Deloitte & Touche

Anvil Range Mining Complex 2005 Seepage Investigation at the Grum Dump Area

2005/06 - Task 20e

Prepared for

Deloitte & Touche Inc.

on behalf of

The Faro Mine Closure Planning Office

Prepared by

SRK Consulting
Engineers and Scientists

In association with

Robertson GeoConsultants Inc.
Mining, Geotechnical and Environmental Engineers

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Anvil Range Mining Complex

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2005/06 Task 20e

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On behalf of

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Executive Summary

As part of the Task 20e, “Continue seepage investigations” program, a series of monitoring wells have been installed along the Grum Dump toe access road to provide an improved understanding of subsurface conditions and groundwater quality in relation to potential contamination of Vangorda Creek. These new monitoring wells indicate that:

- There is a bedrock low in the area of P96-9 and SRK04-5 that has a relatively thin (2 to 6 meters), shallow, unconfined aquifer and a deeper, thicker confined aquifer that likely includes weathered bedrock (thickness of 6 to 7 meters at depths greater than 7 to10 meters).
- Overburden thickness decreases significantly west of P96-9, from about 20 meters near SRK04-5 to about five meters at SRK05-8 and less than five at SRK05-7.
- Water quality in the shallow aquifer generally shows higher sulphate concentrations than the deeper aquifer. Zinc concentrations are still relatively low (<0.02 mg/L) in both the shallow and the deep aquifer, compared to the current reference value for P96-9A of 0.078 mg/L, suggesting zinc attenuation along the flow path. Time trend plots suggest that sulphate concentrations in the shallow aquifer (at P96-9A) are still increasing (currently at 1,600 mg/L), though still below the reference value of 2308 mg/L, whereas zinc concentrations in the same well have remained fairly constant since 2003.

Preliminary loading calculations suggest that the zinc load in groundwater in this area is small (<0.2 tonnes/year). Therefore, seepage collection is not recommended at this time. However, this area should be monitored for any potential increase in zinc concentrations in the existing monitoring wells. If zinc concentrations in the local groundwater increase beyond currently observed levels, seepage interception may be required to protect Vangorda Creek.

At this time, it is recommended that routine monitoring in this area continue on at least a biannual basis. Routine monitoring should include water level monitoring and sampling for water quality analysis in all monitoring wells in this area (including replacement well P96-9B(R)), and an estimation of flow rate for flowing artesian wells.

During the 2006 summer monitoring program, note should be taken on whether P96-9B(R) is flowing freely (artesian) or the water level resides very close to ground surface. As the original P96-9B monitoring well was artesian, it is likely that the replacement will also be artesian. Freezing of shallow water levels during the winter months may be the cause of damage to the original well. If the well is indeed artesian, a mechanical packer (“margo” plug) should be installed at this well for the winter period to prevent freezing and possible damage to this replacement well, similar to that completed in SRK04-5A&B during the 2005 program.

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1 Introduction and Scope of Work

This report presents results of the 2005/2006 hydrogeology program for the Grum Dump area as part of Task 20e – Continue Seepage Investigations. Task 20e includes investigations at four areas: the Emergency Tailings Area (ETA), the S-cluster area, the Zone 2 Pit outwash area, and the Grum Dump area. The scope of work of this report covers the Grum Dump component, the primary objectives of which were:

- Completion of a shallow piezometer along Grum Creek to get information on very shallow groundwater flow,
- Capping of flowing artesian piezometers (SRK04-5a&5b),
- Replacement of piezometer P96-9b (deep piezometer); and
- Installation of a nested piezometer between the two un-named creeks west of P96-9.

Figure 1 shows location of the Grum area.

Both groundwater and surface water in this area have been investigated as part of different programs regarding potential impacts to Vangorda Creek, located down gradient of the Grum waste rock dump. While the 2005/2006 Task 20e investigation focused specifically on groundwater, surface water and a groundwater component have also been investigated as part of the AMP (Adaptive Management Plan) Event #4 Response. In essence, the Task 20e and AMP program in this area are providing a combined monitoring and assessment program for impacts to Vangorda Creek from the Grum Dump and Pit. As such, in order to avoid duplication, readers are referred to data assessments in the AMP reports, where appropriate.

In the report, a brief review of background information is presented in Section 2. Descriptions of field program methodologies and results are presented in Section 3. Contaminant sources and groundwater loading estimates are described in Section 4. Section 5 briefly discusses the implications of this study for seepage interception in this area.

2 Background

2.1 Initial Data Review

A series of memoranda were produced by Robertson GeoConsultants (RGC) in 2004, providing initial review and comments on groundwater quality downstream of the Faro, Grum and Vangorda waste rock dumps (WRDs):

- Initial Review of Groundwater Quality downstream of Faro, Grum and Vangorda WRDs, Yukon Territory, July 14, 2004 (RGC, 2004a); and

- Task 14b – Complete Seepage Investigations for Faro and Grum Waste Rock Dumps, August 13, 2004 (RGC, 2004b).

Five reaches were reviewed by RGC for potential ARD seepage from the Grum and Vangorda waste rock dumps (RGC, 2004a). The following is a brief review of findings.

Grum Dump draining southeast

Water quality data was reviewed from monitoring wells located in a tributary of Grum Creek below the central portion of the Grum Dump (P96-9). Seepage from the Grum Dump was interpreted to have had a smaller impact on local groundwater than seepage from the (older) Faro waste rock dumps. Sulphate concentrations in the shallow monitoring well had increased only in the last four years, from ~50 mg/L in 1996 to ~1250 mg/L in 2003. Zinc concentrations remained low in the shallow groundwater at ~0.01 mg/L. The deeper, confined aquifer showed consistently low sulphate concentrations for the period of record (~150 mg/L until 2001). The deep monitoring well (P96-9B) was damaged in 2001 and could no longer be monitored. Shallow groundwater along the southeast slopes of the Grum Dump was interpreted to represent seepage from the Grum Dump with limited dilution from recharge and/or local groundwater. It was thought that shallow seepage collection in this area could become a future issue (for protection of Vangorda Creek) and was given a moderate priority relative to the Faro sites. While no indication of breakthrough of seepage to the deeper, confined aquifer has been observed, this was considered an important monitoring point below the Grum Dump and replacement of P96-9B was recommended, though as a relatively low priority.

Grum Dump draining southwest

No groundwater monitoring wells were available in this area, but based on results from a seep survey by SRK in 2003, sulphate and zinc levels were observed to be low (SO4 <500 mg/L; Zn <0.03 mg/L). Groundwater quality to the southwest of Grum Dump was not expected to show significant impact of WRD seepage and seepage interception in this reach was given a low priority.

Potential Seepage from Grum Pit

Review of available pit and seepage water level elevations suggested a possible presence of pit induced seepage but water quality data from the pit and seeps ruled out pit water as a source of seepage. A desktop review of available material was suggested, with additional fieldwork based on results, if necessary.

Vangorda Dump draining towards Dixon Creek

Water quality data from the two available monitoring wells, V34 and V35, showed contrasting conditions. V34 was interpreted to be representative of background conditions with pH of 7.5-8.0, high alkalinity (~400 mg/L) and low metals (Zn ~0.01 mg/L). V35 showed limited influence of WRD seepage. Sulphate had increased over time, with peak concentrations of 750-1,000 mg/L, but zinc remained low (0.01-0.1 mg/L). Seepage collection in this area was given a low priority.

Vangorda Dump draining towards Vangorda Creek

Data from six monitoring wells were reviewed for this reach. All wells, with the exception of one, showed levels representative of background conditions. One well, V36 provided early indications of the potential presence of WRD seepage. In general, however, groundwater in this reach was interpreted to show very little impact of WRD seepage and seepage interception in this area was considered to be a low priority.

2.2 2004 Seepage Investigation

As a result of the RGC water quality review, recommendations were made for a field program, including installation of additional groundwater monitoring wells (RGC, 2004b). As part of the 2004 program, two monitoring wells were installed in the Grum area: SRK04-5a & 5b, shown on Figure 1. Details of these completions and borehole logs, as well as conclusions for preliminary seepage collection options, are presented in the 2004 program report: ***Preliminary Seepage Collection Options – Faro and Grum Waste Rock Dumps (SRK, 2006)***.

2.3 Adaptive Management Plan (AMP)

At the same time as the 2004 seepage investigation, an adaptive management plan was being established by Gartner Lee Limited for the Anvil Range Mine, including the Vangorda Creek area. The AMP is described in the following document:

Anvil Range Mine Adaptive Management Plan Implementation Protocol, Draft Report – Gartner Lee Limited, 2004.

This report provides trigger levels and general response actions for the Grum Creek area. As noted in the report, sulphate levels at seep monitoring station V2 were above trigger limits at the time of report submission. As a result of this trigger, an investigation into contaminant sources and installation of additional monitoring wells was completed. The 2005 groundwater component of Task 20e overlapped with the AMP Event #4 response.

3 Field Investigation

3.1 Monitoring Well Drilling and Installation

Six new monitoring wells were drilled in the Grum area in 2005. Three of these monitoring wells were drilled specifically under Task 20e. The remaining three were part of the on-going AMP program. Details of all six wells are included in this report. Table 1 lists completion details for these monitoring wells. The completion details for the monitoring wells installed at grum in 2004 are also shown for ease of reference. Borehole logs for all newly completed monitoring wells are provided in Appendix A.

Table 1: Grum Monitoring Well Summary

Well ID	Informal Name	Easting	Northing	Total Depth (m)	Top of Casing Elevation (m.a.s.l.)	Screen Interval (m.b.g.s.)
2004 Monitoring Wells						
SRK04-5A	n/a	592,871	6,903,205	23.7	1103.93	22.2-23.7
SRK04-5B	n/a	592,871	6,903,205	14.6	1103.95	13.1-14.6
2005 Monitoring Wells						
P96-9B(R)	n/a	592,747	6,903,172	18.6	1101.06	15.5-18.6
SRK05-5C	n/a	592,873	6,903,208	3.2	1104.08	1.5-3.0
SRK05-6	Moose Well 1	593,032	6,902,991	3.2	1073.83	0.7-2.7
SRK05-7	n/a	592,477	6,903,011	4.3	1107.29	0.5-3.5
SRK05-8	n/a	592,690	6,903,063	5.8	1105.25	0.75-5.8
SRK05-9	Moose Well 2	593,058	6,902,986	7.6	1072.82	2.1-7.6

Note that two of the monitoring wells, SRK05-6 and SRK05-9, have been informally called Moose Well 1 and Moose Well 2, respectively. These informal names have been used in the Gartner Lee Ltd (GLL) water quality database, as well as other reports. P96-9B(R) is a replacement monitoring well for P96-9B, which was damaged in 2001.

The 2005 Grum drilling program was conducted using two different drill types: A track mounted sonic drill owned and operated by SDS Sonic Drilling out of Calgary, Alberta; and a hand-portable Pionjar hammer drill operated by Rocky Mountain Soil Sampling, Inc. of North Vancouver, BC.

The sonic rig was equipped with a 4x6 system (4-inch core barrel and 6-inch casing) that allowed for continuous sampling in 10-foot runs (1 core barrel: approximately 3 metres) by advancing the core barrel using ultra-sonic vibrations. Casing was advanced over the core barrel to below the bit to keep the hole open during barrel retrieval. Water was only used during casing advancement to prevent heave between barrel and casing. Run samples were extruded into 4-inch diameter clear plastic sample bags for logging and grab sampling. Rods and casing were in imperial units and all units have been converted to metric. Final drillhole diameter was 152 mm (six-inches). All boreholes drilled with the Sonic rig were completed as monitoring wells using 50 mm (2-inch) polyvinyl chloride (PVC) screen and casing.

The portable Pionjar hammer drill is a flexible system suitable to work in areas where access is difficult, such as the Moose Pond area at Grum. It is mainly suitable for shallow boreholes, as its investigation depth is usually limited to around 10-12 m below surface. It is equipped with a 2-inch split-tube sampler that allows for continuous sampling in 2.5-foot runs (75 cm long core sample). The sampler was pushed (‘hammered’) down by a portable gasoline combustion engine connected to the top of the rod string and the entire rod string (split-tube sampler plus rods) was retrieved between runs using a manual jack. The retrieved soil core was laid down on a sheet of canvas for logging and grab sampling.

Representative grab samples of the different stratigraphic intervals were collected into plastic sample bags. The final drillhole diameter was 2-inch (approximately 51 mm). These smaller diameter boreholes were completed as shallow piezometers using 1 ¼ -inch (approximately 32 mm) PVC screen and casing.

3.2 Hydrostratigraphy

Based on geology from available drillholes, four hydrostratigraphic units are defined for the Grum area:

- Surficial aquifer: gravelly fine to coarse sand with variable organics. Present at ground surface in vicinity of SRK05-5C and Grum Creek. Thickness varies from 2 to 6 meters.
- Till: clayey to sandy silt with trace gravel. Present in all drillholes, ranging in thickness from 2.5 to over 8 meters and in depth from just below ground surface to a maximum of approximately 15 meters. Acts as confining unit for deeper aquifer. This unit is likely the confining unit where the deep aquifer is present.
- Deep Aquifer: fine to coarse sand with gravel and underlying weathered bedrock. This deep aquifer was encountered at SRK04-5 and P96-9. Thickness in range of six to seven meters.
- Bedrock: chlorite schist to phyllite. Depths range from approximately 2 meters to approximately 20 meters below ground surface. Assumed to have a relatively low hydraulic conductivity.

Figure 2 is a cross-section through the site showing interpreted bedrock topography and overburden geology. The only significant feature is a bedrock low present in the vicinity of P96-9 and SRK04-5. To the west of P96-9, bedrock is much closer to ground surface and, consequently, the overburden units thin significantly. Insufficient data is available to the east of former Grum Creek (SRK04-5) to project the cross section in this direction. However, the local topography, as well as the presence of isolated bedrock outcrops, suggest that bedrock may also come closer to ground surface in this direction.

Available information suggests that the majority of groundwater flow occurs within the area of the bedrock depression. The exact extents of this bedrock low to the east of SRK04-5 are unknown, but the presence of isolated bedrock outcrops indicates that bedrock likely becomes closer to ground surface. Water level contours for the shallow aquifer are shown on Figure 2. While only limited monitoring points exist, these data suggest that the water table generally mimics surface topography. The potentiometric surface for the deeper aquifer is artesian (i.e. groundwater potentials are above ground surface) and likely shows a more subdued relationship with surface topography. This deep, artesian aquifer may extend to Vangorda Creek.

3.3 Water Quality

The AMP monitoring location for the Grum Creek Area is station V2, a surface water station on Grum Creek prior to the confluence with Vangorda Creek (shown on Figure 1). Sulphate concentrations at V2 exceeded the proposed trigger at the presentation of the AMP implementation report. Additional monitoring points, including the groundwater monitoring network described herein, are to aid in understanding the groundwater contaminant contributions to V2.

Samples for water quality have been taken from the majority of monitoring wells installed in 2005, as well as SRK04-5A/B installed in 2004. Laboratory analysis results are included in Appendix B. Available results are summarised in Table 2. The initial water quality results from the 2004 field program (for SRK04-5A/B) are also shown for comparison.

Table 2. Water Quality Summary

ID	Date	Lab pH	Lab Conductivity (µS/cm)	SO4 (mg/L)	Zn-D (mg/L)
Moose Well 2	10/3/05	7.66	1730	763	0.0094
SRK04-5A	9/25/04	n/a	n/a	108	0.0081
	5/9/05	7.96	449	89.8	0.0105
SRK04-5B	9/25/04	n/a	n/a	100	0.0154
	5/9/05	8.08	435	85.3	0.0066
SRK05-5C	11/22/05	7.51	651	173	<0.0050
P96-9A	5/9/05	7.41	3070	1600	0.0160
P96-9B	DAMAGED MONITORING WELL				
P96-9B(R)	NOT SAMPLED				
SRK05-7	NO WATER AT TIME OF SAMPLING				
SRK05-8	NO WATER AT TIME OF SAMPLING				

Station P96-9 was established as a Reference Water Quality Station in the AMP Implementation Protocol Report (GLL, 2004). As of January 1, 2006, the reference value for P96-9 was 2308 mg/L and 0.078 mg/L for dissolved sulphate and dissolved zinc, respectively, based on the mean plus 3 standard deviations protocol used in the GLL “WATER” database. At this time, neither P96-9A nor any other groundwater monitoring well have concentrations exceeding these values.

The greatest impact is observed at P96-9A, screened in the shallow aquifer, which shows elevated sulphate concentrations (~1,600 mg/L) and slightly elevated zinc concentrations (0.016 mg/L). In comparison, groundwater quality from SRK05-5C, also located in the shallow aquifer, but much closer to Grum Creek itself, shows very little impact, with sulphate concentrations (173 mg/L) only slightly above background and no detetable zinc concentrations. Contamination by relatively clean drilling water can be ruled out, since SRK05-5C was drilled and installed using the portable hammer drill. The very dilute groundwater quality observed at SRK05-5C may indicate dilution from Grum Creek or, alternatively, that contamination is more focused in the area of P96-9a.

The deeper artesian aquifer generally shows a much lower impact, if any, from waste rock dump seepage. Both piezometers screened in the deep aquifer near former Grum Creek (SRK-04-05A/B) show characteristically low sulphate concentrations (~100 mg/L) and very low, but detectable zinc concentrations (~0.01 mg/L). Very similar groundwater quality has been historically reported in the deep piezometer P96-9B in the drainage to the west of Grum Creek (now replaced by P96-9B(R)). Potential sources for the low, but detectable zinc concentrations would include (i) leakage of Grum WRD seepage into the deep aquifer, and/or (ii) recharge of this deep aquifer from the Grum Pit Lake.

Figure 3 summarises the historic zinc and sulphate time trends for monitoring wells P96-9A and P96-9B, which have been monitored since 1996. The time trends indicate that sulphate concentrations at P96-9a have increased steadily since about 1999. This increasing trend appears to continue to date except for some seasonal dilution during spring runoff. In contrast, zinc concentrations have remained fairly constant (at ~0.02 mg/L) since about 2003. Note that sulphate concentrations at P96-9A are similar to those observed in toe seepage from the Grum WRD, whereas zinc concentrations are still at least two orders of magnitude lower. It is therefore likely that zinc is currently attenuated in the aquifer. Additional monitoring will be required to ascertain if and when the attenuation capacity of the aquifer is exhausted and zinc concentration will increase.

Additional discussion of water quality in this area is included in the adaptive management plan report (SRK, 2006).

3.4 Capping of SRK04-5A&5B

After completion of SRK04-5A&5B in 2004, both monitoring wells exhibited artesian flow. Flows continued through the 2004/05 winter and into the spring. In an effort to stop this free flow, mechanical packers were installed in each monitoring well. The margo plug is a mechanical rubber packer fitted to a relatively long “riser” pipe that is inserted by hand down the monitoring well. Once in position, the rubber packer is compressed by rotating a part of the riser pipe. A technical description of a margo plug is included in Appendix C. NOTE: the center rod passing through the rubber packer was sealed off to keep water in the packed zone.

4.6 meter margo plugs were installed to the maximum possible depth. The exact depth of the packer is not known, but packers were installed to the maximum depth possible by hand, and are estimated to be at least 2.5 meters below ground surface.

After installation, water remaining on top of the plug was pumped out using a peristaltic pump. A quick inspection during spring 2006 indicated no observable flow from the PVC, or from the well annulus, suggesting that the packers have successfully stopped the artesian flow. Evacuation of each annular area above the packers should be completed after each use if freezing conditions are expected prior to the next sampling round.

4 Assessment of Contaminant Sources and Loading

Assessment of contamination in the Grum Creek area is discussed in the AMP Event #4 report (SRK, 2006). In general, deeper groundwater has been considered to be relatively free of contaminants, but the record is terminated in 2001, when monitoring well P96-9B was damaged (likely due to freezing). The highest observed zinc and sulphate levels in the area occur within groundwater at SRK04-5A and P96-9A, which are considered parts of the deep and shallow aquifer, respectively.

While only limited hydrogeologic information is available for determining potential groundwater contaminant loads in this area, conservative estimates are presented here for the purpose of comparison with other areas.

The following assumptions were used for these calculations:

1. Contamination is dominantly constrained to the shallow aquifer in the area of the bedrock low,
2. The shallow aquifer has an average thickness of five meters and width of 200 meters (dimensions were determined based on the cross-section in Figure 2),
3. Hydraulic conductivity is homogeneous and isotropic with a value of $2x10^{-5}$ m/s, and
4. The hydraulic gradient is similar to ground surface topography.

Our best estimate of hydraulic conductivity for both the shallow and deep aquifer ($K=2x10^{-5}$ m/s) is based on slug tests performed in both the shallow and deep aquifer at P96-9 (RGC, 1996).

The following loading scenarios were calculated:

- Scenario 1: Best Estimate for Shallow Aquifer
- Scenario 2: Conservative (High) Estimate for Shallow Aquifer
- Scenario 2: Best Estimate for Deep Aquifer
- Scenario 4: Conservative (High) Estimate for Deep Aquifer.

Table 3 summarizes the input parameters and resulting zinc loading estimates for the four scenarios.

Table 3. Zinc loading estimates

Scenario	Thickness (m)	Width (m)	Hydraulic Conductivity (m/s)	Gradient	Flux (L/s)	Zn Concentration (mg/L)	Load (tonnes/yr)
1	5	200	$2x10^{-5}$	0.1	2	0.02	0.001
2	5	1000	$1x10^{-4}$	0.1	50	0.02	0.032
3	20	200	$2x10^{-5}$	0.1	8	0.02	0.005
4	20	1000	$1x10^{-4}$	0.1	200	0.02	0.126

These calculations present a range of loading estimates based on very simple assumptions. It is recognized that the area is likely more complex than assumed here, but additional detail is not justified based on the available data. Based on these scoping calculations, the current zinc loads in the shallow and deep aquifers are estimated to be very small (0.001 t/yr and 0.005 t/yr, respectively). Assuming "worst-case" conditions, the zinc loading in the shallow and deep aquifer would still be less than 0.2 tonnes/year combined. Note that a width of 1000 m for these "worst-case" scenarios is considered very conservative, i.e. significantly greater than what is expected based on our experience. Even for these "worst-case" conditions the estimated zinc load in groundwater (<0.2 tonnes/year) would be much lower than the estimated zinc load in seepage from other waste rock dump areas (in particular at the Faro Mine) at the Anvil Range Mining Complex.

Based on these estimates and current observed conditions, seepage collection is not recommended at this time. However, this area should be monitored for any potential increase in zinc concentrations in the existing monitoring wells. If zinc concentrations in the local groundwater should increase beyond currently observed levels, seepage interception may be required to protect Vangorda Creek.

5 Options for Seepage Interception System

In the event that groundwater quality in the Grum area deteriorates to a level that it could impact the downstream aquatic environment (Vangorda Creek) seepage collection will be required. Preliminary seepage collection options were presented previously in the SRK report: ***Design Options for Seepage Collection, Grum Waste Rock Dump, June 2004***. Three seepage collection options were presented in that report:

1. Sediment and seepage control ditches,

2. Sediment control ditch, seepage collection sumps and pipes, and

3. Groundwater collection wells.

Readers are referred to the report for detailed descriptions of these options. At this time, these options remain appropriate for the Grum area. If future monitoring determined that contamination remained constrained to the shallow aquifer, a collection system comprised of ditches and sumps may be sufficient. If significant contamination occurs in the deeper aquifer system, groundwater pumping wells would likely be required. These options could be integrated into an adaptive management plan based on observed conditions at the time of installation.

6 Conclusions and Recommendations

As part of Task 20e – continue seepage investigations, a series of monitoring wells have been installed along the Grum Dump toe access road to provide an improved understanding of subsurface conditions and groundwater quality. These new monitoring wells indicate that:

- There is a bedrock low in the area of P96-9 and SRK04-5 that has a relatively thin (2 to 6 meters), shallow, unconfined aquifer and a deeper, thicker confined aquifer that likely includes weathered bedrock (thickness of 6 to 7 meters at depths greater than 7 to10 meters).
- Overburden thickness decreases significantly west of P96-9, from about 20 meters near SRK04-5 to about five meters at SRK05-8 and less than five at SRK05-7.
- Water quality in the shallow aquifer generally shows higher sulphate concentrations than the deeper aquifer. Zinc concentrations are still relatively low (<0.02 mg/L) in both the shallow and the deep aquifer, compared to the current reference value for P96-9A of 0.078 mg/L, suggesting zinc attenuation along the flow path. Time trend plots suggest that sulphate concentrations in the shallow aquifer (at P96-9A) are still increasing (currently at 1,600 mg/L), though still below the reference value of 2308 mg/L, whereas zinc concentrations in the same well have remained fairly constant since 2003.

Preliminary loading calculations suggest that the zinc load in groundwater in this area is (still) very small (<0.2 tonnes/year). Therefore, seepage collection is not recommended at this time. However, this area should be monitored for any potential increase in zinc concentrations in the existing monitoring bores. If zinc concentrations in the local groundwater should increase beyond currently observed levels, seepage interception may be required to protect Vangorda Creek.

At this time, it is recommended that routine monitoring in this area continue, on at least a biannual basis. Routine monitoring should include water level monitoring and sampling for water quality analysis in all monitoring wells in this area (including replacement well P96-9B(R)), and an estimation of flow rate for flowing artesian wells.

During the 2006 summer monitoring program, note should be taken on whether P96-9B(R) is flowing freely (artesian) or the water level resides very close to ground surface. As the original P96-9B monitoring well was artesian, it is likely that the replacement will also be artesian. Freezing of shallow water levels during the winter months may be the cause of damage to the original well. If the well is indeed artesian, a margo plot should be installed at this well for the winter period to prevent freezing and possible damage to this replacement well.

This report, "**Task 20e, 2005/06 Seepage Investigation at the Grum Dump Area**", has been prepared by SRK Consulting (Canada) Inc. and in Association with Robertson GeoConsultants Inc.

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Figures

Legend

- ● Reference Water Quality Stations
- ● Dump Toe Seeps
- ● Downgradient Monitoring Stations
- ⊙ Groundwater Monitoring Well

Note 1:
Sulphide cell outline from as–built drawing, Feb. 1996, as reported in Figure 1, Anvil Range Mining Corporation, May 1996.

0 50 100 150 200 250 300 Metres
Scale 1:5000

Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

SRK Consulting
Engineers and Scientists
Vancouver

SRK JOB NO.: 1CD003.063.0100
Acad–Vangorda–Grum\Acad–2006\ site_plan_2006–Photo.dwg

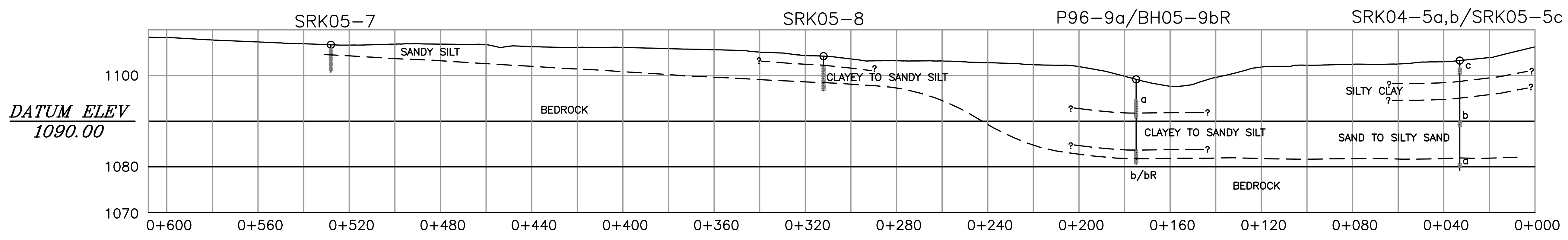
Deloitte & Touche

Anvil Range Mining Complex

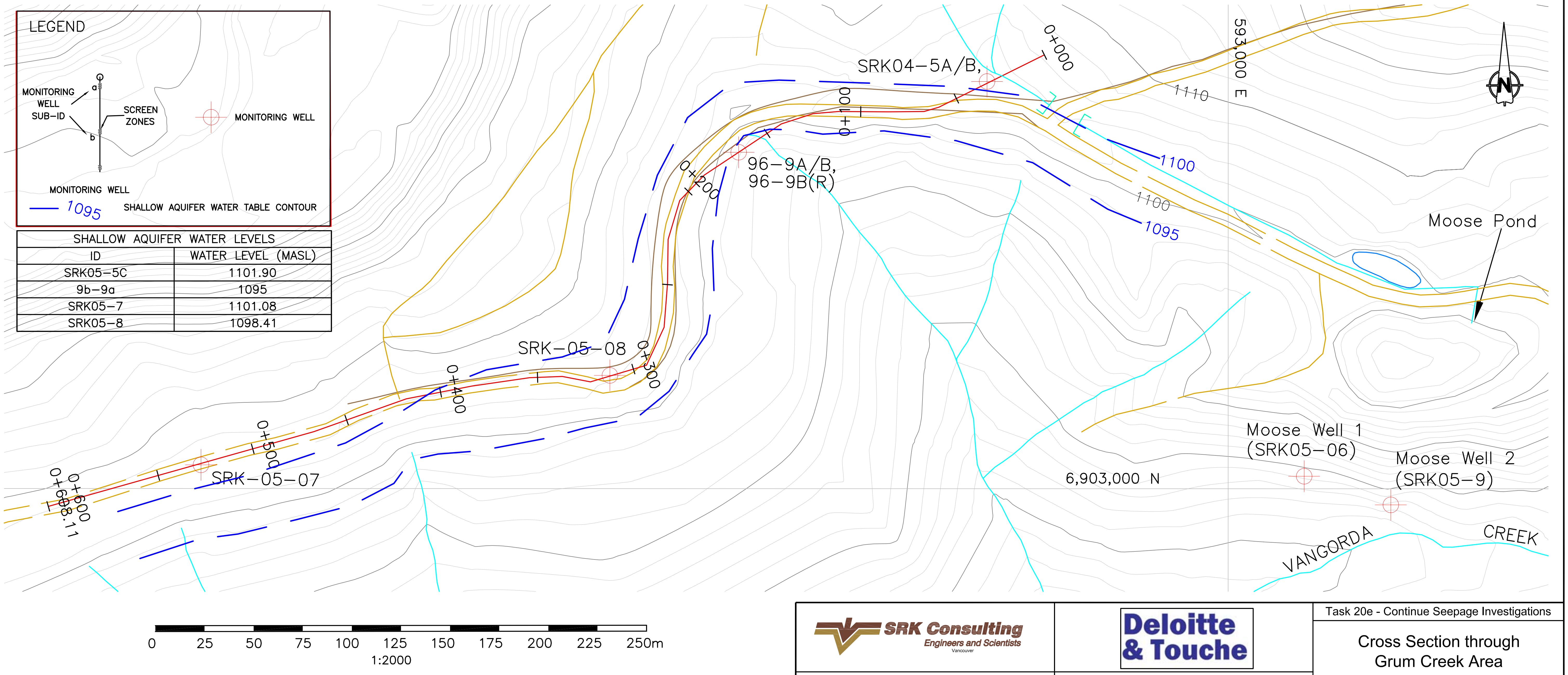
Task 20e - Continue Seepage Investigation

2005 Grum Area -
Monitoring Well Locations

DATE:	APPROVED:	FIGURE:
June 2006	D.M.	1



Profile Scale = 1:2000 – 2x Vertical Exageration



SHALLOW AQUIFER WATER LEVELS	
ID	WATER LEVEL (MASL)
SRK05-5C	1101.90
9b-9a	1095
SRK05-7	1101.08
SRK05-8	1098.41

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SRK JOB NO.: 1CD003.063
Acad-Vangorda-Grum\Acad-2006\ site_plan-Diversions-2006.dwg

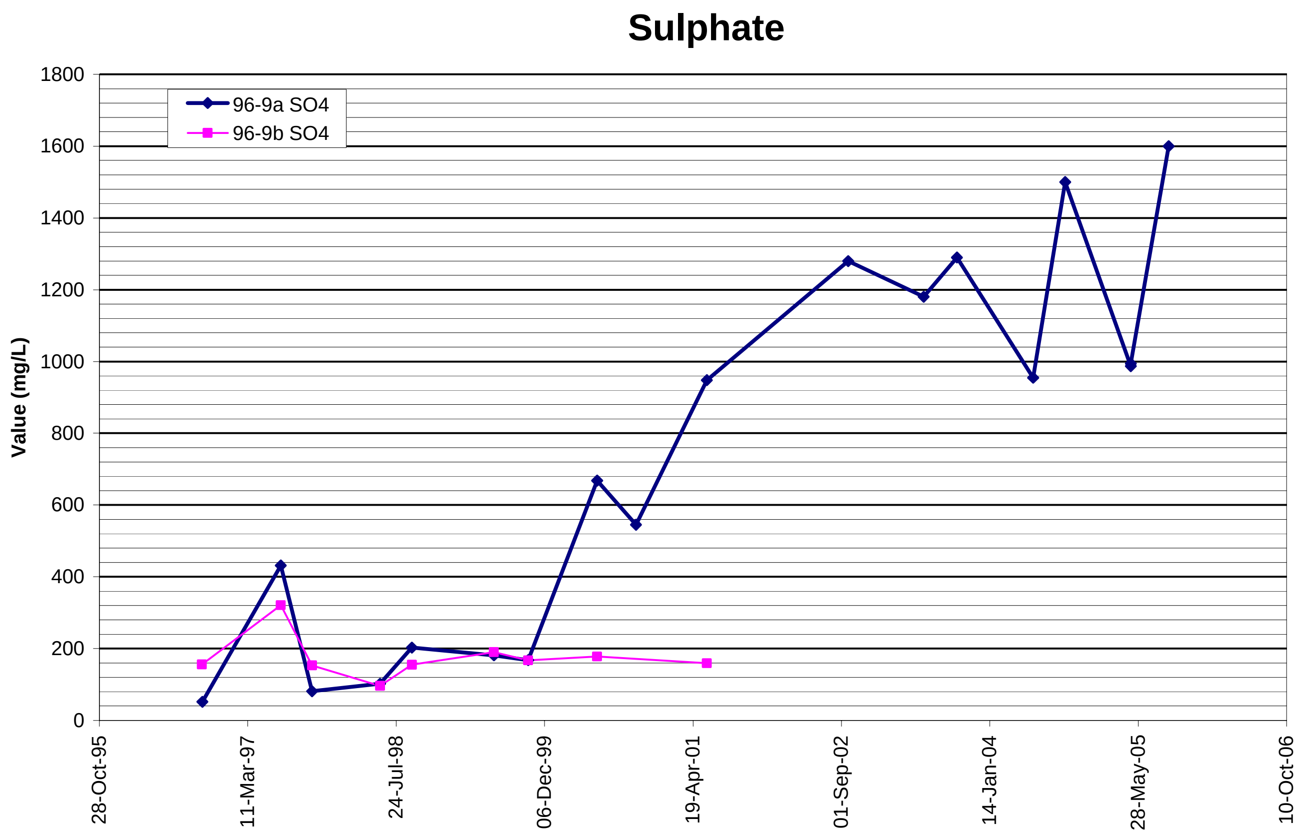
Deloitte & Touche

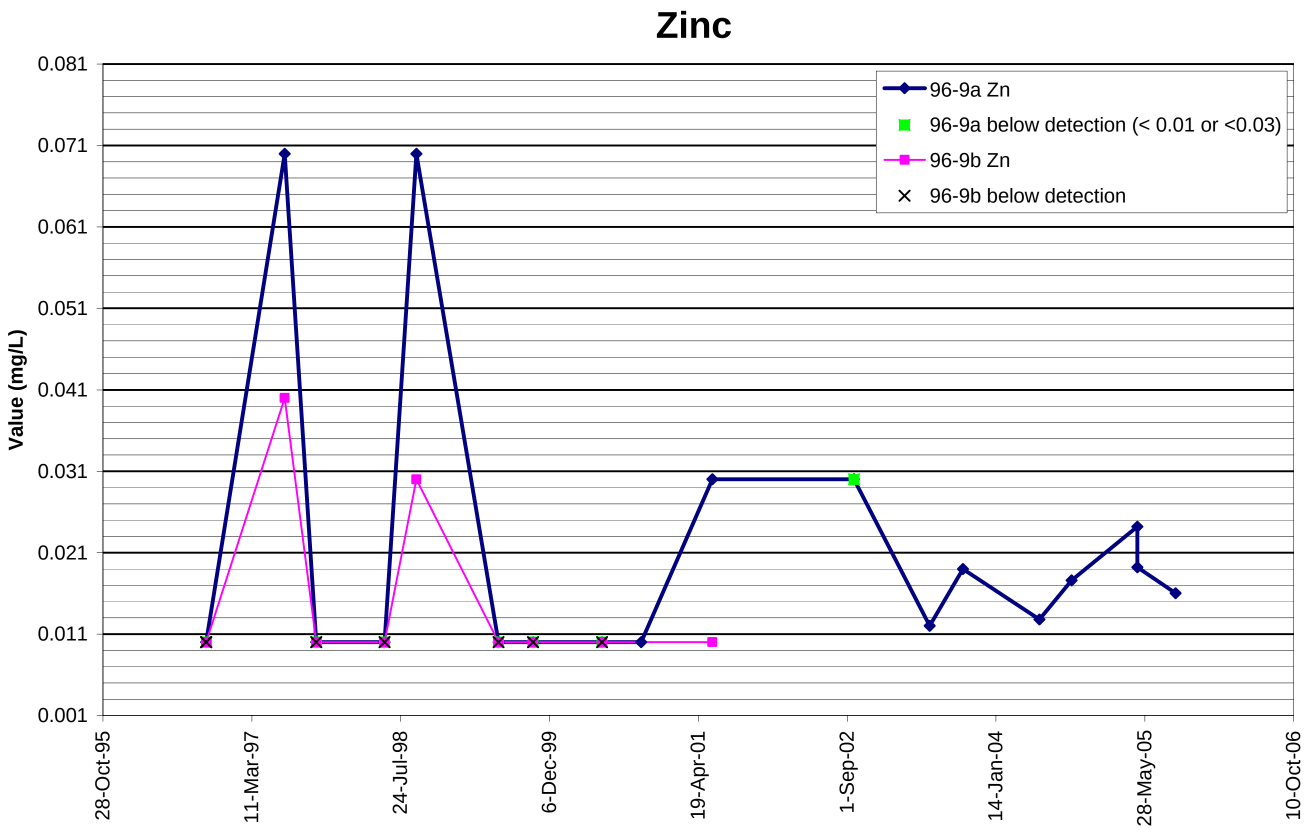
Anvil Range Mining Complex

Task 20e - Continue Seepage Investigations

Cross Section through Grum Creek Area

DATE:	APPROVED:	FIGURE:
May 2006	DM	2





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Task 20e – Continue Seepage Investigations

Historical Water Quality at P96-9

PROJECT:	DATE:	APPROVED:	FIGURE:
1CD003.073	June 2006	DM	3

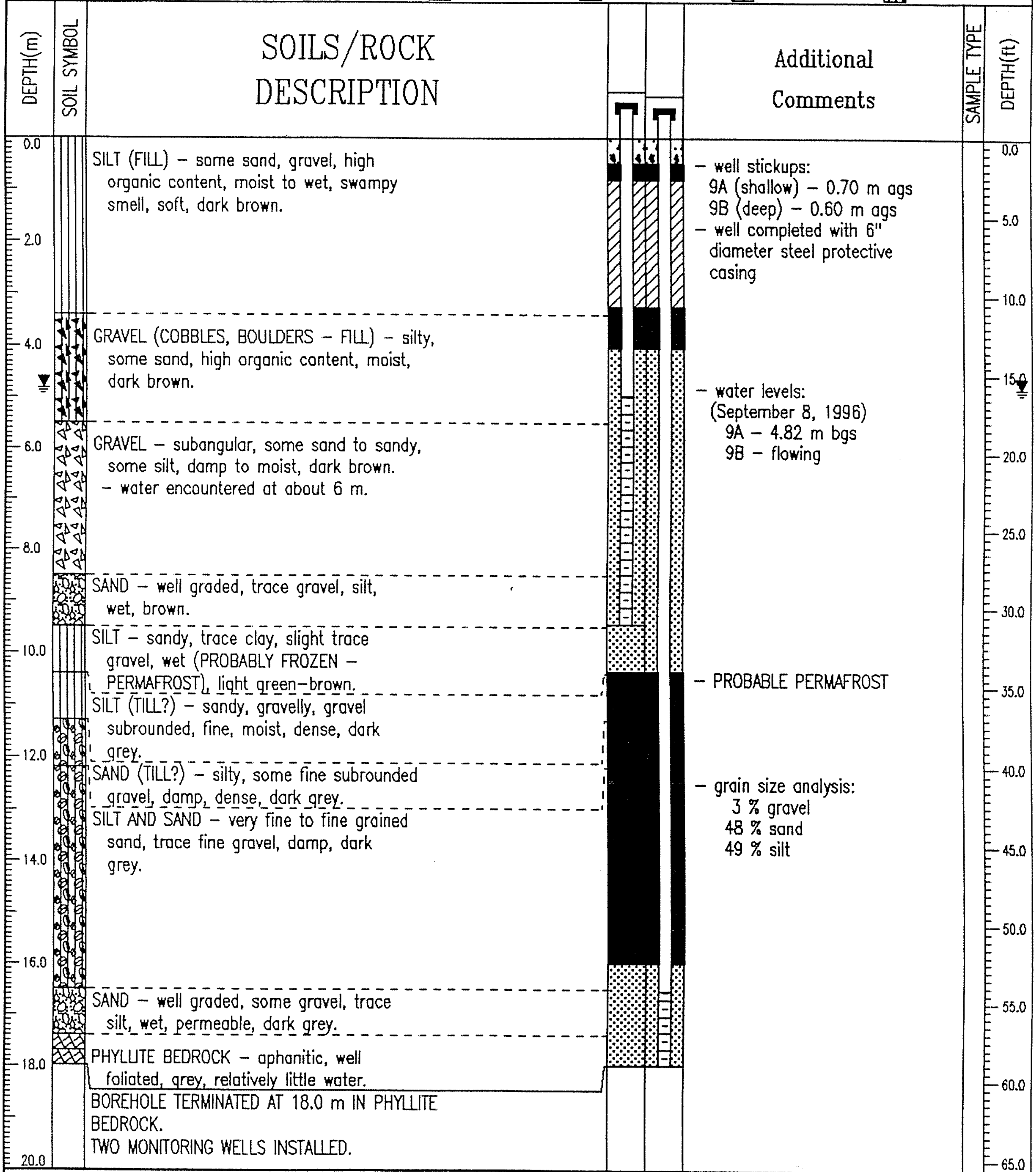
Appendices

Appendix A
Drillhole Logs

Client Name: Anvil Range Mining Corp.	Driller: Midnight Sun Drilling	BOREHOLE NO: BH96-9
Location: Faro, Yukon	Track-mounted Air-rotary (ODEX) - 175 mm	PROJECT NO: 033001
BH Loc: South of Grumm Rock Dump	UTM ZONE: - N - E -	ELEVATION:

SAMPLE TYPE ■ DISTURBED ▨ NO RECOVERY ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

BACKFILL TYPE ■ BENTONITE ⁘ PEA GRAVEL ▥ SLOUGH ▨ CEMENT ▨ DRILL CUTTINGS ▩ SAND



SOILS/ROCK DESCRIPTION

SILT (FILL) - some sand, gravel, high organic content, moist to wet, swampy smell, soft, dark brown.

GRAVEL (COBBLES, BOULDERS - FILL) - silty, some sand, high organic content, moist, dark brown.

GRAVEL - subangular, some sand to sandy, some silt, damp to moist, dark brown.
- water encountered at about 6 m.

SAND - well graded, trace gravel, silt, wet, brown.

SILT - sandy, trace clay, slight trace gravel, wet (PROBABLY FROZEN - PERMAFROST), light green-brown.

SILT (TILL?) - sandy, gravelly, gravel subrounded, fine, moist, dense, dark grey.

SAND (TILL?) - silty, some fine subrounded gravel, damp, dense, dark grey.

SILT AND SAND - very fine to fine grained sand, trace fine gravel, damp, dark grey.

SAND - well graded, some gravel, trace silt, wet, permeable, dark grey.

PHYLLITE BEDROCK - aphanitic, well foliated, grey, relatively little water.

BOREHOLE TERMINATED AT 18.0 m IN PHYLLITE BEDROCK.
TWO MONITORING WELLS INSTALLED.

Additional Comments

- well stickups:
  9A (shallow) - 0.70 m ags
  9B (deep) - 0.60 m ags
- well completed with 6" diameter steel protective casing

- water levels:
  (September 8, 1996)
  9A - 4.82 m bgs
  9B - flowing

- PROBABLE PERMAFROST

- grain size analysis:
  3 % gravel
  48 % sand
  49 % silt

ROBERTSON GEOCONSULTANTS INC. Vancouver, B.C.	LOGGED BY: TH/CW	COMPLETION DEPTH: 18.0 m
	REVIEWED BY: AR	COMPLETE: 07/09/96
	Fig. No: 9	Page 1 of 1

96/12/10 02:25PM (MONWELL2)

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM - Tributary A
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-11 **TO** 2005-08-11
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903172.14 N 592747.06 E **DATUM:** PVC 1101.06

BOREHOLE: 96-9B(R)
PAGE: 1 **OF** 2
DRILL TYPE: Sonic
DRILL: 4x6
CASING: 2"

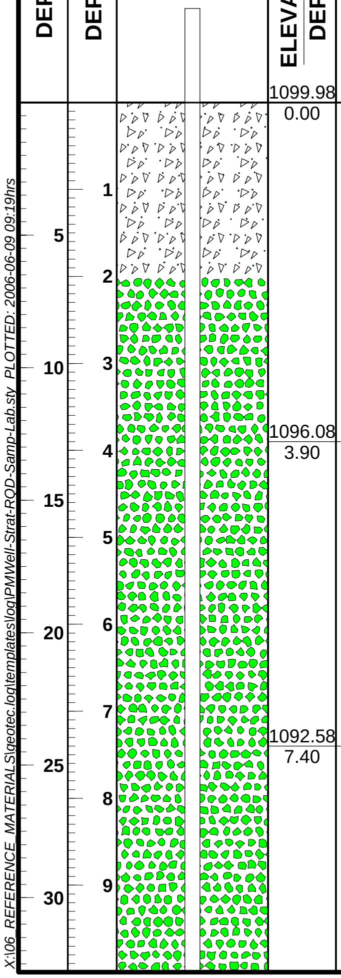
SAMPLE CONDITION
☒ Remoulded
▨ Undisturbed
■ Lost
◧ Rock core

WELL PLUG MATERIALS
Bentonite / Grout
Cuttings
Sand

TYPE OF SAMPLER
DC Diamond core barrel
SS Split spoon
GS Grab sample
AS Auger Sample

GENERAL COMMENTS Replacement monitoring well for P96-9B; Stickup height: 1.08m; Water level = 1100.35 masl on Sept. 8, 2005; Samples:1-1.22m, 2-3.05m, 3-4.57m, 4-7.62m, 5-9.14m, 6-10.66m, 7-12.18, 8-13.71, 9-14.93, 10-15.85.

WELL DETAILS & WATER LEVEL - m



STRATIGRAPHY

ELEVATION - m DEPTH - m	DESCRIPTION
1099.98	Natural ground surface
0.00	Sandy silts.
1096.08 3.90	Well-graded sands.
1092.58 7.40	Clayey-silt.

SAMPLES

TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %
1	▨		
2	▨		
3	▨		
4	▨		
5	▨		
6	▨		
	▨		

SAMPLE DESCRIPTION

0.00
Sandy silt (fine to coarse sand), with fine to coarse, subangular to subrounded gravel and rare cobles (dia. ~10cm), dark brown, with organic matter (roots), loose, damp.

1.20
Clayey silt, trace to minor fine sand, dark brown to black, with organic matter (roots), loose, damp.

1.90
Fine to coarse sandy silt, trace clay, with fine to coarse, subangular to subrounded gravel, dark brown, with organic matter, loose, damp.

3.30
Silty medium to coarse sand with fine sand, trace to minor clay and fine to coarse subangular to subrounded gravel, dark brown, with organic matter, loose, damp.

3.90
Gravelly medium to coarse sand with fine sand, and fine to coarse, subangular to subrounded gravel, trace to minor silt, with sparse cobbles, brown, wet.

6.00
Medium to coarse sand with fine sand, fine to coarse subangular to subrounded gravel and trace silt, brown, loose, wet.

7.40
Clayey silt, with fine to coarse sand, fine to coarse, subangular to subrounded gravel and trace rounded cobbles, gray, stiff, damp, with low plasticity. Till.

DEPTH - m: 1, 2, 3, 4, 5, 6, 7, 8, 9

LABORATORY and IN SITU TESTS

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM - Tributary A
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-11 **TO** 2005-08-11
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903172.14 N 592747.06 E **DATUM:** PVC 1101.06

BOREHOLE: 96-9B(R)
PAGE: 2 **OF** 2
DRILL TYPE: Sonic
DRILL: 4x6
CASING: 2"

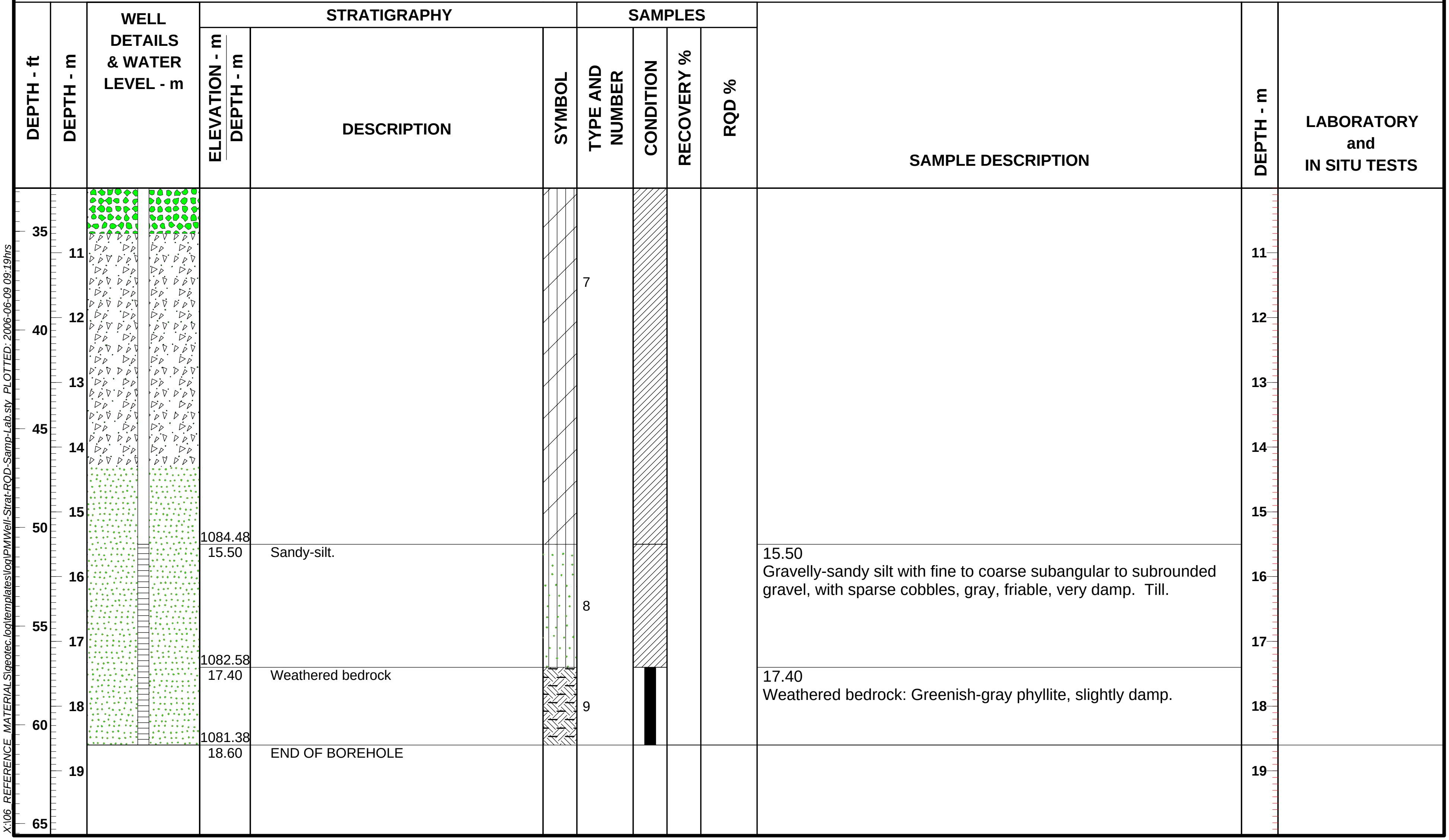
SAMPLE CONDITION
- ☒ Remoulded
- ▨ Undisturbed
- ■ Lost
- ▮ Rock core

WELL PLUG MATERIALS
- ▧ Bentonite / Grout
- ☐ Cuttings
- ░ Sand

TYPE OF SAMPLER

DC Diamond core barrel	SS Split spoon
GS Grab sample	AS Auger Sample

GENERAL COMMENTS Replacement monitoring well for P96-9B; Stickup height: 1.08m; Water level = 1100.35 masl on Sept. 8, 2005; Samples:1-1.22m, 2-3.05m, 3-4.57m, 4-7.62m, 5-9.14m, 6-10.66m, 7-12.18, 8-13.71, 9-14.93, 10-15.85.



ELEVATION - m DEPTH - m	DESCRIPTION	TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %	SAMPLE DESCRIPTION	LABORATORY and IN SITU TESTS
		7	▨				
1084.48 15.50	Sandy-silt.	8	▨			15.50 Gravelly-sandy silt with fine to coarse subangular to subrounded gravel, with sparse cobbles, gray, friable, very damp. Till.	
1082.58 17.40	Weathered bedrock	9	▮			17.40 Weathered bedrock: Greenish-gray phyllite, slightly damp.	
1081.38 18.60	END OF BOREHOLE						

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: Grum Creek
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-04 **TO** 2005-08-04
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903208.00 N 592873.00 E **DATUM:** PVC 1104.08

BOREHOLE: SRK05-05C
PAGE: 1 **OF** 1
DRILL TYPE: Portable Hammer
DRILL: Pionjar
CASING: 2"

SAMPLE CONDITION

☒	Remoulded
▨	Undisturbed
■	Lost
◧	Rock core

WELL PLUG MATERIALS

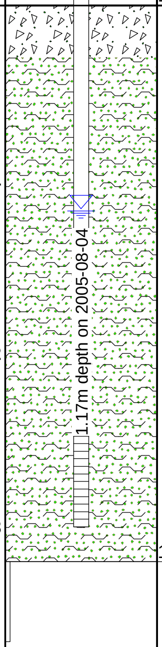
▷	Bentonite / Grout
●	Cuttings
⁘	Sand

TYPE OF SAMPLER

DC Diamond core barrel	SS Split spoon
GS Grab sample	AS Auger Sample

GENERAL COMMENTS: Stickup height = 0.84m

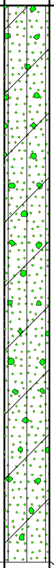
WELL DETAILS & WATER LEVEL - m



STRATIGRAPHY

ELEVATION - m DEPTH - m	DESCRIPTION
1103.14	Natural ground surface
0.00	Sand, gravelly, with silt and clay
1099.94 3.20	END OF BOREHOLE

SYMBOL



SAMPLES

TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %
SS-1	▨		
SS-2	▨		
SS-3	▨		
SS-4	▨		

SAMPLE DESCRIPTION

0.00
Top soil: fine to coarse sand, with clay and gravel (fine to coarse), dark grey, damp, loose, with organic matter (roots).

1.75
Silt or clay, brown, with fine to medium sand and fine to coarse gravel, damp, with some plasticity.

2.10
Fine to coarse sand, brown, with trace clay or silt, with fine to coarse subangular to subrounded gravel, wet, loose (poorly graded sand)

3.10
Sandy clay (fine to coarse sand), with fine gravel, brown to greenish grey, with low plasticity, damp (wet). Drilling refusal at 3.2m.

LABORATORY and IN SITU TESTS

DEPTH - ft	DEPTH - m
5	1
10	2
15	3
	4

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BOREHOLE LOG

PROJECT:	Faro Mine Seepage Investigation	**BOREHOLE:**	SRK04-05
LOCATION:	Grum Creek area	**PAGE:**	1 **OF** 3
FILE No:	FARO (1CD003.053)	**DRILL TYPE:**	ODEX 6"
BORING DATE:	2004-09-06 **TO** 2004-09-09	**DRILL:**	Air Rotary
DIP:	90.00 **AZIMUTH:**	**CASING:**	2"
COORDINATES:	6903205.00 N 592871.00 E **DATUM:**		

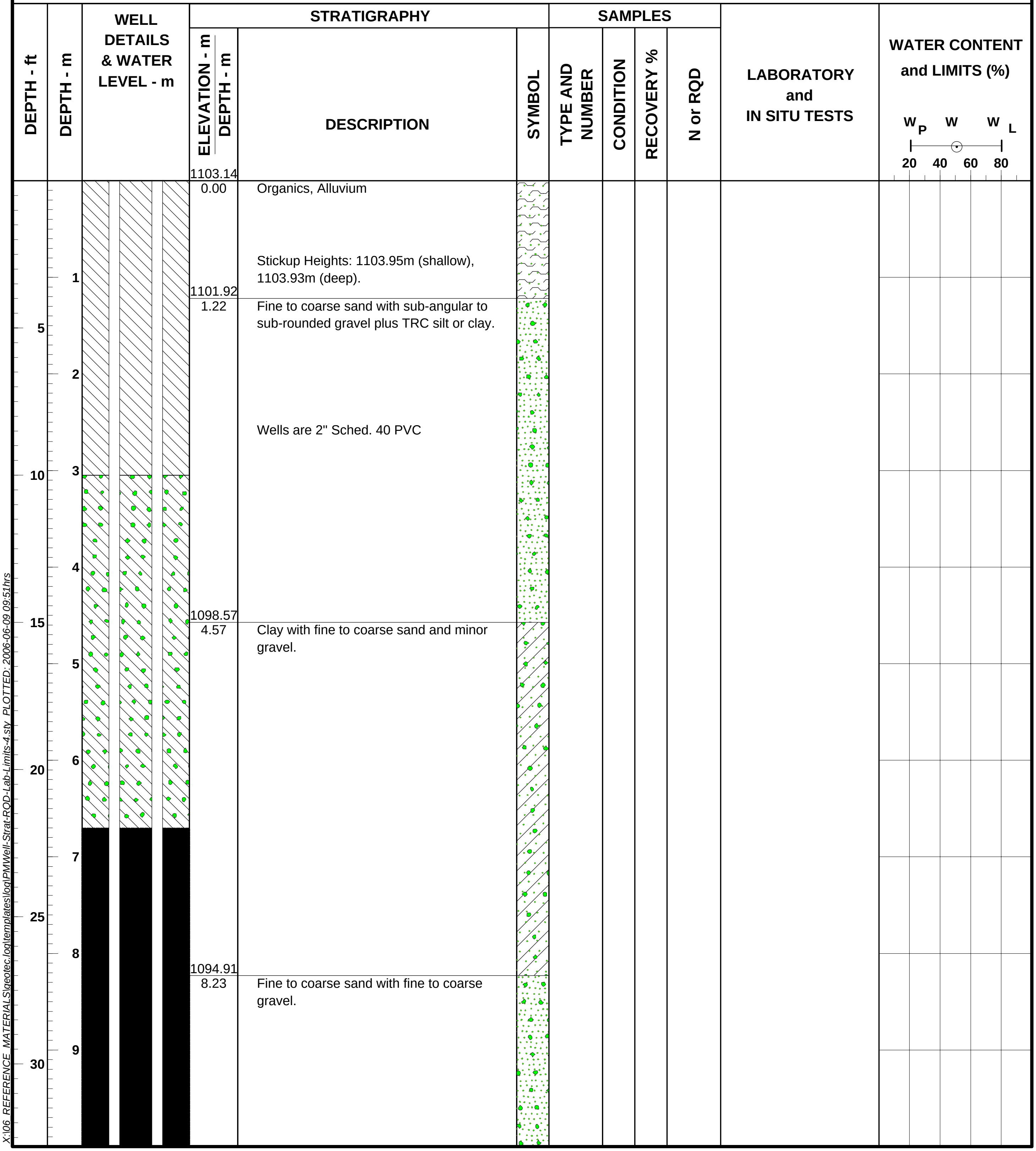
GENERAL COMMENTS:

WELL PLUG MATERIAL
LEGEN

▧	Bentonite
▨	Cuttings
■	Grout
⁘	Sand

LABORATORY AND IN SITU TESTS

pH	Rinse pH	LE	Extraction
Cond	Rinse conductivity		
ABA	Acid Base Accounting		
Metals	Metal ICP		



ELEVATION - m / DEPTH - m	DESCRIPTION
1103.14 0.00	Organics, Alluvium Stickup Heights: 1103.95m (shallow), 1103.93m (deep). Wells are 2" Sched. 40 PVC
1101.92 1.22	Fine to coarse sand with sub-angular to sub-rounded gravel plus TRC silt or clay.
1098.57 4.57	Clay with fine to coarse sand and minor gravel.
1094.91 8.23	Fine to coarse sand with fine to coarse gravel.

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BOREHOLE LOG

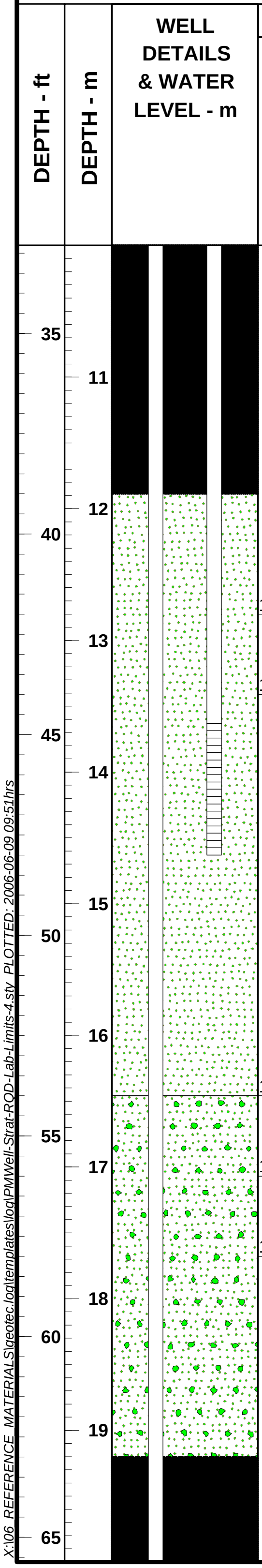
PROJECT: Faro Mine Seepage Investigation
LOCATION: Grum Creek area
FILE No: FARO (1CD003.053)
BORING DATE: 2004-09-06 **TO** 2004-09-09
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903205.00 N 592871.00 E **DATUM:**

BOREHOLE: SRK04-05
PAGE: 2 **OF** 3
DRILL TYPE: ODEX 6"
DRILL: Air Rotary
CASING: 2"

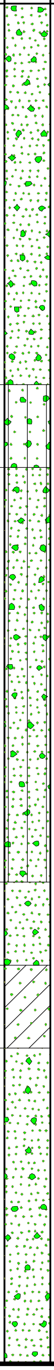
GENERAL COMMENTS:

WELL PLUG MATERIAL
LEGEN
▨	Bentonite
🟩	Cuttings
■	Grout
░	Sand

LABORATORY AND IN SITU TESTS
pH	Rinse pH	LE	Extraction
Cond	Rinse conductivity		
ABA	Acid Base Accounting		
Metals	Metal ICP		



STRATIGRAPHY			SAMPLES					
ELEVATION - m DEPTH - m	DESCRIPTION	SYMBOL	TYPE AND NUMBER	CONDITION	RECOVERY %	N or RQD	LABORATORY and IN SITU TESTS	WATER CONTENT and LIMITS (%) W P W W L 20 40 60 80
1090.34 12.80	Fine to coarse gravel with fine to coarse sand and silt.							
1089.73 13.41	Fine sand with minor medium to coarse sand, TRC gravel and silt. 0.010 Slot 2" PVC screen							
1086.68 16.46	Same as above but with increasing coarse sand.							
1086.07 17.07	Clay with some medium to coarse sand.							
1085.46 17.68	Fine to coarse sand with fine to coarse angular-sub-rounded gravel. Increasing phyllite downwards.							



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BOREHOLE LOG

PROJECT: Faro Mine Seepage Investigation
LOCATION: Grum Creek area
FILE No: FARO (1CD003.053)
BORING DATE: 2004-09-06 **TO** 2004-09-09
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903205.00 N 592871.00 E **DATUM:**

BOREHOLE: SRK04-05
PAGE: 3 **OF** 3
DRILL TYPE: ODEX 6"
DRILL: Air Rotary
CASING: 2"

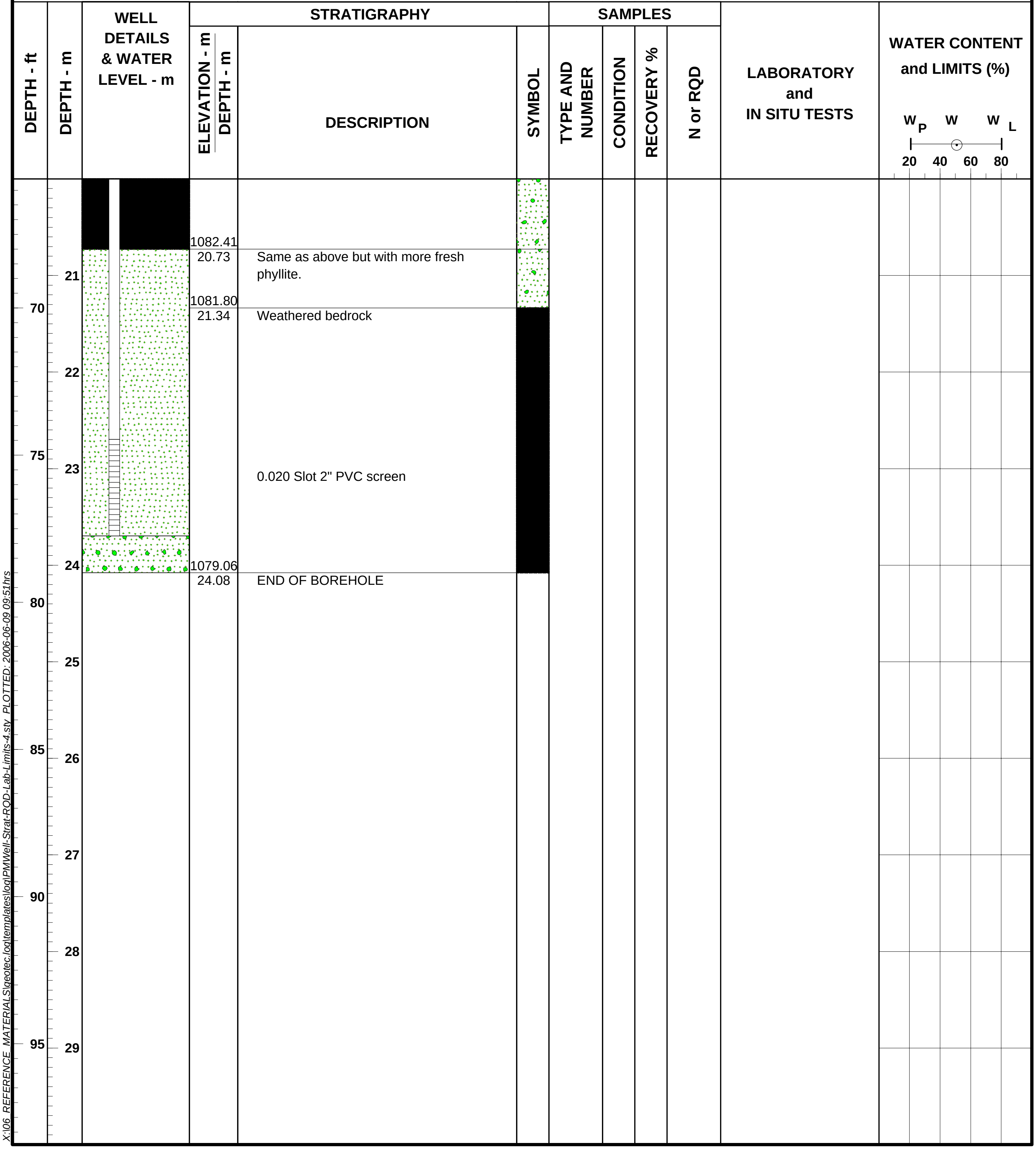
GENERAL COMMENTS:

WELL PLUG MATERIAL LEGEND

- ▨ Bentonite
- ▱ Cuttings
- ■ Grout
- ░ Sand

LABORATORY AND IN SITU TESTS

pH	Rinse pH
LE	Extraction
Cond	Rinse conductivity
ABA	Acid Base Accounting
Metals	Metal ICP



ELEVATION - m / DEPTH - m	DESCRIPTION
1082.41 20.73	Same as above but with more fresh phyllite.
1081.80 21.34	Weathered bedrock
	0.020 Slot 2" PVC screen
1079.06 24.08	END OF BOREHOLE

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM-Moose Pond
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-04 **TO** 2005-08-04
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6902982.00 N 593043.00 E **DATUM:** PVC 1073.83

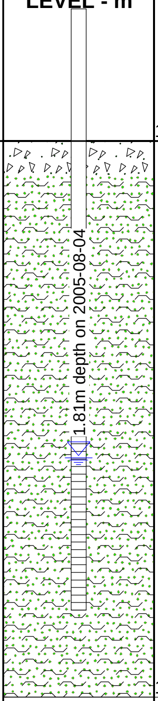
BOREHOLE: SRK05-06
PAGE: 1 **OF** 1
DRILL TYPE: Portable Hammer
DRILL: Pionjar
CASING: 2 "

SAMPLE CONDITION
- ☒ Remoulded
- ▨ Undisturbed
- ■ Lost
- ◧ Rock core

WELL PLUG MATERIALS
- ▷ Bentonite / Grout
- ▲ Cuttings
- ⬚ Sand

TYPE OF SAMPLER
- DC Diamond core barrel
- GS Grab sample
- SS Split spoon
- AS Auger Sample

GENERAL COMMENTS: Stickup height=0.76m; 3 samples/bags: 1.32m, 2.18m, 3.2m



ELEVATION - m / DEPTH - m	STRATIGRAPHY DESCRIPTION	SAMPLES TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %	SAMPLE DESCRIPTION	LABORATORY and IN SITU TESTS
1073.07	Natural ground surface						
0.00	Sand, clayey, gravelly	SS-1	▨			0.00 Top organic soil, black.	
		SS-2	▨			0.10 Sand and gravel, poorly graded, brown, loose, damp.	
		SS-3	▨			0.30 Fine to medium sand, brown, with trace silt, loose, damp, well graded.	
		SS-4	▨			1.60 Fine to medium sand, with clay, with fine to coarse gravel, brown, wet. Some more clayey levels presenting low plasticity.	
		SS-5	▨			2.70 Sandy clay (fine to medium sand), with fine to coarse gravel, dark grey, wet, with low plasticity.	
1069.87 3.20	END OF BOREHOLE						

DEPTH - ft: 5, 10, 15
DEPTH - m: 1, 2, 3, 4

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-24 **TO** 2005-08-24
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903011.00 N 592477.00 E **DATUM:** PVC 1107.29

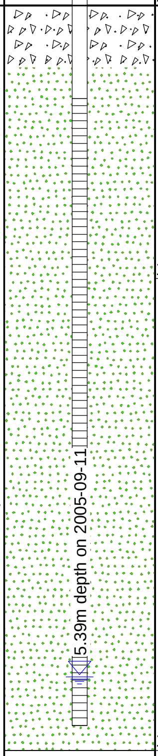
BOREHOLE: SRK05-07
PAGE: 1 **OF** 1
DRILL TYPE: Sonic
DRILL: 4x6
CASING: 2"

SAMPLE CONDITION	
☒	Remoulded
▨	Undisturbed
■	Lost
◧	Rock core

WELL PLUG MATERIALS	
▷	Bentonite / Grout
▲	Cuttings
⁙	Sand

TYPE OF SAMPLER
DC Diamond core barrel
SS Split spoon
GS Grab sample
AS Auger Sample

GENERAL COMMENTS: well dry at time of installation; stickup height 0.72m.



DEPTH - ft	DEPTH - m	ELEVATION - m DEPTH - m	DESCRIPTION	TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %	SAMPLE DESCRIPTION	LABORATORY and IN SITU TESTS
		1106.52	Natural ground surface						
		0.00	Sandy silt with gravel	1	▨			0.00 Sandy silt (fine to coarse sand), with fine to coarse angular to sub-angular gravel, brown, with abundant organic matter (roots, wood fragments), dry, loose. From 1.3-1.6m: cobbles and gravel.	
				2	▨			2.00 Till: As above, consolidated, greyish brown, with coarser gravel (diam.~5-7cm) at the interface with weathered bedrock. Friable, dry.	
		1104.32 2.20	Weathered bedrock, phyllite	3	◧			2.20 Weathered bedrock (phyllite: Silver grey, dry. Fresh fragments recovered. Some oxidised (orange nodes) levels present. Dry. At 5.3m hit harder/fresher bedrock.	
		1100.52 6.00	END OF BOREHOLE						

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BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM
FILE No: FARO (1CD003.063)
BORING DATE: 2005-08-24 **TO** 2005-08-24
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6903063.00 N 592690.00 E **DATUM:** PVC 1105.25

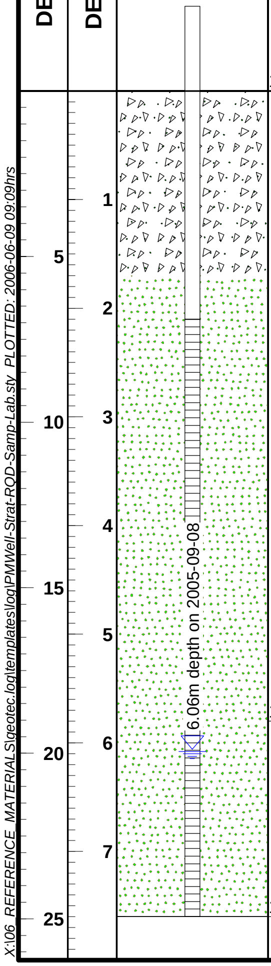
BOREHOLE: SRK05-08
PAGE: 1 **OF** 1
DRILL TYPE: Sonic
DRILL: 4x6
CASING: 2"

SAMPLE CONDITION
- ☒ Remoulded
- ▨ Undisturbed
- ■ Lost
- ▮ Rock core

WELL PLUG MATERIALS
- Bentonite / Grout
- Cuttings
- Sand

TYPE OF SAMPLER
- DC Diamond core barrel
- SS Split spoon
- GS Grab sample
- AS Auger Sample

GENERAL COMMENTS: Stickup height = 0.78m



ELEVATION - m	DEPTH - m	DESCRIPTION	SYMBOL	TYPE AND NUMBER	CONDITION	RECOVERY %	RQD %	SAMPLE DESCRIPTION	LABORATORY and IN SITU TESTS
1104.48		Natural ground surface							
	0.00	Sandy silt, gravel		1	▨			0.00 Sandy silt (fine to coarse sand(, with angular to subrounded fine to coarse gravel, brown, slightly moist, with abundant roots, loose. (white ash layers present ~1-2cm thick)	
				2	▨			0.70 Fine sand, well sorted (minor medium-coarse fractions), trace silt, with minor fine-coarse subang.-subrounded gravel at top and base of the layer, yellowish-brown, loose,dry.	
				3	▨			1.30 Gravelly fine to coarse sand (predominant fine fraction), (fine to coarse angular to sub-angular gravel), trace silt, dark brown, loose, dry.	
				4	▨			1.50 Till: Sandy silt (fine to coarse sand), trace clay, with fine to coarse angular to sub-angular gravel and sparse cobbles (diam.~10cm), greenish-grey, compact, damp, gray. From 3.6m: gets very hard (slow drilling).	
1098.68	5.80	Weathered to fresh bedrock, phyllite		5	▮			5.80 Slightly weathered to fresh bedrock (phyllite). Fresh rock fragments plus ground rock (powder/dust) recovered. No water detected. Granite cobbles in the contact between till and bedrock.	
1096.88	7.60	END OF BOREHOLE							

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SRK Consulting
Engineers and Scientists

BOREHOLE LOG

PROJECT: AMP Event #4 Response
LOCATION: GRUM-Moose Pond
FILE No: FARO (1CD003.063)
BORING DATE: 2005-09-17 **TO** 2005-09-17
DIP: 90.00 **AZIMUTH:**
COORDINATES: 6902985.94 N 593058.50 E **DATUM:** PVC 1072.82

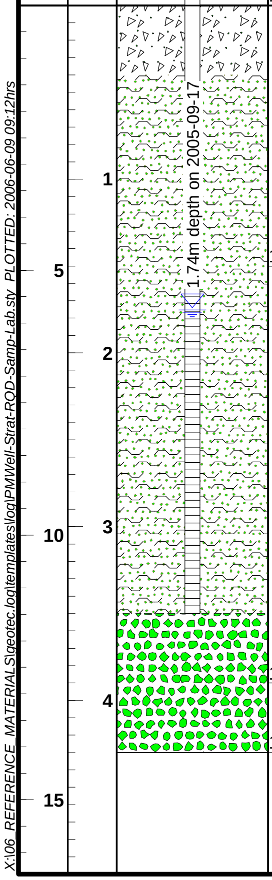
BOREHOLE: SRK05-09
PAGE: 1 **OF** 1
DRILL TYPE: Portable Hammer
DRILL: Pionjar
CASING: 2"

SAMPLE CONDITION
☒ Remoulded
▨ Undisturbed
■ Lost
◧ Rock core

WELL PLUG MATERIALS
Bentonite / Grout
Cuttings
Sand

TYPE OF SAMPLER
DC Diamond core barrel
GS Grab sample
SS Split spoon
AS Auger Sample

GENERAL COMMENTS: Stickup height=1m (approx.)



DEPTH - ft	DEPTH - m	WELL DETAILS & WATER LEVEL - m	STRATIGRAPHY ELEVATION - m DEPTH - m	STRATIGRAPHY DESCRIPTION	SYMBOL	SAMPLES TYPE AND NUMBER	SAMPLES CONDITION	SAMPLES RECOVERY %	SAMPLES RQD %	SAMPLE DESCRIPTION	DEPTH - m	LABORATORY and IN SITU TESTS
			1071.83	Natural ground surface								
			0.00	Top soil layer, no recovery		SS-1	■			0.00 Top soil layer, very soft, no recovery.		
			1070.33 1.50	Silty sand with gravel		SS-2	▨			1.50 Silty fine to coarse sand, with some fine to coarse, angular to subangular gravel, greyish brown, soft, wet. Intercalated organic silt-clay (peat, black) layers, 5-8cm thick, and thin ash (white) layers (max 2cm thick).		
						SS-3	▨			2.60 As above, less fines, sub-angular to sub-rounded fine to coarse, gravel, wet. Contains minor silt.		
			1067.93 3.90	Weathered bedrock, schist		SS-4	▨			3.90 Weathered bedrock, schist, orangish-brown, wet.		
			1067.53 4.30	END OF BOREHOLE								

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Appendix B
Water Quality Results

Project Faro Mines Water Analysis
Report to SRK Consulting (Canada) Inc.
ALS File No. W5604
Date Received 10/6/2005
Date: 10/21/2005

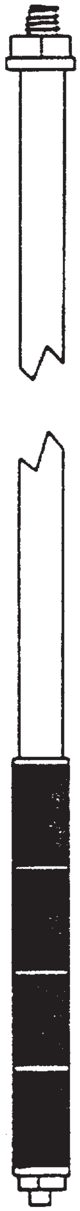
	SRK05-9						
	Moose Well	**SRK04-5a**	**SRK04-5b**	**SRK05-5c**	**P96-9a**	Replicate Results	
RESULTS OF ANALYSIS							
Sample ID	MOOSE POND Well #2	SRK-04-ARTA	SRK-04-ARTB	SRK05-5c	V96-9A	MOOSE POND Well #2	MOOSE POND Well #2
Date Sampled	10/3/2005	5/9/2008	5/9/2008	11/22/2005	5/9/2008	10/3/2005	QC# 468375
Time Sampled	15:45	16:20	16:16	9:45	17:00	15:45	
ALS Sample ID	5	9	10	1	6	5	
Nature	Water	Water	Water	Water	Water	Water	
Physical Tests							
Conductivity (uS/cm)	1730	449	435	651	3070	1730	1740
Hardness (CaCo3)	n/a	172	172	n/a	1810		
pH	7.66	7.96	8.08	7.51	7.41	7.66	7.95
Dissolved Anions							
Acidity (to pH 8.3) CaCO3	9.9	n/a	n/a	14.9	n/a		
Alkalinity-Total CaCO3	325	154	153	187	469	325	324
Chloride Cl	<2.5	n/a	n/a	<0.50	n/a	<2.5	<2.5
Sulphate SO4	763	89.8	85.3	173	1600	763	764
Total Metals							
Aluminum T-Al	37.3	n/a	n/a	n/a	n/a		
Antimony T-Sb	0.00401	n/a	n/a	n/a	n/a		
Arsenic T-As	0.222	n/a	n/a	n/a	n/a		
Barium T-Ba	1.70	n/a	n/a	n/a	n/a		
Beryllium T-Be	<0.0025	n/a	n/a	n/a	n/a		
Bismuth T-Bi	<0.0025	n/a	n/a	n/a	n/a		
Boron T-B	<0.050	n/a	n/a	n/a	n/a		
Cadmium T-Cd	0.00428	n/a	n/a	n/a	n/a		
Calcium T-Ca	258	n/a	n/a	n/a	n/a		
Chromium T-Cr	0.201	n/a	n/a	n/a	n/a		
Cobalt T-Co	0.0639	n/a	n/a	n/a	n/a		
Copper T-Cu	0.333	n/a	n/a	n/a	n/a		
Iron T-Fe	90.4	n/a	n/a	n/a	n/a		
Lead T-Pb	1.39	n/a	n/a	n/a	n/a		
Lithium T-Li	0.063	n/a	n/a	n/a	n/a		
Magnesium T-Mg	157	n/a	n/a	n/a	n/a		
Manganese T-Mn	2.19	n/a	n/a	n/a	n/a		
Molybdenum T-Mo	0.00488	n/a	n/a	n/a	n/a		
Nickel T-Ni	0.207	n/a	n/a	n/a	n/a		
Phosphorus T-P	1.51	n/a	n/a	n/a	n/a		
Potassium T-K	7.5	n/a	n/a	n/a	n/a		
Selenium T-Se	<0.0050	n/a	n/a	n/a	n/a		
Silicon T-Si	52.8	n/a	n/a	n/a	n/a		
Silver T-Ag	0.00285	n/a	n/a	n/a	n/a		
Sodium T-Na	10.9	n/a	n/a	n/a	n/a		
Strontium T-Sr	0.909	n/a	n/a	n/a	n/a		
Thallium T-Tl	0.00117	n/a	n/a	n/a	n/a		
Tin T-Sn	0.00172	n/a	n/a	n/a	n/a		
Titanium T-Ti	0.679	n/a	n/a	n/a	n/a		
Uranium T-U	0.0300	n/a	n/a	n/a	n/a		
Vanadium T-V	0.107	n/a	n/a	n/a	n/a		
Zinc T-Zn	0.930	n/a	n/a	n/a	n/a	0.930	0.938
Dissolved Metals							
Aluminum D-Al	0.0647	<0.010	<0.010	<0.20	<0.050		
Antimony D-Sb	<0.00050	<0.00050	<0.000050	<0.20	<0.0025		
Arsenic D-As	0.00114	0.0121	0.0169	<0.20	<0.0050		
Barium D-Ba	0.0953	0.032	0.049	0.091	0.055		
Beryllium D-Be	<0.0025	<0.0050	<0.0050	<0.0050	<0.0050		
Bismuth D-Bi	<0.0025	n/a	n/a	<0.20	n/a		
Boron D-B	<0.050	<0.10	<0.10	<0.10	<0.10		
Cadmium D-Cd	0.00027	<0.000050	<0.000050	<0.010	0.00101		
Calcium D-Ca	216	47.5	47.6	78.6	347		
Chromium D-Cr	<0.0025	<0.00050	<0.00050	<0.010	<0.0025		
Cobalt D-Co	<0.00050	<0.00050	<0.00050	<0.010	<0.0025		
Copper D-Cu	0.00265	<0.0010	<0.0010	<0.010	<0.0050		
Iron D-Fe	<0.060	0.701	0.479	0.055	<0.030		
Lead D-Pb	0.00169	<0.0010	<0.0010	<0.050	<0.0050		
Lithium D-Li	<0.025	<0.050	<0.050	<0.010	<0.050		
Magnesium D-Mg	131	13	12.9	26.8	228		
Manganese D-Mn	0.00194	0.08	0.08	1.05	0.077		
Molybdenum D-Mo	0.00149	0.0179	0.0204	<0.030	<0.0050		
Nickel D-Ni	<0.0025	<0.0050	<0.0050	<0.050	<0.025		
Phosphorus D-P	<0.30	n/a	n/a	<0.30	n/a		
Potassium D-K	2.9	n/a	n/a	<2.0	n/a		
Selenium D-Se	<0.0050	<0.0010	<0.0010	<0.20	<0.0050		
Silicon D-Si	4.50	n/a	n/a	4.54	n/a		
Silver D-Ag	<0.000050	<0.000050	<0.000050	<0.010	<0.00025		
Sodium D-Na	8.5	13.2	15.8	16.8	9.8		
Strontium D-Sr	0.777	n/a	n/a	0.385	n/a		
Thallium D-Tl	<0.00050	<0.00020	<0.00020	<0.20	<0.0010		
Tin D-Sn	<0.00050	n/a	n/a	<0.030	n/a		
Titanium D-Ti	<0.010	<0.050	<0.050	<0.010	<0.050		
Uranium D-U	0.0256	0.00114	0.00201	n/a	0.0316		
Vanadium D-V	<0.0050	<0.030	<0.030	<0.030	<0.050		
Zinc D-Zn	0.0094	0.0105	0.0066	<0.0050	0.016		
Footnotes:							

Appendix C
Margo Plug Technical Descriptions

WESTCOAST
DRILLING
SUPPLIES LTD.

PRODUCT INFORMATION

MARGO PLUG



Description: A mechanical type hollow stem hole plug, it comes in all standard sizes and lengths. The MARGO PLUG comes with 4 sturdy rubber sleeves.

Function: Mainly used to seal off underground drill holes or pump grout through.

Direction: Insert MARGO PLUG into the drill hole and tighten nut on the end of the plug. This will expand the rubber sleeves to shut the hole off. Now all fluid will flow up the middle of the plug. This flow can be controlled by a ball valve.

	MARGO TYPE EXPANDABLE PLUG		
CATALOGUE	**INCHES**	**MILLIMETER**	**HOLE SIZE**
M-112-36 M-112-48	1-1/8 X 36 1-1/8 X 48	28 X 900 28X1200	1-1/4 IN.
M-125-36 M-125-48	1-1/4 X 36 1-1/4 X 48	32 X 900 32 X 1200	1-3/8 IN.
M-137-36 M-137-48	1-3/8 X 36 1-3/8 X 48	35 X 900 35 X 1200	1-1/2 IN
M-162-36 M-162-48	1-5/8 X 36 1-5/8 X 48	41 X 900 41 X 1200	1-3/4 IN.
M-175-36 A W/L M-175-48	1-3/4 X 36 1-3/4 X 48	44 X 900 44 X 1200	1-7/8 IN.
M-187-36 M-187-48	1-7/8 X 36 1-7/8 X 48	47 X 900 47 X 1200	2 IN.
M-212-36 M-212-48	2-1/8 X 36 2-1/8 X 48	45 X 900 54 X 1200	2-1/4 IN.
M-225-36 M-225-48 B W/L	2-1/4 X 36 2-1/4 x 48	57 X 900 57 x 1200	2-3/8 IN.
M-237-36 M-237-48	2-3/8 x 36 2-3/8 x 48	60 x 900 60 x 1200	2-1/2 IN.
M-262-36 M-262-48	2-5/8 x 36 2-5/8 x 48	66 x 900 66 x 1200	2-3/4 IN.
M-287-36 N W/L M-287-48	2-7/8 x 36 2-7/8 x 48	73 x 900 73 x 1200	3 IN.
M-350-48 H W/L	3-3/4 x 36 3-3/4 x 48	95 x 900 95 x 1200	3-7/8 IN·

NOTE: See disclaimer for
supplier responsibility.

WESTCOAST DRILLING SUPPLIES LTD.
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