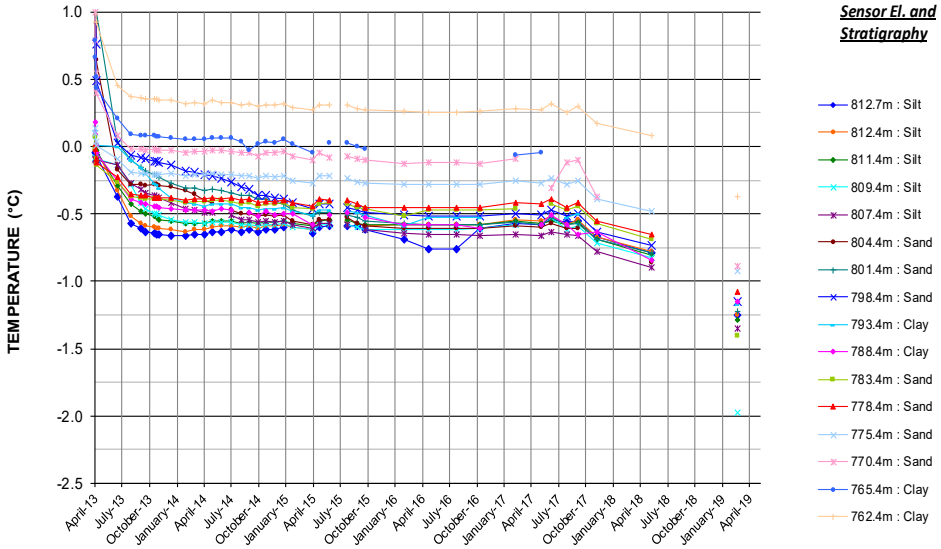
Notes

1. 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:

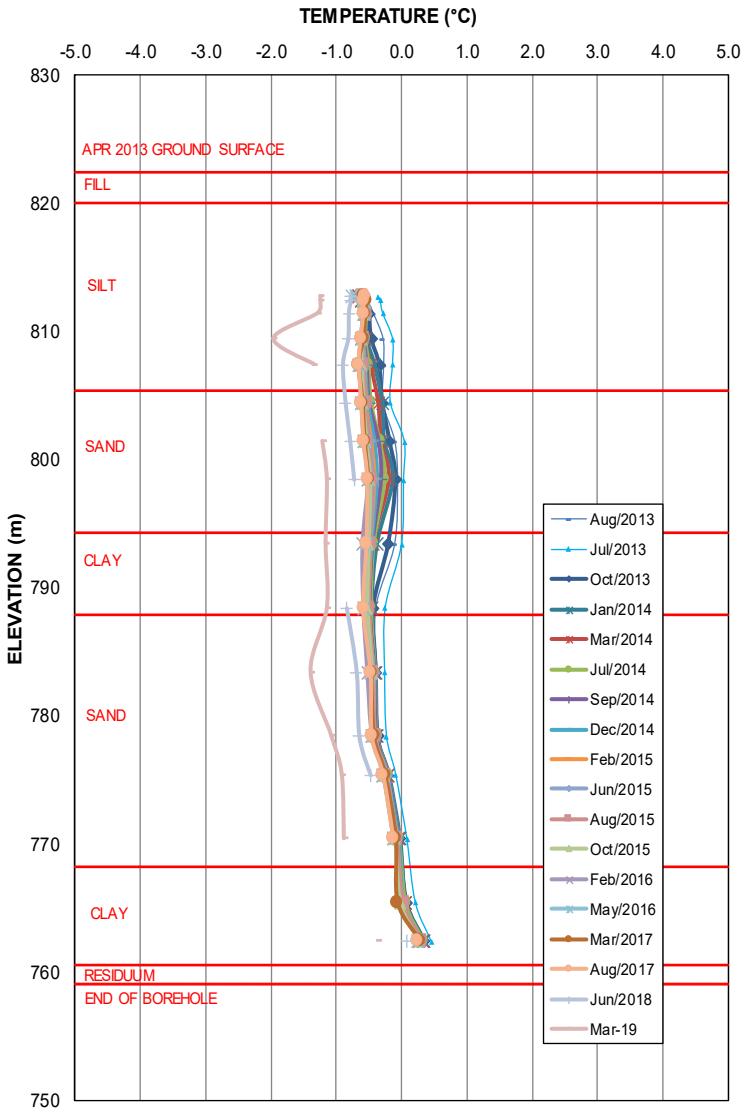
1. AutoCAD: \\VAN-SVR0\Projects\01_SITES\Minto\!040_AutoCAD\GeotechInstrumentation\GeotechInstrumentation.dwg
2. Instrumentation data: \\VAN-SVR0\Projects\01_SITES\Minto\!020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\Minto SI Instrumentation Database.dpw

srk consulting	Minto Explorations Ltd.	Area 2 Pit Instrumentation Data
		Inclinometer A2I-1
Job No: 1CM002.066 Filename: ApC_2019Area2Pit.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: 1



Notes:

1. Cooling trend observed in beginning in the fall of 2017 may be due to mining of the Area 2 Stage 3 Pit.



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2. Excel instrumentation data: \\VAN-SVR0\Projects\01_SITES\Minto\!020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\GTC + Piezometer Instrumentation – Area 2 Pit_SRK_.xlsm

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Area 2 Pit Instrumentation Data

Ground Temperature Cable – A2T-1

Job No: 1CM002.066

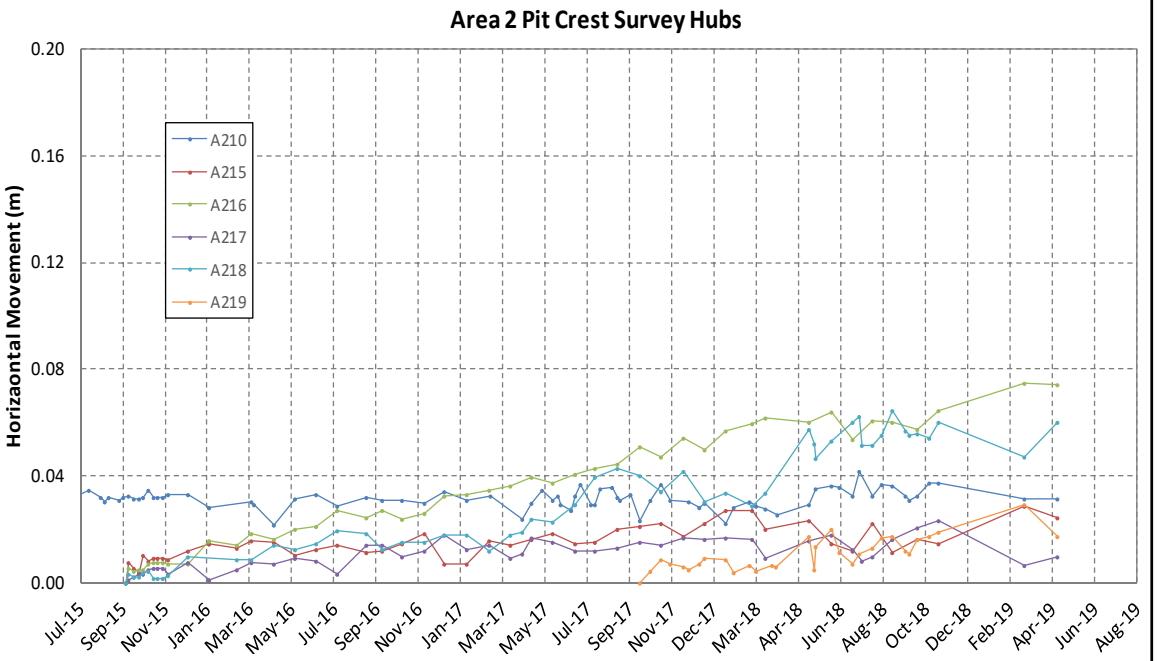
Filename: ApC_2019Area2Pit.pptx

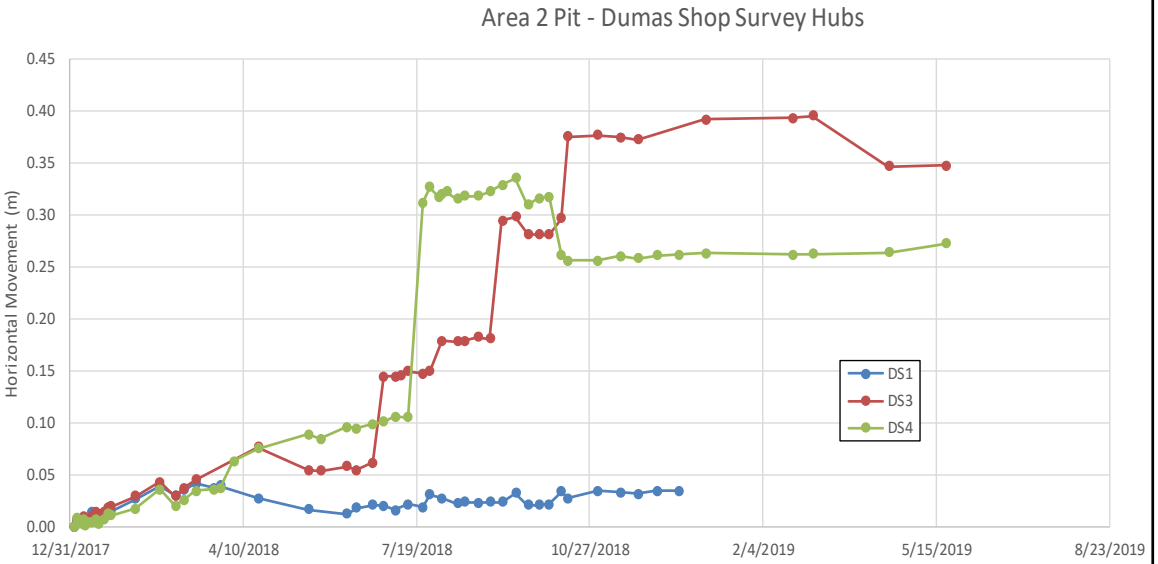
Minto Mine

Date: August 2019

Prepared by PHM

Figure: **2**





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2. Excel instrumentation data: \\VAN-SVR0\Projects\01_SITES\Minto\!020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\Area2_SurveyHubMonitoring_SRK.xlsm

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Minto Explorations Ltd.

Area 2 Pit Instrumentation Data

Survey Hubs

Job No: 1CM002.066

Filename: ApC_2019Area2Pit.pptx

Minto Mine

Date: August 2019

Prepared by PHM

Figure: 3

Appendix D: Dry Stack Tailings Storage Facility Instrumentation Data

Active Survey Hubs					
Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		May 18	May 29		
DSSH06	5/20/2019	0.3	0.2	9	Decelerating.
DSSH10	6/3/2018	0.1	<0.1	41	Decelerating.
DSSH12	5/20/2019	0.2	0.1	20	Decelerating.
DSSH14	5/20/2019	0.2	0.2	14	Slight decelerating trend observable.
DSSH15	5/20/2019	0.2	0.2	21	Slight decelerating trend observable.
DSSH18	5/20/2019	0.2	0.2	27	Slight decelerating trend observable, horizontal movement rates listed.
DSSH19	5/2/2019	0.5	0.3	27	Decelerating. Hub was removed in December 2015 when construction of the MVFES2 began, and was re-installed in August 2016.
DSSH20	5/2/2019	0.4	0.2	33	Decelerating. Movement since re-installation is primarily due to settlement.
DSSH24	5/2/2019	0.8	0.1	3	Decelerating.
DSSH26	5/2/2019	0.1	<0.1	37	Decelerating, horizontal movement rates listed.
DSSH27	5/2/2019	0.1	0.0	345	No significant horizontal movement trend
DSSH28	5/20/2019	0.2	0.1	27	Decelerating.
DSSH29	5/20/2019	0.0	0.0	61	No significant horizontal movement trend
DSSH31	5/20/2019	0.0	0.0	351	No significant horizontal movement trend
DSSH32	5/20/2019	0.1	0.0	72	No significant horizontal movement trend
MV1	5/20/2019	0.0	0.0	111	No significant horizontal movement trend
MV2	5/2/2019	0.1	<0.1	59	Decelerating

Notes:
1. Blue text indicates horizontal movement rates.

Source file: Excel instrumentation data: \\WAN-SVR0\Projects\01_SITES\Minto\020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\DSTFSurveyHubMonitoring_SRK.xlsm

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DSTSF Instrumentation Data

DSTSF Survey Hub Summary

Job No: 1CM002.066

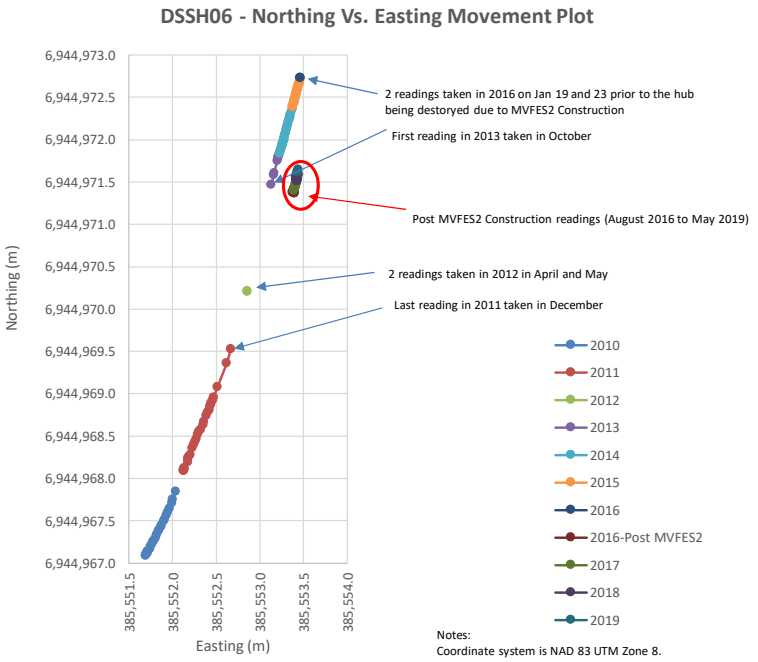
Filename: ApD_DSTSFPort.pptx

Minto Mine

Date: August 2019

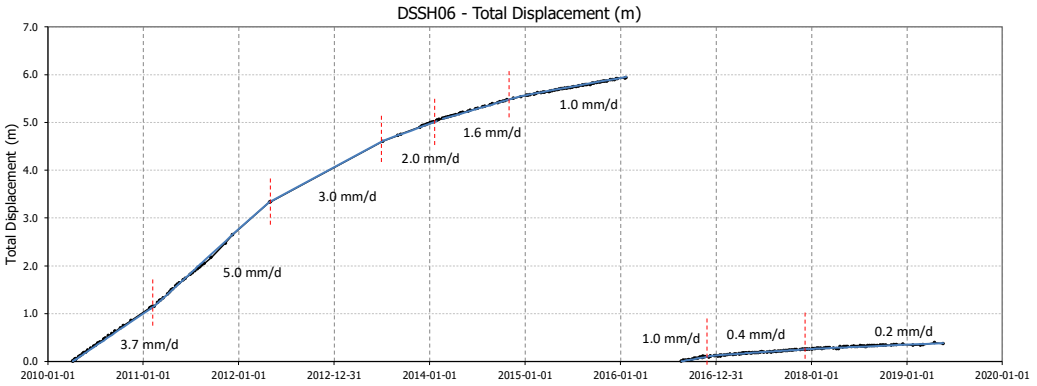
Prepared by: PHM

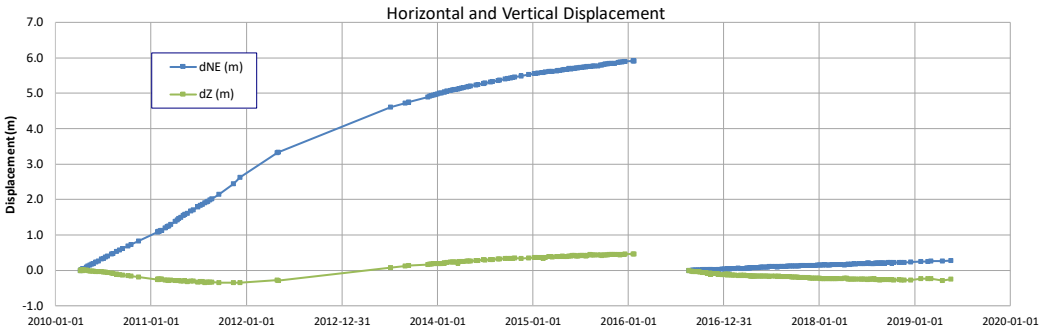
Figure: 1

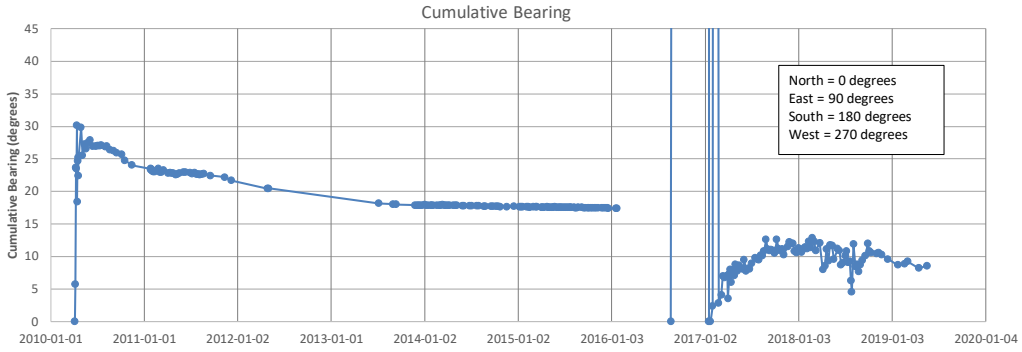


Note:

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







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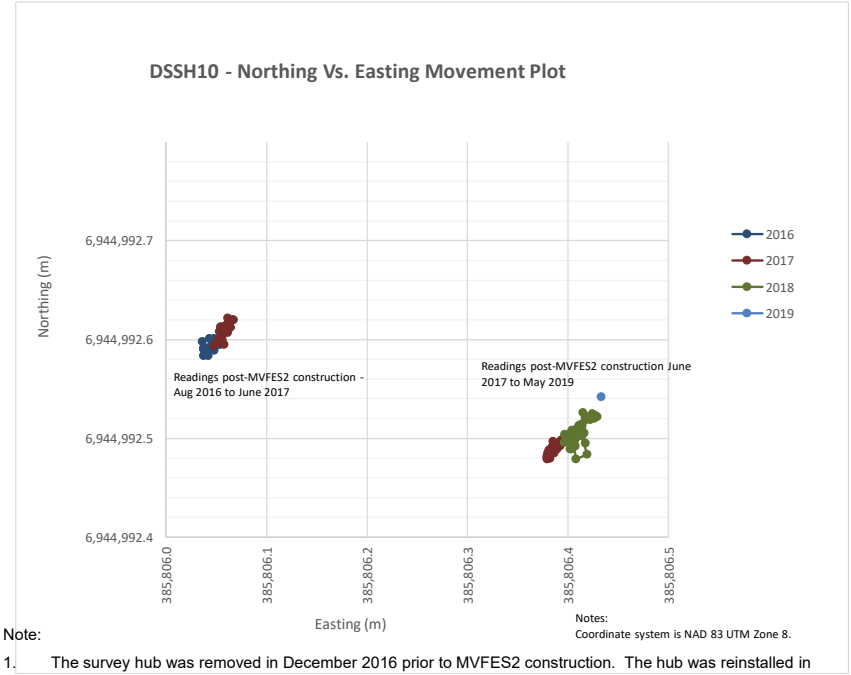
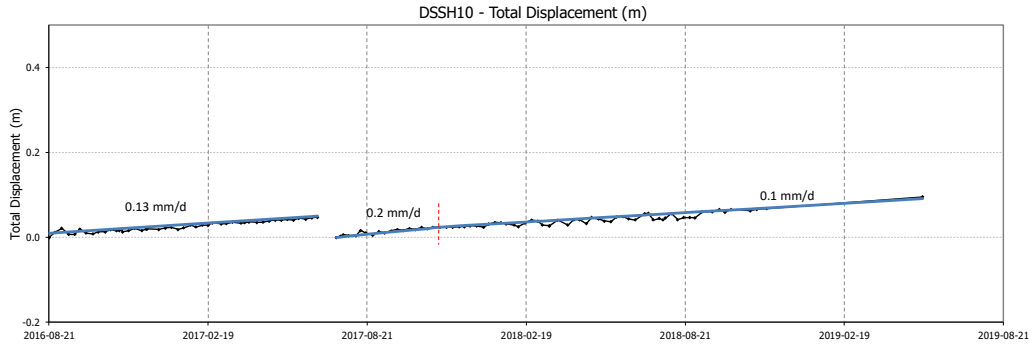
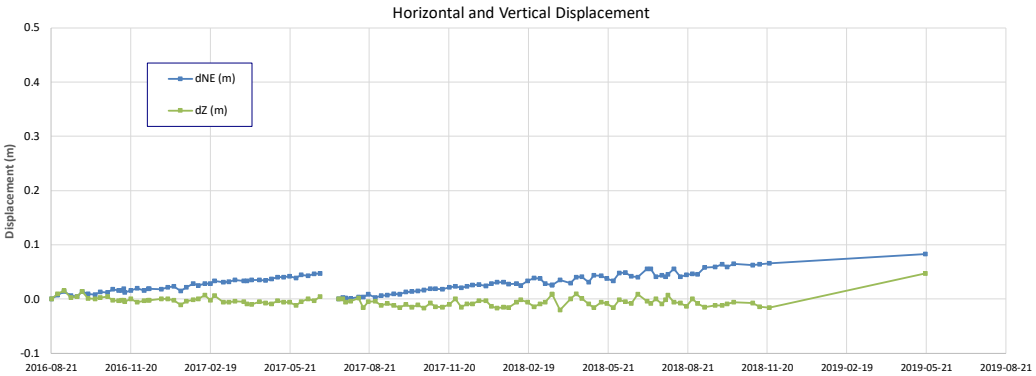
srk consulting	Minto Explorations Ltd.	DSTSF Instrumentation Data
		DSTSF – DSSH06
Job No: 1CM002.066 Filename: ApD_2019DSTSFLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by PHM / Figure: **2**

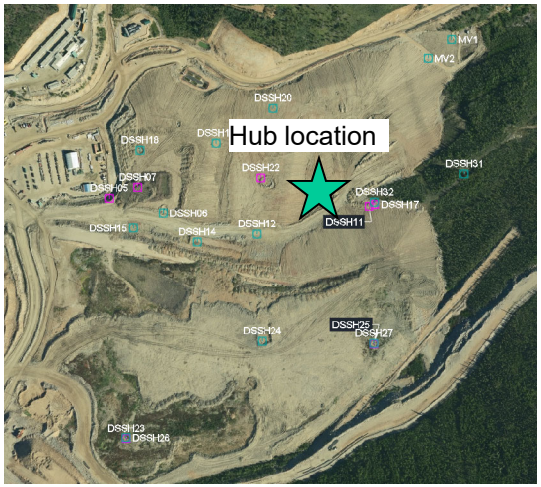


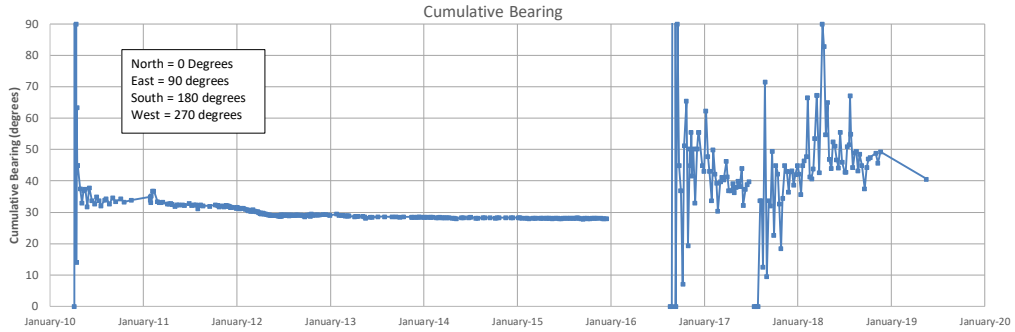
Note:

1. The survey hub was removed in December 2016 prior to MVFES2 construction. The hub was reinstalled in August 2016 following completion of construction and was repositioned in June 2017.









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Minto Explorations Ltd.

DSTSF Instrumentation Data

Survey Hub – DSSH10

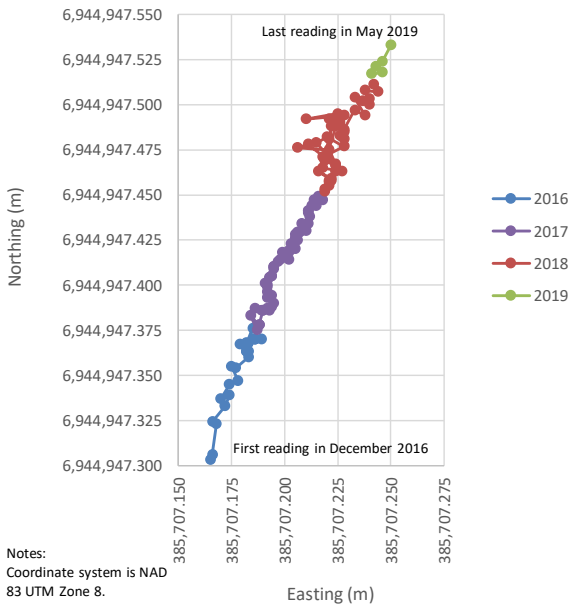
Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	3

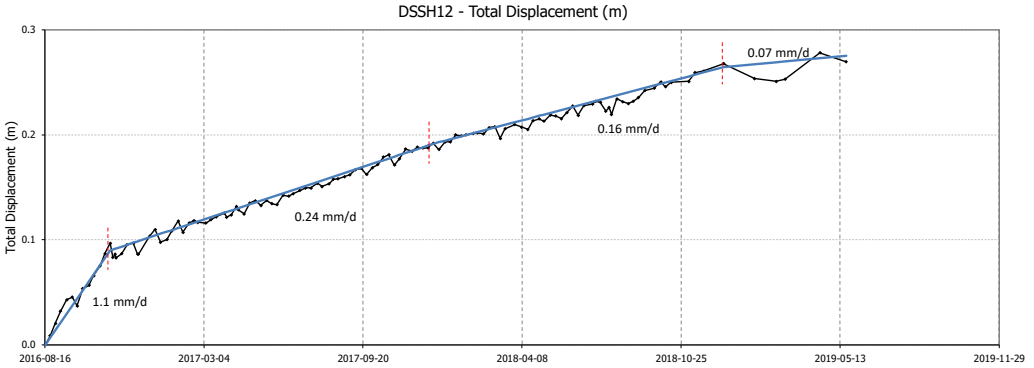
DSSH12 - Northing Vs. Easting Movement Plot

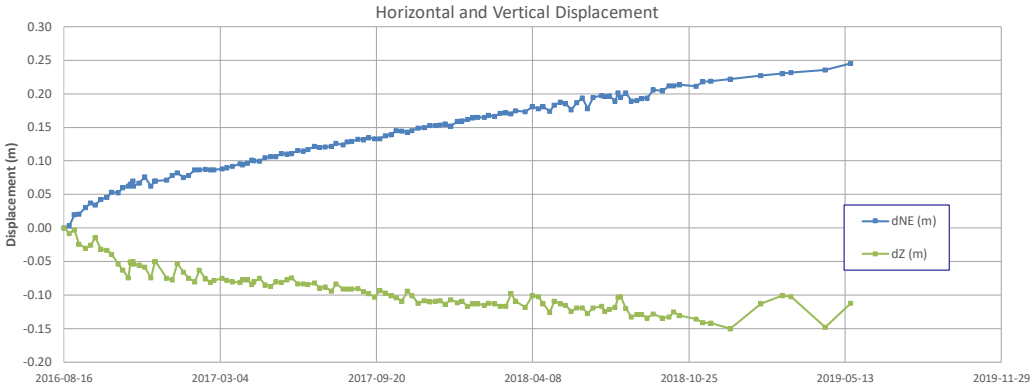


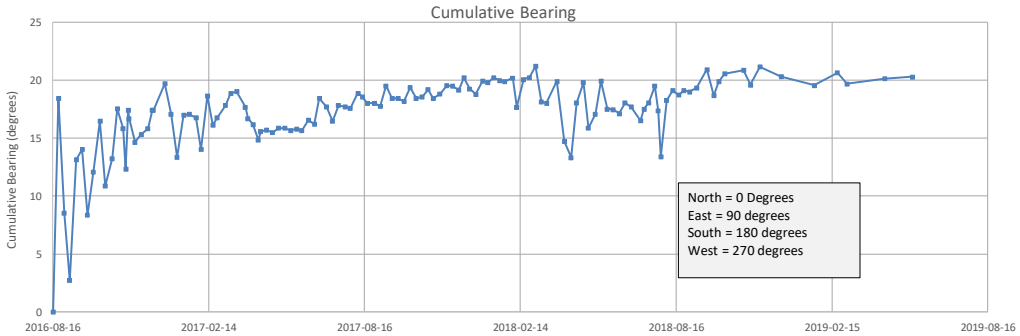
Notes:
Coordinate system is NAD 83 UTM Zone 8.

Note:

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







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DSTSF Instrumentation Data

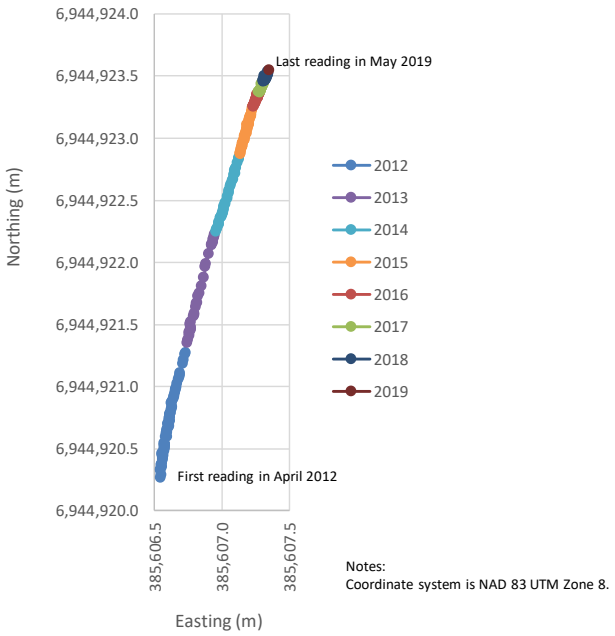
Survey Hub – DSSH12

Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

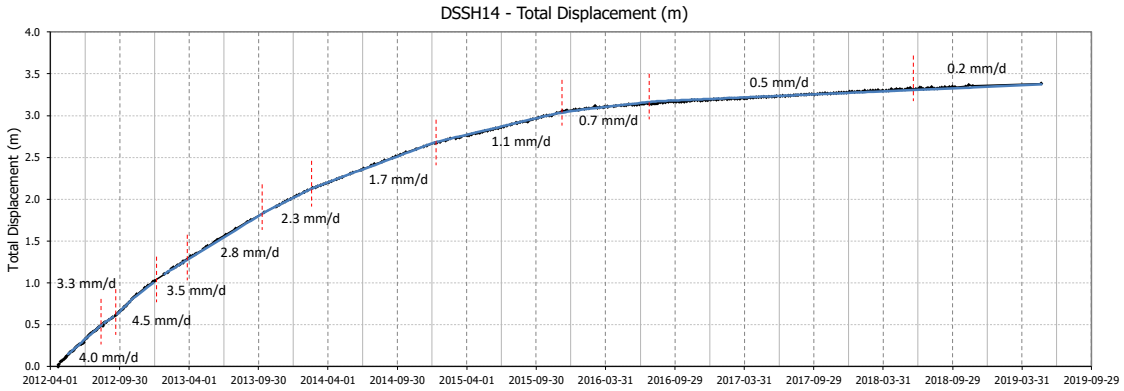
Minto Mine

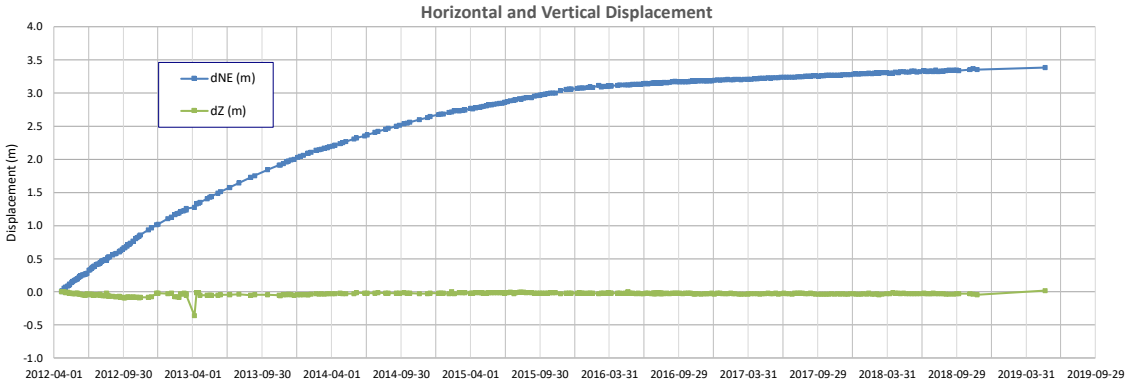
Date: August 2019 | Prepared by: PHM | Figure: **4**

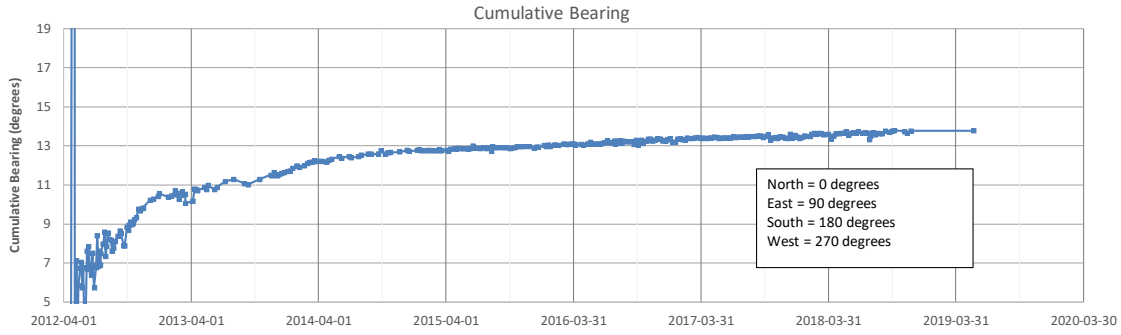
DSSH14 - Northing Vs. Easting Movement Plot



Notes:
Coordinate system is NAD 83 UTM Zone 8.







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Minto Explorations Ltd.

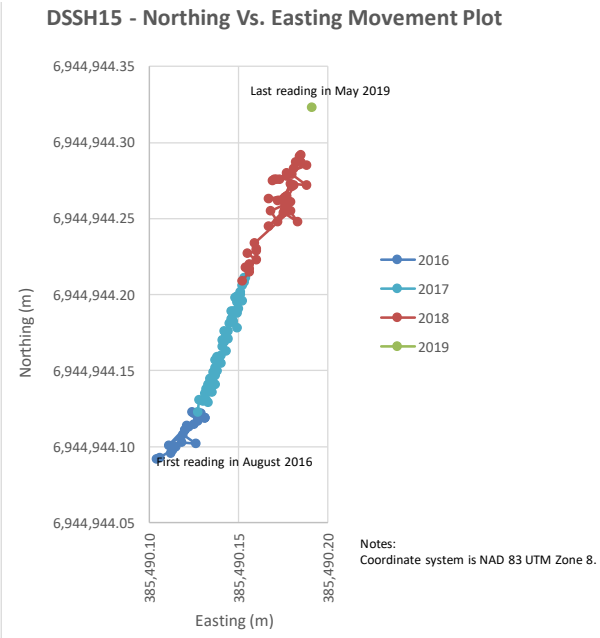
DSTSF Instrumentation Data

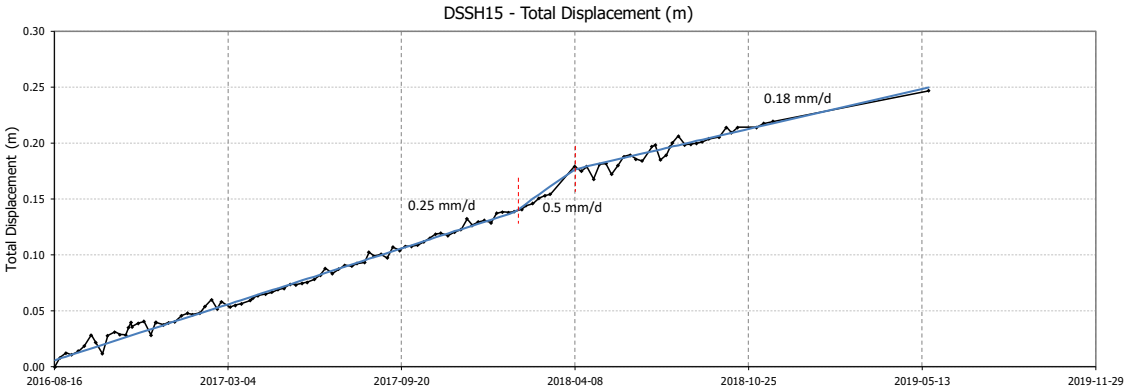
Survey Hub – DSSH14

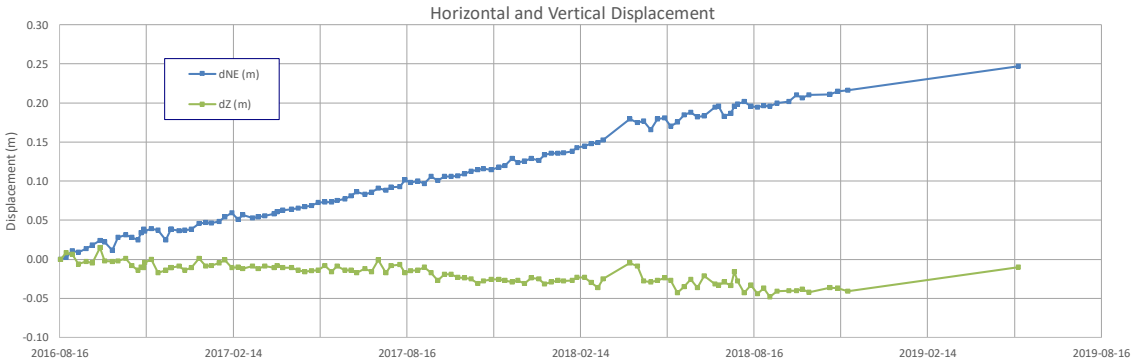
Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019 | Prepared by: PHM | Figure: **5**

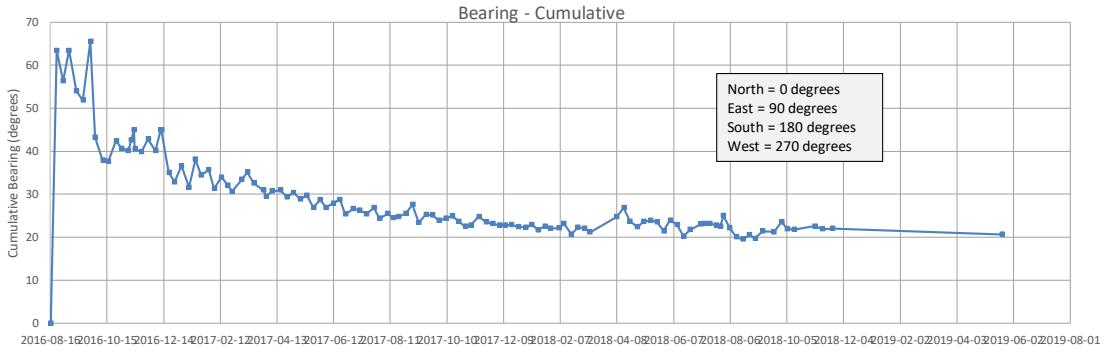






Note:

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



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Minto Explorations Ltd.

DSTSF Instrumentation Data

Survey Hub – DSSH15

Job No: 1CM002.066

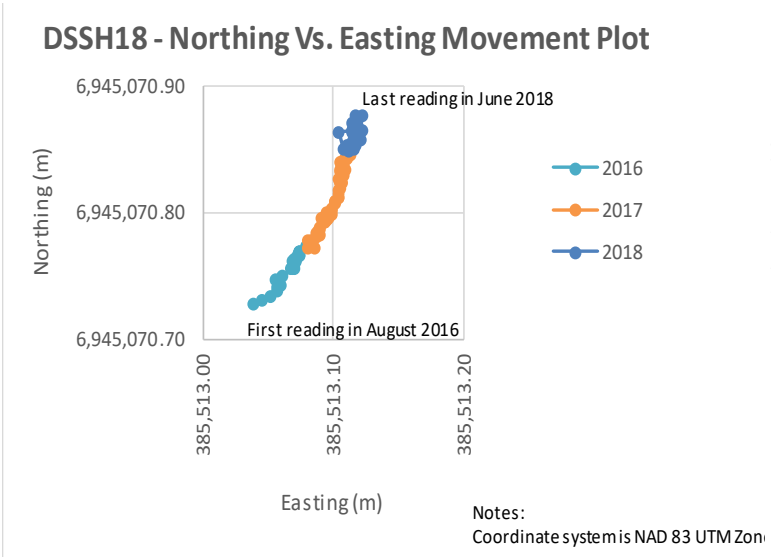
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019

Prepared by PHM

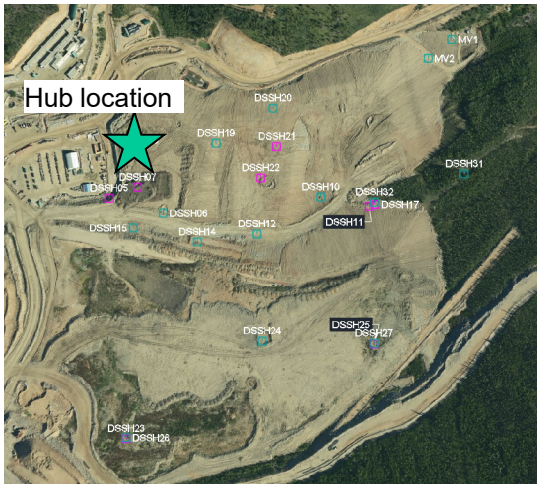
Figure: **6**

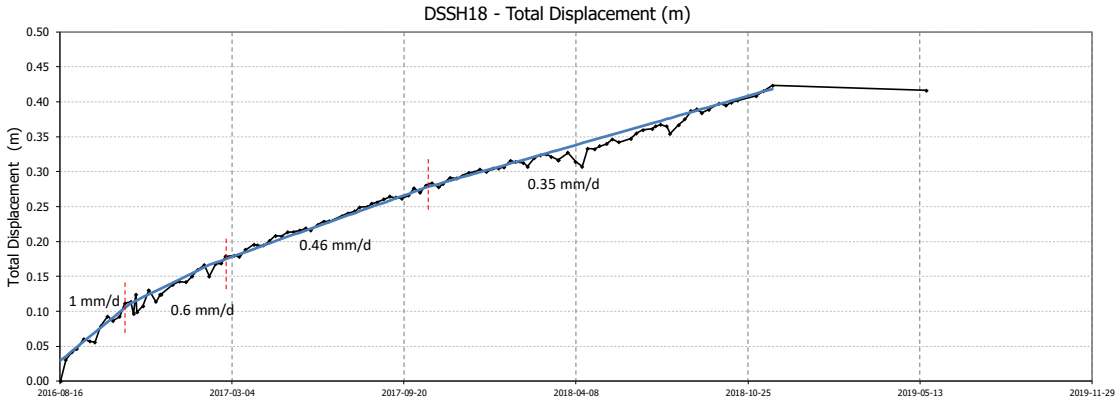


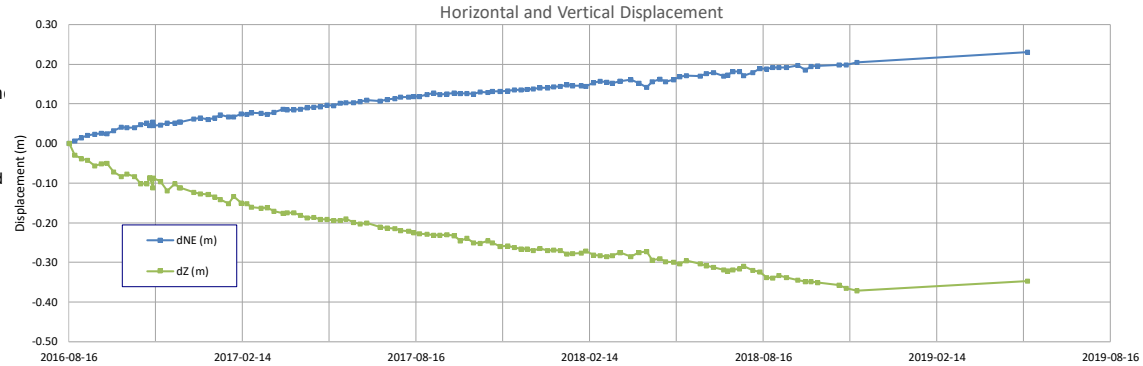
Notes:
Coordinate system is NAD 83 UTM Zon

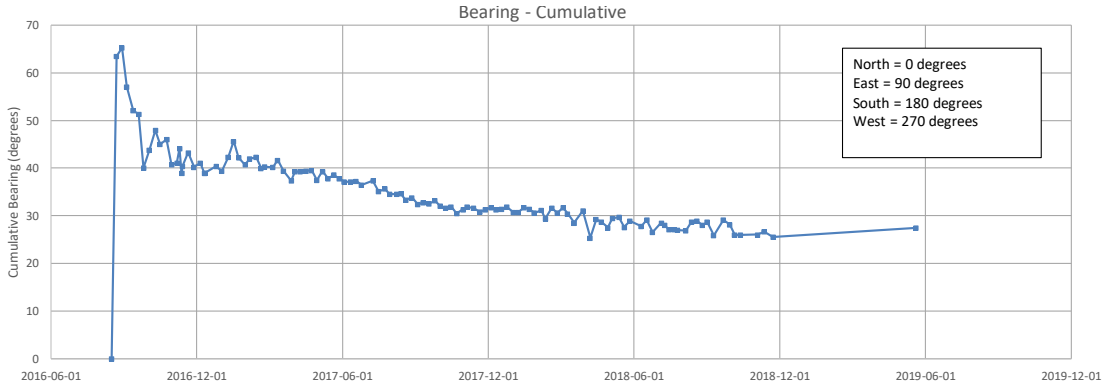
Note:

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









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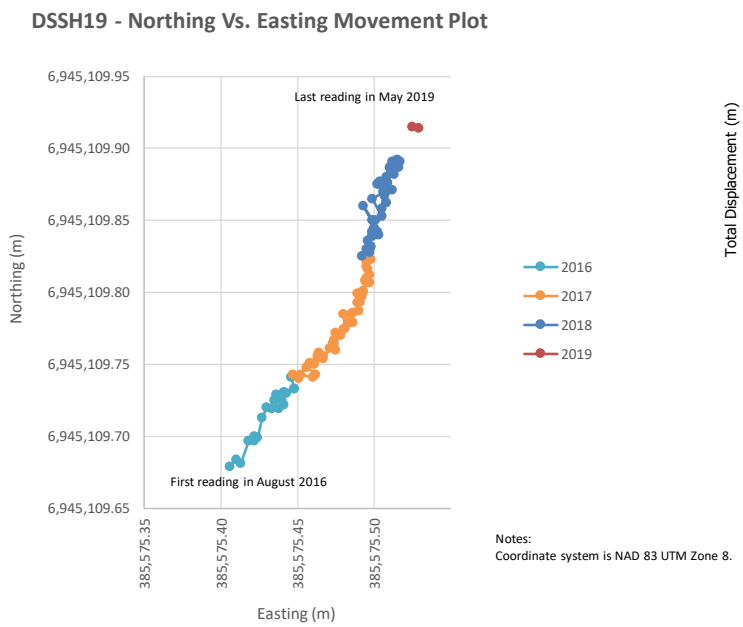
DSTSF Instrumentation Data

Survey Hub – DSSH18

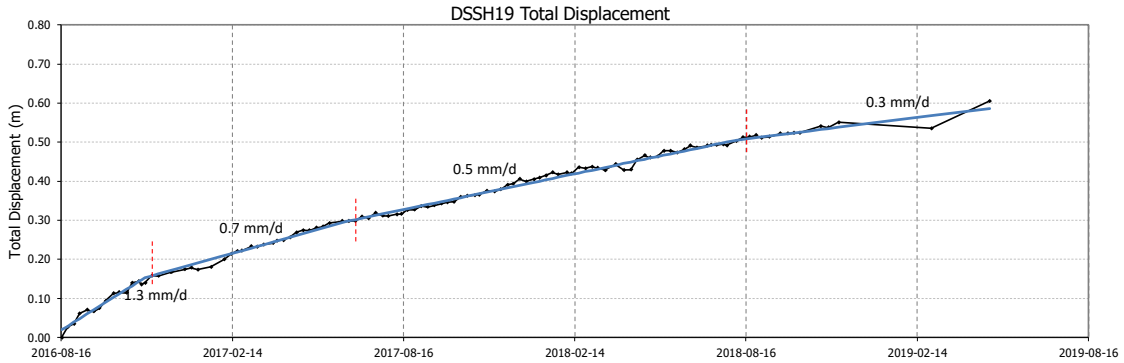
Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

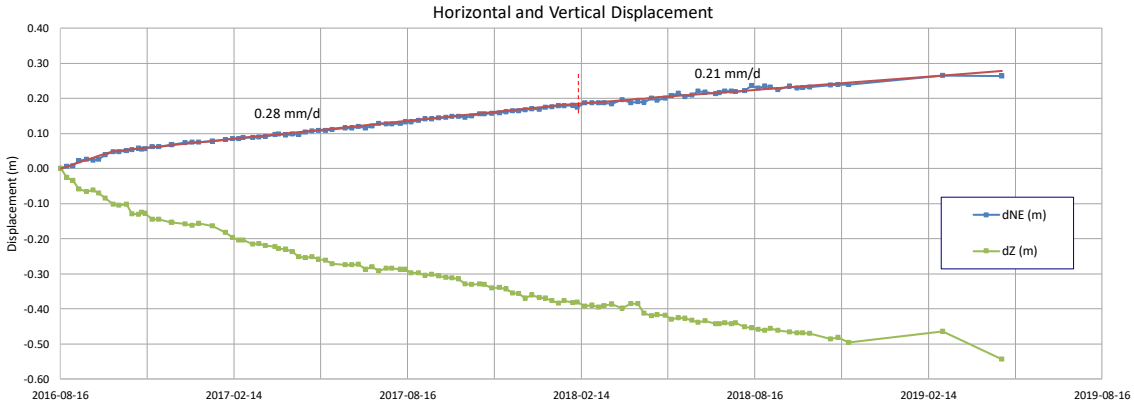
Minto Mine

Date: August 2019 | Prepared by PHM | Figure: 7



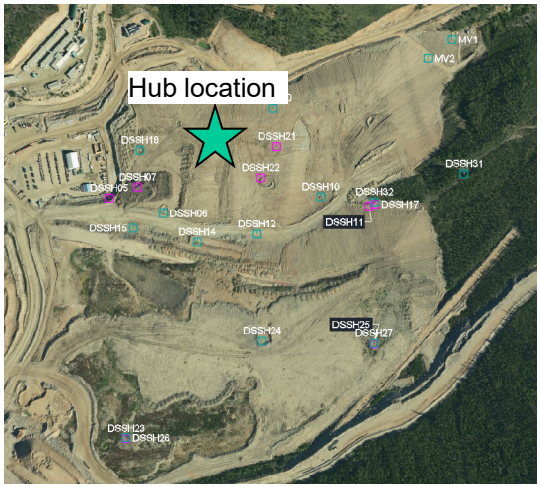
Notes:
Coordinate system is NAD 83 UTM Zone 8.

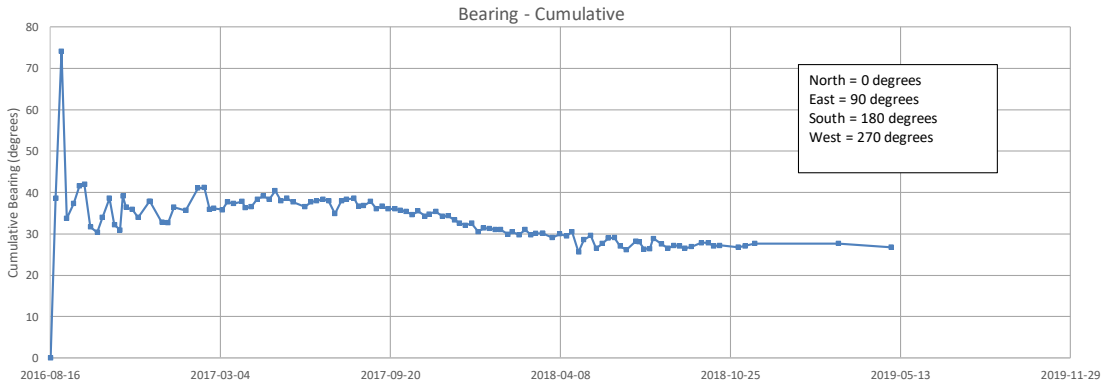




Note:

1. 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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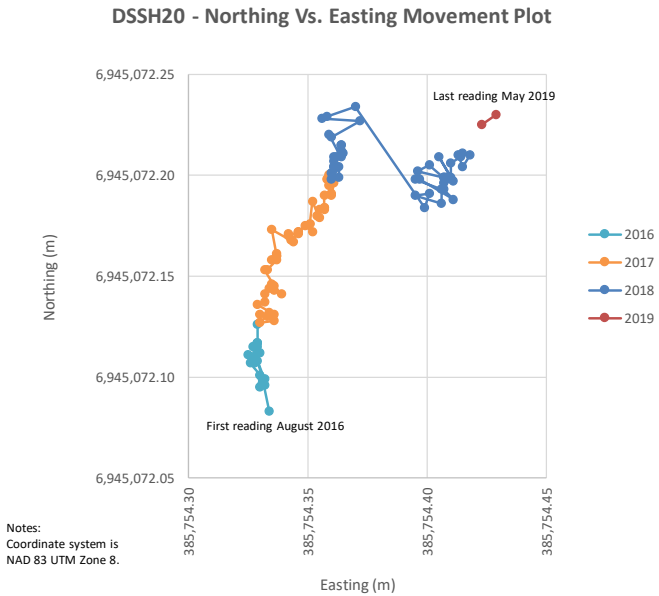
DSTSF Instrumentation Data

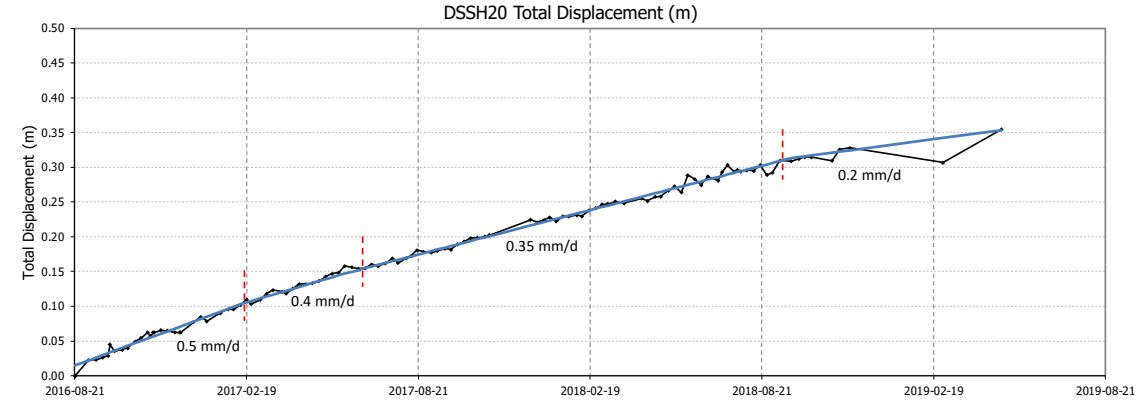
Survey Hub – DSSH19

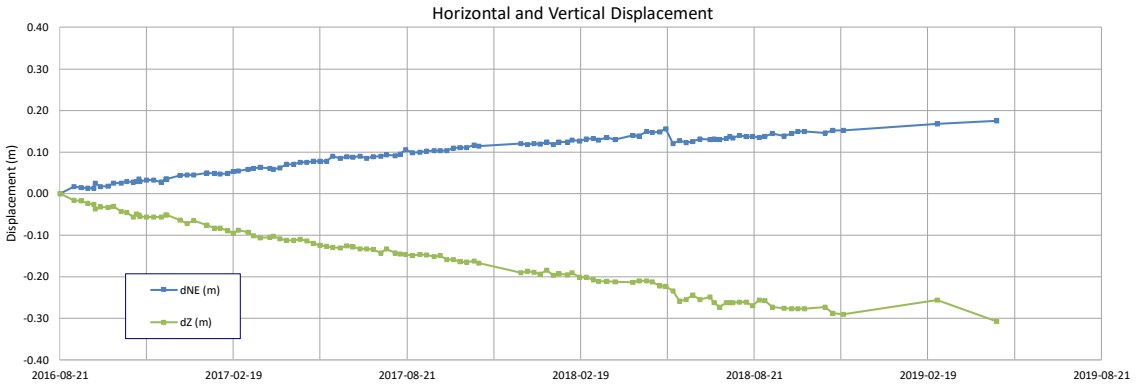
Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

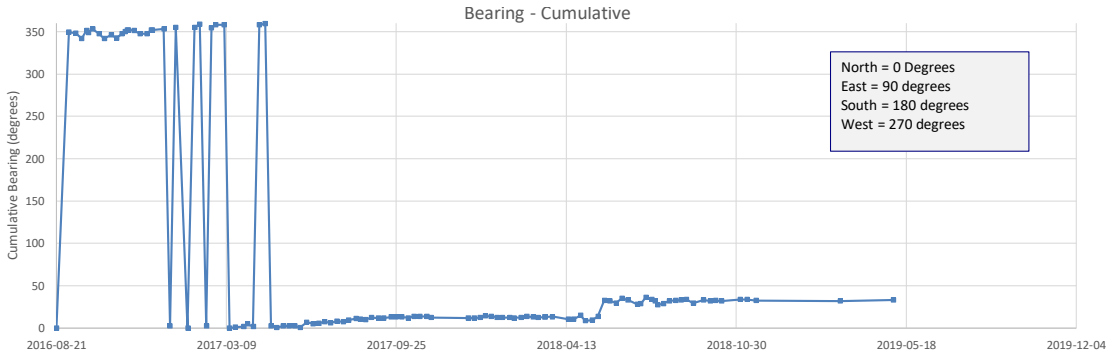
Minto Mine

Date: August 2019
Prepared by: PHM
Figure: **8**



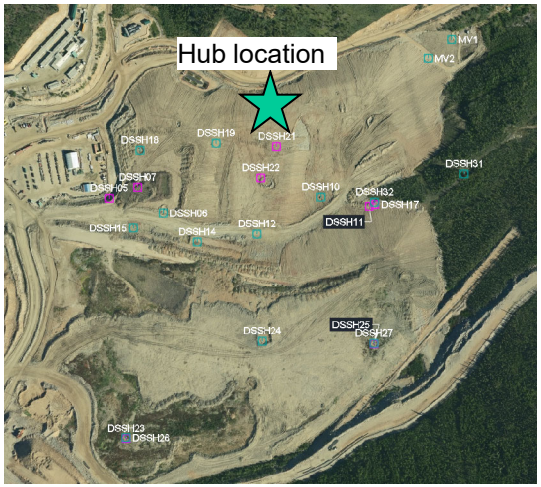






Note:

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



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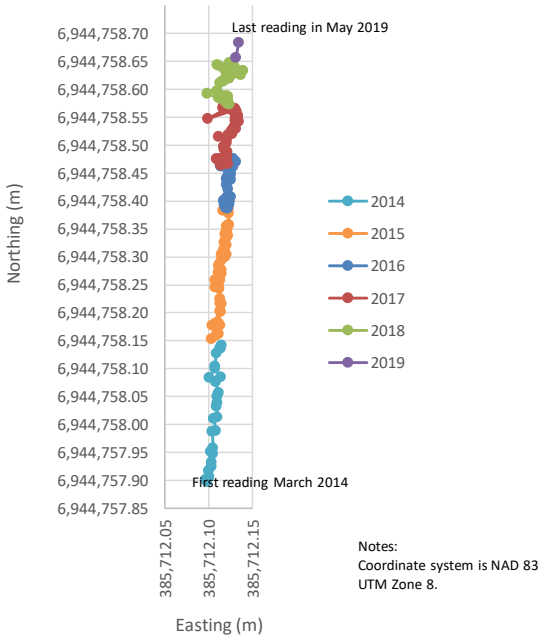
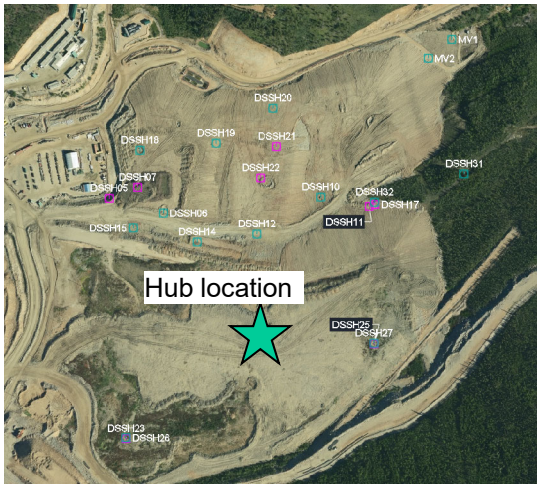
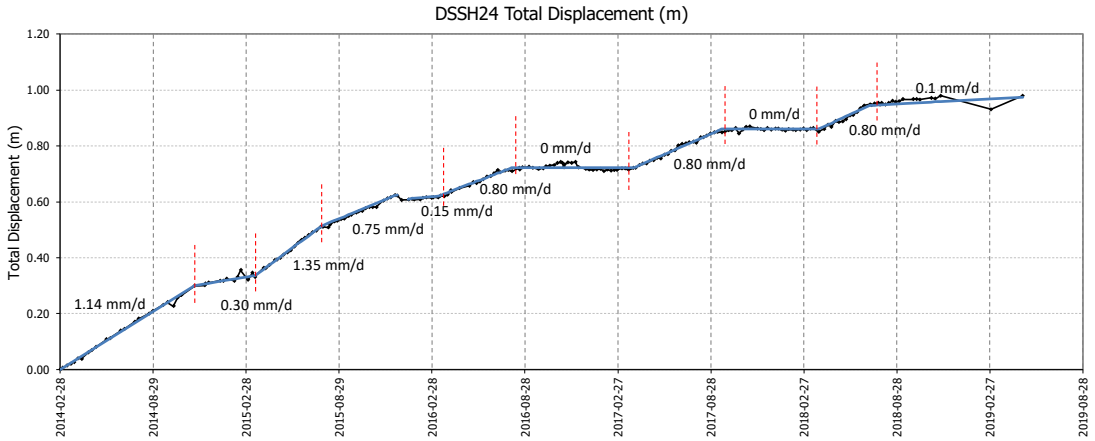
		Survey Hub – DSSH20
Job No: 1CM002.066 Filename: ApD_2019DSTSFLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **9**

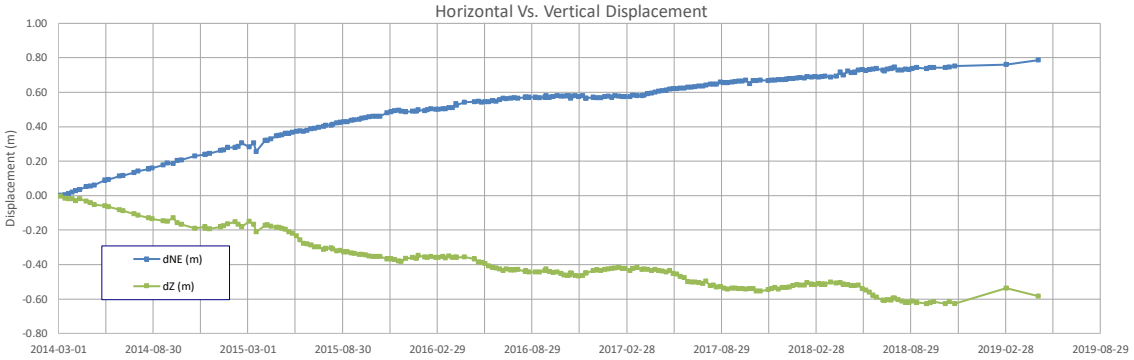
DSSH24 - Northing Vs. Easting Movement Plot

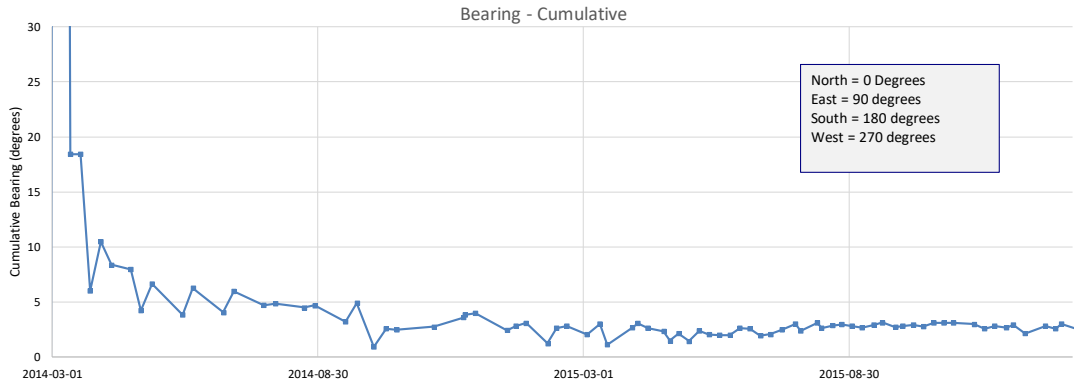


Notes:
Coordinate system is NAD 83
UTM Zone 8.









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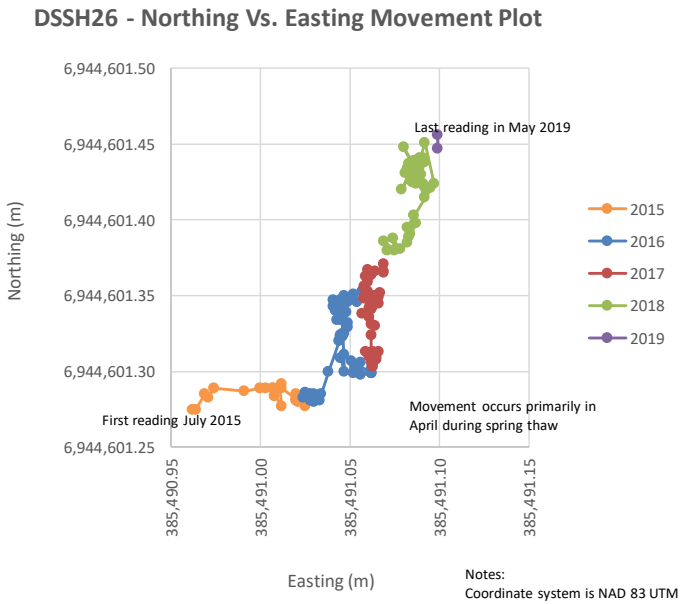
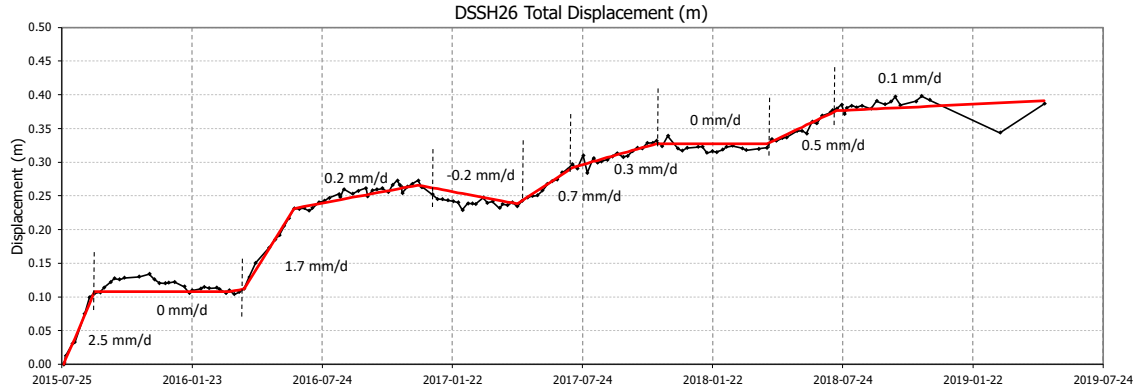
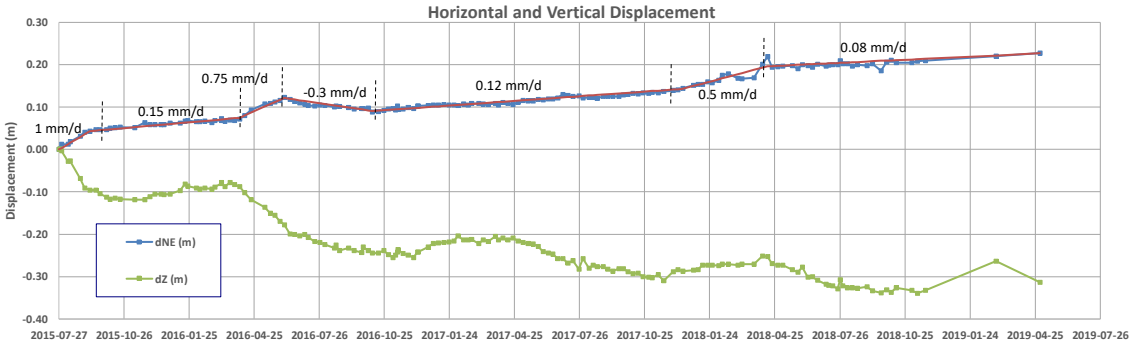
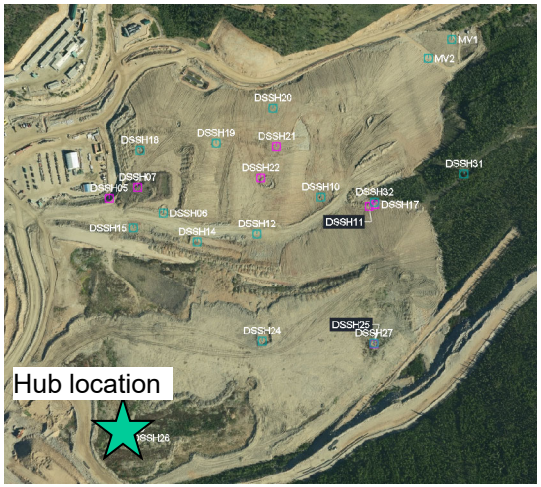
		Survey Hub – DSSH24
Job No: 1CM002.066 Filename: ApD_2019DSTSFLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **10**



Notes:
Coordinate system is NAD 83 UTM Zone 8.







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DSTSF Instrumentation Data

Survey Hub – DSSH26

Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019
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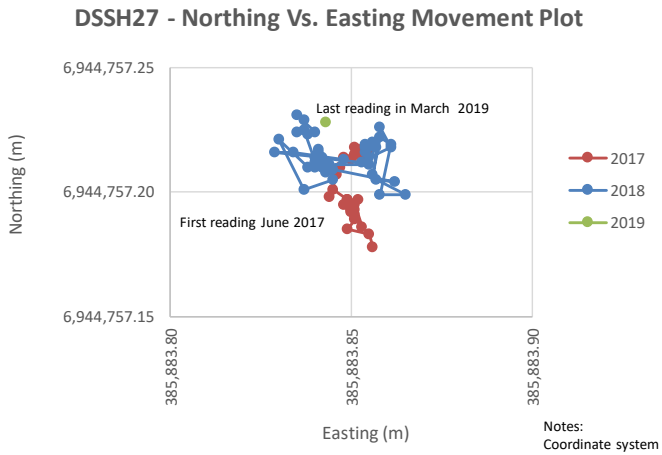
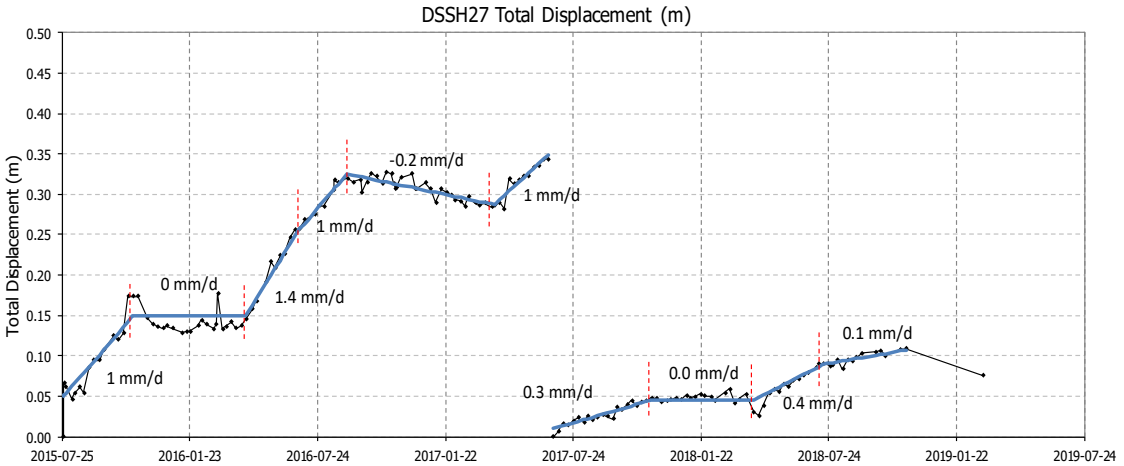
Figure: **11**

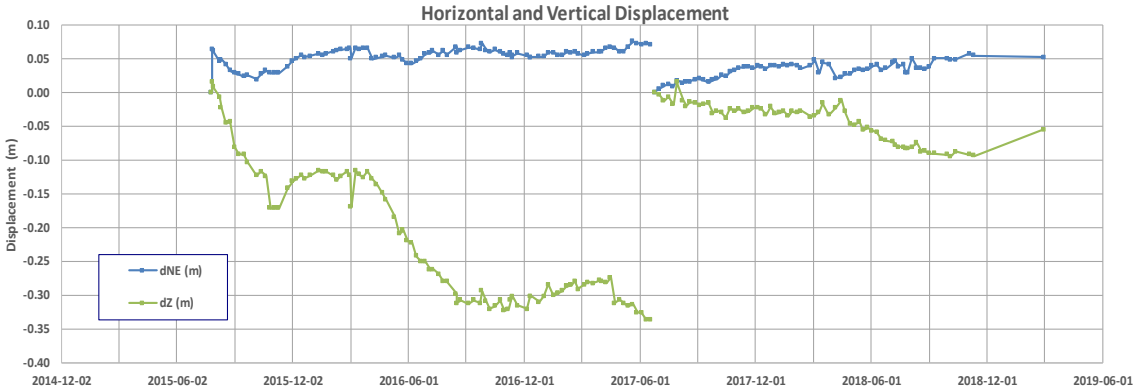


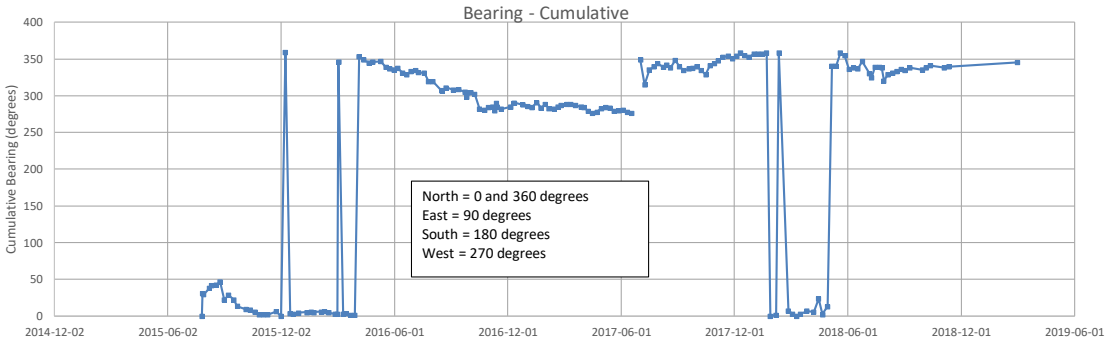
Notes:
Coordinate system is NAD 83 UTM Zon

Note:

1. The survey hub was repositioned in June 2017.







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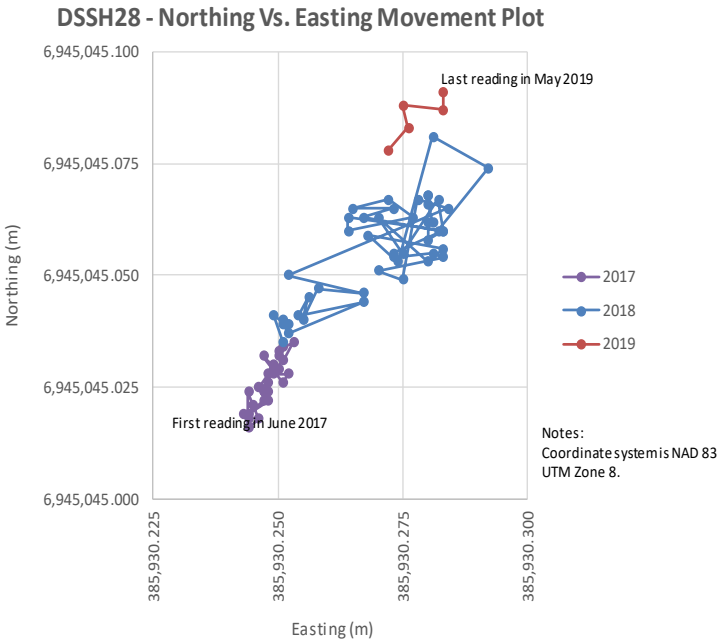
DSTSF Instrumentation Data

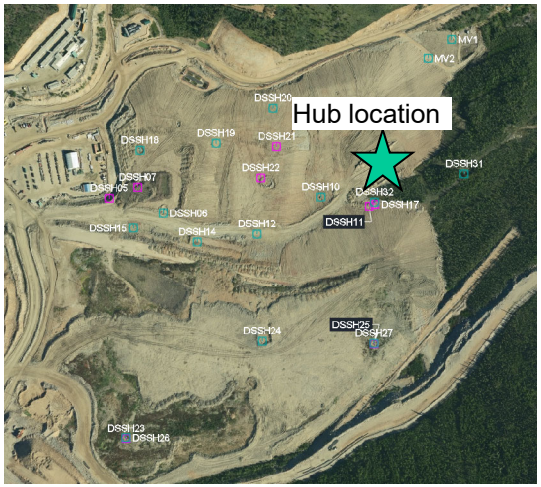
Survey Hub – DSSH27

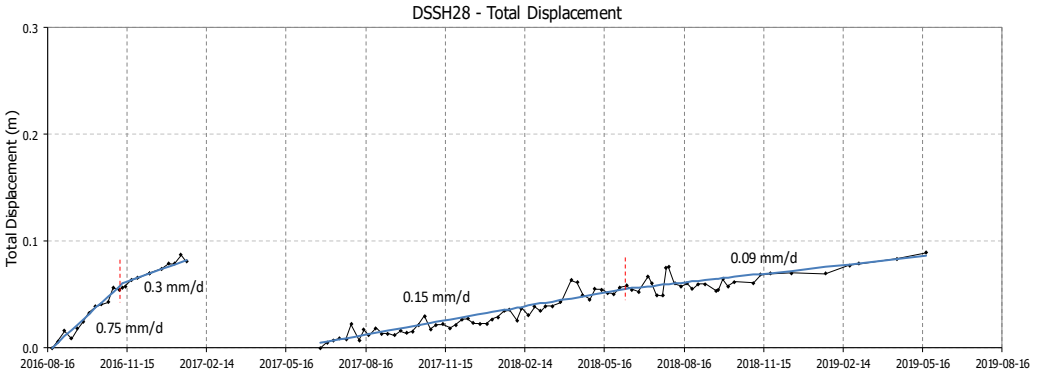
Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

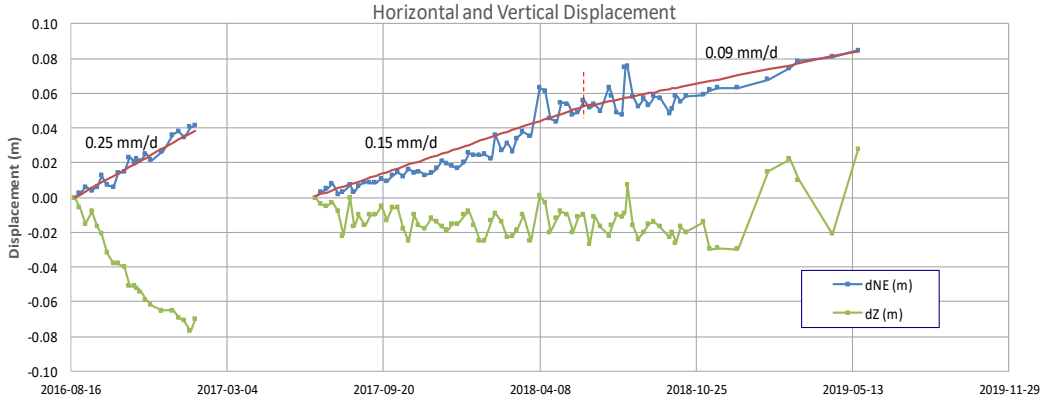
Minto Mine

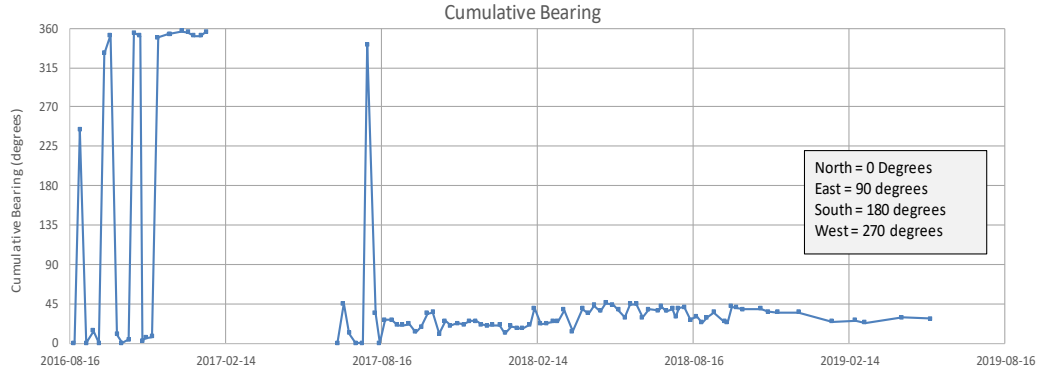
Date: August 2019
Prepared by: PHM
Figure: 12











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DSTSF Instrumentation Data

Survey Hub – DSSH28

Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

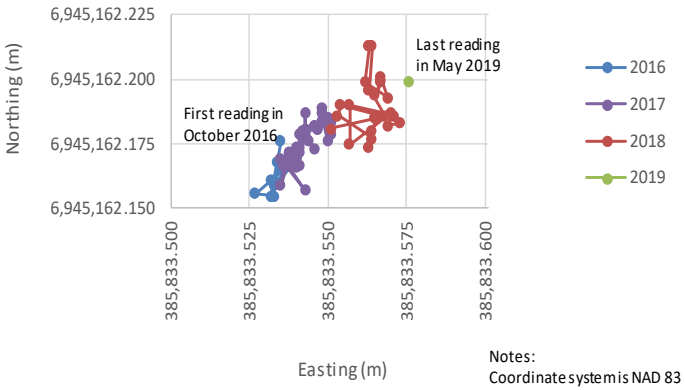
Minto Mine

Date: August 2019

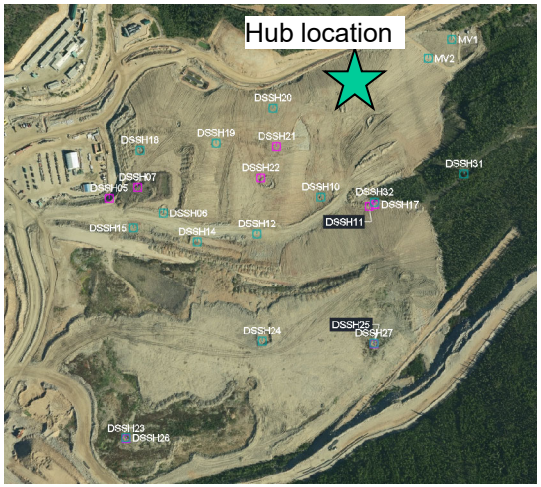
Prepared by PHM

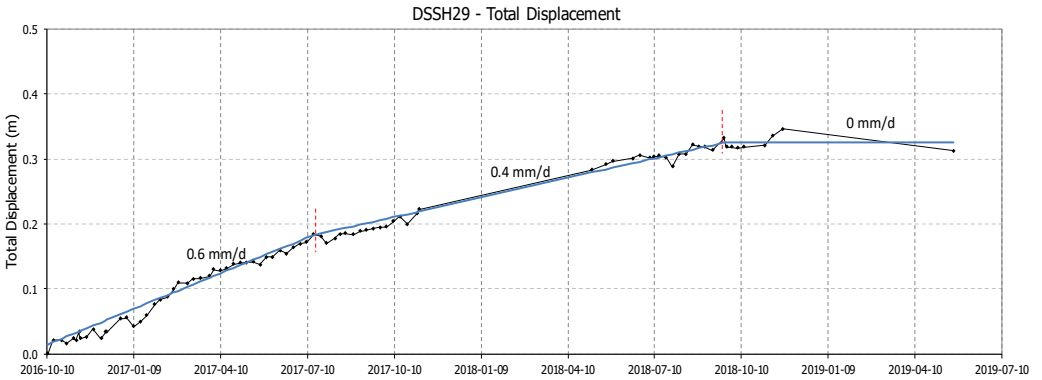
Figure: **13**

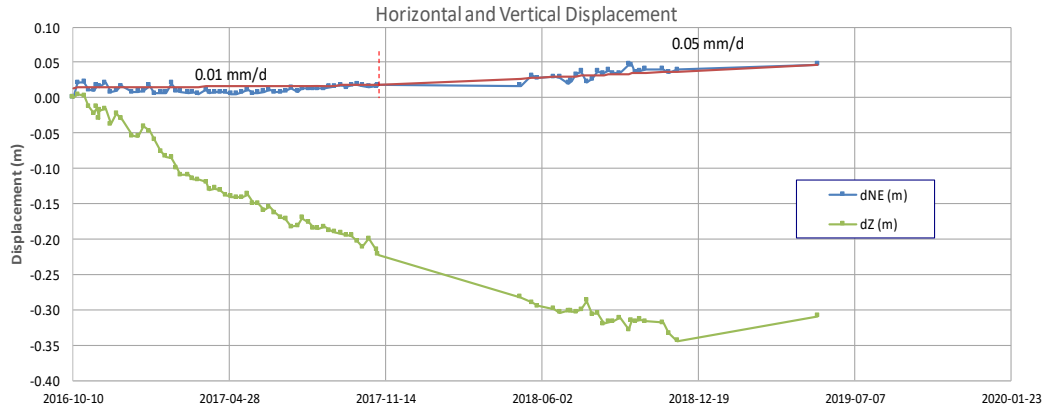
DSSH29 - Northing Vs. Easting Movement Plot

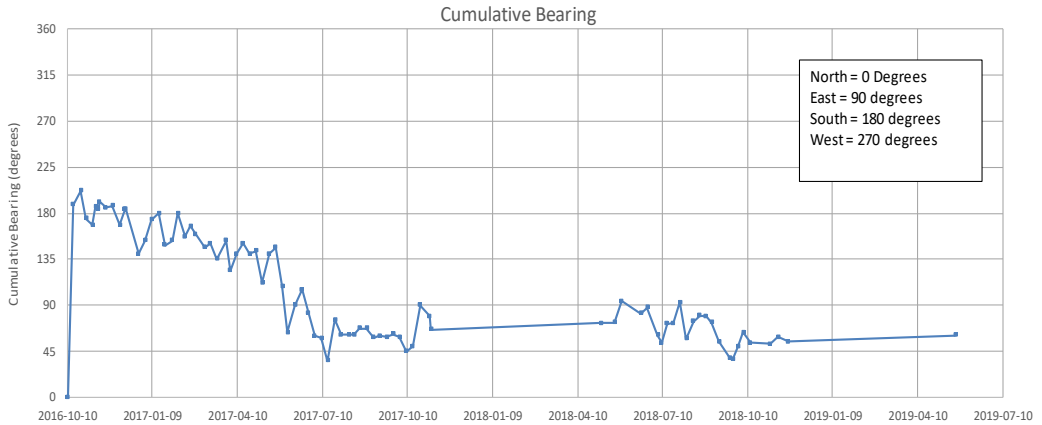


Notes:
Coordinate system is NAD 83 UTM Zone 8.









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DSTSF Instrumentation Data

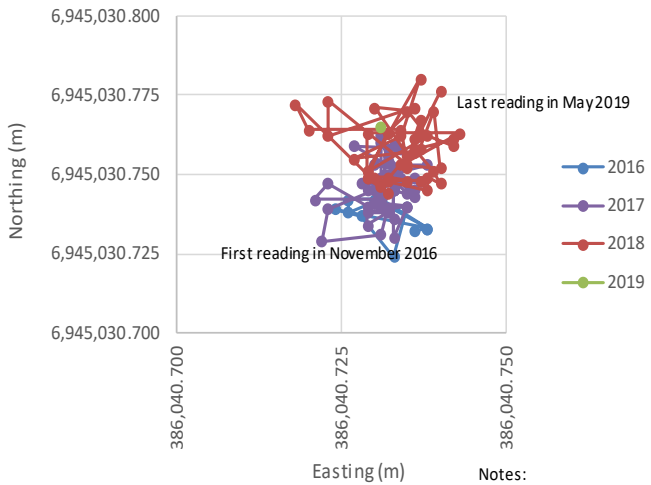
Survey Hub – DSSH29

Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

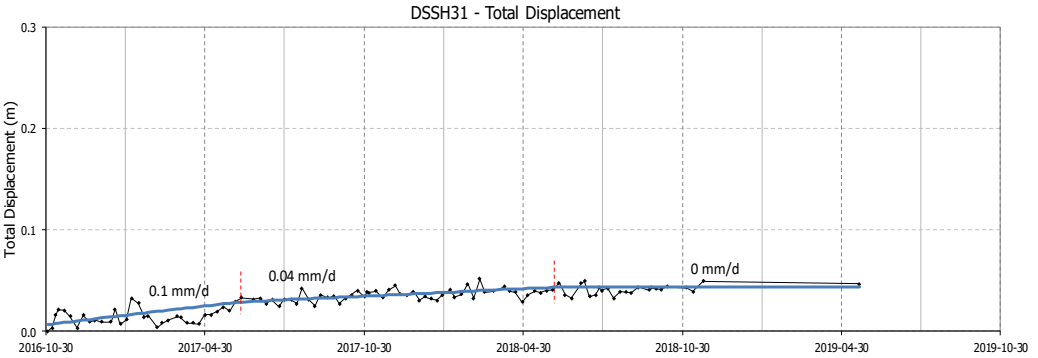
Minto Mine

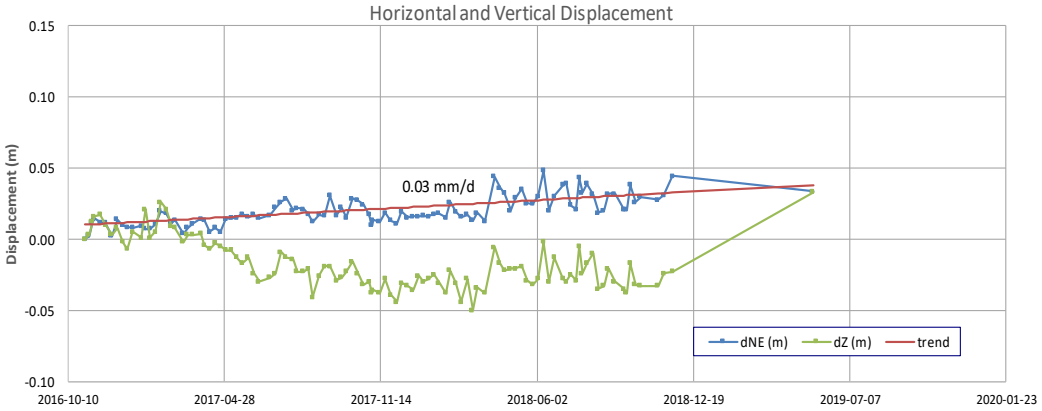
Date: August 2019
Prepared by PHM
Figure: **14**

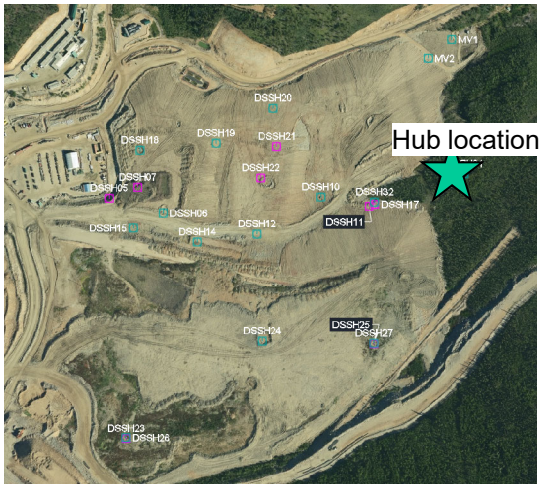
DSSH31 - Northing Vs. Easting Movement Plot

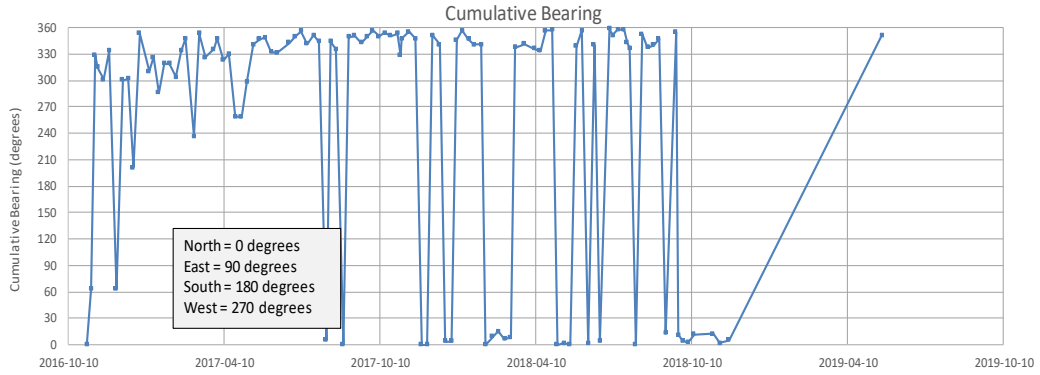


Notes:
Coordinate system is NAD 83 UTM Zone 8.









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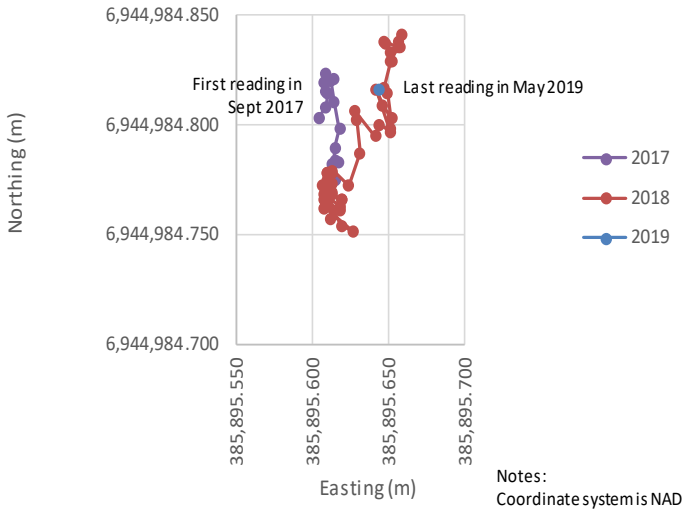
		Survey Hub – DSSH31
Job No: 1CM002.066 Filename: ApD_2019DSTSFLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by PHM / Figure: **15**

DSSH32 - Northing Vs. Easting Movement Plot



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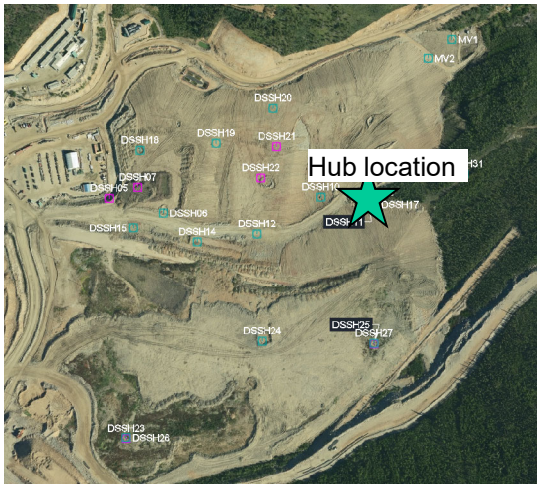

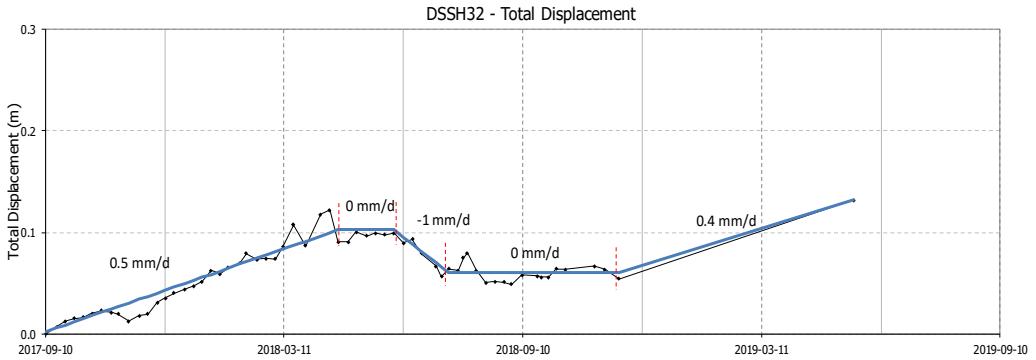

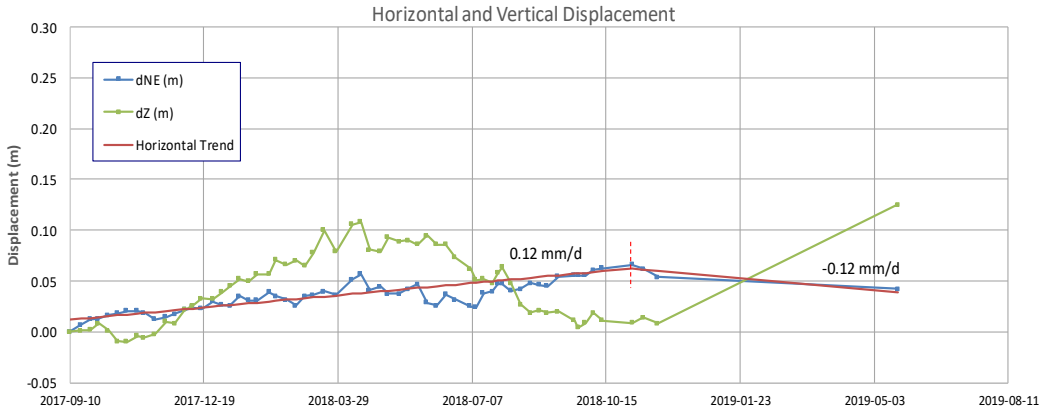

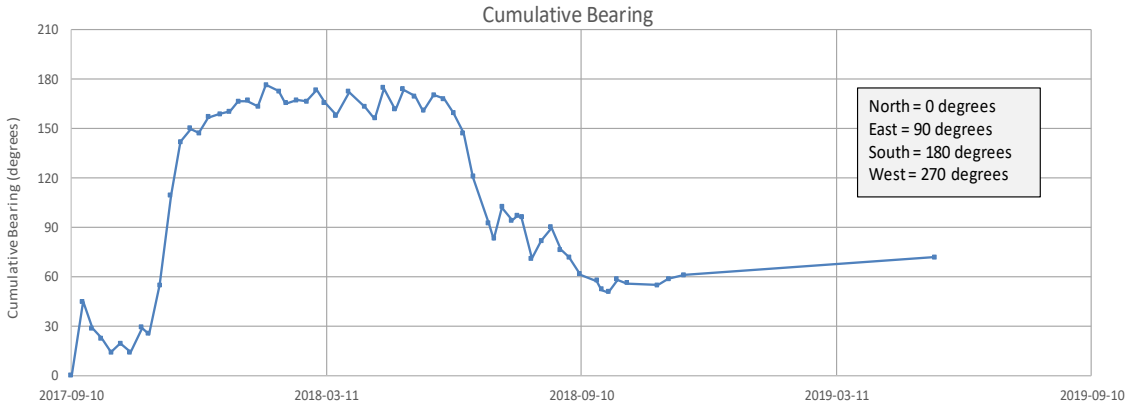

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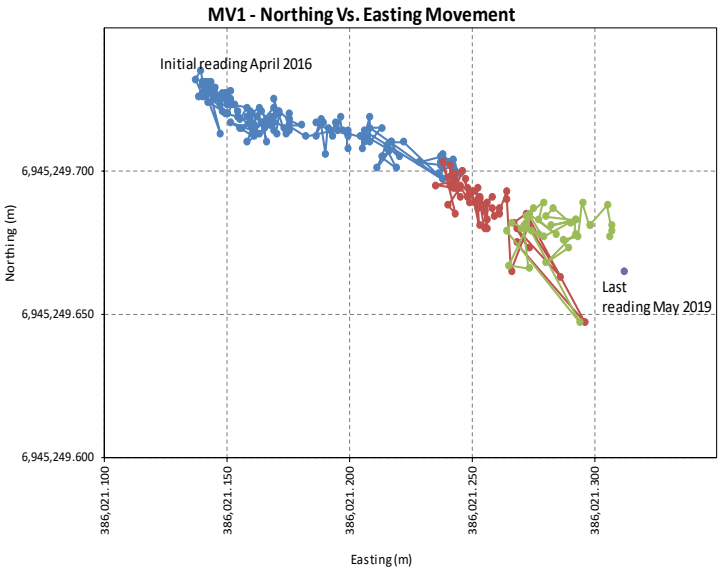
DSTSF Instrumentation Data

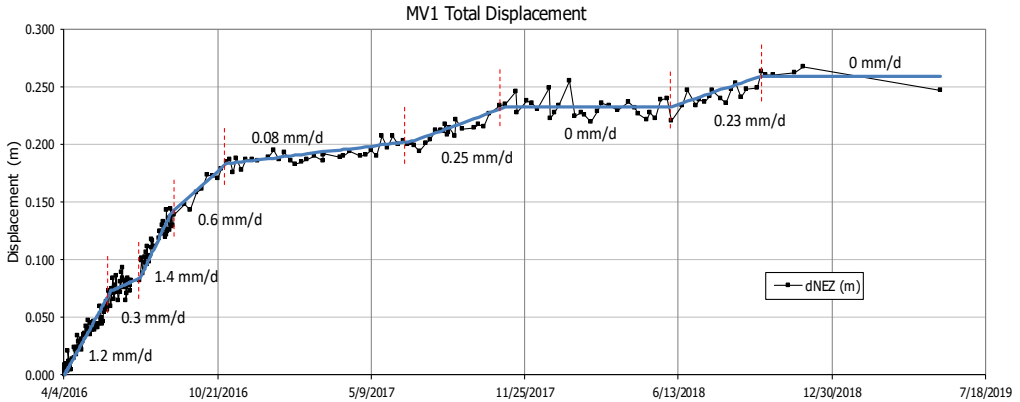
Survey Hub – DSSH32

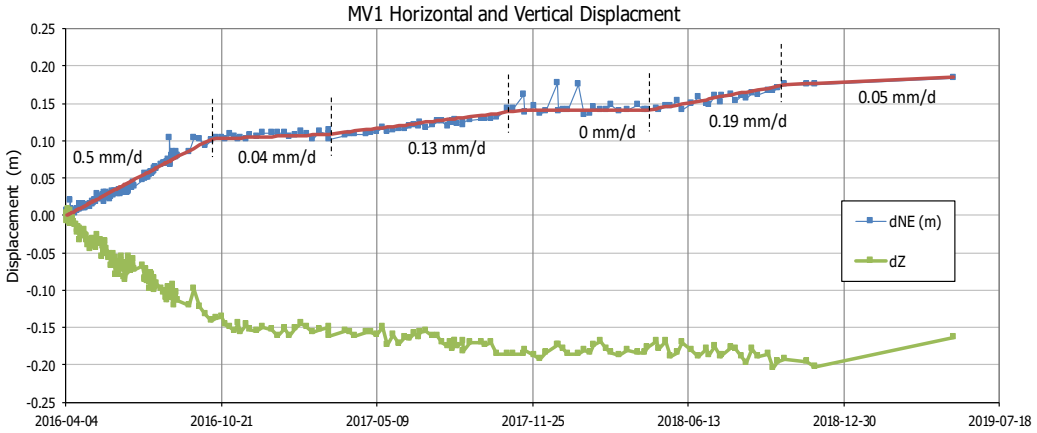
Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

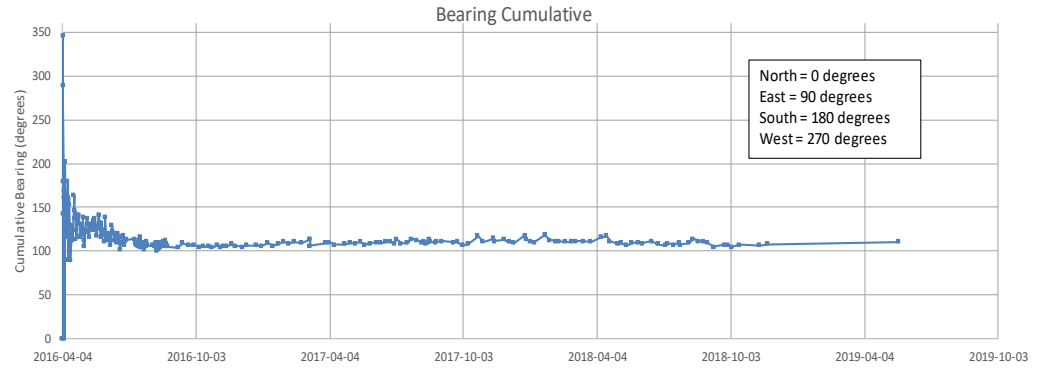
Date: August 2019 | Prepared by PHM | Figure: **16**







Hub location



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DSTSF Instrumentation Data

Survey Hub – MV1

Job No: 1CM002.066

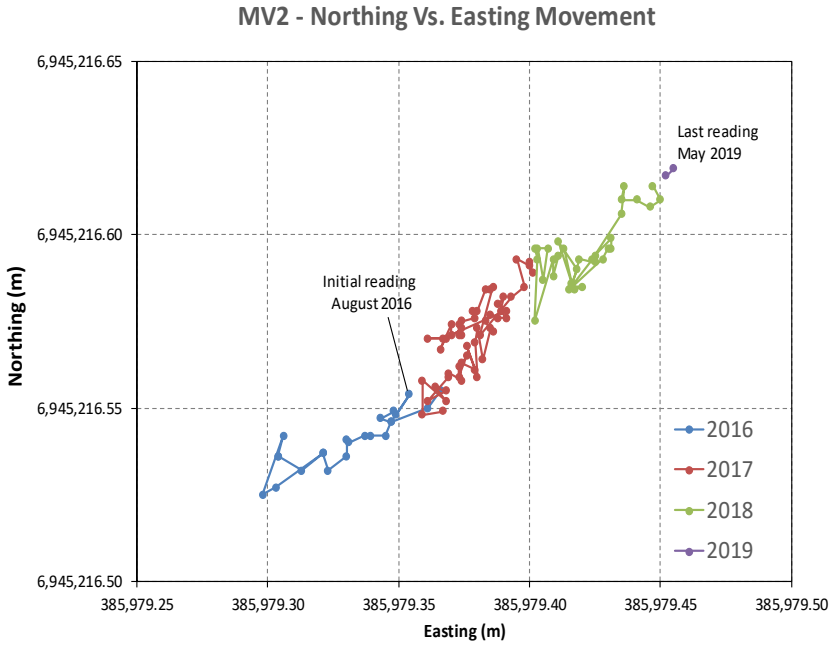
Filename: ApD_2019DSTSFLandscape.pptx

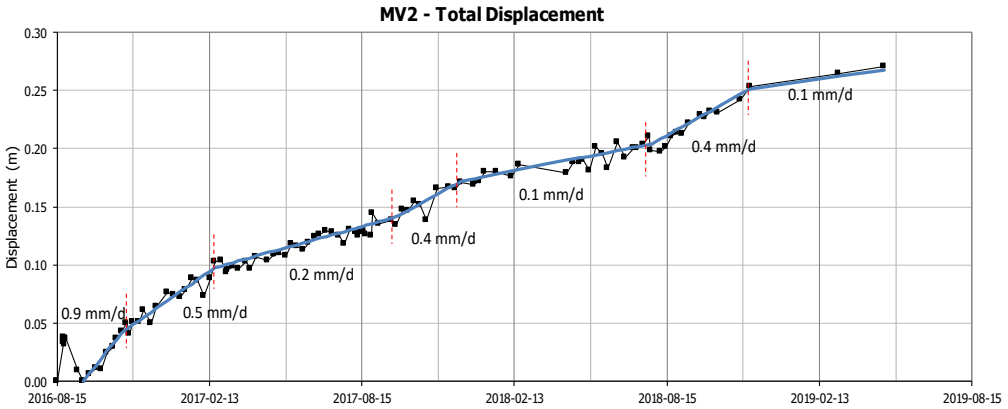
Minto Mine

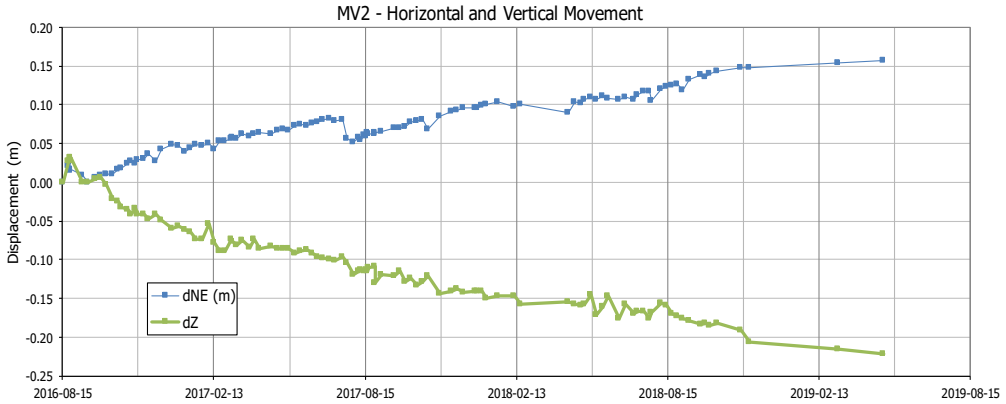
Date: August 2019

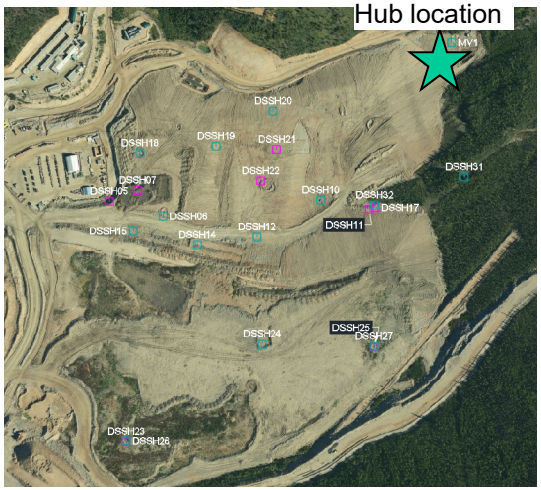
Prepared by PHM

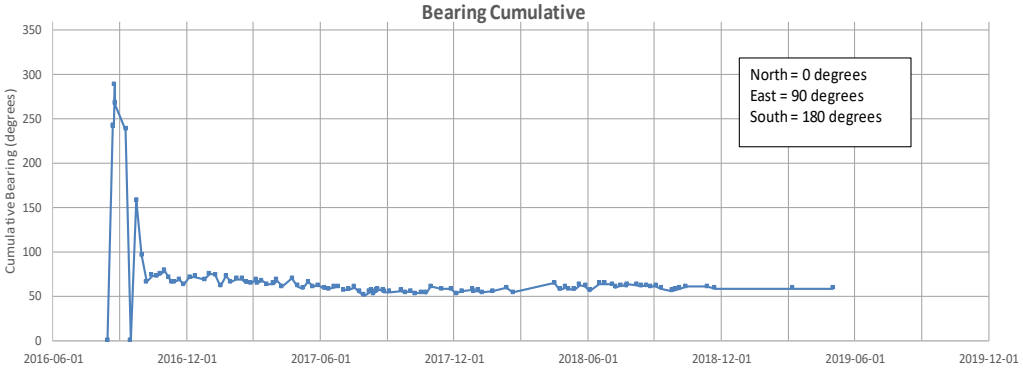
Figure: **17**











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DSTSF Instrumentation Data

Survey Hub – MV2

Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

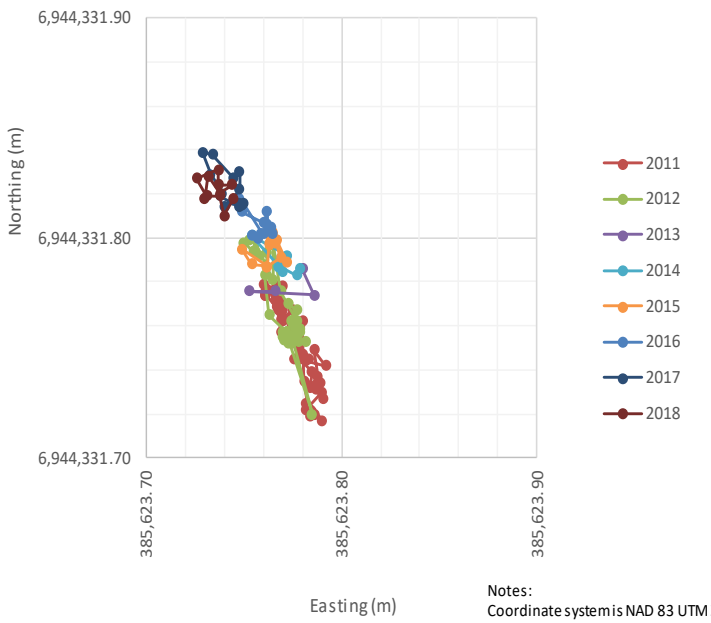
Minto Mine

Date: August 2019

Prepared by PHM

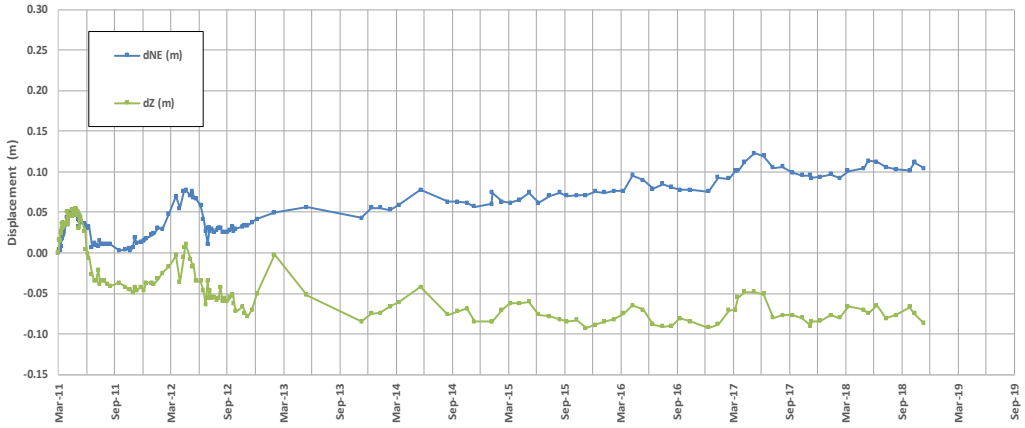
Figure: **18**

ASH06 - Northing Vs. Easting Movement Plot



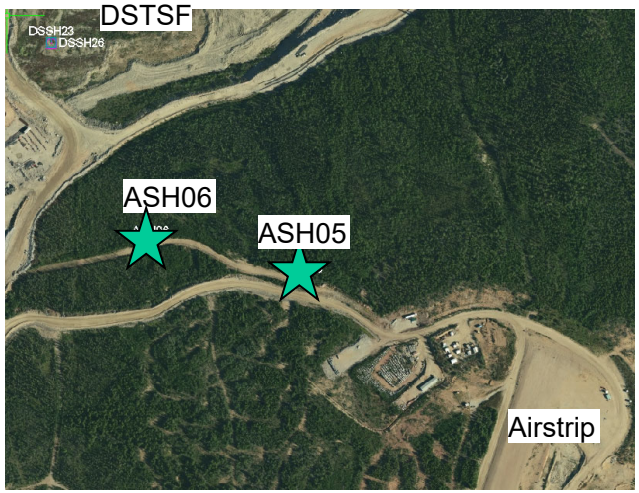
Notes:
Coordinate system is NAD 83 UTM Zone 8.

ASH06 - Horizontal and Vertical Displacement

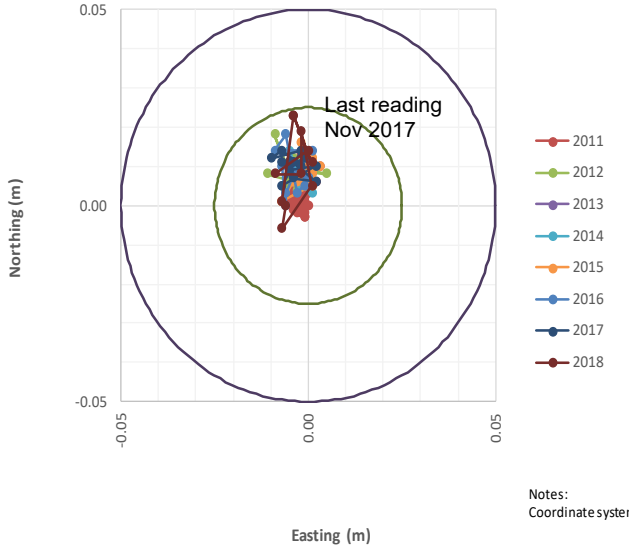


Notes:

1. Minto's survey reading comments on January 14, 207 notes ASH06 may have been disturbed as a result of a pipeline installation.



ASH05 - Northing Vs. Easting Movement Plot



Notes:
Coordinate system is NAD 83 UTM Zone 8.

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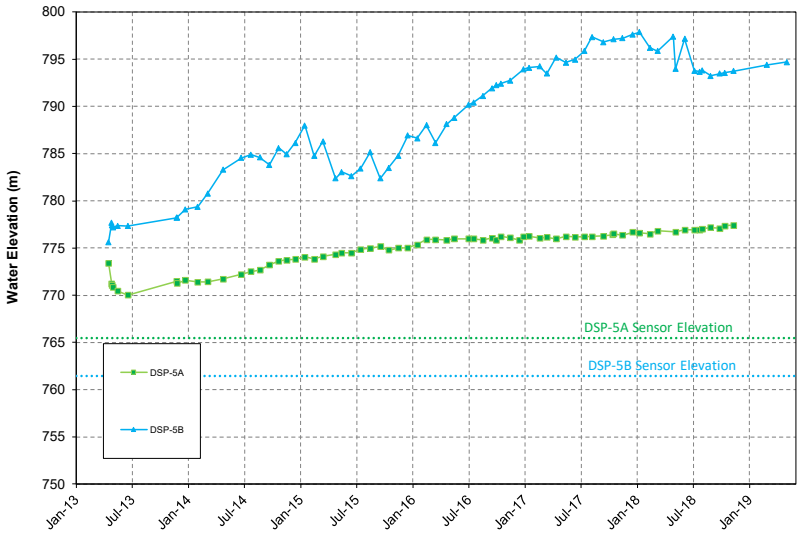
DSTSF Instrumentation Data

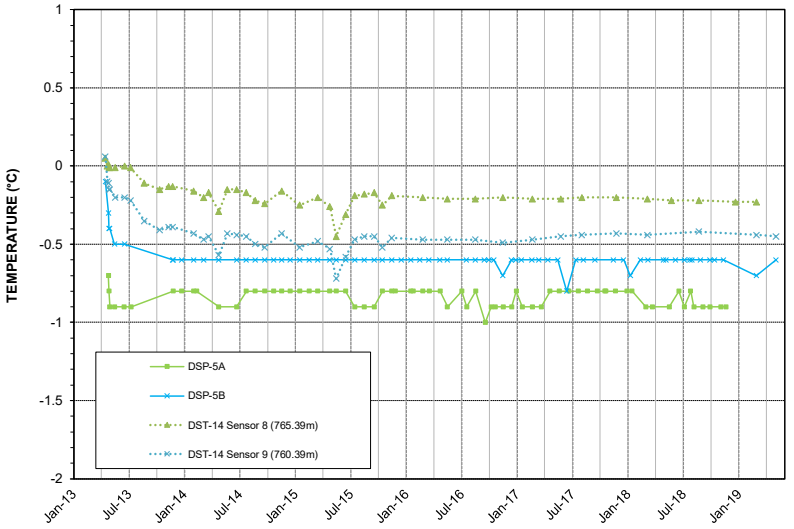
Survey Hubs – ASH05 and ASH06

Job No: 1CM002.066
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019
Prepared by: PHM
Figure: 19





Notes:

1. The pore pressure sensors at DSP-05 are located approximately 2 m above original ground in tailings (A) and 2 m below original ground.
2. The bottom sensor at DSP-05 (B) shows an increase in pore pressure that appears to have peaked in 2018. The sensor is located in an area of silt with stratified ice lenses and the temperature at the sensor is at the freezing point of water -0.5°. The temperature plot also shows thermistor data from nearby ground temperature cable DST-14 for sensors at similar elevations.
3. Sensors at DSP-05A also shows gradual increasing pore pressure trend.

Source files:

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Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

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Minto Mine

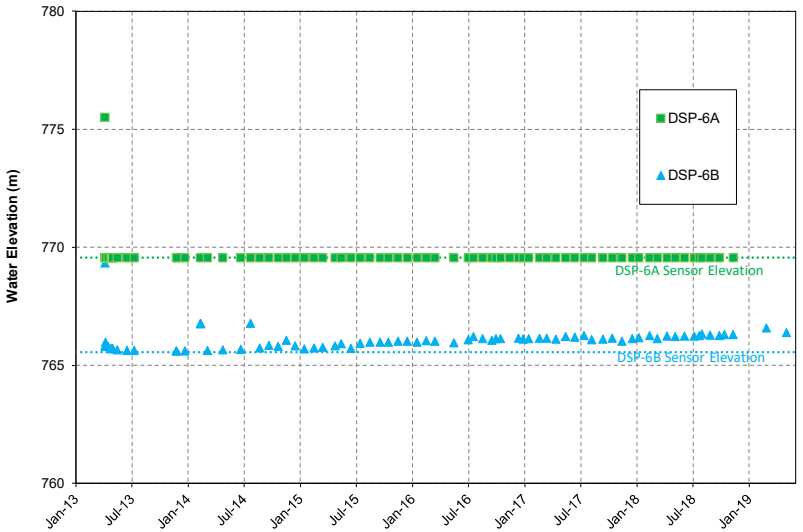
DSTSF Instrumentation Data

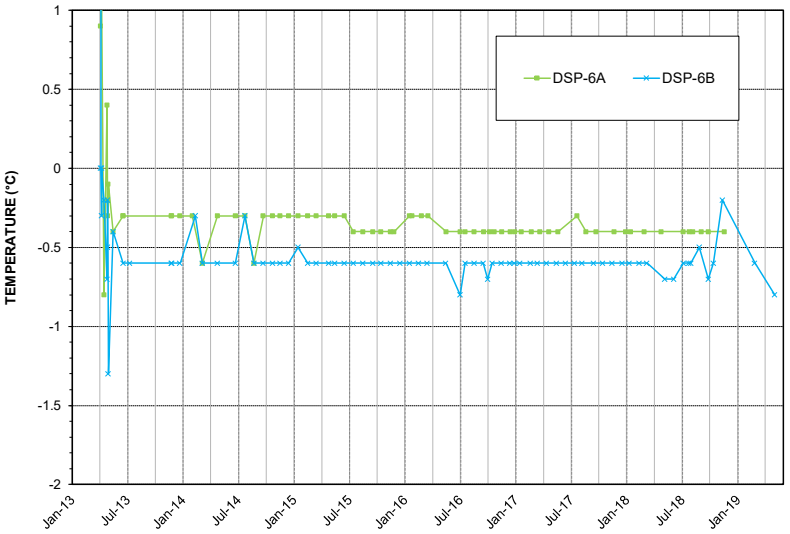
Piezometer – DSP-05

Date: August 2019

Prepared by PHM

Figure: **20**





Notes:

1. The pore pressure sensors at DSP-06 are located approximately 2 m above original ground in tailings (A) and 2 m below original ground (B).
2. DSP-06A shows no pore pressure (pore pressure equal to the sensor elevation). This sensor stopped producing readings in November 2018.
3. The bottom sensor at DSP-06B shows a gradual increasing pore pressure trend.

Source files:

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Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

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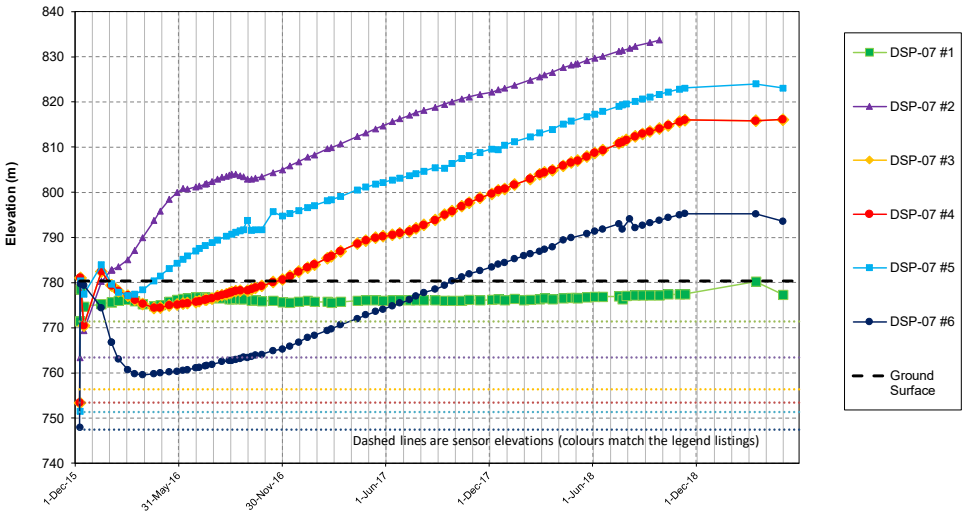
Minto Mine

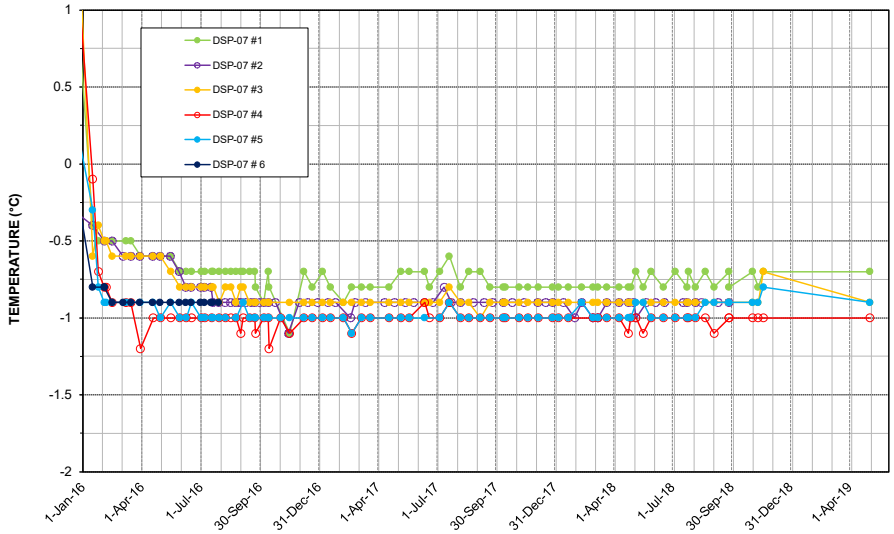
DSTSF Instrumentation Data

Piezometer – DSP-06

Date:	Prepared by	Figure:
August 2019	PHM	21

Sensor #	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.	





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DSTSF Instrumentation Data

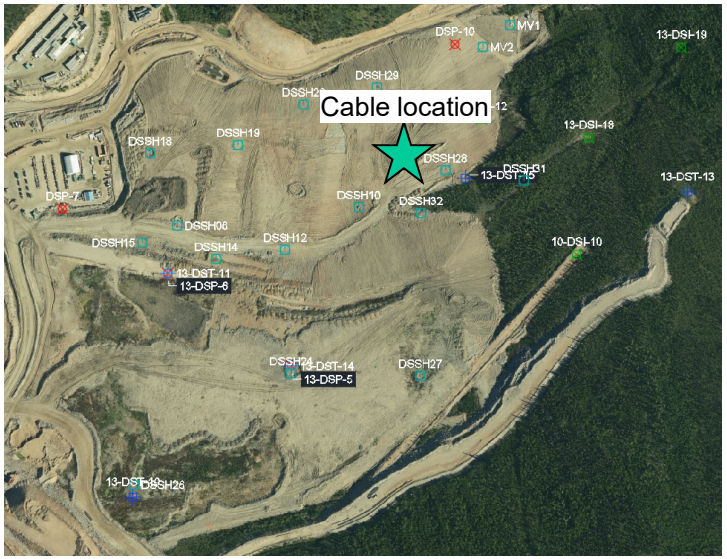
Piezometer – DSP-07

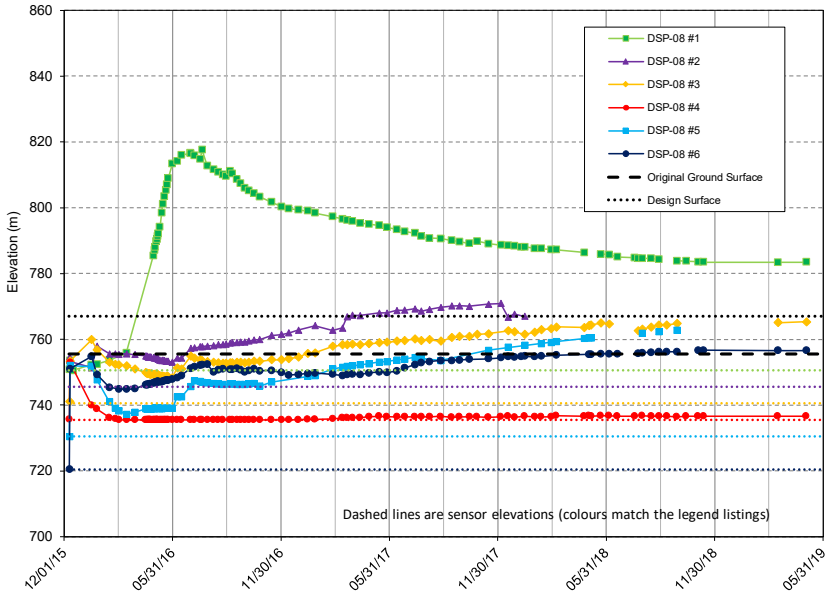
Job No: 1CM002.066

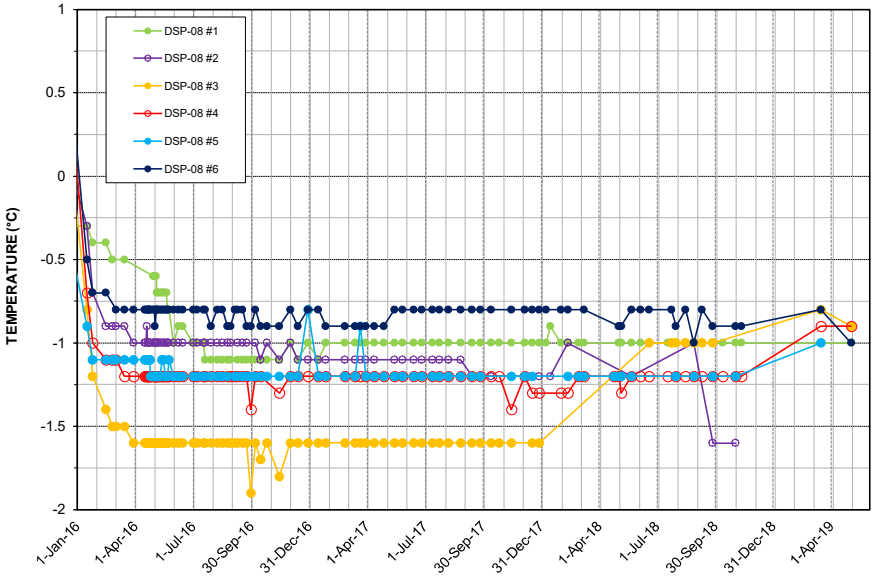
Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019 | Prepared by PHM | Figure: 22







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 (70 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:

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Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

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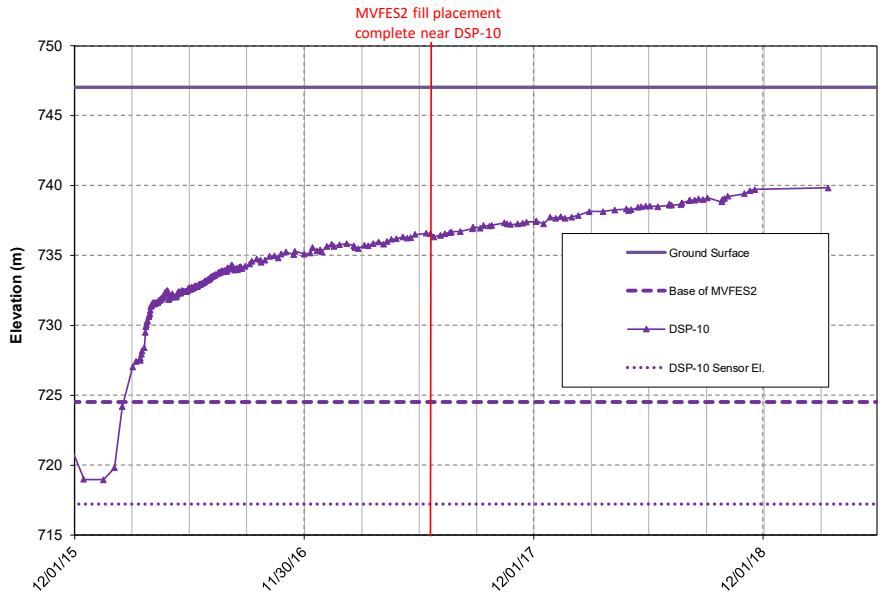
Minto Mine

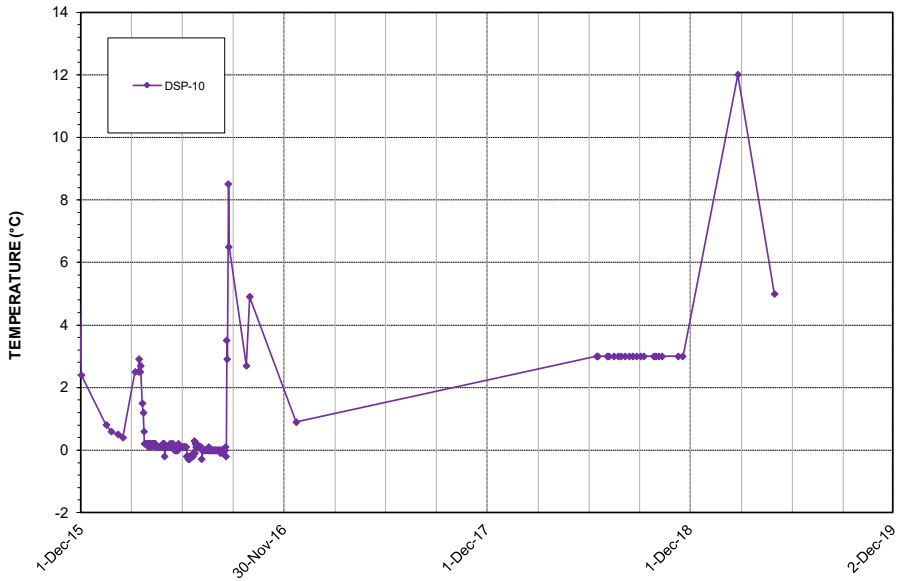
DSTSF Instrumentation Data

Piezometer – DSP-08

Date:	Prepared by	Figure:
August 2019	PHM	**23**

DSP-10





Notes:

1. The pore pressure sensor at DSP-10 is located approximately 5 m below the original ground surface below the MVFE Stage 2.
2. The increase in pore pressure at DSP-10 is related to the fill placement over the sensor (approximately 23 m thick).
3. Since fill placement has been completed, the rate of increase in pore pressure is low and apprears to be decreasing.
4. 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.
5. The temperature readings at DSP-10 show a slight cooling trend up to July 2017. Between July and December 2017, temperature readings were above 0 degrees and highly variable.

Source files:

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DSTSF Instrumentation Data

Piezometer – DSP-10

Job No: 1CM002.066

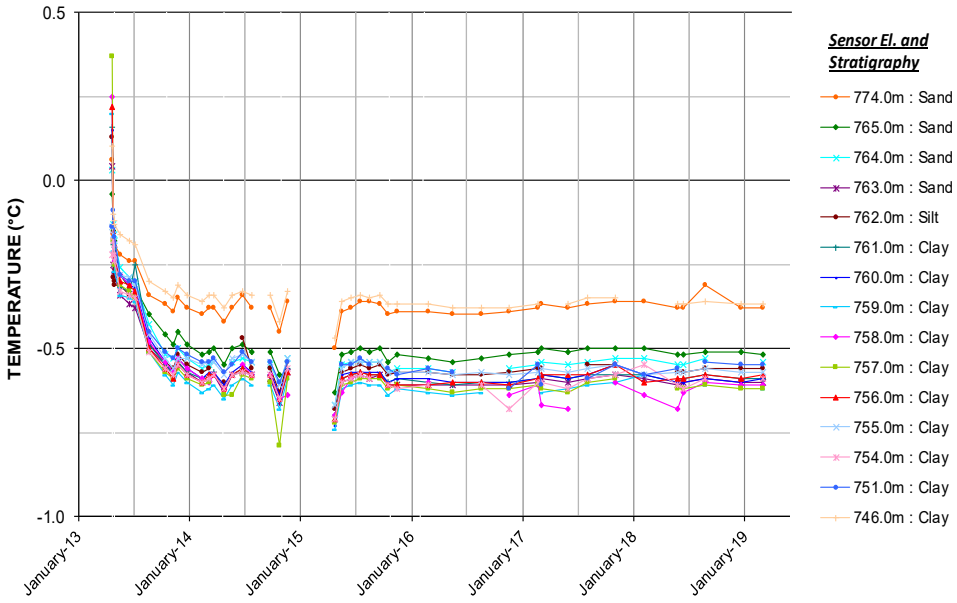
Filename: ApD_2019DSTSFLandscape.pptx

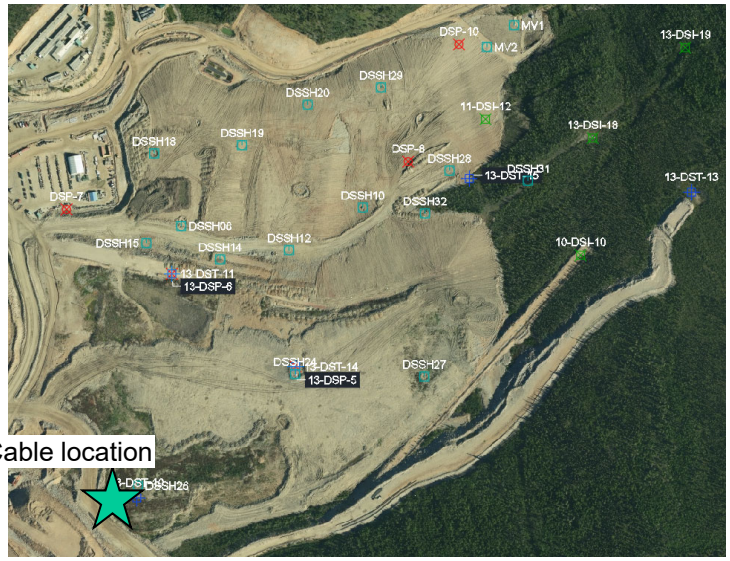
Minto Mine

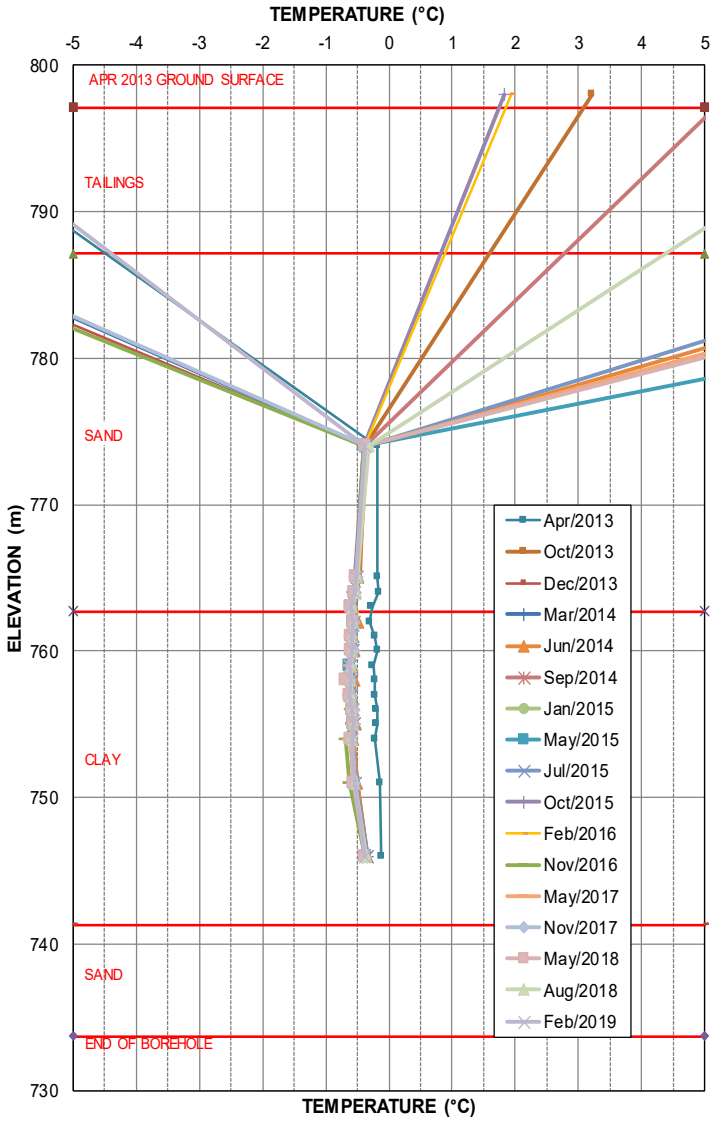
Date: August 2019

Prepared by PHM

Figure: **24**







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DSTSF Instrumentation Data

Temperature Cable – DST-10

Job No: 1CM002.066

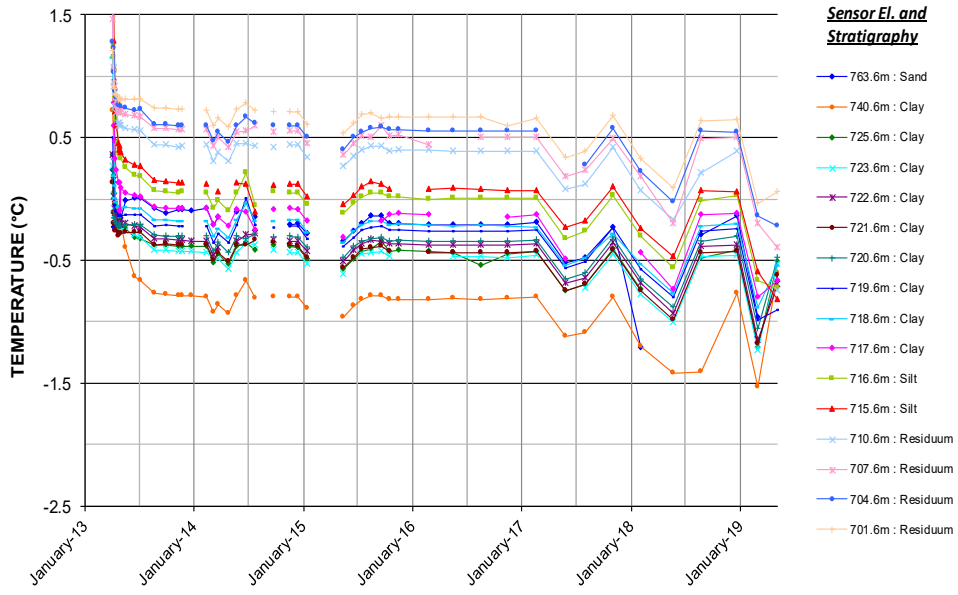
Filename: ApD_2019DSTSFLandscape.pptx

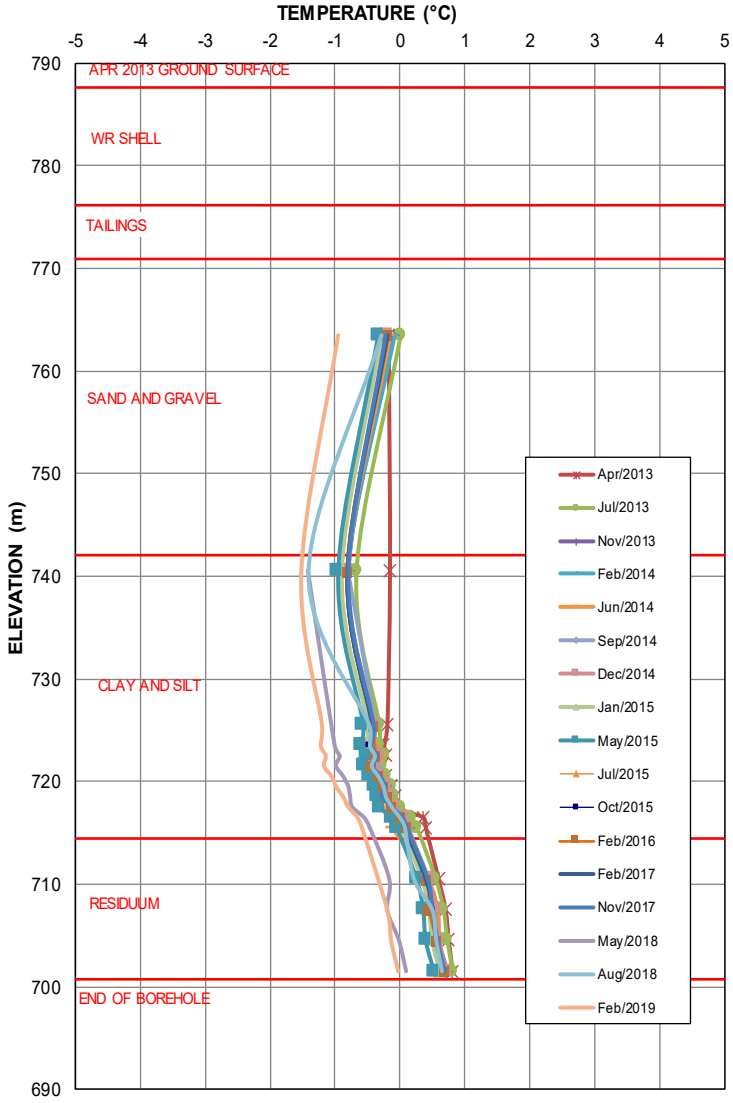
Minto Mine

Date: August 2019

Prepared by PHM

Figure: **25**





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DSTSF Instrumentation Data

Temperature Cable – DST-11

Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

Minto Mine

Date: August 2019

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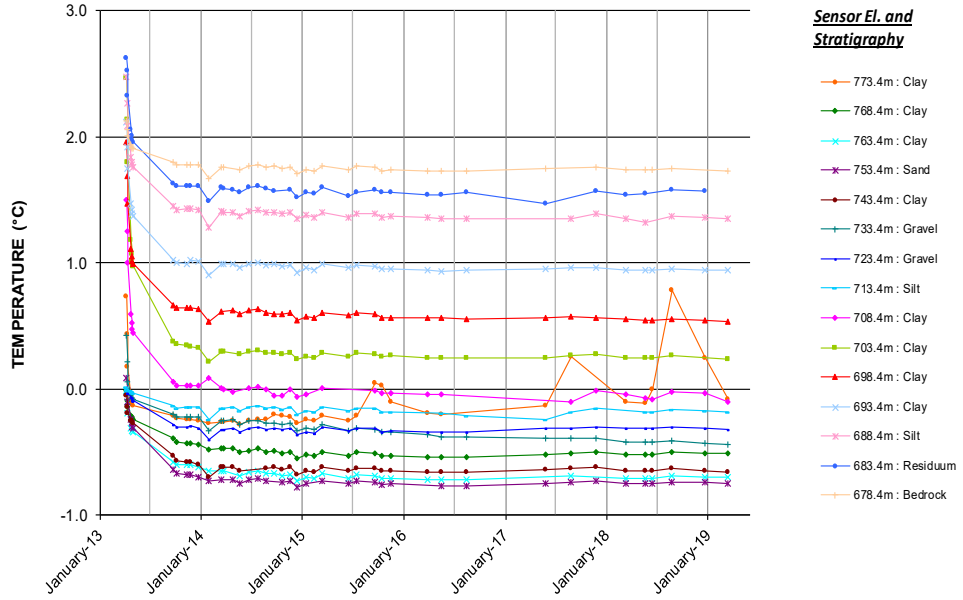
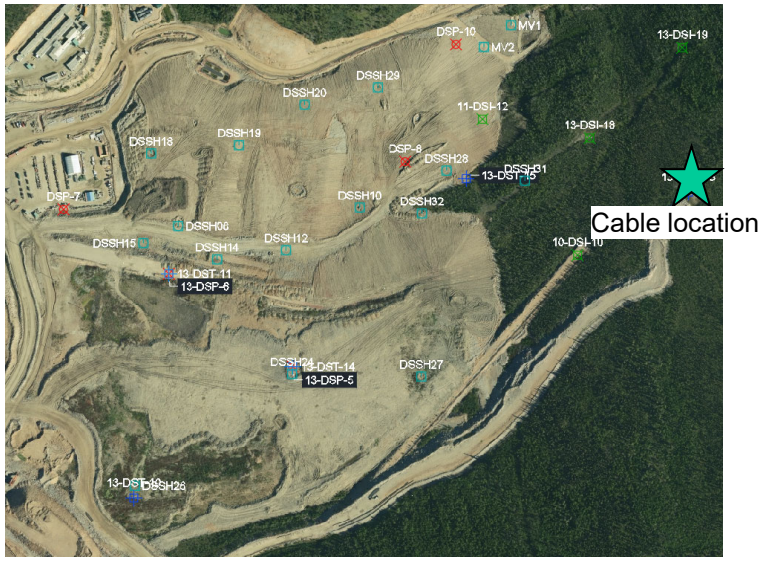
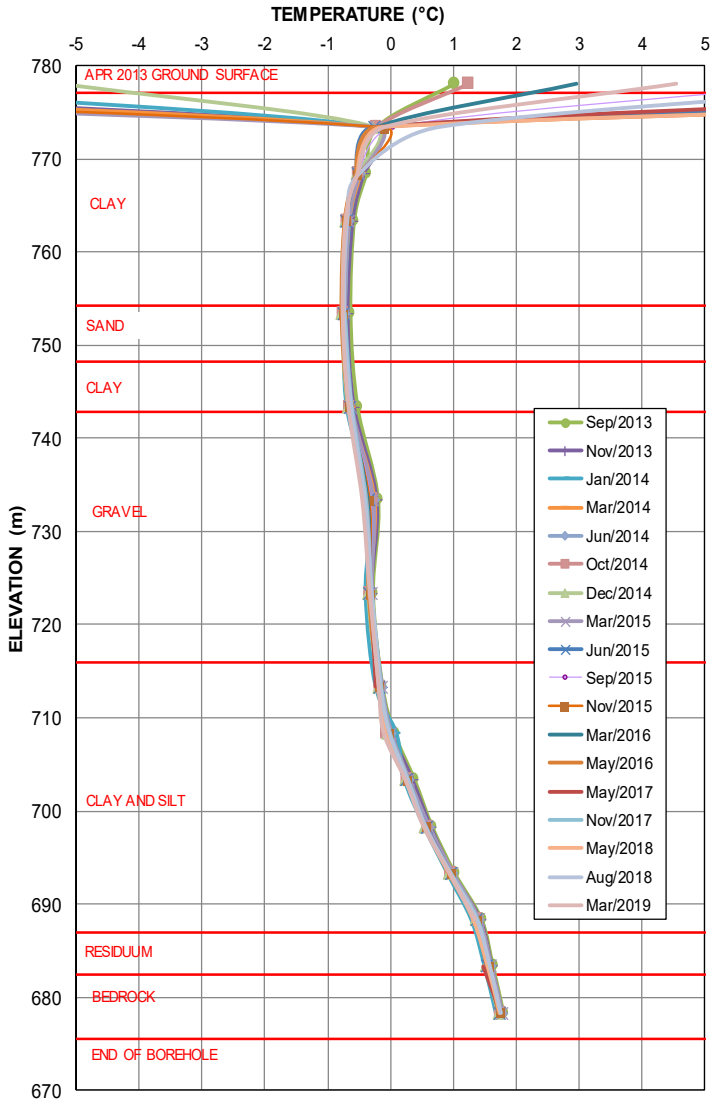
Figure: **26**







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DSTSF Instrumentation Data

Temperature Cable – DST-13

Job No: 1CM002.066

Filename: ApD_2019DSTSFLandscape.pptx

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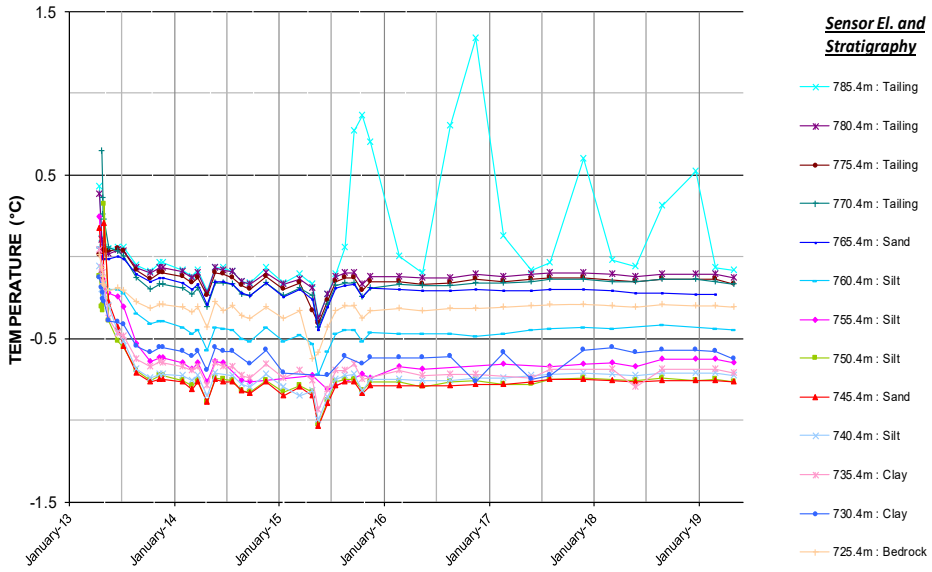
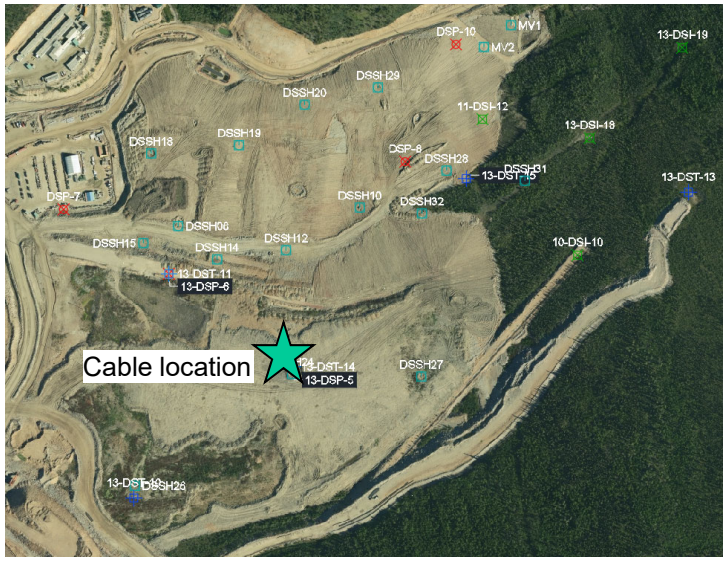
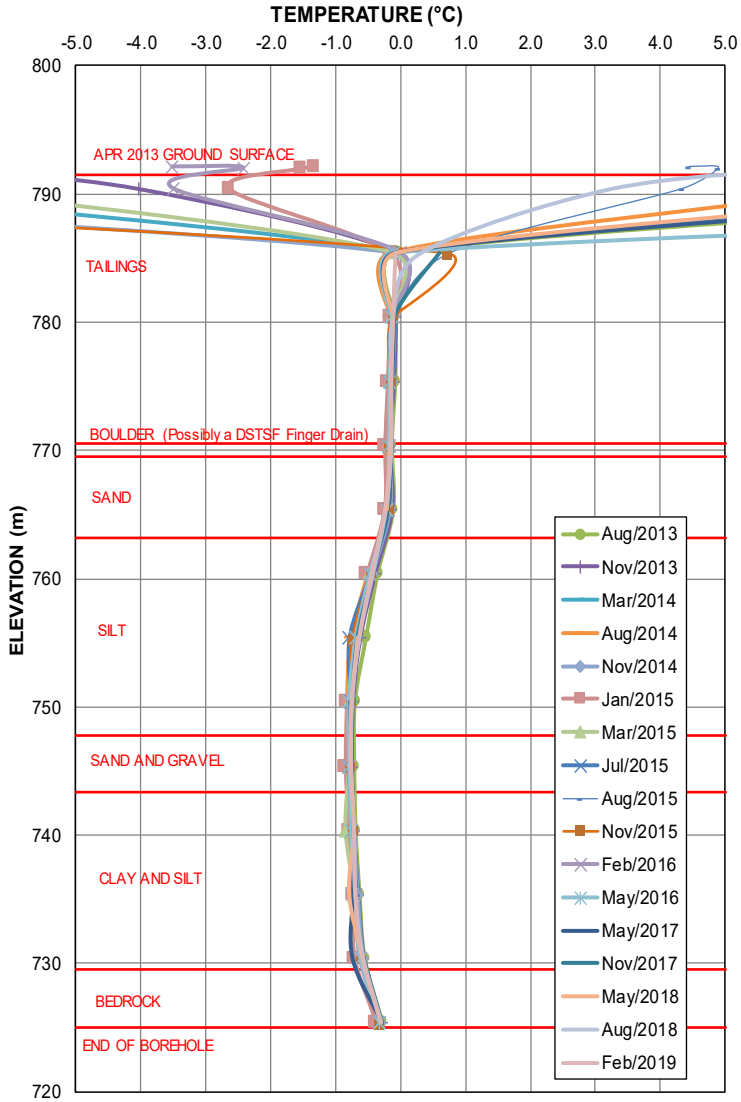
Date:	Prepared by	Figure:
August 2019	PHM	27







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Minto Explorations Ltd.

DSTSF Instrumentation Data

Temperature Cable– DST-14

Job No: 1CM002.066

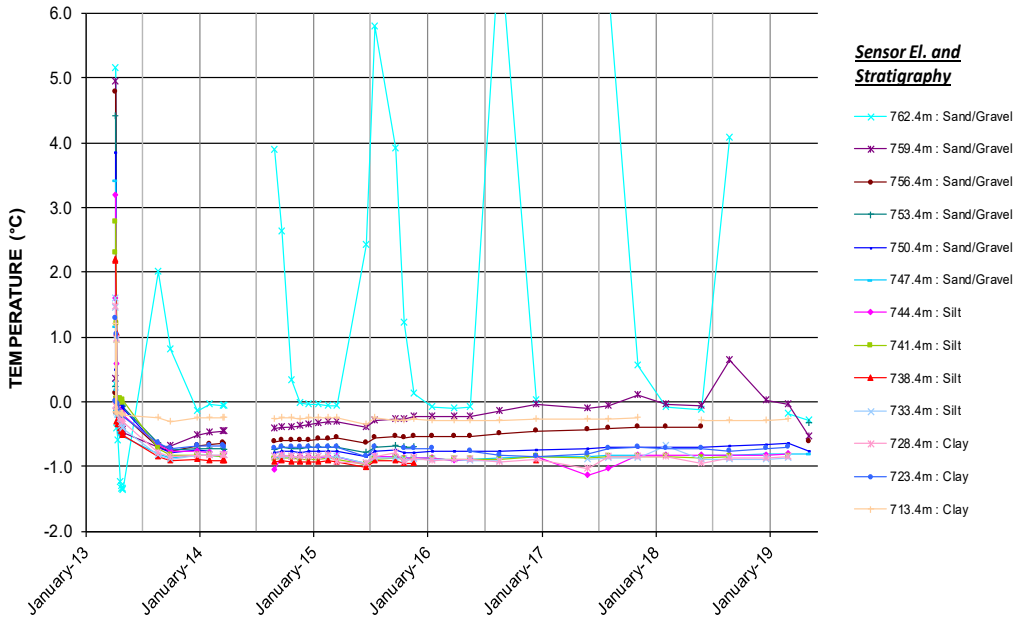
Filename: ApD_2019DSTSFLandscape.pptx

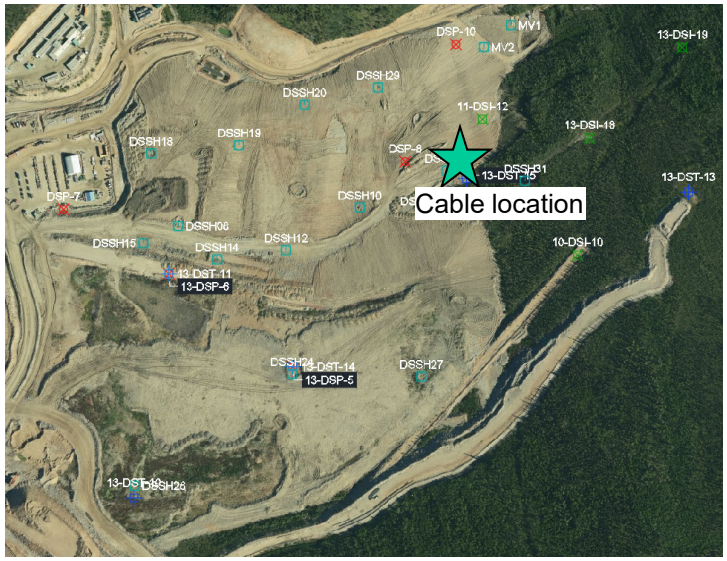
Minto Mine

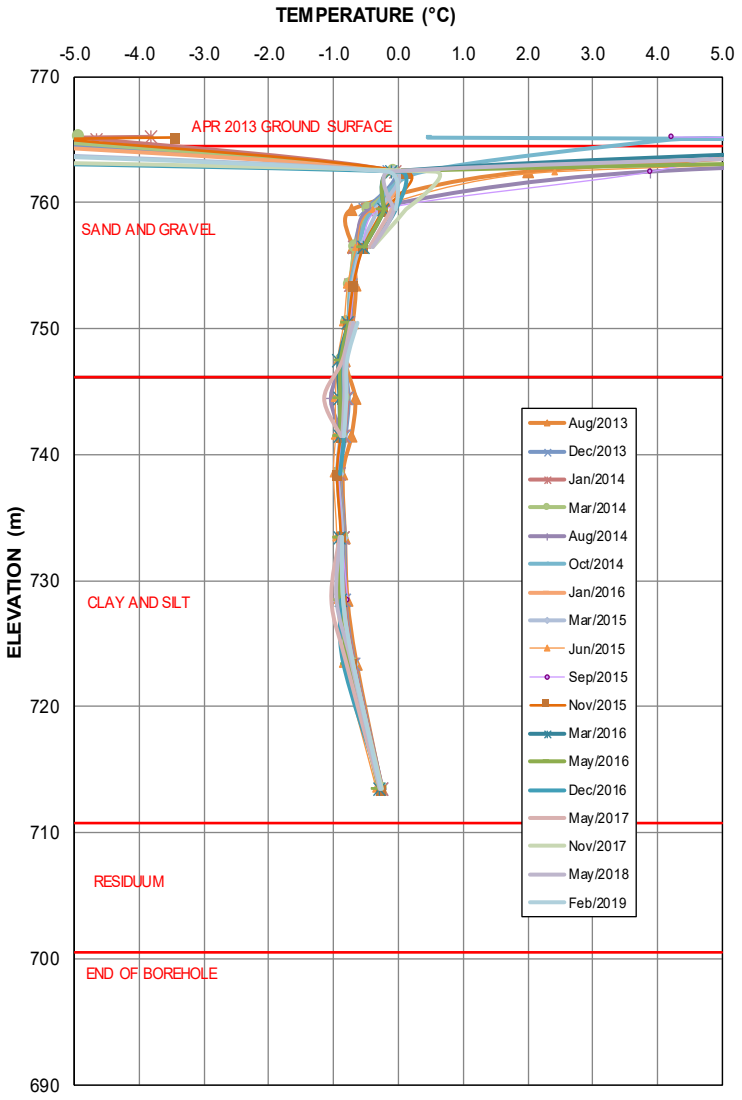
Date: August 2019

Prepared by PHM

Figure: **28**







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srk consulting

Minto Explorations Ltd.

DSTSF Instrumentation Data

Temperature Cable – DST-15

Job No: 1CM002.066

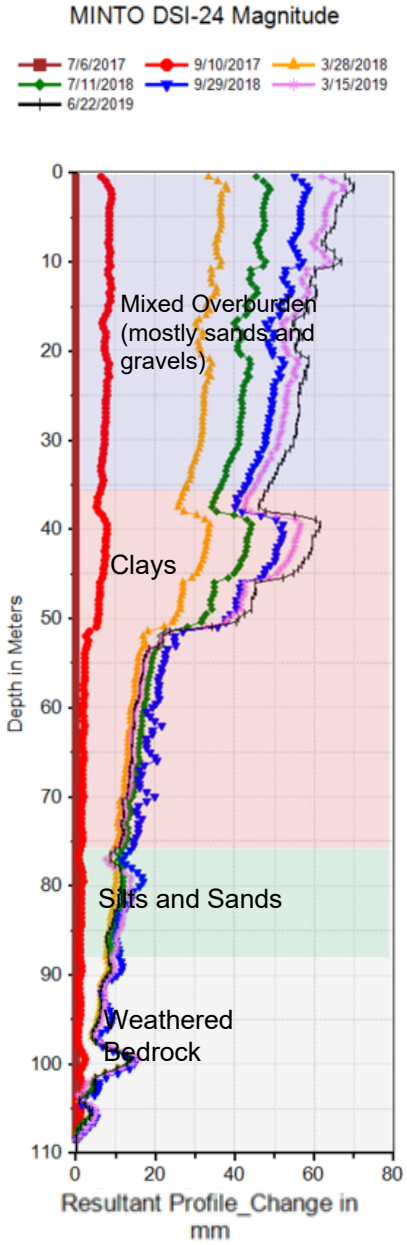
Filename: ApD_2019DSTSFLandscape.pptx

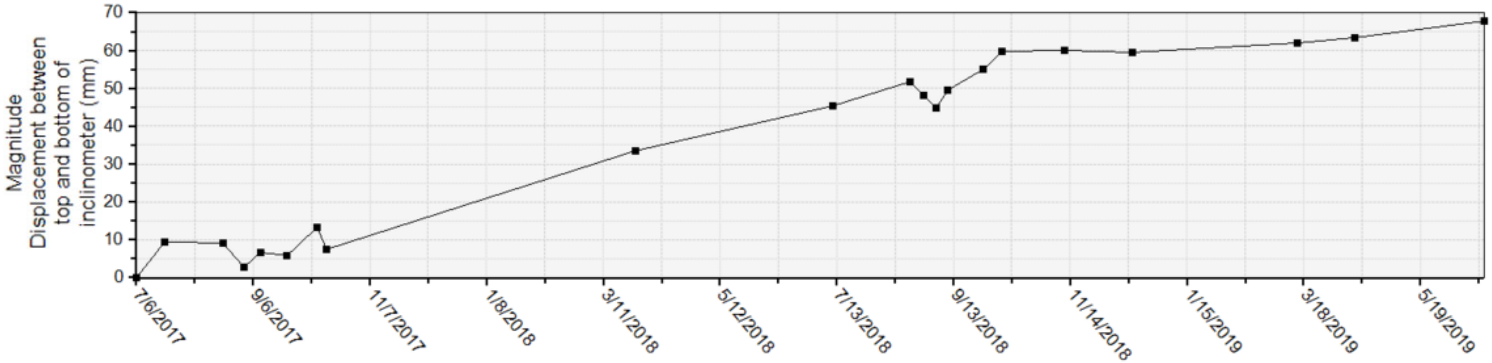
Minto Mine

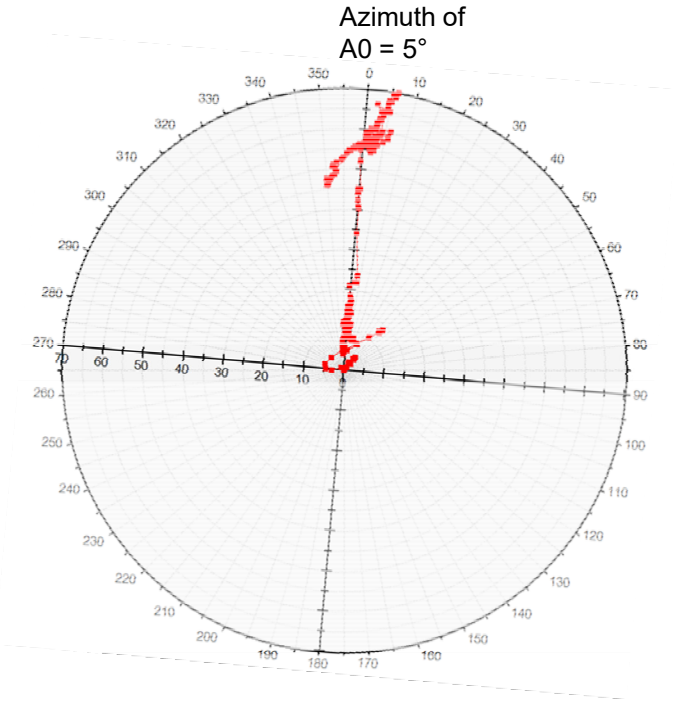
Date: August 2019

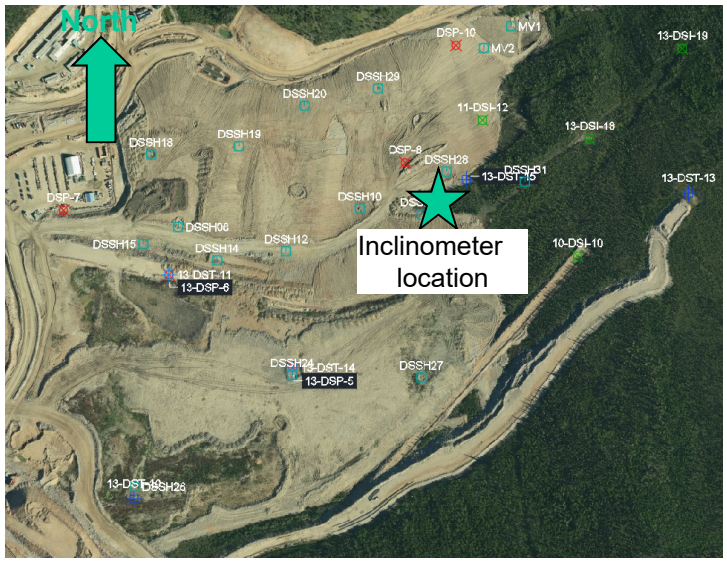
Prepared by PHM

Figure: **29**









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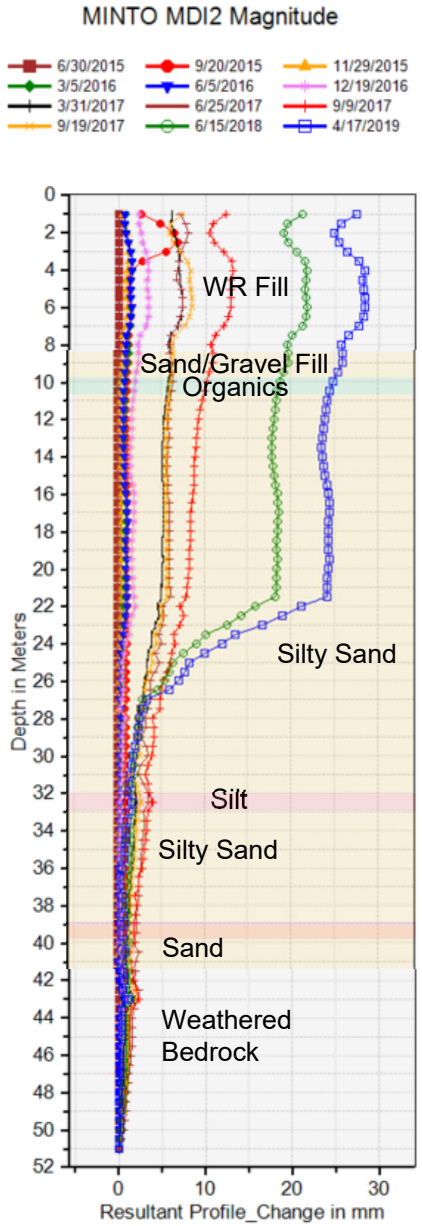
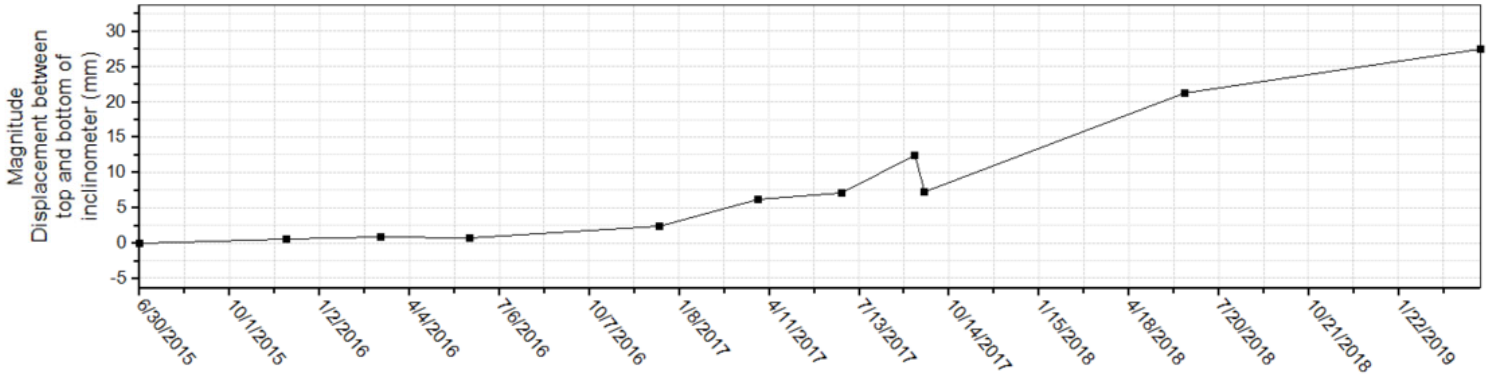
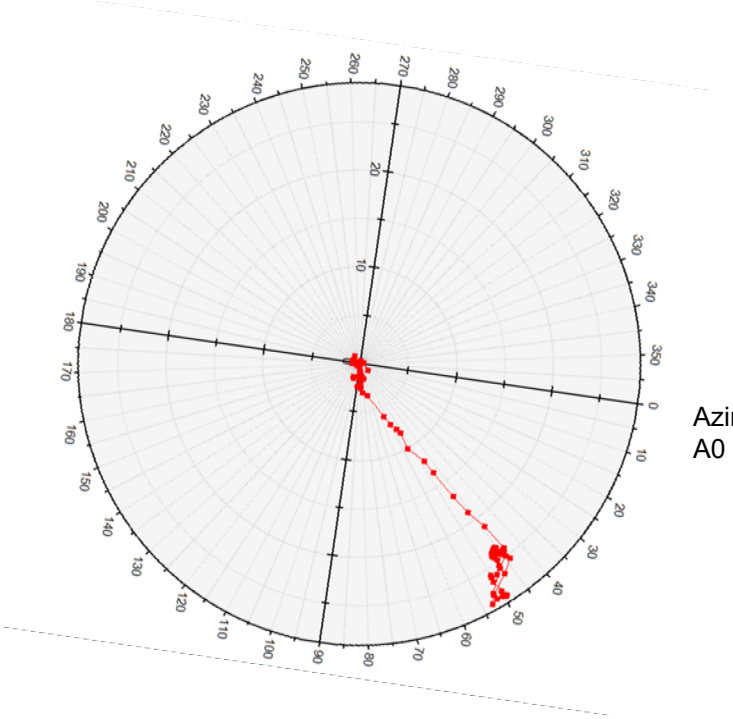
srk consulting	Minto Explorations Ltd.	DSTSF Instrumentation Data
		Inclinometer – DSI-24
Job No: 1CM002.066 Filename: ApD_2019DSTSFLandscape.pptx	Minto Mine	Date: August 2019 | Prepared by PHM | Figure: **30**

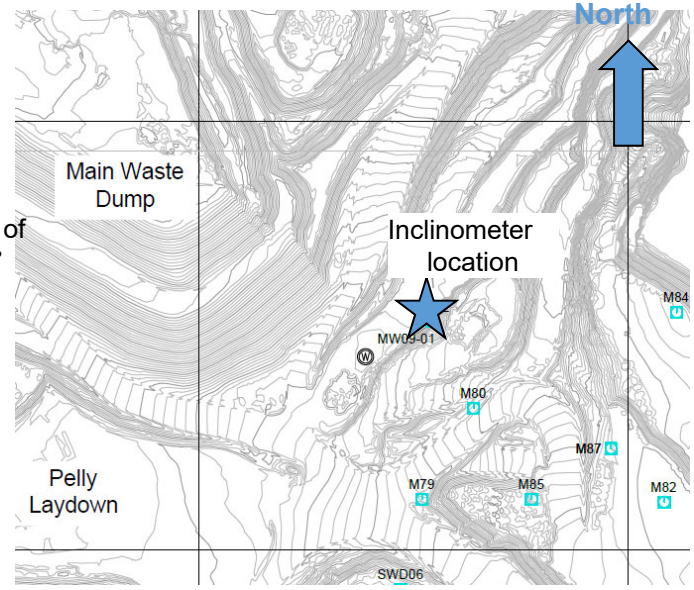
Appendix E: Main Waste Dump Instrumentation Data







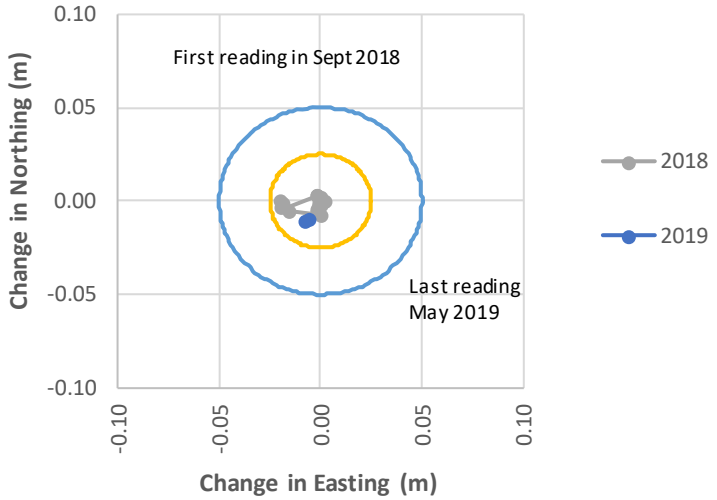
Azimuth of A0 = 93°



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).

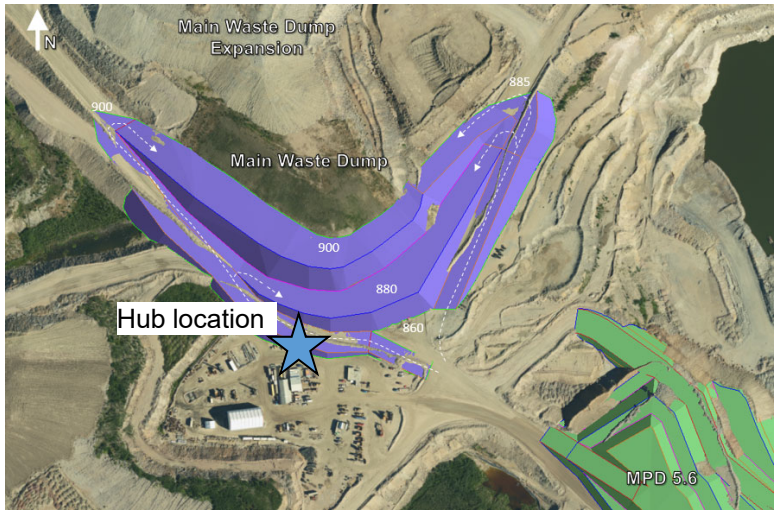
srk consulting	Minto Explorations Ltd.	MWD Instrumentation Data
Job No: 1CM002.066 Filename: ApE_2019MWDInstrumentation.pptx	Minto Mine	**Inclinometer – MDI-2**
		Date: August 2019 / Prepared by: PHM / Figure: 1

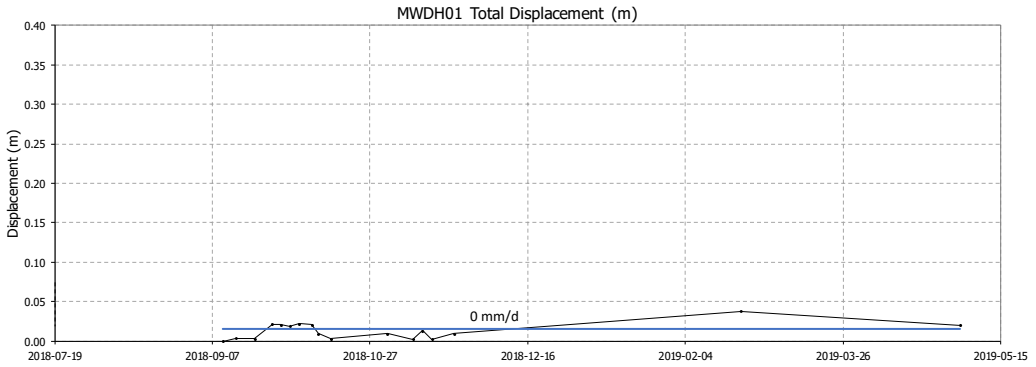
MWDH01 - Northing Vs. Easting Movement Plot

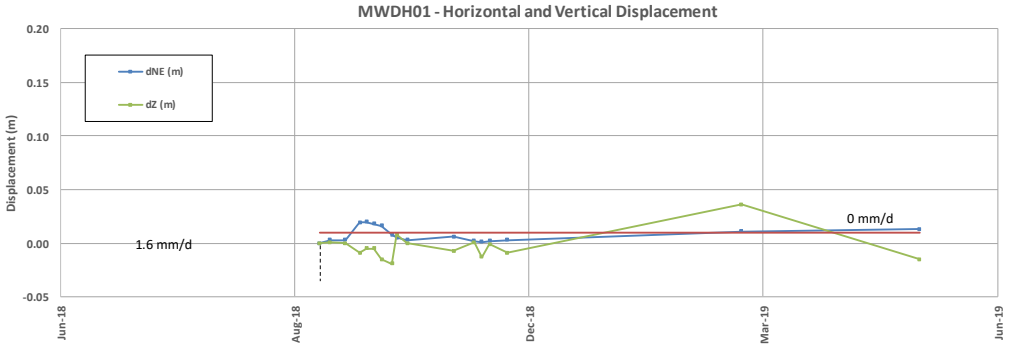


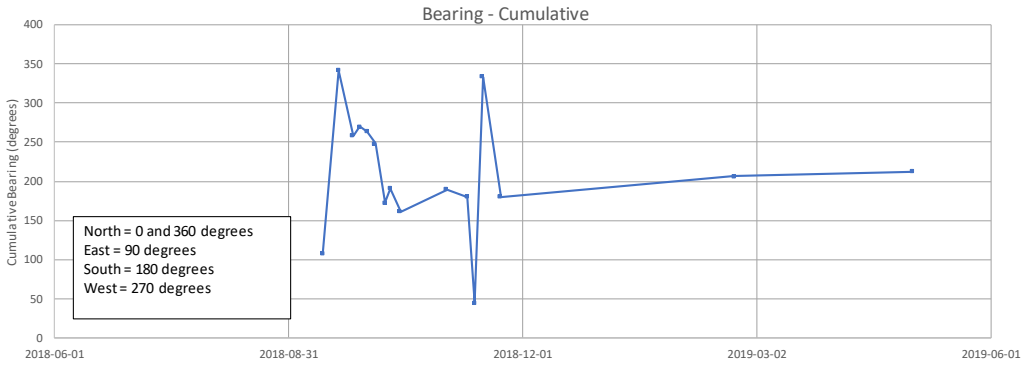
Note:

1. The survey hub was installed August 13, 2018. Data presented in this figure is since September 10, 2018 due to disturbance of the hub.









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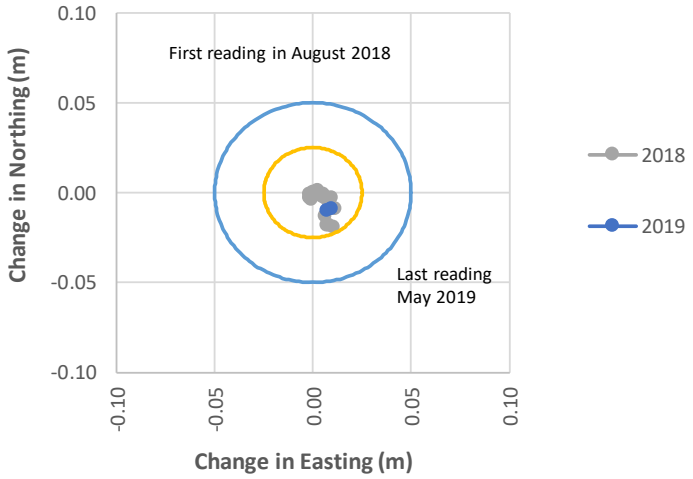
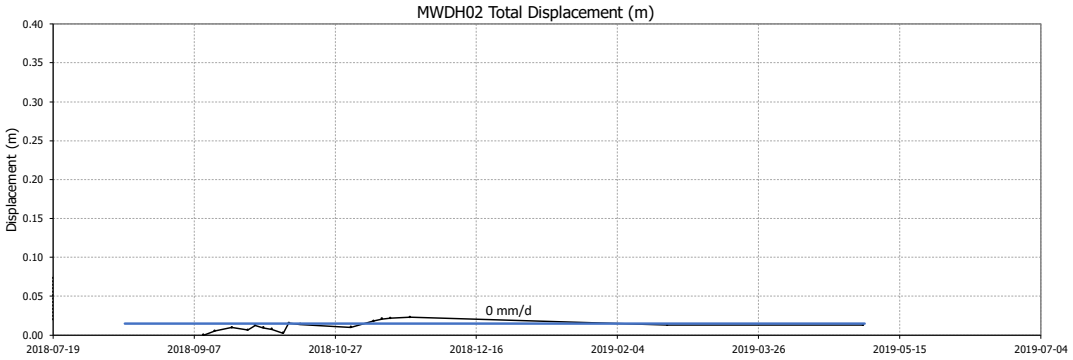
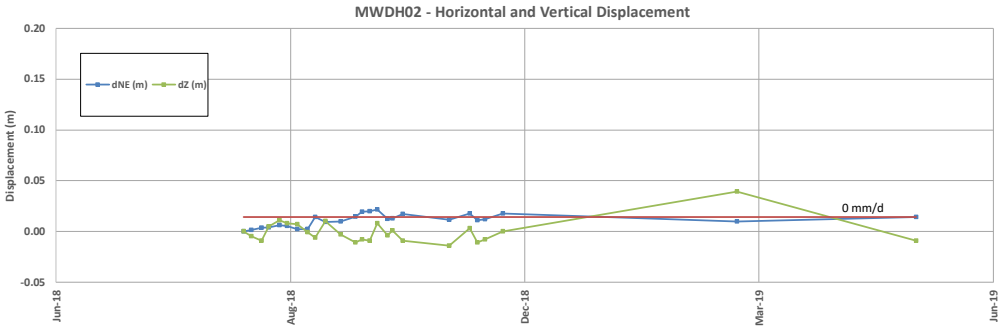
2. Excel instrumentation data: \\VAN-SVR0\Projects\01_SITES\Minto\!020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\MWD_Hub_Monitoring_SRK.xlsm

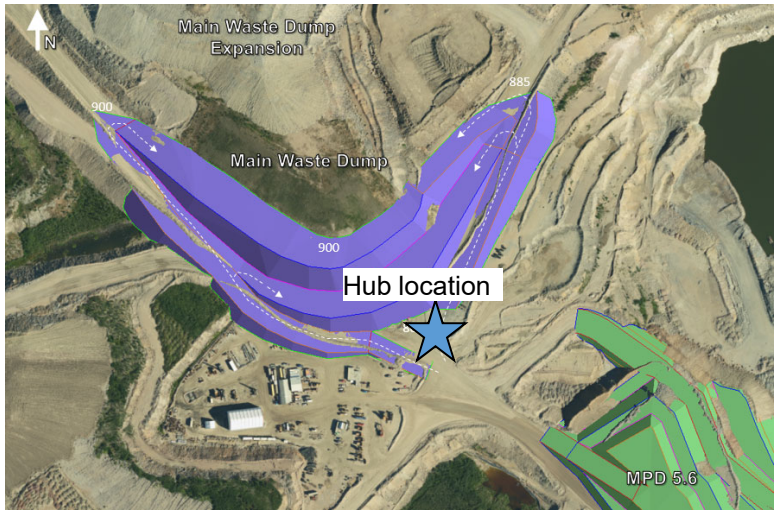
srk consulting	Minto Explorations Ltd.	MWD Instrumentation Data
		Survey Hub – MWDH01
Job No: 1CM002.066 Filename: ApE_2019MWDLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **2**

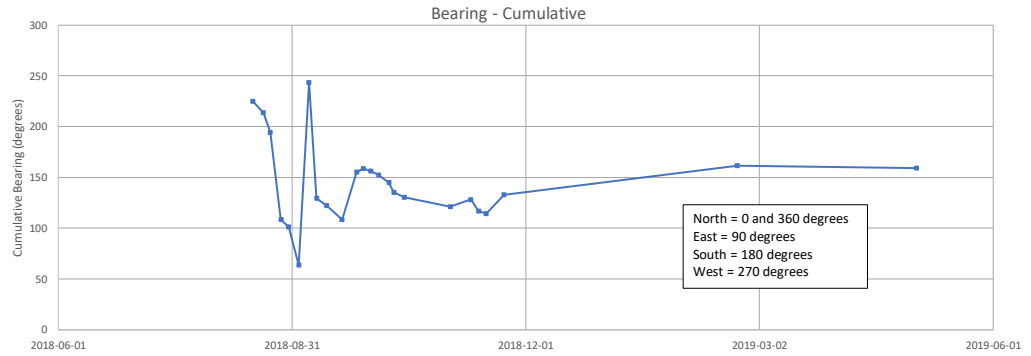
MWDH02 - Northing Vs. Easting Movement Plot











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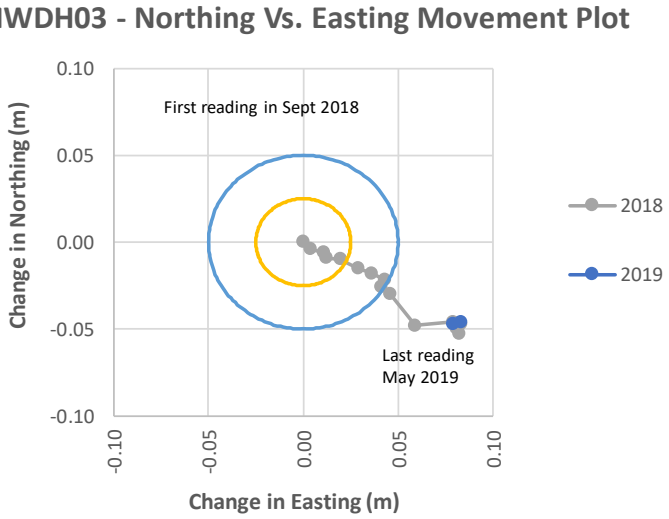
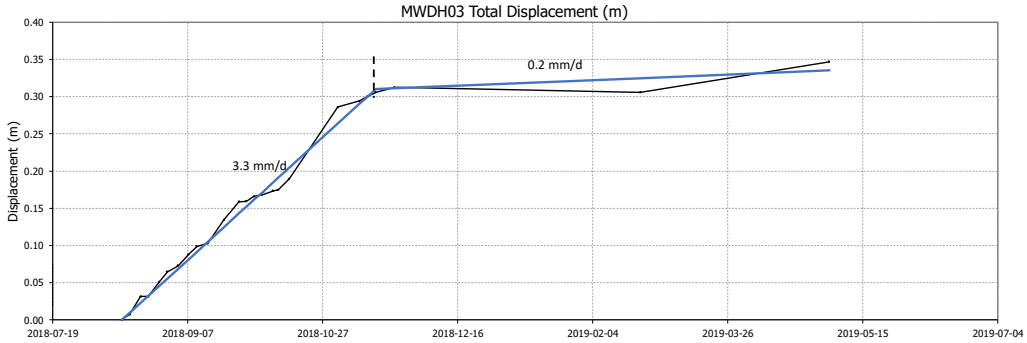
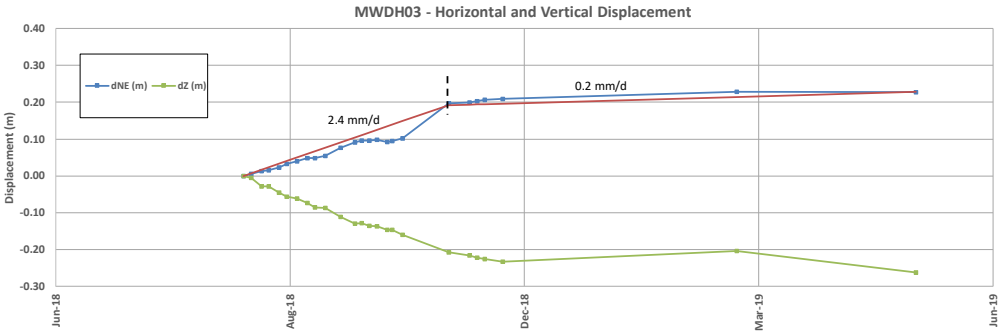
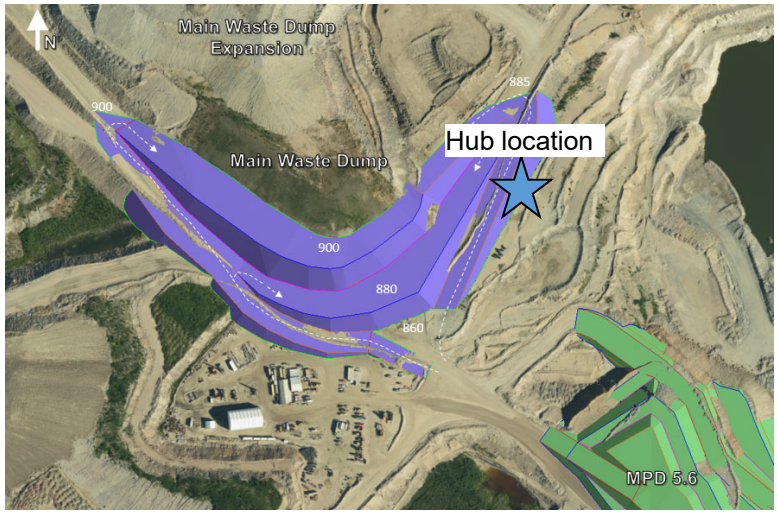
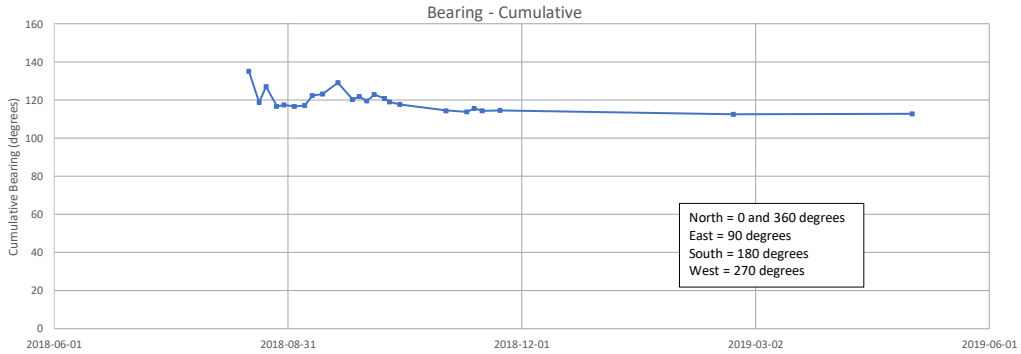
		Survey Hub – MWDH02
Job No: 1CM002.066 Filename: ApE_2019MWDLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **3**











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Minto Explorations Ltd.

MWD Instrumentation Data

Survey Hub – MWDH03

Job No: 1CM002.066

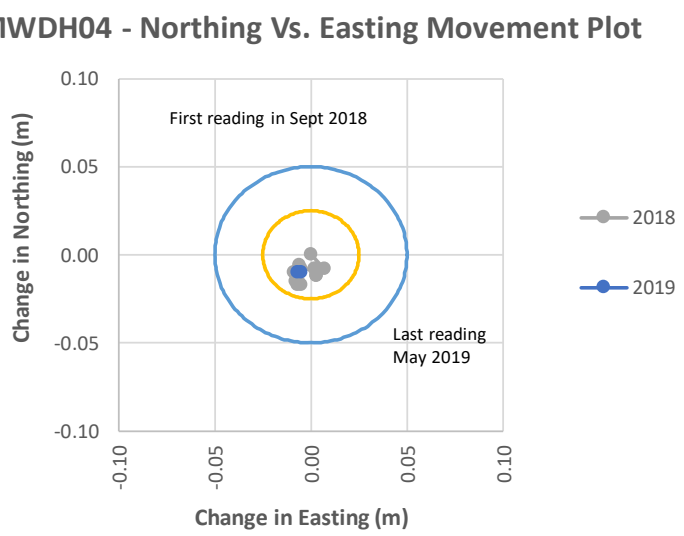
Filename: ApE_2019MWDLandscape.pptx

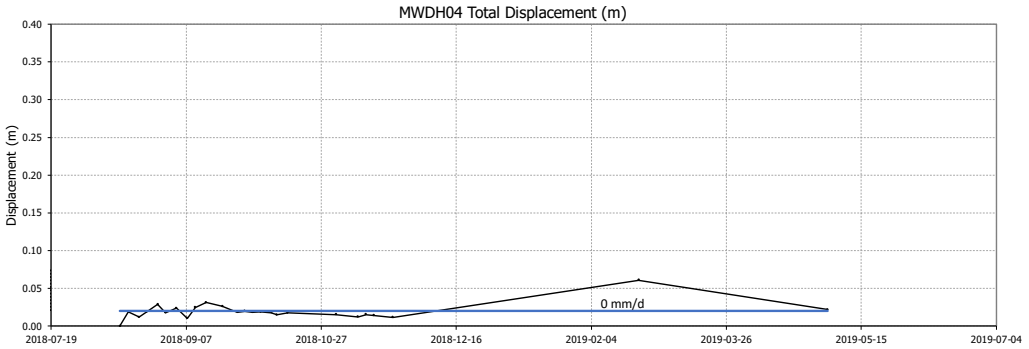
Minto Mine

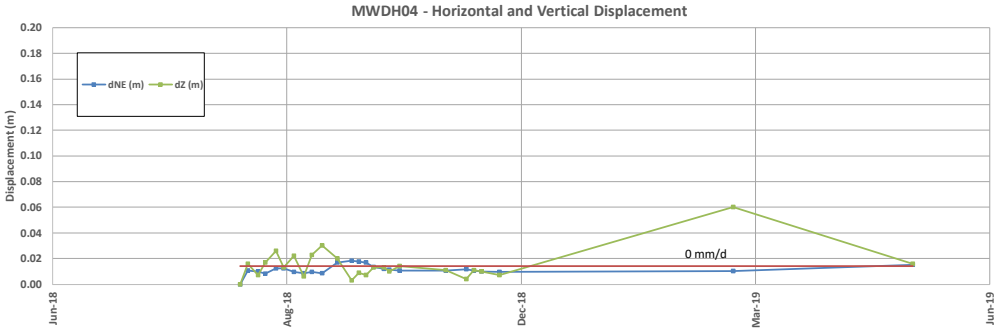
Date: August 2019

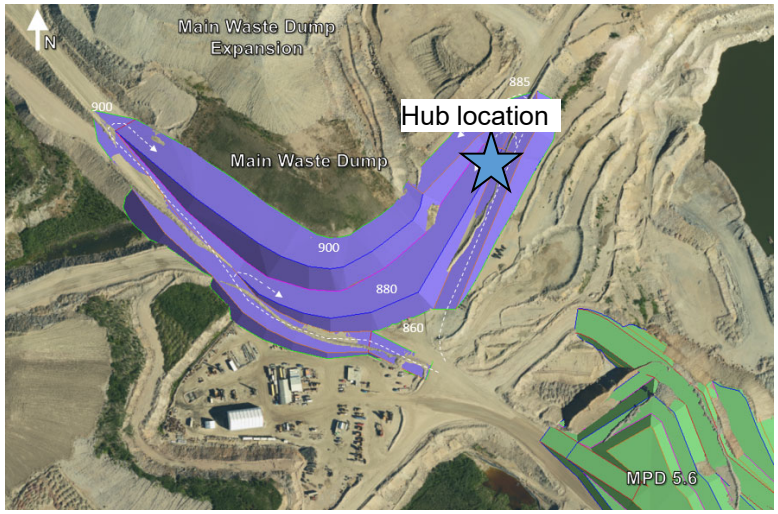
Prepared by PHM

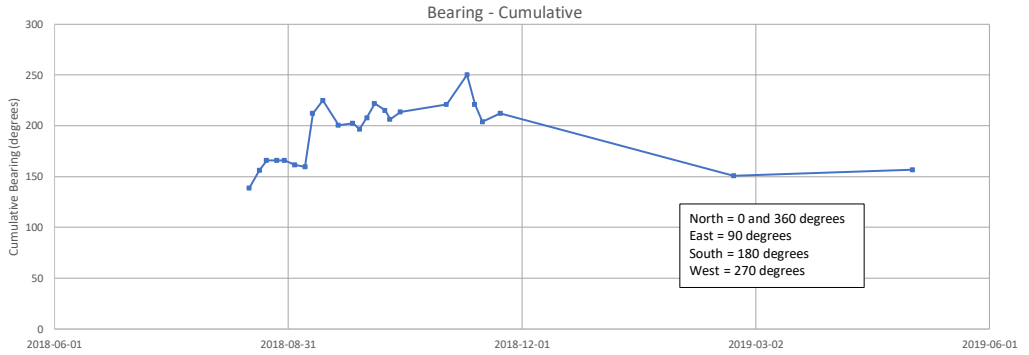
Figure: **4**











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MWD Instrumentation Data

Survey Hub – MWDH04

Job No: 1CM002.066

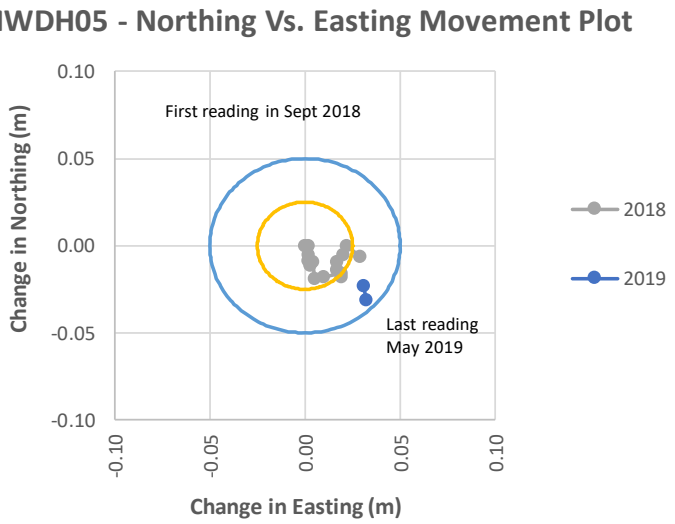
Filename: ApE_2019MWDLandscape.pptx

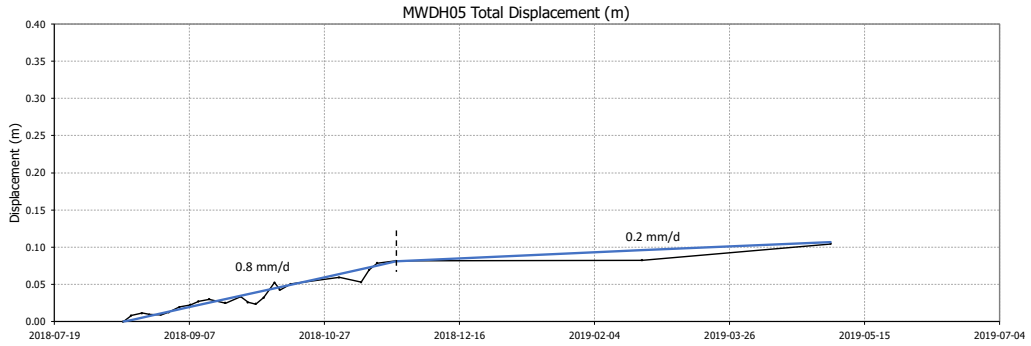
Minto Mine

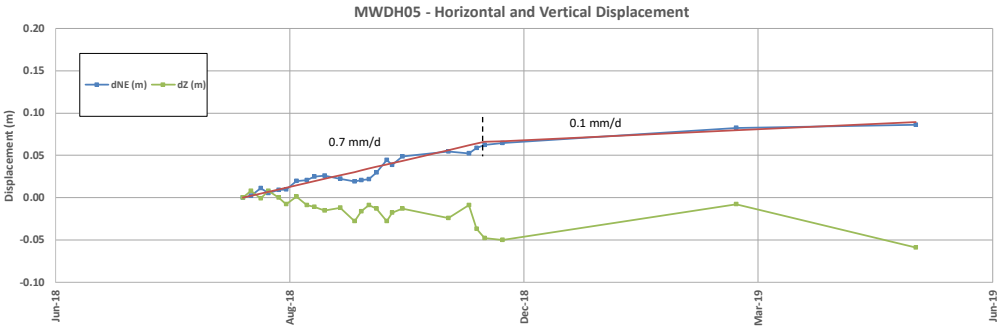
Date: August 2019

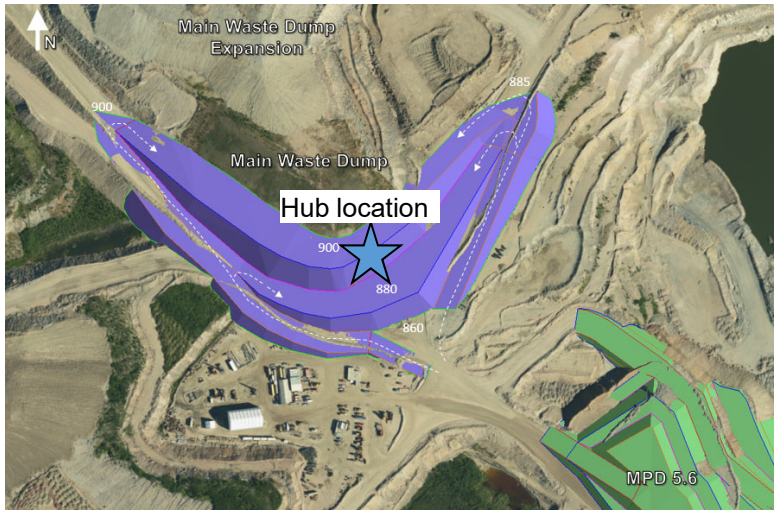
Prepared by PHM

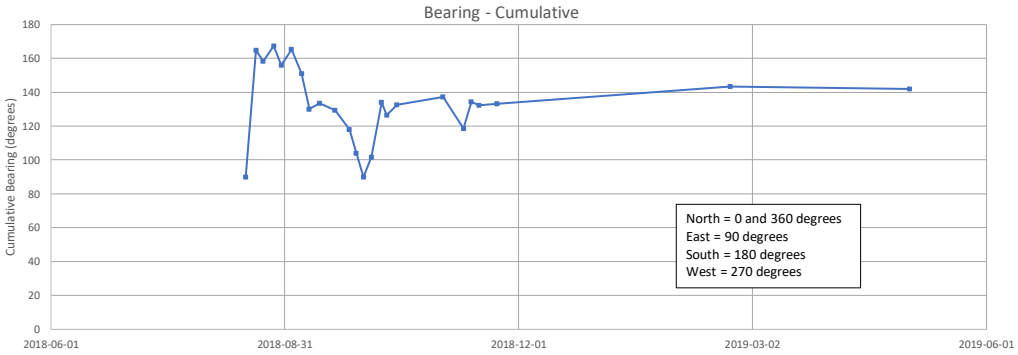
Figure: **5**











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Minto Explorations Ltd.

MWD Instrumentation Data

Survey Hub – MWDH05

Job No: 1CM002.066

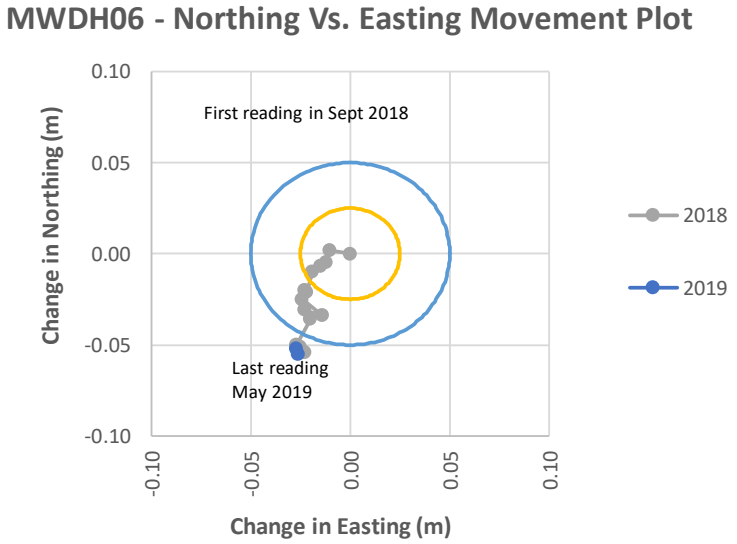
Filename: ApE_2019MWDLandscape.pptx

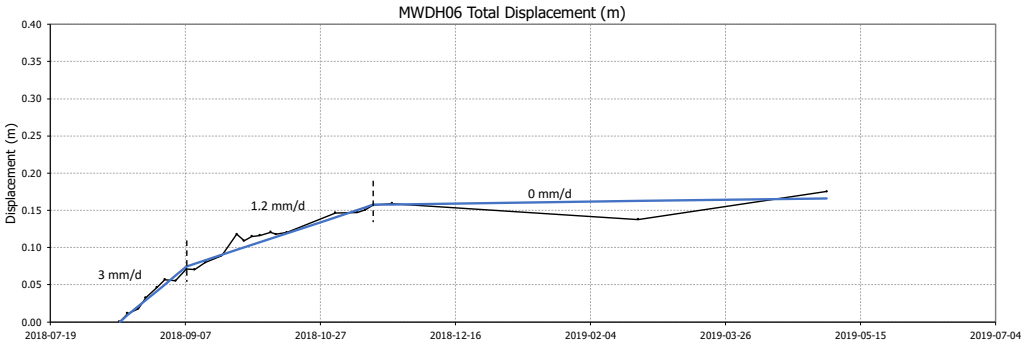
Minto Mine

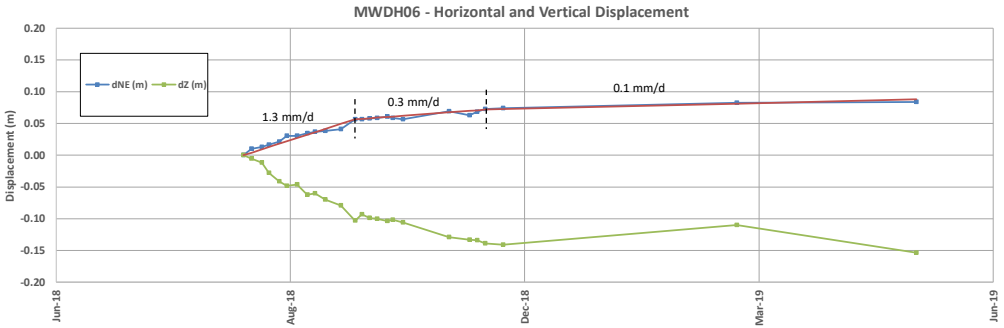
Date: August 2019

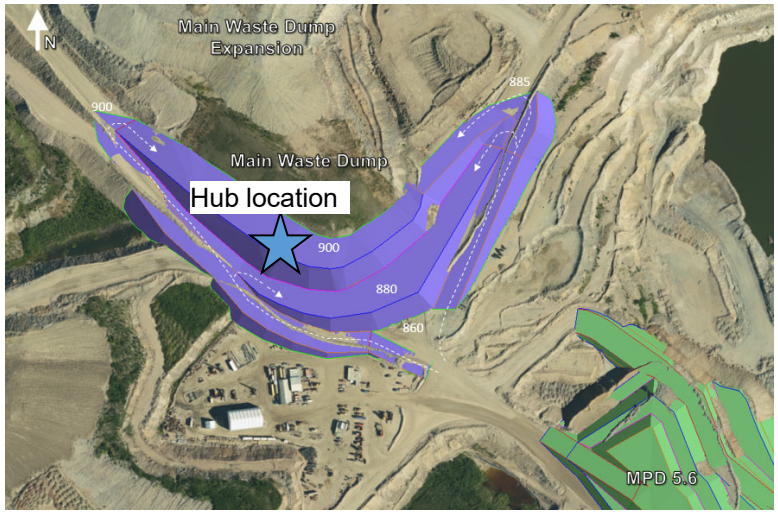
Prepared by PHM

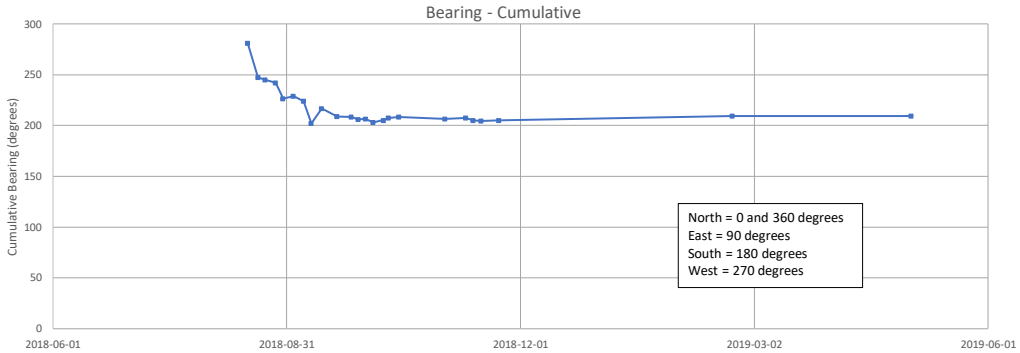
Figure: **6**











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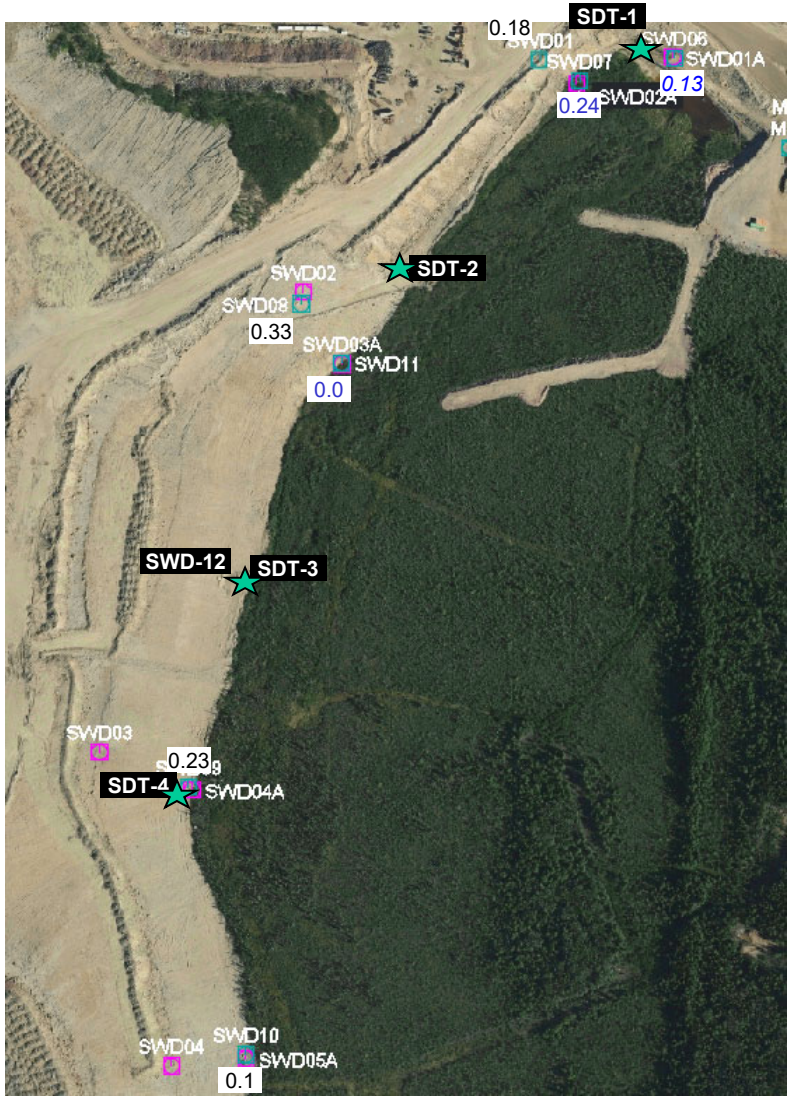
srk consulting	Minto Explorations Ltd.	MWD Instrumentation Data
		Survey Hub – MWDH06
Job No: 1CM002.066 Filename: ApE_2019MWDLandscape.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **7**

Appendix F: Southwest Dump Instrumentation Data



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

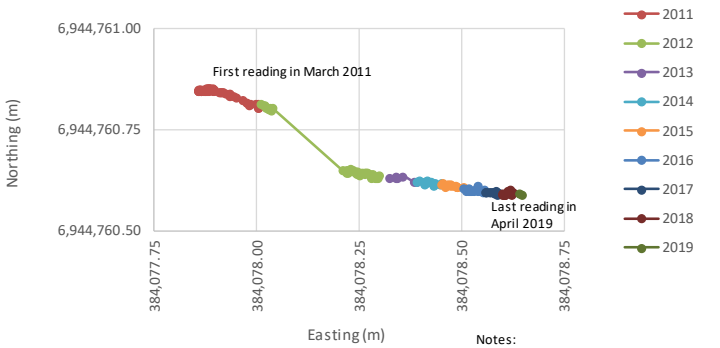
Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		Apr 18	Apr 19		
SWD-01	4/18/2019	0.18	0.15	108	
SWD-06	4/18/2019	0.13	0.05	152	Horizontal movement rate listed.
SWD-07	4/18/2019	0.24	0.10	126	Horizontal movement rate listed.
SWD-08	4/18/2019	0.33	0.28	98	Slight decelleration trend observable.
SWD-09	4/18/2019	0.23	0.33	81	
SWD-10	4/18/2019	0.10	0.03	297	
SWD-11	4/18/2019	0.00	0.00	100	Horizontal movement rate listed.
SWD-12	4/18/2019	-	0.60	98	

Source files:

1. AutoCAD: \\VAN-SVR0\Projects\01_SITES\Minto\!040_AutoCAD\GeotechInstrumentation\GeotechInstrumentation.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

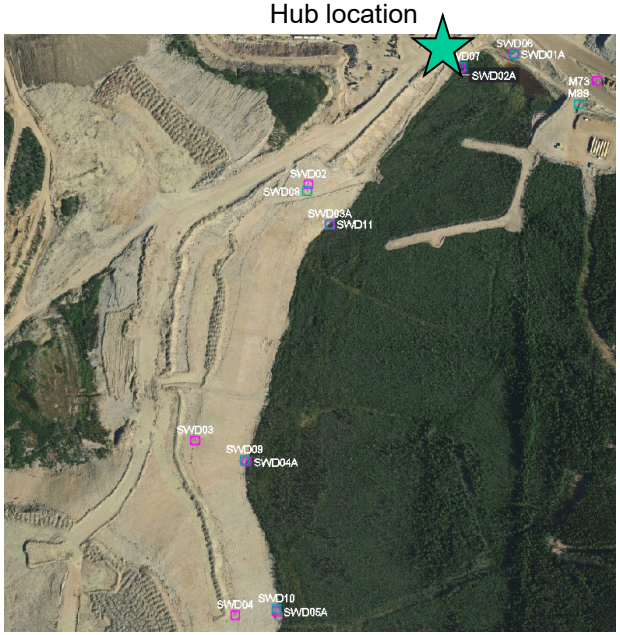
srk consulting	Minto Explorations Ltd.	SWD Instrumentation Data
		Southwest Dump Survey Hub Summary
Job No: 1CM002.066 Filename: ApF_2019SWD Instrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: 1

SWD01 - Northing Vs. Easting Movement Plot

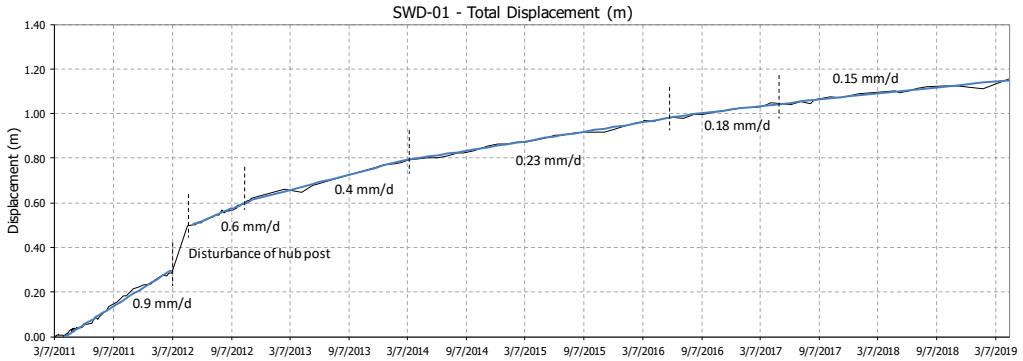


Notes:
Coordinate system is NAD 83 UTM Zone 8.

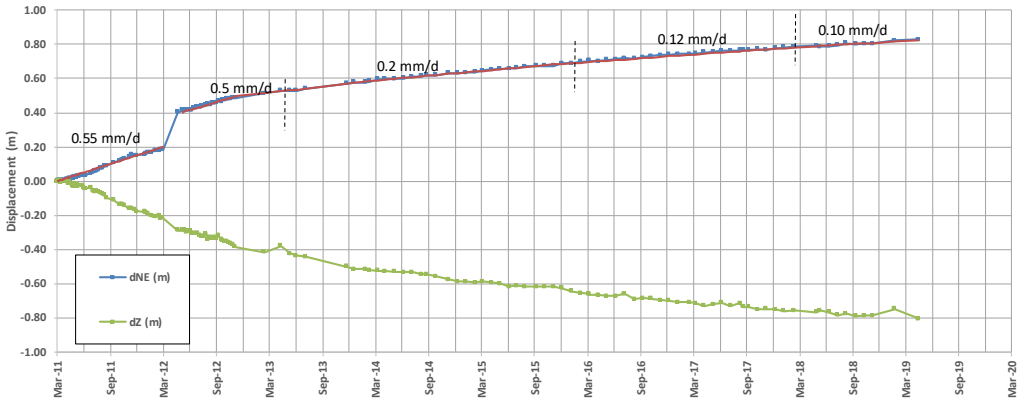
Hub location



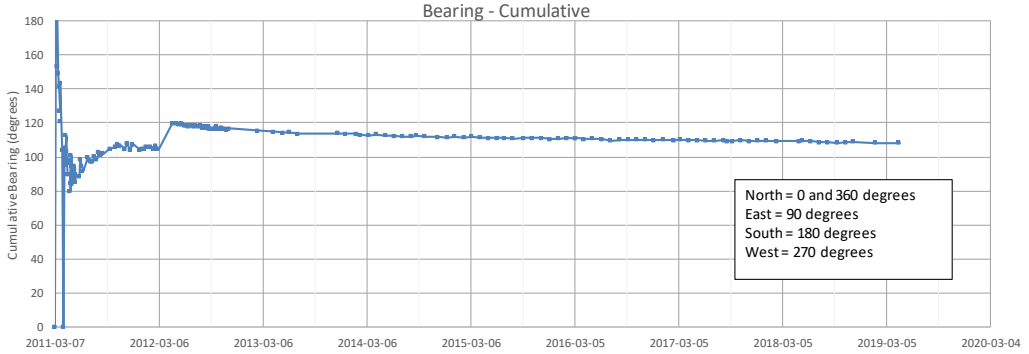
SWD-01 - Total Displacement (m)



SWD-01 - Horizontal and Vertical Displacement



Bearing - Cumulative



Source files:

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2. Excel instrumentation data: \\VAN-SVR0\Projects\01_SITES\Minto\!020_Site_Wide_Data\Geotechnical\Geotech Monitoring Data\SWD_ASH_WSP_SurveyHubMonitoring_SRK.xlsm

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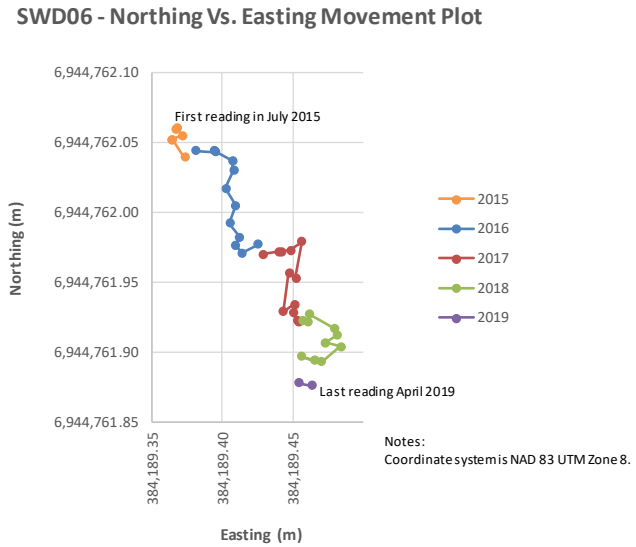
SWD Instrumentation Data

Survey Hub – SWD-01

Job No: 1CM002.066
Filename: ApF_2019SWD Instrumentation.pptx

Minto Mine

Date: August 2019 | Prepared by: PHM | Figure: **2**

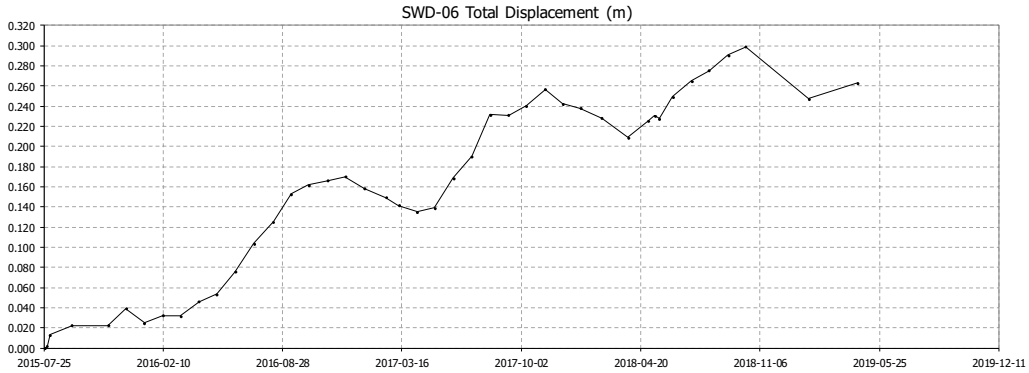


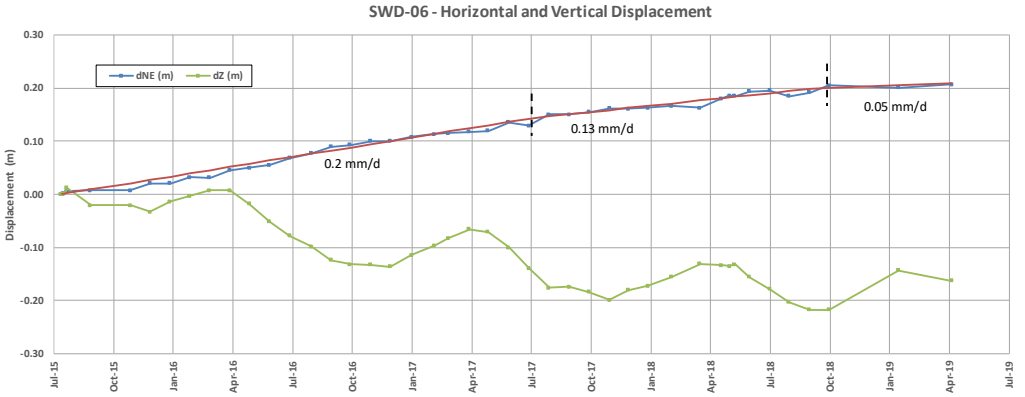
Notes:
Coordinate system is NAD 83 UTM Zone 8.

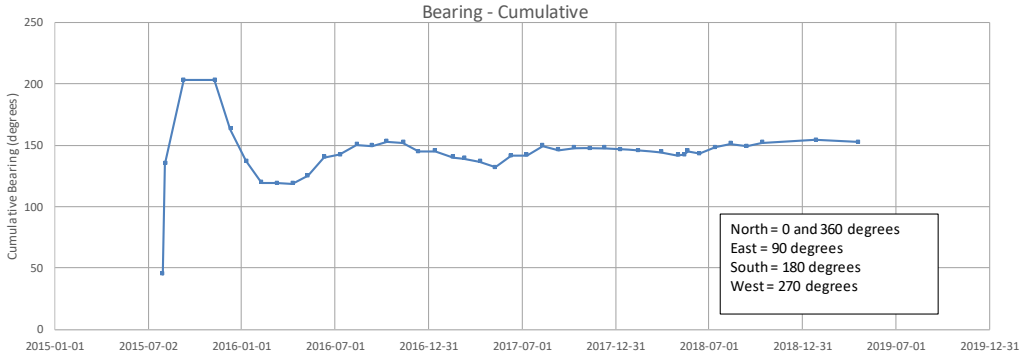
Notes

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.*

Hub location







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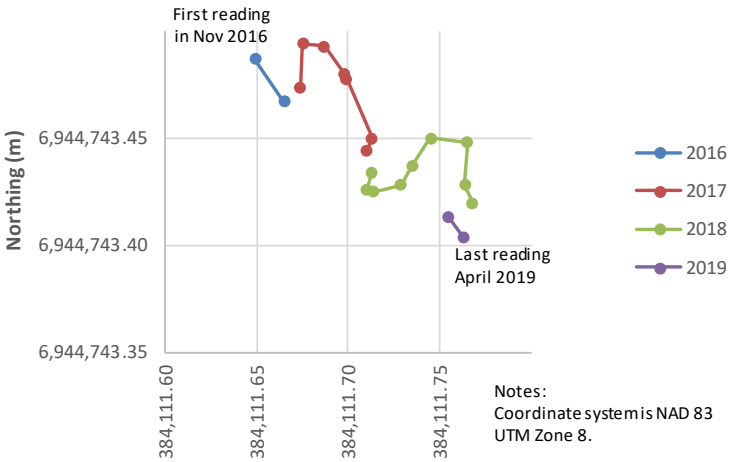
		Survey Hub – SWD-06
Job No: 1CM002.066 Filename: ApF_2019SWD Instrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **3**

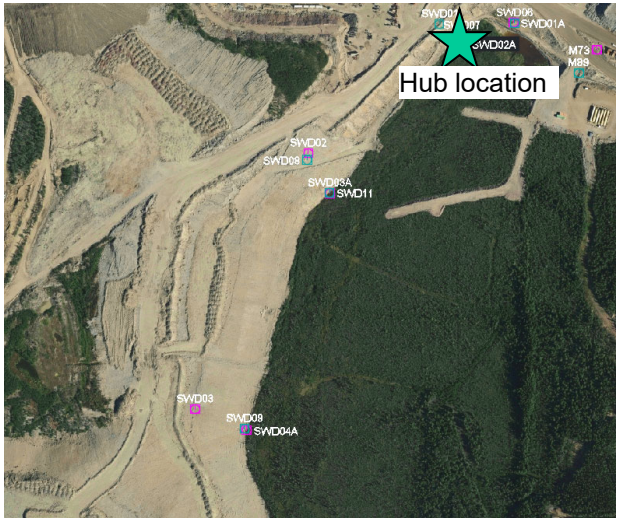
SWD07 - Northing Vs. Easting Movement Plot

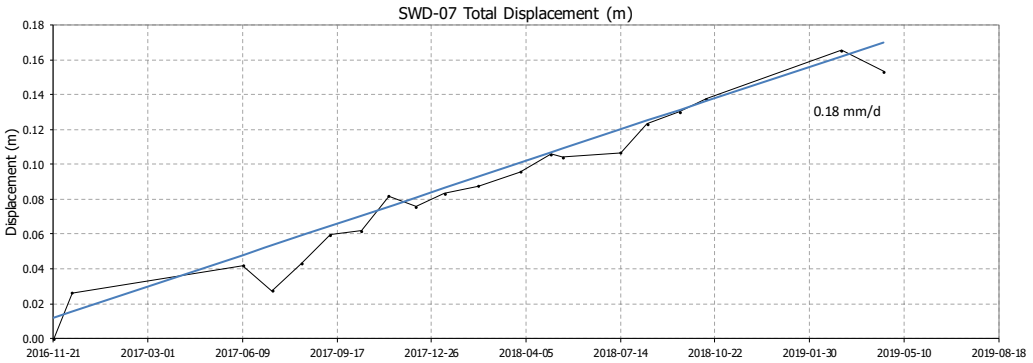


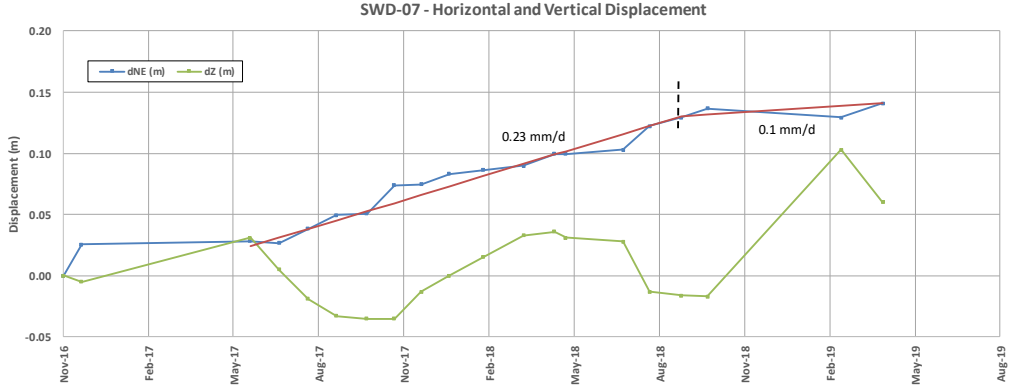
Notes:
Coordinate system is NAD 83
UTM Zone 8.

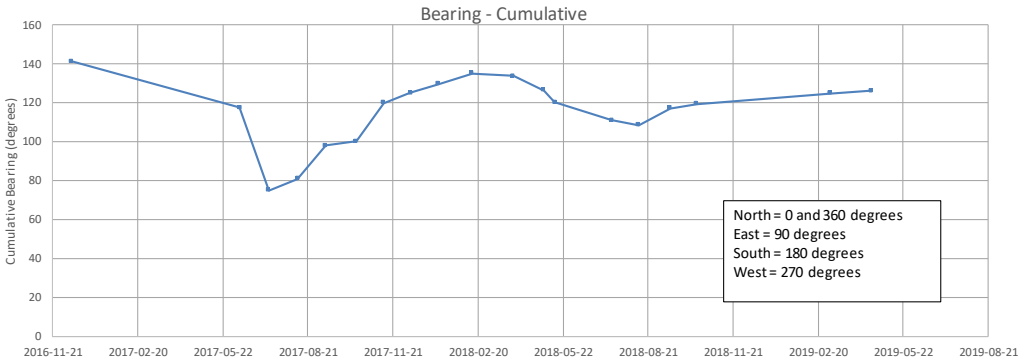
Notes

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









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SWD Instrumentation Data

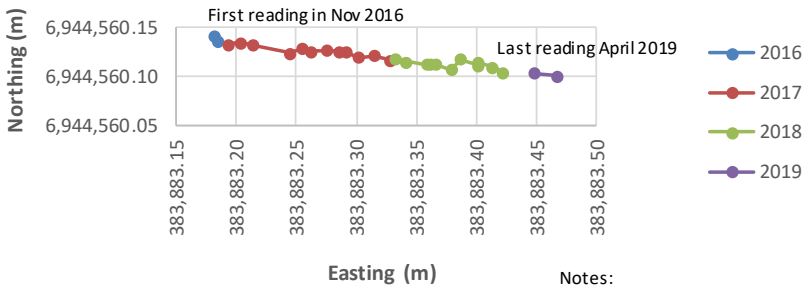
Survey Hub – SWD-07

Job No: 1CM002.066
Filename: ApF_2019SWD Instrumentation.pptx

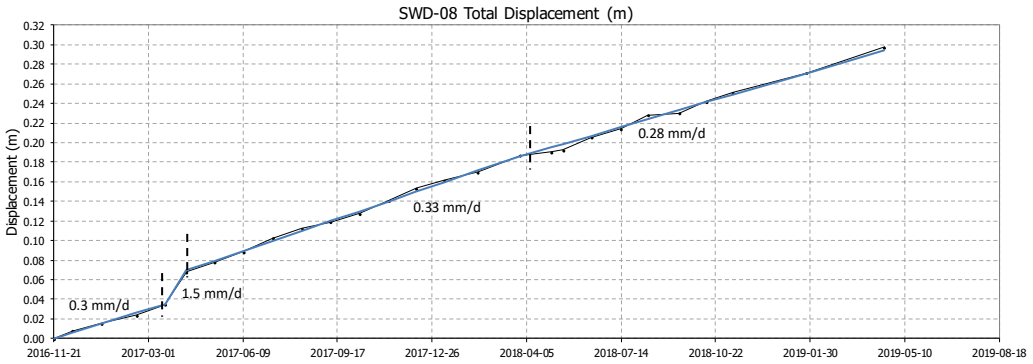
Minto Mine

Date: August 2019 | Prepared by: PHM | Figure: **4**

SWD08 - Northing Vs. Easting Movement Plot

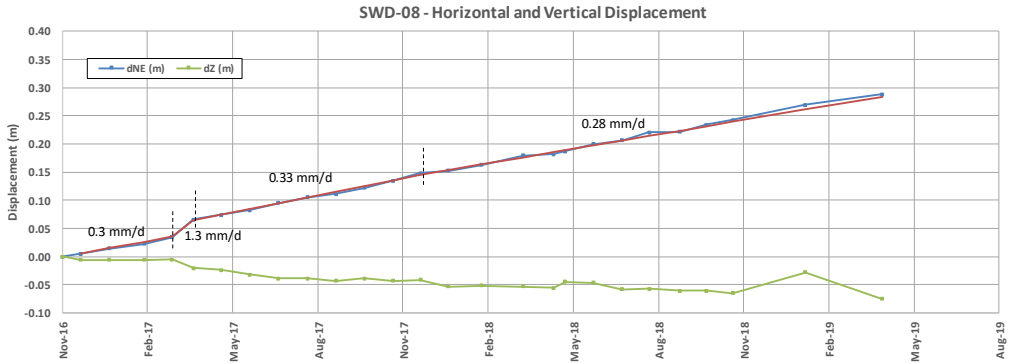


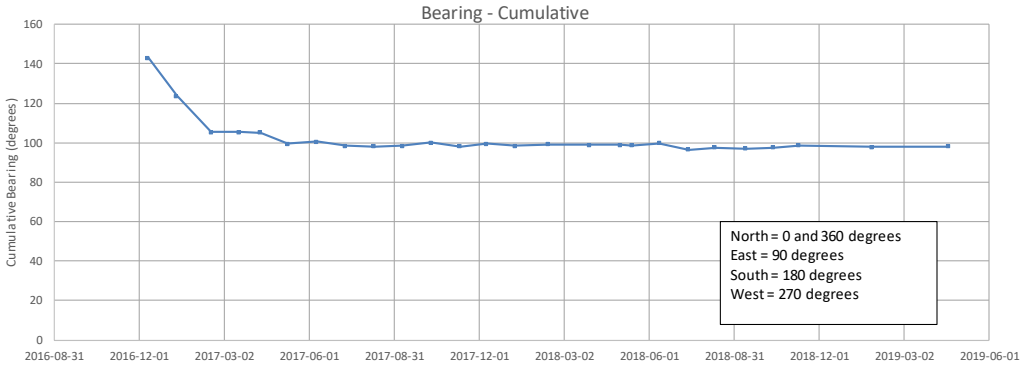
Notes:
Coordinate system is NAD 83 UTM Zone 8.



Notes

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





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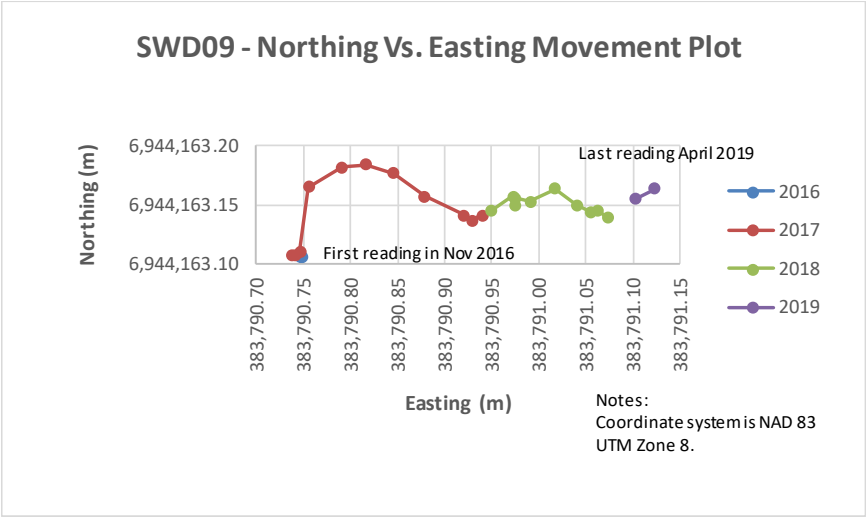
SWD Instrumentation Data

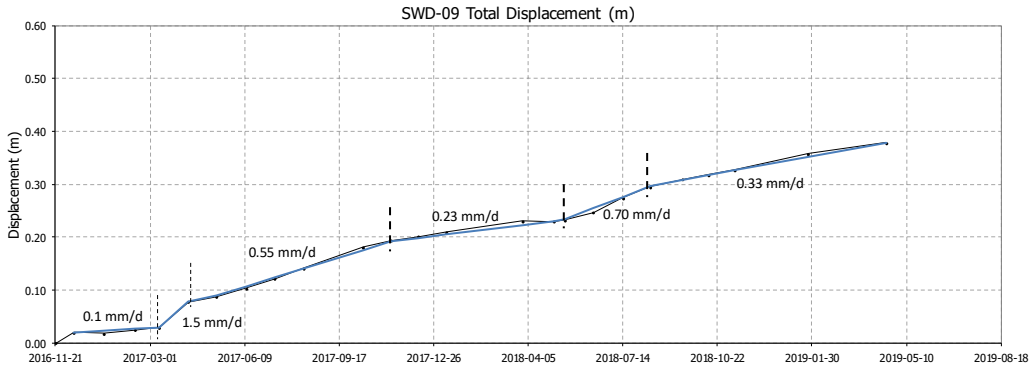
Survey Hub – SWD-08

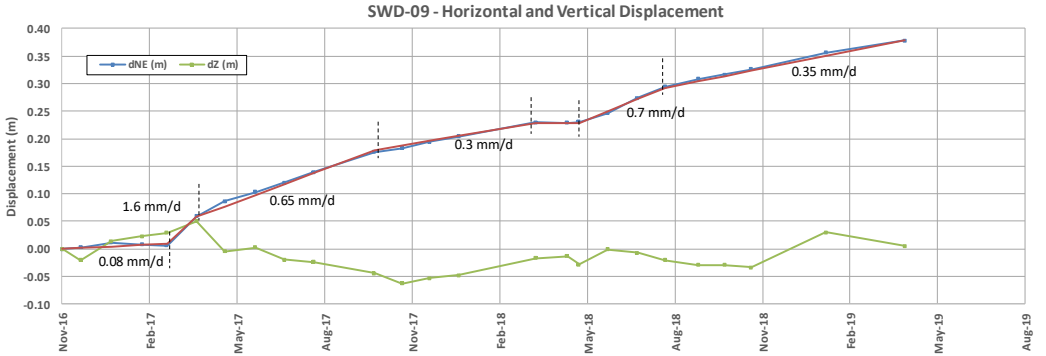
Job No: 1CM002.066
Filename: ApF_2019SWD Instrumentation.pptx

Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	5

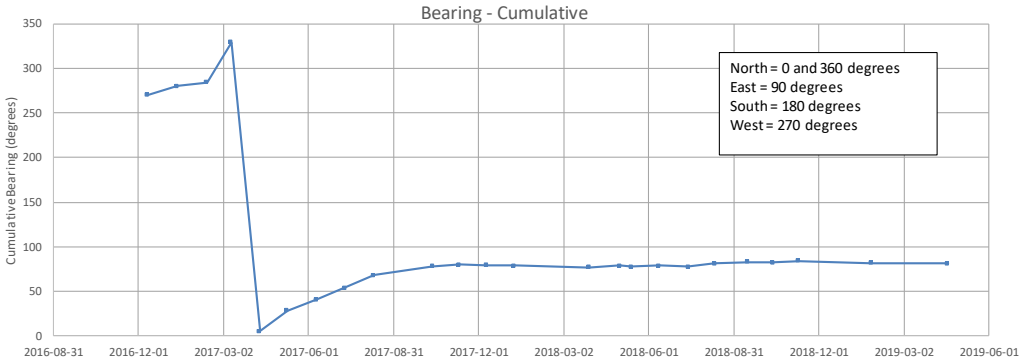






Notes

1. *Hub is a replacement for SWD-04A that was disturbed by frost heave.*
2. *The hub consists of a large boulder 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.*



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SWD Instrumentation Data

Survey Hub – SWD-09

Job No: 1CM002.066

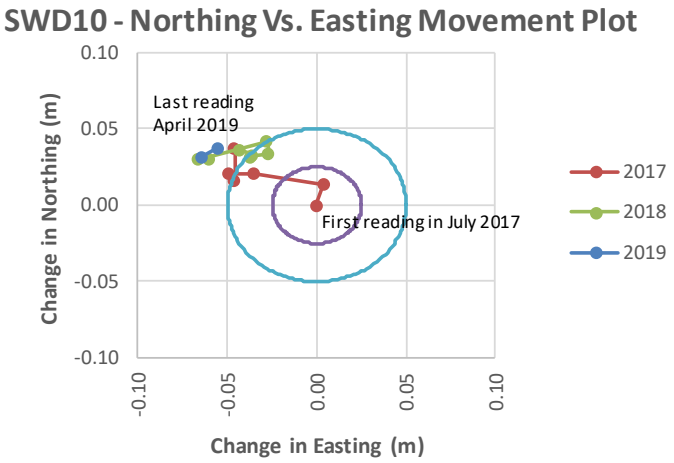
Filename: ApF_2019SWD Instrumentation.pptx

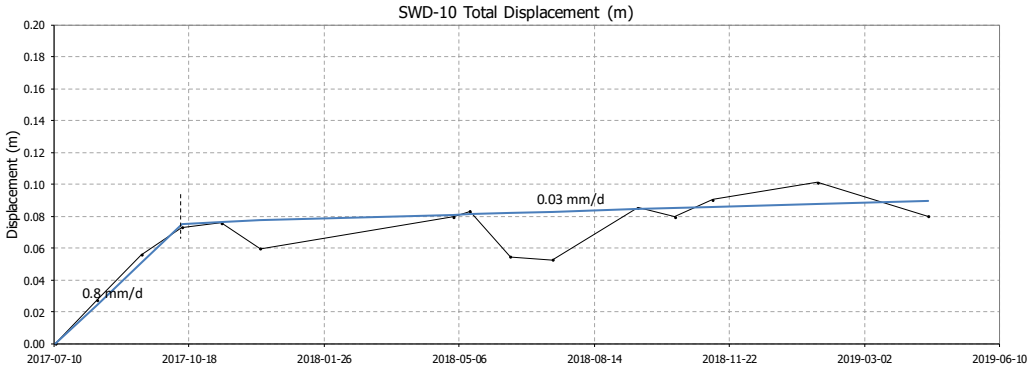
Minto Mine

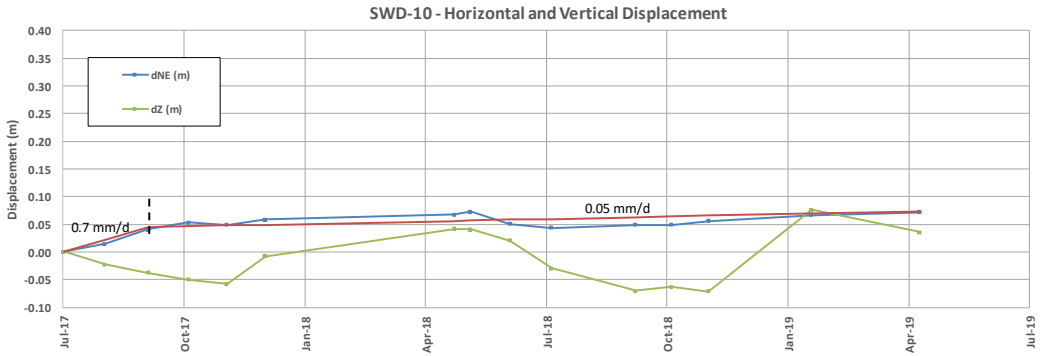
Date: August 2019

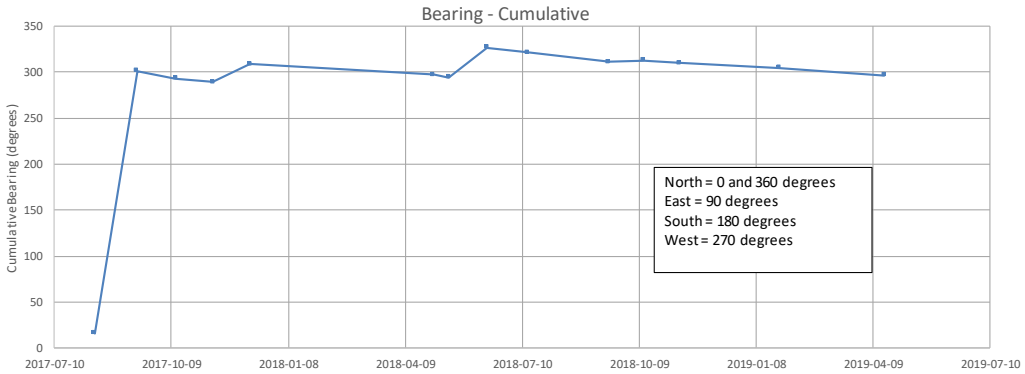
Prepared by PHM

Figure: **6**



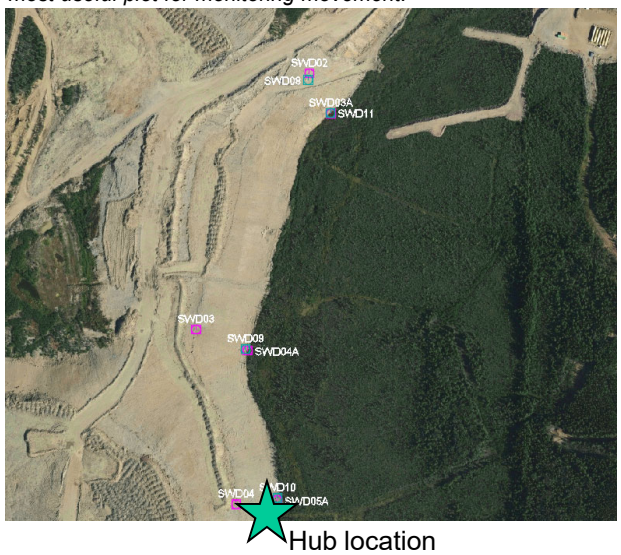






Notes

1. *Hub is a replacement for SWD-05A that was disturbed by frost heave.*
2. *The hub consists of a large boulder 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.*



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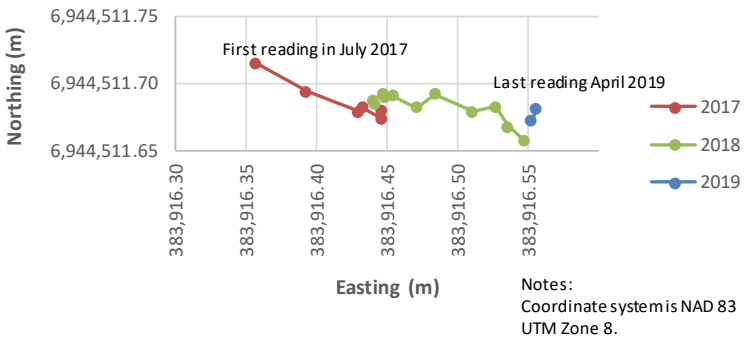
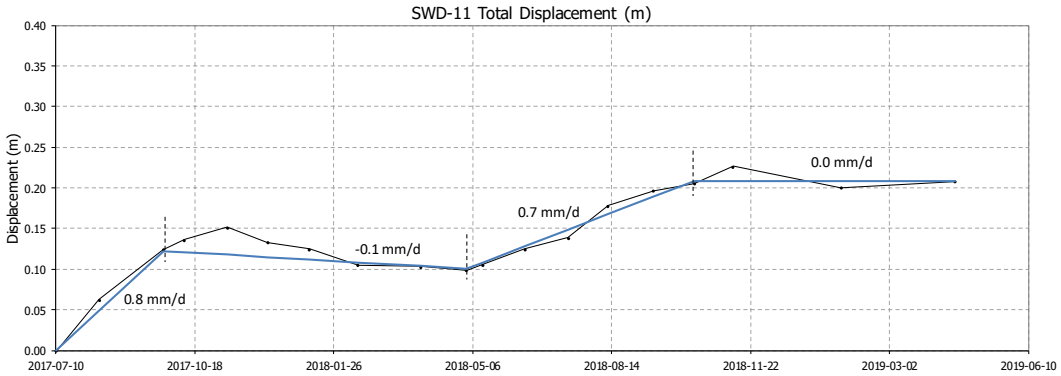
srk consulting	Minto Explorations Ltd.	SWD Instrumentation Data
		Survey Hub – SWD-10
Job No: 1CM002.066 Filename: ApF_2019SWD Instrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: 7

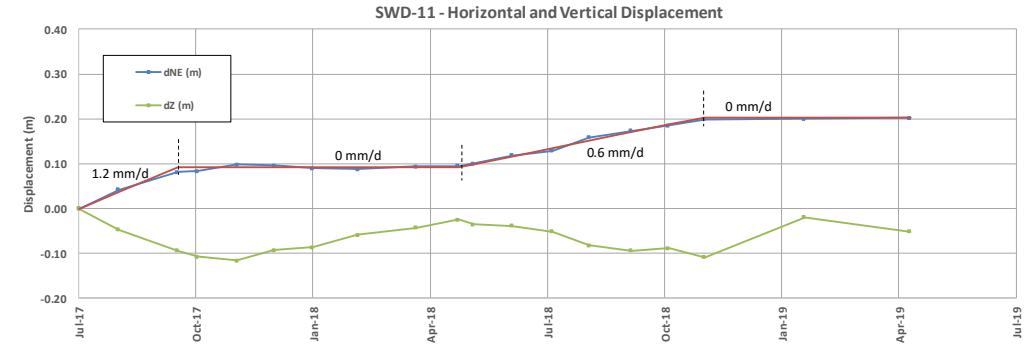


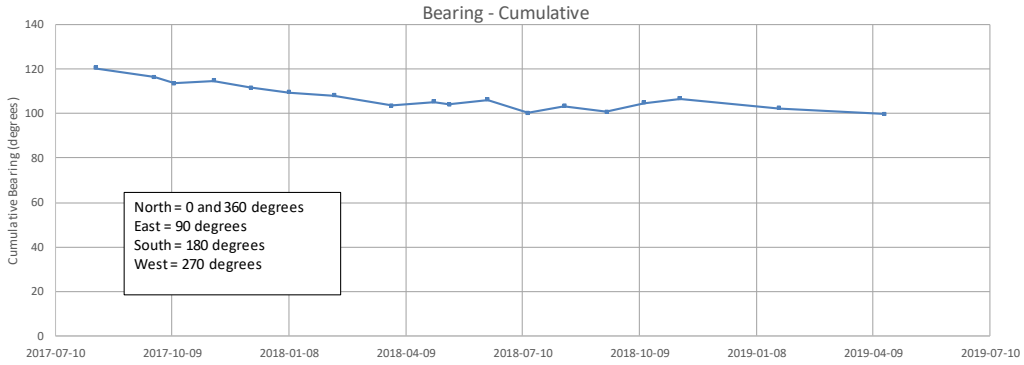
Notes:
Coordinate system is NAD 83 UTM Zone 8.



Notes

1. *Hub is a replacement for SWD-03A that was disturbed by frost heave.*
2. *The hub consists of a large boulder 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.*





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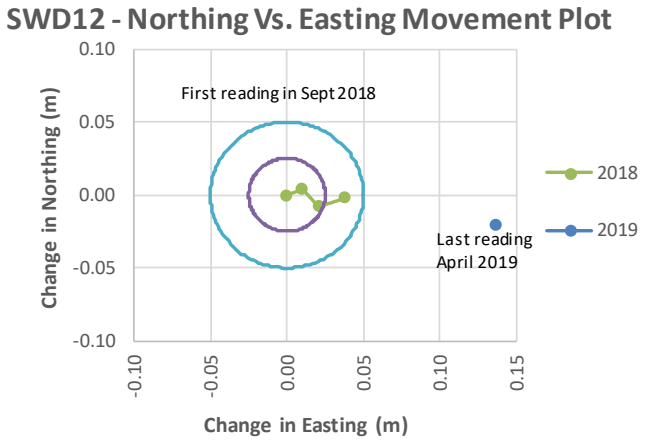
SWD Instrumentation Data

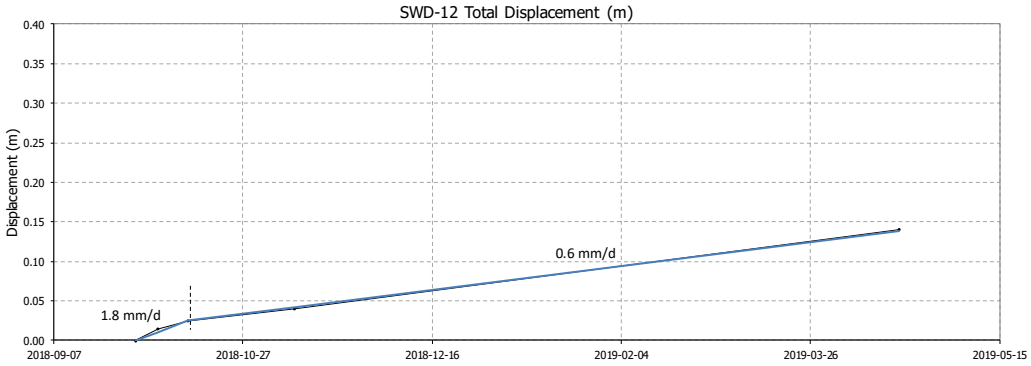
Survey Hub – SWD-11

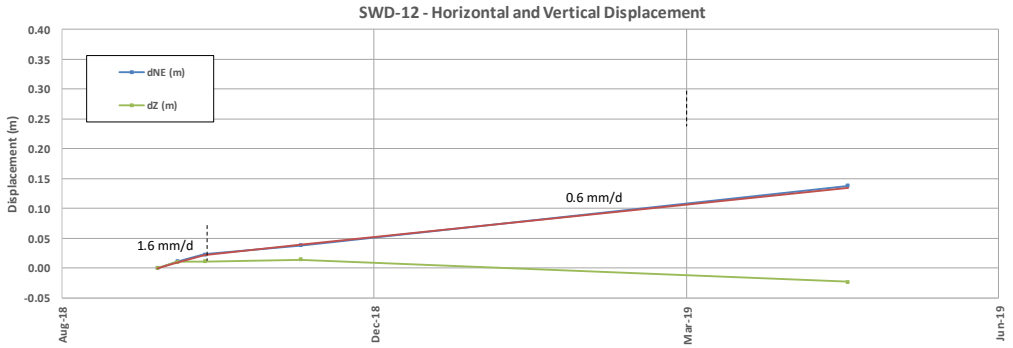
Job No: 1CM002.066
Filename: ApF_2019SWD Instrumentation.pptx

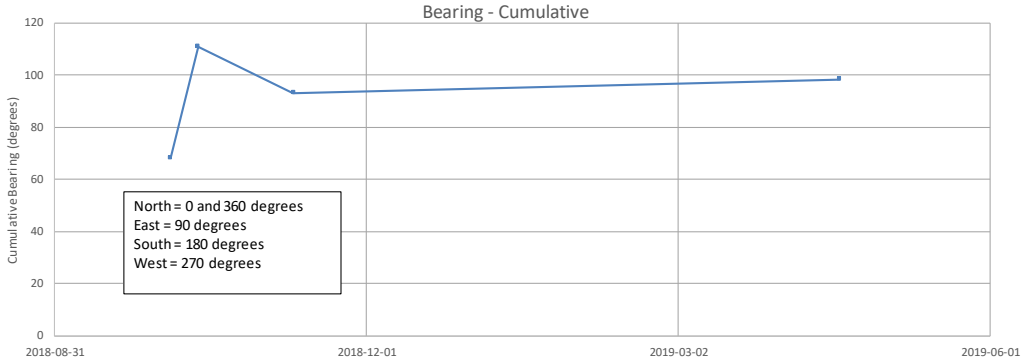
Minto Mine

Date: August 2019 | Prepared by: PHM | Figure: **8**









Notes

1. *Hub is a replacement for inclinometer SDI-3 that sheared off in August 2017.*
2. *The hub consists of a large boulder 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\!040_AutoCAD\GeotechInstrumentation\GeotechInstrumentation.dwg
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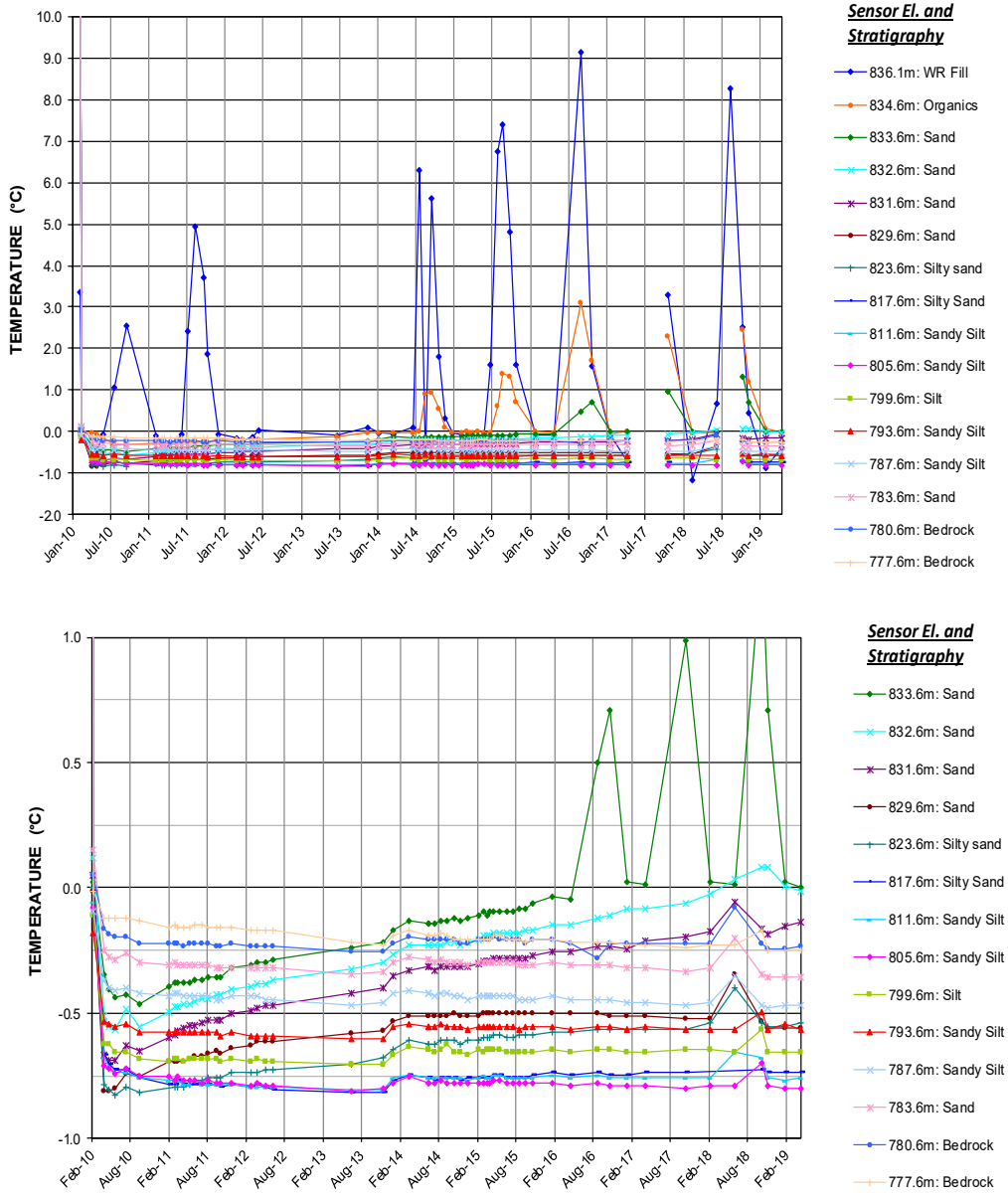
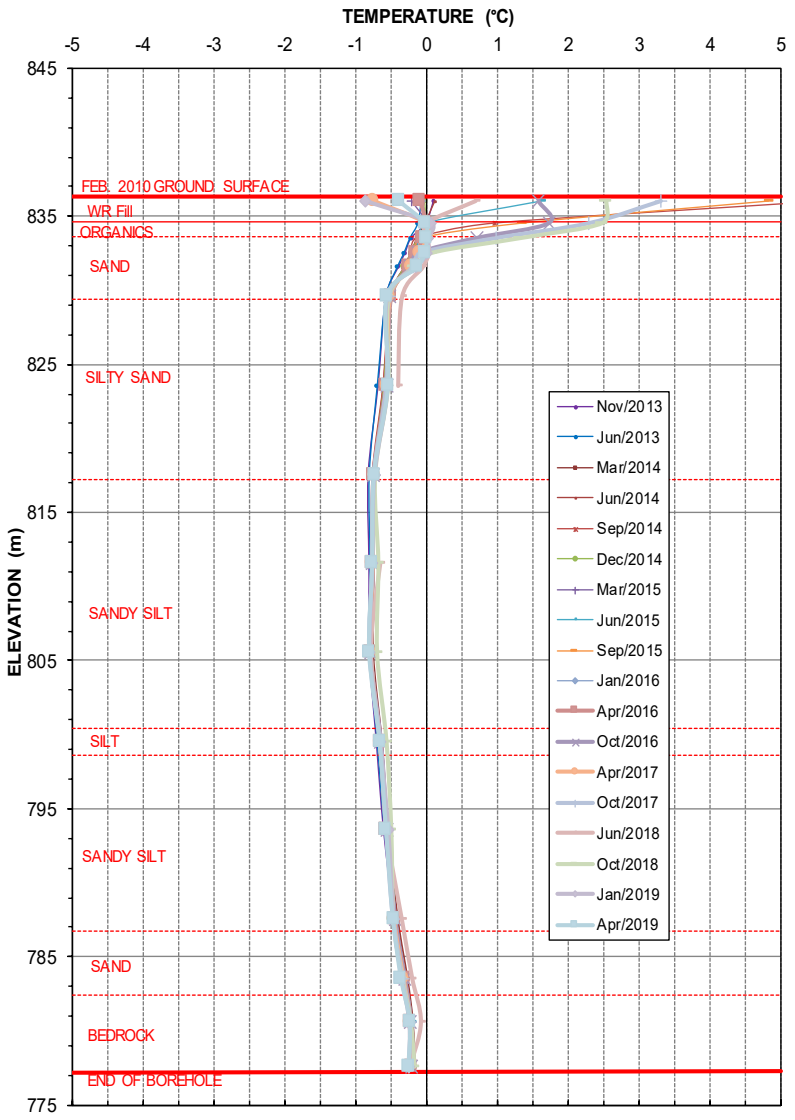
srk consulting	Minto Explorations Ltd.	SWD Instrumentation Data
Job No: 1CM002.066 Filename: ApF_2019SWD Instrumentation.pptx	Minto Mine	**Survey Hub – SWD-12**
		Date: August 2019 / Prepared by: PHM / Figure: **9**





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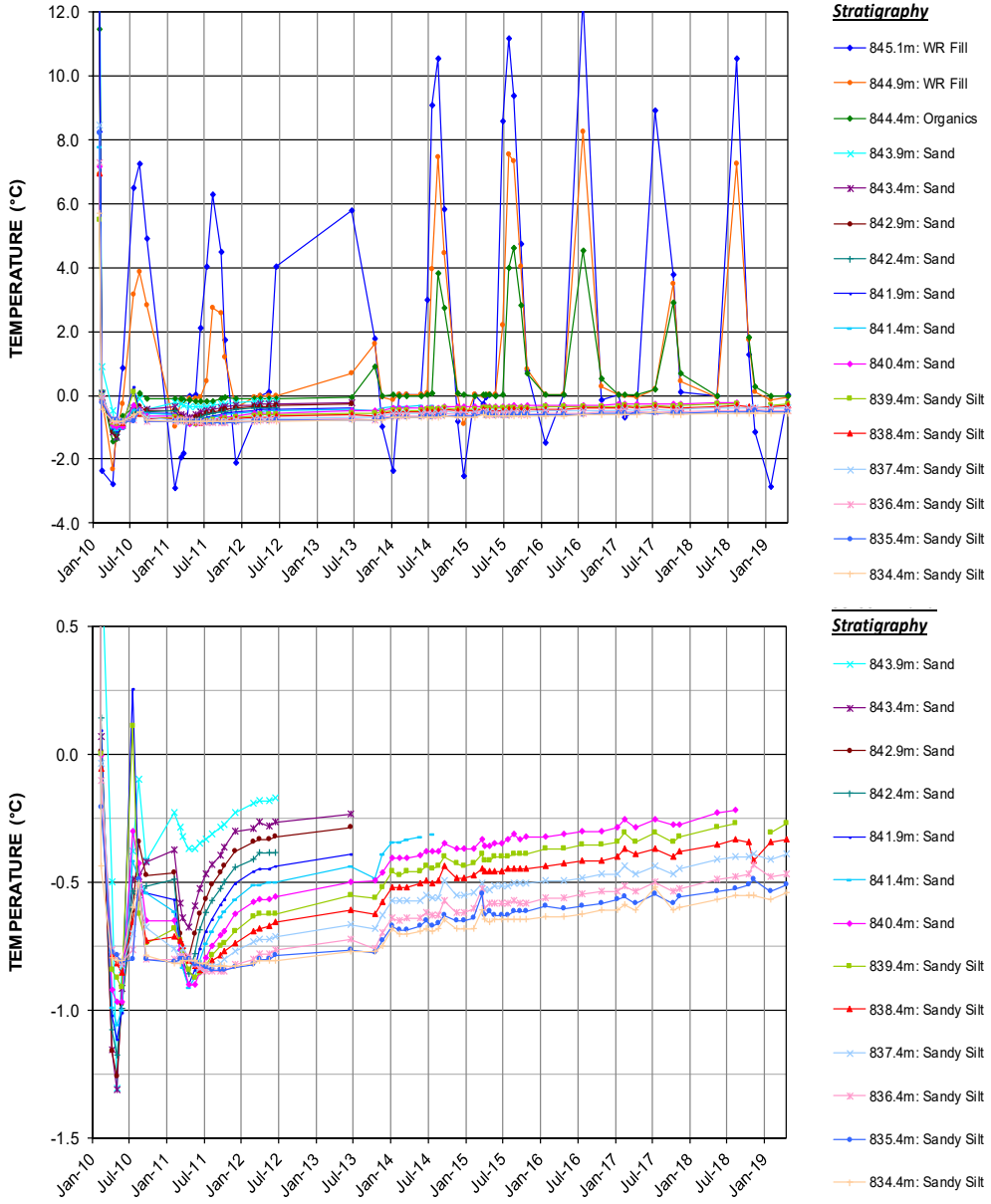
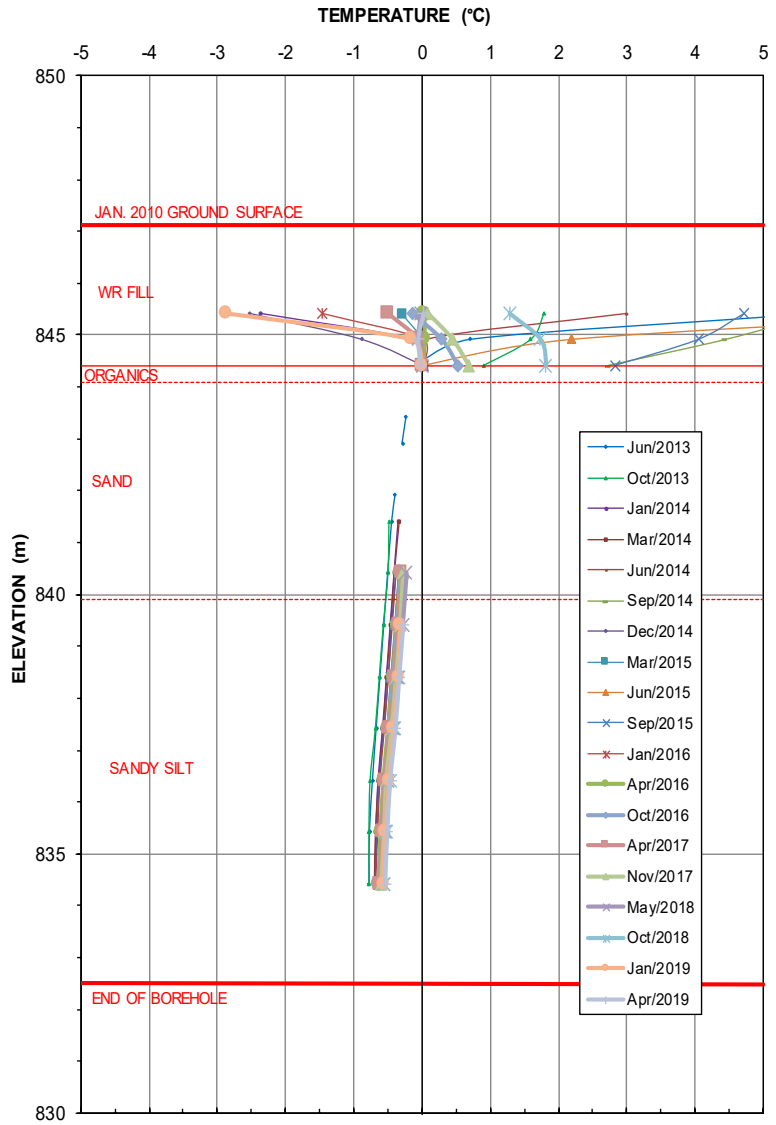
srk consulting	Minto Explorations Ltd.	SWD Instrumentation Data
		Temperature Cable – SDT-1
Job No: 1CM002.066 Filename: ApF_2019SWD Instrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **10**





Source files:

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Minto Explorations Ltd.

SWD Instrumentation Data

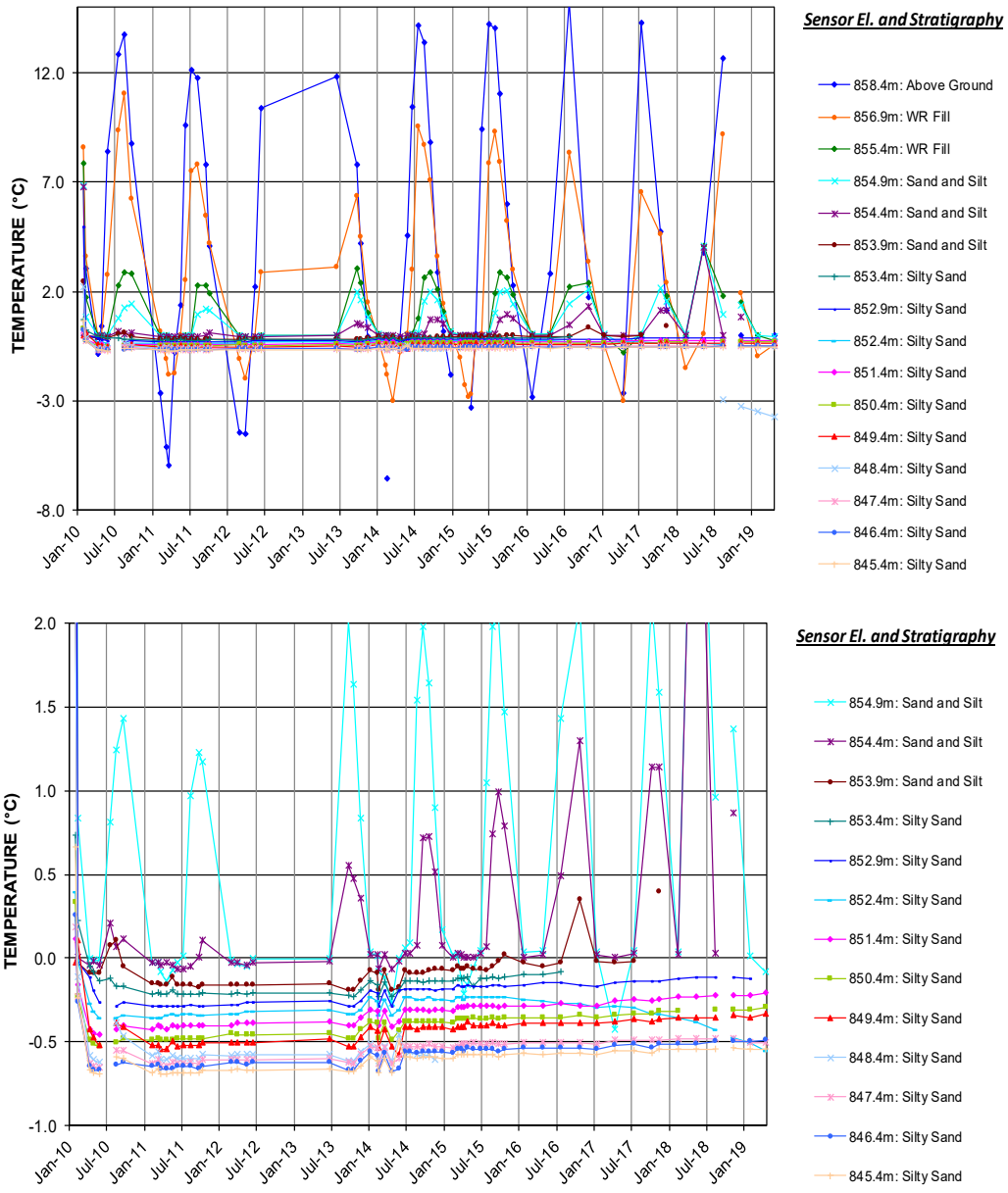
Temperature Cable – SDT-2

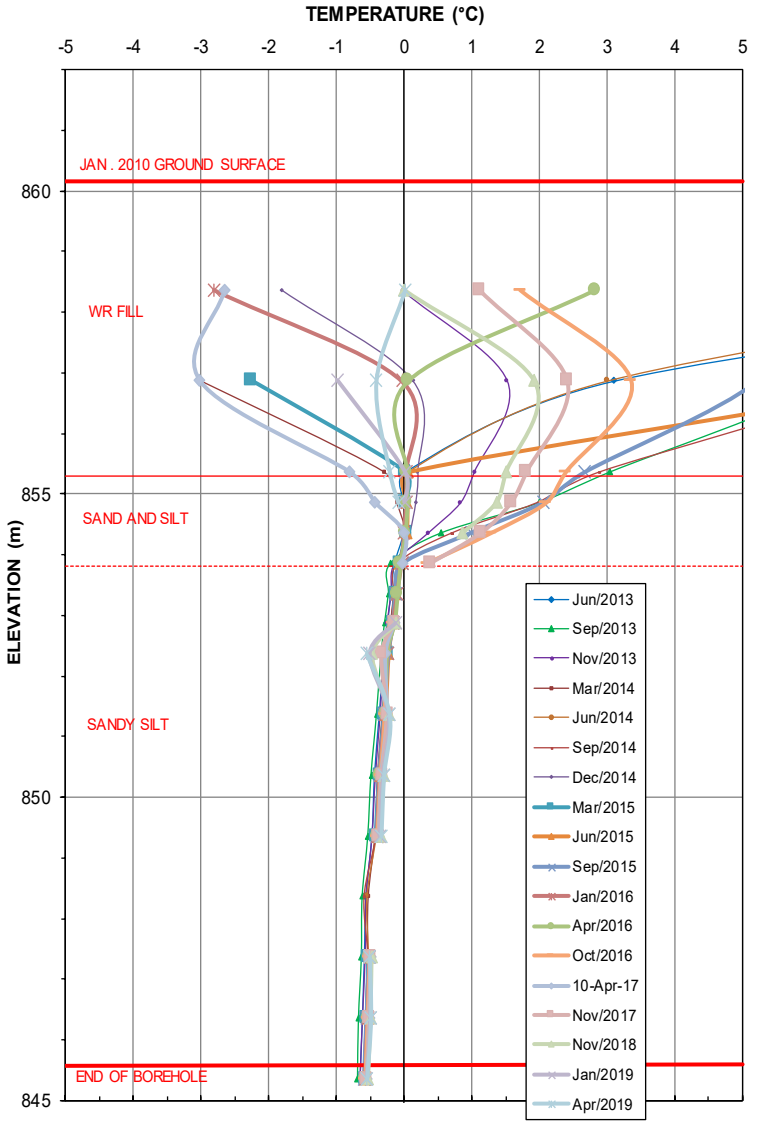
Job No: 1CM002.066

Filename: ApF_2019SWD Instrumentation.pptx

Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	11





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SWD Instrumentation Data

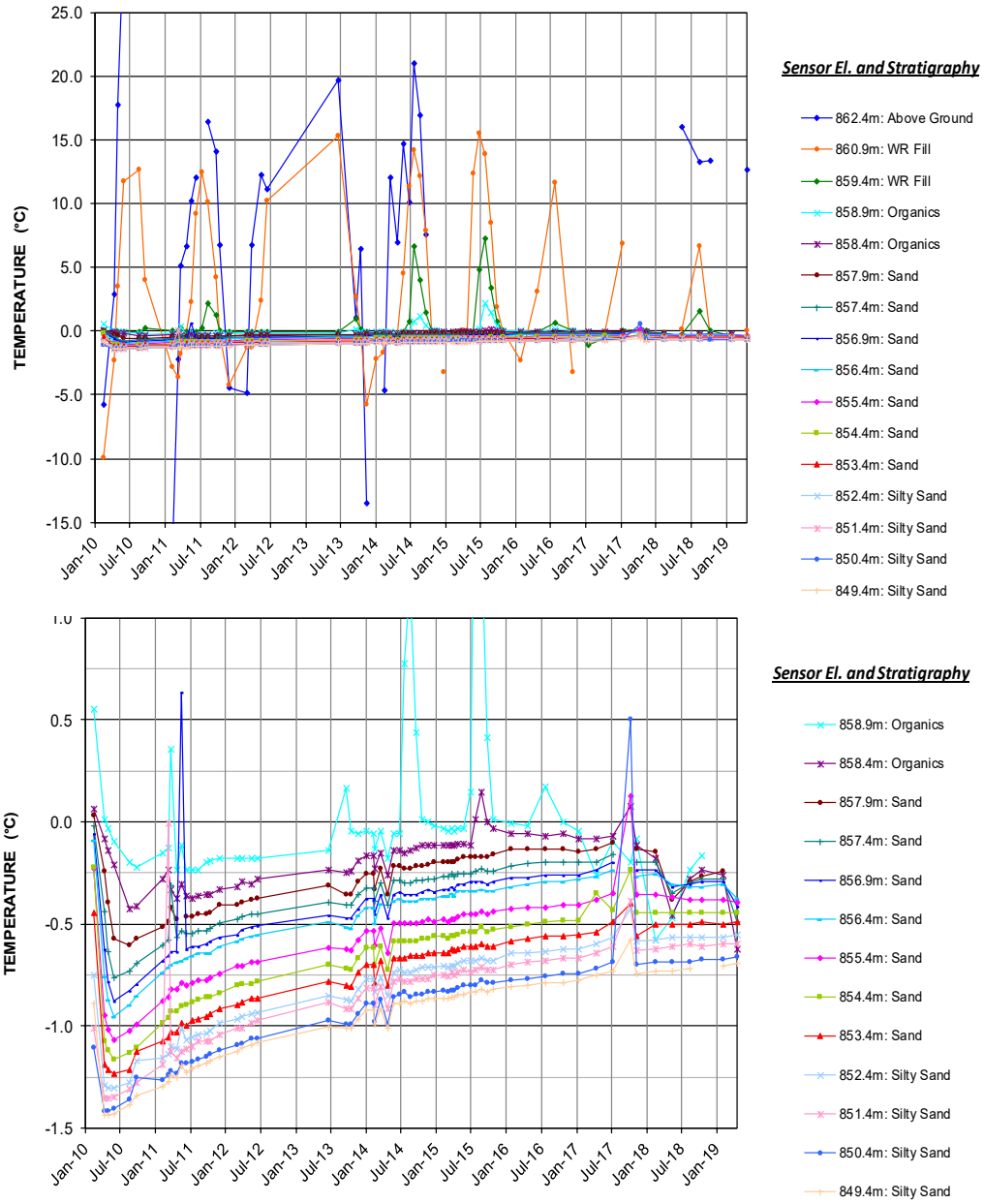
Temperature Cable – SDT-3

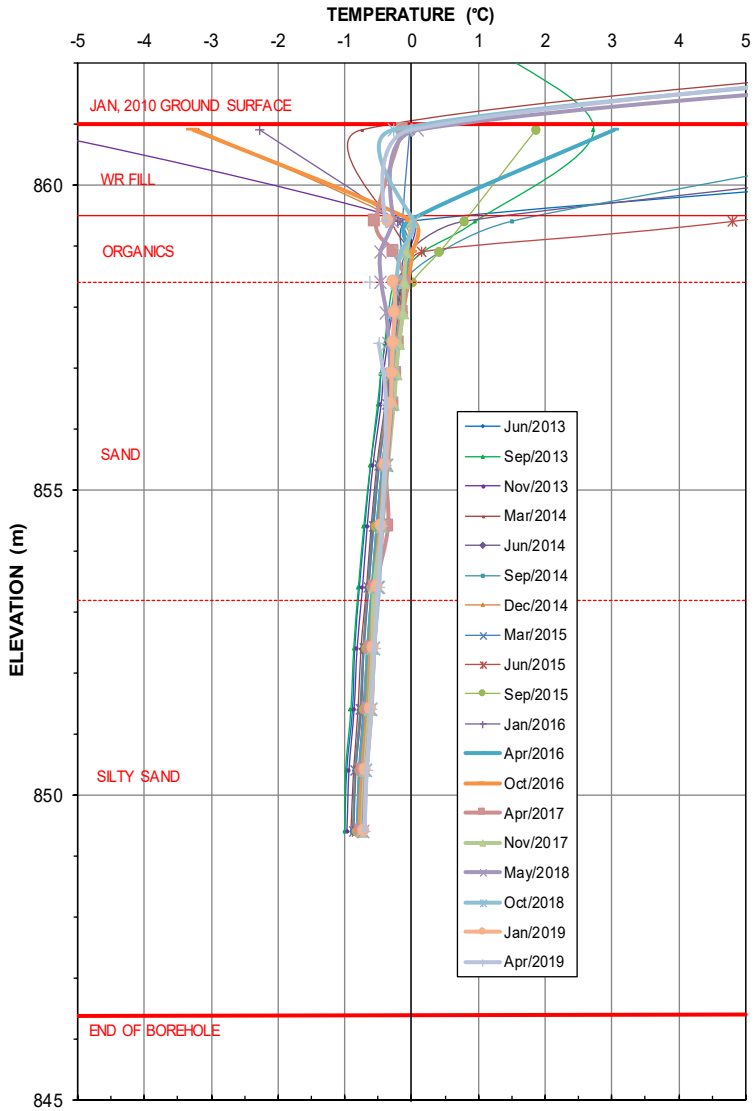
Job No: 1CM002.066

Filename: ApF_2019SWD Instrumentation.pptx

Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	12





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SWD Instrumentation Data

Temperature Cable – SDT-4

Job No: 1CM002.066

Filename: ApF_2019SWD Instrumentation.pptx

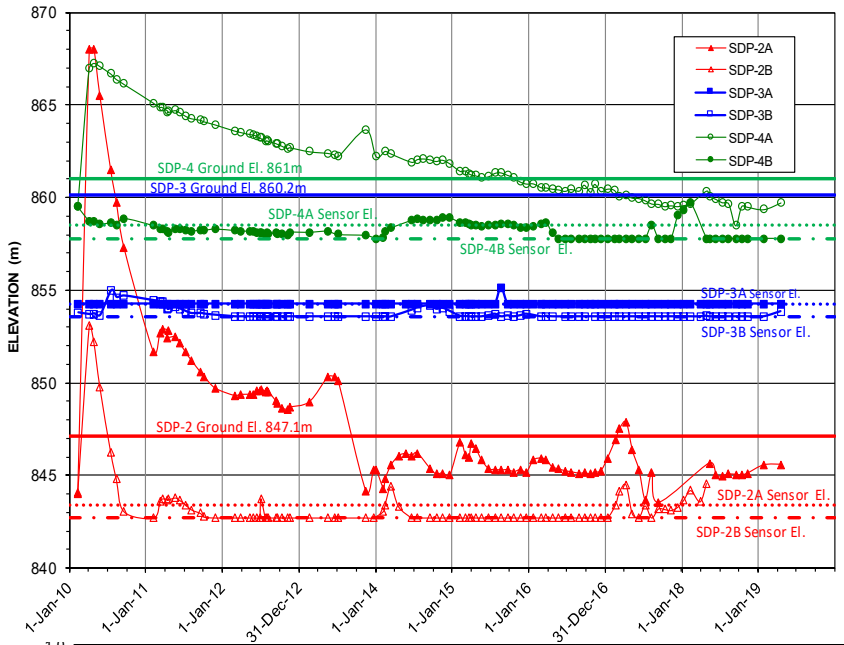
Minto Mine

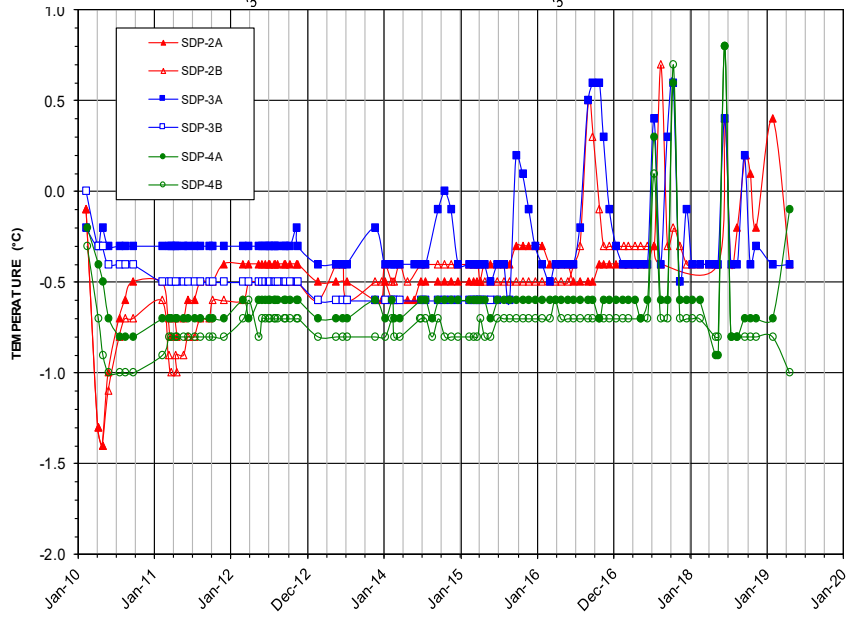
Date: August 2019

Prepared by: PHM

Figure: **13**

Southwest Dump Piezometers and Ground Temperature Cables





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SWD Instrumentation Data

Southwest Dump Piezometers

Job No: 1CM002.066

Filename: ApF_2019SWD Instrumentation.pptx

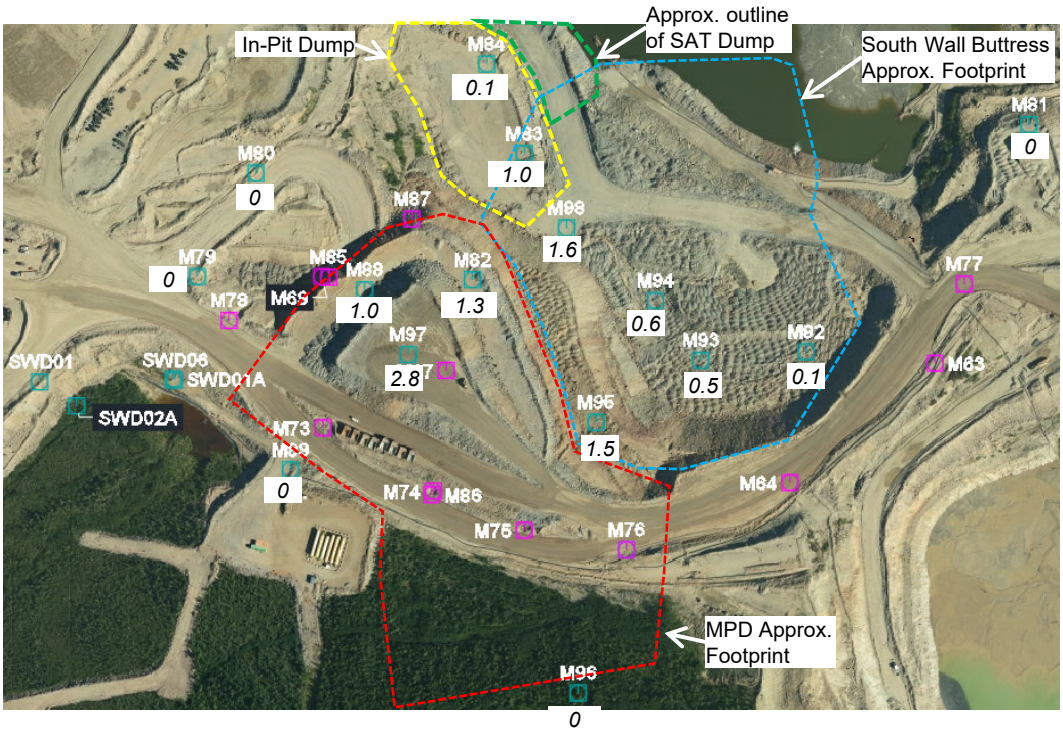
Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	14

Appendix G: Main Pit Instrumentation Data

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.*



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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 Active Survey Hubs

Survey Hub	Last Reading	Movement Rate (mm/day)		Bearing (Cumulative)	Comments
		May 2018	May 2019		
M79	4/17/2019	0.0	0.0	100	No significant movement.
M80	4/17/2019	0.0	0.0	105	No significant movement.
M81	3/4/2019	0.0	0.0	34	No significant horizontal movement.
M82	4/17/2019	3.3	1.3	63	Decelerating since completion of MPD.
M83	5/21/2019	1.5	1.0	48	Movement decelerating since completion of MPD construction.
M84	5/21/2019	0.2	0.1	78	Decelerating.
M88	5/21/2019	3.0	1.0	42	Decelerating.
M89	4/17/2019	0.0	0.0	-	No significant movement.
M92	4/17/2019	0.2	0.1	15	Decelerating.
M93	4/17/2019	1.3	0.5	55	Decelerating since completion of MPD
M94	4/17/2019	1.6	0.6	54	Decelerating since completion of MPD
M95	4/17/2019	4.0	1.5	47	Decelerating.
M96	4/18/2019	0.0	0.0	-	No significant movement.
M97	4/18/2019	8.0	2.8	16	Decelerating.
M98	5/21/2019	4.5	1.6	60	Decelerating.

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Main Pit Instrumentation Data

Survey Hub Summary

Job No: 1CM002.066

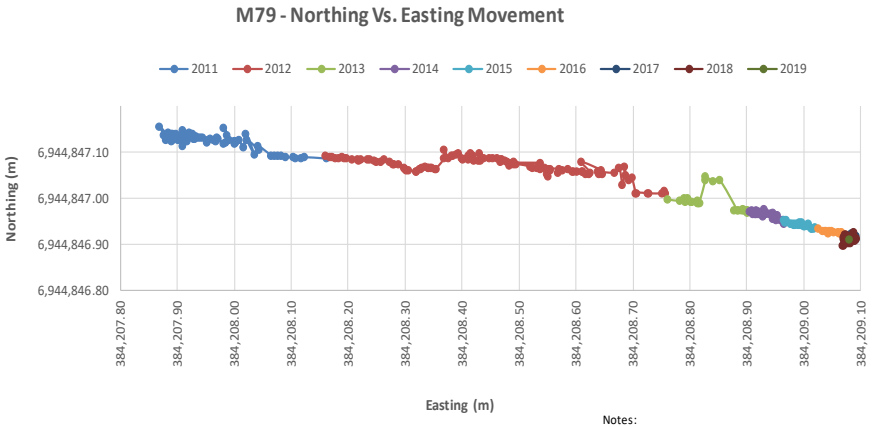
Filename: ApG_MainPitPort.pptx

Minto Mine

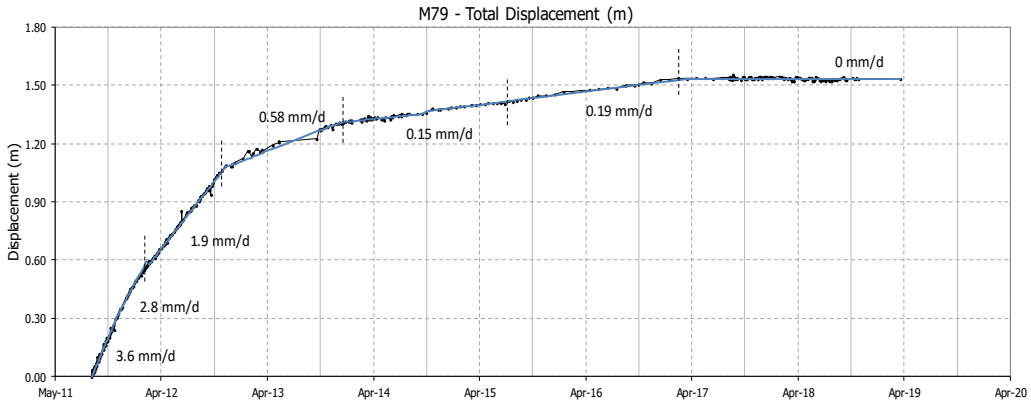
Date: August 2019

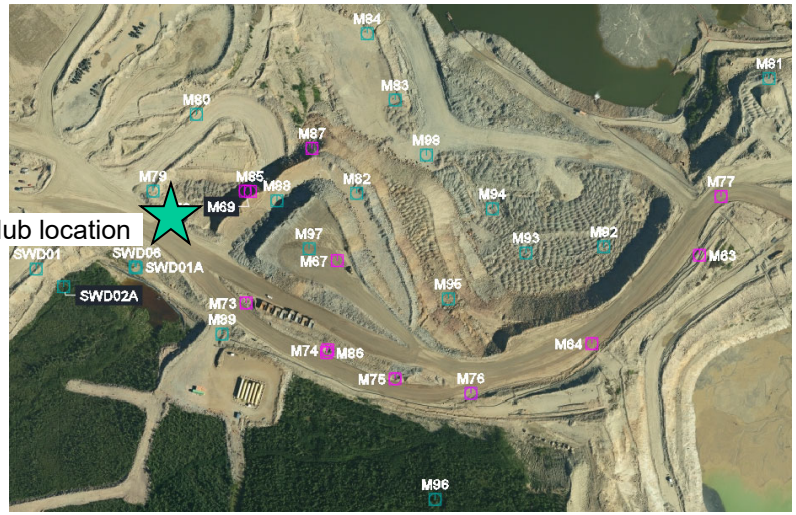
Prepared by: PHM

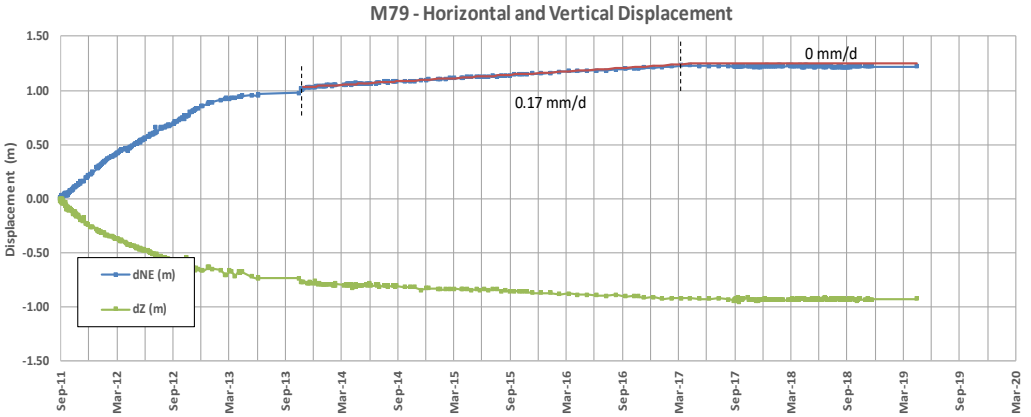
Figure: 1

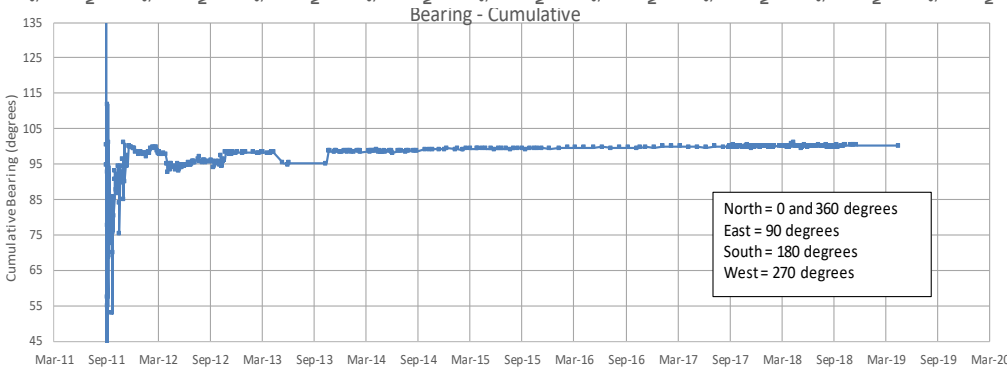


Notes:
Coordinate system is NAD 83 UTM Zone8.









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srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
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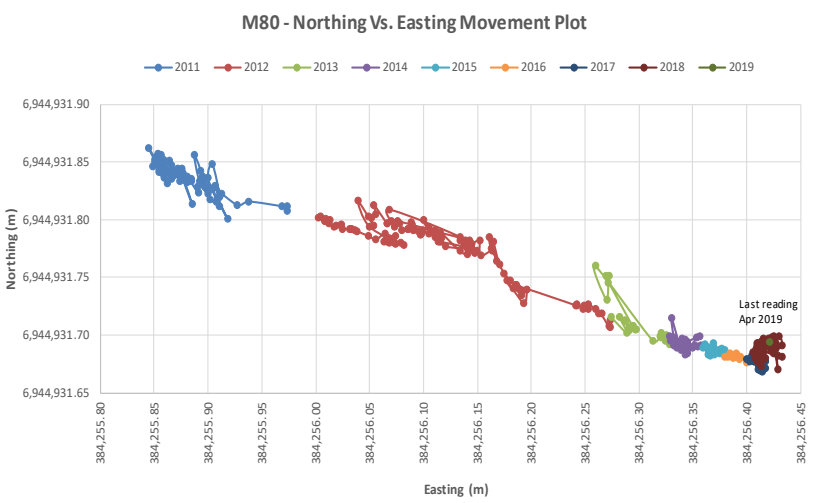
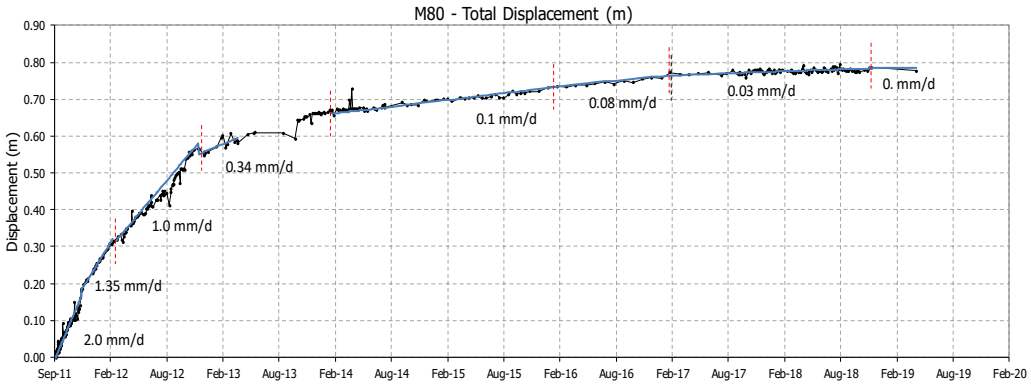
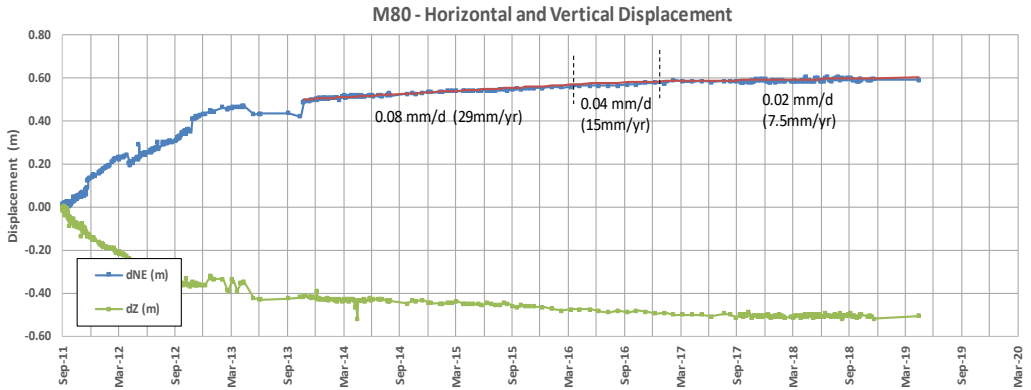
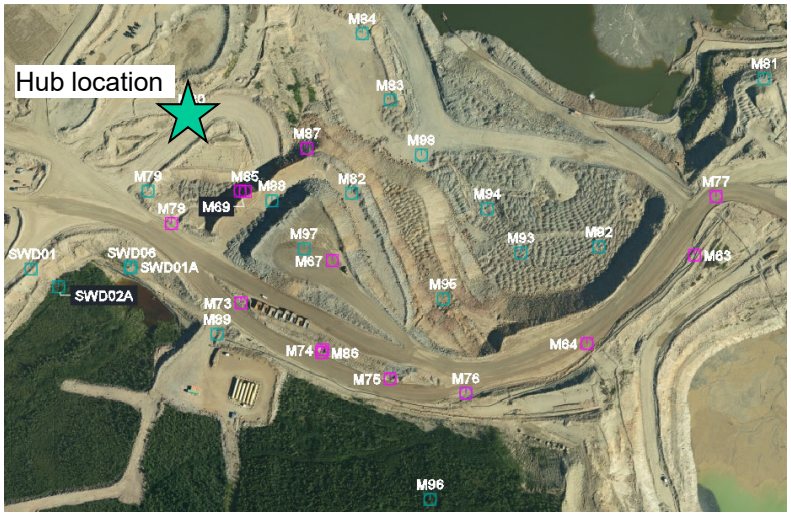
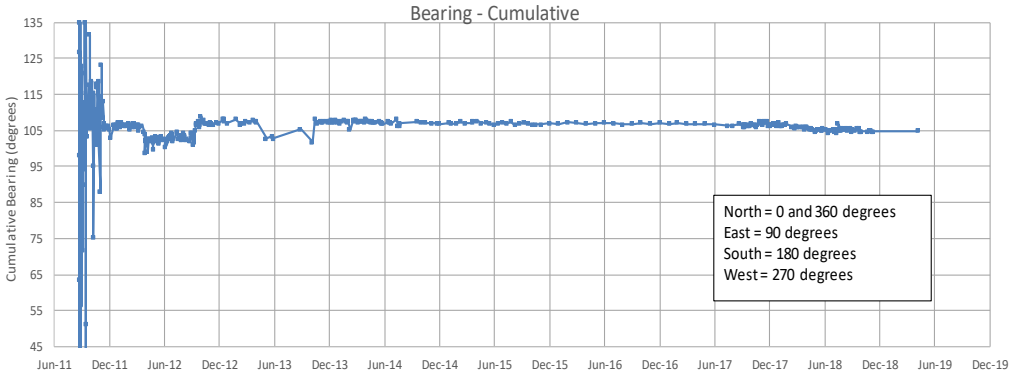
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **2**











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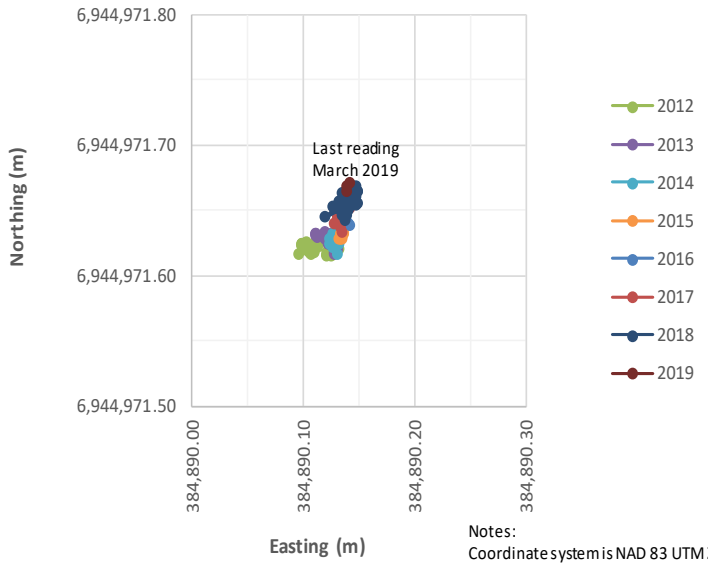
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M80
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: 3

M81 - Northing Vs. Easting Movement Plot



Notes:
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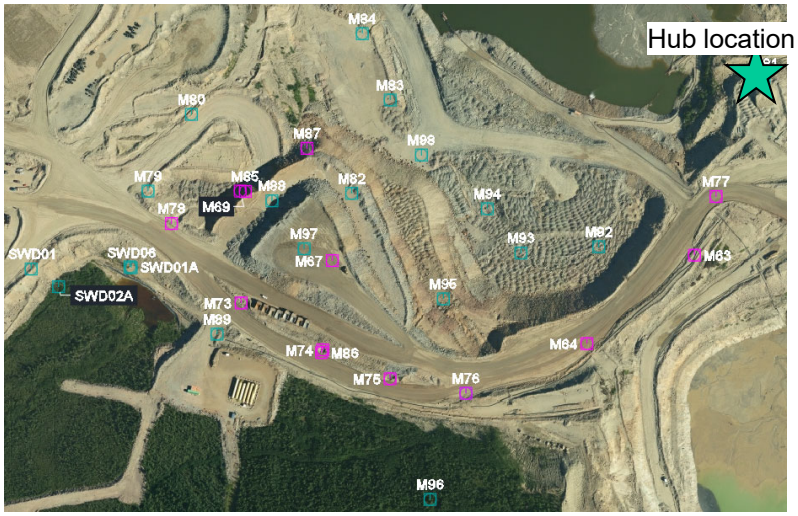

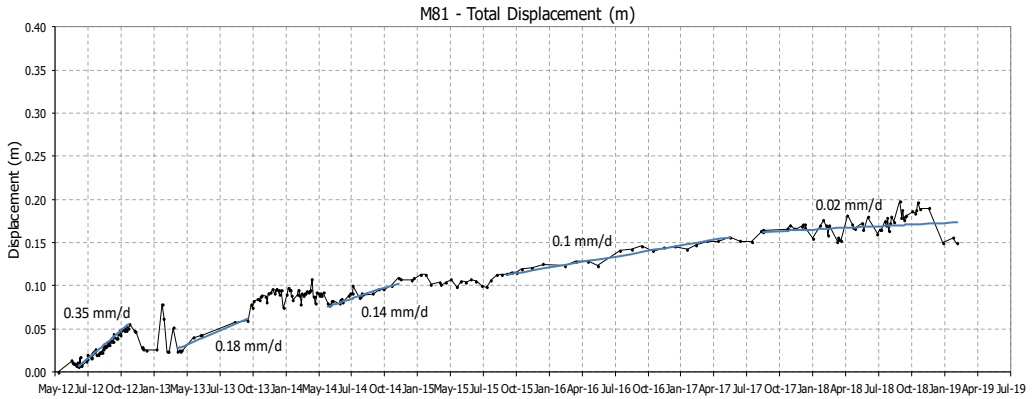

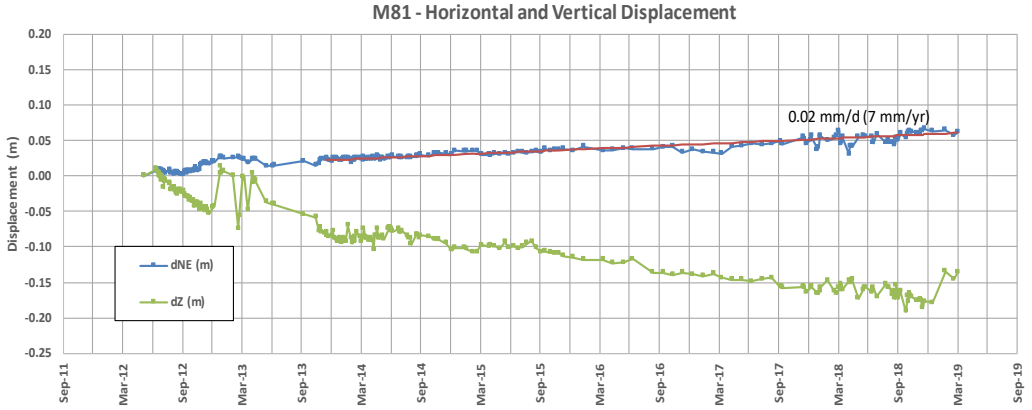

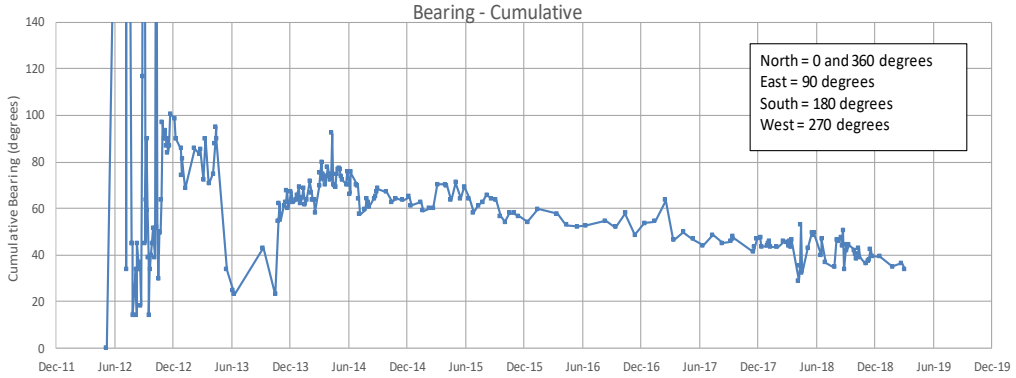

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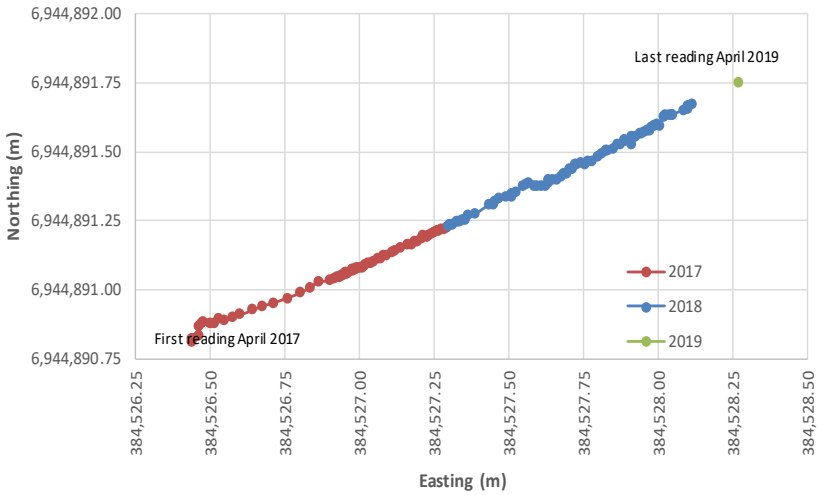
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M81
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 | Prepared by PHM | Figure: 4

M82 - Northing Vs. Easting Movement Plot



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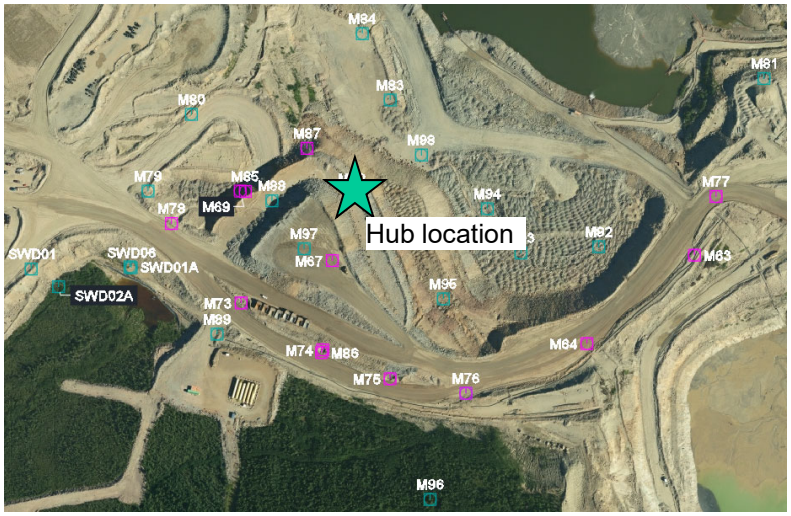
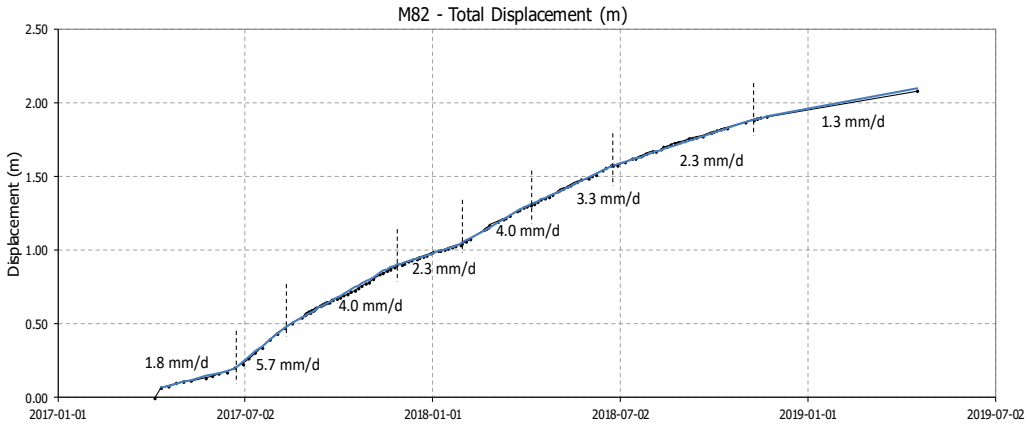
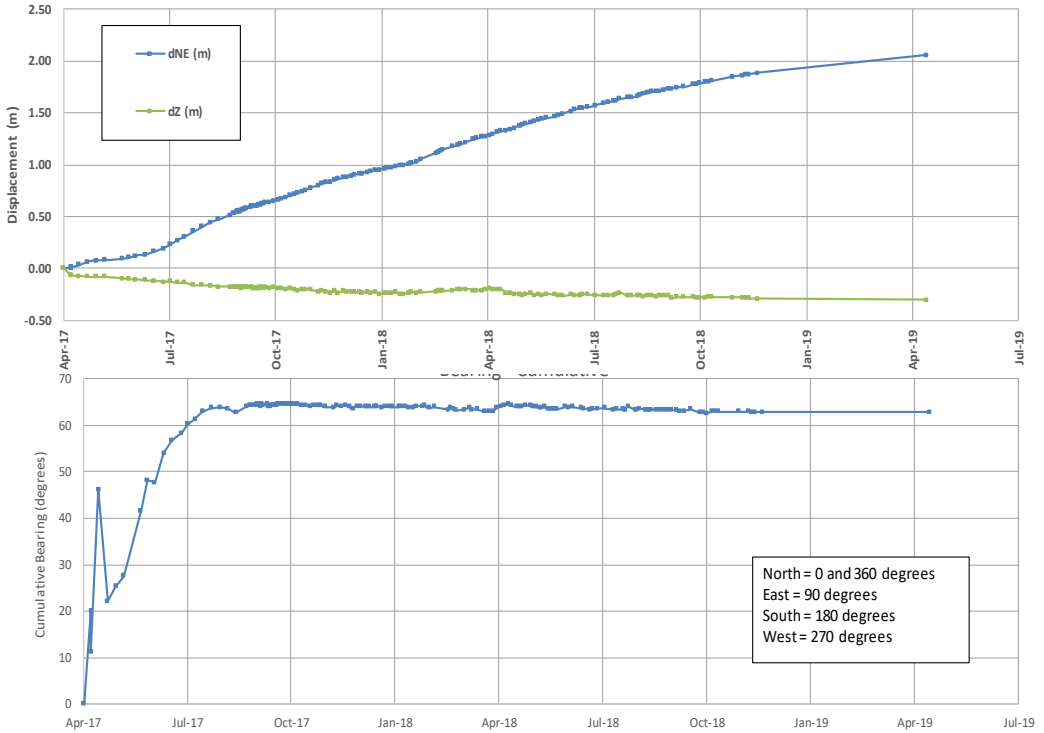


M82 - Total Displacement (m)



M82 - Horizontal and Vertical Displacement



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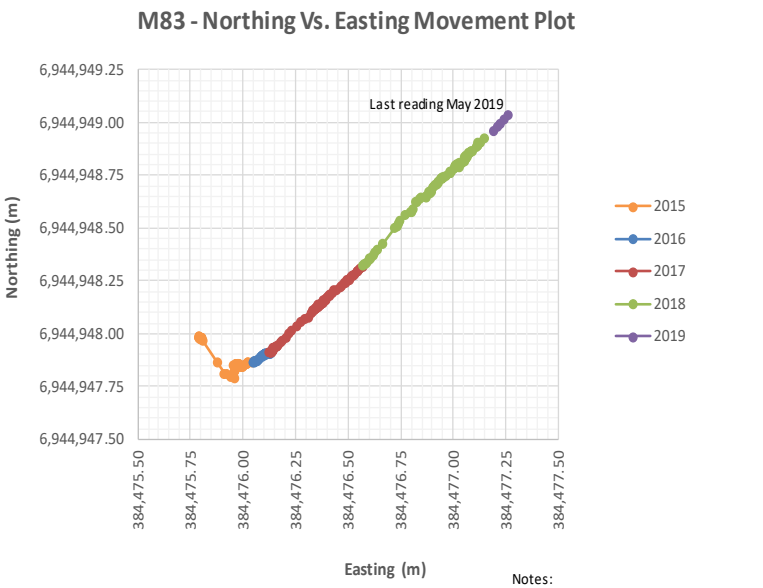
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M82
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **5**



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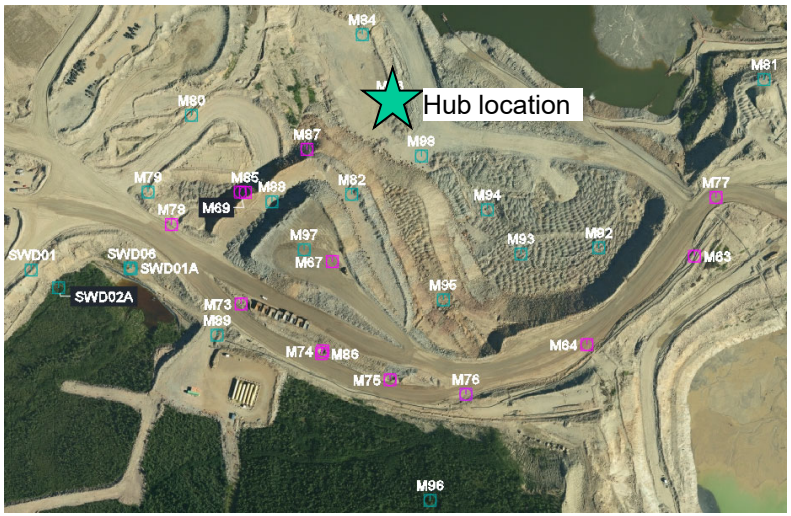

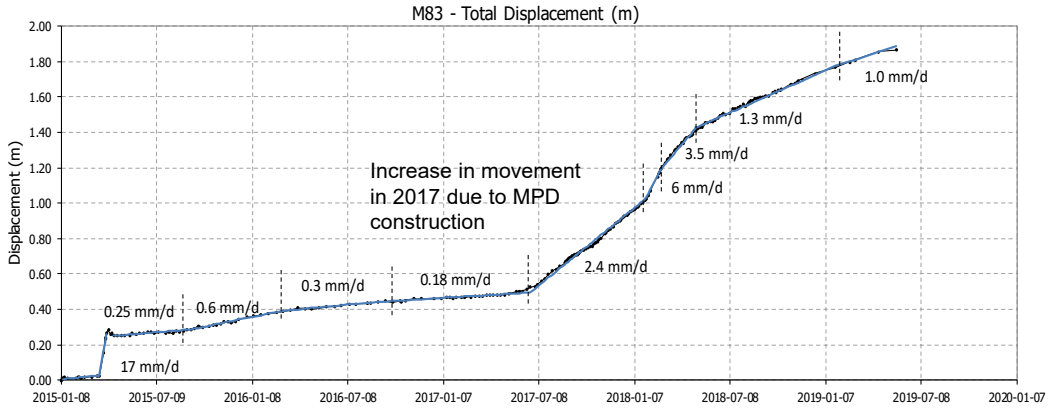

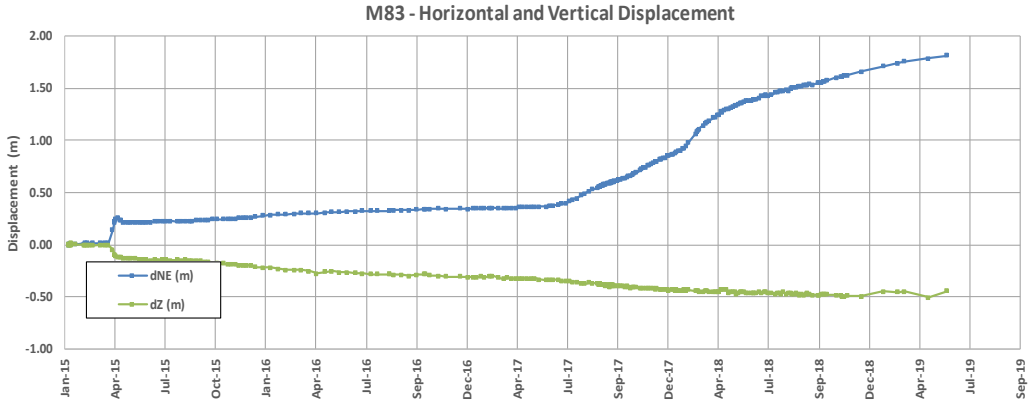

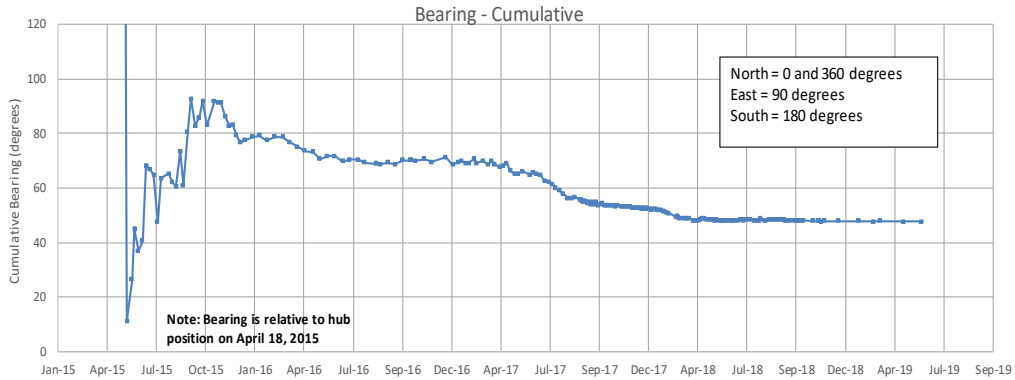

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Main Pit Instrumentation Data

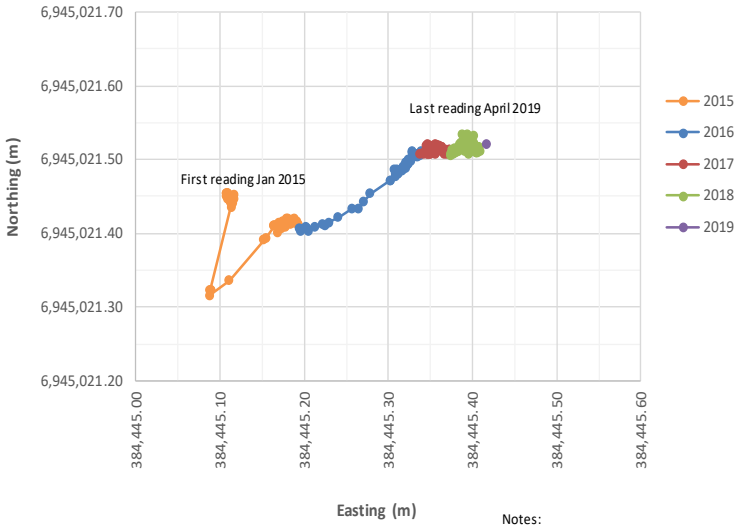
Survey Hub – M83

Job No: 1CM002.066
Filename: ApG_2019MainPitInstrumentation.pptx

Minto Mine

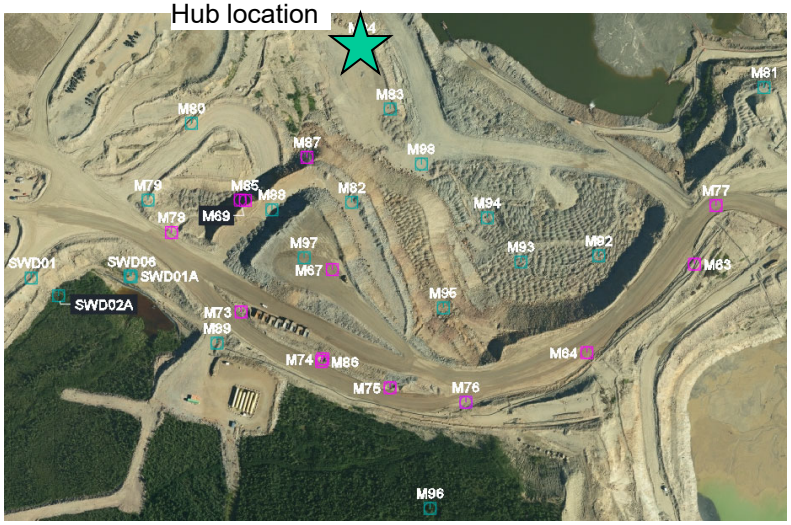
Date: August 2019 | Prepared by: PHM | Figure: 6

M84 - Northing Vs. Easting Movement Plot

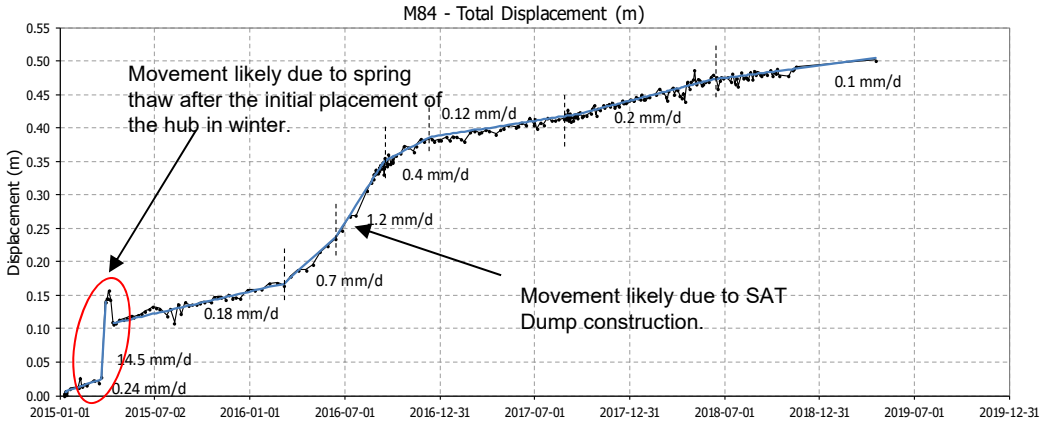


Notes:
Coordinate system is NAD 83 UTM Zone 8.

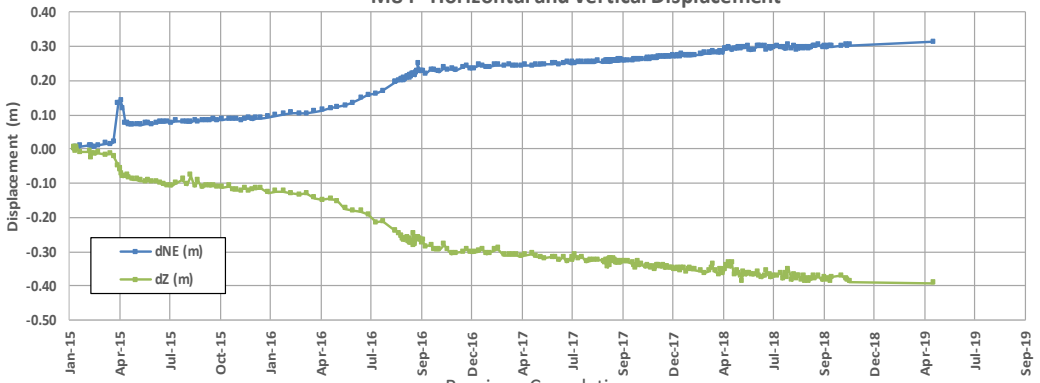
Hub location



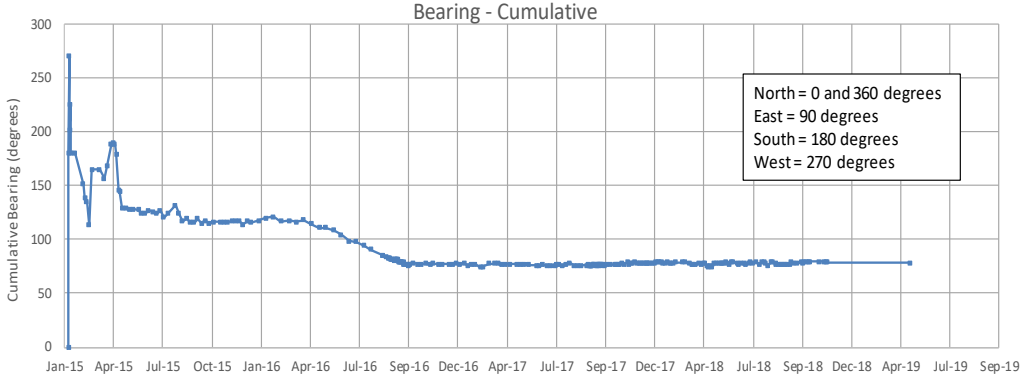
M84 - Total Displacement (m)



M84 - Horizontal and Vertical Displacement



Bearing - Cumulative



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Minto Explorations Ltd.

Main Pit Instrumentation Data

Survey Hub – M84

Job No: 1CM002.066

Filename: ApG_2019MainPitInstrumentation.pptx

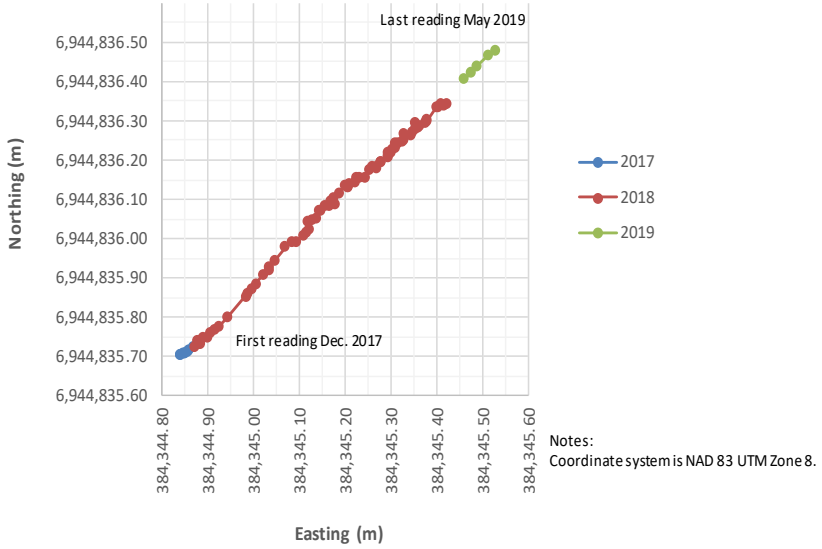
Minto Mine

Date: August 2019

Prepared by PHM

Figure: 7

M88 - Northing Vs. Easting Movement Plot



Notes:
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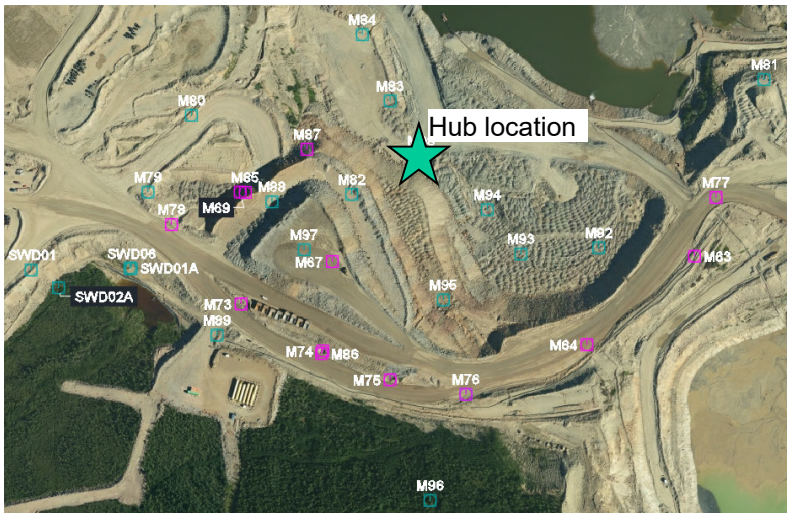
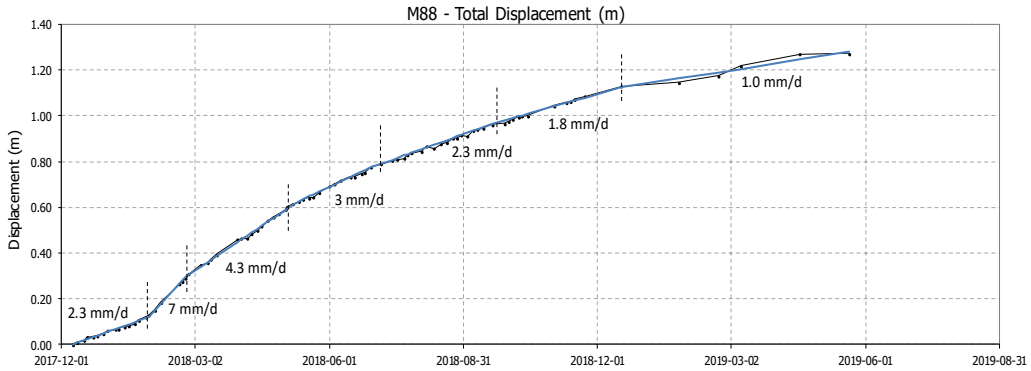
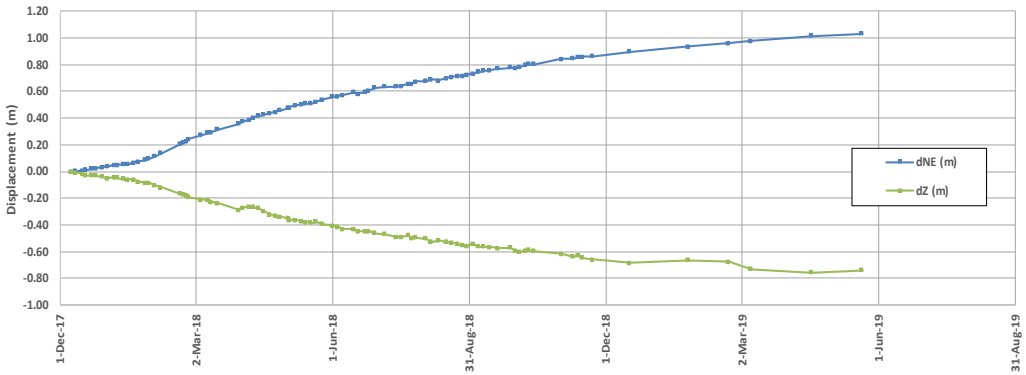


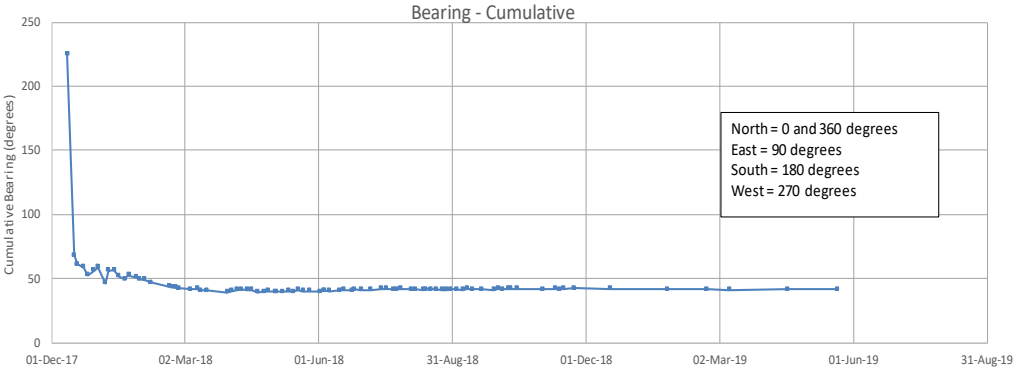
M88 - Total Displacement (m)



M88 - Horizontal and Vertical Displacement



Bearing - Cumulative



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Main Pit Instrumentation Data

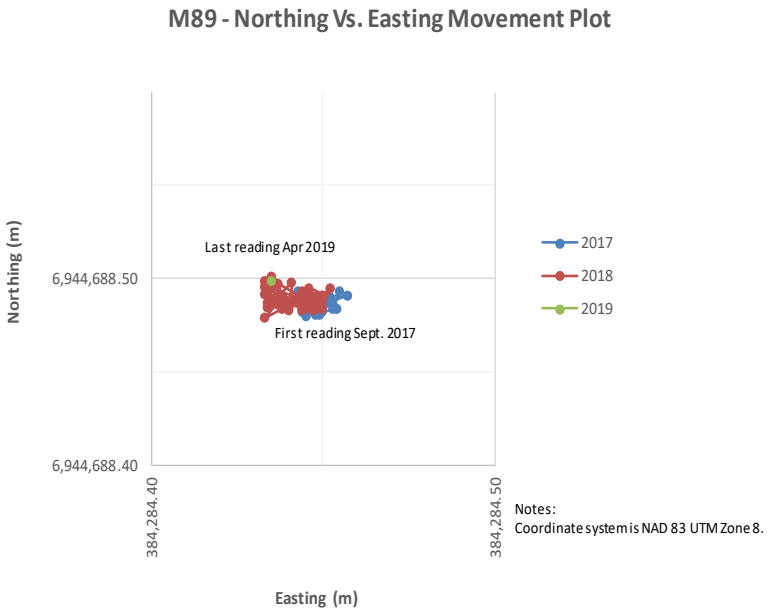
Survey Hub – M88

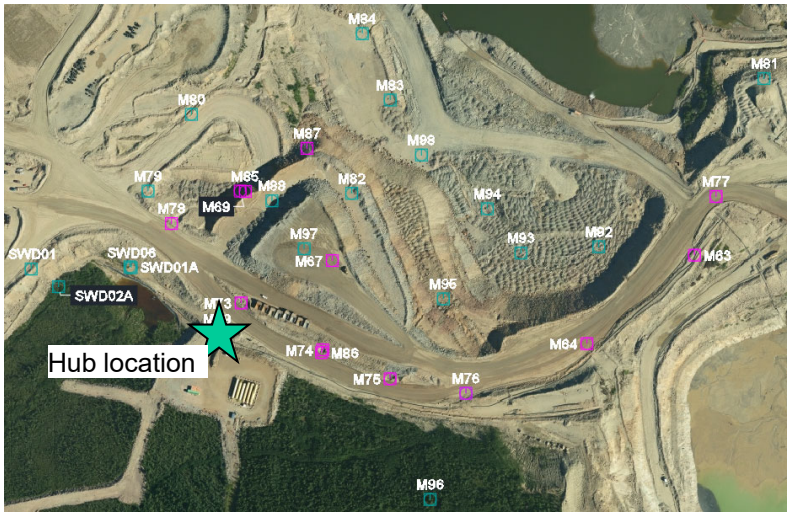
Job No: 1CM002.066

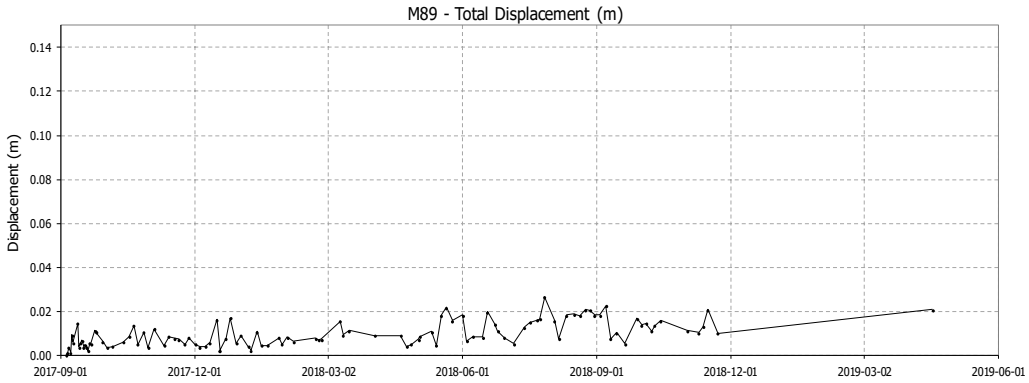
Filename: ApG_2019MainPitInstrumentation.pptx

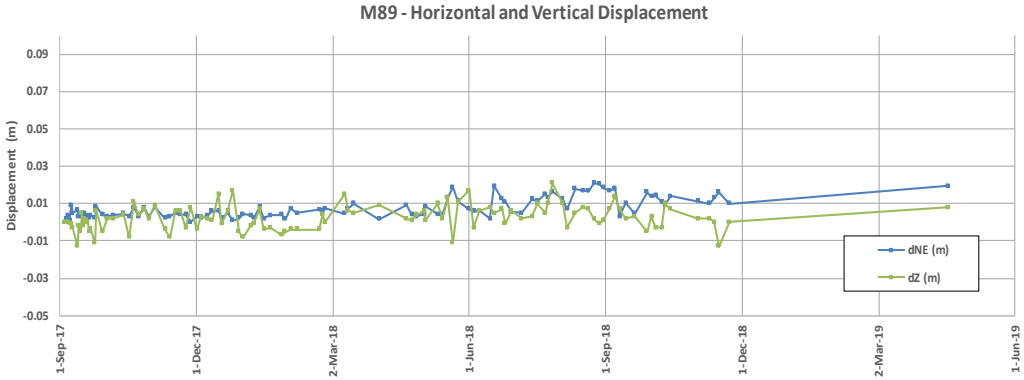
Minto Mine

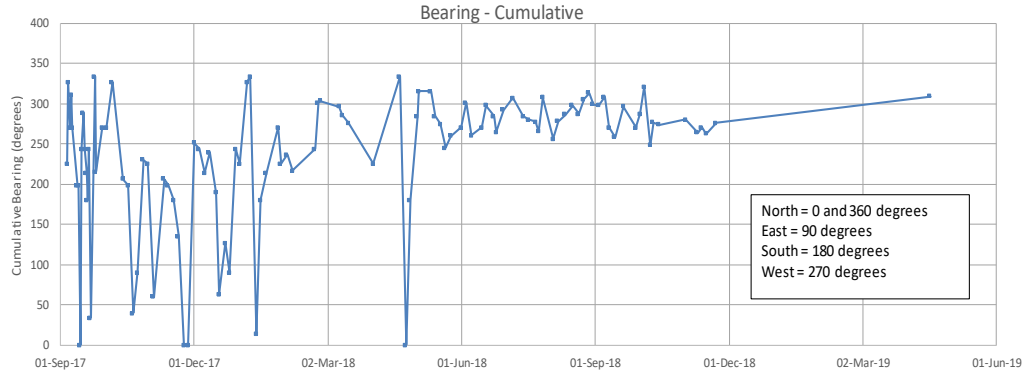
Date:	Prepared by	Figure:
August 2019	PHM	8











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Minto Explorations Ltd.

Main Pit Instrumentation Data

Survey Hub– M89

Job No: 1CM002.066

Filename: ApG_2019MainPitInstrumentation.pptx

Minto Mine

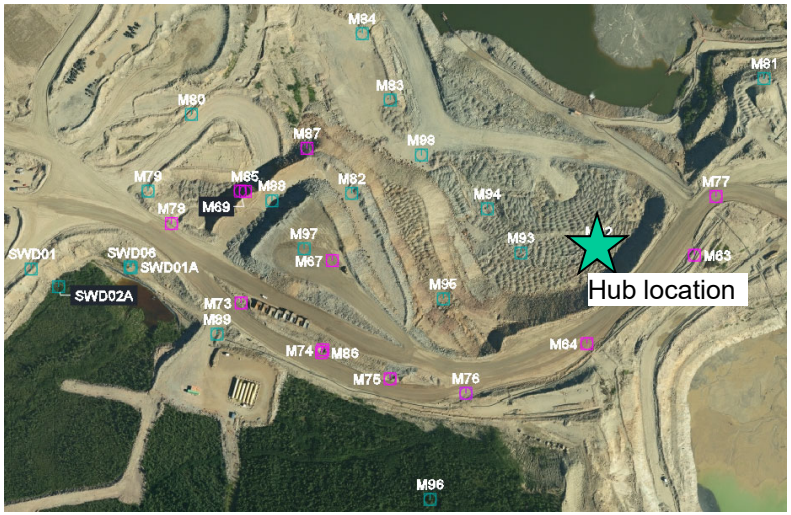
Date: August 2019

Prepared by PHM

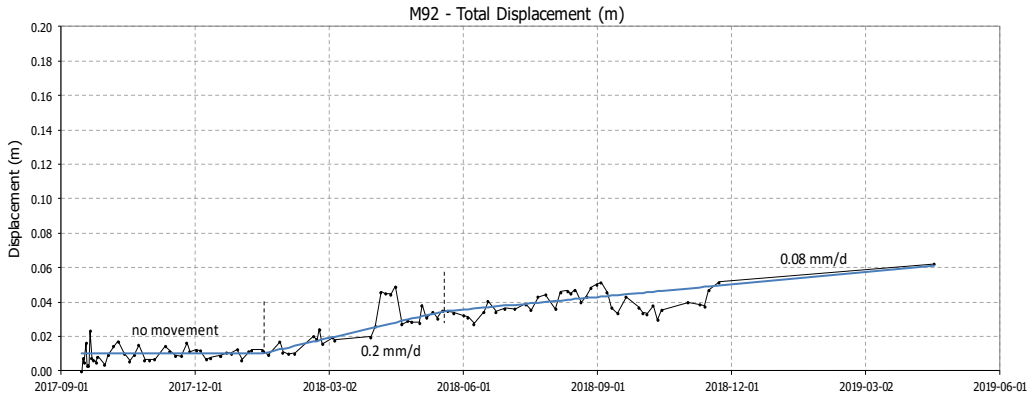
Figure: 9

M92 - Northing Vs. Easting Movement Plot

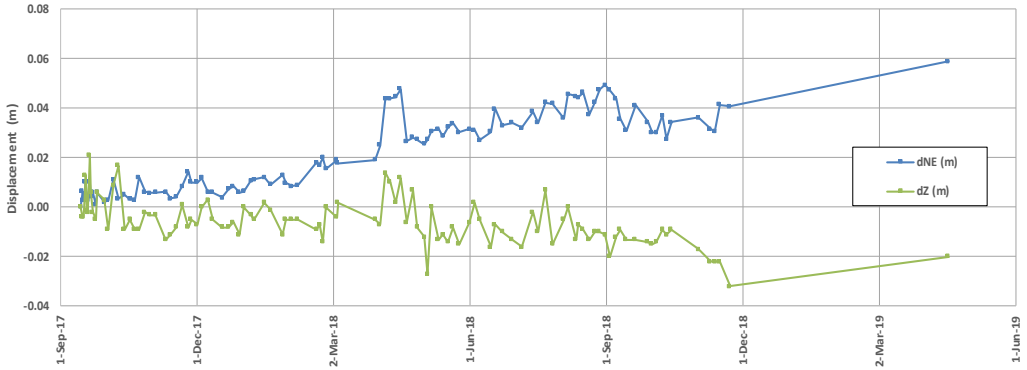
Notes:
Coordinate system is NAD 83 UTM Zone 8



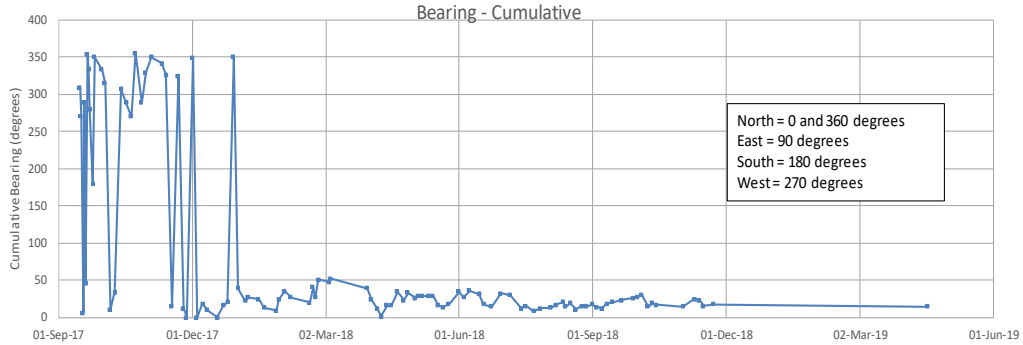
M92 - Total Displacement (m)



M92 - Horizontal and Vertical Displacement



Bearing - Cumulative



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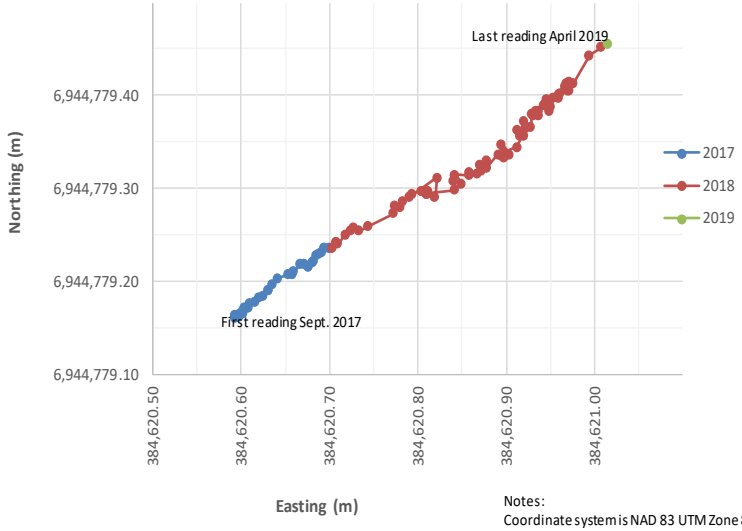
Main Pit Instrumentation Data

Survey Hub– M92

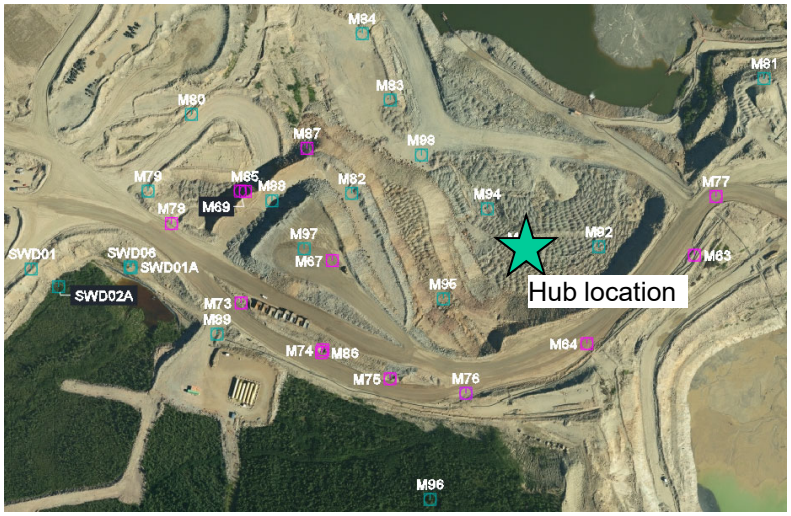
Job No: 1CM002.066
Filename: ApG_2019MainPitInstrumentation.pptx

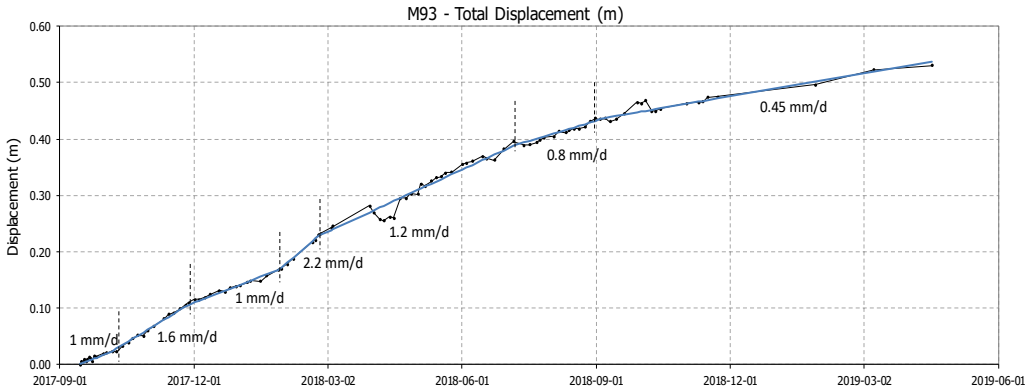
Minto Mine

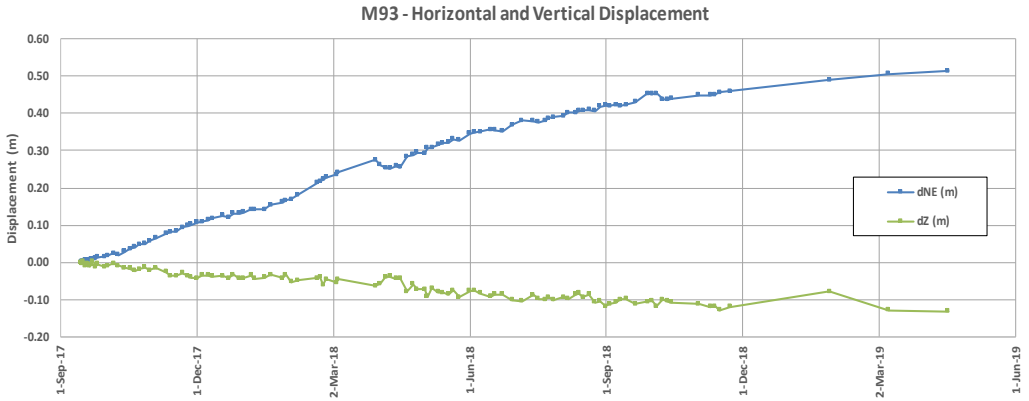
Date:	Prepared by	Figure:
August 2019	PHM	10

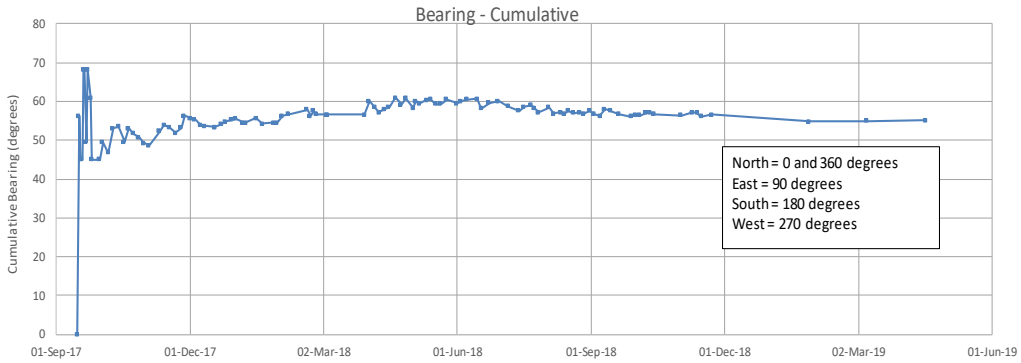


Notes:
Coordinate system is NAD 83 UTM Zone 8.









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Minto Explorations Ltd.

Main Pit Instrumentation Data

Survey Hub – M93

Job No: 1CM002.066

Filename: ApG_2019MainPitInstrumentation.pptx

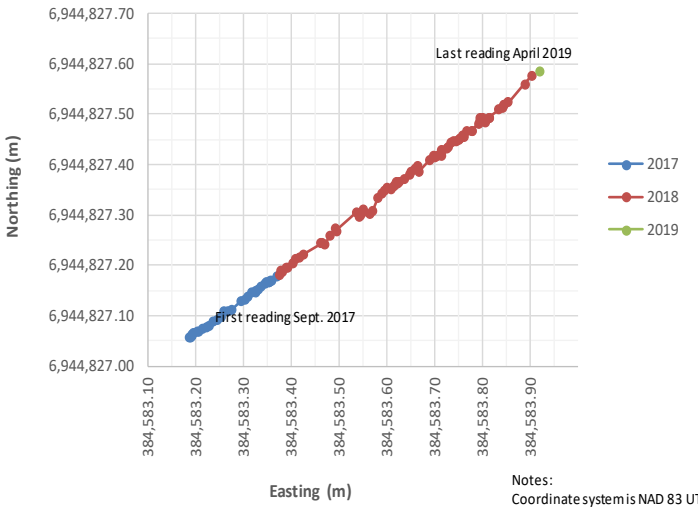
Minto Mine

Date: August 2019

Prepared by PHM

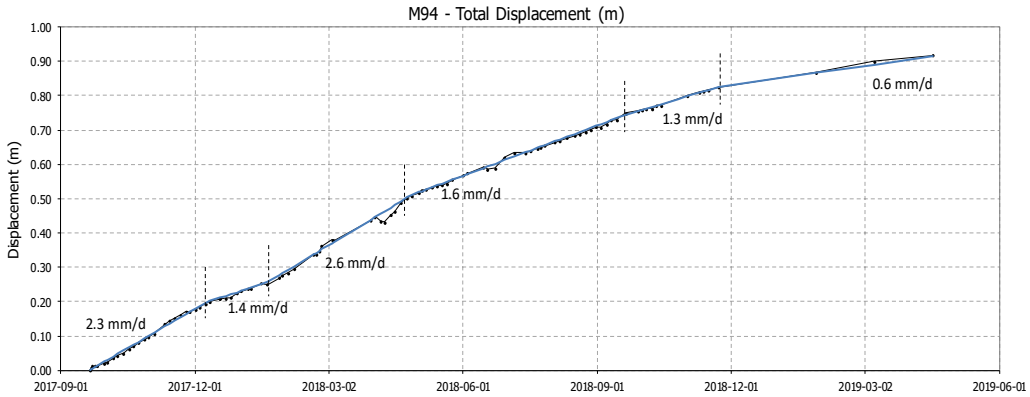
Figure: **11**

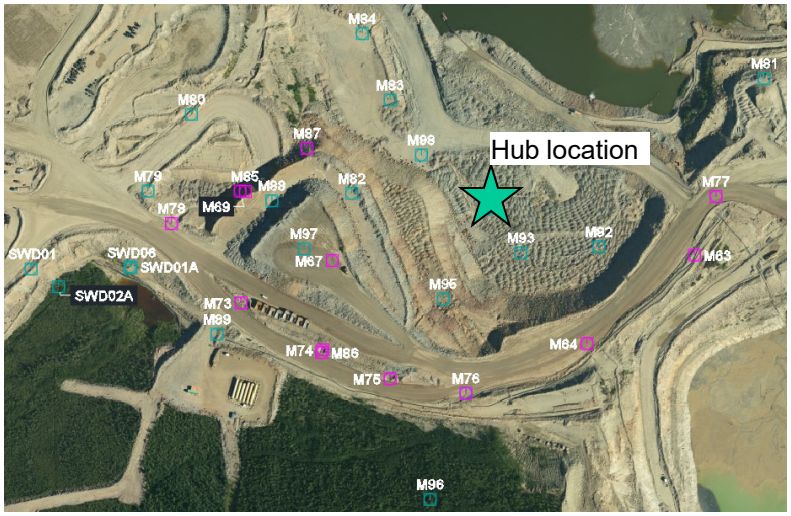
M94 - Northing Vs. Easting Movement Plot



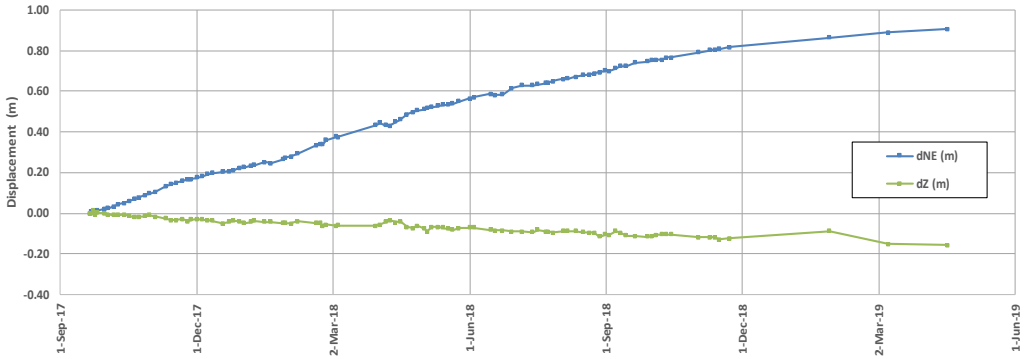
Notes:
Coordinate system is NAD 83 UTM Zone 8.

M94 - Total Displacement (m)

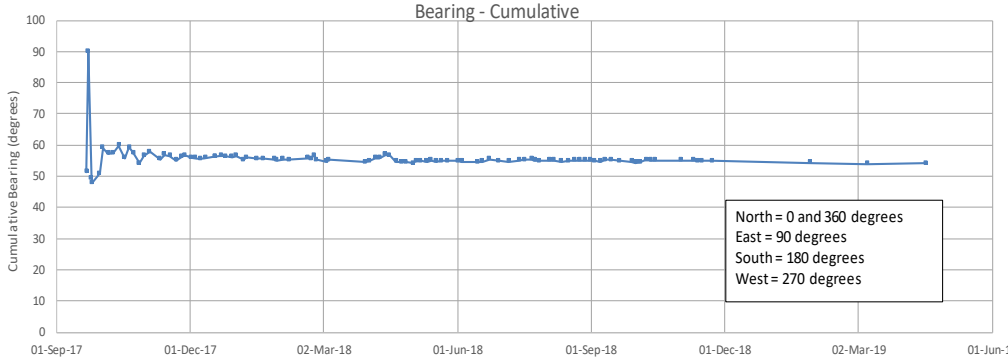




M88 - Horizontal and Vertical Displacement



Bearing - Cumulative



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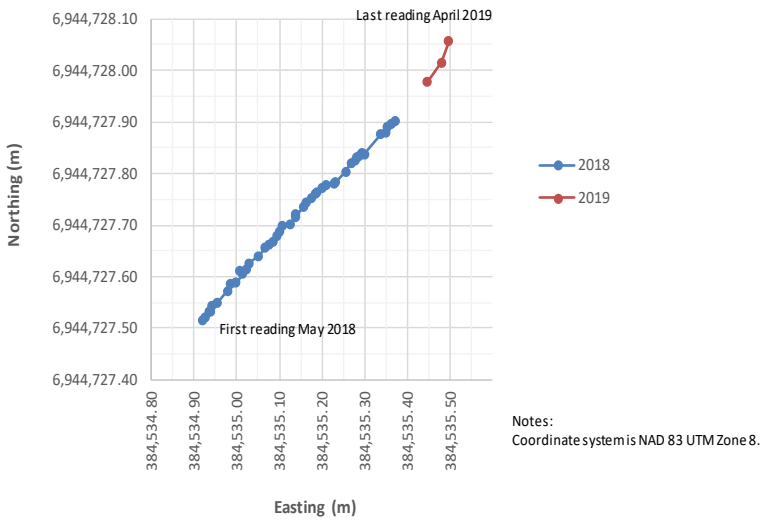
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M94
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **12**



Notes:
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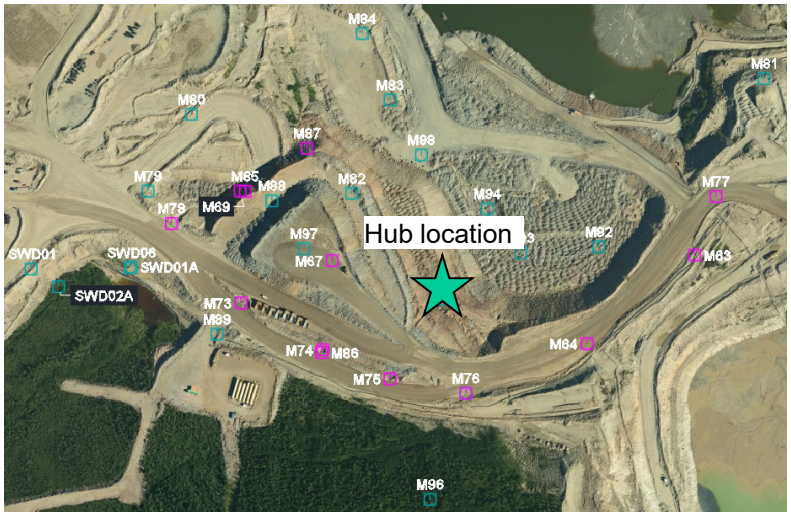

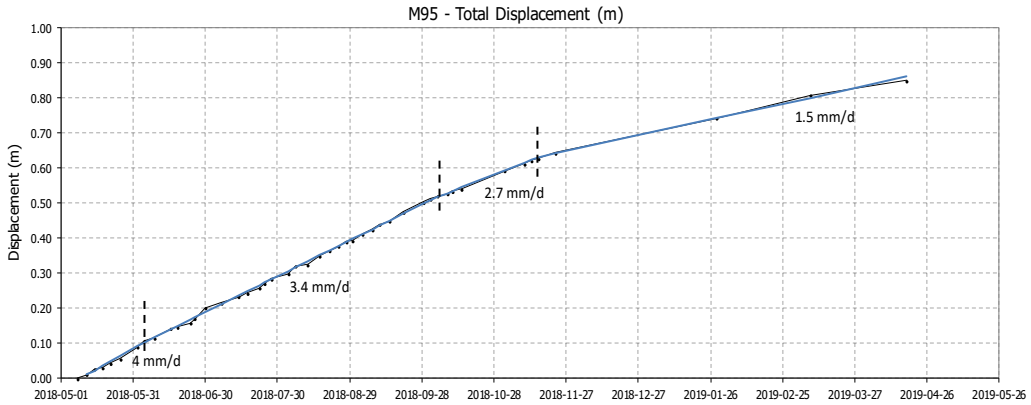

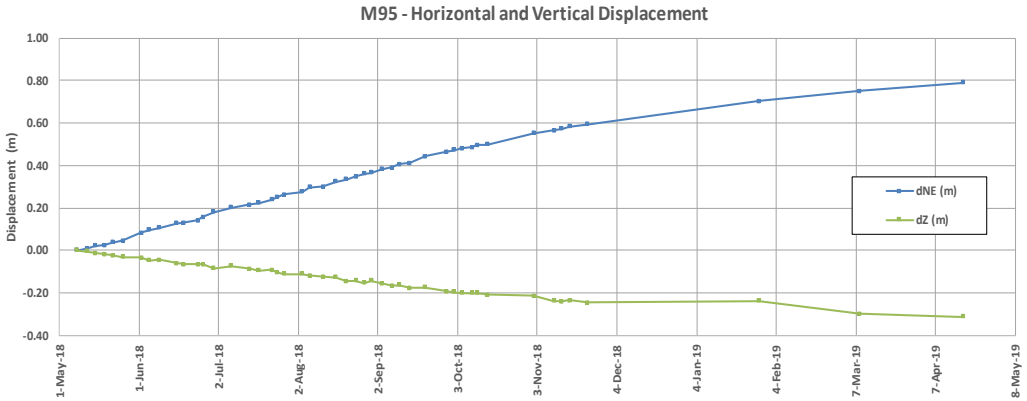

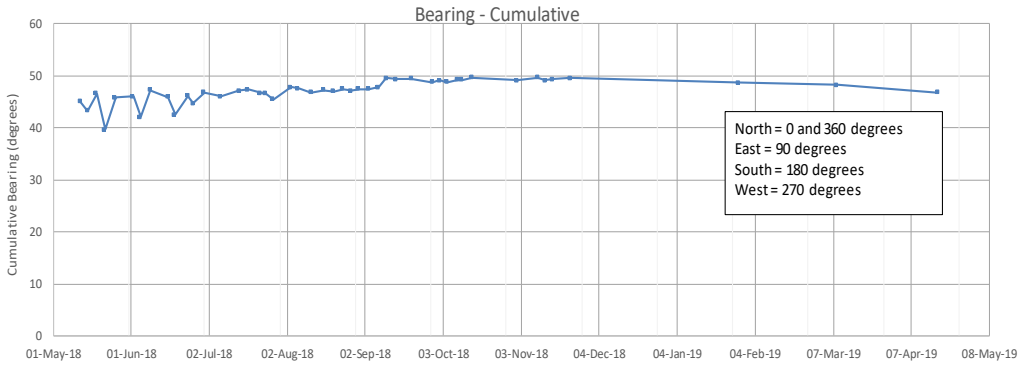

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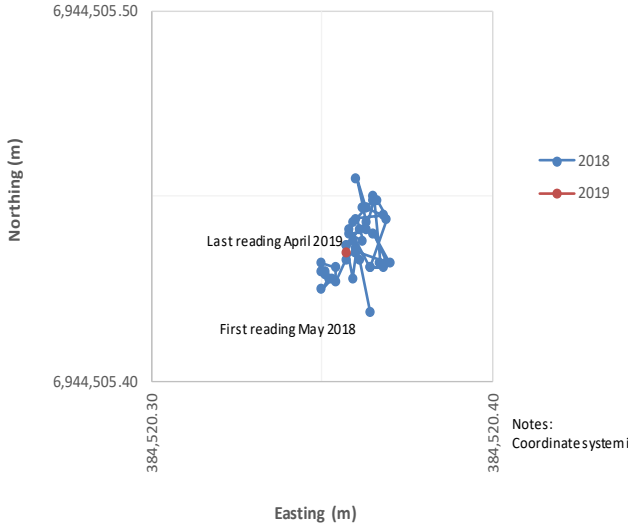
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M95
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by PHM / Figure: **13**

M96 - Northing Vs. Easting Movement Plot



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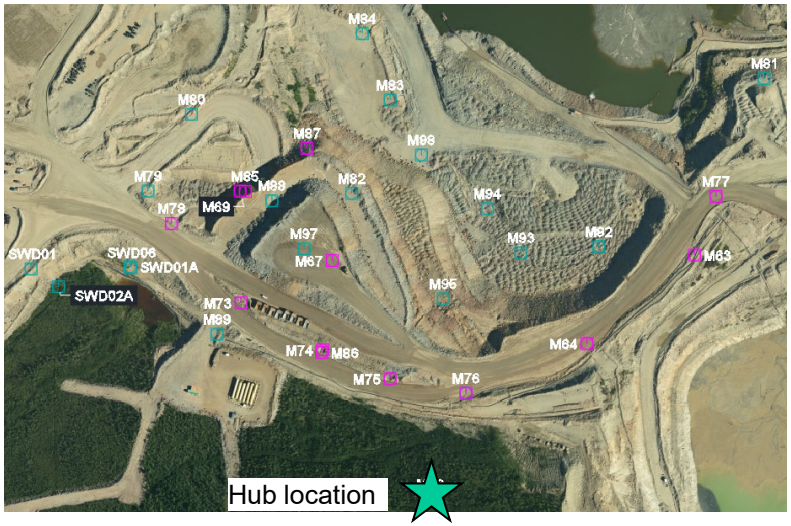
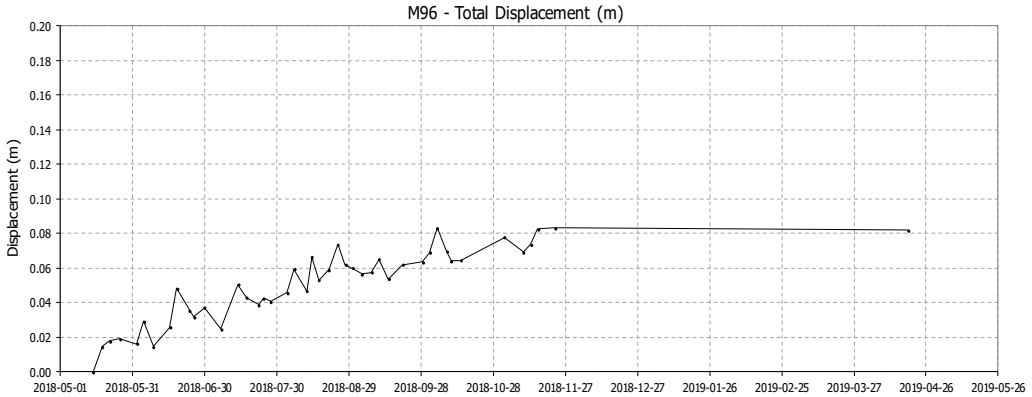
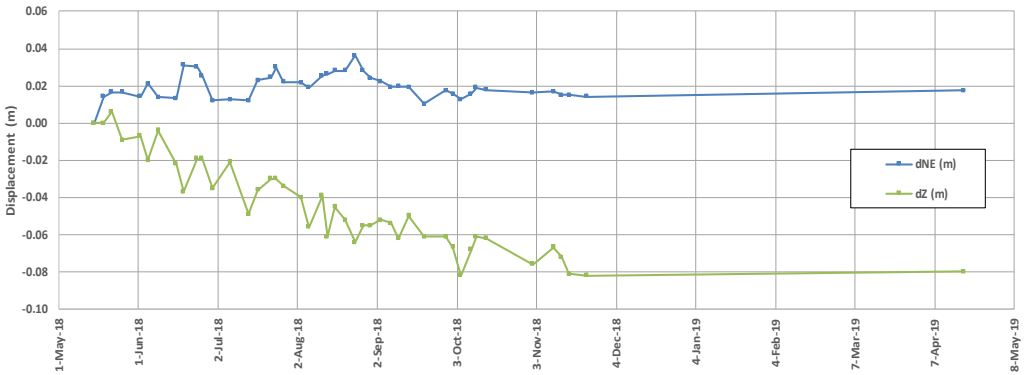


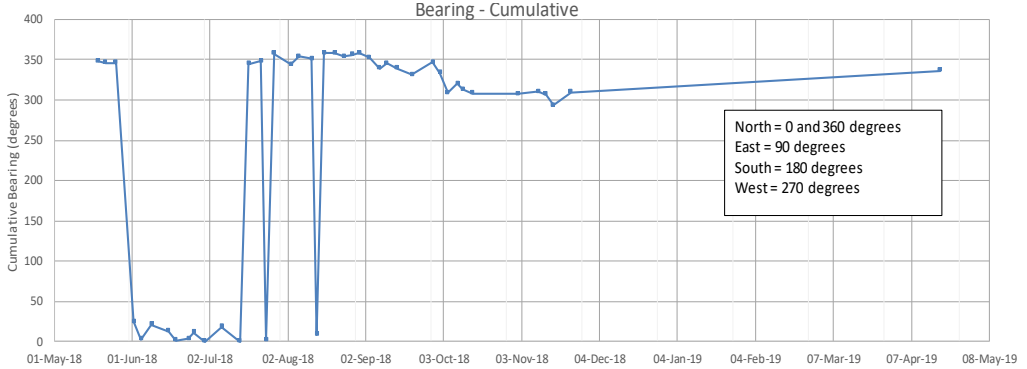
M96 - Total Displacement (m)



M95 - Horizontal and Vertical Displacement



Bearing - Cumulative



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Minto Explorations Ltd.

Main Pit Instrumentation Data

Survey Hub – M96

Job No: 1CM002.066

Filename: ApG_2019MainPitInstrumentation.pptx

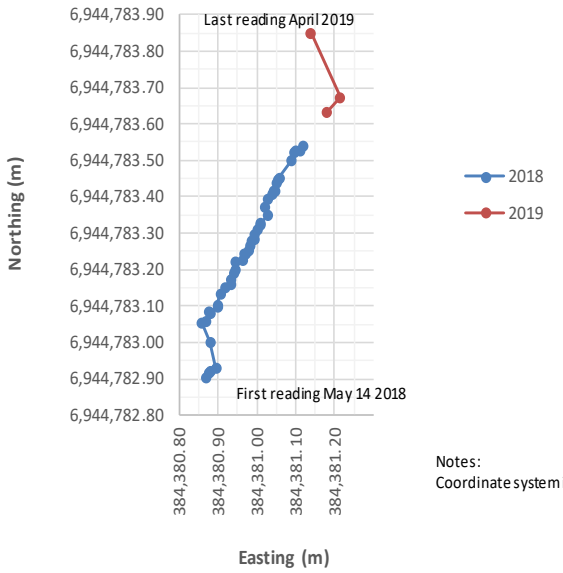
Minto Mine

Date: August 2019

Prepared by PHM

Figure: **14**

M97 - Northing Vs. Easting Movement Plot



Notes:
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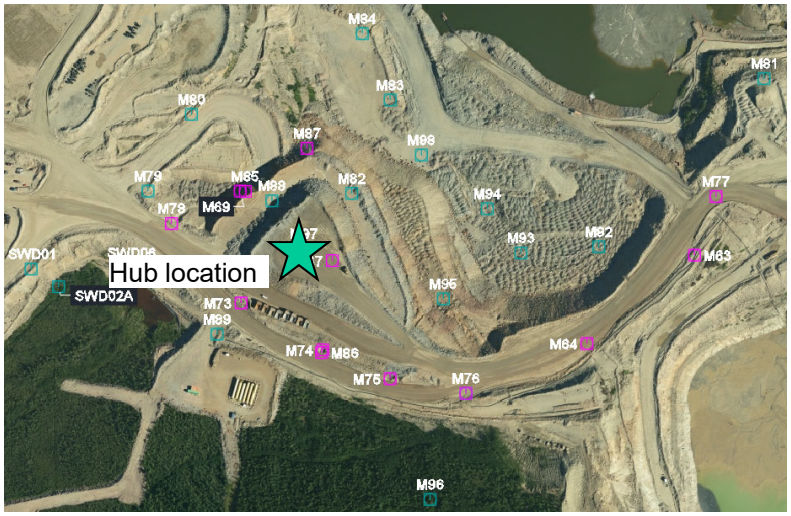

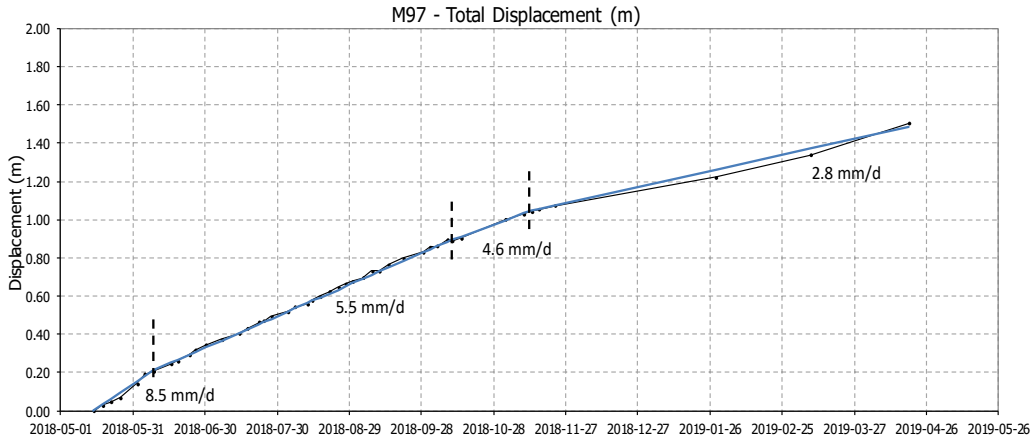

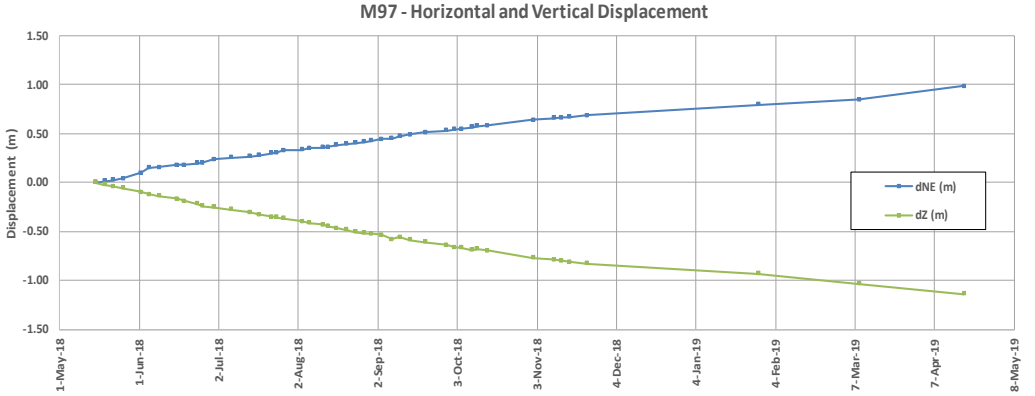

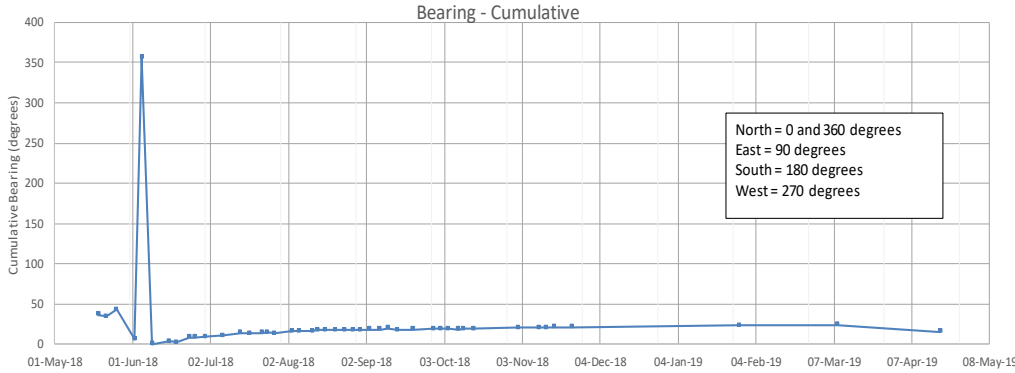

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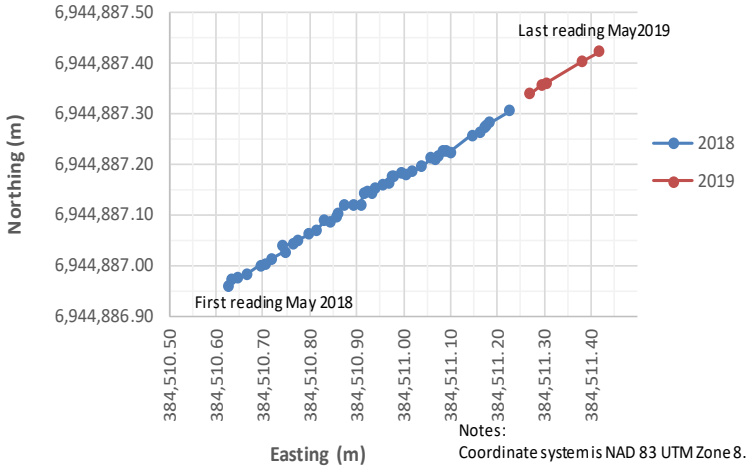
		Survey Hub – M97	
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019	Prepared by PHM	Figure: **15**

M98 - Northing Vs. Easting Movement Plot



Notes:
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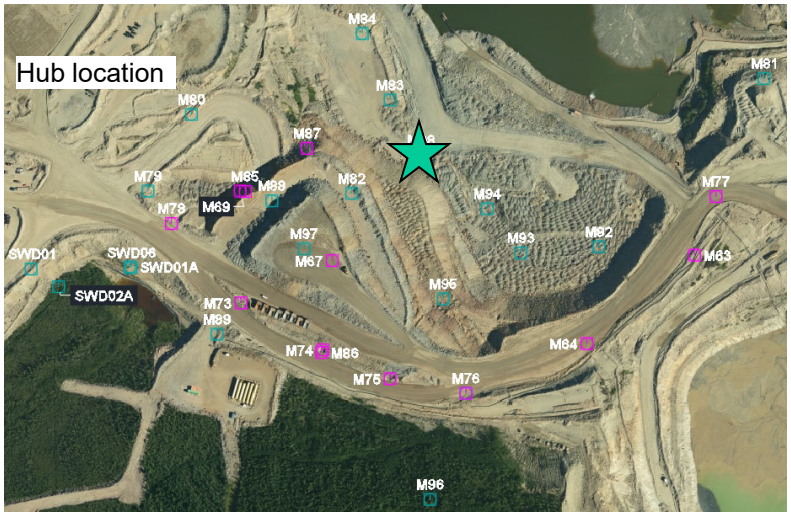

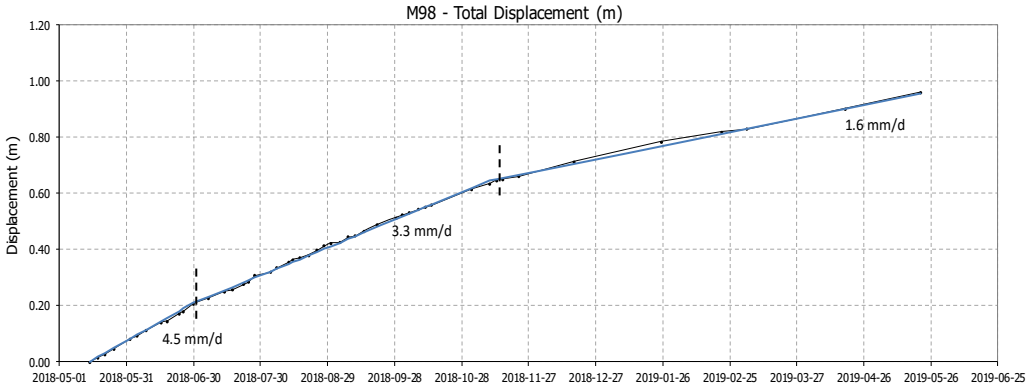

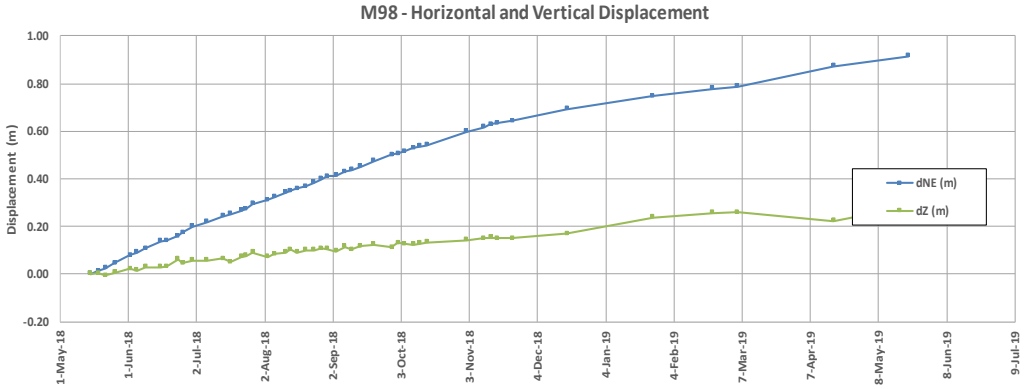

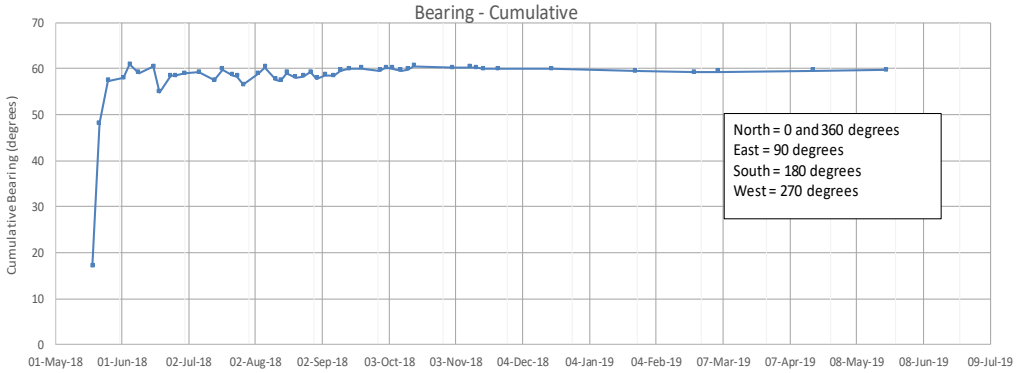

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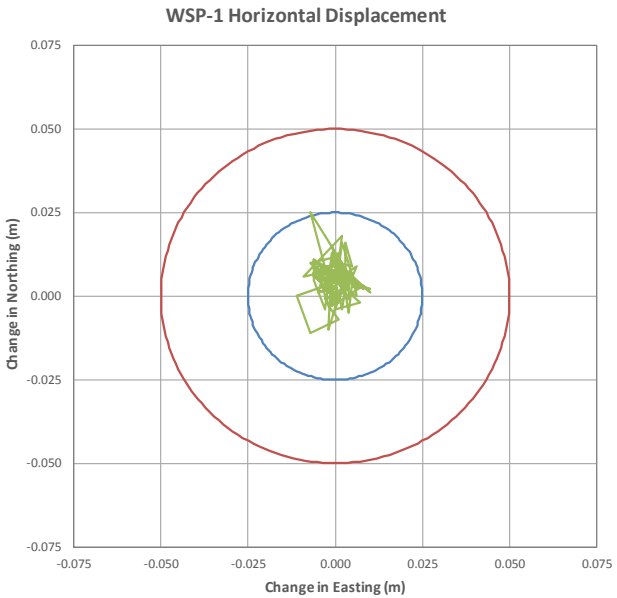
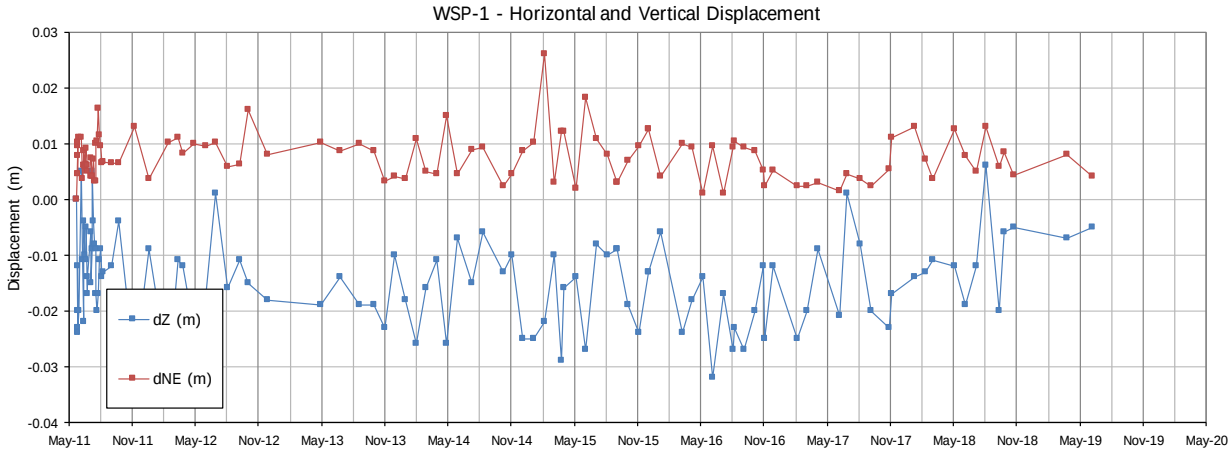
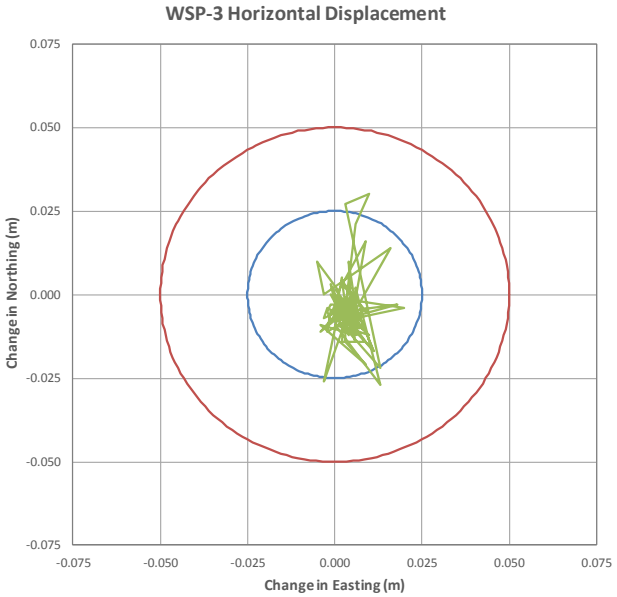
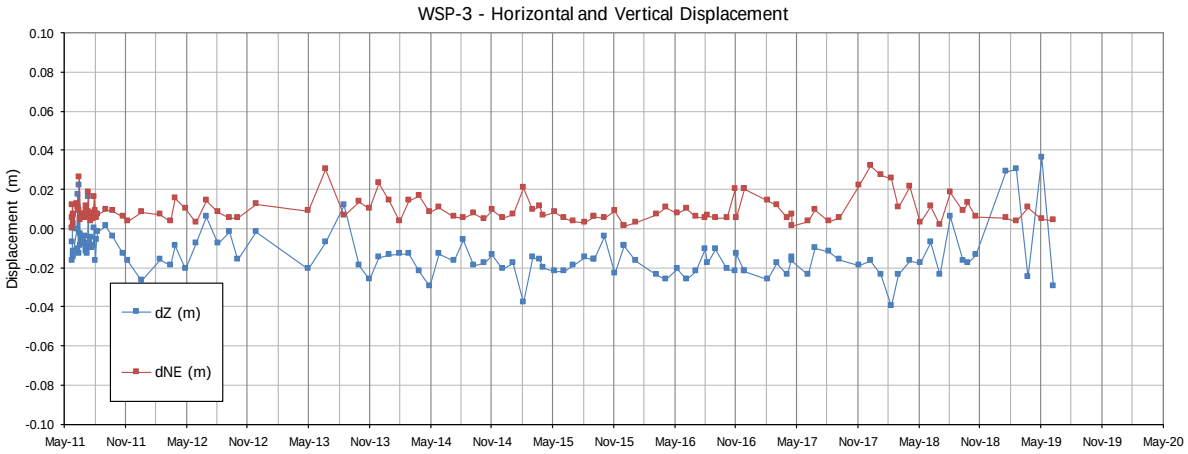
srk consulting	Minto Explorations Ltd.	Main Pit Instrumentation Data
		Survey Hub – M98
Job No: 1CM002.066 Filename: ApG_2019MainPitInstrumentation.pptx	Minto Mine	Date: August 2019 / Prepared by PHM / Figure: **16**

Appendix H: Water Storage Pond Instrumentation Data









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Minto Explorations Ltd.

Water Storage Pond Data

Survey Hubs – WSP-1 and WSP-3

Job No: 1CM002.066

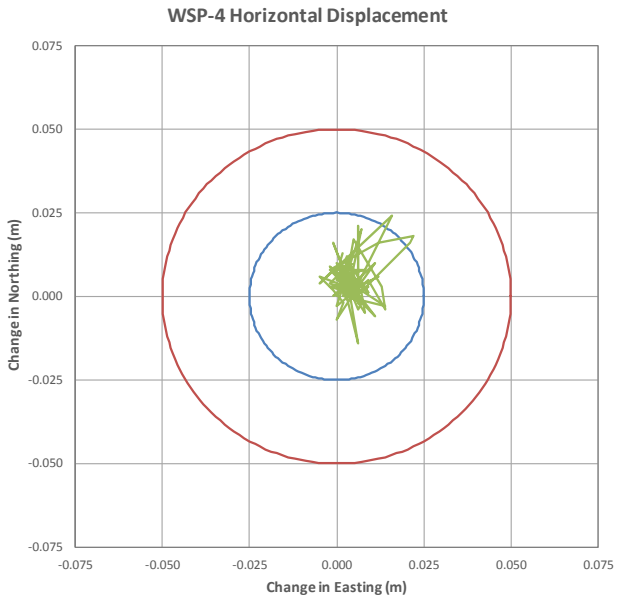
Filename: ApH_WaerStoragePond2019.pptx

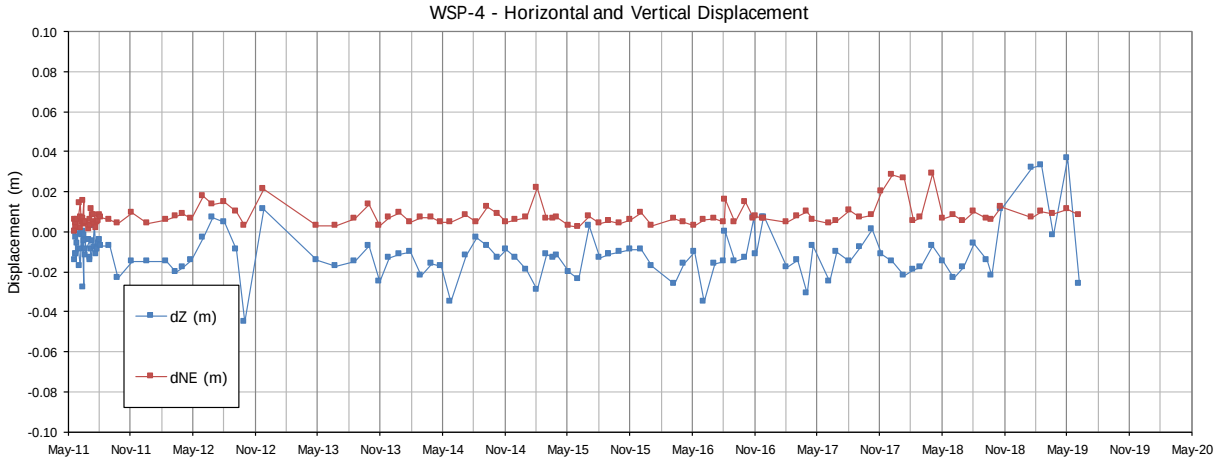
Minto Mine

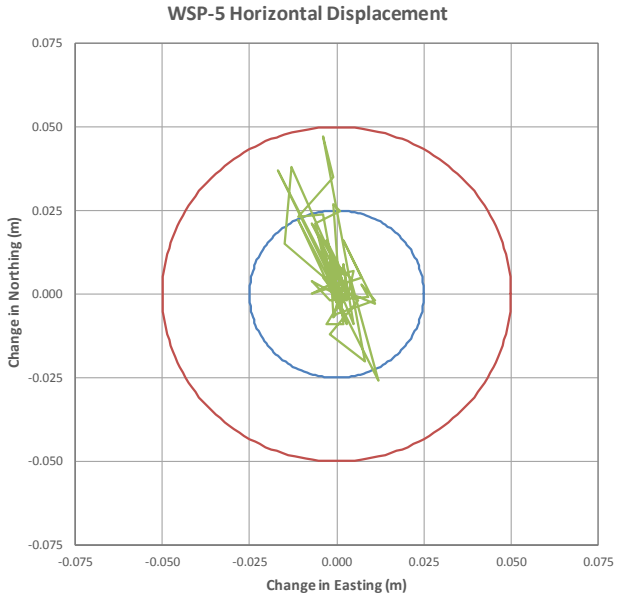
Date: August 2019

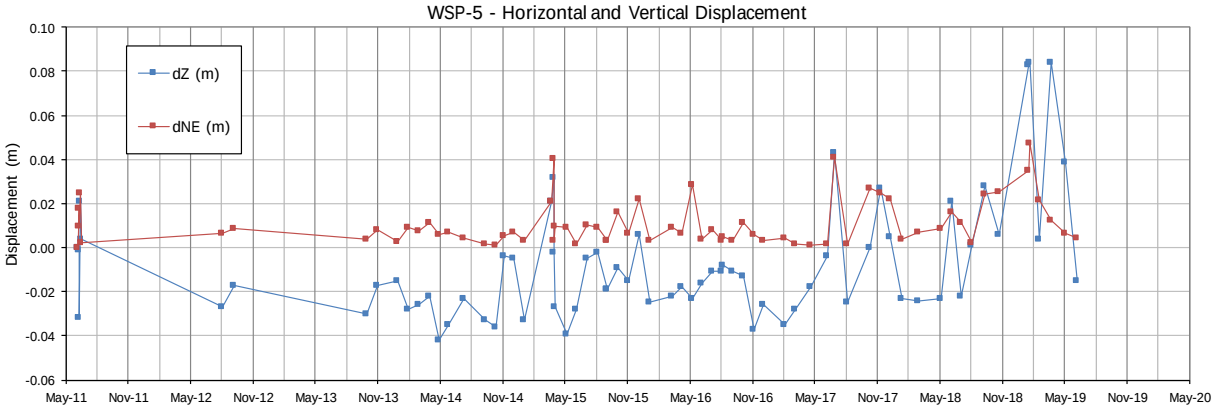
Prepared by PHM

Figure: **1**









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srk consulting

Minto Explorations Ltd.

Water Storage Pond Data

Survey Hubs – WSP-4 and WSP-5

Job No: 1CM002.066

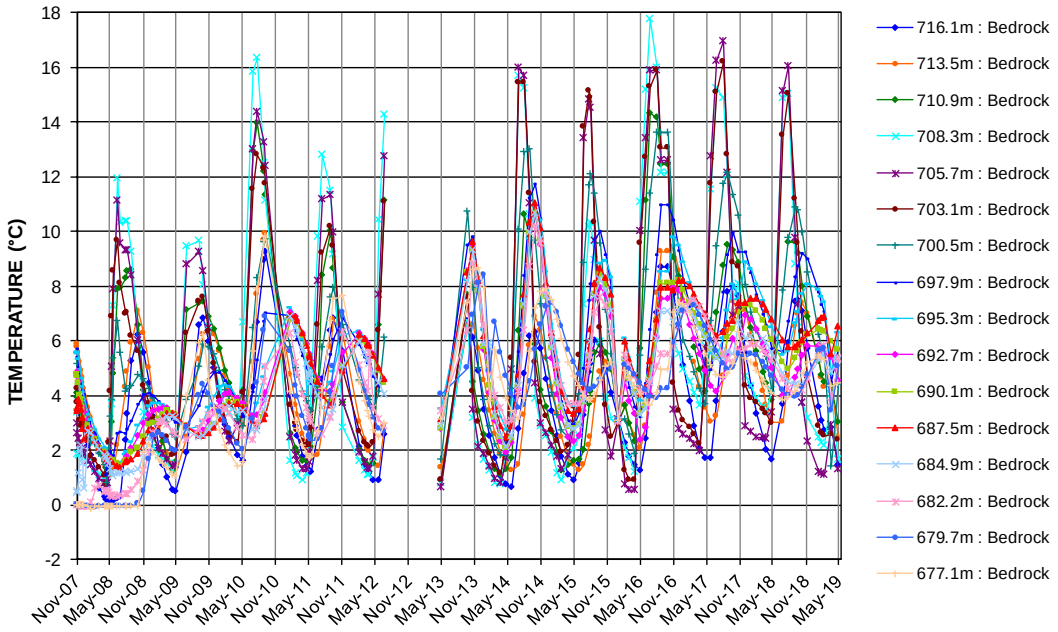
Filename: ApH_WaerStoragePond2019.pptx

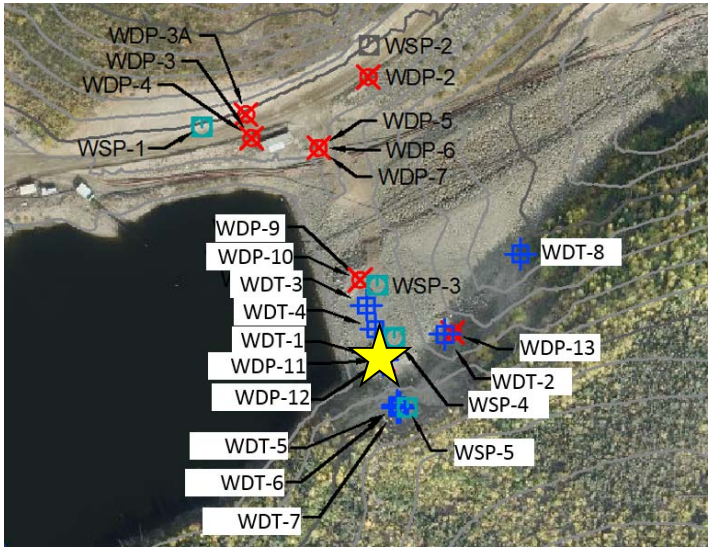
Minto Mine

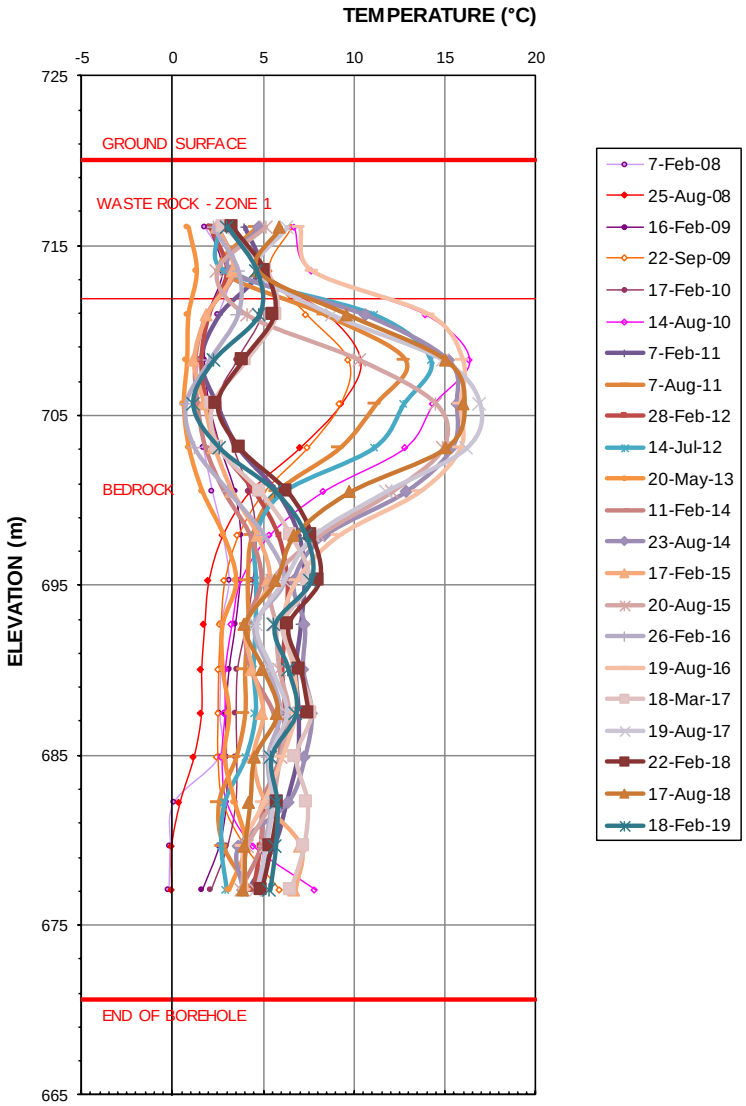
Date: August 2019

Prepared by: PHM

Figure: **2**







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Minto Explorations Ltd.

Water Storage Pond Data

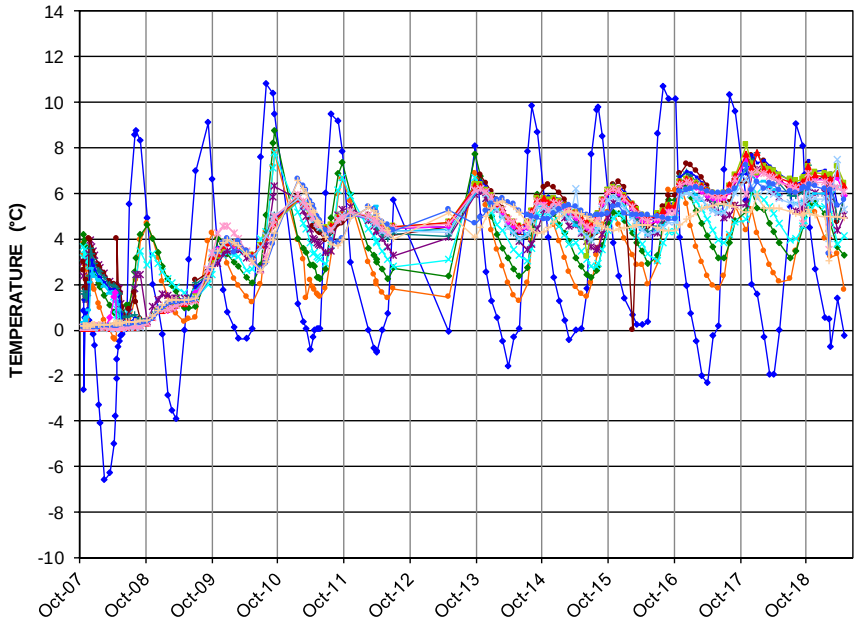
Temperature Cable – WDT-1

Job No: 1CM002.066

Filename: ApH_WaerStoragePond2019.pptx

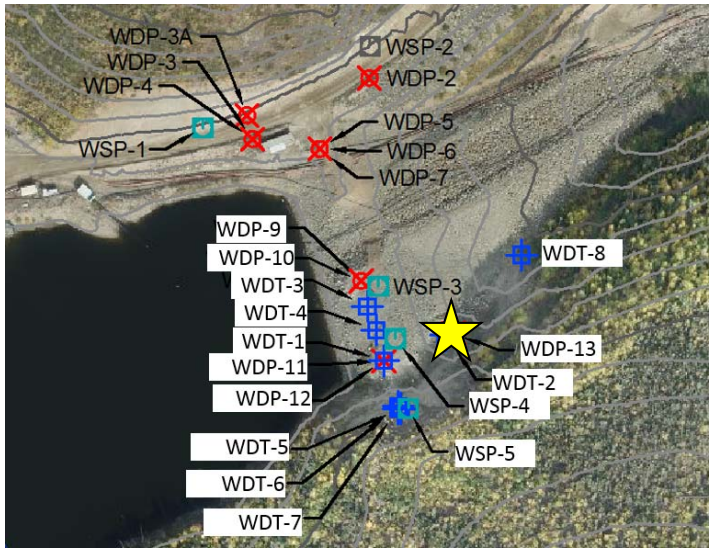
Minto Mine

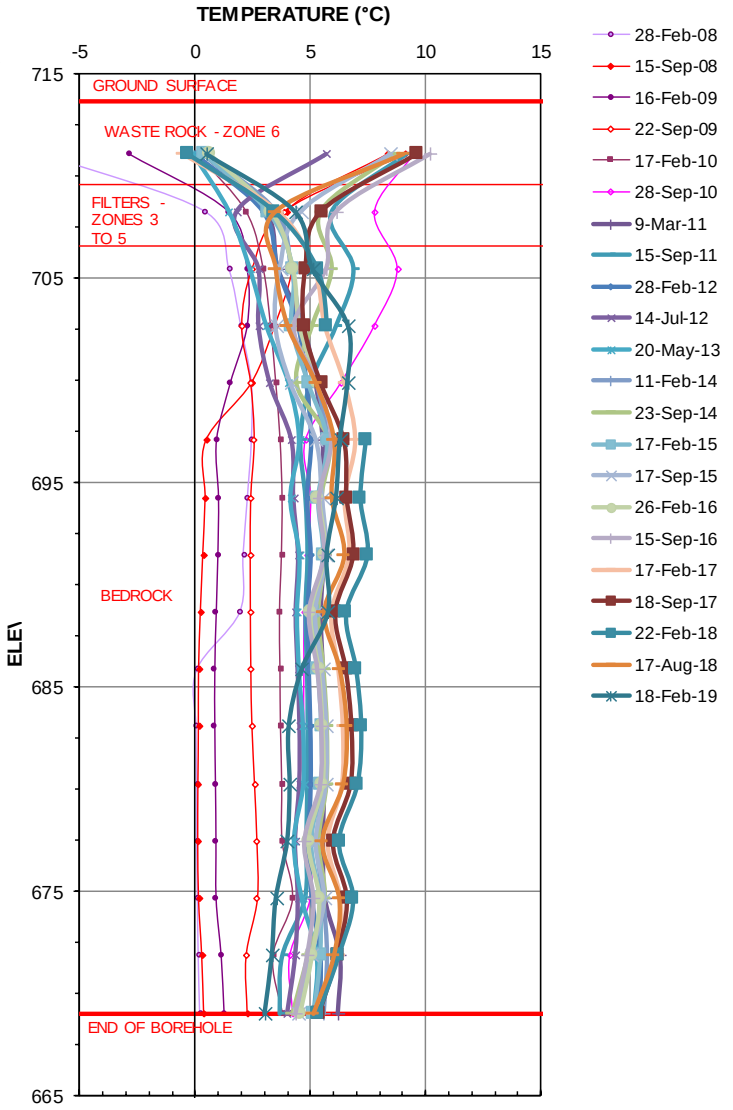
Date:	Prepared by	Figure:
August 2019	PHM	3



Sensor El. and Stratigraphy

- 711.1m : Waste Rock-Zone 6
- 708.3m : Filters-Zones 3 to 5
- 705.5m : Bedrock
- 702.7m : Bedrock
- 699.9m : Bedrock
- 697.1m : Bedrock
- 694.3m : Bedrock
- 691.5m : Bedrock
- 688.7m : Bedrock
- 685.9m : Bedrock
- 683.1m : Bedrock
- 680.3m : Bedrock
- 677.5m : Bedrock
- 674.7m : Bedrock
- 671.9m : Bedrock
- 669.1m : Bedrock





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Minto Explorations Ltd.

Water Storage Pond Data

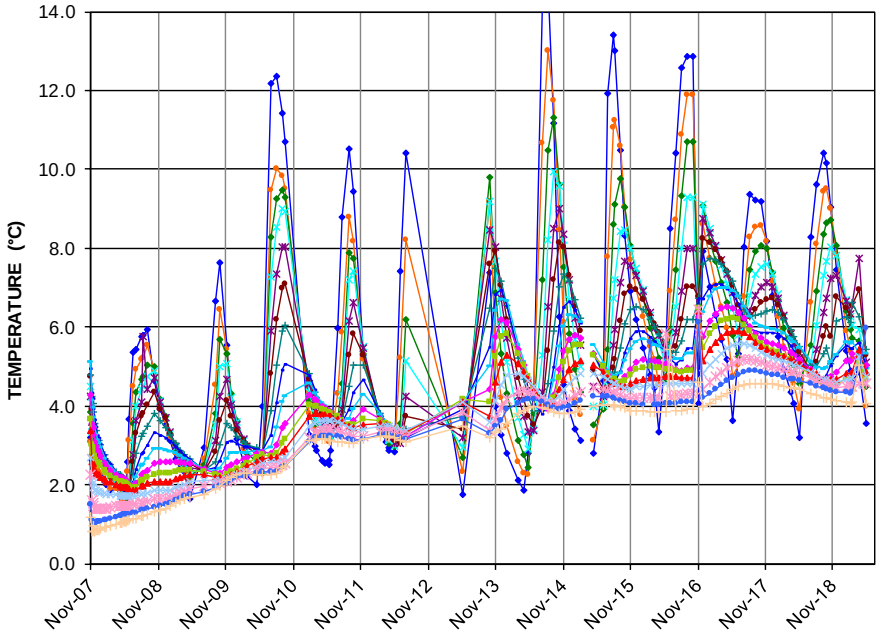
Temperature Cable – WDT-2

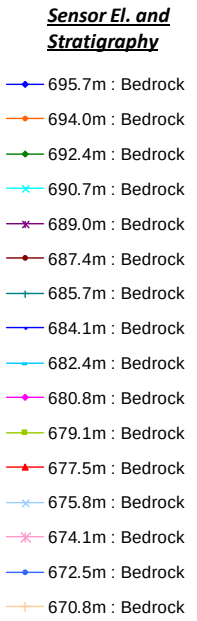
Job No: 1CM002.066

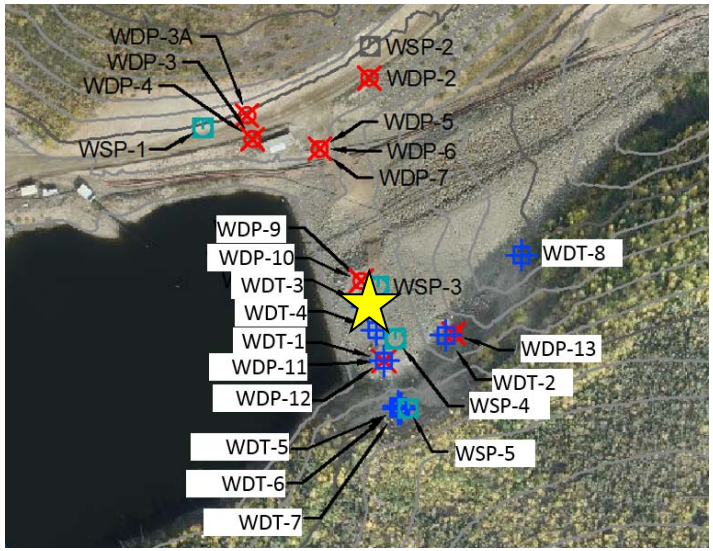
Filename: ApH_WaerStoragePond2019.pptx

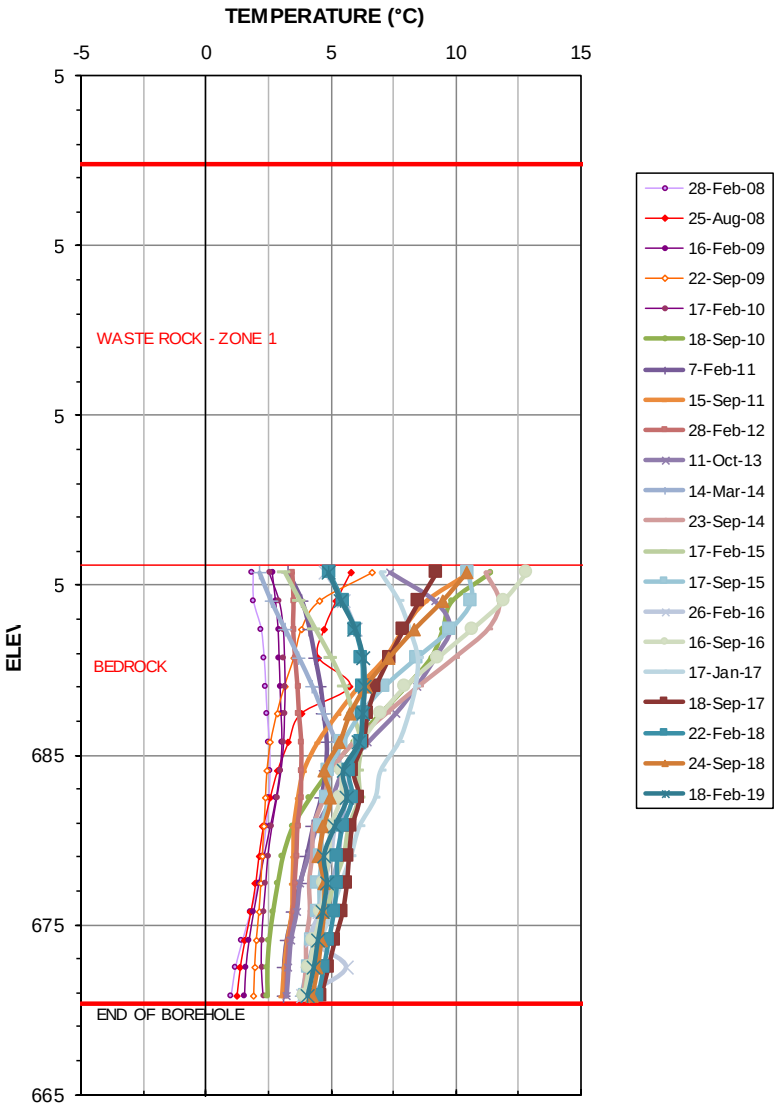
Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	4









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Minto Explorations Ltd.

Water Storage Pond Data

Temperature Cable – WDT-3

Job No: 1CM002.066

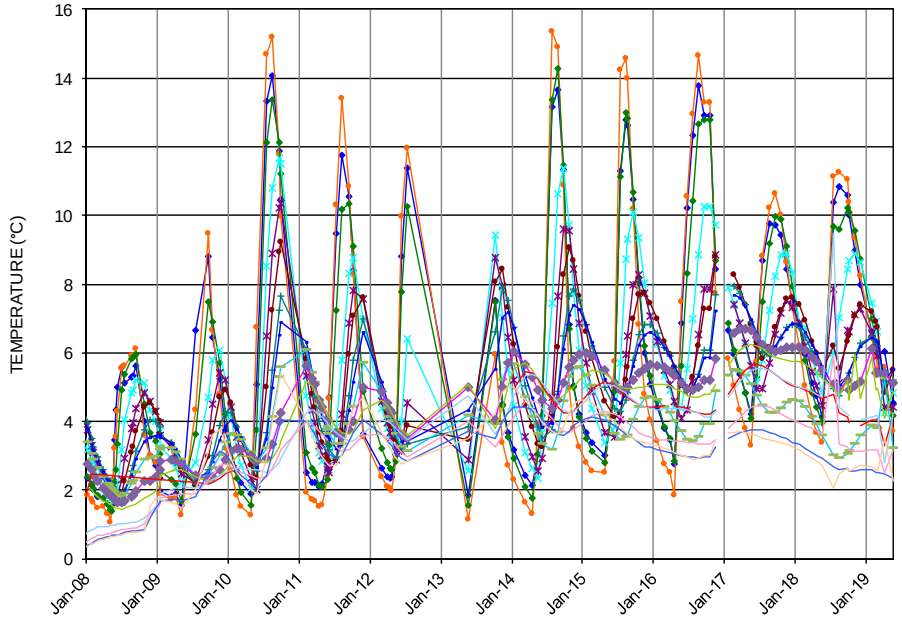
Filename: ApH_WaerStoragePond2019.pptx

Minto Mine

Date: August 2019

Prepared by: PHM

Figure: **5**



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
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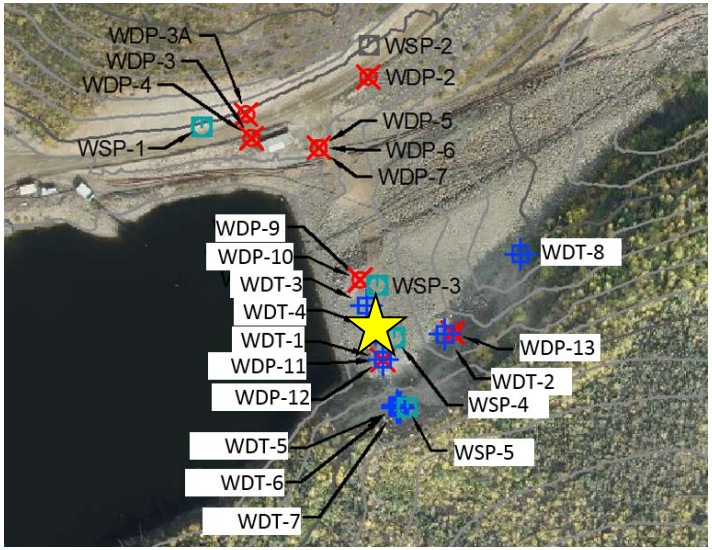
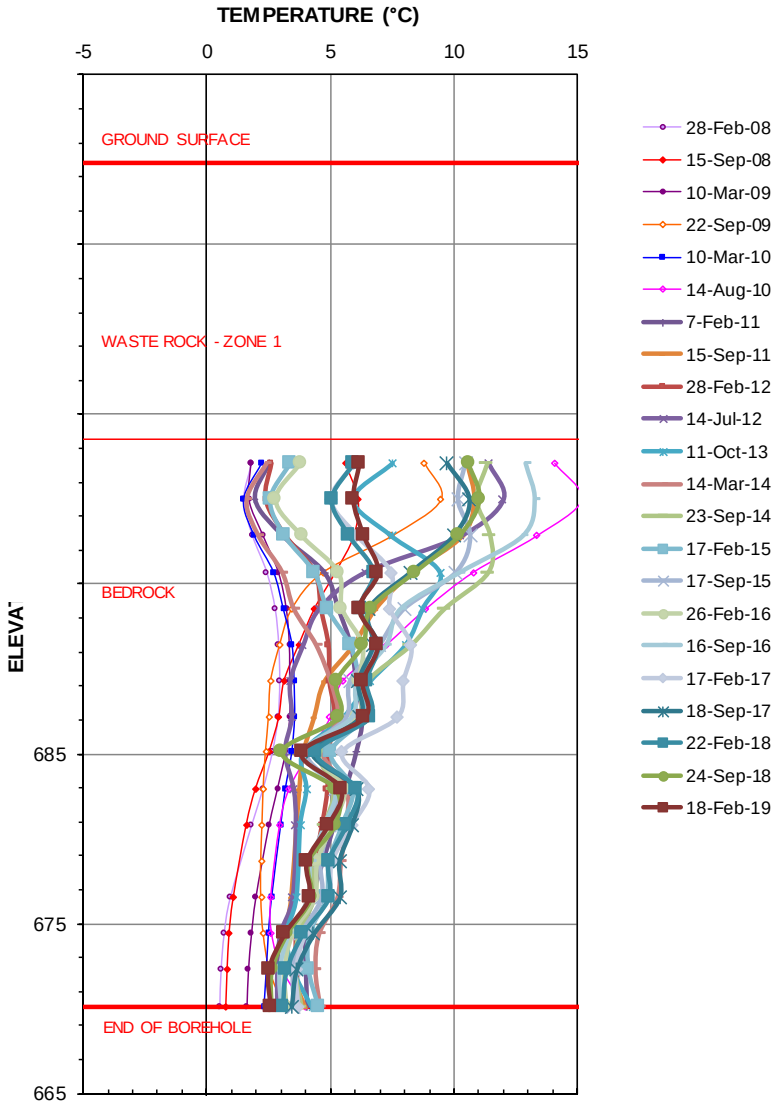
- 676.5m : Bedrock
- 674.4m : Bedrock
- 672.3m : Bedrock
- 670.1m : Bedrock





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Minto Explorations Ltd.

Water Storage Pond Data

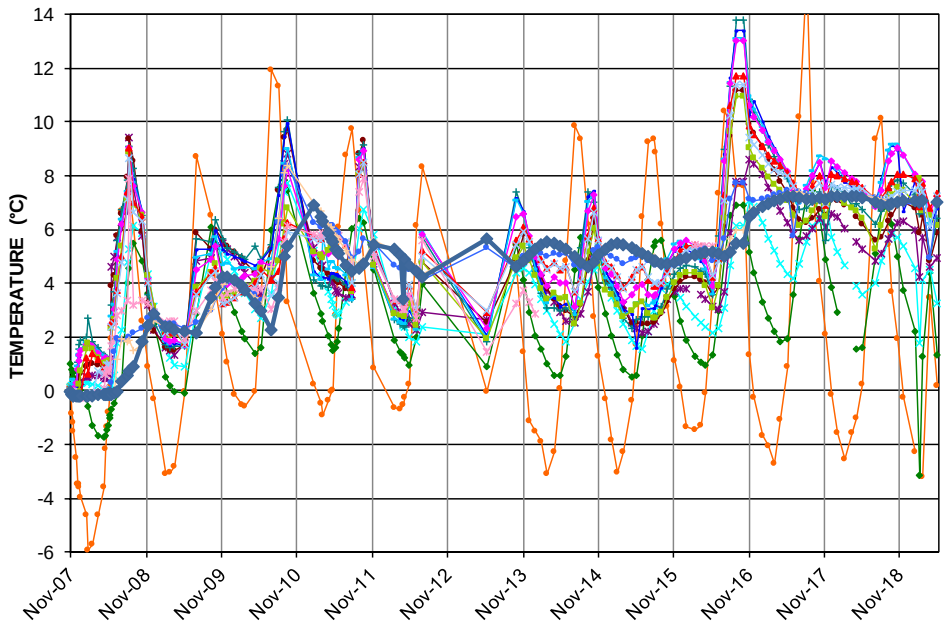
Temperature Cable – WDT-4

Job No: 1CM002.066

Filename: ApH_WaerStoragePond2019.pptx

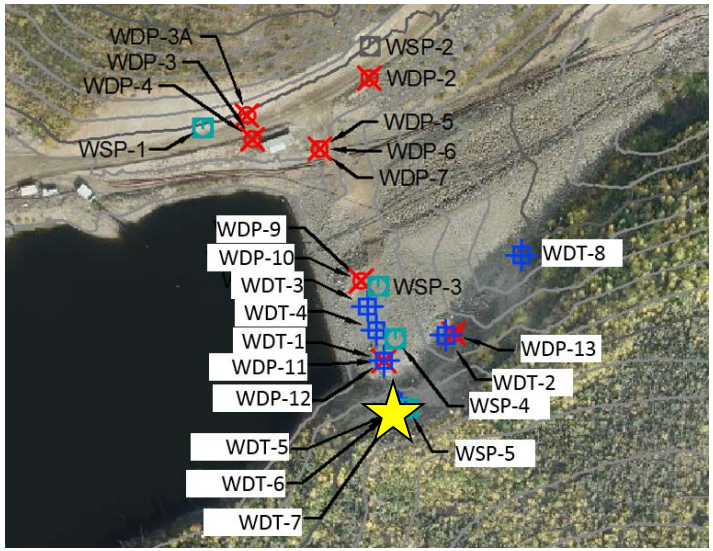
Minto Mine

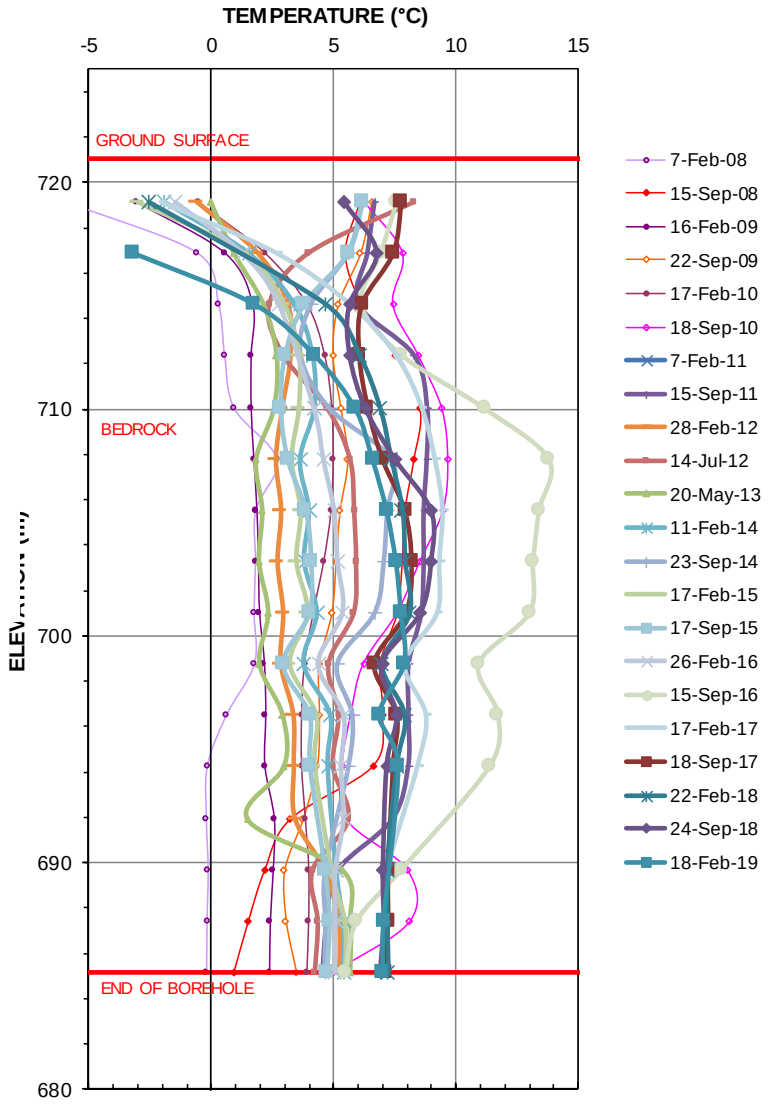
Date:	Prepared by	Figure:
August 2019	PHM	6



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





7-Feb-08
15-Sep-08
16-Feb-09
22-Sep-09
17-Feb-10
18-Sep-10
7-Feb-11
15-Sep-11
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14-Jul-12
20-May-13
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23-Sep-14
17-Feb-15
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17-Feb-17
18-Sep-17
22-Feb-18
24-Sep-18
18-Feb-19

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Minto Explorations Ltd.

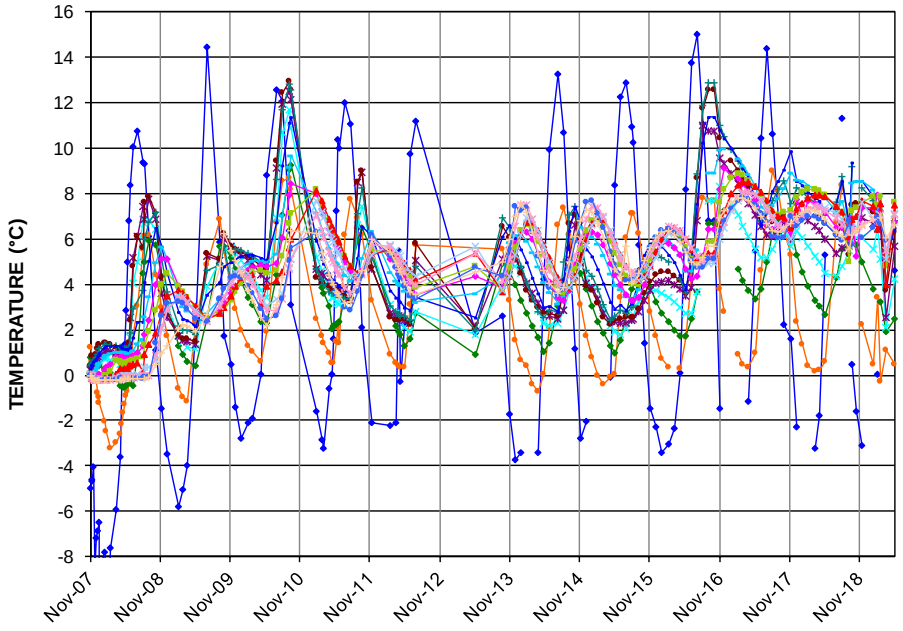
Water Storage Pond Data

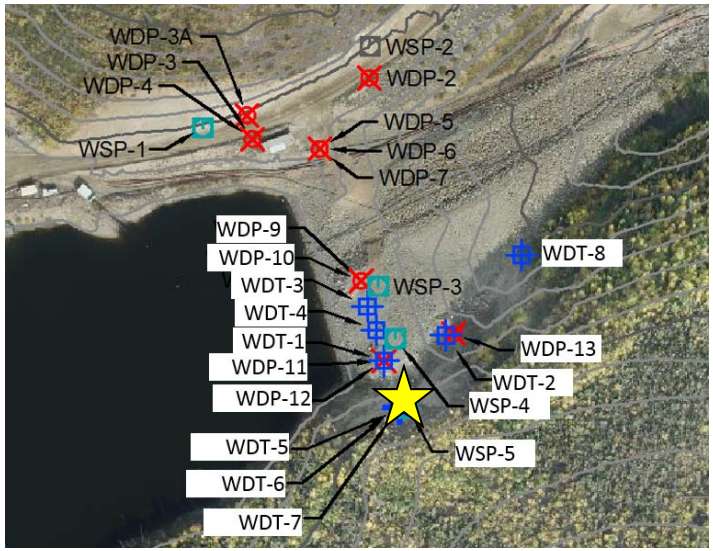
Temperature Cable – WDT-5

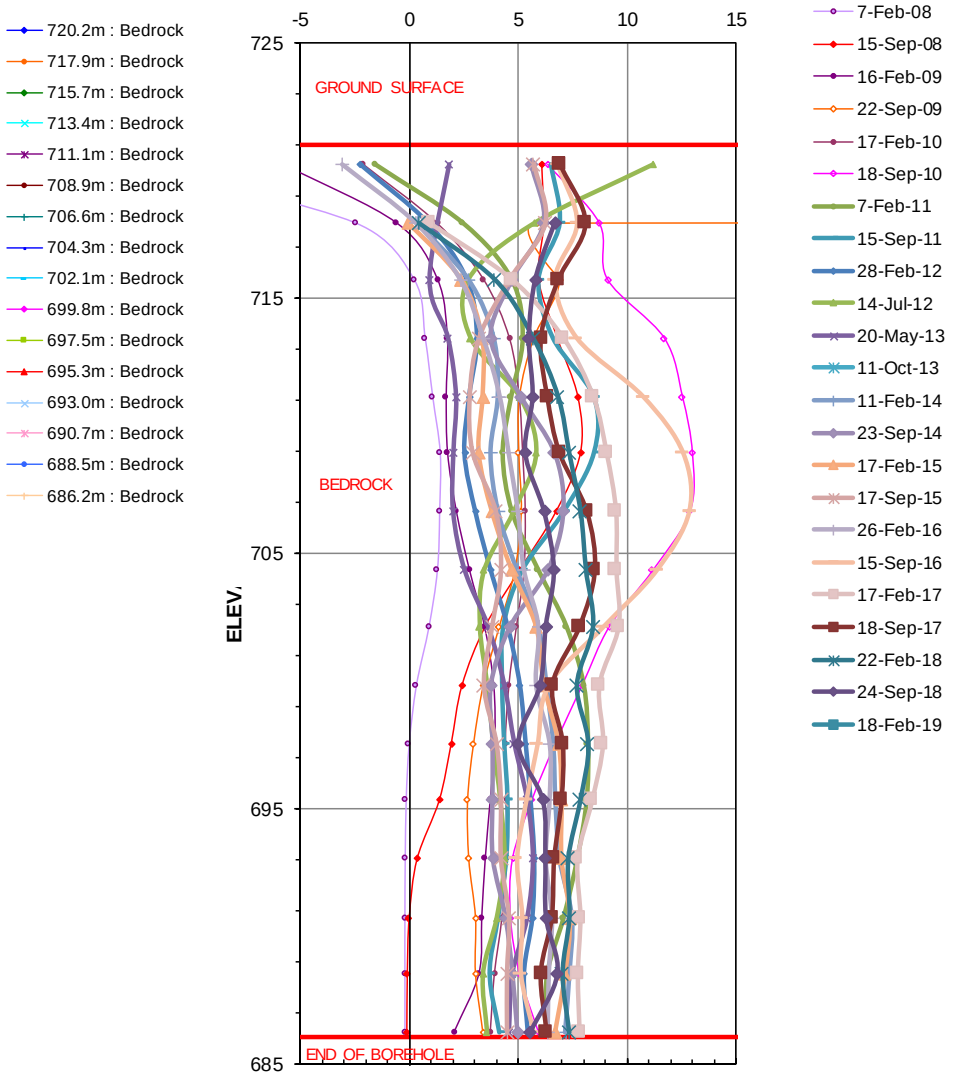
Job No: 1CM002.066
Filename: ApH_WaerStoragePond2019.pptx

Minto Mine

Date:	Prepared by	Figure:
August 2019	PHM	7







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Minto Explorations Ltd.

Water Storage Pond Data

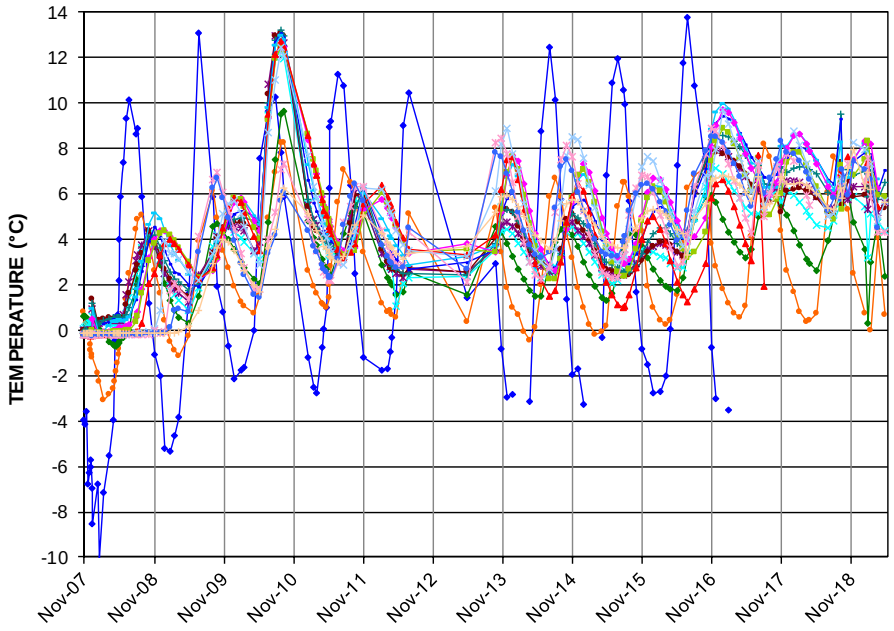
Temperature Cable – WDT-6

Job No: 1CM002.066

Filename: ApH_WaerStoragePond2019.pptx

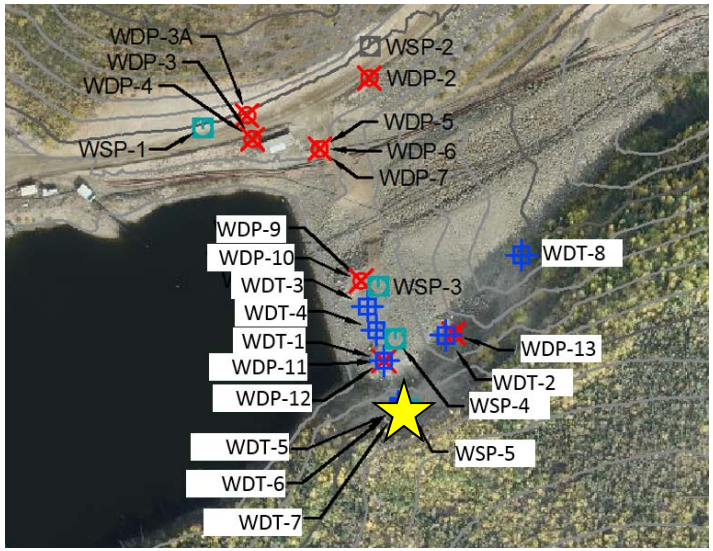
Minto Mine

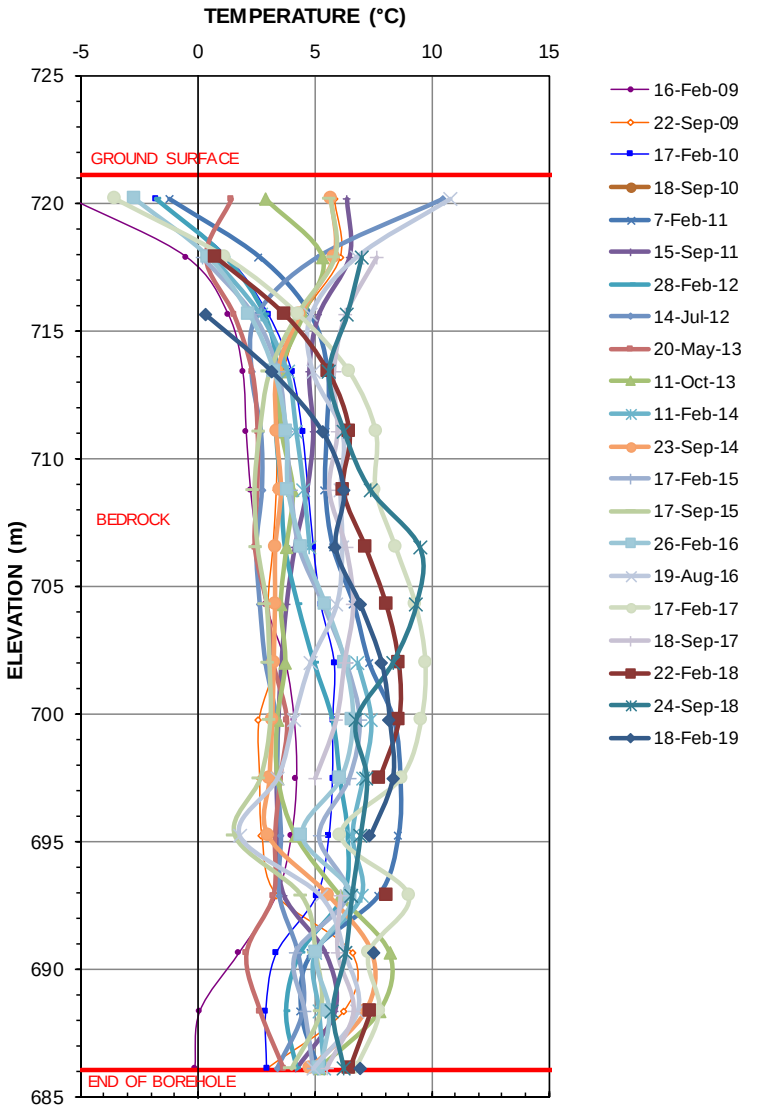
Date:	Prepared by	Figure:
August 2019	PHM	8



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





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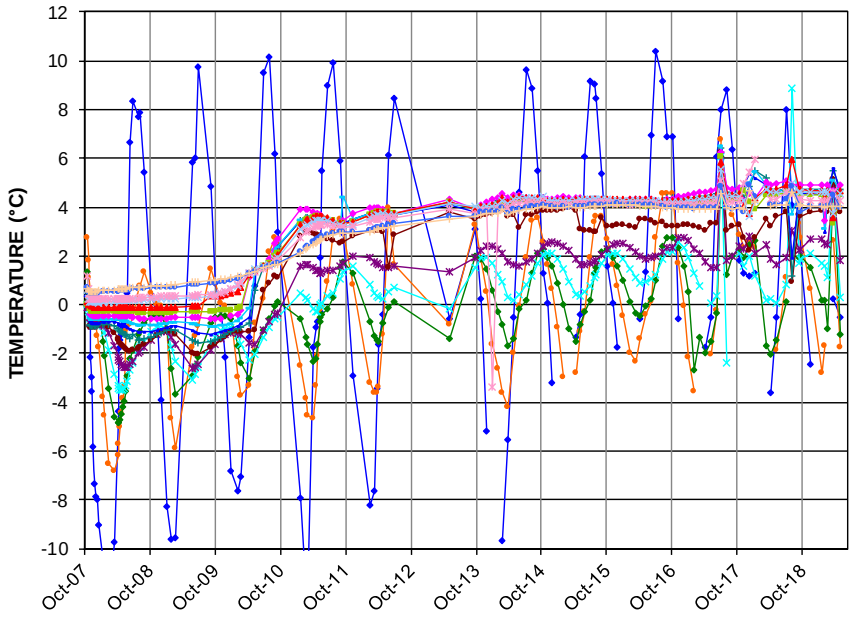
srk consulting	Minto Explorations Ltd.	Water Storage Pond Data
		Temperature Cable – WDT-7
Job No: 1CM002.066 Filename: ApH_WaerStoragePond2019.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **9**



Sensor El. and Stratigraphy

- 700.5m : Waste Rock-Zone 7
- 698.3m : Filters-Zone 7
- 696.1m : Bedrock
- 693.9m : Bedrock
- 691.7m : Bedrock
- 689.5m : Bedrock
- 687.3m : Bedrock
- 685.1m : Bedrock
- 682.9m : Bedrock
- 680.7m : Bedrock
- 678.5m : Bedrock
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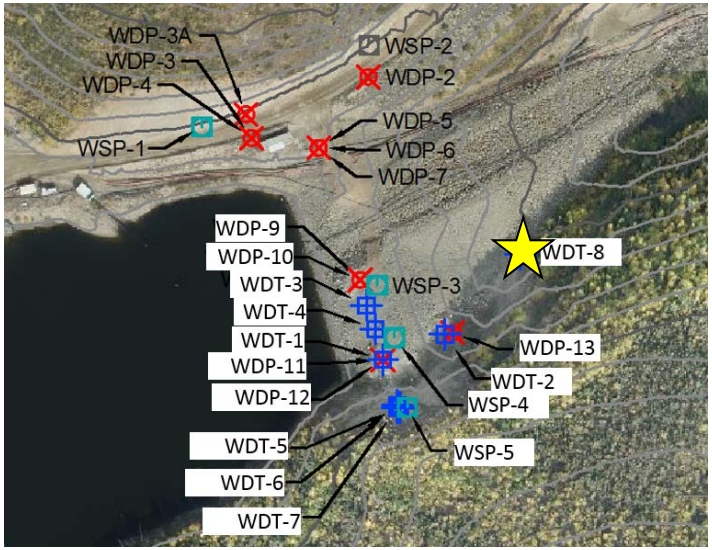
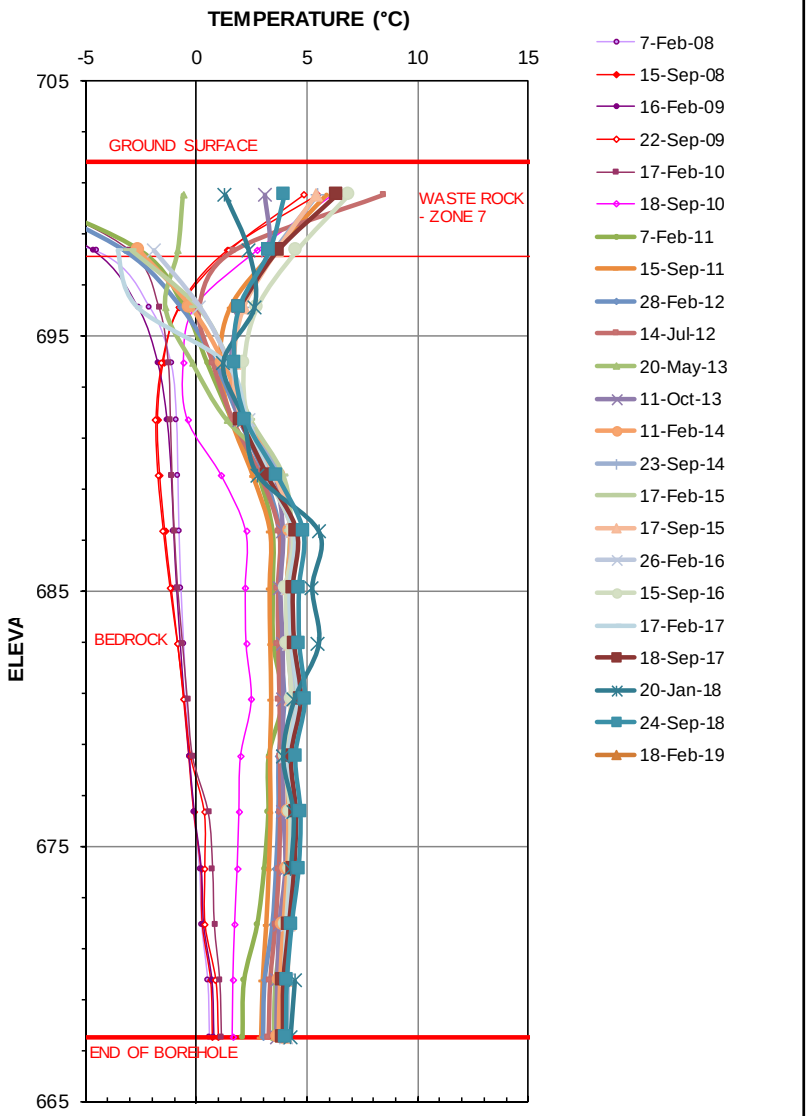
- 674.1m : Bedrock
- 671.9m : Bedrock
- 669.7m : Bedrock
- 667.5m : Bedrock





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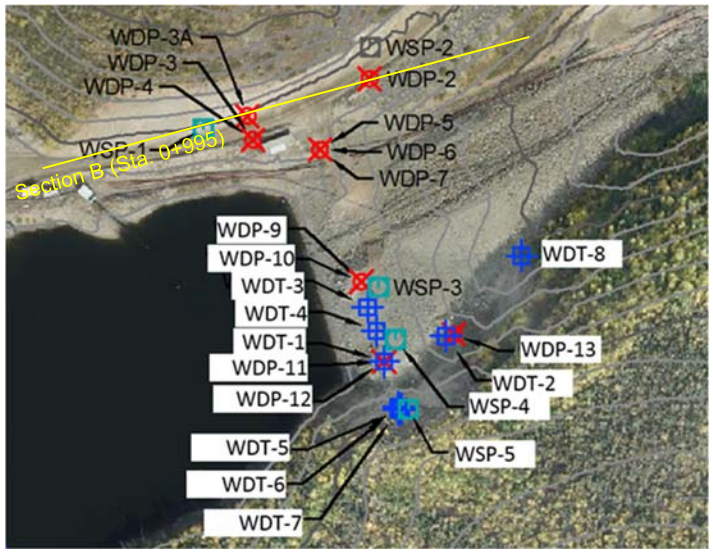
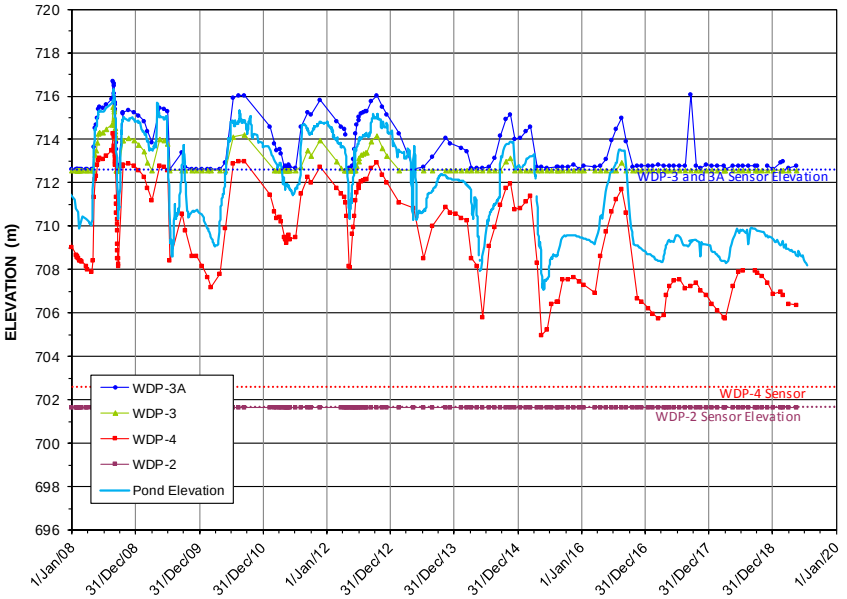
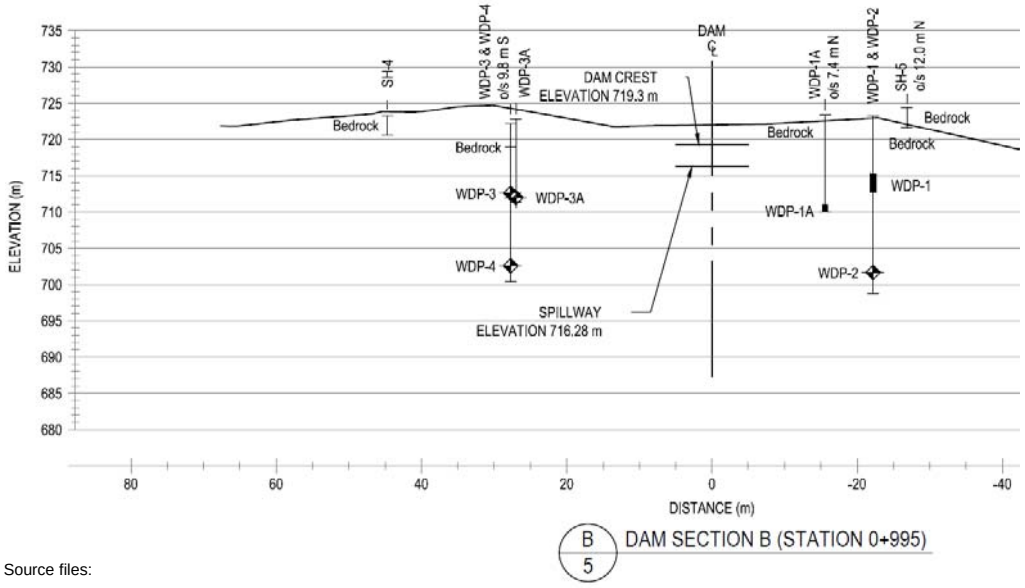
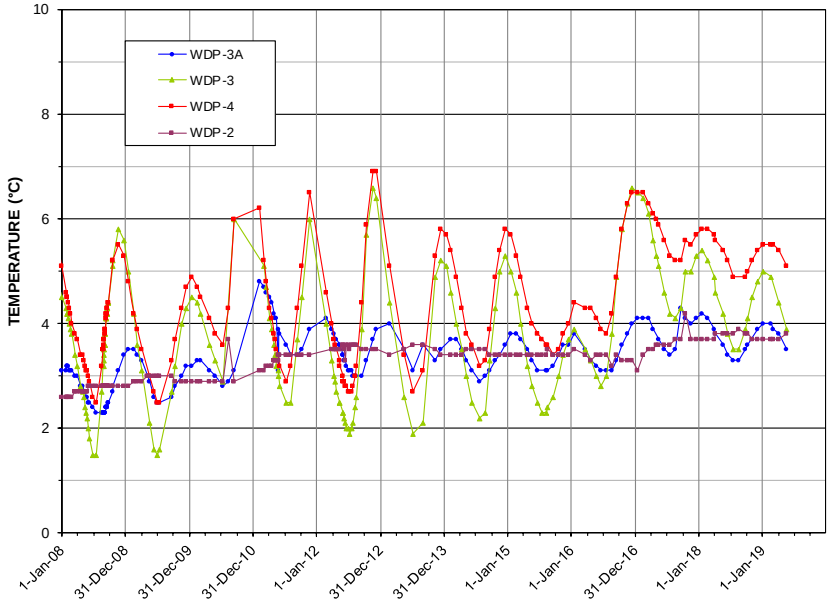
srk consulting	Minto Explorations Ltd.	Water Storage Pond Data
		Temperature Cable – WDT-8
Job No: 1CM002.066 Filename: ApH_WaerStoragePond2019.pptx	Minto Mine	Date: August 2019 / Prepared by: PHM / Figure: **10**







B 5 DAM SECTION B (STATION 0+995)



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3. Cross Section B from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

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Minto Explorations Ltd.

Water Storage Pond Data

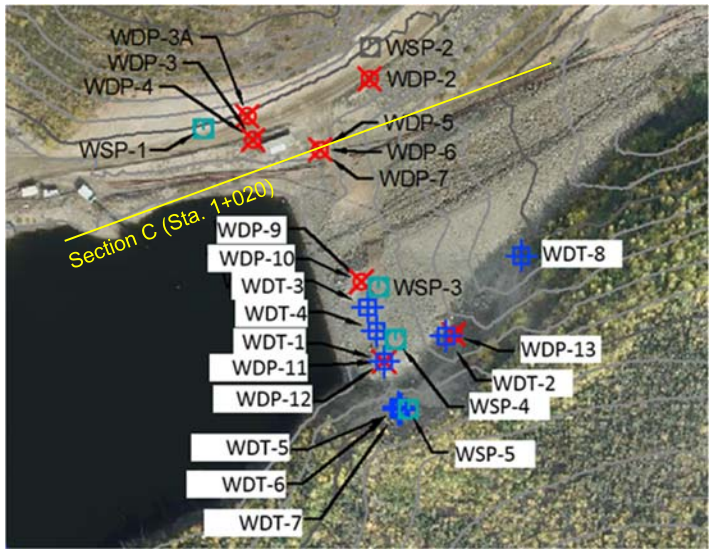
Piezometers – Left Abutment

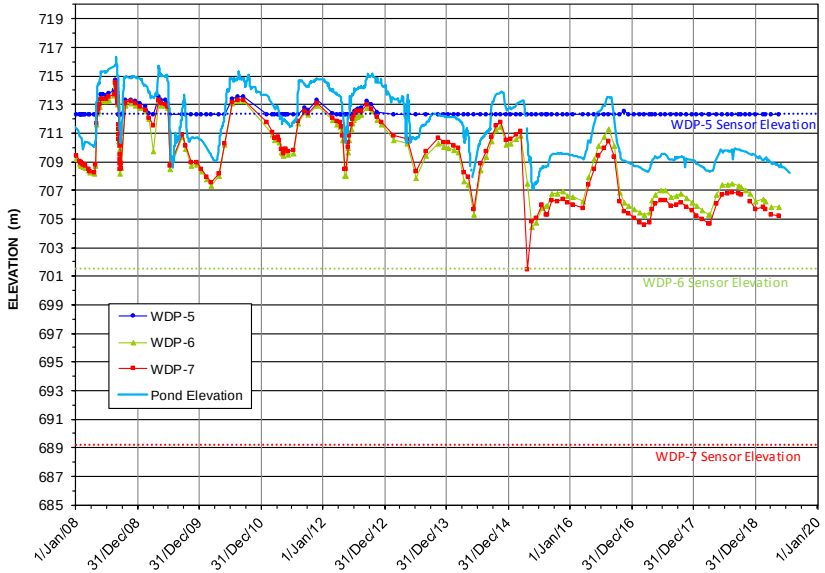
Job No: 1CM002.066

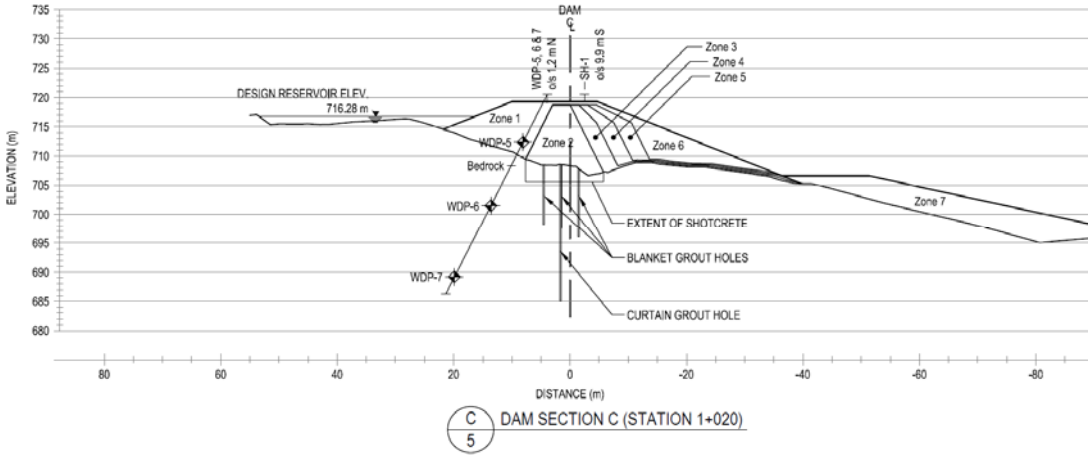
Filename: ApH_WaerStoragePond2019.pptx

Minto Mine

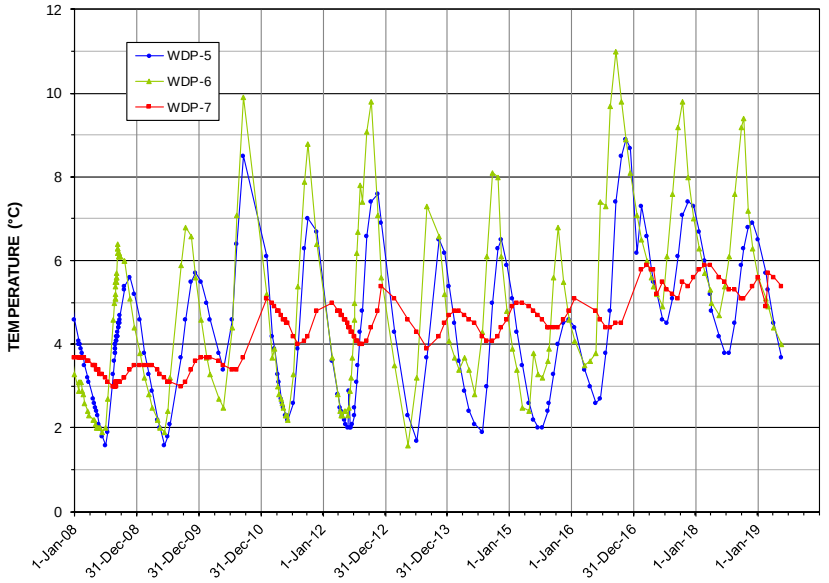
Date:	Prepared by	Figure:
August 2019	PHM	11







C
5
DAM SECTION C (STATION 1+020)



Source files:

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3. Dam section from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

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Minto Explorations Ltd.

Water Storage Pond Data

Piezometers – Section C (Station 1+020)

Job No: 1CM002.066

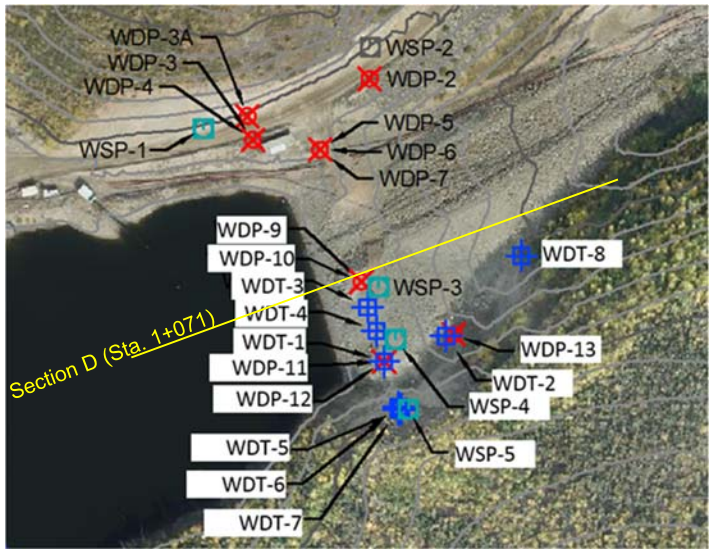
Filename: ApH_WaerStoragePond2019.pptx

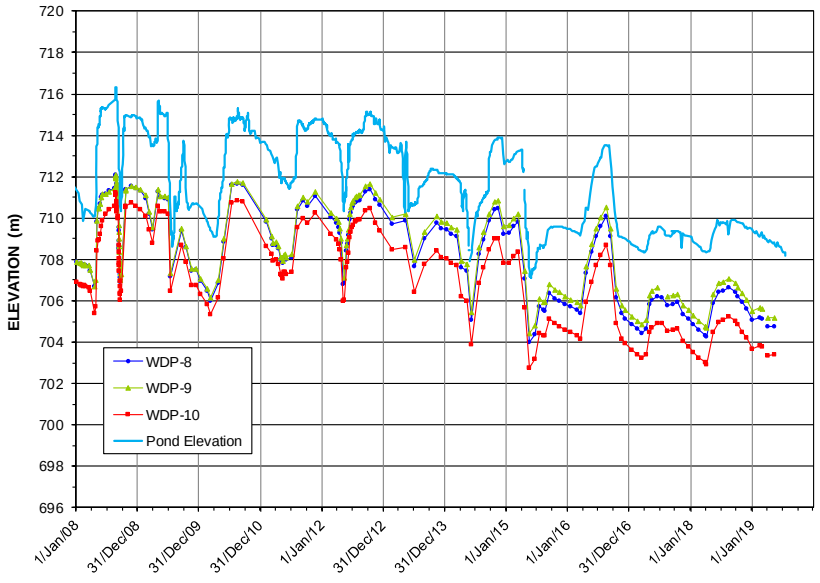
Minto Mine

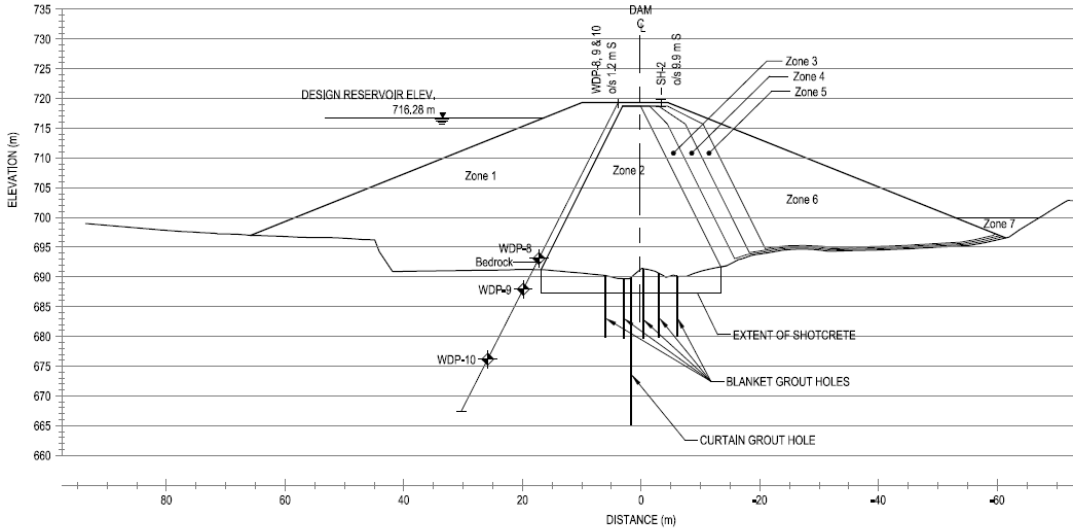
Date: August 2019

Prepared by PHM

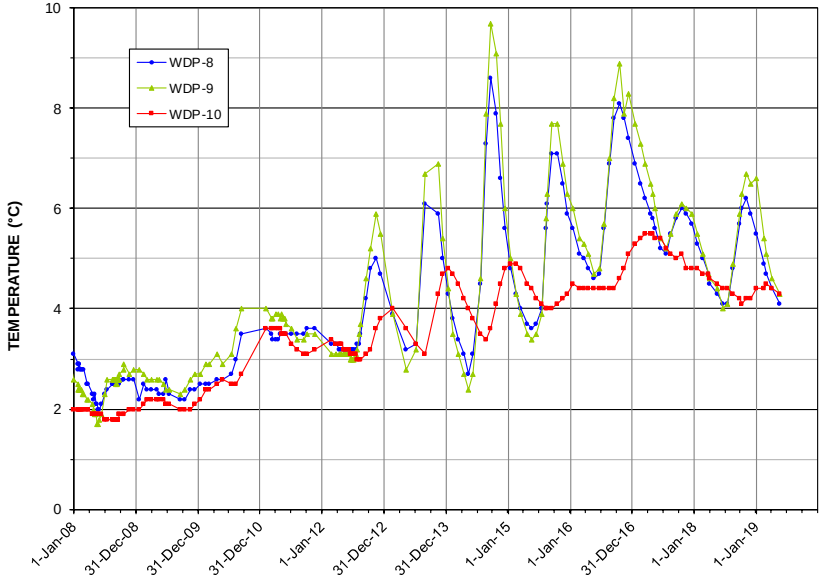
Figure: **12**







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



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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.

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Water Storage Pond Data

Piezometers – Section D (Station 1+071)

Job No: 1CM002.066

Filename: ApH_WaerStoragePond2019.pptx

Minto Mine

Date: August 2019

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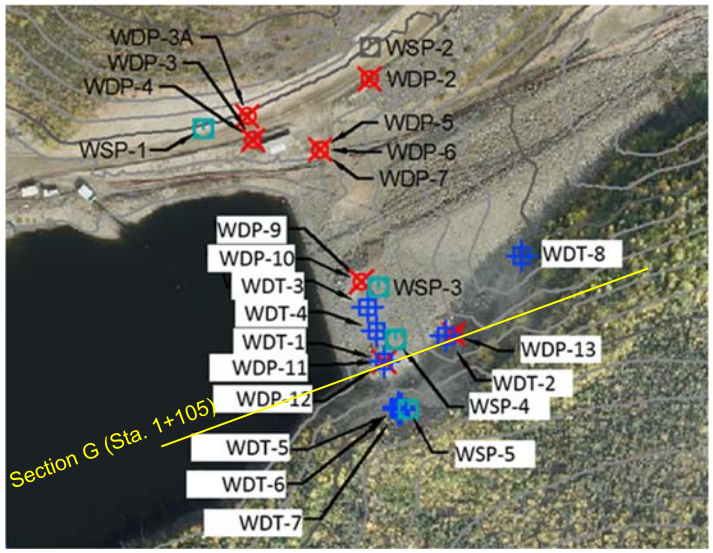
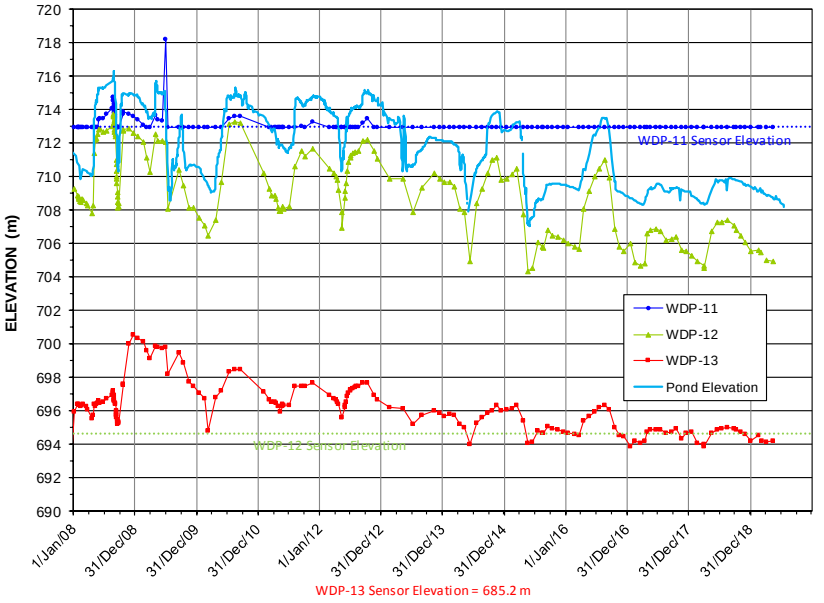
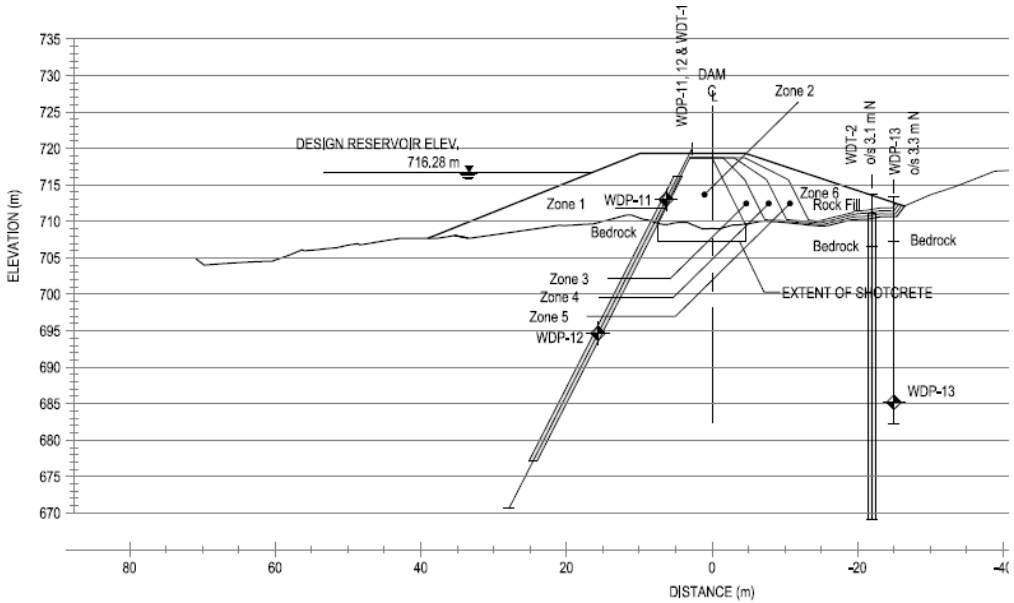
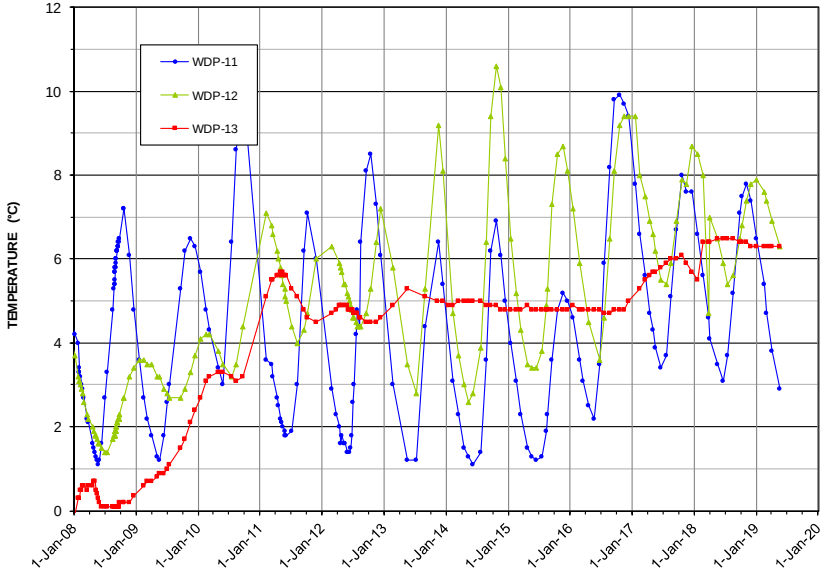
Figure: **13**









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

Source files:

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3. Dam section from EBA (2011) report: Water Storage Pond Dam Geotechnical Instrumentation and Seepage Data Review" dated December 23, 2011.

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Water Storage Pond Data

Piezometers – Section G (Station 1+105)

Job No: 1CM002.066

Filename: ApH_WaerStoragePond2019.pptx

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Figure: **14**