Deloitte & Touche

Anvil Range Mining Complex Investigations in Support of Progressive Reclamation of the Emergency Tailings Area

2005/06 Task 35

Prepared for

Deloitte and Touche Inc.

On behalf of

Faro Mine Closure Planning Office

Prepared by

SRK Consulting
Engineers and Scientists

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Investigations in Support of Progressive Reclamation of the Emergency Tailings Area

2005/06 Task 35

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Executive Summary

The report describes the results of an assessment of the means and costs to efficiently transfer the tailings in the emergency tailings area (ETA) to an acceptable location for disposal and storage.

The results of field studies in 2004 and 2005 indicate that the typical thickness of the tailings in the ETA is about 3 to 4 m and the maximum thickness is about 7 ½ m. The tailings volume is about 51,000 m^3, although the actual volume could vary from this estimate by approximately 5 to 10%. Some of the tailings are quite wet and are, therefore, potentially liquefiable.

Laboratory testing indicated that the near-surface tailings are more oxidized and will require higher lime amendment to facilitate neutralization. The tailings at depth will require about 60% of the lime amendment required by the near-surface tailings. The overall average (mathematical) lime demand is about 7.9 kg $Ca(OH)_2$ per tonne.

Contamination within the underlying soils, measured as a function of lime demand, extends in some areas to a depth of greater than 2.3 m below the tailings-soil contact. The lime demand in the contaminated soils is an average of about 0.9 kg $Ca(OH)_2$ per tonne, or about one tenth of the average lime demand within the tailings.

Mechanical excavation is the most appropriate means of relocating the tailings in the ETA. However, due to the high moisture content in some of the tailings, steps will have to be implemented to prevent the escape of tailings that liquefy in the back of the haul trucks during transport.

Very preliminary costs associated with relocating the ETA tailings and 1 m of underlying soil to the Rose Creek tailings facility have been developed on the basis of recent earthworks on site by independent local contractors and the estimated cost of lime addition. The costs include a potential increase of 8% in the actual volume of the tailings relative to the calculated volume, but do not include an overall contingency. Based on these assumptions, the estimated cost of relocating the tailings is approximately $1.04 million.

A more rigorous cost assessment could be developed using the existing site data in the event that a decision is made to relocate the tailings. In this case, the disposal location will need to be identified. However, the decision on the disposal location should wait until the overall closure plan for the Anvil Range Mining Complex has been selected.

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1 Introduction

The emergency tailings area (ETA) is situated downslope of the Faro plant site, and upslope of the Rose Creek tailings facility at the Anvil Range Mining Complex in Yukon Territory. During the 2004/2005 operating year, studies were conducted to determine the quantity of the tailings solids present in the ETA. In addition, there were initial studies regarding the impact of these tailings on the surrounding environment, including impacts on ground water.

Deloitte & Touche Inc. (D&T) planned incremental studies in conjunction with Task 35 of the 2005/06 Project Work Plan. The scope of these studies was described in the "Summary of Proposed 2005/06 Projects and Costs for the Faro and Vangorda Plateau Mine Sites," dated March 3, 2005, as follows:

> *This project would assess a multi-year program involving progressive reclamation of the emergency tailings area. The assessment would consider various methods and equipment to be utilized to ensure cost efficient tailings removal and approximate costs for removal and transfer to an acceptable location for disposal and storage. Alternative long term storage areas will be investigated.*

A meeting to discuss Task 35 was held in the Vancouver offices of SRK on 8 August 2005 between Doug Sedgwick of D&T and Cam Scott, P.Eng., of SRK Consulting (SRK). The removal options under consideration by D&T at that time were discussed, as were the potential issues and uncertainties associated with each of these options and the select requirements of Task 35 that D&T would like SRK to address. Following this meeting, SRK prepared a draft work scope that included a modest drilling and laboratory testing program, followed by engineering analyses and a report that would provide the following:

- A revised assessment of the volume of tailings that are present at the ETA;
- A brief assessment of the alternative methodologies available to relocate the ETA tailings; and
- General recommendations and a preliminary estimate of the costs for the most appropriate methodology for relocating the ETA tailings.

The drilling plan that accompanied the draft work scope was reviewed by John Brodie of the Faro Mine Closure Planning Office (FMCPO) prior to the initiation of the work. Comments from the FMCPO were included in a revised work plan that was submitted to D&T on 2 September 2005. This report summarizes the work that SRK completed in support of Task 35 as well as the corresponding results.

2 Description of Site

The ETA is situated below the plant site, in a basin-shaped area that is bounded on its north and east sides by high ground, on its west side by high ground and waste rock, and on its south side by the main access road that connects the Town of Faro with the Faro mine site (Figure 1 and the photos in Appendix A). A segment of the original Faro Creek channel that has a northeast to southwest orientation is covered by the tailings in the ETA.

The surface of the ETA is approximately rectangular in shape and covers an area approximately 180 m long by 60 to 110 m wide. The elevation of the top of the tailings ranges from about 1104 to 1110 m above mean sea level.

Although the presence of the Faro Pit limits the ETA catchment, some runoff from west of the plant site is directed to the ETA in a ditch along the north side of the access road. Some of this water seeps through the base of the access road. During freshet, runoff from the plant site flows due south across the ETA. Seepage from the waste rock dump immediately to the northeast flows around the south side of the ETA and reports to a culvert that runs under the access road at the south limit of the ETA.

Nearby areas that might be suitable for tailings storage include the Rose Creek tailings facility and the Faro Pit. The edge of the Rose Creek tailings facility is at elevation 1070 m and is approximately 1.5 km away by haul road. The access road to the Faro Pit has a maximum elevation of about 1188 m and the pit entrance, by haul road, is approximately 3.2 km from the ETA.

3 Investigation

3.1 2004 Drilling and Geophysical Programs

In 2004, data regarding the stratigraphy in the ETA close to the main access road was collected in conjunction with a series of drill holes (SRK04-3A&B and SRK04-4) and a single ground penetrating radar profile line (Line GPR-6) which was completed as part of groundwater studies at the ETA. The locations of these drill holes and GPR line are shown on Figure 2. Monitoring wells SRK04-3A&B encountered 6.5 m of tailings. The pump well at SRK04-4 encountered 6.0 m of tailings. Unfortunately the GPR line didn't provide much useful information.

3.2 2005 Sonic Drilling Program

Five drill holes (ETA-05-1 through ETA-05-5) were completed at the ETA on August 15, 2005 using a track-mounted sonic drill operated by SDS Drilling (Figure 2). The coordinates and the depth to original ground at each of these drill holes are provided in Table 3.1. Piezometers were installed in all five holes. An SRK inspector was present to log and photograph the holes as they were drilled and to direct the installation of the piezometers. The logs and corresponding sample photographs from each of the five drill holes are provided in Appendix B.

Table 3.1: GPS Coordinates and Depth to Original Ground at 2005 Drill Holes

Drill Hole	Northing (m)	Easting (m)	Depth to Original Ground (m)
ETA-05-1	6,913,843	582,964	7.3
ETA-05-2	6,913,841	583,004	4.5
ETA-05-3	6,913,801	582,987	6.8
ETA-05-4	6,913,850	583,056	6.0
ETA-05-5	6,913,851	582,990	5.2

3.3 Laboratory Testing Program

Samples of the tailings and natural soils from each of the five drill holes were collected by the inspector and subsequently sent to the EBA laboratory in Whitehorse for moisture content and gradation testing and the CEMI laboratory in Vancouver for lime amendment testing.

The moisture content and gradation results, coupled with the detailed sample descriptions, provide an indication of how the tailings will behave during relocation. The lime amendment testing was similar to the testing that was adopted in the tailings relocation program which was undertaken on tailings samples as part of 2005/06 Task 22a. Leach extraction tests were conducted on samples from the underlying soils to assess metal contamination.

The moisture content and gradation results are included in Appendix C. The lime demand test results and leach extraction test results are included in Appendix D.

4 Investigation Results

4.1 Tailings Thickness

Five sections (1 to 5) through the ETA are shown on Figure 3. The sections are based on a comparison of the pre-mining topography (7.6-m contour interval) and the 2003 topography (2-m contour interval) obtained from aerial photogrammetry. The 2005 drillhole data related to tailings thickness, which indicates the maximum thickness is about 7 ½ m, has been added to Sections 4 and 5. The drilling results do not match the pre-mining profiles perfectly but, given the apparent changes in the pre-mining topography between Sections 4 and 5 and the offsets of the drill holes relative to these sections, the original ground profiles on Sections 4 and 5 seem reasonable.

The volume of tailings in the ETA was computed using Sections 1, 2 and 3, and then computed a second time using Sections 4 and 5. In the first case, the computed volume was 52,340 m^3. In the second case, the computed volume of tailings was 49,220 m^3. Given the similarity of these results, the mean of these two results (about 51,000 m^3) is assumed to be representative of the volume of tailings in the ETA. It is possible, however, that the actual tailings volume could be greater than 51,000 m^3, although it is likely that a contingency of 5 to 10% (about 2,550 to 5,100 m^3) would cover the potential for the actual volume to exceed the estimated volume.

4.2 Moisture Content of the Tailings

A review of the drillhole logs and the tailings moisture content data in Appendix C indicates the following:

- The sand/silt tailings in drill hole ETA-05-1 are generally slightly moist, with moisture contents (measured on a geotechnical basis, whereby the moisture content, w, is equal to the weight of water divided by the weight of solids) of less than 10%. One exception was at a depth of 2.5 m, where the silt tailings were described as very moist and had a moisture content of 18.3%. A significant amount of gravel, presumably from the access road, is intermixed with the tailings in this drill hole.
- The sand/silt tailings in drill hole ETA-05-2 are slightly moist to moist, with moisture contents which range from 4.1% to 24.7%.
- The sand/silt tailings in the upper 1.5 m of drill hole ETA-05-3 are slightly moist, with moisture contents of less than 14%. However, in general, the tailings are wet with moisture contents which range from 16 to 24.1%.
- The tailings in drill hole ETA-05-4 are generally moist, with moisture contents in the range of 8.6 to 14.8%.
- The tailings in drill hole ETA-05-5 are generally slightly moist to moist, with moisture contents in the range of 2.7 to 15.9%.

Based on this information, the general condition of the tailings in relation to the moisture content data can be summarized as follows:

- Slightly moist (damp but no visible water): laboratory moisture content (geotechnical) of less than about 10%.
- Moist (somewhat wet to the touch, but no free water): laboratory moisture content of about 10% to 15%.
- Wet (visible free water, usually soil is below water table): laboratory moisture content of greater than about 15%.

In summary, the “wettest” tailings are generally found in ETA-05-3. The tailings in ETA-05-4 are moist, and those in ETA-05-2 are slightly moist to moist. The driest tailings are characteristically slightly moist and are found in ETA-05-1 and ETA-05-5. When these results are compared with the drill hole location map (Figure 2), it is apparent that the closer one gets to the drainage channel along the south side of the ETA, the “wetter” the tailings are likely to be. However, there is a dessicated zone of tailings over the entire surface of the ETA. The thickness of this zone ranges from about 0.5 to 2.5 m.

4.3 Extent of Contamination in the Tailings

Composite samples from tailings recovered from each of the drill holes completed in the ETA area were submitted for lime amendment testing to determine the overall lime demand for these tailings. Typically, two composite samples were prepared for each drill location to represent the more oxidized upper zone within the tailings, and the less oxidized tailings at depth. The composite make-up and estimated lime demand at each location are summarised in Table 4.1. Complete results are provided in Appendix D, Table D-1.

The results indicate that the near surface tailings are more oxidized and will require a higher lime amendment to facilitate neutralization. The near surface tailings have, on average, a lime demand of about 10.2 kg $Ca(OH)_2$ per tonne. The tailings at depth will require a lime amendment of about 6.0 kg $Ca(OH)_2$ per tonne. The overall average (mathematical) is about 7.9 kg $Ca(OH)_2$ per tonne.

Based on these lime amendment rates, reagent addition costs are expected to range from about $2.51 per tonne to $4.26 per tonne, with an average of about $3.30 per tonne.

Table 4.1: Summary of Lime Demand for Neutralizing Tailings

Composite	Contact* (m)	Description	Sample Interval	Lime Demand ($kgCa(OH)_2$/tonne)
ETA Comp 1	7.3	Tailings	ETA-05-1 0-2 m ETA-05-1 2-3 m	4.0
ETA Comp 2	7.3	Tailings	ETA-05-1 3-4.5 m ETA-05-1 4.5-6 m ETA-05-1 6-7.5 m	3.8
ETA Comp 3	4.3	Tailings	ETA-05-2 0-1 m ETA-05-2 1-2 m	13.8
ETA Comp 4	4.3	Tailings	ETA-05-2 2-3 m ETA-05-2 3-4.5 m	8.5
ETA Comp 5	6.75	Tailings	ETA-05-3 0-1 m ETA-05-3 1-2 m	8.8
ETA Comp 6	6.75	Tailings	ETA-05-3 2-3 m ETA-05-3 3-4 m	6.9
ETA Comp 7	6.75	Tailings	ETA-05-3 4-5 m ETA-05-3 5-6 m ETA-05-3 6-6.75 m	5.5
ETA Comp 8	6	Tailings	ETA-05-4 0-1 m ETA-05-4 1-2 m	16.1
ETA Comp 9	6	Tailings	ETA-05-4 2-3 m ETA-05-4 3-4 m ETA-05-4 4-4.5 m	6.4
ETA Comp 10	5.2	Tailings	ETA-05-5 0-0.7 m ETA-05-5 1.5-2 m	8.2
ETA Comp 11	5.2	Tailings	ETA-05-5 2-3 m ETA-05-5 3-4 m ETA-05-5 4-5.2 m	4.9

Note: * "Contact refers to the depth of contact between tailings and natural ground.

4.4 Extent of Contamination in the Underlying Soils

Samples of the soils below the tailings in the ETA area were submitted for elemental analysis and for leach extraction testing. Complete results are provided in Appendix D and are summarised below.

The elemental analyses of the soil samples tested are summarised in Table 4.2. The table shows the sample interval tested, and the depth interval of the sample below the contact. As shown, sulphur tends to be elevated in the samples immediately below the contact, and decreases at depth. Sample 4.3 to 5.3 from drill hole ETA-2 appears to have included some tailings, as suggested by the sulphur and lead contents. However, the zinc content is somewhat lower than expected for a tailings contaminated soil sample. Similar to sulphur, lead is elevated in the samples immediately below the contact and is lower at depth. Copper appears to exhibit a similar correlation with depth. Zinc content is generally elevated in all soil samples. Zinc contents also appear to exhibit a decreasing relationship with depth, the relationship is less marked than for sulphur and lead. The results for zinc in the ETA-05-3 samples appear anomalous since zinc increases with depth.

Table 4.2: Elemental Analyses of ETA Soils

Element	Contact (m)	Sample	Depth below OGS (m)	Cu ppm	Pb ppm	Zn ppm	S %
ETA-05-1	7.3	7.6-8.6	0.3 to 1.3	29.6	257.4	1688	0.11
ETA-05-2	4.5	4.3-5.3	0 to 1	93.8	820.2	1574	1.99
ETA-05-2	4.5	5.3-6.3	1 to 2	47.7	133.4	1580	0.33
ETA-05-3	6.75	6.9-7.5	0.15 to 0.75	24.5	85.3	1005	0.13
ETA-05-3	6.75	7.5-8.5	0.75 to 1.75	21.6	33.8	2118	<0.05
ETA-05-4	6	6-7	0 to 1	64.4	511.6	1690	1.19
ETA-05-4	6	7-8	1 to 2	47	108.8	1044	0.09
ETA-05-5	5.2	5.2-6	0 to 0.8	67.5	249	3905	0.76
ETA-05-5	5.2	6-7.5	0.8 to 2.3	44.2	96	2697	0.12

OGS = original ground surface

The results for the leach extraction tests, completed at a 3:1 liquid to solid ratio, are summarised in Table 4.3. The results show that pH increases with depth below the contact in drill holes ETA-05-3, -4 and -5. While near neutral pH values are observed at depth in drill holes ETA-05-3 and -4, the pH in ETA-05-5 remains acidic at depth. In contrast, the results for ETA-05-2 show a decrease in pH at depth. The reason for this is not apparent. Based on the endpoint pH and the high iron concentration, it is likely that the dissolved iron (ferrous) in the porewater had oxidized during the test and formed iron oxy-hydroxides which caused the decrease in pH. The soil likely has no or very little buffering capacity.

As shown in the table, zinc concentrations in the leach extraction tests indicate that the underlying soils have been contaminated to a depth in excess of 2.3 below the contact in some areas of the ETA. The zinc concentration was low in only one sample; ETA-05-3, from 7.5 to 8.5 m, had a zinc concentration of only 0.055 mg/L. This sample also had the highest pH. Manganese concentrations in general are also elevated, as is aluminum in the samples with a low pH.

Table 4.3: Shakeflask Extraction Test Results for ETA Soils

Sample/Interval	Depth* (m)	pH	Al mg/L	Cd mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Mn mg/L	Zn mg/L
ETA-05-1 : 7.6-8.6	0.3 to 1.3	4.30	0.56	0.02	0.12	44	2.11	7.38	111
ETA-05-2 : 4.3-5.3	0 to 1	6.83	0.12	0.02	< 0.02	0.02	0.09	5.6	22
ETA-05-2 : 5.3-6.3	1 to 2	4.05	3.51	0.06	0.22	152	0.25	4.92	126
ETA-05-3 : 6.9-7.5	0.15 to 0.75	4.41	0.6	< 0.01	0.03	0.05	0.06	7.59	76.8
ETA-05-3 : 7.5-8.5	0.75 to 1.75	8.09	0.08	< 0.01	< 0.02	< 0.01	< 0.03	1.54	0.055
ETA-05-4 : 6-7	0 to 1	5.17	0.36	0.1	0.12	0.02	1.12	5.35	56.4
ETA-05-4 : 7-8	1 to 2	7.12	0.09	< 0.01	< 0.02	0.01	< 0.03	5.67	7.14
ETA-05-5 : 5.2-6	0 to 0.8	3.96	18.6	< 0.01	0.07	317	0.85	12.8	488
ETA-05-5 : 6-7.5	0.8 to 2.3	4.77	1.03	0.01	< 0.02	42.5	0.13	4.85	185

Note: * Depth below tailings – soil contact

Based on the solute released observed for the underlying samples, it is apparent that in some areas the underlying soils have been contaminated to a depth in excess of 2.3 m below the tailings-soil contact. The results also suggest that lime amendment will be required for these soils, and that the lime demand will range up to 4.1 kg $Ca(OH)_2$ per tonne, with an estimated average of about 0.89 kg $Ca(OH)_2$ per tonne, calculated from the leach extraction test results.

5 Tailings Relocation Options and Costs

5.1 Relocation Options

As has been discussed in previous reports related to the potential relocation of the tailings in the Rose Creek tailings facility, the main options generally considered for tailings relocation consist of the following:

- Dredging;
- Hydraulic monitoring; and
- Mechanical excavation.

Comments on the potential application of these methods to relocate the ETA tailings are provided below.

5.1.1 Dredging and Hydraulic Monitoring

In view of the relatively modest volume of tailings present in the ETA and the high capital costs associated with the establishment of a dredge or hydraulic monitor system, these two methods of tailings relocation are not recommended for the ETA tailings.

However, because hydraulic monitoring is the preferred method under consideration for relocating the tailings in the Rose Creek tailings facility as part of closure, hydraulic monitoring at the ETA may be worth considering on a trial basis, despite the cost. However, there are a number of factors that suggest that information obtained from a trial with the ETA tailings will provide only limited information that is directly transferable to the larger scale relocation associated with the Rose Creek tailings facility. In particular, while the depth of the ETA tailings is a maximum of about 7½ m, the typical thickness is between 3 and 4 m. With this thickness, a substantial portion of the tailings profile consists of relatively dessicated tailings. Given that, except for the first cut, we would expect most of the tailings in the Rose Creek tailings facility to be relatively moist to wet, the limitations of a trial at the ETA become evident. Based on these factors, we do not recommend using hydraulic monitoring of the ETA tailings to attempt to demonstrate how the relocation of the main tailings deposit might proceed.

5.1.2 Mechanical Excavation

The limited area and thickness of the ETA tailings deposit are factors that support the relocation of the ETA tailings by mechanical measures. In particular, an excavator and small fleet of trucks are well suited to this tailings relocation project. Some of the factors that work in favour of mechanical excavation are as follows:

- The ETA tailings comprise a relatively small volume, occupy a concise area, have shallow thicknesses on the sides of the ETA and, over most of the deposit, are underlain by soils which are favourable to equipment traffic.
- There is a strong likelihood that some of the soil underlying the ETA tailings will require removal, and this removal can most efficiently done using mechanical excavation.
- The type of equipment and expertise required for mechanical excavation is available on a local hire basis.

Despite the attractiveness of mechanical excavation, there are portions of the tailings that will be prone to liquefaction in the back of a moving haul truck. Once liquefied, these tailings could flow out the back of the truck and spread over large, uncontrolled areas. It is important, therefore, that the haul trucks used on this program have gates that close properly. Furthermore, the contractor should have contingency plans to address the situation where the gates are insufficient to prevent the escape of liquefied tailings as the tailings are transported to their deposition location. Due to the depth of the wet tailings, it is unlikely that shifting the relocation process to colder periods of the year will overcome the liquefaction issue.

5.2 Relocation Costs

There are three main costs associated with the relocation of the ETA tailings. They include the following:

- Relocation of the tailings by mechanical methods;
- Addition of lime to the tailings as part of tailings re-handling;
- Relocation of contaminated soil beneath the tailings; and
- Addition of lime to the contaminated soils.

As noted in Section 4.1, the estimated volume of tailings is 51,000 m^3. However, it is reasonable to account for potential inaccuracies in the volume estimates. Allowing for another 4,000 m^3 of tailings (about 8%) would provide a reasonable contingency. Recently obtained information from the site indicates that the cost of moving soil is currently in the range of $7.50 to $9.50 per cubic metre. Given the sloppy nature of some of the tailings, the upper end value is probably more realistic for loading, hauling the tailings to the Rose Creek tailings facility, dumping and spreading the tailings.

Assuming lime must be added to all of the tailings and that the average dry density of the tailings is about 2 tonnes per cubic metre, there will be 55,000 m^3 or 110,000 tonnes of tailings requiring lime amendment. As noted in Section 4.3, the average cost of lime addition is $3.30 per tonne of tailings.

The thickness of the soil beneath the tailings that will have to be removed as well will require input from the FMCPO and others. For this report, it has been assumed that a 1 m thickness of soil will have to be removed from the entire impoundment. This corresponds to a volume of approximately 15,000 m^3. It is relatively inefficient to have to remove 1 m of soil, and as a result, it is assumed that the cost to move this soil to the Rose Creek tailings facility is also $9.50 per cubic metre.

Assuming lime must be added to the contaminated soil and that the average dry density of the soil is about 2 tonnes per cubic metre, there will be 30,000 tonnes of contaminated soil requiring lime amendment. Based on the information in Section 4.4, the average cost of lime addition is $0.37 per tonne of contaminated tailings.

Table 5.1 has been prepared to summarize these quantities and costs based on the assumptions listed above.

Table 5.1 Estimate of Approximate Costs for Tailings Relocation

Item	Quantity	Units	Unit Price	Amount
Move tailings (with 10% contingency on quantity)	55,000	Cubic metres	$9.50	$522,500
Add lime to tailings	110,000	Tonnes	$3.30	$363,000
Move 1-m of contaminated soil beneath tailings	15,000	Cubic metres	$9.50	$142,500
Add lime to contaminated soil	30,000	Tonnes	$0.37	$11,200
Total				**$1,039,200**

With the exception of the contingency applied to the volume of tailings, there is no incremental contingency in the estimated cost provided above.

6 Conclusions and Recommendations

As part of Task 35 of the 2005/06 Project Work Plan, SRK was contracted by Deloitte & Touche Inc. to complete an assessment of the means and costs to efficiently transfer the tailings in the emergency tailings area (ETA) to an acceptable location for disposal and storage. The ETA is situated in a basin-shaped area immediately upstream of the main access road that connects the Town of Faro with the Faro mine.

Following a modest program of drilling and geophysical studies in 2004, five drill holes were completed at the ETA in August 2005 using a sonic drill. Each drill hole was logged and sampled, and the samples were sent to laboratories for routine geotechnical and geochemical testing. Piezometers were installed in each of the five drill holes.

Based on data collected in 2004 and 2005, the typical thickness of the tailings in the ETA is about 3 to 4 m and the maximum thickness is about 7 ½ m. The estimated tailings volume is about 51,000 m^3, although the actual volume could vary from this estimate by approximately 5 to 10%.

There is a dessicated layer of tailings 0.5 to 2.5 m thick over the entire surface of the ETA. Below this dessicated layer, the tailings vary from slightly moist to wet, with “wetter” tailings coinciding with the drainage channel along the south side of the ETA.

Laboratory testing indicated that the near-surface tailings are more oxidized and will require more lime amendment to facilitate neutralization. The tailings at depth will require about 60% of the lime amendment required by the near-surface tailings. The overall average (mathematical) lime demand is about 7.9 kg $Ca(OH)_2$ per tonne.

Contamination within the underlying soils, measured as a function of lime demand, extends in some areas to a depth of greater than 2.3 m below the tailings-soil contact. The lime demand in the contaminated soils is an average of about 0.9 kg $Ca(OH)_2$ per tonne, or about one tenth of the average lime demand within the tailings.

Methods for relocating these tailings include dredging, hydraulic monitoring and mechanical excavation. However, due to factors such as the relatively modest volume of tailings, the relatively shallow depth of the tailings, the expectation that at least some of the natural soils immediately beneath the tailings will also require relocation and the ready availability of mechanical equipment, mechanical excavation is the most appropriate means of relocating the tailings in the ETA. However, based on the high moisture content in some of the tailings, the haul trucks will have to have to be fitted in a manner that prevents the escape of tailings that liquefy in the back of the haul trucks during transport.

Possible locations to store the relocated tailings include, for example, the Rose Creek tailings facility (about 1.5 km away, but the actual distance would depend on the storage location on the tailings facility) and the Faro pit (about 3.2 km away).

Very preliminary costs associated with relocating the ETA tailings to the Rose Creek tailings facility have been developed on the basis of recent earthworks on site by independent local contractors and the estimated cost of lime addition. The costs include a potential increase of 8% in the actual volume of the tailings relative to the calculated volume, but do not include an overall contingency. Based on these assumptions, the estimated cost of relocating the tailings is approximately $1.04 million.

A more rigorous cost assessment could be developed using the existing site data in the event that a decision is made to relocate the tailings. In this case, the disposal location will need to be identified. However, the decision on the disposal location should wait until the overall closure plan for the Anvil Range Mining Complex has been selected.

This report, **"Anvil Range Mining Complex: Investigations in Support of Progressive Reclamation of the Emergency Tailings Area - 2005/06 Task 35"**, has been prepared by SRK Consulting (Canada) Inc.

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Daryl Hockley, P.Eng.

Figures

SRK Consulting
Engineers and Scientists
Vancouver

Deloitte & Touche

ETA Tailings Characterization

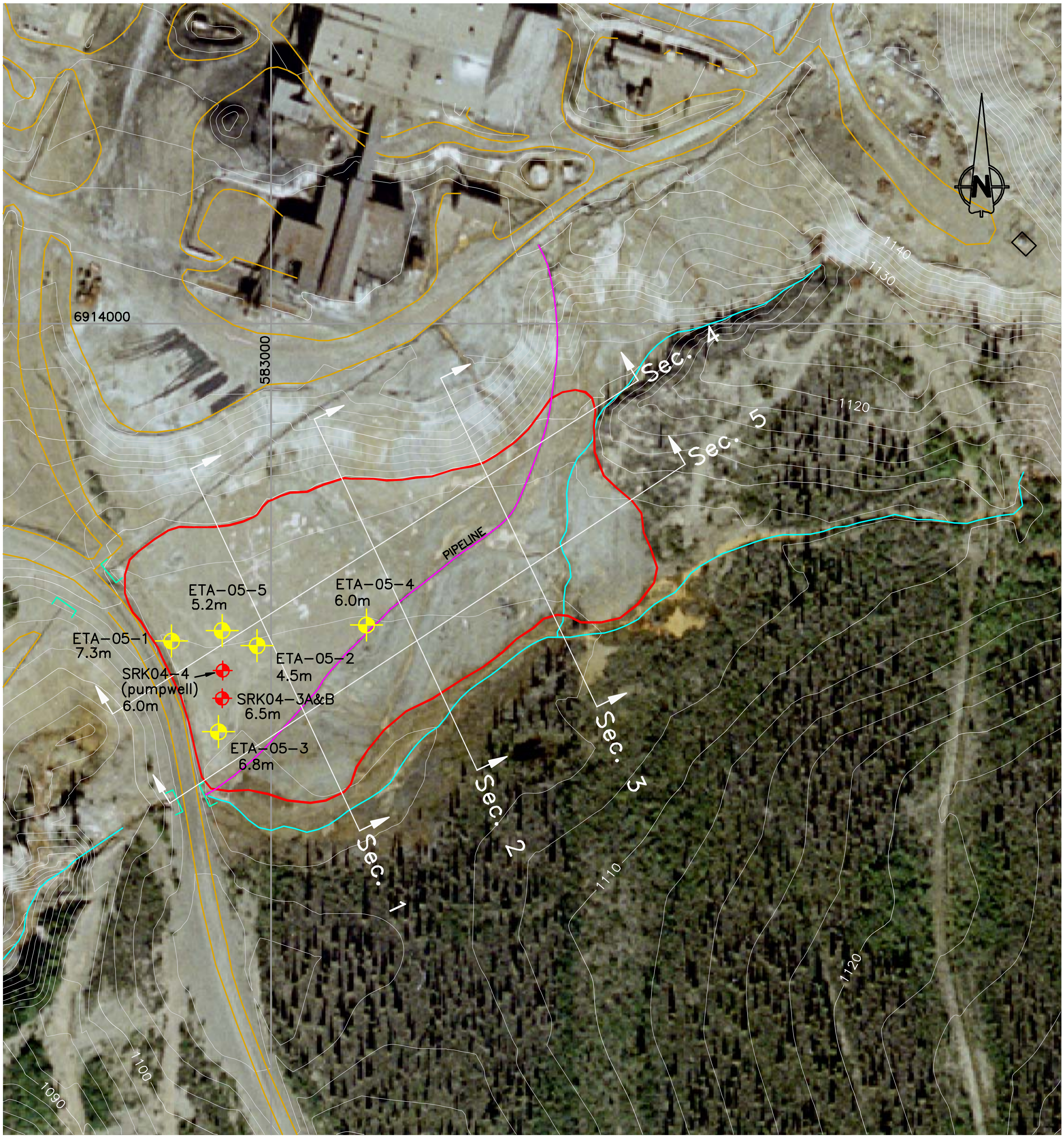
ETA Location

SRK JOB NO.: 1CD003.081

FILE NAME: \2006 Acad drawings\ETA_Location.dwg

Faro Mine Site

DATE:	APPROVED:	FIGURE:
July 06	CS	1



Faro Mine, Yukon

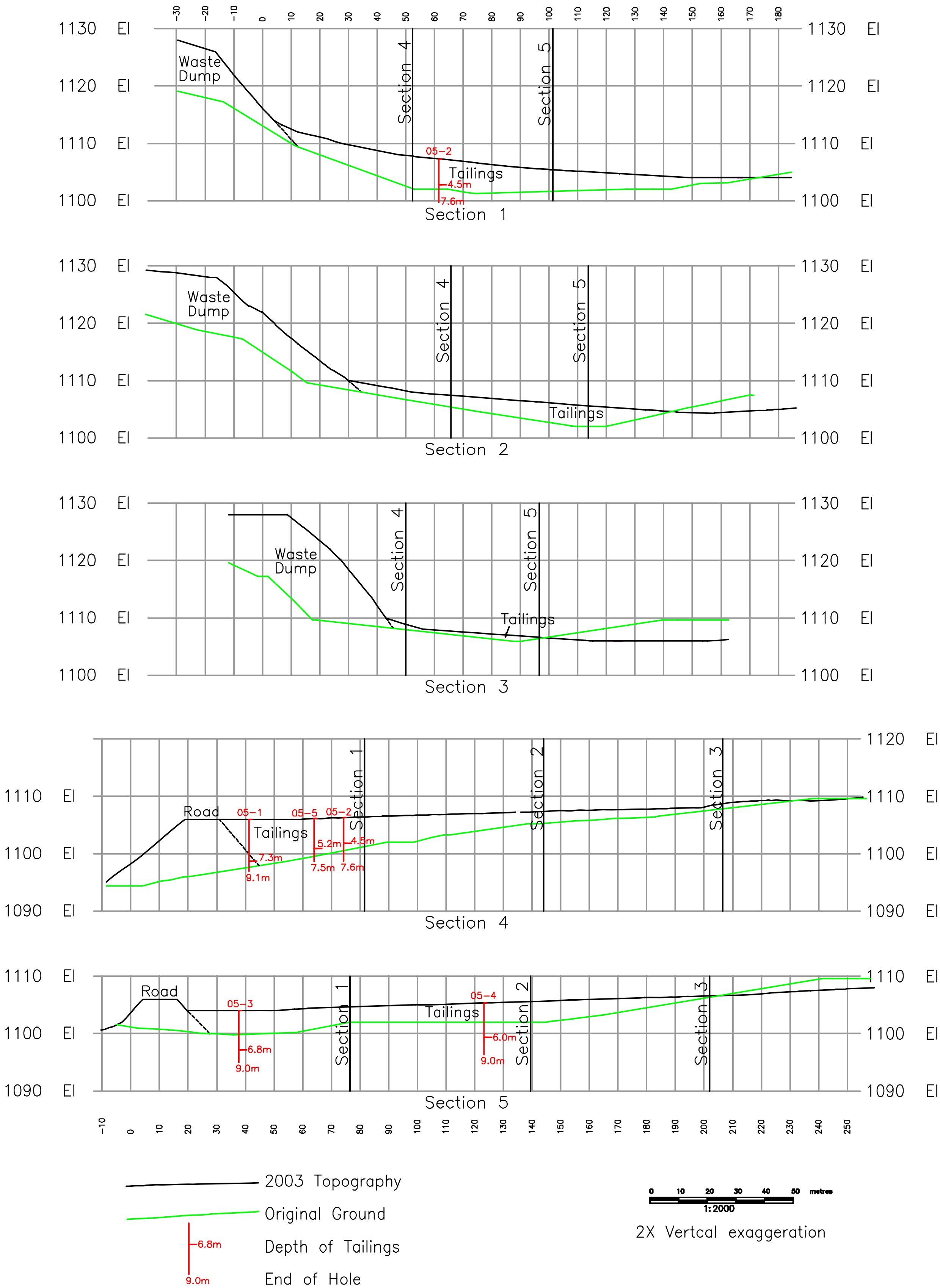
Map Scale : 1:5000
Contour Interval: 2m
Date of Photography: 03/07/25
Scale of Photography: 1:20000
Survey control derived from existing 1:20000 photography
Survey control based on: UTM Projection, NAD27
Compiled by The ORTHOSHOP, Calgary, September 2003
WO 8856

2005 Drill Hole
2004 Drillhole
8.0m Estimated thickness of tailings

0 10 20 30 40 50 Metres
1:2000

Refer to Fig. 3 for Sections

SRK Consulting Engineers and Scientists Vancouver	Deloitte & Touche	ETA Tailings Characterization
		ETA Drillholes and Estimated Thickness of Tailings
SRK JOB NO.: 1CD003.081	Faro Mine Site	DATE: July 06
FILE NAME: \2006 Acad drawings\FARO SITE PLAN-ETA.dwg		APPROVED: CS
		FIGURE: 2



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ETA Tailings Characterization

ETA Sections

SRK JOB NO.: 1CD003.081

FILE NAME: \2006 Acad drawings\ETA_sections.dwg

Faro Mine Site

DATE:	APPROVED:	FIGURE:
July 06	CS	3

Appendix A
Site Photos

Photo 1: Southeastward view across the ETA from the general vicinity of the plant site. The mine access road is visible in the background. June 2006.

Photo 2: View similar to Photo 1, with the access road in the background (with trucks). June 2006.

Photo 3: Southwestward view across the east edge of the ETA. The Rose Creek Tailings Impoundment is visible in the background. June 2006.

Photo 4: Ground level view, looking southwestward, of the ETA. The trees were cut down leaving the stumps that are evident above the surface of the tailings. June 2006.

Photo 5: Southward view along the west side of the ETA. June 2006.

Photo 6: Westward view across the ETA (lower left foreground), with the plant site situated to the right (north) of the waste rock. June 2006.

Photo 7: Northwestward view from the access road. The pipes on the surface of the ETA are piezometers installed during the drilling campaigns. June 2006.

Photo 8: Westward view from the access road. The gully to the left (south) of the access road is part of the original channel for Faro Creek. June 2006.

Appendix B
2005 Drill Logs and Sample Photos

Drillhole: ETA-05-1
Date Drilled: August 15, 2005
Inspector: Dylan MacGregor
Coordinates:
GPS Easting: 582,964 GPS Northing: 6,913,843
Location: on north half of ETA, close to the access road
Estimated total depth: 9.14m

From (m)	To (m)	Description
0.00	0.15	Light brown, slightly moist SAND mixed with dark grey discrete pods. Subang gravel at surface.
0.15	0.30	Dark grey to black, fresh sulphides (sand), no oxidation, slightly moist.
0.30	0.61	Light yellowish, brown gravelly sand, slightly moist, angular gravel up to 2cm diameter.
0.61	2.13	Dark grey sulphide sand, some lenses up to 20cm with more fines, fresh slightly moist pyrite (sand). Bottom of unit has more pyritic sand, less fines.
2.13	2.90	Brownish orange, gravelly sand silt, moist to very moist. Angular gravel (20%) up to 3cm. No fresh sulphides observed.
2.90	7.32	Mottled white/orange/grey/brown zone, dry to slightly moist, silty sandy gravel (angular, up to full core diameter (10cm)). Lenses of visible pyrite up to 20cm.
7.32	7.60	Original ground. Peat layer 5cm thick, coarse, fibrous. Smells like diesel.
7.62	9.14	Dark chlorite green to olive green, gravelly, silty sand, moist to wet, mottled rusty zone @ 8.53m (diesel smell from 7.62 - 8.53m)

Photo of sample obtained with Sonic Drill from hole ETA-05-1. Material from top of hole is at left rear. Sample at depth is laid out sequentially left to right, back to front.

Photo of sample from ETA-05-1. Sample order is as indicated by upper photo, so the material from the bottom of the hole is at front right.

Drillhole: ETA-05-2
Date Drilled: August 15, 2005
Inspector: Dylan MacGregor
Coordinates:
GPS Easting: 583,004 GPS Northing: 6,913,841
Location: on ETA, northeast of the pumpwell at SRK04-4
Estimated total depth: 7.60m

From (m)	To (m)	Description
0.00	0.30	Light brown, gravelly sand, dry, ang - subang gravel. ETA surface material.
0.30	1.20	Yellowish grey moist tailings, 95% fresh, sandy silt, vertical black and orange laminations
1.20	3.00	Yellowish brown tailings sand, very slightly moist, 5% loosely cemented no silt
3.00	4.30	Dark grey tailings sand, little to no silt, moist. Water level appeared to be at 4.0m
4.30	4.50	Mixed tailings and organics
4.50	5.50	Sandy gravel, subang - subround, light brown, moist
5.50	6.50	Olive green till, silty sandy gravel, moist. Diesel smell.
6.50	6.70	Coarse sand with gravel, no silt
6.70	7.60	Wet till, silty sandy gravel, light orangey brown

Photo of sample obtained with Sonic Drill from hole ETA-05-2. Material from top of hole is at left rear. Sample at depth is laid out sequentially left to right, back to front.

Photo of sample from ETA-05-2. Sample order is as indicated by upper photo, so the material from the bottom of the hole is at front right.

Drillhole: ETA-05-3
Date Drilled: August 15, 2005
Inspector: Dylan MacGregor
Coordinates:
GPS Easting: 582,987 GPS Northing: 6,913,801
Location: on south half of ETA, close to the access road
Estimated total depth: 9.00m

From (m)	To (m)	Description
0.00	0.40	Gravel, subangular, 40% sand, orange, dry.
0.40	1.50	Yellowish brown coarse tailings, <5% angular gravel mixed in, dry to slightly moist.
1.50	3.00	Dark grey fresh tailings, silt with 5% sand, wet.
3.00	5.25	Yellowish grey tailings sand, fresh, wet, very little silt.
5.25	6.75	Wet silt (tailings - fresh) as from 1.5 - 3m.
6.75	6.78	Fibrous peat.
6.78	7.50	Coarse sandy gravel with silt, light brown, wet. Angular to sub-rounded gravel.
7.50	8.40	Dark chlorite green, gravelly sandy silt (till), moist, angular gravel chips to 3cm diameter.
8.40	9.00	Probable bedrock: powder rock flour and chips that look like quartzite - siliceous (EOH).

Photo of sample obtained with Sonic Drill from hole ETA-05-3. Material from top of hole is at left rear. Sample at depth is laid out sequentially left to right, back to front.

Photo of sample from ETA-05-3. Sample order is as indicated by upper photo, so the material from the bottom of the hole is at front right.

Drillhole: ETA-05-4
Date Drilled: August 15, 2005
Inspector: Dylan MacGregor
Coordinates:
GPS Easting: 583,056 GPS Northing: 6,913,850
Location: near the approximate middle of the ETA
Estimated total depth: 9.00m

From (m)	To (m)	Description
0.00	0.20	Pale orangey tan, silty gravel with streaks of yellow and orange silt.
0.20	1.70	Fine to medium sand tailings, moist. Transitions with depth from orange at top through brownish orange, yellowish grey, brownish yellow.
1.70	4.50	Uniform yellowish dark grey, fresh, medium sand tailings, moist
4.50	6.00	Tailings, based on drill response. Note that sonic core from this run was lost due to cobble layer. Transition from tailings to overburden occurred over this interval but the driller thinks native soil starts @ 6m.
6.00	6.40	Orangey brown, sandy gravel with silt, subangular gravel, wet.
6.40	8.00	Transition from gravel through gravelly till to silty till. Moist, yellowish brown
8.00	9.00	Yellowish brown silt (till), sandy gravelly silt, moist
		because of lost interval, piezo was screened from 6.4 to 9.0 to allow 0.4m seal b/w screen and base of tailings (minimum). Seal likely much thicker (<1.5m thicker) based on drillers observations.

Drillhole: ETA-05-5
Date Drilled: August 15, 2005
Inspector: Dylan MacGregor
Coordinates:
GPS Easting: 582,990 GPS Northing: 6,913,851
Location: on ETA, north of the pumpwell at SRK04-4
Estimated total depth: 7.50m

From (m)	To (m)	Description
0.00	0.50	Tan sandy gravel, subangular to subrounded, dry to slightly moist.
0.50	0.70	Yellowish brown tailings, fine sand with silt, moist. Isolated orangey-brown clasts
0.70	1.50	Moist tailings, based on drill response. Granite cobble stuck in bit at 0.7m; no sample recovery from 0.7m - 1.5m.
1.50	1.70	Moist silty fine sand tailings, yellowish brown
1.70	2.00	Tan sandy gravel as from 0m to 0.5m
2.00	3.80	Yellowish brown fine to medium sand tailings, slightly moist, little to no fines
3.80	5.20	Tailings as above - transition to yellowish grey color
5.20	5.40	Dark grey to black organics, silt, moist
5.40	6.20	Tan to light brown fine to medium sand with silt, moist
6.20	7.50	Pale green silty sandy gravel, moist (till). Particles subrounded to subang. Becomes sandier towards EOH

Photo of sample obtained with Sonic Drill from hole ETA-05-5. Material from top of hole is at left rear. Sample at depth is laid out sequentially left to right, back to front.

Photo of sample from ETA-05-5. Sample order is as indicated by upper photo, so the material from the bottom of the hole is at front right.

Appendix C
Moisture Content Results

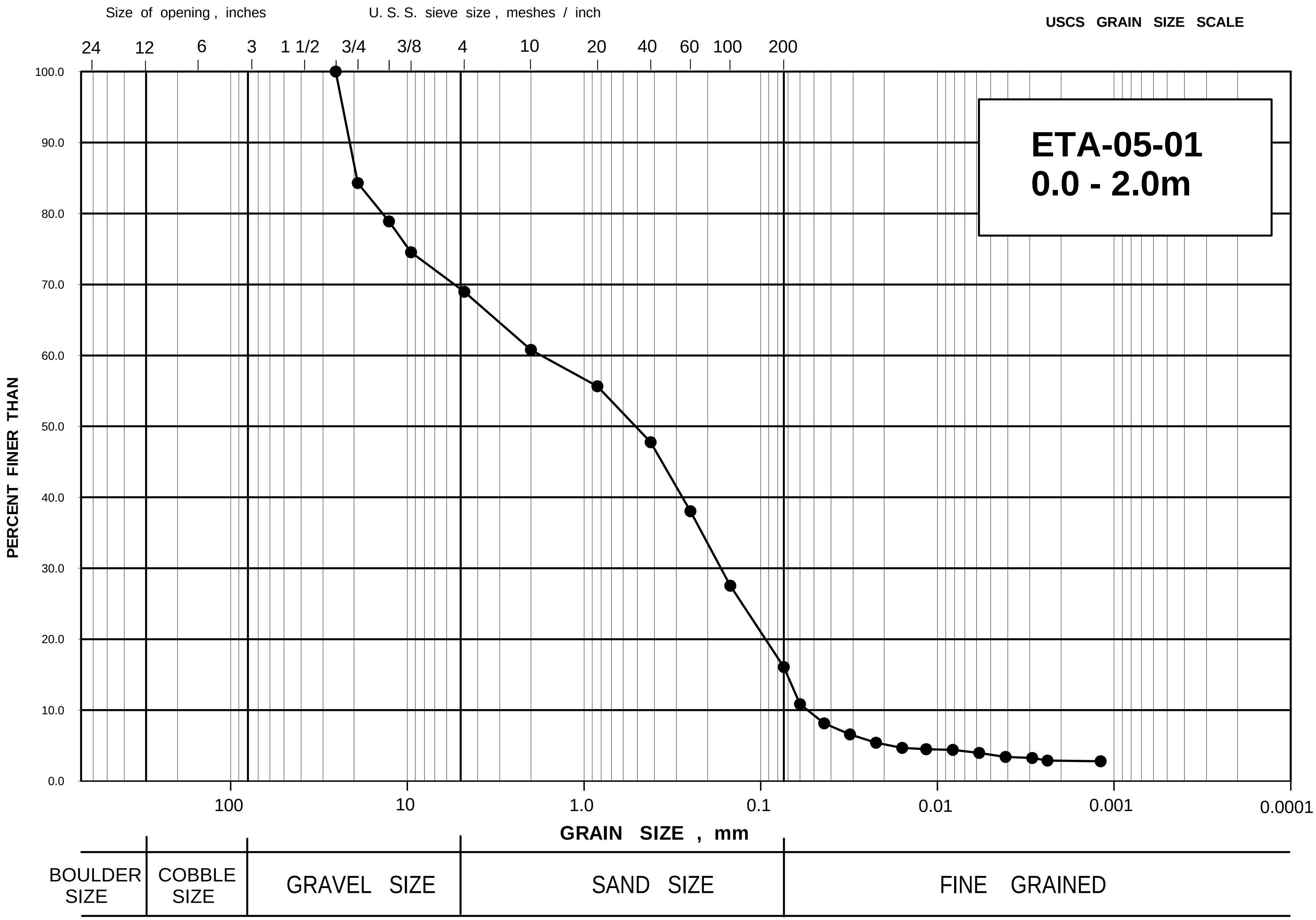
Project Number : **05-1416-162** **Tech :** **TM**

Laboratory Determination of Water Content of Soil and Rock
ASTM D 2216-92

Borehole	**ETA-05-1**	**ETA-05-2**	**ETA-05-3**	**ETA-05-4**	**ETA-05-5**	
Sample Number						
Depth (m)	0.0-2.0	3.0-4.3	6.0-6.75	3.0-4.0	4.0-5.2	
CONTAINER NUMBER	521	100	166	478	102	
MASS WET SOIL + TARE	159.8	120.5	122.9	117.2	124.1	
MASS DRY SOIL + TARE	151.1	106.9	109.5	106.1	113.4	
MASS OF WATER	8.7	13.6	13.4	11.1	10.7	
MASS OF CONTAINER	17.4	16.8	17.3	18.6	19.6	
MASS OF DRY SOIL	133.7	90.1	92.2	87.5	93.8	
Water Content W (%)	**6.5**	**15.1**	**14.5**	**12.7**	**11.4**	

Borehole						
Sample Number						
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
Water Content W (%)						

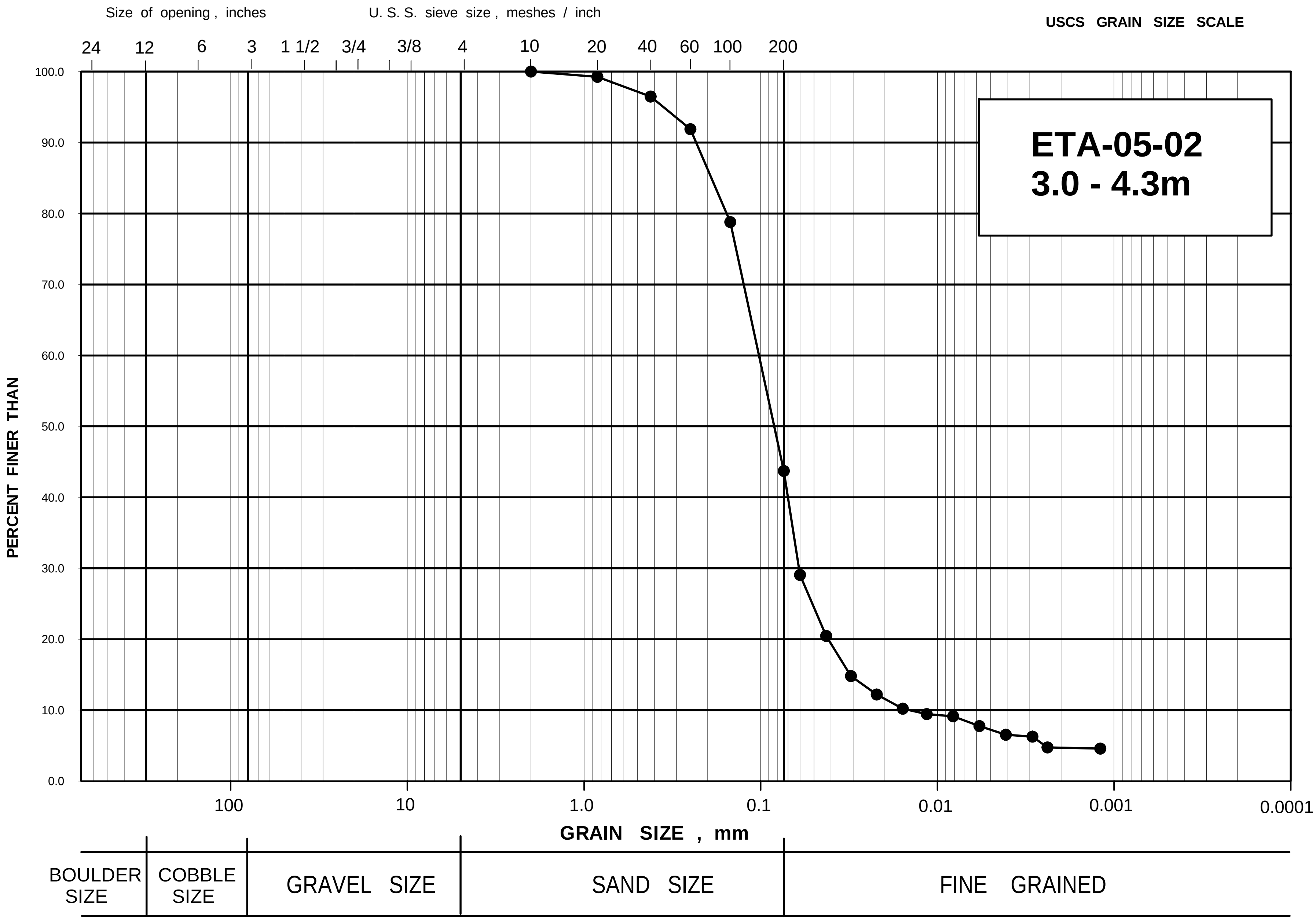
Borehole						
Sample Number						
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
Water Content W (%)						



Project No. 05-1416-162
Drawn TM
Reviewed LL
Date 10/07/05

Golder Associates

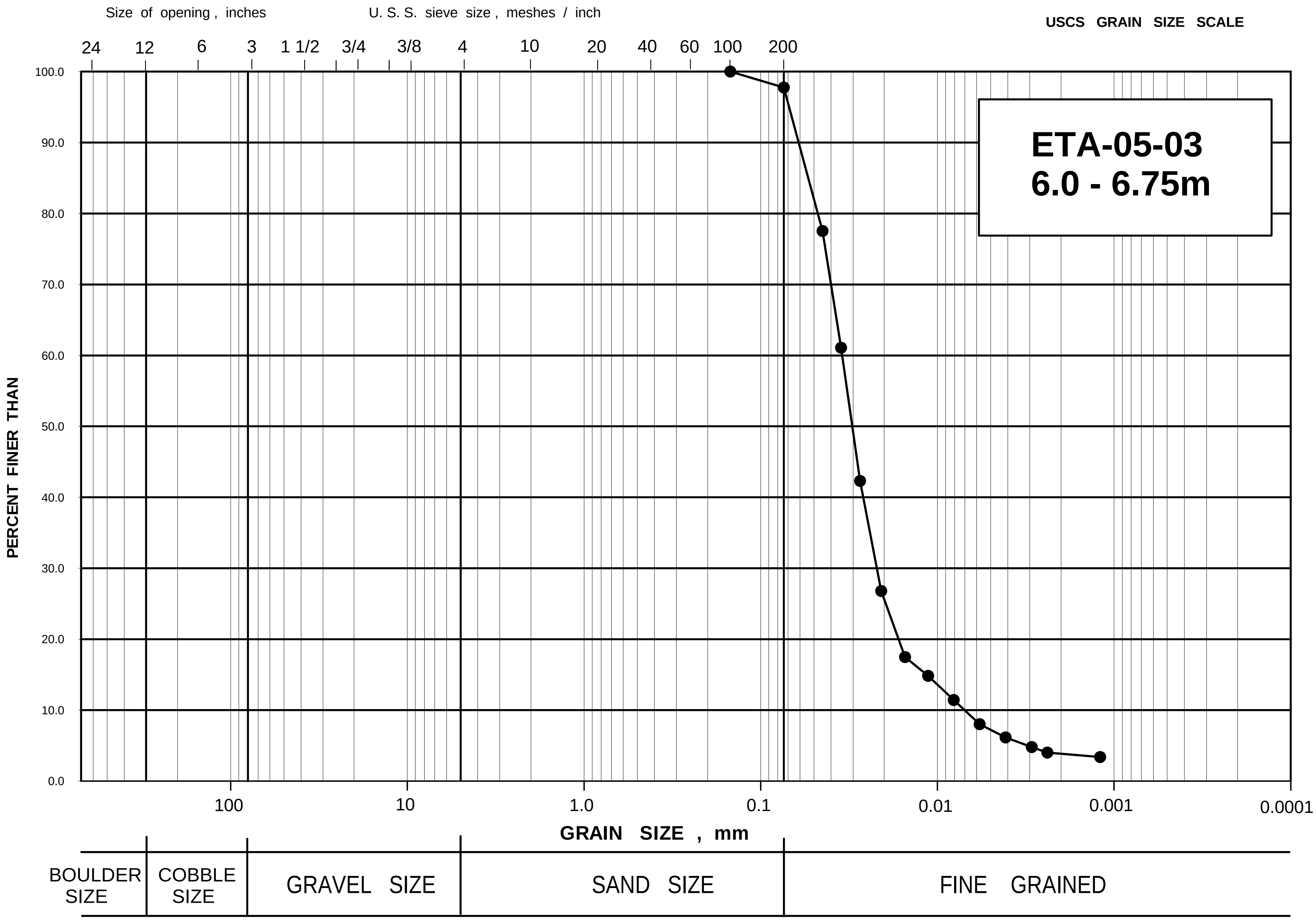
GRAIN SIZE DISTRIBUTION



Project No. 05-1416-162
Drawn TM
Reviewed LL
Date 10/07/05

Golder Associates

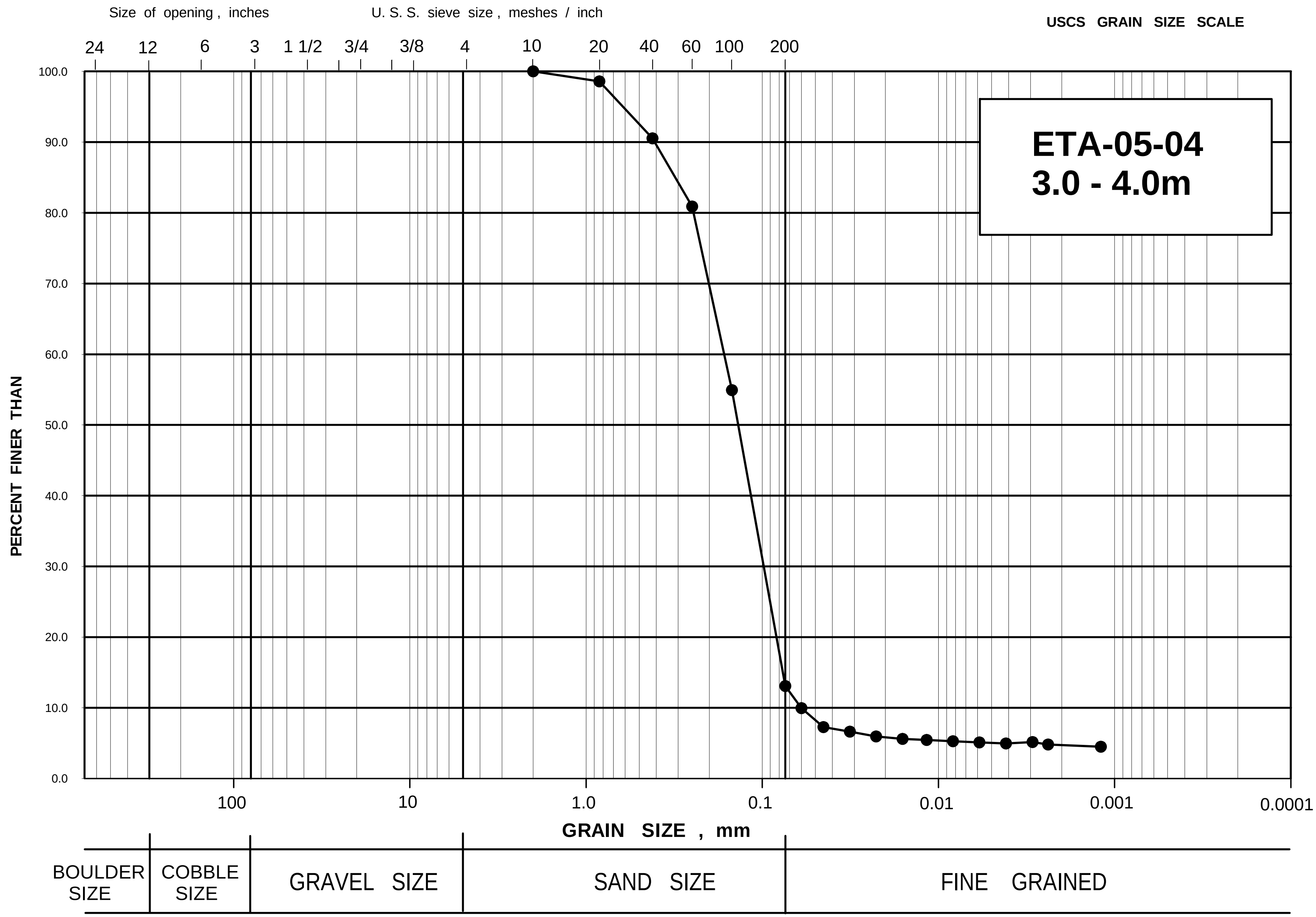
GRAIN SIZE DISTRIBUTION



Project No. 05-1416-162
Drawn TM
Reviewed LL
Date 10/07/05

Golder Associates

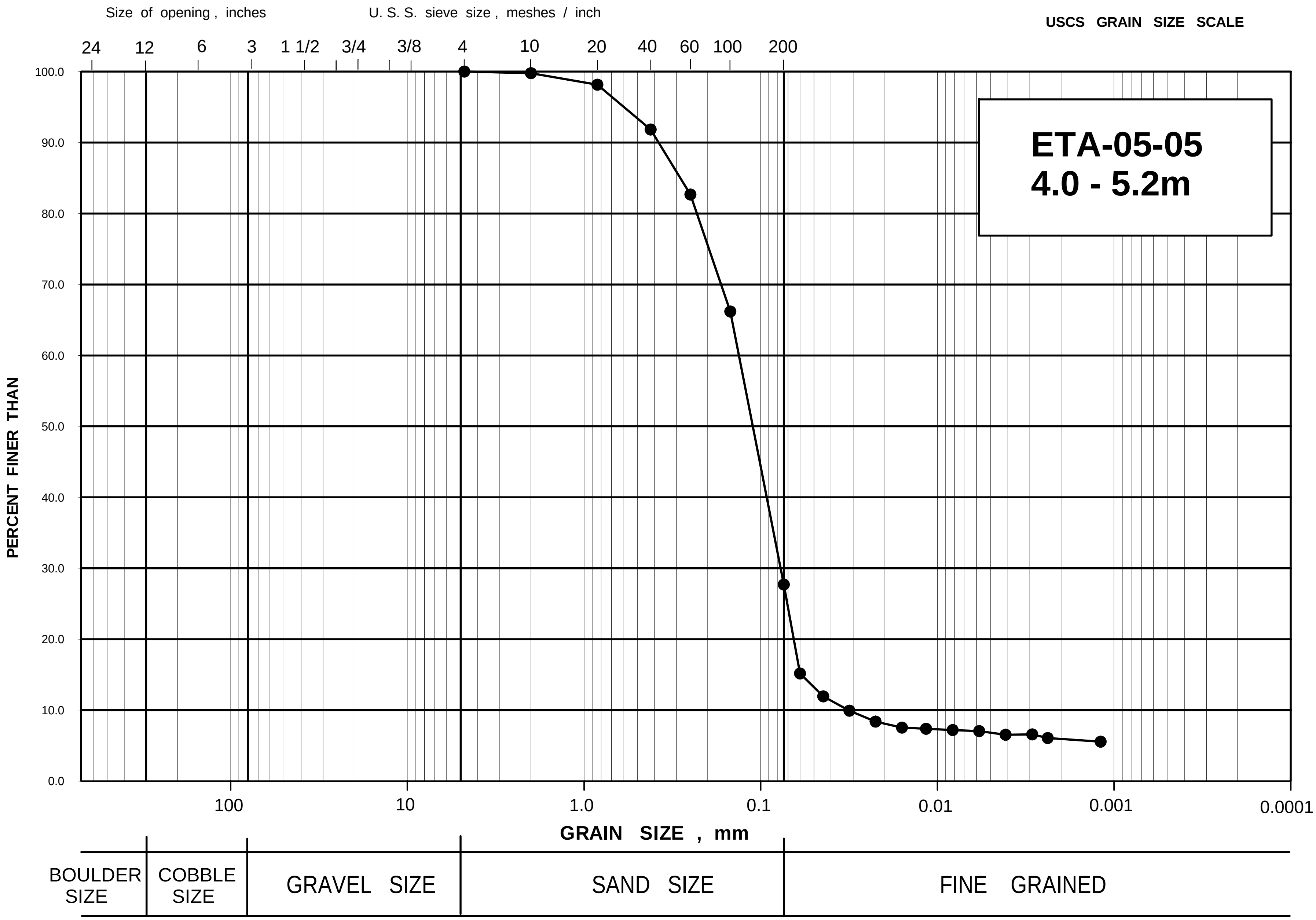
GRAIN SIZE DISTRIBUTION



Project No. 05-1416-162
Drawn TM
Reviewed LL
Date 10/07/05

Golder Associates

GRAIN SIZE DISTRIBUTION



Project No. 05-1416-162
Drawn TM
Reviewed LL
Date 10/07/05

Golder Associates

GRAIN SIZE DISTRIBUTION

PARTICLE SIZE ANALYSIS OF SOILS   ASTM D 422-63

Project No. :	05-1416-162	**Client :**	SRK		**BH :**	ETA-05-1	
Sch#	225	**Project :**	Faro Lab Testing		**Sample :**		
Lab Work:	TM	**Location:**	Burnaby		**Depth :**	0.0-2.0m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.1	
	Total Weight	133.1	Before Wash	55.6	Total -200	14.7	
			After Wash	42.0	Gs	4.00	
Size (USS)	**Weight Retained**	**Retained** (%)	**Weight Retained**	**Retained** (%)	**% Retained Total**	**Diameter** (mm)	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	20.9	15.7			15.7	**19.1**	**84.3**
1/2"	7.2	5.4			5.4	**12.7**	**78.9**
3/8"	5.8	4.4			4.4	**9.52**	**74.5**
#4	7.4	5.6			5.6	**4.76**	**69.0**
#10	10.9	8.2			8.2	**2.00**	**60.8**
#20			4.7	8.5	5.1	**0.840**	**55.6**
#40			7.2	12.9	7.9	**0.420**	**47.8**
#60			8.9	16.0	9.7	**0.250**	**38.0**
#100			9.6	17.3	10.5	**0.149**	**27.5**
#200			10.5	18.9	11.5	**0.074**	**16.1**
Pan			14.7	26.4	16.1		

HYDROMETER ANALYSIS

Time (min)	**Hydrometer Reading**	**Temperature** (^{o}C)		**Composite Correction**	**Hydrometer Corrected**	**Diameter** (mm)	**% Passing**
0.5	16.0	18.0		-4.04	12.0	**0.0600**	**10.9**
1	13.0	18.0		-4.04	9.0	**0.0438**	**8.1**
2	11.3	18.0		-4.04	7.3	**0.0313**	**6.6**
4	10.0	18.0		-4.04	6.0	**0.0223**	**5.4**
8	9.2	18.0		-4.04	5.2	**0.0158**	**4.7**
15	9.0	18.0		-4.04	5.0	**0.0116**	**4.5**
30	8.9	18.0		-4.04	4.9	**0.0082**	**4.4**
60	8.4	18.0		-4.04	4.4	**0.0058**	**4.0**
120	7.8	18.0		-4.04	3.8	**0.0041**	**3.4**
240	7.5	19.0		-3.91	3.6	**0.0029**	**3.3**
360	7.1	19.0		-3.91	3.2	**0.0024**	**2.9**
1440	7.0	17.5		-3.91	3.1	**0.0012**	**2.8**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	05-1416-162	**Client :**	SRK		**BH :**	ETA-05-2	
Sch#	225	**Project :**	Faro Lab Testing		**Sample :**		
Lab Work:	TM	**Location:**	Burnaby		**Depth :**	3.0-4.3m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	3.4	
	Total Weight	54.2	Before Wash	54.2	Total -200	23.7	
			After Wash	33.9	Gs	4.00	

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.4	0.7	0.7	**0.840**	**99.3**
#40			1.5	2.8	2.8	**0.420**	**96.5**
#60			2.5	4.6	4.6	**0.250**	**91.9**
#100			7.1	13.1	13.1	**0.149**	**78.8**
#200			19.0	35.1	35.1	**0.074**	**43.7**
Pan			23.7	43.7	43.7		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (°C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	23.0	18.0		-4.04	19.0	**0.0600**	**29.0**
1	17.4	18.0		-4.04	13.4	**0.0427**	**20.5**
2	13.7	18.0		-4.04	9.7	**0.0308**	**14.8**
4	12.0	18.0		-4.04	8.0	**0.0220**	**12.2**
8	10.7	18.0		-4.04	6.7	**0.0157**	**10.2**
15	10.2	18.0		-4.04	6.2	**0.0115**	**9.4**
30	10.0	18.0		-4.04	6.0	**0.0081**	**9.1**
60	9.1	18.0		-4.04	5.1	**0.0058**	**7.8**
120	8.3	18.0		-4.04	4.3	**0.0041**	**6.5**
240	8.0	19.0		-3.91	4.1	**0.0029**	**6.3**
360	7.0	19.0		-3.91	3.1	**0.0024**	**4.7**
1440	6.9	17.5		-3.91	3.0	**0.0012**	**4.6**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	05-1416-162	**Client :**	SRK		**BH :**	ETA-05-3	
Sch#	225	**Project :**	Faro Lab Testing		**Sample :**		
Lab Work:	TM	**Location:**	Burnaby		**Depth :**	6.0-6.75m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	0.9	
	Total Weight	53.5	Before Wash	53.5	Total -200	52.3	
			After Wash	2.1	Gs	4.00	
Size (USS)	**Weight Retained**	**Retained** (%)	**Weight Retained**	**Retained** (%)	**% Retained Total**	**Diameter** (mm)	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.0			**0.840**	**100.0**
#40			0.0			**0.420**	**100.0**
#60			0.0			**0.250**	**100.0**
#100			0.0			**0.149**	**100.0**
#200			1.2	2.2	2.2	**0.074**	**97.8**
Pan			52.3	97.8	97.8		

HYDROMETER ANALYSIS

Time (min)	**Hydrometer Reading**	**Temperature** (^oC)		**Composite Correction**	**Hydrometer Corrected**	**Diameter** (mm)	**% Passing**
0.5	54.0	18.0		-4.04	50.0	**0.0446**	**77.5**
1	43.4	18.0		-4.04	39.4	**0.0351**	**61.1**
2	31.3	18.0		-4.04	27.3	**0.0274**	**42.3**
4	21.3	18.0		-4.04	17.3	**0.0208**	**26.8**
8	15.3	18.0		-4.04	11.3	**0.0153**	**17.5**
15	13.6	18.0		-4.04	9.6	**0.0113**	**14.8**
30	11.4	18.0		-4.04	7.4	**0.0081**	**11.4**
60	9.2	18.0		-4.04	5.2	**0.0058**	**8.0**
120	8.0	18.0		-4.04	4.0	**0.0041**	**6.2**
240	7.0	19.0		-3.91	3.1	**0.0029**	**4.8**
360	6.5	19.0		-3.91	2.6	**0.0024**	**4.0**
1440	6.1	17.5		-3.91	2.2	**0.0012**	**3.4**

PARTICLE SIZE ANALYSIS OF SOILS   ASTM D 422-63

Project No. :	05-1416-162	**Client :**	SRK		**BH :**	ETA-05-4	
Sch#	225	**Project :**	Faro Lab Testing		**Sample :**		
Lab Work:	TM	**Location:**	Burnaby		**Depth :**	3.0-4.0m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.2	
	Total Weight	49.7	Before Wash	49.7	Total -200	6.5	
			After Wash	44.4	Gs	4.00	
Size (USS)	**Weight Retained**	**Retained (%)**	**Weight Retained**	**Retained (%)**	**% Retained Total**	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.7	1.4	1.4	**0.840**	**98.6**
#40			4.0	8.0	8.0	**0.420**	**90.5**
#60			4.8	9.7	9.7	**0.250**	**80.9**
#100			12.9	26.0	26.0	**0.149**	**54.9**
#200			20.8	41.9	41.9	**0.074**	**13.1**
Pan			6.5	13.1	13.1		

HYDROMETER ANALYSIS

Time (min)	**Hydrometer Reading**	**Temperature** (^oC)		**Composite Correction**	**Hydrometer Corrected**	**Diameter** (mm)	**% Passing**
0.5	10.0	18.0		-4.04	6.0	**0.0600**	**10.0**
1	8.4	18.0		-4.04	4.4	**0.0450**	**7.3**
2	8.0	18.0		-4.04	4.0	**0.0319**	**6.6**
4	7.6	18.0		-4.04	3.6	**0.0226**	**6.0**
8	7.4	18.0		-4.04	3.4	**0.0160**	**5.6**
15	7.3	18.0		-4.04	3.3	**0.0117**	**5.5**
30	7.2	18.0		-4.04	3.2	**0.0083**	**5.3**
60	7.1	18.0		-4.04	3.1	**0.0058**	**5.1**
120	7.0	18.0		-4.04	3.0	**0.0041**	**5.0**
240	7.0	19.0		-3.91	3.1	**0.0029**	**5.2**
360	6.8	19.0		-3.91	2.9	**0.0024**	**4.8**
1440	6.6	17.5		-3.91	2.7	**0.0012**	**4.5**

PARTICLE SIZE ANALYSIS OF SOILS   ASTM D 422-63

Project No. :	05-1416-162	**Client :**	SRK		**BH :**	ETA-05-5	
Sch#	225	**Project :**	Faro Lab Testing		**Sample :**		
Lab Work:	TM	**Location:**	Burnaby		**Depth :**	4.0-5.2m	
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	2.5	
	Total Weight	93.1	Before Wash	49.0	Total -200	13.6	
			After Wash	37.9	Gs	4.00	

Size (USS)	Weight Retained	Retained (%)	Weight Retained	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.2	0.2			0.2	**2.00**	**99.8**
#20			0.8	1.6	1.6	**0.840**	**98.2**
#40			3.1	6.3	6.3	**0.420**	**91.8**
#60			4.5	9.2	9.2	**0.250**	**82.7**
#100			8.1	16.5	16.5	**0.149**	**66.2**
#200			18.9	38.6	38.5	**0.074**	**27.7**
Pan			13.6	27.8	27.7		

HYDROMETER ANALYSIS

Time (min)	Hydrometer Reading	Temperature (°C)		Composite Correction	Hydrometer Corrected	Diameter (mm)	% Passing
0.5	13.0	18.0		-4.04	9.0	**0.0600**	**15.2**
1	11.1	18.0		-4.04	7.1	**0.0443**	**11.9**
2	9.9	18.0		-4.04	5.9	**0.0315**	**9.9**
4	9.0	18.0		-4.04	5.0	**0.0224**	**8.4**
8	8.5	18.0		-4.04	4.5	**0.0159**	**7.5**
15	8.4	18.0		-4.04	4.4	**0.0116**	**7.4**
30	8.3	18.0		-4.04	4.3	**0.0082**	**7.2**
60	8.2	18.0		-4.04	4.2	**0.0058**	**7.0**
120	7.9	18.0		-4.04	3.9	**0.0041**	**6.5**
240	7.8	19.0		-3.91	3.9	**0.0029**	**6.6**
360	7.5	19.0		-3.91	3.6	**0.0024**	**6.1**
1440	7.2	17.5		-3.91	3.3	**0.0012**	**5.6**

Appendix D
Lime Demand and Leach Extraction Test Results

Table D-1: ETA Tailings Lime Addition Rates

Time	Parameter	Sample	ETA Comp 1	ETA Comp 2	ETA Comp 3	ETA Comp 4	ETA Comp 5	ETA Comp 6	ETA Comp 7	ETA Comp 8	ETA Comp 9	ETA Comp 10	ETA Comp 11
20 Minutes	pH	Before	5.11	5.38	3.03	4.79	4.30	5.06	5.55	3.67	5.01	3.87	5.45
		After	9.93	9.70	9.60	10.20	10.50	9.50	10.20	10.00	9.62	9.70	10.20
	Conductivity	Before	1480	1710	3460	2330	3130	1170	1140	4940	2220	4240	1670
	Lime Addition	(mL)	12	17	170	70	60	80	35	195	60	75	45
4 Hours	pH	Before	7.75	8.30	7.28	7.20	7.06	8.12	8.16	6.79	7.39	7.23	7.17
		After	10.10	10.60	9.70	9.60	9.60	9.60	9.80	10.00	10.10	9.90	9.90
	Lime Addition	(mL)	8	8	25	25	20	15	8	45	20	25	20
24 Hours	pH	Before	7.70	7.72	7.52	7.39	6.90	8.75	7.67	7.70	7.60	7.70	7.60
		After	9.70	10.10	9.80	9.70	10.00	9.70	9.70	10.00	10.00	10.10	10.00
	Lime Addition	(mL)	15	10	35	15	35	12	18	30	20	20	20
48 Hours	pH	Before	7.60	8.12	7.66	8.28	7.60	8.62	7.65	8.01	7.90	7.82	8.26
		After	10.10	10.20	9.90	9.80	10.00	10.20	10.00	10.00	10.33	9.90	10.33
	Lime Addition	(mL)	15	10	20	25	20	20	20	15	10	15	5
72 Hours	pH	Before	7.87	8.00	7.81	7.85	7.64	9.25	7.55	8.10	7.99	7.89	7.97
		After	10.40	10.40	9.75	10.00	9.90	9.98	10.00	9.86	10.12	9.91	9.64
	Lime Addition	(mL)	20	20	15	20	20	5	15	17	10	13	3
96 Hours	pH	Before	8.10	8.05	7.77	8.22	7.58	9.10	7.56	7.80	7.85	7.87	7.83
		After	9.70	9.90	9.70	10.13	9.97	9.97	9.64	9.98	9.70	10.00	9.80
	Lime Addition	(mL)	10	10	10	15	20	5	13	20	8	15	5
	Cond.		2920	3160	2950	3380	3410	3900	4550	2980	3000	2910	3200

Note: Lime addition at 50 g/L $Ca(OH)_2$; see Table 4.1 for composite make-up

Table D-2: Elemental Analyses

ELEMENT	Units	ETA-05-1	ETA-05-2	ETA-05-2	ETA-05-3	ETA-05-3	ETA-05-4	ETA-05-4	ETA-05-5	ETA-05-5
Contact	m	7.3	4.3	4.5	6.75	6.75	6	6	5.2	5.2
Sample Interval	m	7.6-8.6	4.3-5.3	5.3-6.3	6.9-7.5	7.5-8.5	6-7	7-8	5.2-6	6-7.5
Mo	ppm	0.8	1.2	0.9	1	0.7	1.2	0.9	1	0.7
Cu	ppm	29.6	93.8	47.7	24.5	21.6	64.4	47	67.5	44.2
Pb	ppm	257.4	820.2	133.4	85.3	33.8	511.6	108.8	249	96
Zn	ppm	1688	1574	1580	1005	2118	1690	1044	3905	2697
Ag	ppm	0.4	1.3	0.3	0.2	<0.1	1	0.3	0.5	0.1
Ni	ppm	58.2	34.7	62.8	26	47.1	45.8	50.2	29.3	51.7
Co	ppm	18.5	15.6	17.5	8.7	20.7	16.9	14.3	11.1	13.8
Mn	ppm	343	264	308	228	489	325	348	279	313
Fe	%	4.16	3.83	4.37	2.27	5.18	3.98	3.53	3.56	4.1
As	ppm	12.6	31	18.3	7	7.6	20	19	14.5	10.6
U	ppm	1.7	0.9	2.2	2.6	1.5	2	2	1.4	1.2
Au	ppb	2.5	8.4	2.2	1.4	1	7.6	<0.5	2.9	0.7
Th	ppm	9.6	6.7	8	6.8	13.9	6.6	7.6	4.6	8.5
Sr	ppm	47	142	106	71	174	89	75	30	83
Cd	ppm	0.5	1.8	0.8	0.6	0.9	2.3	0.5	0.9	0.5
Sb	ppm	0.5	1.5	0.3	0.6	0.1	1	0.5	0.8	0.3
Bi	ppm	0.3	1	0.4	0.6	0.5	0.5	0.6	0.6	0.3
V	ppm	67	34	67	36	57	48	47	40	63
Ca	%	0.49	2.01	1.33	0.79	2.8	1	0.62	0.34	0.85
P	%	0.064	0.055	0.071	0.056	0.04	0.059	0.082	0.061	0.063
La	ppm	22	16	19	19	30	14	22	17	18
Cr	ppm	128.2	60.9	93.7	38.4	69.6	90	59.9	43	85.4
Mg	%	1.57	0.73	1.49	0.6	2.5	1.03	0.96	0.68	1.42
Ba	ppm	175	31	133	205	177	110	178	165	137
Ti	%	0.157	0.081	0.107	0.063	0.107	0.093	0.07	0.066	0.112
B	ppm	1	3	1	5	<1	3	<1	4	1
Al	%	2.51	2.59	3.12	1.85	4.17	2.33	2.03	1.86	2.76
Na	%	0.105	0.23	0.149	0.108	0.23	0.122	0.077	0.114	0.126
K	%	0.59	0.18	0.26	0.19	0.45	0.19	0.27	0.22	0.34
W	ppm	0.2	0.5	0.3	1.6	0.1	0.7	0.2	0.7	0.3
Hg	ppm	0.18	0.72	0.09	0.04	0.03	0.45	0.08	0.24	0.03
Sc	ppm	7.3	3.8	6.5	3.1	8.3	3.8	5.2	3.9	6.7
Tl	ppm	0.4	0.6	0.2	0.2	0.2	0.5	0.3	0.4	0.3
S	%	0.11	1.99	0.33	0.13	<0.05	1.19	0.09	0.76	0.12
Ga	ppm	11	8	11	6	15	7	7	6	10
Se	ppm	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table D-3: ETA Subsoil Shakeflask Test Results – Immediate Parameters

SAMPLE	Starting pH	Ending pH	Final pH	Starting COND. (uS/cm)	Ending COND. (uS/cm)	Final COND. (uS/cm)	Starting Redox (mV)	Ending Redox (mV)	Final Redox (mV)	ALK	ACIDITY (pH 4.5)	ACIDITY (pH 8.3)
ETA-05-1 7.6-8.6	4.45	4.45	4.30	851	923	1049	289	341	338	<1.0	1.8	477.3
ETA-05-2 4.3-5.3	5.73	6.40	6.83	871	1193	1023	247	293	289	6.5	<1.0	34.8
ETA-05-2 5.3-6.3	4.12	4.13	4.05	1069	1465	1420	296	346	310	<1.0	6.0	618.5
ETA-05-3 6.9-7.5	4.40	4.46	4.41	785	862	827	307	405	345	<1.0	1.0	176.0
ETA-05-3 7.5-8.5	7.83	7.70	8.09	779	852	856	228	250	255	42.0	<1.0	1.5
ETA-05-4 6-7	5.01	4.93	5.17	733	872	818	318	367	333	12.5	<1.0	105.0
ETA-05-4 7-8	6.46	6.78	7.12	405	953	904	265	323	306	9.0	<1.0	10.3
ETA-05-5 5.2-6	3.91	4.01	3.96	1786	2180	2040	225	56	41	<1.0	15.0	1857.5.0
ETA-05-5 6-7.5	4.73	4.75	4.77	894	1210	1183	231	320	188	1.5	<1.0	330.0

Note: Alkalinity and acidity reported in mg $CaCO_3$/L

Table D-4: Shakeflask Leach Extraction Leachate Analyses

Parameter:	Units	ETA-05-1 7.6-8.6	ETA-05-2 4.3-5.3	ETA-05-2 5.3-6.3	ETA-05-3 6.9-7.5	ETA-05-3 7.5-8.5	ETA-05-4 6-7	ETA-05-4 7-8	ETA-05-5 5.2-6	ETA-05-5 6-7.5
Aluminum Al	mg/L	0.56	0.12	3.51	0.6	0.08	0.36	0.09	18.6	1.03
Antimony Sb	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Arsenic As	mg/L	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Barium Ba	mg/L	0.027	0.008	0.005	0.021	0.025	0.015	0.023	< 0.001	0.012
Beryllium Be	mg/L	< 0.003	< 0.003	0.006	< 0.003	< 0.003	< 0.003	< 0.003	0.015	< 0.003
Boron B	mg/L	0.02	0.02	< 0.01	0.02	< 0.01	0.01	0.01	0.08	0.02
Cadmium Cd	mg/L	0.02	0.02	0.06	< 0.01	< 0.01	0.1	< 0.01	< 0.01	0.01
Calcium Ca	mg/L	40.5	364	208	53.6	163	135	199	78.3	174
Chromium Cr	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cobalt Co	mg/L	0.3	0.07	0.27	0.19	< 0.02	0.12	0.03	0.1	0.1
Copper Cu	mg/L	0.12	< 0.02	0.22	0.03	< 0.02	0.12	< 0.02	0.07	< 0.02
Iron Fe	mg/L	44	0.02	152	0.05	< 0.01	0.02	0.01	317	42.5
Lead Pb	mg/L	2.11	0.09	0.25	0.06	< 0.03	1.12	< 0.03	0.85	0.13
Magnesium Mg	mg/L	18.3	14.3	33.2	54.2	45.8	36.6	55.8	40.5	26.2
Manganese Mn	mg/L	7.38	5.6	4.92	7.59	1.54	5.35	5.67	12.8	4.85
Molybdenum Mo	mg/L	< 0.02	< 0.02	< 0.02	0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02
Nickel Ni	mg/L	0.14	0.05	0.29	0.27	< 0.02	0.17	0.04	0.15	0.1
Phosphorus P	mg/L	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
Potassium K	mg/L	7.1	5.7	6.1	6.7	9.7	6.7	7.1	5.1	6
Silicon Si	mg/L	5.89	4.05	10.5	6.24	1.51	5.7	3.5	6.82	4.03
Silver Ag	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Sodium Na	mg/L	56.8	15	15.9	8.6	7.9	6.1	8.6	181	44.1
Strontium Sr	mg/L	0.23	0.38	0.45	0.39	0.4	0.55	0.77	0.26	0.46
Tin Sn	mg/L	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Titanium Ti	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium V	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc Zn	mg/L	111	22	126	76.8	0.055	56.4	7.14	488	185
Zirconium Zr	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02