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FARO MINE COMPLEX

2015 Pit Slope Stability Review

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Faro Mine Remediation Project
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REPORT

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Table of Contents

TABLES

PLATES

FIGURES

APPENDICES

UNITS OF MEASURE

Unit	Definition
No.	number
cm	centimetre
d	day
m	metre
mm	millimetre
masl	metres above sea level
yr	year

1.0 INTRODUCTION

1.1 Project Scope

The Faro Mine Complex (FMC) is located approximately 350 kilometres northeast of Whitehorse, Yukon (Plate 1). The former lead/zinc mining complex consists of the Faro Mine and the Vangorda Plateau Mine.

This report summarizes the observations made and discussions held with site staff during the site visit carried out by Golder Associates Ltd. (Golder) between September 8 and 11, 2015, to review the pit slope stability at the property. In particular, the following items are covered by this report.

- The Faro Pit, Grum Pit, and Vangorda Pit are described, including the mine site history and the pit geology.
- The Faro Creek Diversion, Grum Creek Diversion Channel and Vangorda Creek Diversion Flume are described, and current conditions as they relate to pit slope stability are discussed.
- The stability performance of the Faro Pit is discussed, including a discussion of the North and South Instabilities on the east wall of the pit.
- The stability performance of the Grum Pit is discussed, including a discussion of the instability zone on the east wall of the pit.
- The stability performance of the Vangorda Pit is discussed, including a discussion of the potential instability zone on the west wall of the pit and recommendations on mitigation of the upper portion of the slope.
- The Faro and Grum Pit 2015 slope stability monitoring data are reviewed and discussed.
- A visual comparison of previous and current photos of the Faro, Grum, and Vangorda pits is presented.
- A summary of the previous pit slope monitoring program and Golder's recommendations for modifying the pit slope monitoring program are provided.
- Finally, a summary of our observations and recommendations related to pit slope stability are provided.

1.2 Project Background

The Faro Mine was active from 1969 to 1992, and consists of the Faro Pit and the associated waste and water containment facilities. The Vangorda Plateau Mine was active from 1986 to 1998, and consists of the Grum and Vangorda pits and the associated waste and water containment facilities. Figure 1 shows an overview of the Faro Mine Complex and the location of the Faro, Grum and Vangorda open pits.

Plate 1: Faro Mine Location

(Faro Mine Remediation Project 2014, Internet Site)

In 1998, all mining was halted at the Faro Mine Complex when the mining operator was placed into receivership. The Government of Canada took over the care and maintenance of the site from 1998 until March 1, 2009. The Faro Mine Complex was managed for the Government by Deloitte & Touche Inc., the court-appointed interim receiver, from 1998 to March 1, 2009. On March 1, 2009, the Government of Yukon (YG) took over the care and maintenance responsibilities of the site, and Denison Environmental Services provided ongoing care, maintenance, and environmental protection services on behalf of YG until March 2012. As of April 1, 2012, Tlicho Engineering and Environmental Services Ltd. (TEES) has been contracted to provide care & maintenance services of the facility on behalf of YG.

As the care and maintenance providers of the Faro Mine Complex, YG has retained Golder to carry out the 2015 pit slope review to assess the stability conditions of the Faro, Grum and Vangorda pits. Golder has previously carried out slope stability reviews for the Faro Pit from 2002 to 2010, for the Grum Pit in 2009, and for all three pits in 2012 and 2014. CH2M Hill carried out the 2013 annual pit slope review (CH2M Hill 2014).

2.0 SITE GEOLOGY

The ore bodies of the Faro, Grum and Vangorda deposits lie along the western margin of the Selwyn Basin, in sedimentary and volcanic/plutonic rocks that have been variably metamorphosed and have undergone several phases of deformation. The walls of the three pits have been excavated in the Mt. Mye Formation and the overlying Vangorda Formation. The geologic descriptions below are summarized from Curragh Resources (1986, 1987).

- The Vangorda Formation consists of mostly soft, highly fissile, calcareous phyllites. At a higher metamorphic grade (amphibolite facies), the calcareous phyllite is transformed to calc-silicate rocks. This unit also includes, to a lesser degree, mafic meta-igneous rocks occurring as highly foliated chlorite phyllite and carbonated chlorite phyllites that are widespread near the ore zones. An important mineralized sulphide zone is associated with a basal carbonaceous member of this formation, with the carbonaceous rocks being soft, highly sheared and gouged immediately below this zone. Elsewhere, these rocks are described to exist as moderately hard, highly fractured, black siliceous phyllites.
- The Mt. Mye Formation consists of schists, and predominantly grey, non-calcareous, weakly carbonaceous phyllite. The phyllites are interlayered with black carbonaceous phyllite and schists. Amphibolite is a minor rock type in the formation. A white, calc-silicate and marble marker horizon is located about 500 to 700 metres below the top of the Mt. Mye Formation. The formation has a minimum thickness of 2,000 metres, but the base has not been exposed.

3.0 FARO PIT AND FARO CREEK DIVERSION CHANNEL

3.1 Description

The Faro Pit is an inactive open pit mine, roughly elliptical-shaped with the major axis striking northwest–southeast, as shown in Figure 2. The pit is approximately 1,675 metres long and approximately 975 metres wide at the crest (Faro Mine Remediation Project 2011). Mining in the Faro Pit was completed in 1991. Photographs of the existing pit are presented in Appendix A.

Since mining operations were discontinued, a pit lake has accumulated at the bottom of the pit. Due to water quality issues, the pit water requires treatment before it can be released to the environment. Water pumping and treatment facilities are operated at the site to control the water elevation in the pit and to treat the water. The pit lake elevation is discussed further in Section 3.4.2.4.

The Faro Pit is partially located within the Faro Creek Valley. The Faro Creek Diversion Channel (FCDC) and Faro Valley Interceptor (FVI) were originally built as part of the mine development to divert the Faro Creek and surface runoff water from north of the pit area around the southeast side of the Faro Pit and the south side of the mill site, as shown in Figure 1. The diversion channel and valley interceptor collect the majority of the water from upstream of the waste dumps and the Faro Pit, and direct it in a southeasterly direction to the north fork of Rose Creek. These facilities divert clean water away from the pit, and reduce the amount of water that could flow to the pit and would have to be treated. The diversion channel is located immediately behind the crest of the east wall of the pit, and behind the two large instability zones on the east wall. The diversion channel will have to be relocated if excessive ravelling or additional instability develops at the crest of the east wall. A slope stability monitoring program has been established at the crest of the east wall in an attempt to provide as much advance warning as possible of any potential instability that would require implementation of the diversion channel relocation plan. The slope stability monitoring program is discussed further in Section 6.0.

3.2 Geology

The mined-out ore body in the Faro Pit consists of en-echelon sulphide lenses striking northwest–southeast and generally dipping moderately toward the southwest. These rocks are contained within metamorphosed, interbedded, non-calcareous phyllites, schist and calc-silicate rocks of the Vangorda and Mt. Mye Formations. Rocks immediately adjacent to the sulphide lenses have undergone intensive alteration, and are essentially massive, featureless muscovite/kaolinite clay envelopes. The east wall was excavated along the footwall of the sulphide lenses, i.e., the ore body.

The Big Indian Fault is the most dominant structural feature observed in the east wall (Figure A-1 in Appendix A). This fault strikes roughly north–south and dips toward the west at an inclination of approximately 60 degrees. The west boundary of the north–south trending band of calc-silicate rock in the east wall is defined by the Big Indian Fault.

A layer of glacial till covers the bedrock in the area. The till layer varies in thickness from less than a metre up to 100 metres on the north side of the Faro Pit.

A previous review of geologic cross-sections (Golder 2011) indicated the presence of shallow to moderate, westerly dipping strata, and other north–south trending, westerly dipping faults. Smaller, east–west trending faults were also previously noted on geologic plans.

3.3 Previous Pit Slope Stability Performance

The east wall of the Faro Pit experienced ongoing slope instability during and immediately following mining, and two large-scale pit slope failures have occurred in the east wall. These are generally described as the "North Instability" and "South Instability" Zones. Figure 1 and Figure A-1 in Appendix A show the location and extents of these instability zones. Both instabilities occurred along the southwesterly dipping foliation in a slow, on-going deformation process (Golder 2011). To date, both instability zones have exhibited little change from year to year, with only localized crest regression, raveling and erosion. This has resulted in oversteepened head scarps in the till at the crest of the east wall.

Because there was a concern that the potential ongoing instability in the east wall could threaten the integrity of the FCDC, the stability conditions of the east wall were assessed by Golder in September 2002 (Golder 2002). In 2003, remedial works were carried out on the FCDC in an effort to reduce seepage losses, and some adjustments were made to the channel geometry. The road located behind the east wall crest and along the west side of the FCDC was also adjusted and levelled, and a safety berm was constructed along the road.

Golder has continued to assess the east wall of the Faro Pit and review the monitoring data periodically since 2005 (Golder 2006, 2007, 2008a, 2008b, 2009, 2011, 2013, and 2015). Following the 2005 assessment, recommendations for a slope monitoring program were presented in the Golder site visit report (Golder 2006). The recommended slope stability monitoring procedures were put in place along the east wall of the Faro Pit. A portion of the monitoring program was suspended in 2014 and this is discussed further in Section 6.0.

The 2015 stability conditions of the Faro Pit east wall are discussed in the following section.

3.4 2015 Observations

Photos of the North and South Instability Zones are presented in Figures A-1, A-2 and A-3, in Appendix A.

During the 2015 site visit, the North and South Instability Zones were inspected for cracks and ponded water. The following areas were also inspected.

- behind the crest of the east wall;
- behind the backscarps of the instability zones;
- the road behind the crest;
- accessible benches on the slope;
- accessible monitoring points and reference pins; and
- sections of the Faro Creek Diversion Channel.

The following observations were made during the visual inspection of the pit slopes, and photographs are provided in Appendix A as indicated.

- No recent cracks were observed either behind the crest of the east wall or behind the backscarps of the instability zones (Figure A-4).
- No cracks were observed along the road behind the crest of the east wall.
- There is a large berm at the crest of the east wall, on the east side of the access road, behind the south instability zone. Water was observed in a ditch at the toe of the berm, and this may be contributing to water infiltrating into the slope (Figure A-5).
- The minimum distance between the crest of the east wall instability and the FCDC remains in the middle of the North Instability Zone. The minimum distance between the outside edge of the berm on the access road to the crest is approximately 3 metres (Figure A-6). This part of the crest is near crest regression pin 15342, and the distance in this area has decreased by approximately 0.5 metres since 2014.
- The monitoring pins and regression pins that were observed appear to be in poor to good condition (Figure A-6). These are discussed further in Section 3.4.2 of this report.
- The till slope on the north side of the east wall is slowly eroding, raveling, and slumping (Figure A-7) and seepage was evident in the till portion of the slope (Figure A-8, bottom photograph).
- Seepage and water flow into the pit was observed to the north of the North Instability Zone. The water appears to be emanating from the overburden/bedrock contact (Figure A-8, top photograph), some of which may be coming from the ponded water behind the crest, discussed in the next point.
- There is ponded water behind the small dam (Figure A-9) in the northeast corner of the pit at the crest, as was previously observed and reported. It appears that this water is seeping into the slope and reappearing in the slope face as seepage to the north of the North Instability Zone (Figure A-8, top photograph), but does not appear to be impacting the slope in terms of stability.
- The FCDC was conveying water at the time of the site visit. The side slopes appeared to be in good condition and no cracks or offsets in the geometry were observed. The FCDC appears to be diverting the majority of the water away from the crest of the east wall (Figure A-10). Although some water in the FCDC still continues to seep into the ground, based on visual observations, the volume is likely small in comparison to all the other sources of water that flow to the pit from the east side of the pit. Therefore, the ditch seepage is not a concern with respect to slope stability.
- The north and northwest rock slopes are exhibiting adequate stability performance. Only localized raveling is occurring on these slopes, mainly in the altered zones. These zones appear to be raveling into angle of repose talus slopes (Figure A-11). No overall stability concerns with these walls were identified during the site visit.
- The access road to the pump facility on the west side of the pit (Figure 1) has a well-constructed barrier at the end of the road to prevent vehicles and personnel from entering the pit lake (Figure A-12).

- Golder recommended a barrier at the end of the Zone 2 access road after the 2014 site visit. Boulders have since been placed at the end of the Zone 2 access road and are moved as needed to act as barriers (Figure A-12).
- Rockfall berms have been placed at the base of the slopes on the west side of the access road to the pump facility. However, near the end of the road there is a section of the berm where material has infilled behind the berm. This material should be removed to re-establish the catchment for falling rocks from the slope, particularly as it is near the pipelines, and personnel may be required to work below this part of the slope (Figure A-13).
- Rockfall berms have been placed at the base of the slopes on the west side of the Zone 2 access road (Figure 1) as per Golder's 2014 recommendations (Figure A-14).
- The south side of the pit consists of benches excavated in rock with waste material on top. The Zone 2 access ramp is located on the south side of the pit and accesses the pit lake (Figures 1 and A-15). The rock benches on the southwest side are raveling into angle of repose talus slopes. Some bench crests are still visible, but it appears that waste material from above has also raveled onto some portions of the slope, leaving portions that are unbenched and at angle of repose. The waste material on the southwest wall appears to be at angle of repose (Figure A-15). The rock benches on the southeast wall are also slowly raveling, but bench crests appear to be relatively intact.

3.4.1 East Wall Photograph Comparison

Figures A-15 and A-16 in Appendix A show comparison photographs from 2014 and 2015 of the North and South Instability Zones on the east wall, respectively. Several features in each instability zone were identified in both photographs and compared. The 2015 photos were also compared to the 2012 photos. The crest continues to erode and ravel, particularly in the till slopes, and the large erosion zones and gullies continue to grow. However, no significant changes in the crest, backscarp, slide material or bedrock were noted between the 2012, 2014, and 2015 photographs.

3.4.2 East Wall Monitoring Data Review

A slope stability monitoring program was implemented at the Faro Pit in 2006, with the following components.

- Crest Regression Monitoring: Reference pins have been installed behind the crest of the east wall along the FCDC in order to provide fixed reference points for measurement of the shortest distance to the crest of the wall. The periodic measurement of distances provides a means to assess crest regression rates. These measurements were historically carried out by staff on site twice a year.
- Survey Monitoring Points: Survey monitoring points have also been established behind the crest of the east wall in order to provide monitoring of fixed points to assess displacement and ground movements in the areas that have a greater potential for deformation. In addition, survey monitoring points have also been installed uphill beyond the FCDC in natural ground to serve as control points. The periodic monitoring of survey points can provide indications of overall stability conditions as well as information on instability mechanisms, should instability develop. The surveying of these monitoring points has been carried out by Yukon Engineering Services (YES), typically once per year.

In addition, site personnel have been carrying out visual inspections of the Faro Pit, and photographs are taken of the walls on a monthly basis.

The reference pin and monitoring point locations are shown in Figure 3, and the monitoring data are discussed in the following section.

3.4.2.1 Slope Stability Monitoring Program Terminology

In the past, there has been some confusion regarding the terms for the various monitoring components. To maintain consistency, the following definitions have been applied.

- Reference pin or bar: An object, such as a mill rod or railroad spike, installed near the crest to serve as a fixed reference point to measure the distance from the crest. Reference pins are used at the Faro Pit and reference bars are used at the Grum Pit.
- Survey monitoring point: A pin or rod installed at the crest or on the slope that is surveyed periodically using conventional surveying techniques. The UTM grid coordinates of the monitoring points are obtained and plotted. The coordinates are compared to previous survey data to detect any deformation in the slope. Survey monitoring points are used at the Faro and Grum Pit.
- Survey monitoring prism: A permanent survey prism installed at the crest or on the slope that can be surveyed remotely using conventional surveying techniques. Permanent survey prisms have not been used for pit slope stability monitoring at the Faro Mine complex.

3.4.2.2 East Wall Crest Regression Monitoring

The purpose of the reference pins is to physically measure the rate of erosion or retreat of the crest of the east wall, in order to determine if and when the FCDC may be undercut at some time in the future. Nine reference pins have been installed just behind the crest of the slope.

Reference pins 15351, 15352, 15353, 15354, 15355, and 15356 were installed in 2008, and the location data are summarized in Table 1, and are shown in plan in Figure 2. Reference pins 15717, 15737, and 15742 were installed in 2011 but coordinates were not available until 2015 when YES surveyed the points. Also in 2011, the tag for pin 15353 was lost, and this pin was retagged as 13908.

The location data of the pins surveyed in 2015 are summarized in Table 2. It appears that pin 13908 was not surveyed. Note that the 2008 pins were surveyed in the UTM NAD 27 coordinate system when they were installed. The 2015 survey was carried out in UTM NAD 83, which is the current coordinate system used on site.

Table 1: Location of 2008 Faro Pit Reference Pins

Reference Pin No.	Installation Coordinates (UTM NAD 27)		Bearing of Distance Measurements from Reference Pin to Pit Crest (Azimuth)	Initial Distance Measurements (m) (July, 2008)
	Northing	Easting		
15351	6,914,799.449	585,229.770	235°	11.19
15352	6,914,849.439	585,204.524	245°	11.25
15353 (13908)	6,915,216.929	585,064.654	240°	17.41
15354	6,915,241.231	585,025.422	235°	8.06
15355	6,915,292.340	584,978.739	220°	5.59
15356	6,915,336.758	584,936.761	225°	17.55

° = degree

Table 2: Location of Faro Pit Reference Pins, Surveyed in 2015[(a)]:

Reference Pin No.	Surveyed Coordinates (UTM NAD 83)		
	Northing	Easting	Elevation (m)
15351	6,914,974.203	585,123.234	1,263.913
15352	6,915,023.942	585,097.951	1,269.118
15353 (13908)	Not provided	Not provided	Not provided
15354	6,915,415.731	584,919.028	1,295.526
15355	6,915,466.804	584,872.404	1,295.157
15356	6,915,511.269	584,830.450	1,298.082
15717	6,915,471.744	584,866.178	1,295.013
15737	6,915,463.094	584,878.635	1,295.496
15742	6,915,386.216	584,949.220	1,296.645

a) Pin survey data provided by YES, October 6, 2015

From 2008 to 2014, TEES personnel measured the distance from the crest to each pin twice a year, usually in May and September. In addition, YES took separate measurements on an annual basis, at the same time that they surveyed the survey monitoring points.

TEES no longer carries out the distance measurements due to safety concerns related to walking along the crest of the east wall, so no 2015 crest regression data are available from TEES. However, YES took measurements during their site visit in September 2015.

The measurements taken by YES are not easily combined with the TEES data because it appears that the measurements were not taken along the same bearing. In addition, the data from TEES shows a great degree of variability (see Golder, 2014). Therefore, only the data from YES are presented in Plate 2, which shows the annual distance measurements from 2011 to 2015. Note that pin 15353 (13098) has not been measured by YES. The original data received from YES are included in Table D-1 in Appendix D.

Trendlines have been added to the data from each pin in Plate 2. Assuming the measurements were made along the same bearing each year, the trendlines indicate that, on average, the distance from the crest to each pin is decreasing from year to year, which reflects the crest regression that is occurring, as discussed below.

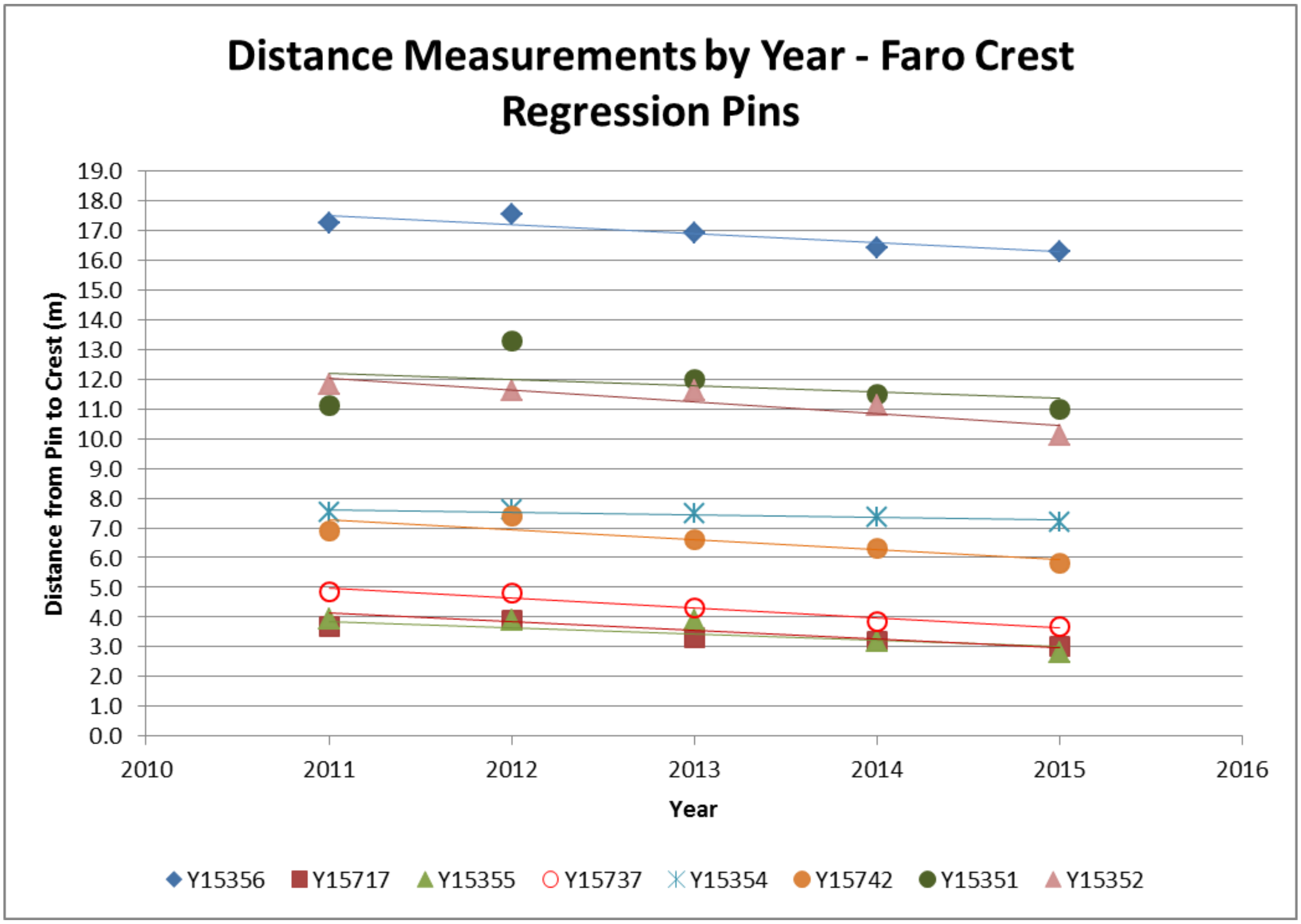

Plate 2: Annual Distance Measurements by YES, Faro Crest Regression Monitoring

Table 3 summarizes the average annual crest regression at each pin location based on the trendlines.

Table 3: Average Annual Crest Regression at Pin Location, Based on YES Crest Regression Measurements

Reference Pin No.	Average Annual Crest Regression (cm/yr)
15351	20
15352	39
15353 (13908)	No data provided
15354	9
15355	21
15356	30
15717	29
15737	33
15742	33

Plate 2 indicates that the pins with the shortest distance to the crest are 15717, 15355, and 15737, with distances between 3 and 4 metres. These pins are located behind a large gully in the North Instability Zone that is losing approximately 30 cm of crest each year. However, based on site drawings, these three pins are approximately 40 metres away from the FCDC. Therefore, at the present rate of crest regression, it would take more than 130 years to undermine the FCDC.

Pin 15353 (13908) has not been measured by YES. However, the last measurement by TEES was reported to be 17 metres from the crest (Golder 2014). This pin is approximately 7 metres from the FCDC, so the distance from the crest to the FCDC at this location is about 24 metres. At this location it would take more than 80 years to undermine the FCDC based on the current rate of crest regression.

The highest average rate of crest regression (39 cm/yr) is occurring near pin 15352, which is behind the South Instability Zone. This pin is approximately 10 metres behind the crest, and is approximately 85 metres from the FCDC.

In summary, based on the annual surveys by YES, and assuming the measurements are accurate and were taken along the same bearing each time, the low rate of crest regression indicates that the FCDC will not be undermined in the near future due to crest regression. However, annual crest regression measurements should continue to be carried out in order to identify any changes in the rate of crest regression. In addition, crest regression along the entire crest should also be visually monitored because crest regression is also occurring at locations not currently monitored by the pins. Without visual monitoring, crest regression at other locations may not be easily detected. The visual monitoring program is discussed further in Section 6.0.

3.4.2.3 East Wall Survey Monitoring Points

3.4.2.3.1 Background

In August 2006, seven survey monitoring points were installed behind the crest of the Faro Pit east wall, within the area of greater potential for ground deformation. In addition, two monitoring points were installed uphill of the FCDC (13875 and 13877). These latter monitoring points are located in an area that is not expected to exhibit deformation, and can be used as baseline monitors to determine the accuracy of the monitoring system.

The nine monitoring points have been surveyed annually by YES. The location of the survey monitoring points is shown in Figure 2 and is summarized in Table 4.

Table 4: Faro Pit Survey Monitoring Point Locations

Survey Monitoring Point	Initial Installation Coordinates (UTM NAD 27)		
	Northing	Easting	Elevation (m)
13872	6,915,376.00	584,838.73	1,289.09
13873	6,915,330.14	584,922.20	1,298.26
13874	6,915,302.30	584,972.86	1,297.44
13875[(a)]	6,915,262.94	585,078.53	1,303.92
13876	6,915,108.37	585,074.49	1,281.13
13877[(a)]	6,915,066.79	585,200.63	1,300.46
13878	6,915,002.33	585,128.77	1,280.65
13879	6,914,854.63	585,228.55	1,275.00
13880	6,914,786.53	585,240.53	1269.17

a) Control point.

Relative displacement graphs and wander plots of the monitoring point data are presented in Figures D-1 to D-9 in Appendix D. The relative displacement graphs show the change in vertical, horizontal and total displacement from year to year. If the vertical displacement shows a downward trend, this could indicate that the monitoring point is moving downward (or the survey base station is moving upward). If the horizontal displacement shows an increasing or decreasing trend, this would indicate that the monitoring point is moving in the horizontal plane, and the wander plot should be checked to determine the direction of movement.

The wander plots show the relative change in northing and easting of the monitoring points. The relative change in horizontal displacement is defined as the change from the current survey to the original survey. If the points in the wander plots are clustered in a tight pattern, with limited relative displacement, this typically indicates that the point is not moving and is simply reflecting the accuracy of the monitoring system. Conversely, if the wander plot shows significant displacement from point to point in a consistent direction, this typically indicates that the monitoring point is exhibiting displacement in that direction.

The wander plots in Appendix D exhibit a degree of accuracy varying between 30 and 40 mm in the east–west direction, and 25 to 50 mm in the north–south direction. This range of accuracy is slightly larger than most mine pit slope surveying systems. Accuracies on the order of 25 to 30 mm can typically be achieved at active mines where surveys of fixed monitoring prisms are being carried out on a weekly or monthly basis. At the Faro Pit, removable survey prisms are attached once a year to the monitoring points to carry out the survey and this likely decreases the accuracy of the surveys. Nevertheless, the degree of accuracy at Faro is considered to be appropriate for the large scale deformation that the monitoring of survey points is intended to detect.

Slope distance measurements are another means to detect displacements in a slope when surveying monitoring points. Slope distance is the horizontal distance between the total station and the monitoring point being surveyed. If this distance decreases over time, it can indicate that the area around the monitoring point is deforming and moving out of the slope. We recommend that YG request that the survey contractor report slope distance data as well as coordinates of the monitoring points each year, provided that the total station is set up in the same location each year. If it is not set up in the same location, then a designated location for the total station is recommended, so that slope distance can be measured annually.

3.4.2.3.2 Data Review

The review of the monitoring data indicates that survey points 13874, 13875 and 13876, which previously exhibited displacements, continue to exhibit displacements. As discussed in our 2014 report (Golder 2014), monitoring point 13875 is located at the crest of the east wall on the far side of the road, and is one of two control points located in areas that were not expected to exhibit displacement. The other control point, 13877 is also on the far side of the road from the crest. As in 2014, point 13875 appears to exhibit displacement beyond the accuracy of the monitoring system, whereas point 13877 does not. In addition, the total cumulative displacement, azimuth and negative vertical displacement of point 13875 are very similar to those of points 13873 and 13874. Therefore, these considerations would indicate that this entire area is in fact moving, albeit very slowly at this time, and it is possible that the North Instability Zone is slowly extending to the north.

In addition to the points previously exhibiting displacements, points 13873 and 13878 also appear to exhibit displacements that are beyond the accuracy of the monitoring system. Figure D-10 shows displacement vectors in plan view for the five monitoring points that exhibit displacements, and Table D-1 in Figure D-10 summarizes the displacement data for these points. As shown in the figure, survey points 13873, 13874, and 13875 are to the north of the North Instability Zone and are adjacent to crest regression pins 15355, 15717 and 15737, which are near a large gully that is exhibiting crest regression on the order of 30 cm/yr. These three points are exhibiting displacements out of the slope, at an azimuth of approximately 260 degrees, and exhibit total negative vertical displacements between 80 and 170 mm (Figures D-2, D-3 and D-4).

Monitoring point 13876 is located at the crest of the North Instability Zone. This point was previously exhibiting displacements to the south, but the current net azimuth is around 210 degrees, to the southwest. The vertical displacement appears to have remained steady since 2009 (Figure D-5), and the horizontal displacement appears to be within the accuracy of the monitoring system since 2012, based on the wander plot. However, because of its location and past displacement history, it should continue to be monitored for any signs of re-activation.

Monitoring point 13878 is located near the backscarp on the south side of the North Instability Zone. This point exhibits a displacement trend towards approximately 330 degrees azimuth, and an upward total vertical displacement. It is not clear if this is actual displacement or if the point has been disturbed and moved from its original location. It is possible that it reflects localized displacement of a small block in the instability zone, and should continue to be monitored.

The remaining monitoring points, 13872, 13877 (control point), 13879, and 13880, do not exhibit displacements beyond the accuracy of the monitoring system.

The displacements exhibited by points 13873, 13874, 13875, 13876, and 13878 highlight the importance of continuing the annual surveys of the monitoring points. Although the displacements currently indicate slow, creep-type deformation, it is only with the monitoring point data that any accelerations in displacement, which could indicate a more rapid overall slope failure, can be detected.

3.4.2.4 Pit Lake Level

Water level data for the Faro Pit were provided by YG. Plate 3 shows the fluctuations in the Faro Pit lake level from January 2004 to July 2015. The pit lake levels have historically fluctuated between 1,141 and 1,143 masl. However, in July 2013 pit lake levels rose beyond the maximum recommended elevation of 1,144 masl due to suspension of water treatment because of safety issues with the plant. After that time, the water elevation continued to rise to a high of 1,153 metres in April 2015, with periods of intermittent pumping. In April 2015, regular pumping resumed and the pit lake level is being lowered.

As of July 13, 2015, the pit lake level is at approximately 1,152 masl, which is 8 metres above the maximum recommended elevation of 1,144 masl, and 2 metres above the estimated elevation of the lowest contact between overburden and bedrock at approximately 1,150 masl (Klohn Crippen Berger 2014). YG has indicated that has resolved the water treatment issue and intends to pump the pit lake back down to appropriate levels as soon as practicable.

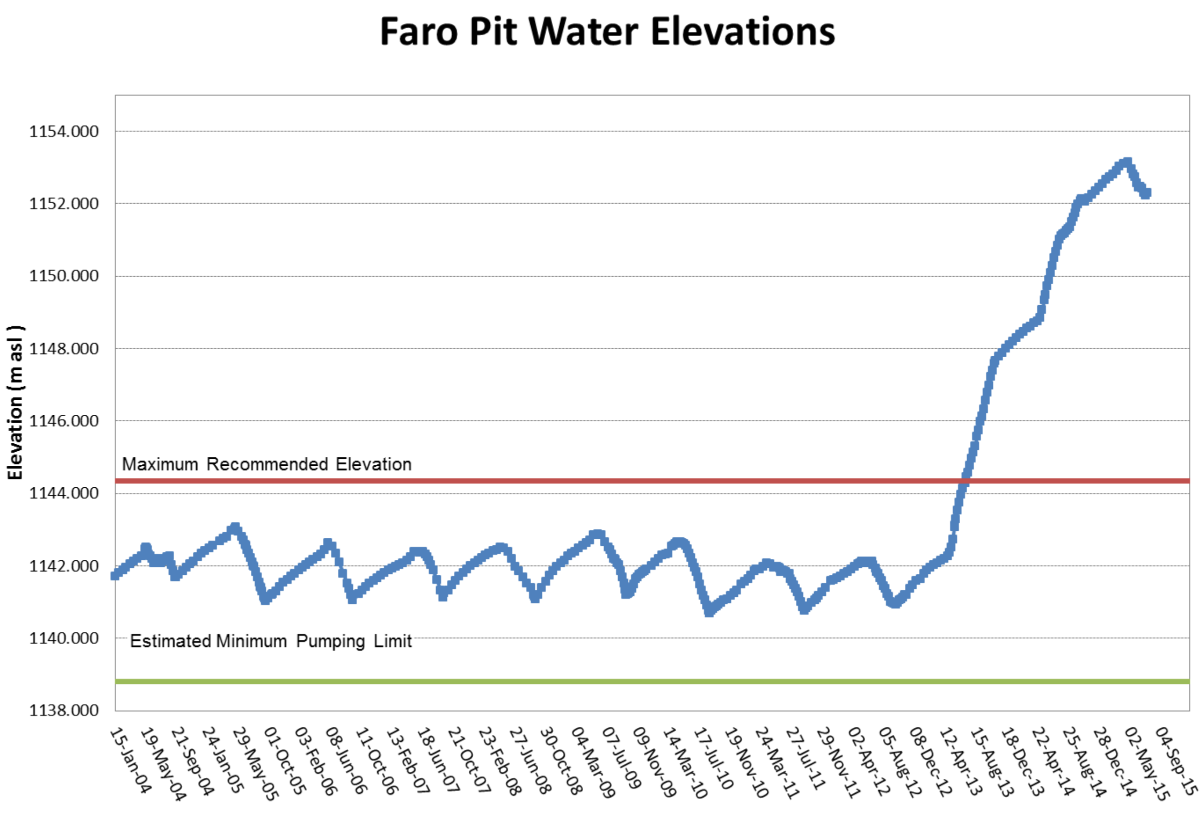

Plate 3: Faro Pit Lake Levels to July 13, 2015

The recommendations for the Faro Pit are provided in the following section and summarized in Table E-1 in Appendix E.

3.5 Faro Pit Recommendations

- Monitor the water in the ditch on the east side of the berm on the east wall during the spring and fall (Figure A-5). If large amounts of ponded water are observed, grade the ditch to channel the water to the south, rather than form large ponds of water that could infiltrate into the slope.
- Water is ponding behind the waste dump platform in the Faro Valley Rock Dump in the northwest corner of the pit (Figure A-9). We understand that the water is pumped every spring to maximize the storage capacity in case of a failure of the Faro Creek Diversion, and that this is included in the Emergency Response Plan for the Faro Creek Diversion. The water level in this pond should continue to be visually monitored in the spring and fall, and should be pumped again in the fall if water levels are high. A pump should be available for emergency pumping.
- In addition, the pond level and the integrity of the waste dump platform that is containing the pond should be assessed by a geotechnical engineer. The toe of the platform on the downstream side should be inspected and assessed to ensure that it will not fail due to the water ponding behind the platform.
- As previously recommended, the monitoring point survey data should be plotted as soon as possible to determine if there is an error with the survey data so that the monitoring points can be re-surveyed if necessary before they are covered with snow. Considering that the monitoring points are only surveyed once a year, not reviewing the data in a timely manner could result in significant displacement of the slope not being detected in a timely manner. This should be discussed with the survey contractor to set up a way for the survey to be checked by the survey contractor against all the previous data before the contractor leaves the site.
- A discussion of the recommended changes to the Faro slope monitoring program is provided in Section 6.0.

4.0 GRUM PIT

4.1 Description

Mining of the Grum Pit was carried out intermittently from 1990 to 1998, and the pit is currently inactive. The water level in the pit has been continuously rising.

The Grum Pit is oval in shape, with the long axis trending northwest–southeast, as shown in Figure 4. The pit is approximately 850 metres long and approximately 700 metres at its widest point. The east wall represents the main slope of the mined pit. The crest of the east wall is located at approximately 1,300 masl. The pit bottom is currently flooded, but a bathymetry survey conducted by Laberge Environmental Services indicates a minimum pit floor elevation of 1,134 masl (Golder 2009).

The main drainage in the area of the Vangorda Plateau is the Vangorda Creek. The Grum Pit is located to the north of this creek, and most of the area in the vicinity of the pit prior to mining drained to the Grum Creek, a secondary tributary flowing into Vangorda Creek. Apparently, the pit area prior to mining was not intersected by well-defined drainage, but it was described to be generally wet, and a shallow lake, the Doal Lake, was located within the current pit area. As part of the mining development, surface water was subsequently diverted around the Grum Pit via the Grum Interceptor Ditch (Figure 4). Since mining operations ceased in 1998, water from groundwater flow, surface run-off and precipitation has accumulated in the pit, forming the existing pit lake. The current water level is at approximately the 1,217 metre elevation.

4.2 Geology

The Grum Pit has been excavated mainly in calcareous phyllites and schists of the Vangorda Formation, with minor exposures of sulphides, and minor post-metamorphic gabbro dykes.

In terms of distinct geologic structures, several faults are reported to exist within the Grum deposit. The main structural features include the following (Golder 2010).

- Faults that truncate the deposit on the northwest and southeast sides, and would not be exposed in the pit. The main off-set displacements within the deposit are associated with these moderately dipping (35 to 45 degree) structures. In the vicinity of these faults, the surrounding rocks vary from intact rock that is similar to the enclosing phyllites to approximately 3 to 10 metre thick zones of gouge and fractured rock.
- A steep, northwest dipping fault set that trends approximately 060˚ azimuth, and intersects the deposit with a down drop of approximately 60 metres to the northwest.
- A north–south striking fault which juxtaposes the Mount Mye phyllite member with the Vangorda phyllite member (CHM2 HILL 2014).
- Smaller faults mapped underground and later in the pit, trend on average 080˚ azimuth and are steeply-dipping.
- Joints mapped underground and on surface tend to strike 060˚ azimuth and dip sub-vertically.

4.3 Previous Pit Slope Stability Performance

With the exception of one area along the northeast side of the pit, the stability performance of the rock walls has reportedly been adequate. Raveling is occurring above the pit access ramp, and this is discussed in further detail below.

The east wall of the Grum Pit was excavated through a bedrock paleo-valley infilled with glacial till that has a maximum observed thickness of 100 metres. Layers of sand and gravel were also encountered within the till (Golder 2010). This thick overburden soil sequence was exposed in the pit slopes on the east wall of the Grum Pit, and large-scale slope instability developed within these sediments. Apparently, the slope instability occurred during the temporary mine shut down from late 1996 to mid-1997, when mining, dewatering operations, and overburden slope depressurization were suspended. Water flow at the base of the till was reportedly considered to have caused the overburden instability (Deloitte & Touche 2002). Golder provided a review of the stability of the east wall in 2009 (Golder 2010). Recommendations for monitoring the instability zone were also provided.

Between the time of the slope failure in the east wall of the Grum Pit in winter/spring of 1996-1997 and the 2009 site visit, the limits of the instability zone had expanded to the south and north, as well as extending to the east and to the upper portion of the pit wall (Golder 2010).

The current stability conditions of the Grum Pit east wall are discussed in the following section.

4.4 2015 Observations

During the 2015 site visit, the crest of the east wall of the Grum Pit was inspected for recent cracks and ponded water. The following areas were also inspected, and photographs are provided in Appendix B.

- behind the crest of the east wall;
- behind the backscarp of the instability zone;
- the road behind the crest of the east wall;
- the North and South Arrays of reference bars;
- the north, west and south walls; and
- the Grum Pit Interceptor Ditch.

The following observations were made during the visual inspection of the pit slopes:

- With respect to overall stability, the east wall instability zone (Figures B-1, B-2 and B-18 in Appendix B) has remained relatively unchanged since the 2014 site visit based on field observations and a photo comparison.
- Small deformations are evident on the south side of the instability zone (Figure B-3).
- Very small cracks were observed near the south array of reference bars, near GP-S2 and GP-S3 (Figure B-4).
- The till slump on the north side of the instability zone continues to deform, as shown in Figure B-5. The backscarp appears to be extending to the north and the material below the backscarp is deforming.
- At the north array, the crest surrounding reference bars GP-N2 and GP-N1 has dropped further since the 2014 site visit (Figure B-6). The vertical displacement has increased from about 0.60 metres in 2014, to about 1.20 metres.
- There is a second set of cracks ahead of the cracks between GP-N2 and GP-N3 and an old power pole is located on the dropped portion of the crest (Figure B-7).
- A photo comparison between 2014 and 2015 in the area of the north array of reference bars confirms that this portion of the crest has dropped (Figure B-8).
- Fresh cracks were also observed at the crest to the north of the north array of reference bars (Figure B-9).
- The extent of the slump zone and the cracks is shown in the photo in Figure B-10. The cracks to the north of the north array are not continuous; however, the length of the crest appears to be slumping and deforming.
- A photographic comparison of the bench to the north of the east wall instability zone does not indicate any large deformations in this area, which is part of the rock slope (Figure B-11).
- At the end of the access ramp into the pit, in the northeast corner of the pit, there is an area of rockfall near two power poles. A rockfall berm has been added at the base of the wall since 2014, but the berm does not extend beyond the power poles where personnel may be working (Figure B-12). The berm should be extended beyond the power poles, across the base of the rockfall zone.
- Some ponded water was observed behind the crest of the east and north walls within the vegetated areas.
- The Grum Pit Interceptor Ditch appears to be in fair to good condition (Figure B-13). The ditch had a relatively low water level, and water was flowing in the ditch. The exception is one section of the ditch where the culvert was too high to allow water to flow through it (Figure B-13). This ponded water should be eliminated by lowering the culvert to allow all the water to flow along the ditch. Vegetation is growing in the ditch and should be periodically removed.
- The north, west and south walls are exhibiting adequate overall stability. Based on the photographs and visual inspection, only localized raveling of the bedrock is occurring on these slopes, and the bench crests are mainly intact (Figure B-14).

- In the 2014 report, it was indicated that on the southwest corner of the pit, where the west ramp into the pit begins, a portion of the slope appeared to be slumping. A photographic comparison indicates no change from 2014 to this area (Figure B-15).
- The water level in the Grum Slot Cut is higher than in the Grum Pit. As the water level in the Slot Cut rises it appears to flow onto the rock bench on the west side and into the pit, as indicated in Figure B-16. However, there is waste material at the end of the slot cut holding back the water. The east side of the Slot Cut is waste material and overburden. During an extreme rain event, it is possible that the water level in the Slot Cut could rise rapidly and possibly breach the waste material and overburden holding back the water.
- The east slope above the Grum Slot Cut is slowly eroding and raveling. A power pole is located near the edge, in an area that does not appear to be stable over the long term (Figure B-17).

4.4.1 East Wall Photograph Comparison

Figure B-18 in Appendix B shows comparison photographs from 2014 and 2015 of the east wall instability zone. Several features in each instability zone were identified in both photographs and compared. Based on the photographs, it appears that slumping and raveling continue to occur in the oversteepened backscarp at the crest, and on the north side. However, no significant changes were noted in the lower portion of the slope.

4.4.2 East Wall Monitoring Data Review

A slope stability monitoring program has been implemented on the east wall of the Grum Pit, with the following components.

- Crest Regression Monitoring: Reference bars have been installed in two locations behind the crest of the east wall to serve as fixed reference points for measurement of the distance between the bars and the shortest distance between the first bar and the crest of the wall. The reference bars have been installed in linear arrays behind the instability zone, and are referred to as the North Array and the South Array.
- Survey Monitoring Points: Golder recommended the installation of survey monitoring points at the crest and on the slope of the instability zone (Golder 2013). Of the 14 recommended monitoring points, four were installed in 2013 by Yukon Engineering Services (YES). YES is also carrying out the annual surveying of the monitoring points.

In addition, TEES staff is carrying out visual inspections of the Grum Pit, and photographs are taken of the walls on a monthly basis.

The reference bar arrays and monitoring point locations are shown in Figure 4, and the monitoring data are discussed in the following section.

4.4.2.1 East Wall Crest Regression Monitoring

The installation coordinates and the initial distance measurement data are presented in Table 5, below (Brodie Consulting Ltd. 2010). Note that the coordinate system is in WGS 84.

Table 5: Location of Grum Pit Reference Bars

Reference Bar No.	Installation Coordinates (WGS 84)			Initial Distance Measurements, June 2010 (m)	Description
	Northing	Easting	Elevation (m)		
GP-S1	N 62°15'59.8"	W 133°12'47.8"	1,294	4.00	Distance from crest to Bar 1
GP-S2	N 62°15'59.9"	W 133°12'47.5"	1,295	5.56	Distance between Bar 1 and Bar 2
GP-S3	N 62°16'00.1"	W 133°12'47.5"	1,313	7.81	Distance between Bar 2 and Bar 3
GP-S4 (1)	N 62°16'00.2"	W 133°12'46.1"	1,308	15.63	Distance between Bar 3 and Bar 4
GP-N1	N 62°16'04.6"	W 133°12'52.0"	1,305	4.00	Distance from crest to Bar 1
GP-N2	N 62°16'04.6"	W 133°12'51.7"	1,304	5.38	Distance between Bar 1 and Bar 2
GP-N3	N 62°16'04.4"	W 133°12'52.5"	1,312	5.23	Distance between Bar 2 and Bar 3
GP-N4	N 62°16'04.7"	W 133°12'51.0"	1,303	6.13	Distance between Bar 3 and Bar 4
GP-N5	N 62°16'04.7"	W 133°12'50.9"	1,305	6.26	Distance between Bar 4 and Bar 5
GP-N6	N 62°16'04.8"	W 133°12'50.1"	1,308	5.74	Distance between Bar 5 and Bar 6

1) Bar GP-S4 was installed in July 2010, and the first reading in July is reported.

After the installation of the reference bars in 2010 and the initial distance measurements, distance measurements were subsequently carried out by TEES staff on site until August 2014. Measurements were suspended after this time due to concerns with walking the crest of the east wall and visible deformation and cracking behind the instability zone. YES has not taken measurements of the reference bars at Grum. Therefore, there are no new crest regression data for 2015, but Golder's visual observations of the cracks near the north array have been provided in Section 4.4. A remote visual monitoring system has been recommended to monitor crest regression on the east wall, and this is discussed further in Section 6.0.

4.4.2.2 East Wall Survey Monitoring Points

After the 2009 and 2012 site visits, Golder recommended the installation of monitoring prisms to monitor the overall stability of the east wall (Golder 2010, 2013). CH2M Hill (2014) report that their personnel marked locations in the field for 14 survey monitoring points (not prisms) to be installed by YES. Of the 14 monitoring points, three were installed at the crest of the instability zone and one monitoring point was installed at the south end of the instability zone, as shown in Figure 2. The monitoring points consist of metal stakes that have been embedded into the ground and surveyed annually. Table 6 presents the initial coordinates of the monitoring points.

Table 6: Grum Pit Monitoring Point Initial Location Coordinates

Survey Monitoring Point	Initial Installation Coordinates (UTM NAD 83)		
	Northing	Easting	Elevation (m)
YG13-304-MP005	6,905,130.140	592,758.532	1,296.414
YG13-304-MP006	6,905,026.930	592,743.677	1,288.575
YG13-304-MP007	6,904,933.207	592,676.994	1,270.918
YG13-304-MP008	6,905,006.179	592,673.427	1,251.337

Coordinate system is Universal Trans Mercator NAD83 CSRS Coordinates, HT2.0 Geoid.

The remaining 10 monitoring points were planned to be installed in 2014. However, due to safety concerns related to allowing personnel on the instability zone, they were not installed.

The four monitoring points that were installed in 2013 were surveyed by YES in 2014 and again in 2015. Relative displacement graphs and wander plots of the monitoring point data are presented in Figures D-11 to D-14 in Appendix D. A review of the displacement graphs and wander plots indicates the following.

- Monitoring points MP005 to MP007 exhibit little to no displacement (Figures D-11 to D-13).
- However, monitoring point MP008 exhibits a total displacement of 288 mm since 2013 (Figure D-14). Point MP008 is located on the south side of the instability zone, as indicated in Plate 4.

The vertical downward displacement of monitoring point MP008 is on the order of 850 mm, which represents a drop of 686 mm since 2014. In addition, the horizontal displacement is on the order of 478 mm, which represents an increase in horizontal displacement of approximately 380 mm since 2014. The wander plot indicates a displacement trend toward the northwest, at an azimuth of 289 degrees. This monitoring point is the only monitoring point located on the slope of the failure debris, rather than at the crest of the east wall (Plate 4). The photograph comparison indicates that there is slumping occurring in this area (Figure B-3) and it appears that monitoring point MP008 is reflecting real ongoing displacement confirming the visual assessment of this part of the instability zone.

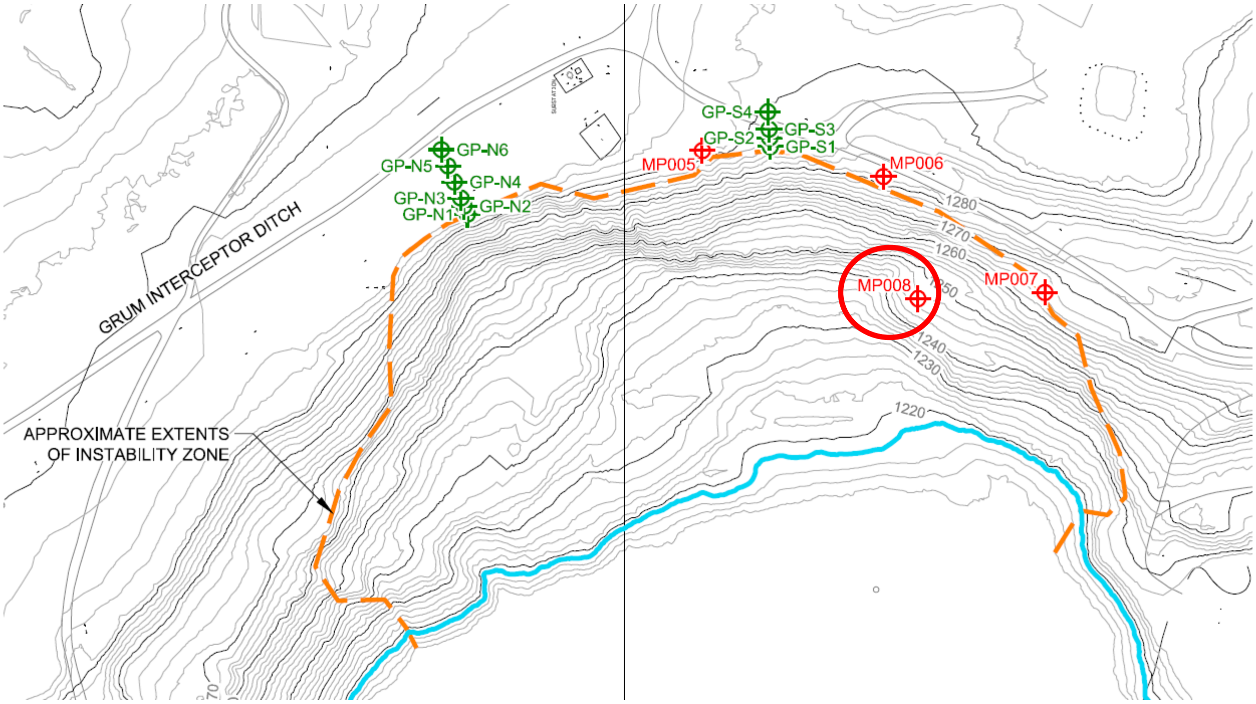

Plate 4: Grum Pit Monitoring Point MP008 Location

As with the Faro Pit monitoring points, we recommend that slope distance measurements be taken each year by the survey contractor of the four Grum monitoring points.

4.4.2.3 Pit Lake Level

Water level data for the Grum Pit were provided by YG. Plate 5 shows the fluctuations in the Grum Pit lake level from January 2004 to July 2015. The Grum Pit lake level was reported to be at 1,186 masl in early 2004 and at 1,205 masl by mid-2009 (Golder 2010). Water levels reached a peak on June 23, 2014, at 1,217 masl. As of July 13, 2015, the pit lake level is at approximately 1,216 masl. This is 5 metres above the maximum recommended elevation of 1,211 masl, and equal to the estimated elevation of the lowest contact between overburden and bedrock (Klohn Crippen Berger 2014). In the Grum Pit, rising water levels have the potential to seep into the overburden and contaminate groundwater along the south side of the pit, as well as to destabilize the old slide debris along the east wall. The pit overflow elevation is located on the south side of the pit, where the access ramp enters the pit, at approximately 1,230 masl.

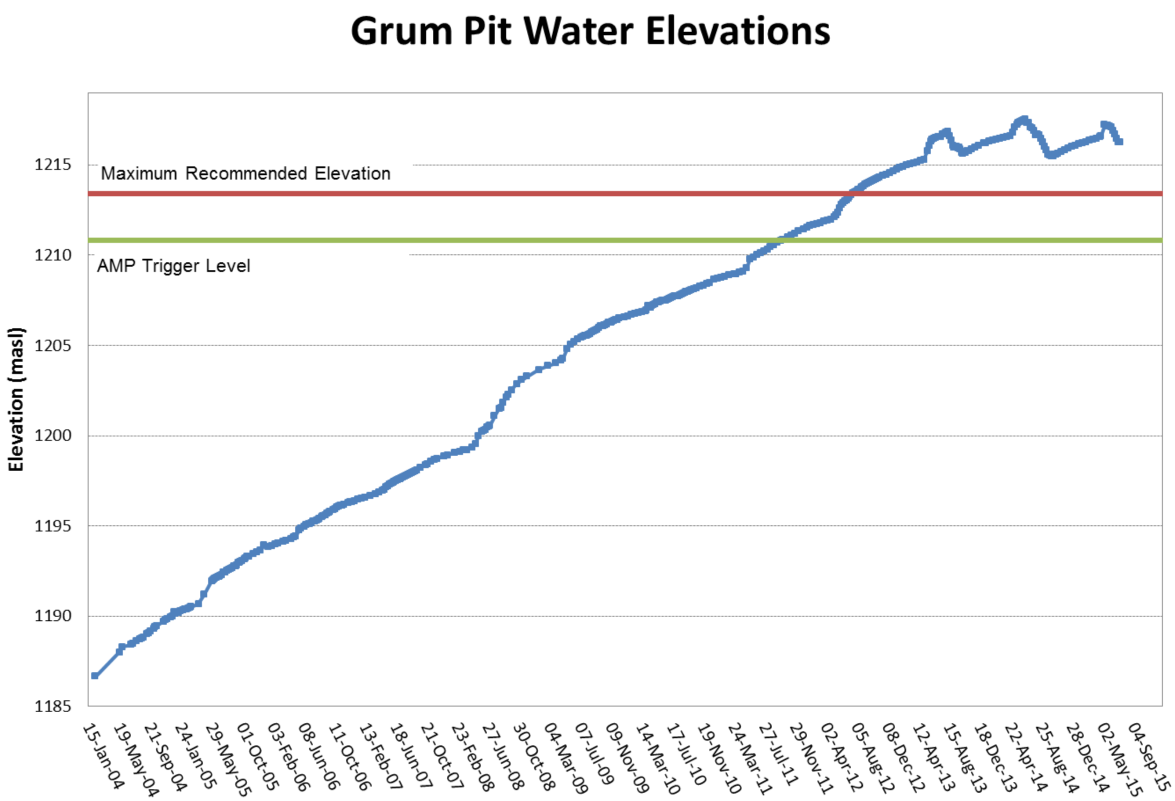

Plate 5: Grum Pit Lake Levels to July 13, 2015

Because pit lake levels fluctuate due to pumping water in and out of the pit, an important consideration for pit slope stability along the east wall is the rate at which the lake level rises and falls. Rapid increases or decreases in the lake level should be avoided. Rapid changes in water levels could contribute to additional slope instability along the east wall due to high water levels being maintained in the overburden.

The rate of increase of the lake level in the Grum Pit is less than 1 mm/d, which does not present a concern with respect to overall pit slope stability. YG plans to continue pumping water from the Grum Pit to the Vangorda Pit for treatment. Based on historical pumping levels, the lake level decreases by approximately 3 mm/d, and this also does not present a concern with respect to overall pit slope stability. Because the pumping rate is already at the maximum capacity of the pump, a rapid drawdown scenario for the pit lake is not expected. However, if additional pumps are added, or if a situation arises where rapid drawdown of the pit lake is required, a qualified geotechnical engineer should first be consulted.

The recommendations for the Grum Pit are provided in the following section and summarized in Table E-1 in Appendix E.

4.5 Grum Pit Recommendations

- Continue to visually monitor the instability zone on a monthly basis.
- The four survey monitoring pins should continue to be surveyed once per year by YES.
- If the old power pole on the dropped portion of the crest of the east wall (Figure B-7) is supporting a live wire, consider relocating the pole behind the instability zone. Alternatively, if it is not supporting a live wire, then it is not necessary to relocate or remove it.
- Extend the berm at the end of the access ramp into the pit beyond the power poles (Figure D-12). If the berm is not extended, a minimum setback distance of 10 metres is recommended for any work carried out in the area of the rockfall zone. Install a sign to inform workers of rockfall hazard and the required setback distance.
- Relocate the power pole on the north slope above the Grum Slot Cut (Figure B-17) to a more stable location.
- If large areas of ponded water are observed behind the crest of the east wall, grade the area away from the slope to minimize ponded water and infiltration into the slope as well as to control runoff onto the slope face.
- Monitor the waste material at the end of the Grum Slot Cut for erosion and possible breaching. Alternatively, cut a slot through the fill to allow the ponded water to drain into the pit.
- Clear the vegetation from the Grum Interceptor Ditch.
- Lower the culvert shown in Figure B-13 to allow water to drain along the full length of the Grum Interceptor Ditch.
- A discussion of the recommended changes to the Grum monitoring program is provided in Section 6.0.

5.0 VANGORDA PIT

5.1 Description

The Vangorda Pit is located approximately 2 kilometres southeast of the Grum Pit. Mining in the Vangorda Pit began in 1990 and was completed in 1996. Mining activities were temporarily suspended from 1993 to late 1994.

The Vangorda Pit is oval in shape, with the long axis trending northwest–southeast, as shown on Figure 4. The widest and deepest part of the pit is on the northwest side. The pit is approximately 1,115 metres long, approximately 350 metres across at its widest point, and has a maximum of depth of 150 metres. The southeast side of the pit is narrower and shallower, with a width of approximately 200 metres and a depth of approximately 50 metres (Deloitte & Touche Inc. 2002).

The Vangorda Creek initially flowed from east to west across the thickest part of the ore body. The creek was subsequently diverted around the northeast and north side of the pit in a flume that consists of a 2.4 metre diameter half-round culvert placed into an open channel lined with riprap. This diversion is called the Vangorda Creek Diversion Channel (Figure 4).

Water enters the pit via three gullies. One gully is located on the east wall, and two gullies are located in the northwest corner of the pit.

The Vangorda Pit is currently inactive and inundated to 1,085 masl as of August 2014. Water from the Grum Pit has been periodically pumped to the Vangorda Pit for water treatment. A pump barge pumps water from the Vangorda Pit to the water treatment plant. No monitoring instrumentation has been installed in the Vangorda Pit.

5.2 Geology

A full description of the engineering geology of the Vangorda Pit is provided in Golder (2013). The Vangorda ore zone consists of one major sulphide horizon located approximately 50 to 120 metres beneath the basal carbonaceous member of the Vangorda Formation, and the pit walls are comprised of phyllites and schists of the Mount Mye and Vangorda Formations. Regionally, the strata dip northeast and southwest; however local bedding may dip to the northwest. The rocks exposed in the pit wall are of variable strength. In the northwest wall, the rocks range from dark grey to black, low-strength, graphitic schists to light grey, strong, relatively massive and competent schists (SRK 2003). The sulphide-bearing rock exposed in the pit is subject to oxidation and is observed to be highly oxidized in some walls. Iron staining is evident to some degree on all the pit walls. A steep normal fault truncates the deposit at the northwest end (Curragh Resources 1986).

A till blanket overlies the bedrock; it is up to 30 metres thick along the northwest side of the pit and thins out to the southeast.

5.3 Previous Pit Slope Stability Performance

The 2002 Deloitte & Touche Inc. report indicates that the Vangorda Pit slopes experienced local instability, particularly in the northwest corner of the pit. This area is characterized by carbonaceous phyllites and is adjacent to several faults. The localized wall failures were reportedly related to a pit expansion. The northeast walls and the slot area walls have historically exhibited adequate stability performance.

In 2013, CH2M Hill observed cracks in the haul road berm on the west side of the Vangorda Pit (CH2M Hill 2014), and cracks were also observed by Golder in 2014 (Golder 2014). The upper slope on the west wall of the pit consists of till overlain by fill. This part of the west wall has exhibited continuous slumping and raveling such that the upper till slope is almost entirely oversteepened.

5.4 2015 Observations

During the 2015 site visit, portions of the crest on each side of the Vangorda Pit were inspected for new cracks and ponded water. The four pit walls were also visually inspected from the crest and from the bottom of the access road that leads into the pit. The following areas were inspected, and photographs are provided in Appendix C.

- portions of the pit crest perimeter;
- the roads behind the crests and the access road into the pit;
- sections of the Vangorda Creek Diversion Channel; and
- the north, south, west and east walls were inspected from the bottom of the access road and from vantage points at the crest.

The following observations were made during the visual inspection.

- The north, south and east walls are exhibiting adequate stability performance with respect to overall stability (Figures C-1 and C-2). Compared to the 2014 photographs, no significant changes in the slope morphology were observed.
- The benches in competent rock in the north wall (Figure C-1) are in good condition, with mostly intact bench crests and adequate catchment. The slope excavated in the weak, graphitic schist is slowly raveling into a talus slope with no catchment remaining. Some seepage zones were observed in the wall.
- Water transported from various locations on the site is discharging into the pit in the northwest corner of the pit. The discharge is slowly eroding the rock (Figure C-1).
- The rock in the south and east walls is of moderate quality and the benches are slowly raveling into a talus slope. Although some bench crests remain intact, there are areas where bench crests have been lost entirely and catchment is limited (Figures C-1 and C-2).

- The till slopes on the east wall are overly-steep and are sloughing (Figure C-2), but do not present a concern to personnel as there is catchment in the benches below and personnel are not working above or below this slope.
- The rock benches in the west wall do not exhibit much change from previous years (Figure C-3).
- However, the upper slope in overburden and fill continues to ravel and slough (Figure C-3), and a sinkhole has formed near one of the power poles near the crest (Figure C-4). Cracks, areas of recent slumping, and possible seepage were observed in the loose material in the upper portion of the west wall, on the south side where the sinkhole is located (Figure C-5). The sinkhole and cracks are discussed in more detail in Section 5.4.1, West Wall Instability.
- It is our understanding that water is no longer being discharged from the booster pump on the southwest side of the pit, as this was eroding a portion of the west wall (Figure C-5).
- Cracks and areas of recent slumping were also observed in the loose material on the north side of the upper west wall (Figure C-6).
- No recent cracks or ponded water were observed at the crest of the pit.
- No recent cracks were observed in, or near, the roads around the crest of the pit.
- No recent cracks were observed near the Vangorda Flume. However, portions of the flume are in disrepair and are leaking, and water is flowing along the riprap channel located beneath the flume (Figure C-7). We understand the YG is investigating options to repair or replace the flume.
- Abundant water was observed in the Vangorda Creek, upstream from the Vangorda Creek Diversion Channel (Figure C-7).
- In the centre of the northeast wall, some water flows into the pit from the original Vangorda Creek bed. However, the majority of the water is pumped from the ponded creek bed to the diversion channel. The pump is activated when a certain water level is reached (Figure C-8).

Finally, in previous site visit reports, rockfall was highlighted as a concern along the in-pit access road on the south side of the pit. On the east side of the access road, a ditch serves as adequate catchment for rockfall (Figure C-9, upper left). However, HDPE pipe is located along the west side of the road, and electric cables have also been installed near the west slope, indicating that workers have been working beneath this slope in areas where there is inadequate rockfall protection. Golder recommended that a berm be developed on the west side of the access road as rockfall protection (Golder 2014). A berm has been developed on the west side of the upper part of the access road (Figure C-9, upper right); however, this berm does not continue along the lower part of the road (Figure C-9, lower left). Rather, a small ditch serves as catchment for rockfall.

5.4.1 West Wall Instability

The upper portion of the west wall of the Vangorda Pit is composed of till overlain by fill. In previous years, cracks were observed at the crest in the fill material (Golder 2014; CH2M Hill 2014). The cracks were oriented parallel to the strike of the crest. Slumping of material was also observed in the face of the upper slope. During the site visit, site personnel reported that, after a period of heavy rainfall, a sinkhole had developed at the crest of the west wall at the south end (Figure C-4). Recent slumping and cracks were also observed in the face of the slope on both the south side and the north side (Figures C-5 and C-6). While on site Golder recommended that access to the Vangorda Pit be temporarily suspended and that resloping of the oversteepened portion of the upper slope be carried out on both the north and south sides.

Resloping and unloading of the crest at the south end of the west wall was carried out in mid-September and photographs of the work are shown in Figure C-11. Golder reviewed the photographs and provided the following recommendations in an email communication dated September 30, 2015.

- Access to the Vangorda Pit can be re-established, but personnel should continue to carry out a visual inspection of the crest area and from the other side of the pit prior to working in the pit. Look for any new cracks or sinkholes, or signs of active raveling prior to entering the pit.
- After inspection, discuss and decide if a spotter is necessary, for example, after unfavourable weather conditions and when new cracks or slumps have been identified.
- Periodic photographs are recommended as documentation.
- Avoid working in the pit during and after heavy precipitation events - wait at least 24 hours to ensure any effects from water seepage and flow have dissipated. Exit the pit if there are any signs of active raveling of the west wall.

In addition to the above, Golder recommends that the north portion of the west wall also be re-sloped as cracks and slumping were observed in this part of the wall. Although personnel do not work beneath this part of the slope, a sudden failure of material into the pit lake could result in a wave that could impact personnel working inside the pit.

5.4.2 Pit Lake Level

Water level data for the Vangorda Pit were provided by YG. Plate 6 shows the fluctuations in the Vangorda Pit lake level from June 2004 to July 2015. The plot shows that lake levels have remained well below the maximum recommended elevation except on two occasions in June of 2008 and June of 2009. The Vangorda Pit lake level was measured at 1,086.2 masl on July 13, 2015, and water level was rising. However, this is 5.5 metres below the maximum elevation of 1091.8 masl and is not a concern.

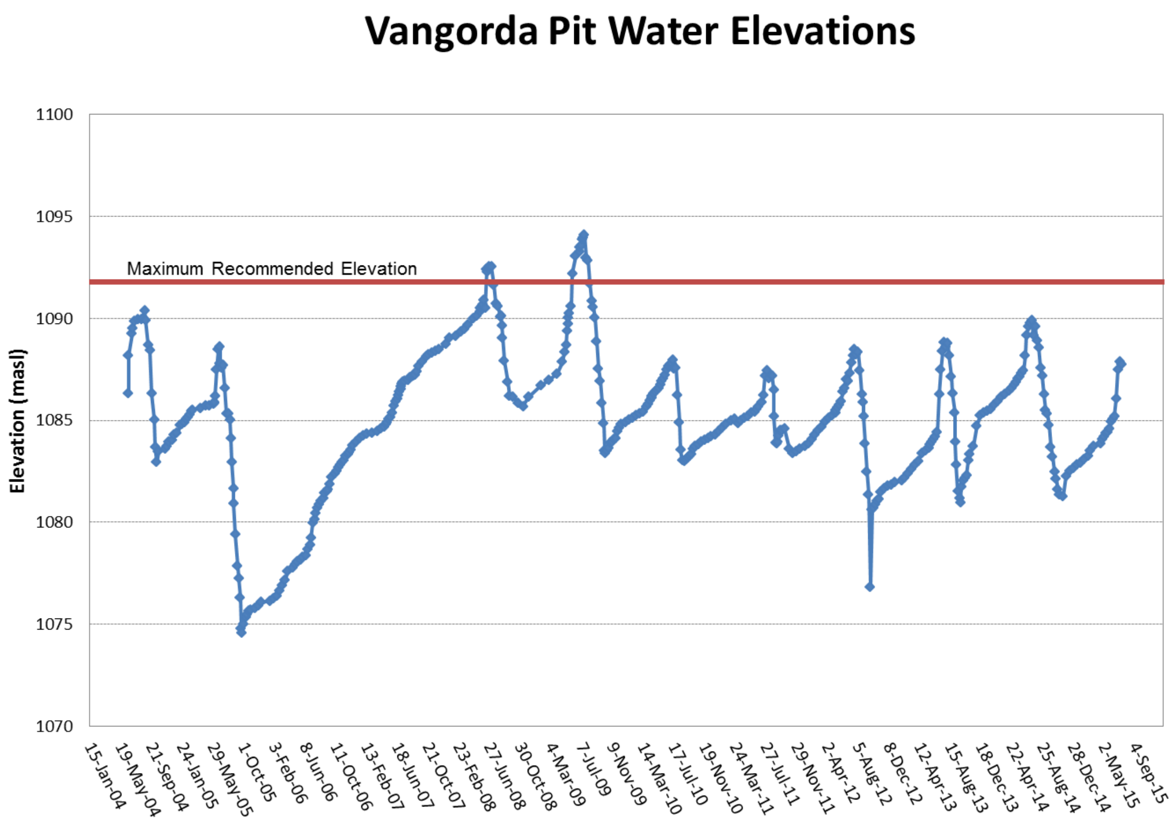

Plate 6: Vangorda Pit Lake Levels to July 13, 2015

The recommendations for the Vangorda Pit are provided in the following section and summarized in Table E-1 in Appendix E.

5.5 Vangorda Pit Recommendations

- Reslope the upper portion of the north side of the west wall, similar to what has been done on the south side. The central portion is not oversteepened and can remain in its current configuration.
- Extend the berm on the west side of the access road to the end of the road at the bottom of the pit, to provide rockfall protection to personnel working near the slope. Move equipment to the outside of the berm so personnel do not work near the toe of the slope.
- Repair or replace the Vangorda Flume as soon as practicable to limit the amount of water that is seeping into the slope on the north side.
- Golder previously recommended that a berm be developed on the west side of the access road as rockfall protection (Golder 2014). A berm has been developed on the west side of the upper part of the access road (Figure C-9, upper right); however, this berm does not continue along the lower part of the road (Figure C-9, lower left). Rather, a small ditch serves as catchment for rockfall. However, there is equipment close to the base of the slope, and it is recommended that the berm be extended all the way down the west side of the road to the end of the road. Alternatively, when personnel are working near this slope, they should visually inspect the slope for possible rockfall before beginning work, and should consider using a spotter. Figure C-10 shows the part of the road where the berm should be extended on the west side of the access road.

6.0 DISCUSSION OF FMC SLOPE STABILITY MONITORING PROGRAM

The slope monitoring program at the Faro Mine Complex was implemented to monitor the following:

- crest regression occurring at the backscarps of the instability zones on the east walls of the Faro and Grum pits;
- overall stability of the Faro east wall instability zones; and
- stability of the backscarp and the slide material below the backscarp of the instability zone on the east wall of the Grum Pit.

The monitoring program consisted of site personnel taking frequent measurements of reference bars or pins to monitor crest regression, and a survey contractor carrying out an annual survey of monitoring points installed at the crest of the east walls of both the Faro and Grum pits to monitor overall slope stability.

However, in 2014, site personnel expressed safety concerns regarding accessing the crest of the slopes to measure the distance from the crest to the reference pins or bars. Consequently, the crest regression monitoring was suspended, and YG requested that Golder carry out a review of the current monitoring program and methodology, and of alternative methods of monitoring crest regression and slope stability that would not require personnel to access the crest of the wall (Golder 2015).

Based on the results of the study and discussions with YG, we understand that either a photography or photogrammetry-based remote monitoring system is under consideration. Further to this, YG requested that Golder locate points in the Faro and Grum pits from where the remote monitoring can take place. Two points were located across from the east wall in the Faro Pit, two points were located across from the east wall in the Grum Pit, and an additional point was located across from the west wall of the Vangorda Pit to allow for remote monitoring of the instability that has developed in the upper portion of this wall. The proposed photo location points are shown in plan in Figures 1 to 3.

With photographs taken from the same location in each pit, YG will be able to monitor and document crest regression and changes in the overall slopes. Golder recommends that site personnel take photos from the photo location points on a monthly basis. A mounting station should be placed in each photo location point, such that a camera can be mounted and photos can be taken from the same location and in the same direction each time. Once the stations are installed and the camera equipment has been purchased, Golder can provide training to site personnel for consistency in photograph settings and methodology.

In addition to photographs, photogrammetry software should be used periodically to create three-dimensional surfaces to detect changes in the slope more accurately. This can be done 2-4 times per year, with an increase in frequency when warranted. The photogrammetry software can be purchased by YG and site personnel can be trained in using the software and documenting the changes between surfaces or the photographs can be sent to Golder for photogrammetry processing and interpretation.

In order to carry out photogrammetry, targets must be painted or placed on the slope and these must be surveyed for geo-referencing of the photographs. Golder also recommended that old electric poles be placed flat on the ground and perpendicular to the crest alignment in areas where crest regression is to be monitored.

Distance markers should be painted on the poles so that these can be read in the photographs and used to measure crest regression.

Accurate displacement rates cannot be obtained from the proposed remote monitoring system; therefore, this system should continue to be complemented with the annual monitoring point surveys carried out by the survey contractor. This is because only the monitoring point data provide quantifiable overall slope displacement data, such as the magnitude, rate and trend of displacement. As shown in Sections 3.4.2.3 and 4.4.2.2 certain survey monitoring points at both Faro and Grum are exhibiting displacements, and the displacement vectors provide invaluable information on the area that is deforming, the magnitude, rate and direction. For this reason, Golder recommends that the annual surveys continue to be carried out by the survey contractor to monitor overall stability at the Faro and Grum pits. Further to this, the number of monitoring points behind the east wall of the Faro Pit is adequate. However, additional points should be identified or installed behind the crest of the east wall of the Grum Pit, to the north of MP005. The locations of these additional points can be finalized after discussion with YG as to whether existing structures can be used or additional metal stakes can be installed.

In addition, site personnel should continue to qualitatively assess and document when the slopes are more active by visual observations, and should record this activity in their field notes.

Golder has previously recommended that the slope stability monitoring program be included in the existing Emergency Response Plan, to give site personnel a basic understanding of the signs of slope instability and a framework for the communication of and response to these hazards.

It must be reiterated that regardless of the monitoring system in place, and whether or not it requires access to the east wall, without a timely and thorough review of the monitoring data, significant changes in the stability of the slope may not be detected in sufficient time to enact the emergency response plan or remedial actions. Three to five monitoring points in the Faro Pit and one monitoring point in the Grum Pit are currently exhibiting possible deformation. This apparent deformation could accelerate and extend to other areas of the slope at some point in the future. It is the combination of an appropriate monitoring system with a timely and thorough data review that allows the monitoring system to provide adequate warning of conditions that warrant a response.

7.0 SUMMARY OF OBSERVATIONS AND RECOMMENDATIONS

Based on the observations and monitoring data from the 2015 review, the slopes of the Faro, Grum and Vangorda pits are exhibiting adequate stability with respect to overall slope stability. However, the Faro North Instability and the Grum Instability are exhibiting deformations that must continue to be monitored. The recommendations for each pit are summarized in Table E-1 in Appendix E. The recommendations have been grouped into risk categories corresponding to high, medium and low, to assist with planning.

A review of the pit slope monitoring data should continue to be carried out on an annual basis by a qualified geotechnical engineer.

Based on past slope stability performance, and provided there is adequate slope stability monitoring coverage at the site through visual inspections, and the data are reviewed annually as a minimum, the frequency of the site visits to carry out a pit slope stability review can be reduced to every two to three years, and should continue to be carried out by a geotechnical engineering consultant. A site visit by a geotechnical engineering consultant may also be required when site visual observations and/or monitoring data indicate significant signs of pit slope instability.

8.0 CLOSURE

The reader is referred to the Study Limitations, which follows the text and forms an integral part of this report.

We trust this report satisfies your current requirements, and we appreciate this opportunity to continue to provide our support to the Yukon Government. If you have any questions or require further assistance, please do not hesitate to contact us.

GOLDER ASSOCIATES LTD.

PROFESSIONAL ENGINEER YUKON TERRITORY
February 17/2016

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Geological Engineer, Mining Division

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Principal, Mining Division

JJR/AVC/it/jc/bb

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REFERENCES

Faro Mine Remediation Project. 2011. *FMRP Location*. Available at:http://www.faromine.ca/mine/location.html. Accessed September 16, 2014.

CH2M Hill. 2014. *Faro Mine Complex 2013 Pit Wall Stability Inspection*. Prepared for Government of Yukon. Submitted March 26, 2014.

Curragh Resources. 1986. *Geology and reserves sections from Faro, Vangorda and Grum mine plans*. Energy, Mines and Resources Property File Collection, ARMC001951. Available at: http://data.geology.gov.yk.ca/Reference/53442. Accessed September 26, 2014.

Curragh Resources. 1987. *The Vangorda Plateau Project, Summary of Geology, Pit Design, Metallurgy and Infrastructure.* March 1987.

Deloitte & Touche Inc. 2002. *Anvil Range Mine Complex, 2002 Baseline Environmental Information.* Prepared for Anvil Range Mining Corporation, produced by Gartner Lee Limited. Submitted May 2002.

Klohn Crippen Berger. 2014. *Faro Mine Complex 2013 Annual Geotechnical Review – Draft*. Prepared for Yukon Government. Submitted March 31, 2014.

Golder Associates Ltd. 2002. *Faro Creek Diversion Channel Short-term Stability Review, Faro YT.* Report submitted December 16, 2002.

Golder Associates Ltd. 2006. *Faro Pit Slope Movement Monitoring.* Report submitted February 8, 2006.

Golder Associates Ltd. 2007. *Review of 2006 Pit Slope Monitoring Data, Faro Pit*. Report submitted April 24, 2007.

Golder Associates Ltd. 2008a. *Review of 2007 Pit Slope Monitoring Data, Faro Pit.* Report submitted March 14, 2008.

Golder Associates Ltd. 2008b. *2008 Faro Pit Slope Movement Monitoring.* Report submitted December 10, 2008.

Golder Associates Ltd. 2009. *2009 Faro Pit Slope Movement Monitoring.* Report submitted November 3, 2009.

Golder Associates Ltd. 2010. *Phase 1A Geotechnical Slope Stability Assessment of the East Wall of the Grum Pit, Faro Mine, Yukon.* Report prepared for Faro Project Management Team, Government of Yukon. Submitted March 23, 2010.

Golder Associates Ltd. 2011. *2010 Faro Pit Slope Stability Monitoring Data Review*. Report prepared for Denison Environmental Services. Submitted February 23, 2011.

Golder Associates Ltd. 2013. *Faro Mine Complex (2012) Annual Pit Slope Stability Inspection*. Report prepared for Yukon Government. Submitted February 7, 2013.

Golder Associates Ltd. 2014. *Faro Mine Complex 2014 Annual Pit Slope Stability Inspection*. Report prepared for Yukon Government. Submitted December 19, 2014.

Golder Associates Ltd. 2015. *Study of Alternative Slope Monitoring Methods for Faro and Grum Pits*. Technical Memorandum prepared for Yukon Government. Submitted January 14, 2015.

SRK Consulting. 2003. *Engineering Analysis of Vangorda Pit Wall Stability.* Prepared for Deloitte & Touche Inc. Submitted April 2003.

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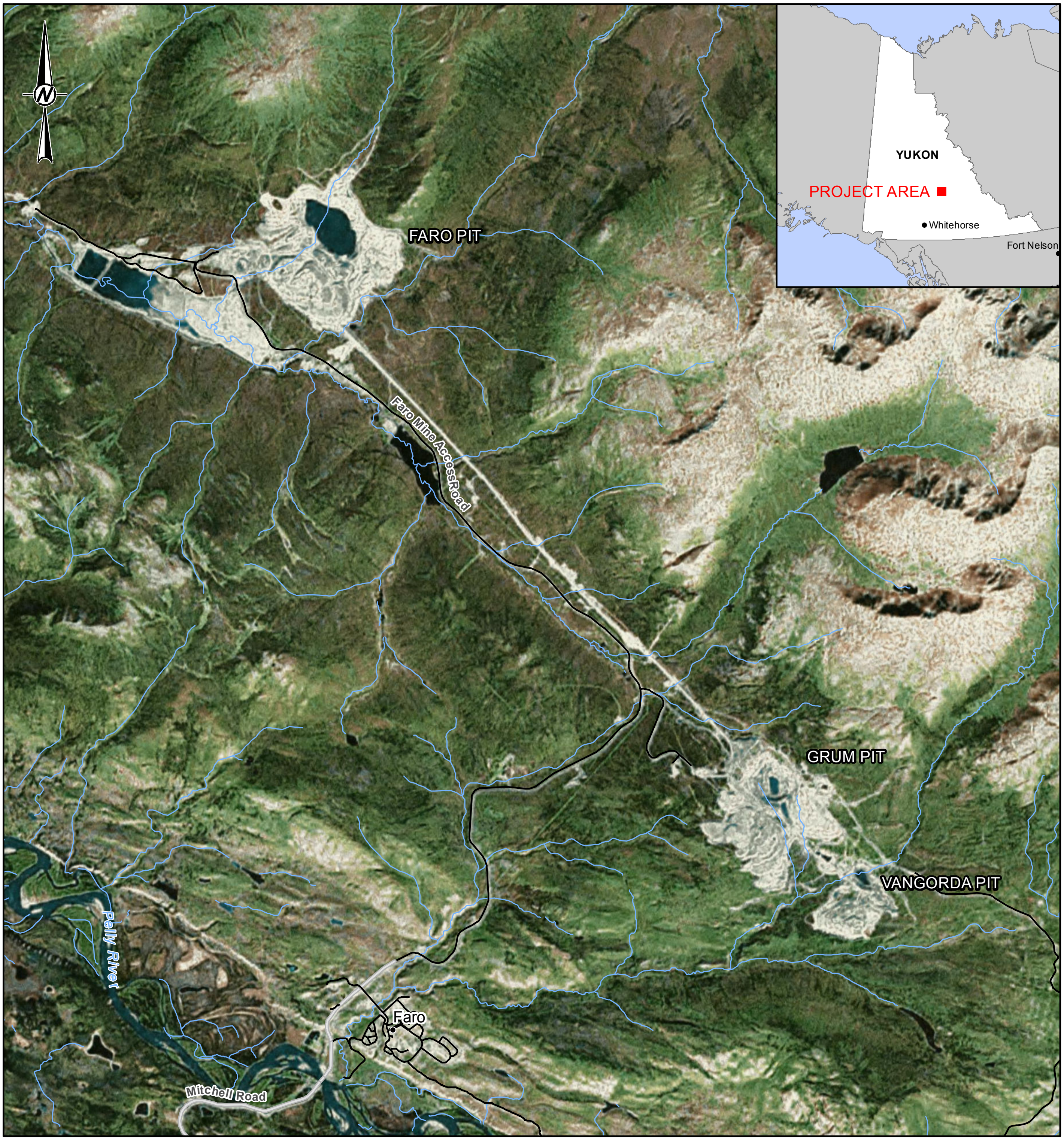

LEGEND

- TOWN
- MAJOR ROAD
- LOCAL ROAD
- WATERCOURSE

0 2 4
1:100,000 KILOMETRES

REFERENCES

1. HYDROLOGY AND ROAD DATA OBTAINED FROM THE YUKON GOVERNMENT.
2. INSET MA DATA OBTAINED FROM ESRI.
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CLIENT
YUKON GOVERNMENT

PROJECT
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO MINE COMPLEX OVERVIEW

CONSULTANT

YYYY-MM-DD	2016-02-12
DESIGNED	JJR
PREPARED	AD/DL
REVIEWED	AVC
APPROVED	AVC

PROJECT NO.	PHASE	REV.	FIGURE
1410944	2015	0	1

PATH: Y:\burnaby\CAD-GIS\Client\Government_of_Yukon\YG_Faro_Mine\99_PROJECTS\1410944\2015\02_PRODUCTION\MXD\1410944_FIG1_OVERVIEW.mxd

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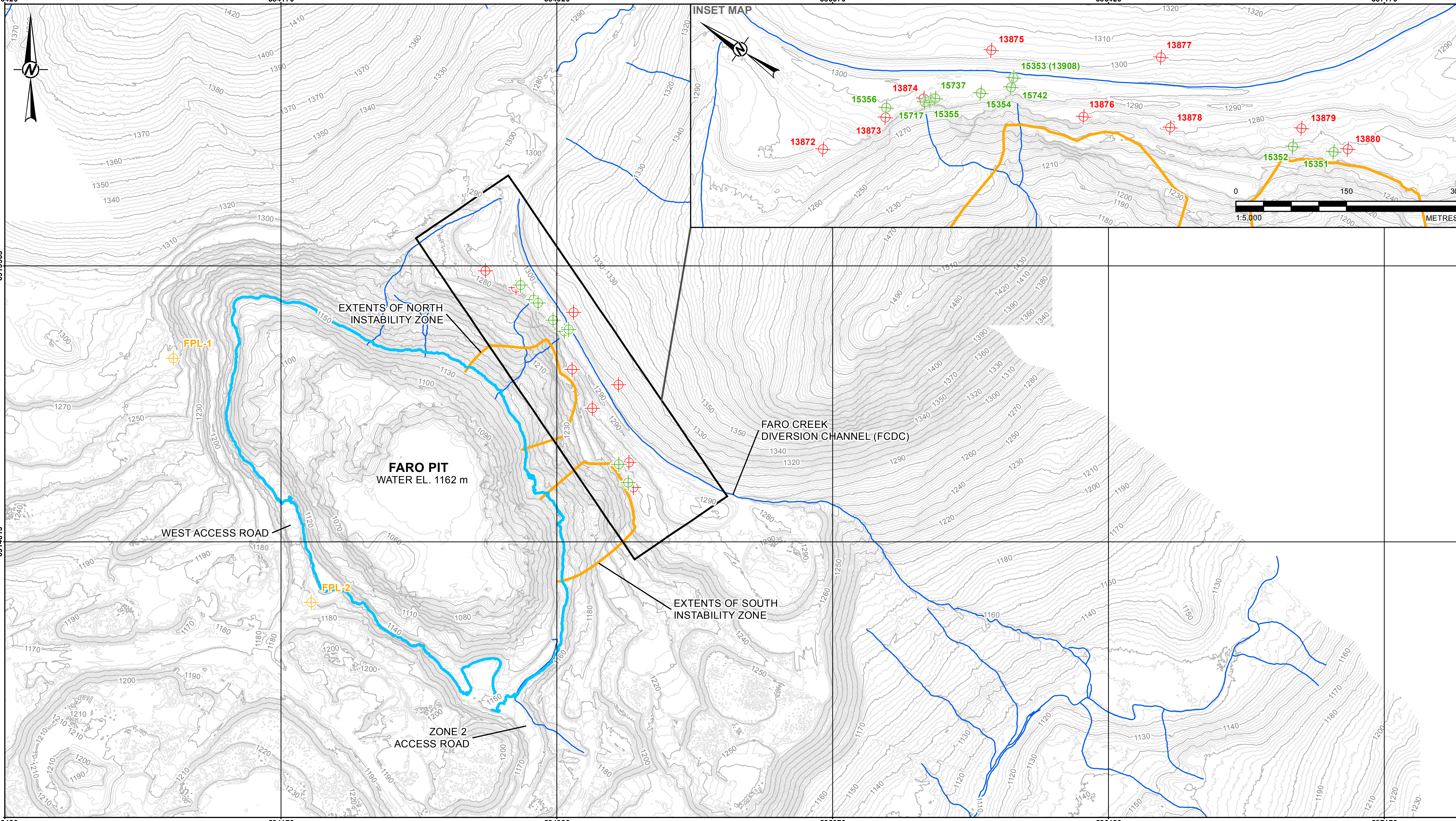

LEGEND

- MONITORING POINT
- REFERENCE PIN
- PHOTO LOCATION POINT
- WATERCOURSE
- APPROXIMATE PIT WATER LEVEL
- EXTENT OF INSTABILITY ZONE
- MAJOR CONTOUR (10 m)
- MINOR CONTOUR (2 m)

NOTE:
1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.

REFERENCES
1. CONTOUR DATA OBTAINED FROM THE GOVERNMENT OF YUKON. DATED: SEPTEMBER 18, 2014, FILE: FARGO_PIT_50CM_CONTOURS.DWG.
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 8N

0 200 400
1:10,000 METRES

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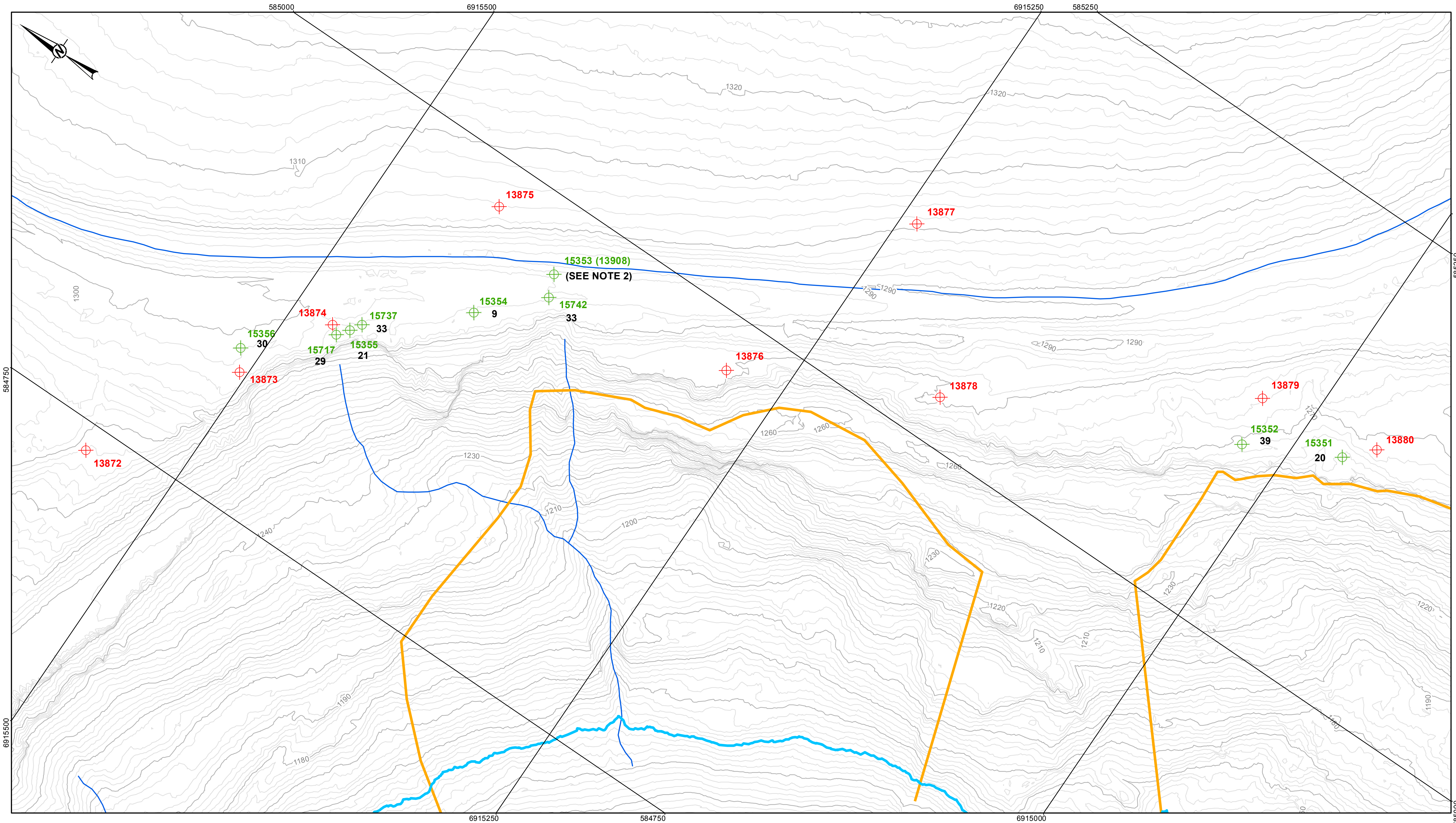
DESIGNED	JJR
PREPARED	AD/DL
REVIEWED	AVC
APPROVED	AVC

PROJECT
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT

PROJECT NO.	PHASE	REV.	FIGURE
1410944	2015	0	2



LEGEND

- MONITORING POINT
- REFERENCE PIN
- 33 AVERAGE ANNUAL CREST LOSS (cm / yr)
- WATERCOURSE
- APPROXIMATE PIT WATER LEVEL
- EXTENT OF INSTABILITY ZONE
- MAJOR CONTOUR (10 m)
- MINOR CONTOUR (2 m)

NOTE:
1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. NO DATA PROVIDED BY YES FOR REFERENCE PIN 15353.

REFERENCES
1. CONTOUR DATA OBTAINED FROM THE GOVERNMENT OF YUKON. DATED: SEPTEMBER 18, 2014, FILE: FARGO_PIT_50CM_CONTOURS.DWG.
2. COORDINATE SYSTEM: NAD 1983 UTM ZONE 8N

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1:2,000 METRES

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APPROVED	AVC

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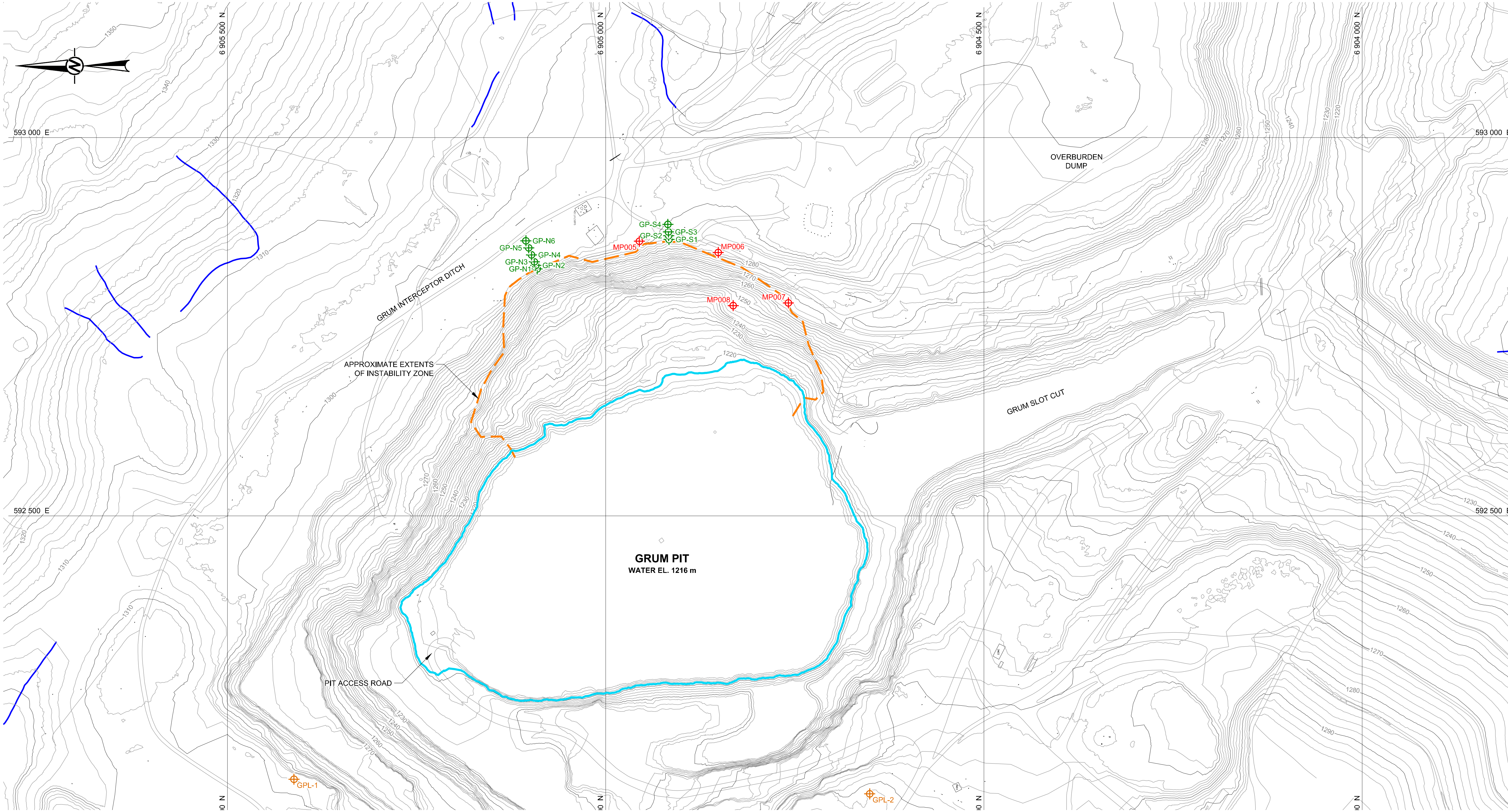
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT DETAILED INSTRUMENTATION PLAN

PROJECT NO.	PHASE	REV.	FIGURE
1410944	2015	0	3



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LEGEND

- MP008 MONITORING POINT
- GP-N6 REFERENCE BAR
- GPL-2 PHOTO LOCATION POINTS
- WATERCOURSE
- APPROXIMATE PIT WATER LEVEL
- APPROXIMATE EXTENTS OF INSTABILITY ZONE
- MAJOR CONTOUR (10 m)
- MINOR CONTOUR (2 m)

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATE SYSTEM IS NAD 27, UTM.
3. CONTOUR INTERVAL SHOWN AT 2 m MINOR AND 10 m MAJOR.

REFERENCE

1. CONTOUR DATA PROVIDED BY GOVERNMENT OF YUKON, DATED: SEPTEMBER 21, 2012.

0 100 200
1:5,000 METRES

CLIENT
YUKON GOVERNMENT

CONSULTANT

YYYY-MM-DD	2016-02-12
PREPARED	TAK
DESIGN	JJR
REVIEW	AVC
APPROVED	AVC

PROJECT
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
GRUM PIT

PROJECT No.	PHASE	Rev.	FIGURE
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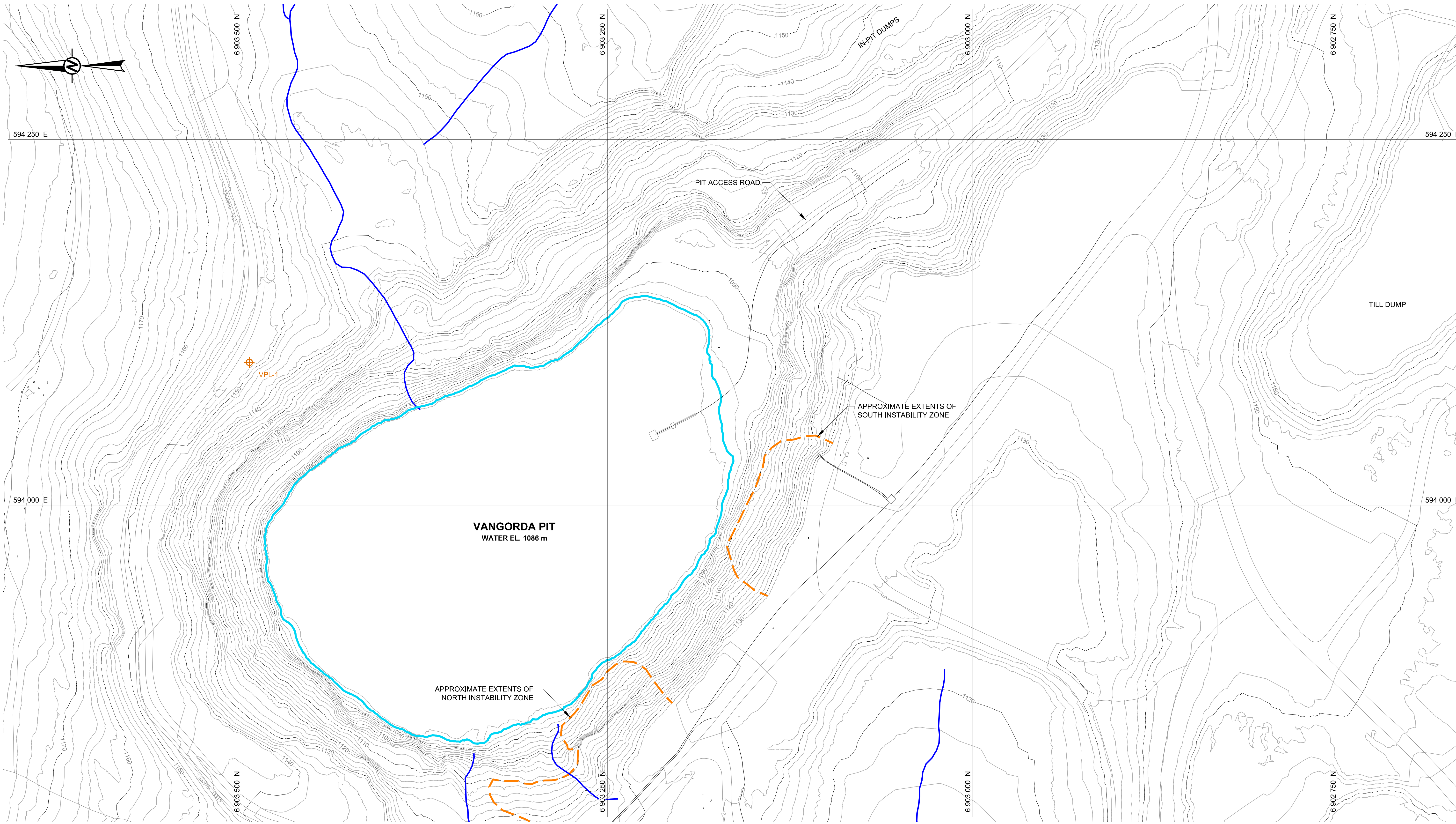
25 mm



LEGEND

VPL-1 PHOTO LOCATION POINTS

WATERCOURSE

APPROXIMATE PIT WATER LEVEL

APPROXIMATE EXTENTS OF INSTABILITY ZONE

MAJOR CONTOUR (10 m)

MINOR CONTOUR (2 m)

NOTES

1. ALL UNITS ARE IN METRES UNLESS NOTED OTHERWISE.
2. COORDINATE SYSTEM IS NAD 27, UTM.
3. CONTOUR INTERVAL SHOWN AT 2 m MINOR AND 10 m MAJOR.

REFERENCE

1. CONTOUR DATA PROVIDED BY GOVERNMENT OF YUKON, DATED: SEPTEMBER 21, 2012.

0 50 100

1:2,500 METRES

CLIENT

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DESIGN	JJR
REVIEW	AVC
APPROVED	AVC

PROJECT

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

VANGORDA PIT

PROJECT No.	PHASE	Rev.	FIGURE
1410944	2015	0	5

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25 mm

APPENDIX A

Faro Pit Photographs

NORTH INSTABILITY ZONE

AREA OF BIG INDIAN FAULT

SOUTH INSTABILITY ZONE

NORTH AND SOUTH INSTABILITY ZONES, EAST WALL,
VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
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PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT EAST WALL

FIGURE No. A-1

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

NORTH INSTABILITY ZONE, EAST WALL, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT

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2015 PIT SLOPE STABILITY REVIEW

TITLE

FARO PIT NORTH INSTABILITY ZONE

FIGURE No. A-2

SOUTH INSTABILITY ZONE, EAST WALL, VIEW LOOKING SOUTHEAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT SOUTH INSTABILITY ZONE

FIGURE No. A-3

NORTH INSTABILITY ZONE, VIEW LOOKING WEST FROM CREST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
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PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT NORTH INSTABILITY ZONE
VIEW FROM BEHIND BACKSCARP

FIGURE No. A-4

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

BERM AT CREST OF EAST WALL, ON WEST SIDE OF ROAD, VIEW LOOKING NORTHWEST

BERM AT CREST OF EAST WALL, ON WEST SIDE OF ROAD, VIEW LOOKING SOUTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: FARO PIT
WATER IN DITCH AT CREST OF EAST WALL

FIGURE No. A-5

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

PIN 13908 – STRUCTURE STILL STANDING, BUT COULD NOT FIND PIN

STRUCTURE FOR PIN 15742

PIN 15742 NEAR STRUCTURE

DISTANCE FROM CREST TO EDGE OF BERM IS APPROXIMATELY 3 METRES NEAR PIN 15742

15354
PIN AND TAG IN GOOD CONDITION

15737
PIN AND TAG IN GOOD CONDITION

FARO PIT MONITORING DATA AND THE PIT SLOPE MONITORING PROGRAM ARE DISCUSSED IN REPORT SECTIONS 3.4.2 AND 6.0, RESPECTIVELY.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: Yukon Government — YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: FARO PIT MONITORING POINTS AND REGRESSION BARS

FIGURE No. A-6

TILL SLOWLY ERODING AND RAVELING

TILL SLOWLY ERODING AND RAVELING

BACKSCARP SLUMPING

RAVELING ON BENCHES

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

CONSULTANT
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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT NORTHEAST WALL – RAVELING AND SLUMPING

FIGURE No. A-7

SEEPAGE AND SURFACE RUNOFF ON NORTH SIDE OF NORTH INSTABILITY ZONE, VIEW LOOKING EAST

SEEPAGE AT TILL / BEDROCK CONTACT, EAST WALL, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
Yukon Government
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PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT SEEPAGE ON EAST WALL

FIGURE No. A-8

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

PONDED WATER BEHIND FARO VALLEY WASTE DUMP, VIEW LOOKING
NORTH FROM ROAD ON NORTHEAST SIDE OF FARO PIT

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT PONDED WATER BEHIND CREST OF NORTHEAST SLOPE

FIGURE No. A-9

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

VIEW LOOKING EAST
FROM ROAD ON NORTHEAST
SIDE OF FARO PIT

VIEW LOOKING WEST
FROM ROAD ON NORTHEAST
SIDE OF FARO PIT

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO CREEK DIVERSION CHANNEL

FIGURE No. A-10

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

NORTH AND NORTHWEST WALL

NORTHWEST WALL

BENCH CRESTS INTACT IN MORE COMPETENT ROCK

WEAKER ROCK IS RAVELING AND FORMING A TALUS SLOPE. BENCH CRESTS ARE ERODING AWAY.

0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: FARO PIT NORTH AND NORTHWEST WALLS

FIGURE No. A-11

BERM AT END OF WEST ACCESS ROAD,
WEST SIDE OF PIT, VIEW LOOKING NORTH

BOULDERS AT END OF ZONE 2 ACCESS ROAD,
SOUTH SIDE OF PIT, VIEW LOOKING NORTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

CONSULTANT

TITLE
FARO PIT ACCESS ROADS

FIGURE No. A-12

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

WEST ACCESS ROAD,
WEST SIDE OF PIT, VIEW LOOKING NORTH

REMOVE MATERIAL BEHIND BERM TO RE-ESTABLISH ROCKFALL CATCHMENT

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
Yukon Government
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT WEST ACCESS ROAD

FIGURE No. A-13

BOTH PHOTOS ABOVE:
2014 – NO ROCKFALL BERM

BOTH PHOTOS ABOVE:
2015 – ROCKFALL BERMS IN PLACE

ZONE 2 ACCESS ROAD,
SOUTH SIDE OF PIT

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

PROJECT 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

FARO PIT - AREAS OF ROCKFALL HAZARD
WEST SLOPE - ZONE 2 ACCESS ROAD

FIGURE No. A-14

SOUTHWEST WALL

SOUTH SIDE OF FARO PIT

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

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2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT SOUTH AND SOUTHWEST WALLS

FIGURE No. A-15

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

2014 PHOTOGRAPH OF NORTH INSTABILITY ZONE,
VIEW LOOKING EAST

2015 PHOTOGRAPH OF NORTH INSTABILITY ZONE,
VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

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2015 PIT SLOPE STABILITY REVIEW

TITLE
FARO PIT NORTH INSTABILITY ZONE
PHOTO COMPARISON

FIGURE No. A-16

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2014 PHOTOGRAPH OF SOUTH INSTABILITY ZONE,
VIEW LOOKING SOUTHEAST

2015 PHOTOGRAPH OF SOUTH INSTABILITY ZONE,
VIEW LOOKING SOUTHEAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

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2015 PIT SLOPE STABILITY REVIEW

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TITLE
FARO PIT SOUTH INSTABILITY ZONE
PHOTO COMPARISON

FIGURE No. A-17

O:_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

APPENDIX B

Grum Pit Photographs

EAST WALL AND INSTABILITY ZONE, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM PIT EAST WALL

FIGURE No. B-1

INSTABILITY ZONE, VIEW LOOKING SOUTHEAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
Yukon Government
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
GRUM PIT EAST WALL INSTABILITY ZONE
OBLIQUE VIEW

FIGURE No. **B-2**

O:\Active_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices

2014 PHOTOGRAPH OF INSTABILITY ZONE, VIEW LOOKING EAST

2015 PHOTOGRAPH OF INSTABILITY ZONE, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

CONSULTANT
Golder Associates

TITLE
GRUM PIT SOUTH SIDE OF INSTABILITY ZONE

FIGURE No. B-3

SMALL CRACKS NEAR GP-S2 AT SOUTH ARRAY

SMALL CRACKS NEAR GP-S2 AT SOUTH ARRAY

GRUM PIT MONITORING DATA AND THE PIT SLOPE MONITORING PROGRAM ARE DISCUSSED IN REPORT SECTIONS 4.4.2 AND 6.0, RESPECTIVELY.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

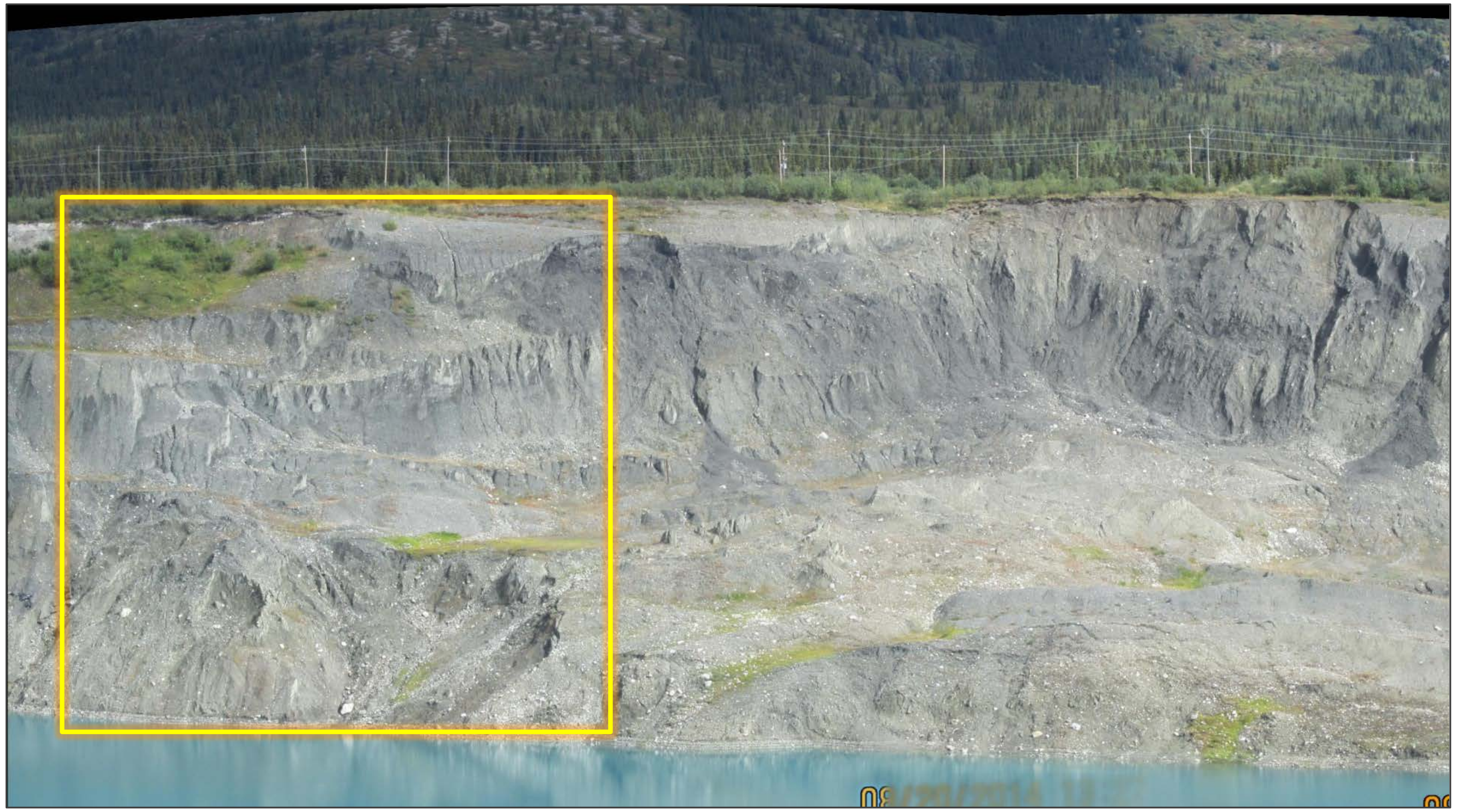
CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FAQ MINE COMPLEX

TITLE: GRUM PIT SOUTH ARRAY OF REFERENCE BARS

FIGURE No. B-4



2014 PHOTOGRAPH OF NORTH SIDE OF INSTABILITY ZONE, VIEW LOOKING EAST

2015 PHOTOGRAPH OF NORTH SIDE OF INSTABILITY ZONE, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM PIT NORTH SIDE OF INSTABILITY ZONE

FIGURE No. B-5

CRACKS AND SLUMPED BLOCK AT NORTH ARRAY, CREST OF
EAST WALL, VIEWS LOOKING SOUTHWEST

GRUM PIT MONITORING DATA AND THE PIT SLOPE MONITORING PROGRAM ARE DISCUSSED IN REPORT SECTIONS 4.4.2 AND 6.0, RESPECTIVELY.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

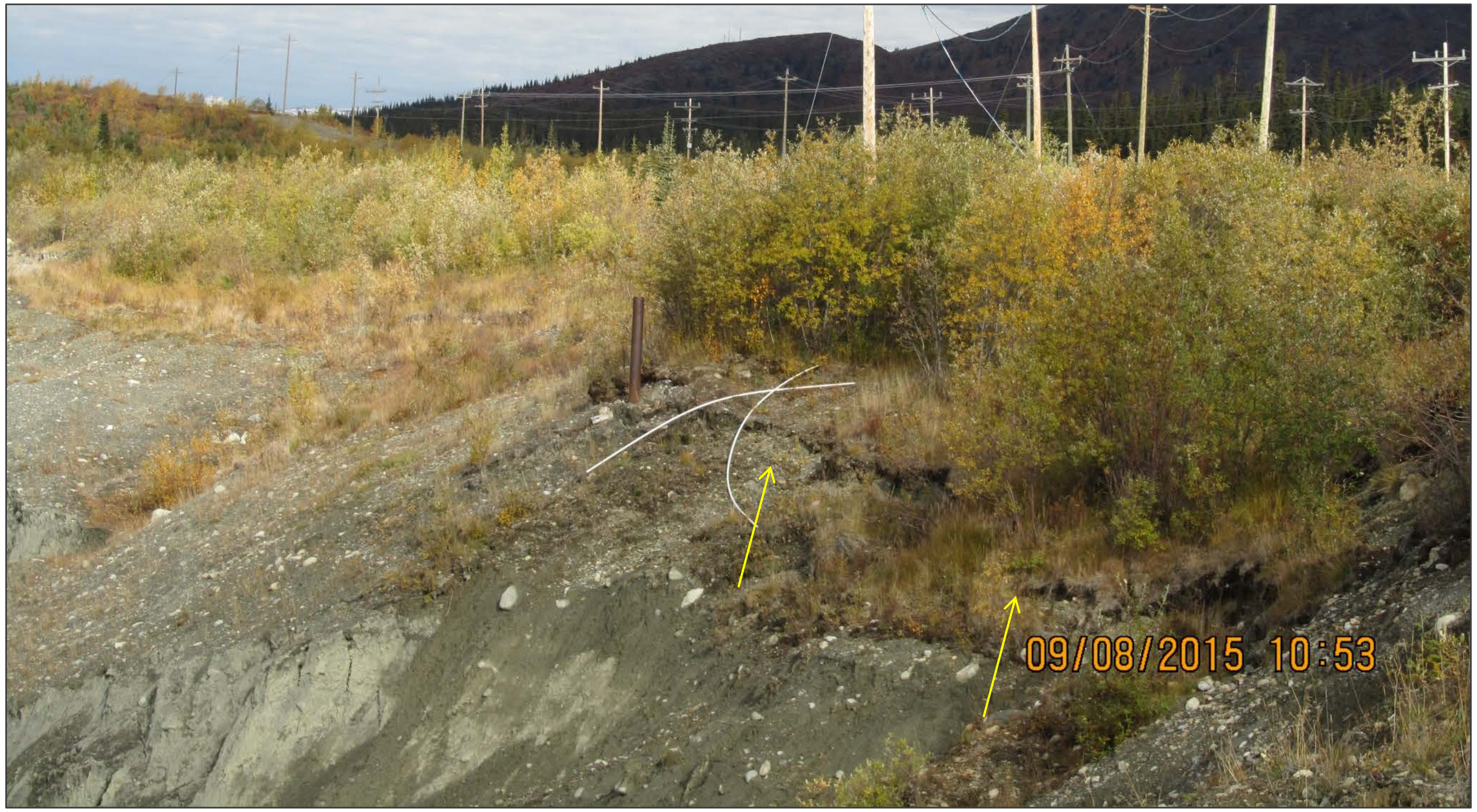
PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM PIT CRACKS AT NORTH ARRAY OF REFERENCE BARS

FIGURE No. **B-6**

O:\Active_2014\1426\1410944 YG 2014 Faro Pit Slopes\2015\07 Deliverables\Doc 007 Site Visit Report\Rev. 0\Appendices



SECOND SET OF CRACKS LOWER DOWN ON CREST OF EAST WALL NEAR NORTH ARRAY, VIEW LOOKING NORTH

POWER POLE ON DROPPED SIDE OF SLUMP BLOCK, EAST WALL, VIEW LOOKING NORTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
GRUM PIT SLUMP BLOCK AT CREST OF EAST WALL

FIGURE No. B-7

2014 PHOTOGRAPH OF CREST OF EAST WALL, BACKSCARP OF INSTABILITY ZONE, VIEW LOOKING EAST

2015 PHOTOGRAPH OF CREST OF EAST WALL, BACKSCARP OF INSTABILITY ZONE, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM PIT PHOTO COMPARISON OF SLUMP BLOCK, EAST WALL

FIGURE No. B-8

CRACKS CONTINUE TO THE NORTH OF NORTH ARRAY,
BEHIND THE CREST OF THE EAST WALL

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT

Yukon Government — YUKON GOVERNMENT

PROJECT 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

CONSULTANT

Golder Associates

TITLE

CRACKS IN TILL BEHIND CREST OF EAST WALL

FIGURE No. B-9

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INSTABILITY ZONE, EAST WALL, VIEW LOOKING NORTHEAST

- ESTIMATED LATERAL EXTENT OF CRACKS INDICATED BY ARROWS
- WATER SEEPING THROUGH TILL DESTABILIZES SLOPE
- CRACKS ARE NOT CONTINUOUS

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

GRUM PIT - SEEPAGE IN TILL AND EXTENT OF CRACKS BEHIND INSTABILITY ZONE

FIGURE No. B-10

2014 PHOTOGRAPH OF ROCK BENCH TO THE NORTH OF THE INSTABILITY ZONE, EAST WALL, VIEW LOOKING SOUTH

2015 PHOTOGRAPH OF ROCK BENCH TO THE NORTH OF THE INSTABILITY ZONE, EAST WALL, VIEW LOOKING SOUTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM PIT BENCH NORTH OF INSTABILITY ZONE

FIGURE No. B-11

ROCKFALL ZONE IN NORTHEAST CORNER OF GRUM PIT,
AT END OF IN-PIT ACCESS ROAD

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: ROCKFALL ZONE IN NORTHEAST CORNER OF GRUM PIT

FIGURE No. B-12

- BOTH PHOTOS ABOVE: WATER IS PONDED IN DITCH BECAUSE CULVERT IS HIGHER THAN WATER LEVEL. DITCH IS LOCATED BEHIND THE EAST WALL OF THE GRUM PIT. VIEW LOOKING SOUTHEAST.
- PHOTO TO THE LEFT: SECTIONS OF GRUM DITCH TO THE NORTH AND SOUTH OF PONDED SECTION ARE FLOWING AND DRAINING ADEQUATELY. VIEW LOOKING SOUTHEAST.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM INTERCEPTOR DITCH

FIGURE No. B-13

NORTH WALL

WEST AND SOUTH WALL

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT

Yukon Government

YUKON GOVERNMENT

CONSULTANT

Golder Associates

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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

GRUM PIT NORTH, WEST AND SOUTH WALLS

FIGURE No. B-14

2014 PHOTOGRAPH OF ROCK SLOPE IN SOUTHWEST CORNER OF GRUM PIT. VIEW LOOKING SOUTHWEST.

2015 PHOTOGRAPH OF ROCK SLOPE IN SOUTHWEST CORNER OF GRUM PIT. VIEW LOOKING SOUTHWEST.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

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2015 PIT SLOPE STABILITY REVIEW

TITLE
SLUMPING AREA IN SOUTHWEST CORNER OF GRUM PIT

FIGURE No. B-15

GRUM SLOT CUT, VIEW LOOKING WEST

GRUM SLOT CUT, VIEW LOOKING SOUTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM SLOT CUT

FIGURE No. B-16

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POWER POLE ON EDGE OF EAST SLOPE OF
GRUM SLOT CUT. VIEW LOOKING WEST.

CLOSE UP OF POWER POLE ON EDGE OF EAST SLOPE
OF GRUM SLOT CUT. VIEW LOOKING NORTHEAST.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

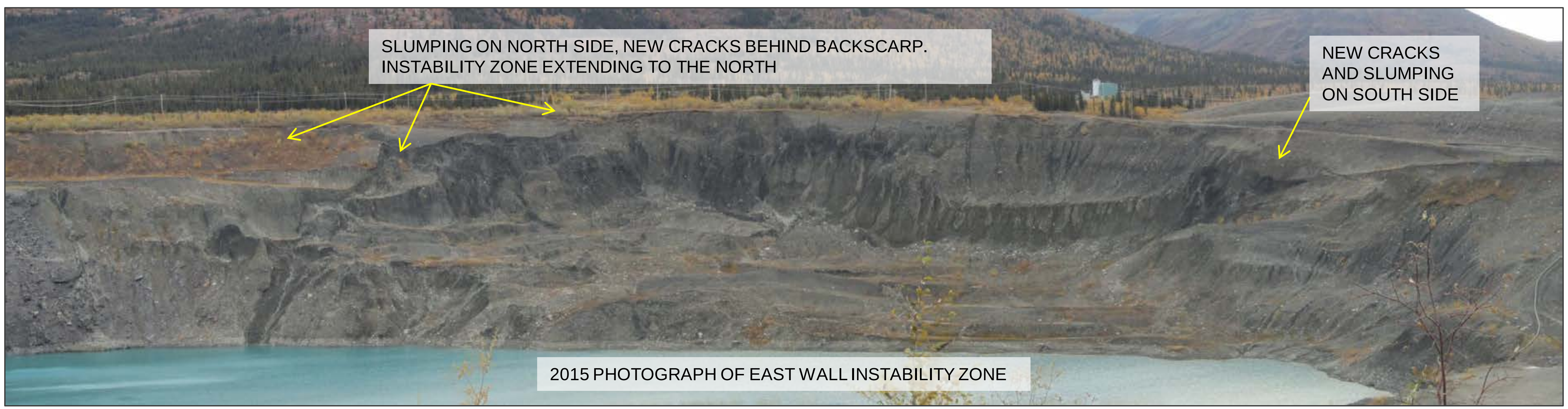
CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: NORTH SLOPE ABOVE GRUM SLOT CUT

FIGURE No. B-17


2014 PHOTOGRAPH OF EAST WALL INSTABILITY ZONE



2015 PHOTOGRAPH OF EAST WALL INSTABILITY ZONE

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	29/SEP/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

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2015 PIT SLOPE STABILITY REVIEW

TITLE
GRUM PIT INSTABILITY ZONE PHOTO COMPARISON

FIGURE No. B-18

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APPENDIX C

Vangorda Pit Photographs

NORTH WALL

SOUTH WALL

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
VANGORDA PIT NORTH AND SOUTH WALLS

FIGURE No. C1

EAST WALL, VIEW LOOKING NORTHEAST

TILL SLOPE IN UPPER EAST WALL, VIEW LOOKING SOUTHEAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

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TITLE

VANGORDA PIT EAST WALL

FIGURE No. C2

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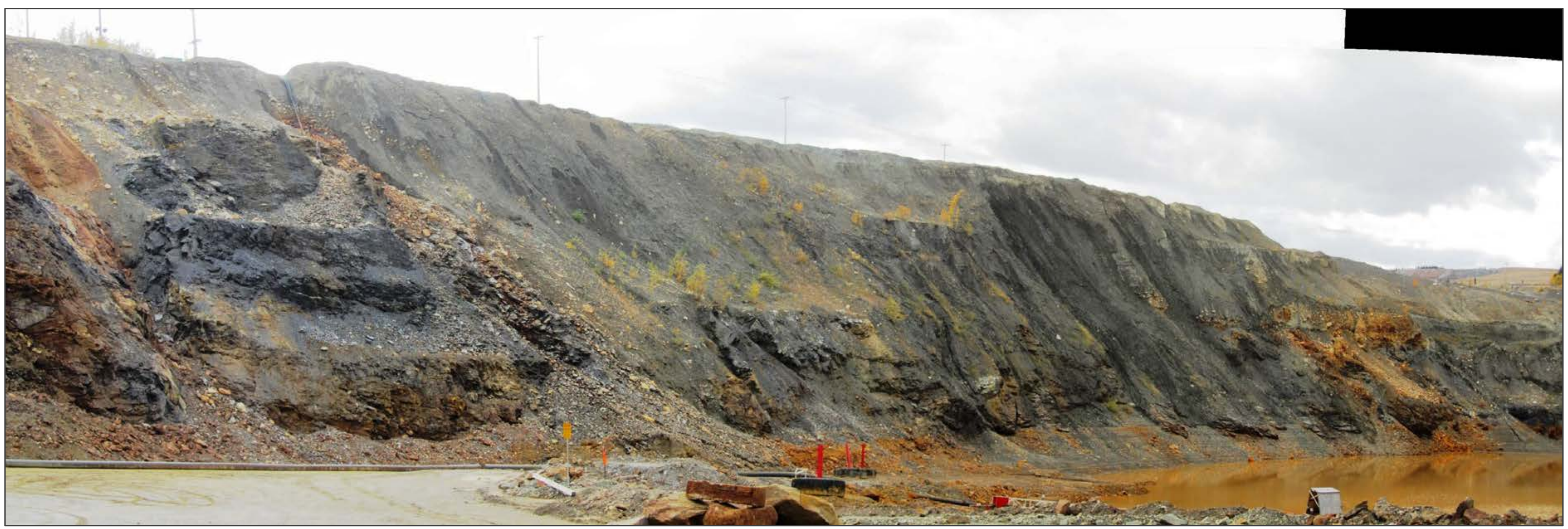
WEST WALL, VIEW LOOKING WEST



WEST WALL, VIEW LOOKING NORTHWEST FROM IN-PIT ACCESS ROAD

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
Yukon Government
YUKON GOVERNMENT

CONSULTANT
Golder Associates

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
VANGORDA PIT WEST WALL

FIGURE No. C3

VIEWS OF SINKHOLE IN WEST WALL, TAKEN FROM THE SOUTH SIDE OF THE WALL AT THE CREST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

VANGORDA PIT - CRACKS IN TILL SLOPE, WEST WALL

FIGURE No. C4

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SOUTH SIDE OF UPPER WEST WALL, VIEW LOOKING WEST
YELLOW ARROWS INDICATE CRACKS OR SLUMPED AREAS

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

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2015 PIT SLOPE STABILITY REVIEW

TITLE: CRACKS AND SLOUGHING IN UPPER PART OF VANGORDA WEST WALL – SOUTH SIDE

FIGURE No. C5

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NORTH SIDE OF WEST WALL, VIEW LOOKING WEST
ARROWS INDICATE RECENTLY SLUMPED AREAS

NORTH SIDE OF WEST WALL, VIEW LOOKING SOUTH FROM CREST
ARROWS INDICATE CRACKS

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: CRACKS AND SLOUGHING IN UPPER PART OF VANGORDA WEST WALL – NORTH SIDE

FIGURE No. C6


VANGORDA FLUME, VIEW LOOKING EAST


VANGORDA FLUME, VIEW LOOKING EAST


VANGORDA CREEK UPSTREAM OF FLUME, VIEW LOOKING EAST


VANGORDA FLUME, VIEW LOOKING EAST

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

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2015 PIT SLOPE STABILITY REVIEW

TITLE: VANGORDA FLUME AND CREEK

FIGURE No. C7

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POND BEHIND CREST OF EAST WALL OF VANGORDA PIT, VIEW LOOKING SOUTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

CONSULTANT: Golder Associates

TITLE: POND BEHIND EAST WALL OF VANGORDA PIT

FIGURE No. C8

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DITCH SERVES AS ROCKFALL CATCHMENT ON EAST SIDE OF ACCESS ROAD, VIEW LOOKING NORTH

BERM ON UPPER PART OF ACCESS ROAD, WEST SIDE, VIEW LOOKING NORTH

SOME EQUIPMENT CLOSE TO SLOPE IN AREA WITH NO BERM, WEST SIDE OF ACCESS ROAD, LOWER SECTION (SEE NEXT FIGURE). VIEW LOOKING NORTH

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
Yukon Government
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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
VANGORDA PIT - AREAS OF ROCKFALL HAZARD

FIGURE No. C9

IN-PIT ACCESS ROAD, SOUTH SIDE OF PIT,
VIEW LOOKING SOUTHWEST

BERM ENDS APPROXIMATELY HERE.

EXTEND BERM TO THE END OF THE ROAD AS SHOWN BY RED ARROW. MOVE EQUIPMENT AWAY FROM TOE OF SLOPE TO THE OUTSIDE OF THE BERM.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

PROJECT: 1410944/2015

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2015 PIT SLOPE STABILITY REVIEW

CONSULTANT: Golder Associates

TITLE: VANGORDA PIT - BERM ON WEST SIDE OF ACCESS ROAD

FIGURE No. C10

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BEFORE REMEDIAL WORK

BEFORE REMEDIAL WORK

AFTER REMEDIAL WORK

AFTER REMEDIAL WORK

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

VANGORDA PIT REMEDIAL WORK AT SOUTH END OF UPPER WEST WALL

FIGURE No. C11

APPENDIX D

Monitoring Data

Table D-1: YES Annual Crest Regression Measurements - Faro East Wall

Y15356	**2011**	**2012**	**2013**	**2014**	**2015**
To Spike		14.94			
To Edge	17.3	17.6	16.9	16.4	16.3
Y15717	**2011**	**2012**	**2013**	**2014**	**2015**
To Spike		3.20			
To Edge	3.7	3.9	3.3	3.2	3.0
Y15355	**2011**	**2012**	**2013**	**2014**	**2015**
To Spike		3.50			
To Edge	3.9	3.9	3.9	3.2	2.8
Y15737	***2011***	***2012***	***2013***	***2014***	***2015***
To Spike		4.29			
To Edge	4.9	4.8	4.3	3.85	3.7
Y15354	***2011***	***2012***	***2013***	***2014***	***2015***
To Spike		6.63			
To Edge	7.5	7.6	7.5	7.35	7.2
Y15742	***2011***	***2012***	***2013***	***2014***	***2015***
To Spike		3.85			
To Edge	6.9	7.4	6.6	6.3	5.8
Y15351	***2011***	***2012***	***2013***	***2014***	***2015***
To Spike		8.00			
To Edge	11.1	13.3	12.0	11.5	11.0
Y15352	***2011***	***2012***	***2013***	***2014***	***2015***
To Spike		10.13			
To Edge	11.8	11.6	11.6	11.1	10.1

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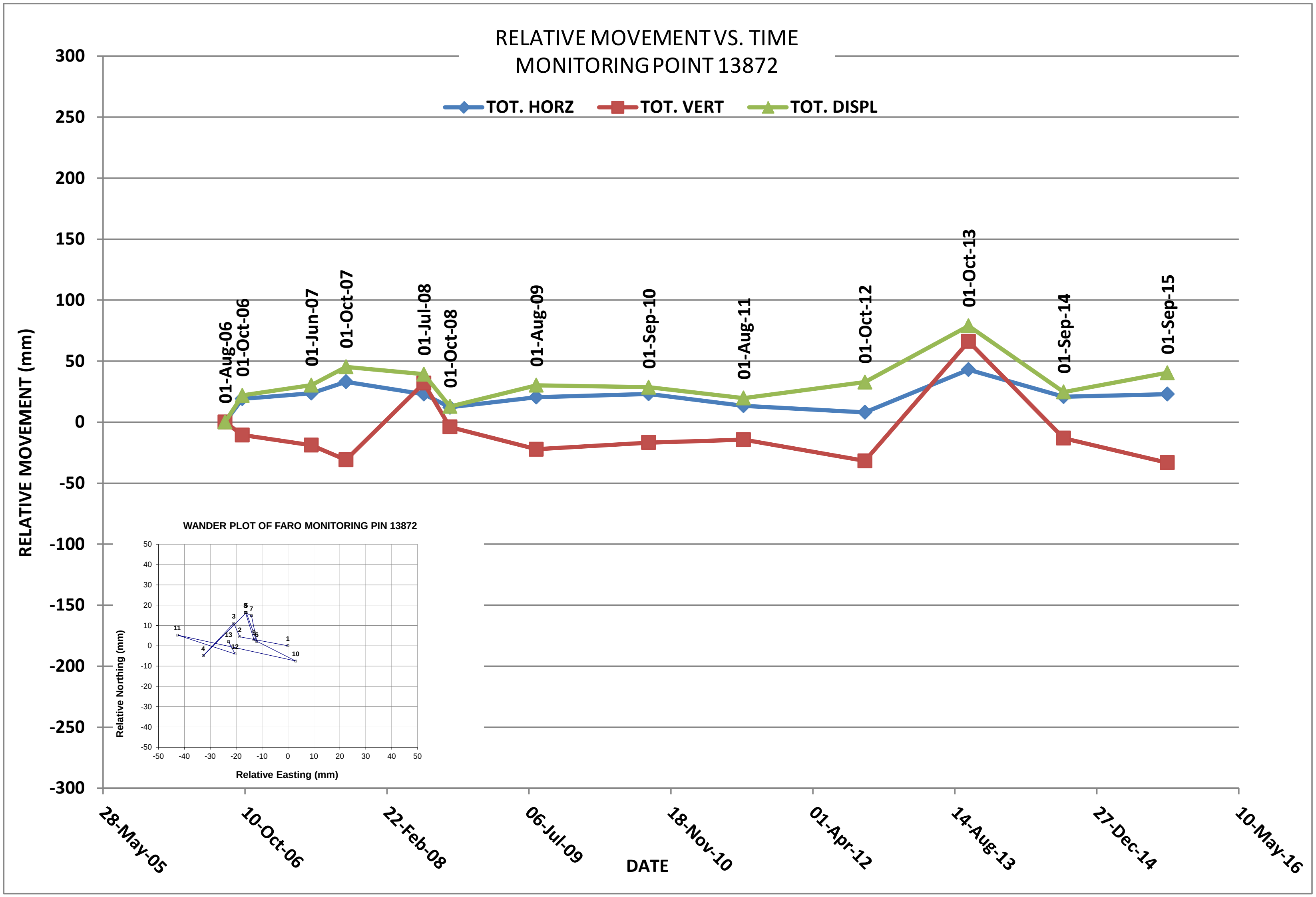


CLIENT	YUKON GOVERNMENT
CONSULTANT	Golder Associates

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

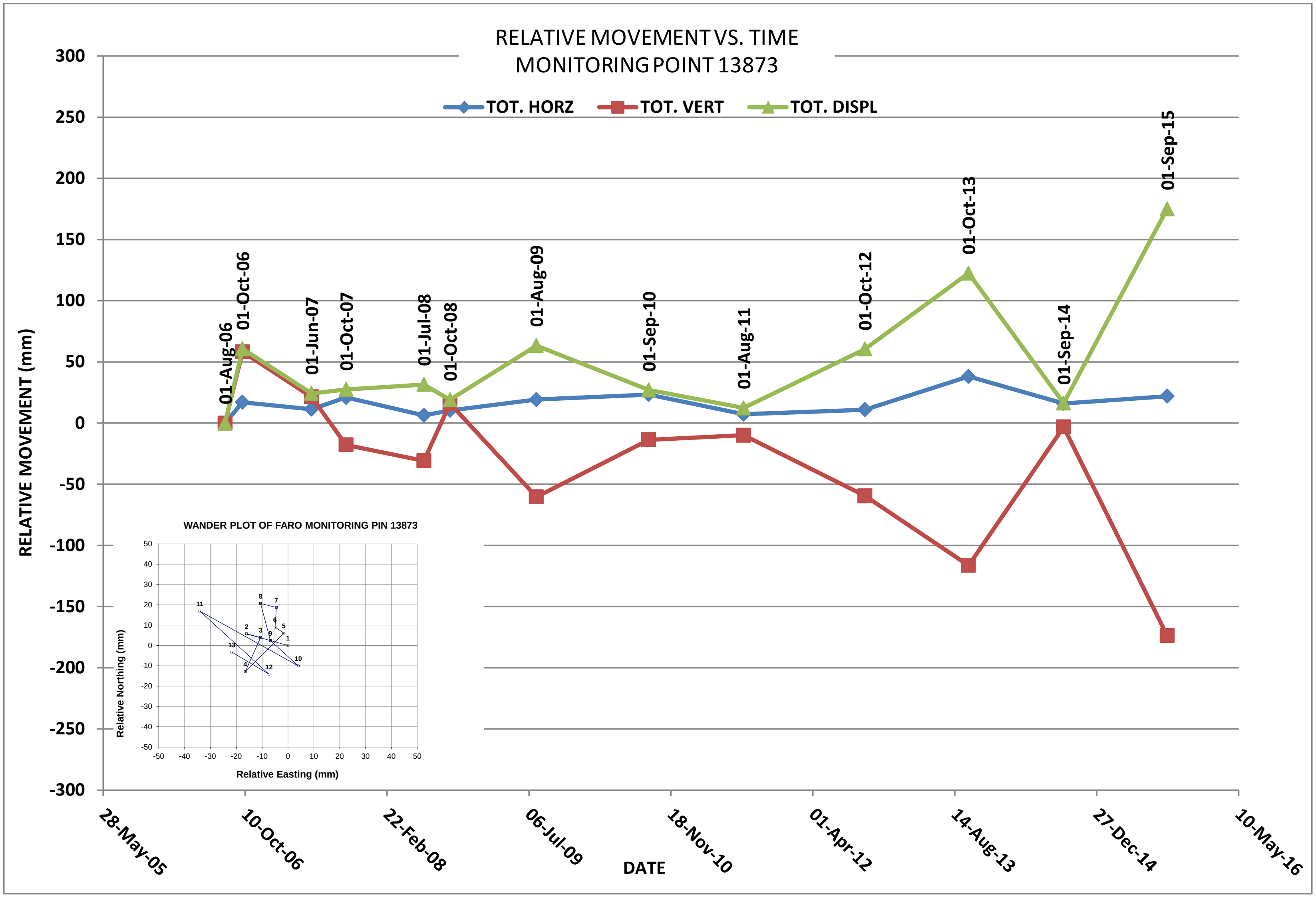
PROJECT 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE

FARO MONITORING POINT 13872

FIGURE No. D-1



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

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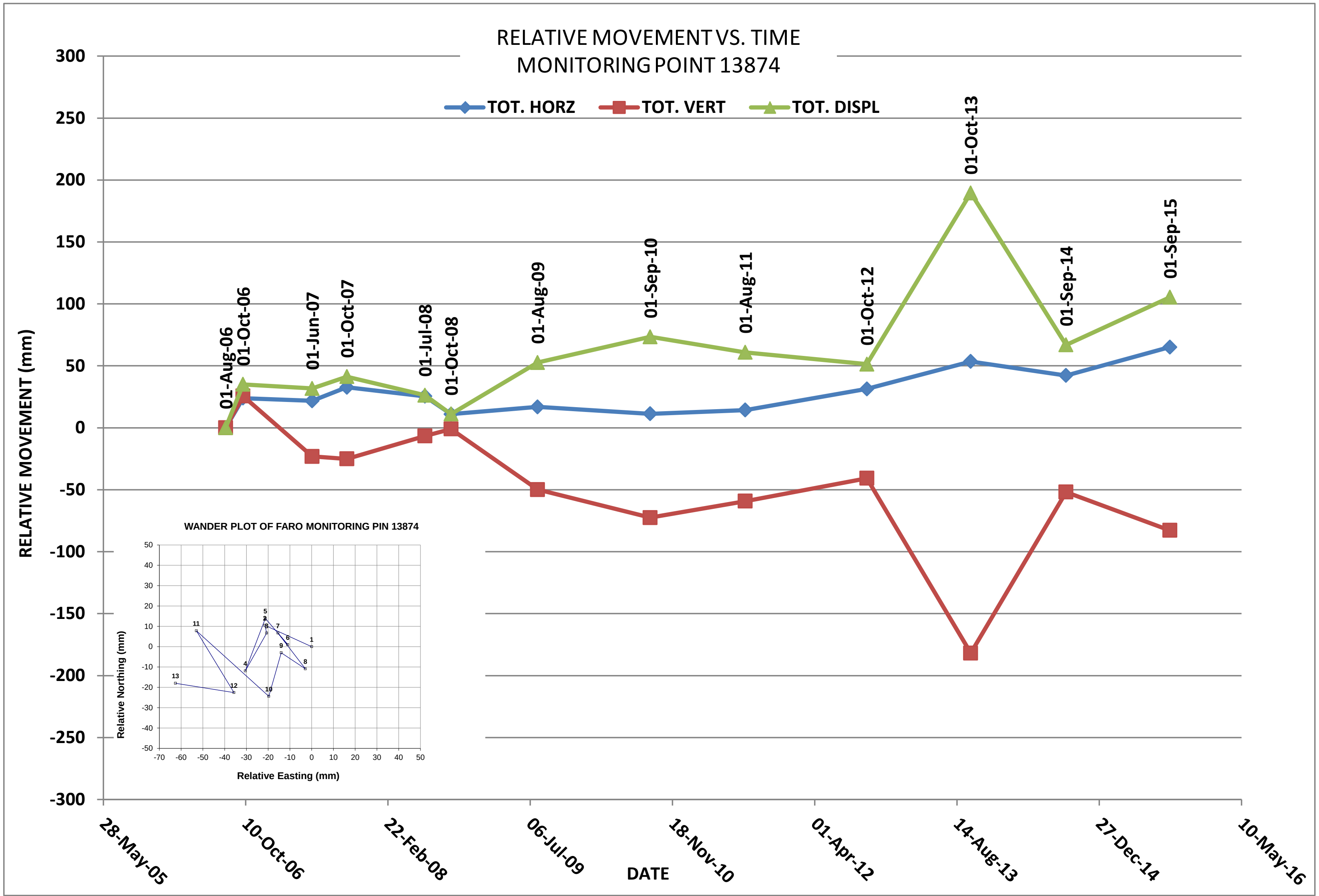
FARO MONITORING POINT 13873

FIGURE No. D-2



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT
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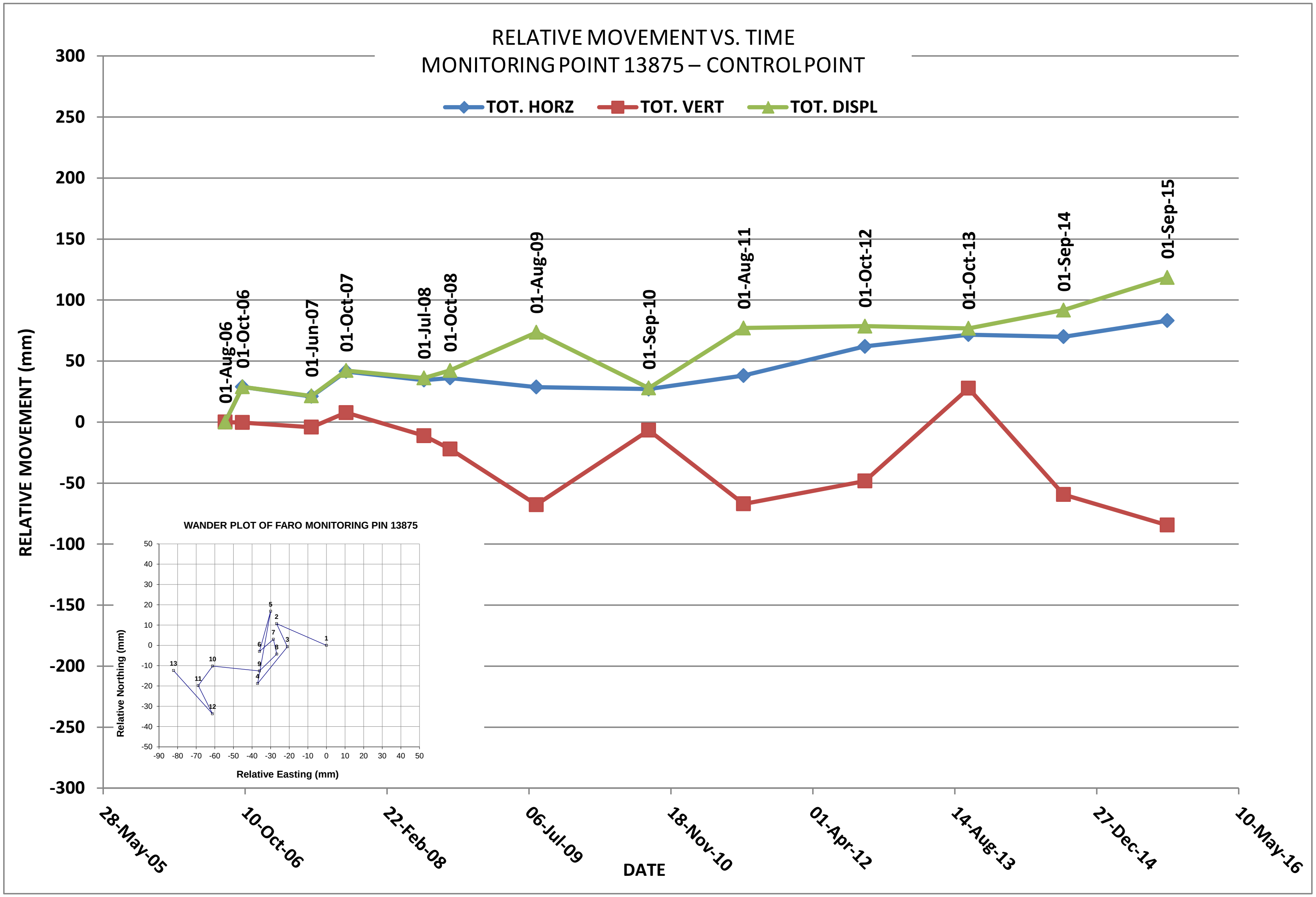
Golder Associates

TITLE
FARO MONITORING POINT 13874

FIGURE No.
D-3



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT

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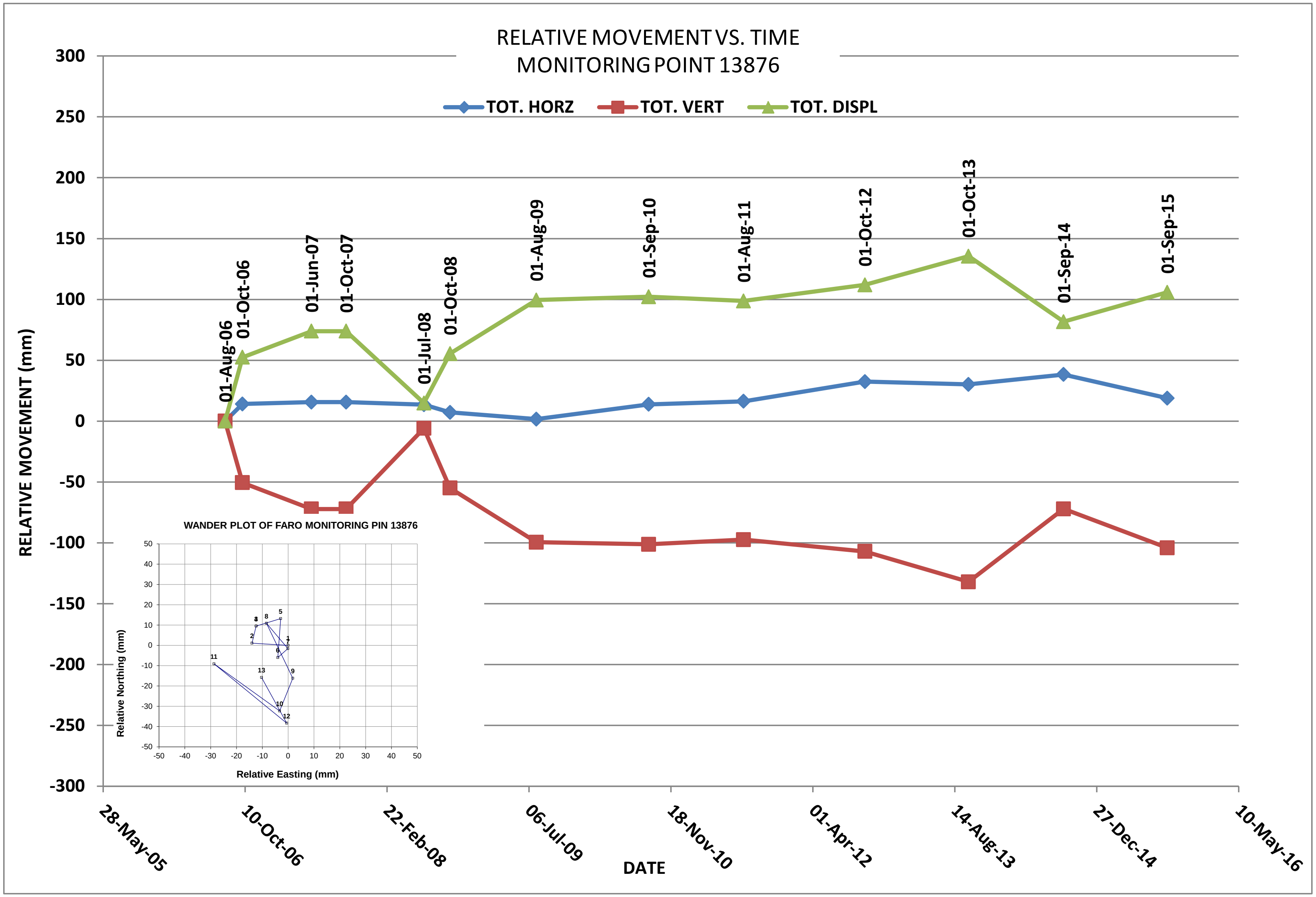
FARO MONITORING POINT 13875

FIGURE No.
D-4



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

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FARO MONITORING POINT 13876

FIGURE No.
D-5

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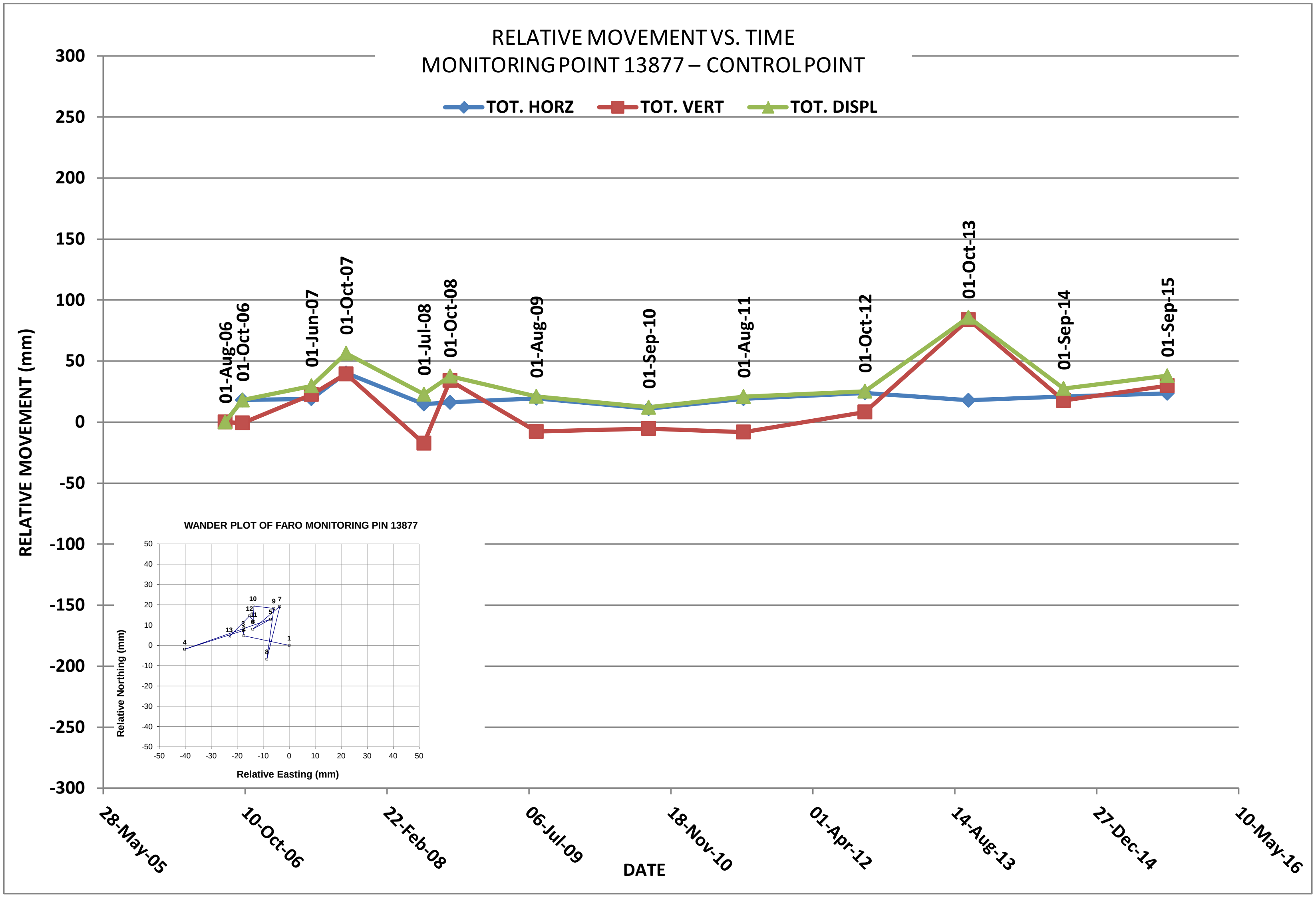

0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT
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TITLE
FARO MONITORING POINT 13877

FIGURE No.
D-6

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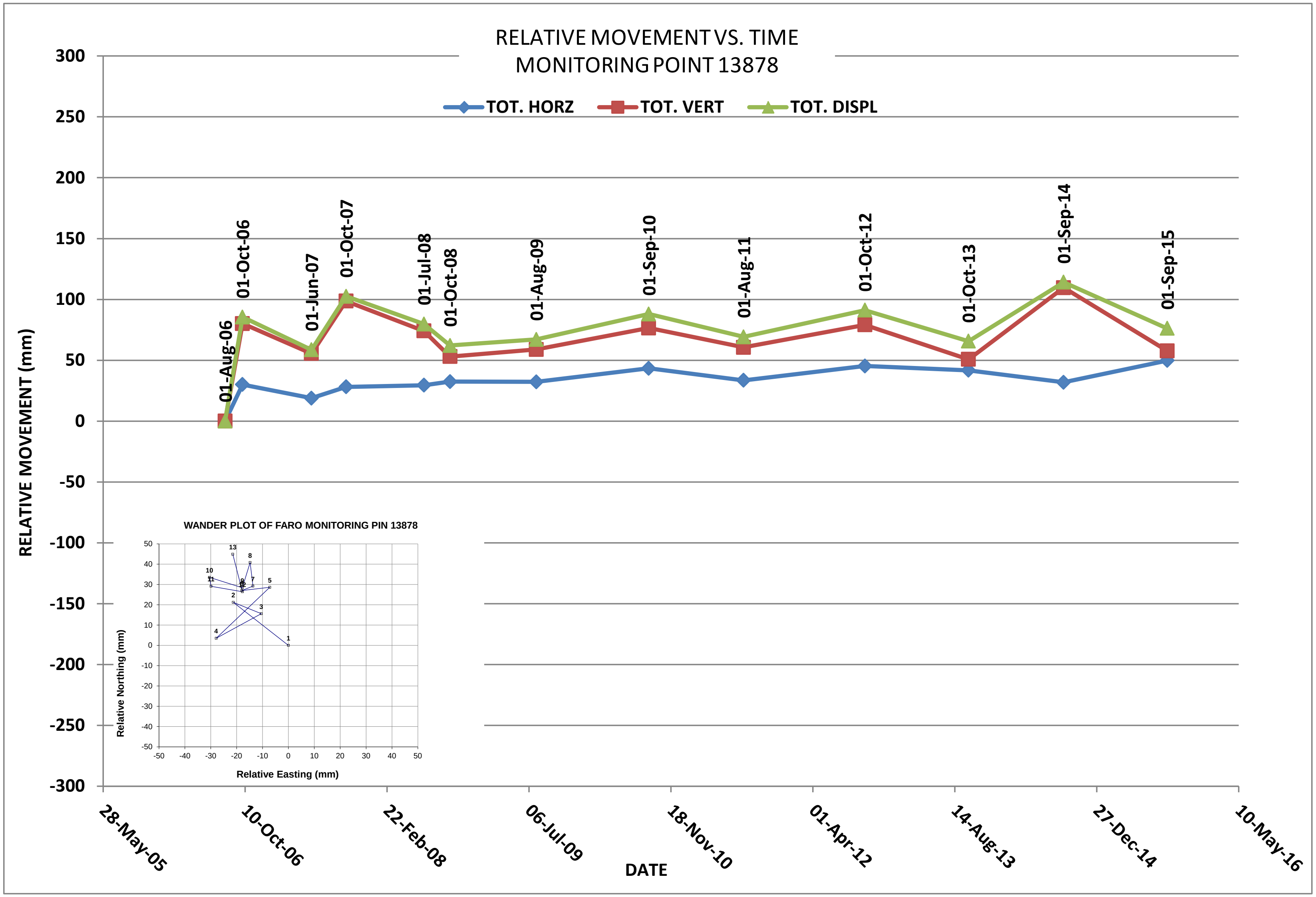

0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

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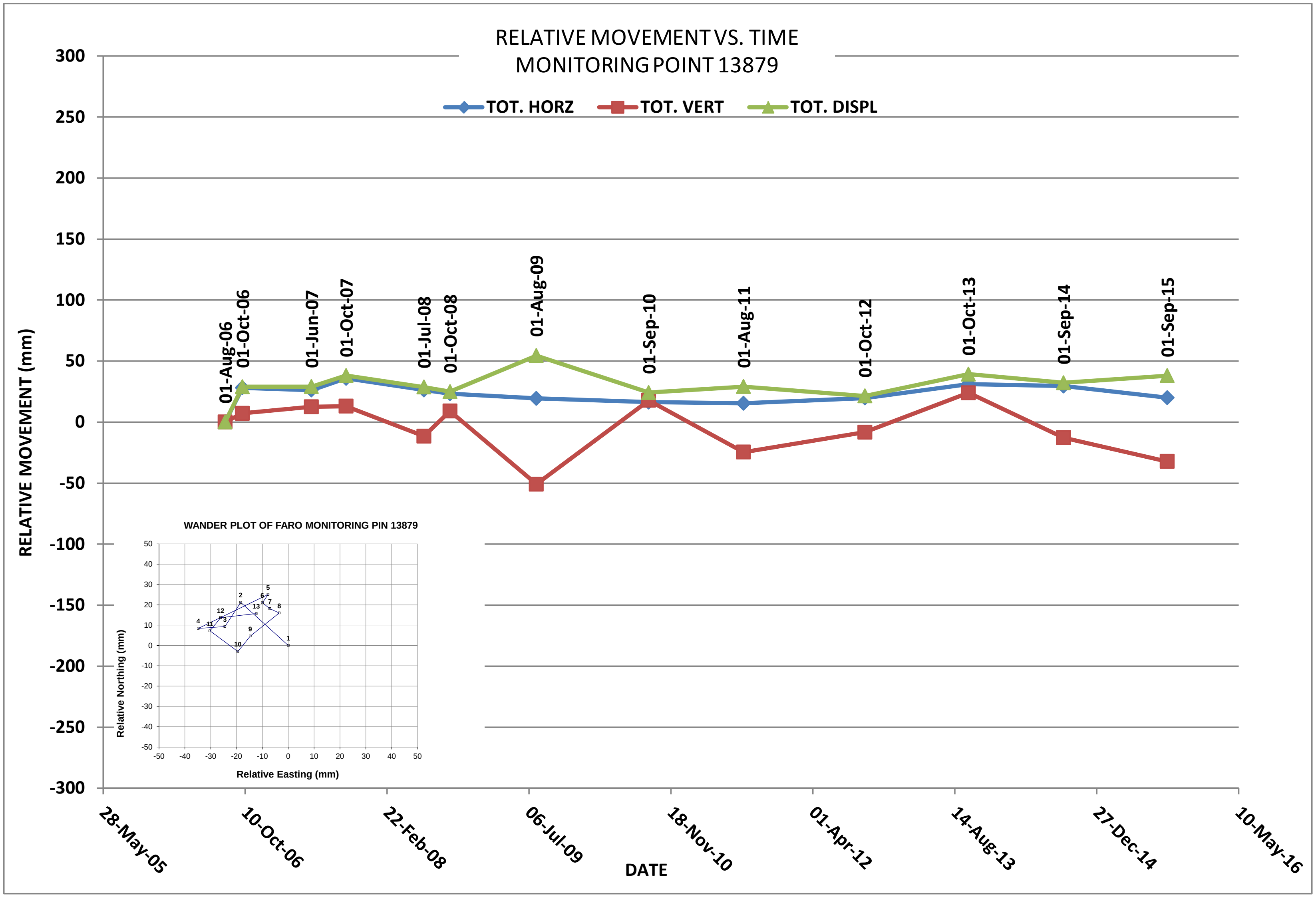
2015 PIT SLOPE STABILITY REVIEW

CONSULTANT: Golder Associates

TITLE: FARO MONITORING POINT 13878

FIGURE No. D-7



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT

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FARO MONITORING POINT 13879

FIGURE No.
D-8

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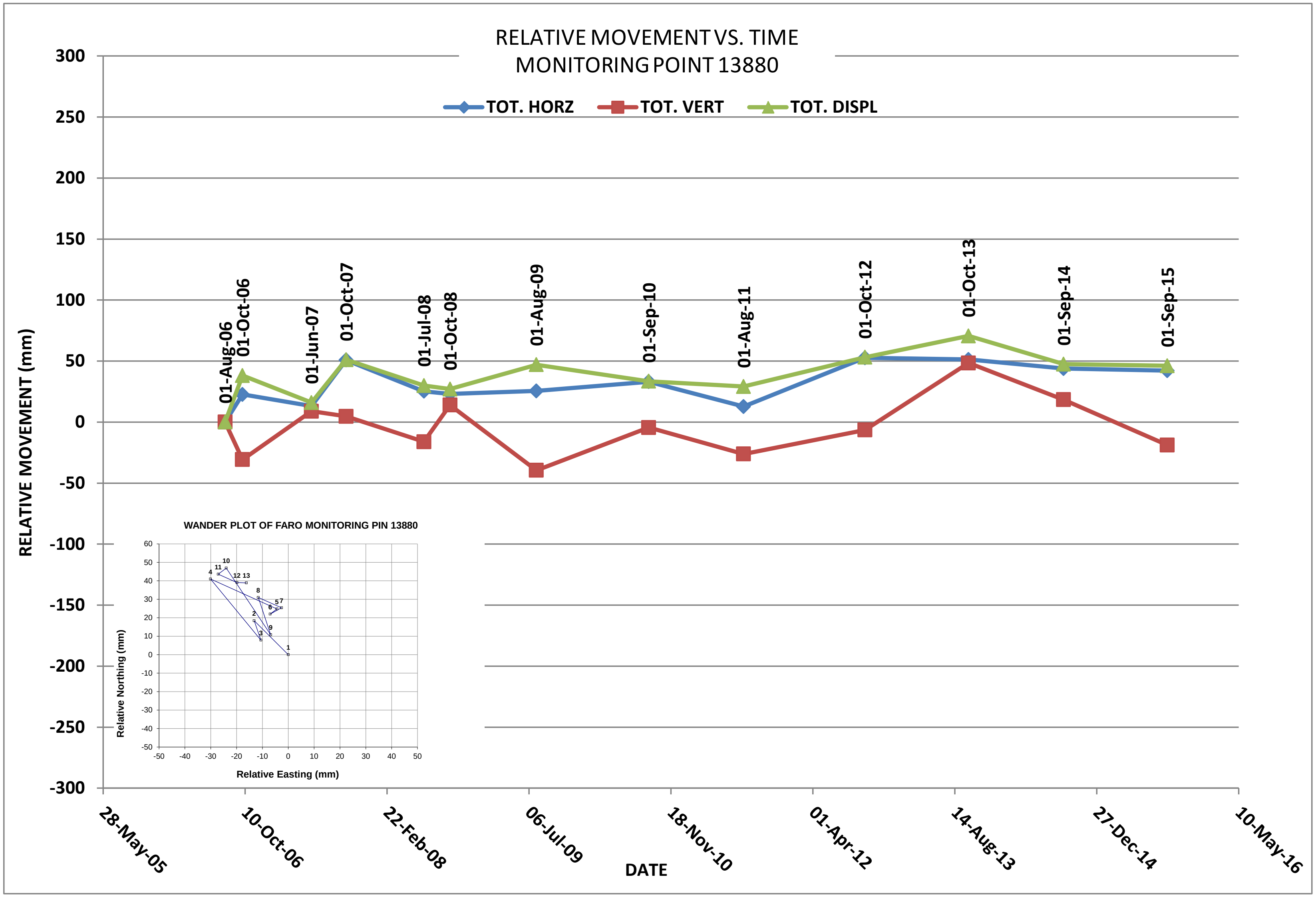

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT

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FARO MONITORING POINT 13880

FIGURE No.
D-9

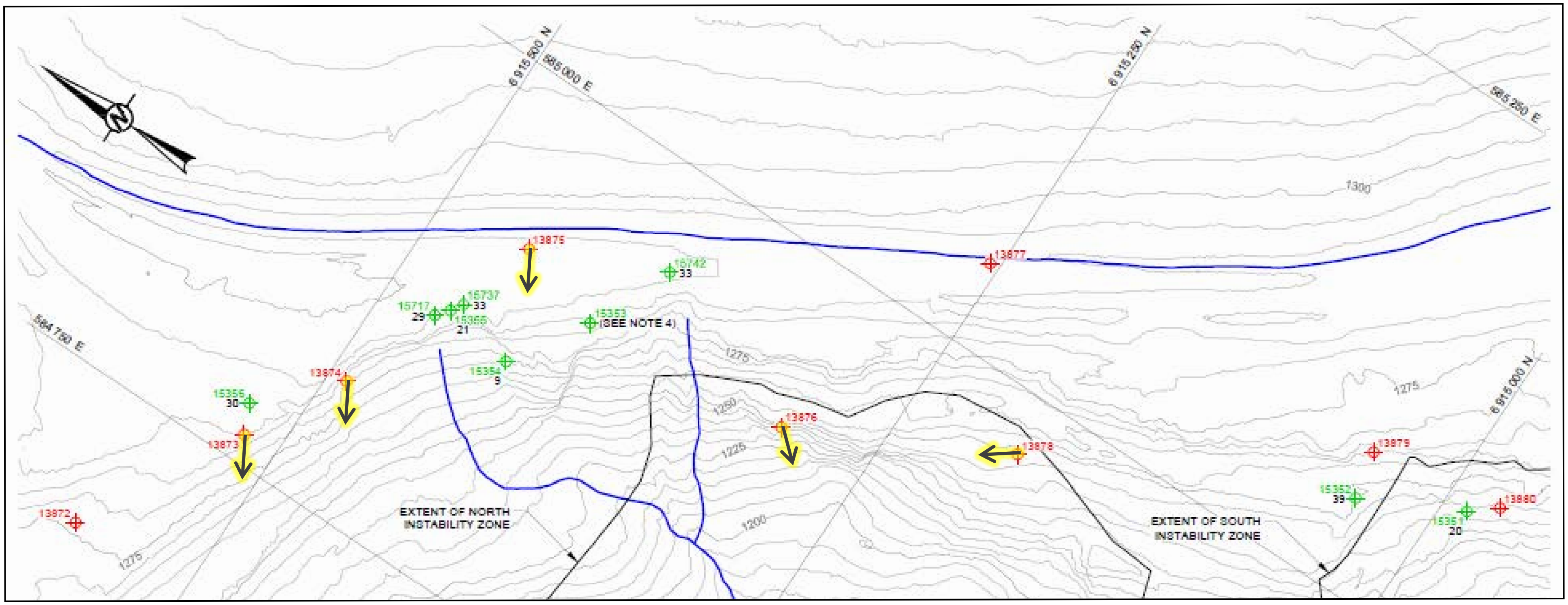

Table D-1: Summary of Monitoring Point Displacement Data(1)

MONITORING POINT	TOTAL CUMULATIVE DISPLACEMENT (2006 – 2015) (mm)	NET AZIMUTH (deg.)	NET PLUNGE (deg.)
13873	175.1	261.4	-82.8
13874	105.3	254.0	-51.8
13875	118.5	261.4	-45.4
13876	105.8	213.1	-79.7
13878	76.2	334.4	49.2

NOTES:

1. TABLE LISTS ONLY MONITORING POINTS EXHIBITING DISPLACEMENTS. THE REMAINING MONITORING POINTS DO NOT EXHIBIT DISPLACEMENTS BEYOND THE ACCURACY OF THE MONITORING SYSTEM.
2. FIGURE NOT TO SCALE.
3. DISPLACEMENT VECTORS SHOW THE AZIMUTH OF THE DISPLACEMENT TREND. VECTOR LENGTH IS NOT TO SCALE.

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	16/SEP/14 04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

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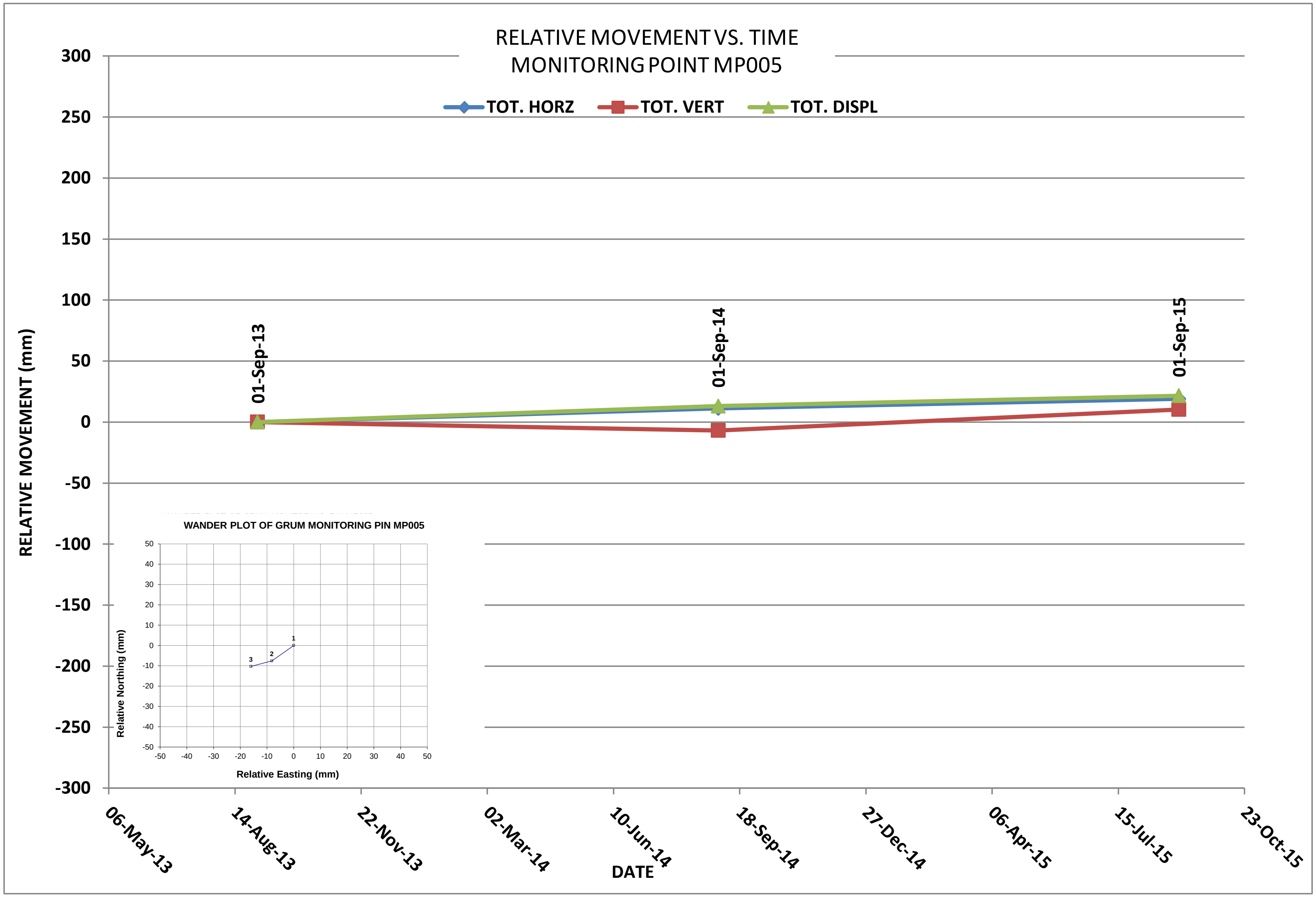
TITLE

DISPLACEMENT VECTORS
FARO MONITORING POINTS

FIGURE No.
D-10



REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015

FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM MONITORING POINT MP005

FIGURE No. D-11

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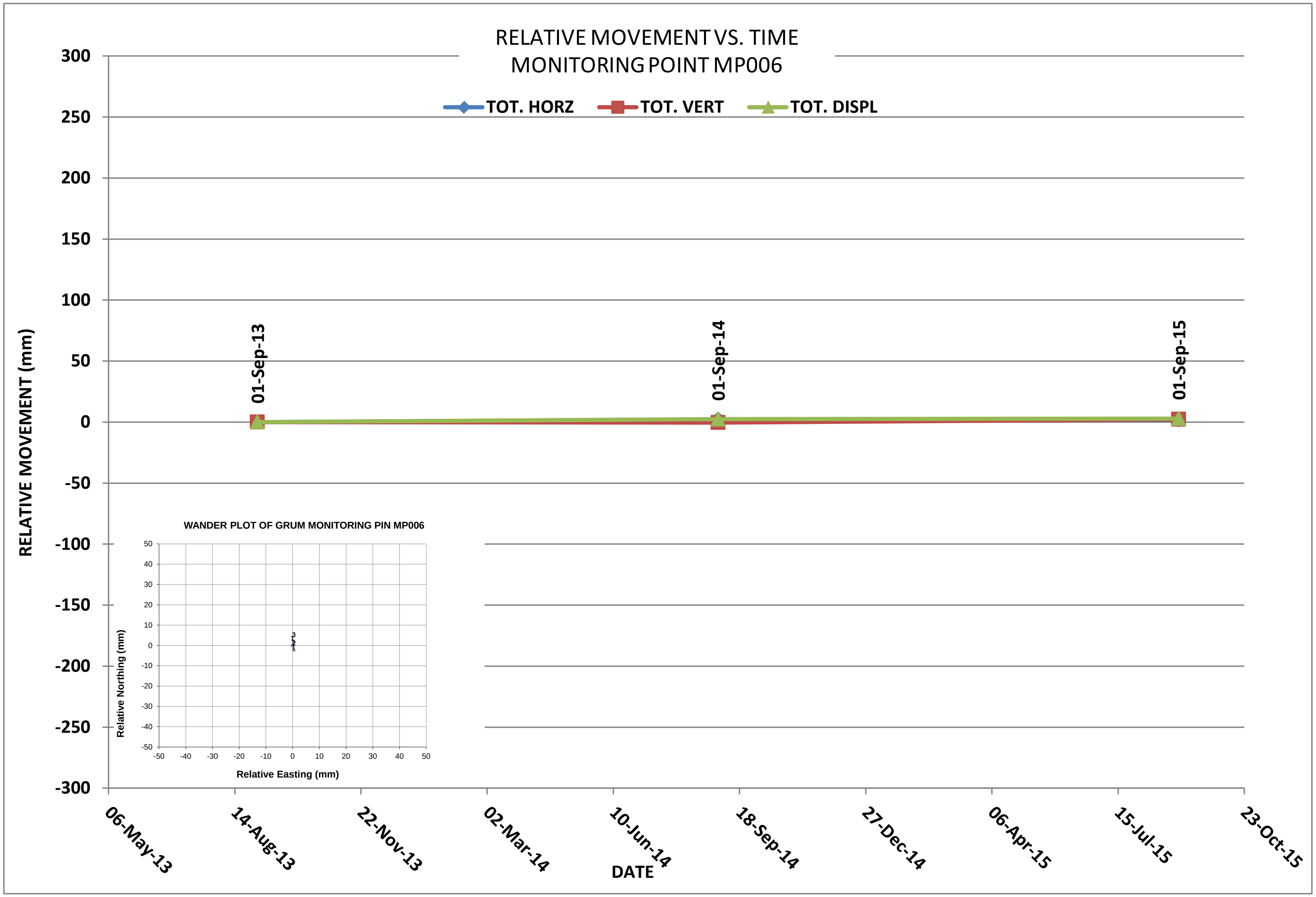


REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

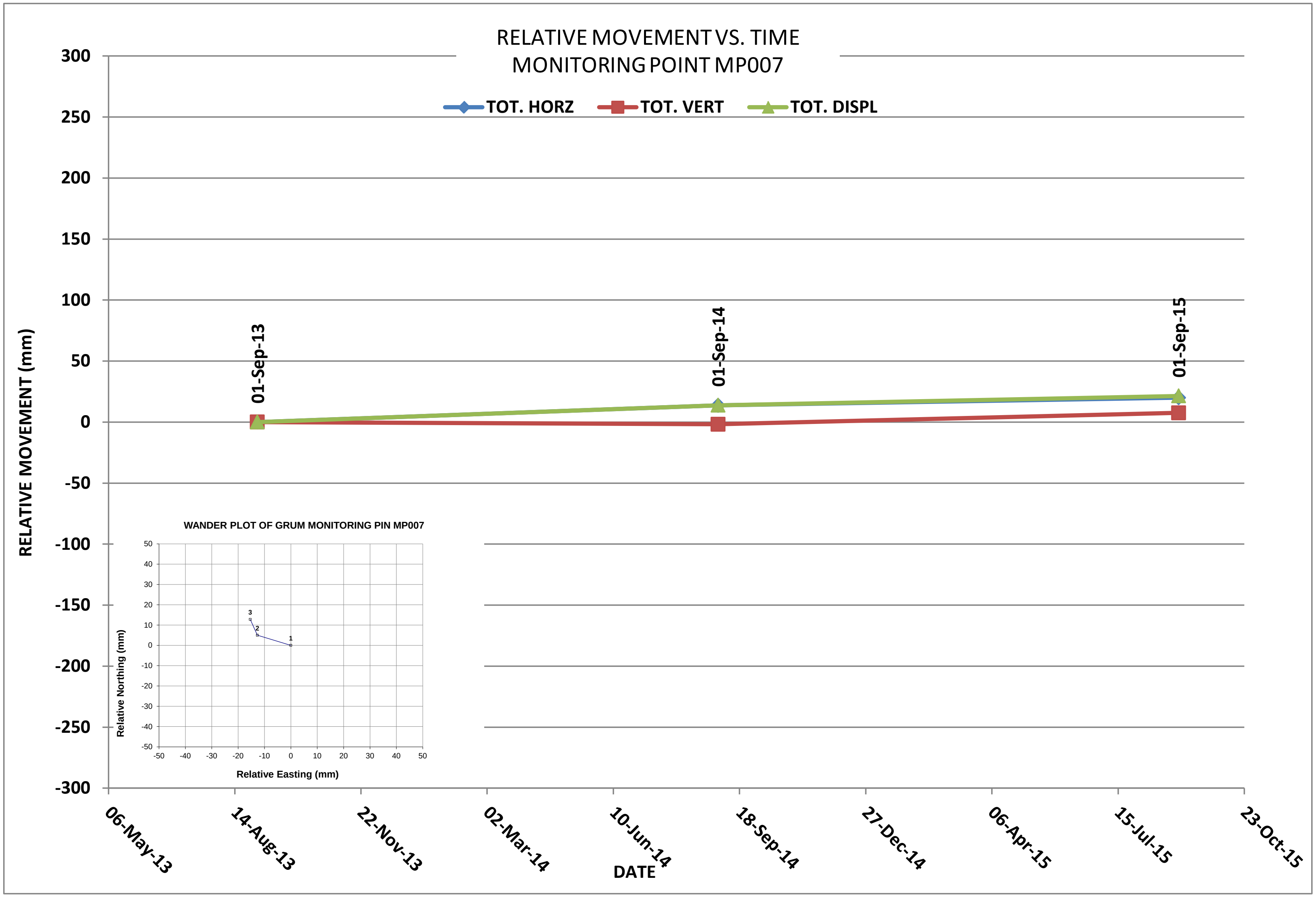
CLIENT: YUKON GOVERNMENT

CONSULTANT: Golder Associates

PROJECT: 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE: GRUM MONITORING POINT MP006

FIGURE No. D-12



0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC
REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW

CLIENT
YUKON GOVERNMENT

PROJECT 1410944/2015
FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

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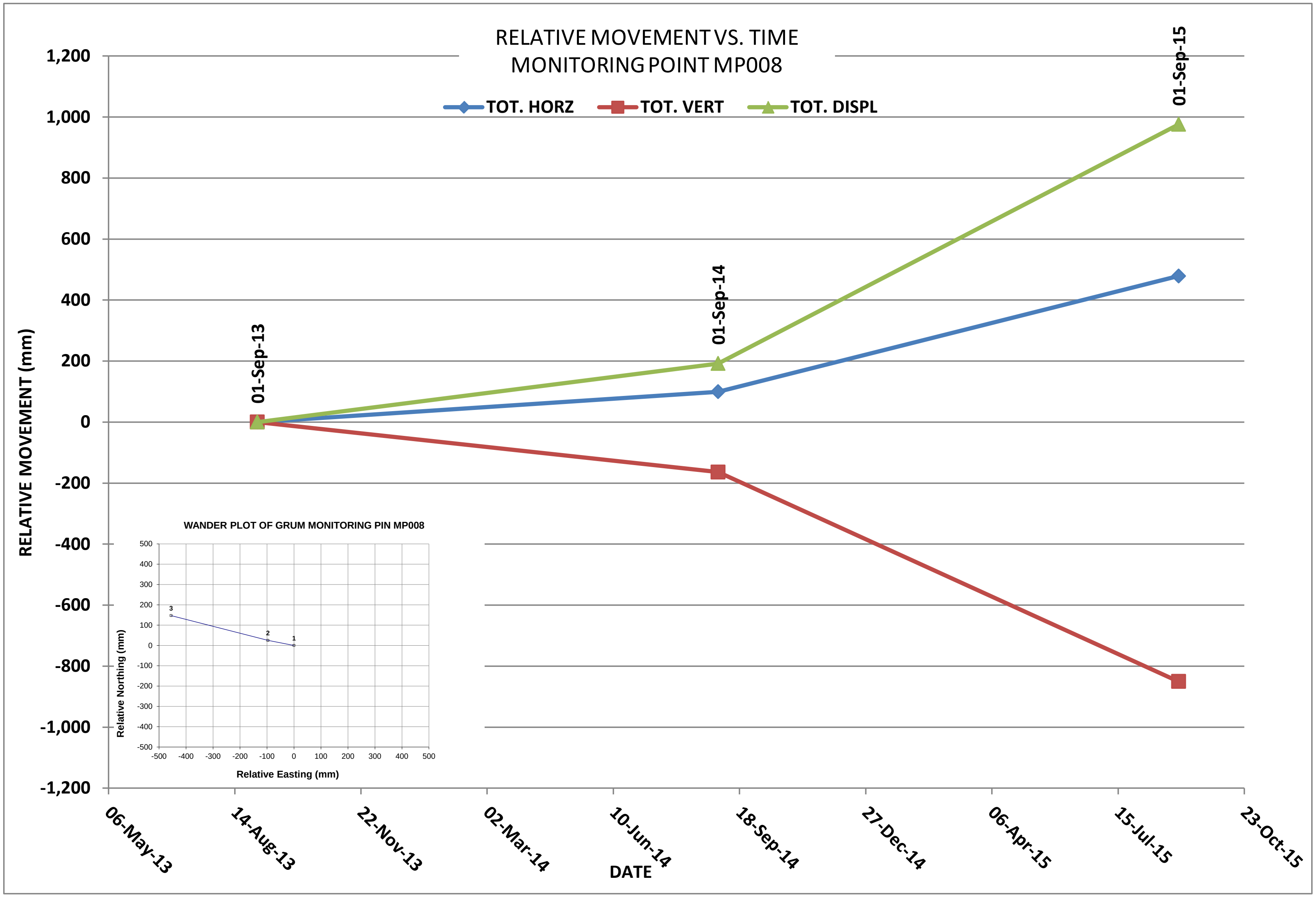
TITLE
GRUM MONITORING POINT MP007

FIGURE No.
D-13



REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	04/NOV/15	FIGURE	JJR	JJR	AVC	AVC

CLIENT
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FARO MINE COMPLEX
2015 PIT SLOPE STABILITY REVIEW

TITLE
GRUM MONITORING POINT MP008

FIGURE No.
D-14

APPENDIX E

Summary of Recommendations

Table E-1: Summary of Faro Mine Complex 2015 Pit Slope Inspection Recommendations

Pit	Recommendation	Level of Importance and Timeframe for Action
Faro	■ The survey monitoring points should continue to be surveyed once per year by the survey contractor. As previously recommended, the monitoring point survey data should be plotted as soon as possible to determine if there is an error with the survey so that the monitoring points can be re-surveyed if necessary before they are covered with snow. Considering that the monitoring points are only surveyed once a year, not reviewing the data in a timely manner could result in significant displacement of the slope not being detected in a timely manner.	High - Long Term
	■ The water level in the pond behind the waste dump in the northwest corner of the pit (Faro Valley Rock Dump) should be visually monitored during the spring and fall, and should be pumped again in the fall if water levels are high, to maximize the storage capacity in case of a failure of the Faro Creek Diversion.	Medium - Long Term
	■ The pond level and the integrity of the waste dump platform (referred to above) should be assessed by a geotechnical engineer to ensure that the waste dump platform will not fail due to the ponded water.	Medium - Short Term
	■ Monitor the water in the ditch on the east side of the berm on the east wall during the spring and fall. If large amounts of ponded water are observed, grade the ditch to channel the water to the south, rather than form large ponds of water that could infiltrate the slope.	Low - Long Term
■ Grum	■ Continue to visually monitor the instability zone on a monthly basis. The survey monitoring points should continue to be read once per year by the survey contractor. Golder and YG to discuss adding additional survey points using existing structures behind the crest or installing additional stakes.	High - Short Term
	■ If the old power pole on the dropped portion of the crest of the east wall (Figure B-7) is supporting a live wire, consider relocating the pole behind the instability zone. Alternatively, if it is not supporting a live wire, then it is not necessary to relocate or remove it.	Medium - Short Term
	■ Extend the berm at the end of the access ramp into the pit beyond the power poles. If the berm is not extended, a minimum setback distance of 10 metres is recommended for any work carried out in the area of the rockfall zone. Install a sign to inform workers of rockfall hazard and the required setback distance.	High - Short Term
	■ Relocate the power pole on the north slope above the Grum Slot Cut to a more stable location.	Medium - Short Term
	■ Lower the culvert shown in Figure B-13 to allow water to drain along the full length of the Grum Interceptor Ditch.	Medium - Short Term
	■ If large areas of ponded water are observed behind the crest of the east wall, grade the area to minimize ponded water and infiltration into the slope as well as to control runoff onto the slope face.	Medium - Long Term
	■ Monitor the waste material at the end of the Grum Slot Cut for erosion and possible breaching.	Medium - Long Term
	■ Clear the vegetation from the south end of the Grum Interceptor Ditch.	Low – Long Term
Vangorda	■ Reslope the north side of the upper west wall, similar to what has been done on the south side. The central portion is not oversteepened and can remain in its current configuration.	High - Long Term
	■ Repair or replace the Vangorda Flume as soon as practicable to limit the amount of water that is seeping into the slope on the north side.	High - Long Term
	■ Extend the berm on the west side of the access road to the end of the road, to provide rockfall protection to personnel working near the slope, as shown in Figure C-10. Move equipment to the outside of the berm so personnel do not work near the toe of the slope.	High - Short Term
Overall	■ Implement the photography / photogrammetry-based remote monitoring system as soon as practicable. Incorporate pit slope stability into the Emergency Response Plan.	High – Short Term
	■ Request that the survey contractor measure and report slope distance when surveying the monitoring points in the Faro and Grum Pits.	High – Long Term

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