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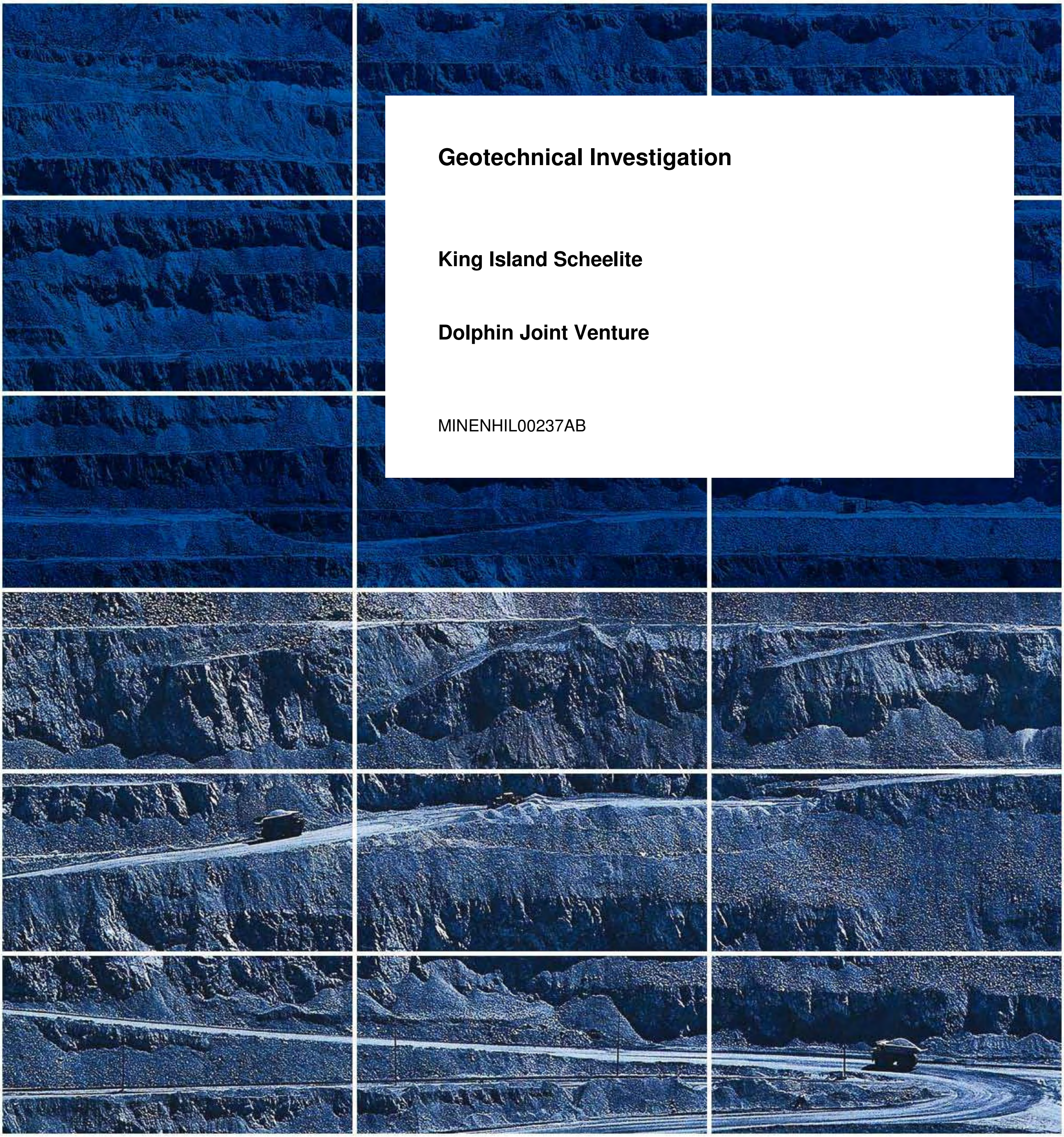
Geotechnical Investigation

King Island Scheelite

Dolphin Joint Venture

MINENHIL00237AB



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22 July 2009

Project Manager: King Island Scheelite
PO Box 183
Exeter 7275
Tasmania

Attention: Mr Lindsay Newnham

Dear Lindsay

RE: Geotechnical Investigation

We are pleased to provide this compilation and interpretation of geotechnical data from the King Island Scheelite mine for the Dolphin Joint Venture project. Please contact us for any clarification or discussion.

For and on behalf of Coffey Mining Pty Ltd

____
John Smith
Associate

MINENHIL00237AB

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Supervising Principal
Don Miller

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EXECUTIVE SUMMARY

King Island Scheelite is proposing to reopen the existing mine at Grassy. This mine comprises a small open pit approximately 80m deep and an underground mine. Currently, it is proposed to extend the mine eastwards, out into Bass Strait and deepen the mine to approximately 200m below sea-level. This report seeks to collate geotechnical data on the mine and its surrounds to support further analysis of the proposed mine.

The scheelite orebody at Grassy, King Island is hosted by contact metamorphic rocks within a package of Neoproterozoic sedimentary and volcanic rocks. Only very limited geotechnical data is available from the previous mining. The rock mass is, however, known to be heavily faulted with system of strike-slip and reverse faults locally disrupting the mineralised lenses. Recent geotechnical data has come from a drilling campaign of six drill holes, with a total of 948m of core, which targeted the offshore geology with easterly inclined holes located mainly along the existing coastline. These drill holes identified thick offshore sand and gravel deposits and provided new information on basement rock mass characteristics. The logging methodology used in this campaign provided detailed data on the spacing and frictional properties of defects. The parameters collected were used to calculate the rock mass rating (RMR) for use with empirical slope design curves.

Given the limited geotechnical data available a first pass assessment has been made by dividing the rock mass into separate geotechnical domains, separated by known major faults and lithologies. This results eight domains in the basement and one domain for the sedimentary cover. Of the nine domains recent and reliable geotechnical data has been obtained for two basement domains and the sedimentary cover. Of the remaining domains, one had been the subject of a previous investigation which included geotechnical drill holes. Geotechnical data for the remaining domains comprises limited information from the open pit and underground workings. Surface and underground drill holes are also available but their logs contain only very limited geotechnical parameters and these parameters have not been entered into an electronic format. For the purpose of this report, geotechnical evaluations of selected examples of these drill hole logs were conducted.

Structural Domains

Domain	Location
1	Sediments
2	East of the Decline fault and west of Grassy River fault
3	North Boundary fault, west of Grassy River fault
4	East of Grassy River fault
5	Between Wedge, Decline and Northern Boundary faults
6	West of Wedge fault, North of No. 3 fault
7	Between Central fault and No. 3 fault
8	Between Swan fault and Central fault
9	South of Swan fault, west of Decline fault

The purpose of this report is to present a collation of all available data, however, some general analysis of the data has been undertaken to allow preliminary slope geometries in each of the domains to be established for further pit optimisation studies.

Based on the previous geotechnical pit slope study by K. Rosengren (domain 3), the analysis of data from the recent geotechnical drilling program (domains 2 and 4) and a review of the existing geological and geotechnical database the slope geometries in the table below are recommended for the purpose of on-going planning and pit optimisation studies.

Preliminary slope recommendations for the purpose of pit optimisation studies

	Domain			
	2	**3, 6**	**4**	**5, 7, 8, 9**
Bench height (m)	20	20	20	20
Batter slope (deg)	60	60	65	65
Berm width (m)	10	10	10	10
Inter-ramp slope (deg)	43	43	46	46

For the sand layer in domain 1, previous analysis has shown slope angles as low as 27^o to be unstable when seepage is included in the analysis. Stable slopes in the sand layer require stabilisation works such as protective layers of crushed rock at the toe of the slope. Although further analysis is required, slope angles between 27^o and 35^o may be achievable depending on the amount of stabilisation works undertaken.

These preliminary slope recommendations do not take into account the location or orientation of specific pit walls and are not detailed slope designs. Information on the orientation of defects is very limited, however, it is noted that domains 3 and 6 may be particularly influenced by sliding on bedding-parallel defects. It is recommended that obtaining such oriented structural data for these and other domains is necessary to enhance the confidence of pit slope designs.

1 INTRODUCTION

1.1 Scope

This project was initiated to achieve the following staged outcomes:

Stage 1: Data acquisition

- Monitor and advise on the current geotechnical drilling program
- Develop an understanding of the engineering constraints for the pit and sea walls
- Assess and advise on the geotechnical data from existing and current drilling

This stage was achieved during two site visits by John Smith, preparation of a geotechnical logging manual and advice on geological logging parameters for engineering purposes.

Stage 2: Detailed planning

- Provide geotechnical inputs to consultants designing the sea walls, open-cut, mill and infrastructure
- Attend and provide input into technical meetings convened by the Project Manager to ensure the proficient development and operation of the project

To achieve this stage, interim reports were provided to define geotechnical constraints to pit development and summarising the new off-shore geological model for sea wall and cut-off design review. These data are also contained in this report.

Stage 3: Operations

- Develop a strategy for the ongoing geotechnical monitoring of the project
- Assist with the training and development of employees responsible for longer term operational geotechnical functions, particularly with reference to the development of the open-cut and sea walls.
- Provide a geotechnical audit service to the project once operations commence

This stage is addressed as recommendations in this report.

The work by Coffey Mining in this report builds on the existing geotechnical and hydrological data bases and was done co-operatively with other consulting organisations involved in the project.

1.2 Location

The King Island Scheelite mine is located on the southeastern coast of King Island which is located in Bass Strait. The existing open pit, which is currently flooded, has a portal with access to underground workings toward the east. During previous mining the coast was extended by development of a significant waste rock dump (Figure 1).

Figure 1
Aerial photograph of the King Island Scheelite mine at Grassy, King Island. North to top of page, the flooded part of the existing pit is approximately 500m long.

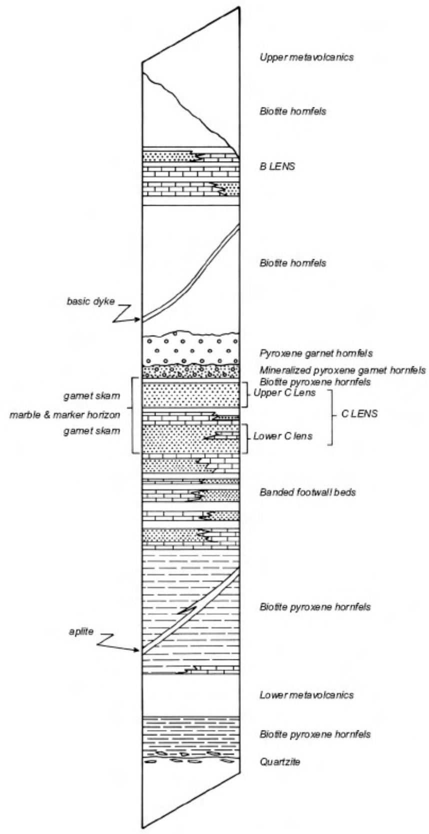
1.3 Geology and Mineralisation

The scheelite deposit at Grassy, King Island, is a large skarn orebody formed by the selective replacement of carbonate beds during the contact metamorphism of the sediments in the lower Grassy Group, caused by intrusion of the Grassy granite (Brown 1990). The metamorphosed and mineralised rocks are termed the 'Mine Series' and include limestone metamorphosed to marble; impure or dolomitic limestone metamorphosed to diopside-grossularite hornfels; calcareous shales metamorphosed to actinolite-biotite-feldspar hornfels; and shales metamorphosed to biotite hornfels (Figure 2).

The orebody structure is an anticlinal nose plunging south-east at approximately 30°. Bedding typically strikes approximately 290° and dips 15–20° in the west, steepening to 55–60° in the eastern extensions of the orebody. The skarn deposits are internally disrupted by the Swan, Central, No.3, Wedge and Decline Faults. The North Boundary Fault terminates the skarn host rocks in the north and further to the east, the regional north-south trending Grassy River Fault also locally terminates the skarns.

Intermittent mining of the deposit occurred between 1917 and 1942 when a major geological survey and drilling programme confirmed the presence of a significant orebody. The open pit and underground mining operations were expanded and continued almost continuously until 1990.

Figure 2
Stratigraphy of the King Island Scheelite deposit (Calver, 2007).

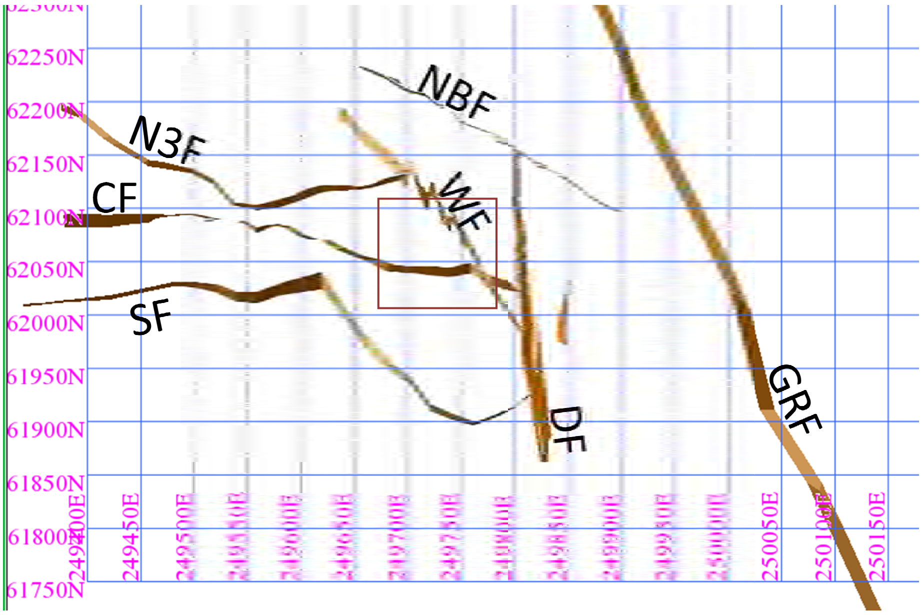


2 STRUCTURAL GEOLOGY

2.1 Fault model

The existing three-dimensional fault model was developed from the mapping of underground workings and correlation of drill hole intersections. There are seven individual faults in the model namely, Central fault, Decline fault, Grassy River fault, Northern Boundary fault, Number 3 fault, Swan fault and Wedge fault (Figure 3).

Figure 3
King Island Scheelite
Elevation slice (20m) through fault model at -100m elevation. CF=Central fault, DF=Decline fault, GRF=Grassy River fault, NF=Northern Boundary fault, N3F=Number 3 fault, SF=Swan fault, WF=Wedge fault. Inset shows location of Figure 6.



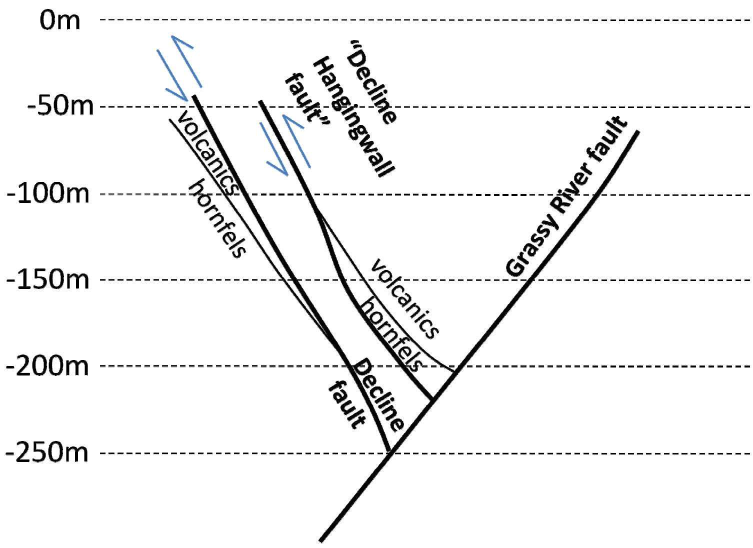
2.2 Northern Boundary fault

This vertical structure truncates ore and marks a change in geology to quartzite on the northern side of the fault.

2.3 Decline fault

This west-dipping structure was first recognised by the poor ground conditions it caused in the decline. The Decline fault shows reverse (E over W) movement by the displacement of the volcanic-Mine Series contact (Figure 4). A parallel fault approximately 15m into the hangingwall ("Decline hangingwall fault") has been identified in this investigation.

Figure 4
King Island Scheelite
Cross-section (5562000mN) showing evidence of reverse displacement of lithological contacts across the Decline fault and a parallel fault within its hangingwall.



2.4 Number 3, Central and Swan Faults

These faults have been modelled as sub-parallel, wavy surfaces. Other faults described in reports (e.g. Geopeko 1973) appear to form splays or links between the main fault surfaces. For example, the Dividing fault appears to splay from a tight bend in the Swan fault and link to the central fault (Figure 5). Further east, the Q or Quail fault splays off the Central fault toward the southeast (Figure 6).

Figure 5
Location of the "Dividing fault" appears to coincide with a linking structure between the Central and Swan faults.

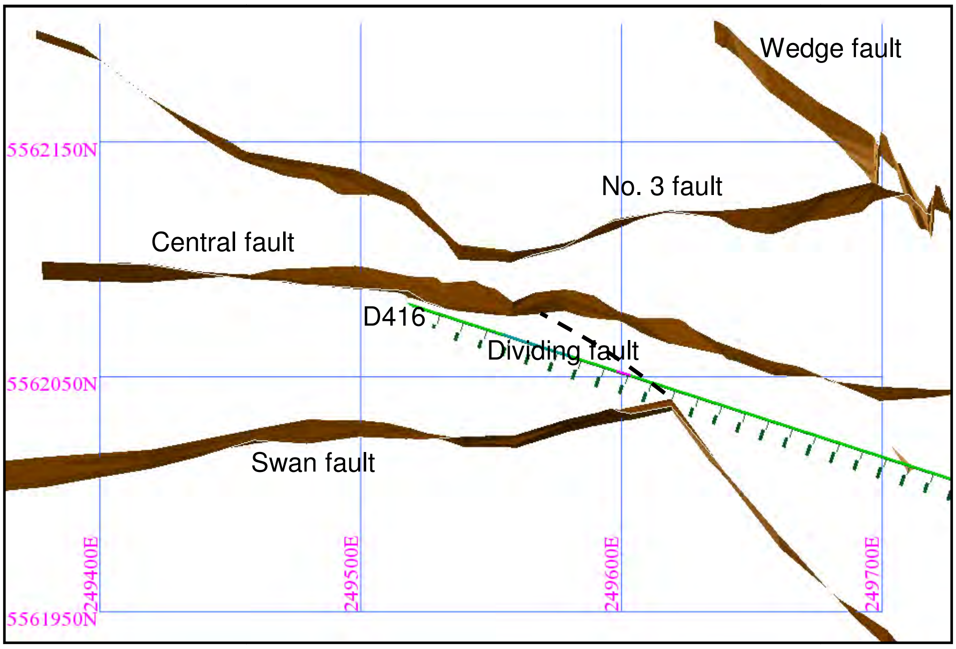
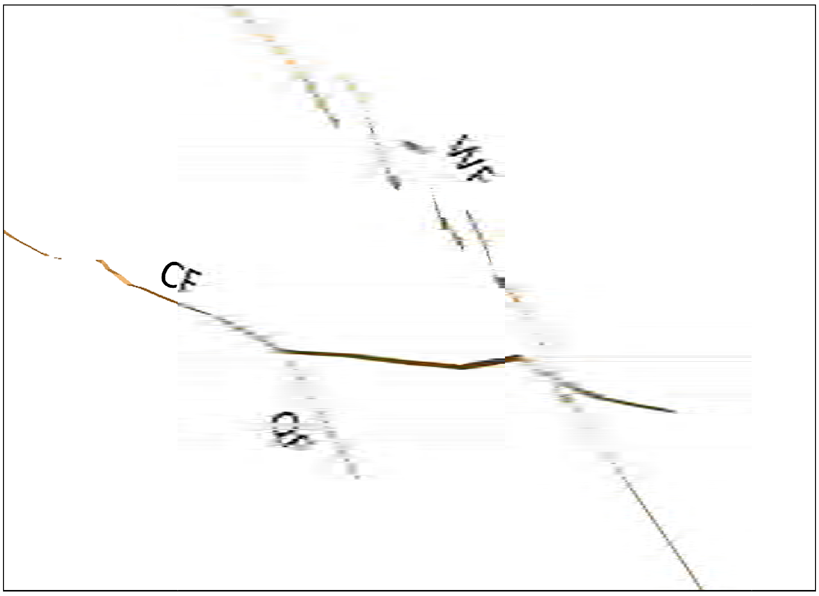


Figure 6
Location of the Q or Quail fault forming a splay from the Central fault (CF). The irregular shape of the Wedge fault (WF) is considered to be an artefact of the three-dimensional model package in which it was developed. See inset in Figure 3 for scale and location.



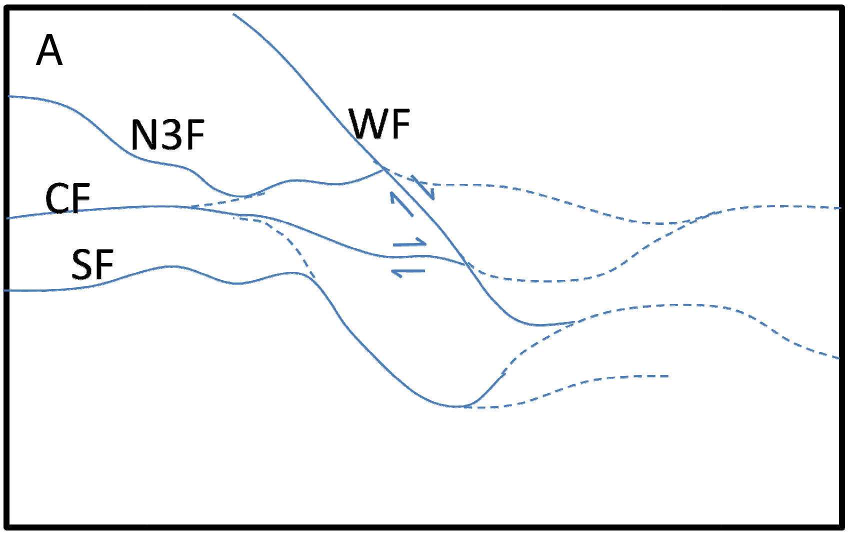
2.5 Wedge Fault

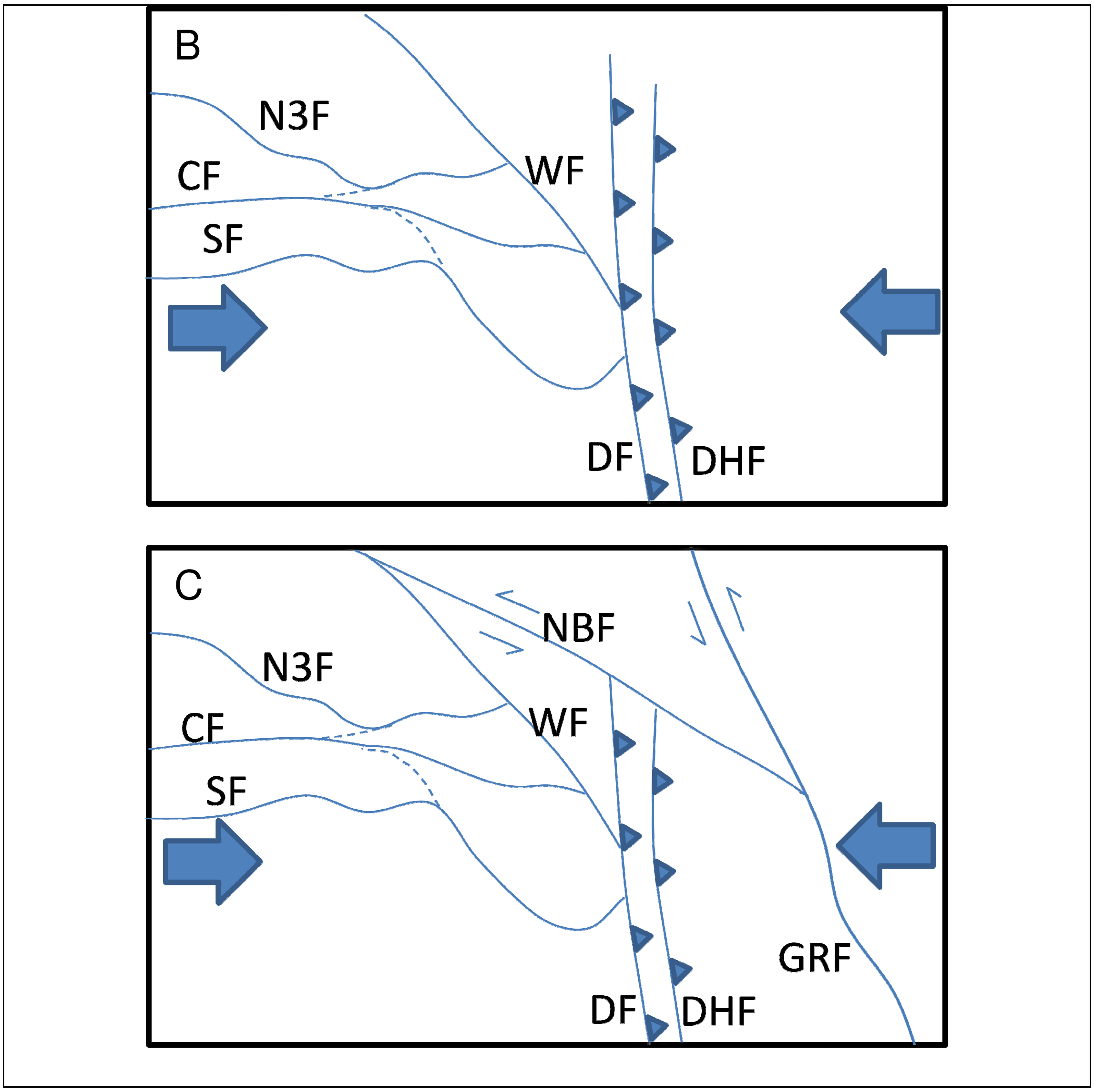
The relationship of the Wedge faults to other faults is unclear. The existing fault model has it crossing the Central fault with neither fault being truncated. Based on orientation, it is likely that the Wedge fault is part of an anastomose network of faults which includes the No. 3, Central and Swan faults. The Wedge fault model contains numerous small scale irregularities which are likely to be artefacts from the three-dimensional modelling package in which it was created.

2.6 Fault history

The evidence derived from the relationships of the faults to country rocks, mineralisation and each other indicates three main stages of fault development. The No. 3 fault, Central fault and Swan fault together with the Wedge fault are inferred to be the oldest faults and to comprise an approximately E-W trending anastomose system (Figure 7A). Limited offsets of Mine Series stratigraphy indicate dextral displacement. The Decline fault and associated reverse faults are inferred to represent a stage of E-W compression with a vertical minimum compressive stress (Figure 7B). While compression maintained an E-W direction, the minimum stress changed to horizontal, possibly in response to thickening of the deformed rock, causing a change to strike-slip faulting, forming the Grassy River fault (Figure 7C). The Northern boundary fault is inferred to be a splay from the Grassy River fault.

Figure 7
King Island Scheelite
Interpreted stages of fault development based on plan view at -100m elevation. Dashed faults are conceptual only. A) E-W trending strike-slip braided fault system. B) Thrusting due to E-W compression. C) Dextral faulting. CF=Central fault, DF=Decline fault, GRF=Grassy River fault, NF=Northern Boundary fault, N3F=Number 3 fault, SF=Swan fault, WF=Wedge fault.





2.7 Structural Domains

It is proposed that the major faults are an appropriate set of boundaries for structural domains within the proposed mining area (Figure 8). This is consistent with the approach used in the Dolphin mine underground workings where mining areas were identified based on their location within the system of faults. Table 1 summarises the domains and their bounding structures. The numbering is similar to that of Rosengren (2006) except that his domain 4 (sediments) has been renamed domain 1 and the name domain 4 has been reassigned to the zone east of the Grassy River fault which has not previously been designated as a separate domain (Table 2).

Figure 8
King Island Scheelite
Elevation slice (20m) through fault model at -100m elevation. CF=Central fault, DF=Decline fault, GRF=Grassy River fault, NF=Northern Boundary fault, N3F=Number 3 fault, SF=Swan fault, WF=Wedge fault. Numerals designate the proposed structural domains.

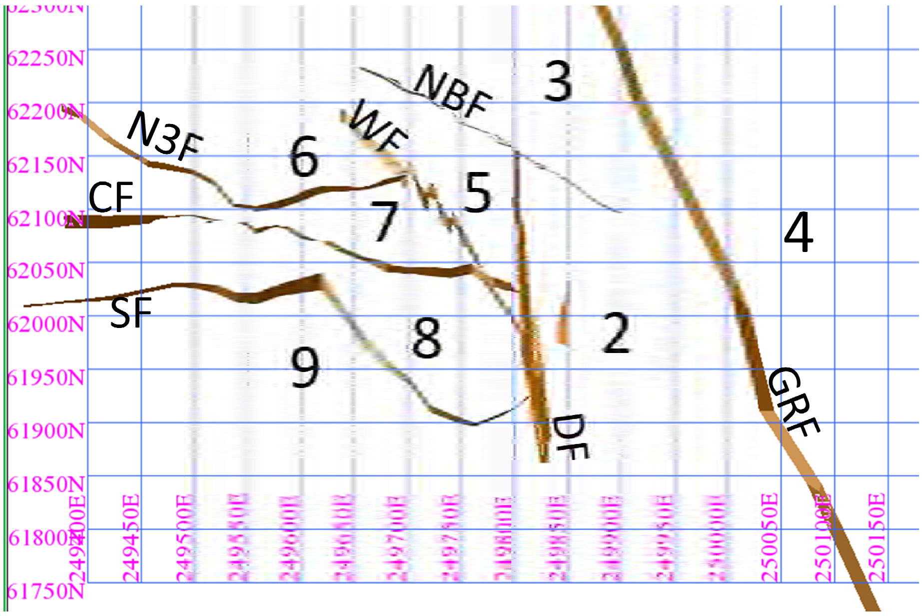


Table 1 Structural Domains	
Domain	**Location**
1	Sediments
2	East of the Decline fault and west of Grassy River fault
3	North Boundary fault, west of Grassy River fault
4	East of Grassy River fault
5	Between Wedge, Decline and Northern Boundary faults
6	West of Wedge fault, North of No. 3 fault
7	Between Central fault and No. 3 fault
8	Between Swan fault and Central fault
9	South of Swan fault, west of Decline fault

Table 2 **Correlation of domains**			
Domain (This report)	**Domain (Rosengren 2006)**	**Dolphin Underground Mining Areas**	**Information from recent drilling program**
1	4		New data on offshore sediment thickness
2	2		New data on basement rock mass quality
3	3		Negligible new data on basement rock mass quality
4	2		New data on basement rock mass quality
5	1	Wedge area	NA
6			NA
7		Central area	NA
8		Pit area	NA
9			NA

3 DATA SOURCES

One of the purposes of a structural domain model is to allow an assessment of the distribution of data and the adequacy of information coverage within the proposed mining areas. It is inferred that by defining area boundaries according to structural criteria that the conditions within domains will be more similar than if areas were selected arbitrarily. The domain-based data is then available to guide geotechnical design of any excavations that may be proposed within that domain.

The main sources of data which contribute to the understanding of the geological conditions are listed in Table 3. The main sources of data which can potentially contribute to the understanding of the geotechnical conditions are listed in Table 4. Each data source varies greatly in its potential applicability to geotechnical investigations.

A geophysical study (conducted by Fugro) has the potential to contribute to the offshore geological model, however the data would require reprocessing and reinterpretation by geophysicists with reference to the newly acquired geological data. The geophysical interpretation (e.g. inferred depth to basement) in its current format was found not to correlate well with the drill holes completed since the geophysical interpretation was made.

Table 3
Sources of geological data for structural domains

Data Source Coverage/Structural Domain	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Surface Drill holes	✓	✓	✓		✓	✓	✓	✓	✓
Underground drill holes		✓			✓		✓	✓	✓
Underground rock mass study (Miller, 1980)					✓		✓	✓	
GHD Seawall Investigations (c. 2007)	✓								✓
K. Rosengren Pit-Infrastructure Investigations (c. 2006) [Incl G040-42]			✓						
Existing Pit						✓	✓	✓	✓
Recent Drilling Program [G045, 48-52]	✓	✓		✓					

Table 4
Sources of geotechnical data for structural domains

Data Source Coverage/Structural Domain	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Surface Drill holes	~	~	~		~	~	~	~	~
Underground drill holes		~			~		~	~	~
Underground rock mass study (Miller, 1980)					✓		✓	✓	
GHD Seawall Investigations (c. 2007)	✓								✓
K. Rosengren Pit-Infrastructure Investigations (c. 2006) [Incl G040-42]			✓						
Existing Pit						~	~	~	~
Recent Drilling Program [G045, 48-52]	✓	✓		✓					

Tilda (~) = limited data, not analysed

3.1 Drilling

3.1.1 Surface drilling database

Drill holes numbered up to 480 are distributed mainly in the vicinity of the existing pit but are also located along the trend of the granite contact inland toward the west and southwest. There are 127 drill holes in the database that are located in the vicinity of the proposed pit extension (Map 1). Attention has been paid to identifying any errors in the database, particularly in relation to grid conversions (Appendix A). The data in the scanned logs has mostly not been entered into the electronic database except for the lithological codes. The lithological codes in the electronic database were not consistent so a “grouped lithology” field was added to the database (Figure 9). Major faulted intervals are identified as such in the electronic log so a database field was created to distinguish these fault intervals from other "unfaulted" intervals to simplify three-dimensional analysis of the major fault intersections in the drill holes. However, there are many minor faulted intervals recorded in the geological logs which are not identified in the electronic database. The geological logs also contain some data on the rock quality designation (RQD) of the rock but contain very little other geotechnical information.

Figure 9
Grouped lithologies (in alphabetical order) applied to the database.

The database has been investigated with special attention on identifying holes which are located in areas relevant to the proposed pit. Resource holes with collars located to the east of 249350E are considered relevant to the proposed pit extension. This area incorporates 127 surface holes of which 20 intersect walls of the 10-year pit (Table 5).

Table 5. Surface Boreholes Intersecting the Walls (Eastern) of the 10 year Pit

HoleID	Data in Scanned Logs	Wall
181	Geology	NE
201	Geology, Samples	NE
202	Geology, Samples	NE
210	Geology, Samples, Survey	ESE
215	Core Recovery, Geology	NE
259	Geology	NE
260	Geology	NE
400	Geology, Basic Structure, Survey	ESE
401	Geology, Survey	ESE
402	Geology, Basic Structure, Survey	E
403	Geology, Basic Structure, Survey	E
404	Assay, Geology, Structure, Survey	SSE
407	RQD (volcanics only), Geology, Bedding, Survey	SSE
408	Survey, Geology, Structures (Basic alpha & Depth)	SSE
409	Survey, Geology, Structures (Basic alpha & Depth)	ESE
203A	Geology, Samples	ESE
D461	Survey, Core Recovery, Geology	NE
G008	Survey, Geology, Core Recovery	NE
G010	Survey, Geology, Core Recovery	NE
G043	Survey, Geology, Core Recovery	ESE

3.1.2 Underground drilling database

There are 389 underground drill holes located in clusters drilled from cuddies within the underground workings (Map 2). As with the surface drill holes, the data in the scanned paper logs has mostly not been entered into the electronic database, except for the lithological codes. The "grouped lithology" column was also added to the electronic database for these drill holes. The geotechnical log for these holes has not been entered into the electronic database but contains information on fracture spacing and joint infill minerals. Selected underground drill hole logs have been studied to estimate RMR parameters for comparison with other data.

3.1.3 CB-Series

Seven drill holes were drilled to investigate the near-surface geology in the area east of the existing pit (Map 3). The thickness of sediment in these drill holes was generally limited, leading to the assumption of sediment thickness not exceeding 20m used in the original seawall design (GHD, 2006).

3.1.4 WB-Series

Nine drill holes were drilled mainly in the waste rock to the east of the existing pit to investigate the hydrological properties of the near-surface materials in the area (Map 3).

3.1.5 G-Series

Drill holes G002 to G044 and G046 were drilled in the area to the northeast, east and southeast of the existing pit (Map 3). G047 was drilled at a location away from the proposed mine expansion area. Geology and core recovery logs are available for these drill holes but only the most basic geological information is in electronic format. Where both RQD and recovery data were available these were not found to correlate well. Therefore, recovery has not been used as a surrogate for rock mass quality in this investigation.

Recent G-Series

G045 and G048-52 are the most recently drilled holes and were drilled from March to May 2009 (Table 6). The location and orientation of these drill holes was mainly intended to intersect sediment and basement rocks offshore (Map 3). These drill holes were logged using the Coffey Mining geotechnical data collection procedure (Appendix B). The geological and geotechnical logs are provided as Appendix C and D, respectively.

Table 6
Recent drilling program

Hole ID	Domain	Notes
G045	2 & 4	
G046	2	Also known as BHA, drilled prior to recent program
G047	NA	Located outside area of current interest
G048	2	
G049	2 & 4	
G050	4	
G051	4	
G052	3	Very highly fractured. Not included in RMR analysis

3.2 Existing Open Pit Experience

The existing open pit represents an important source of geotechnical information. The geometry of the pit slopes and their performance over time provides insight into potential failure mechanisms to guide future slope analysis. Any extrapolation of data from the existing pit requires consideration of two points: 1) different geology and geotechnical conditions in the location of the extended pit and 2) different alignment of pit walls in the extended pit. The first of these issues is addressed by the structural domain approach which provides a framework for recognising and assessing the effect of differing ground conditions. The second issue requires understanding of the orientation of rock mass defects.

Although the pit is currently flooded to sea level (Figure 10) much of the northern pit wall is exposed. As shown in Figure 11, the main batter faces display the smooth faces of rock mass defects rather than blasted rock. The berm widths are relatively consistent and contain only moderate amounts of rock debris (Figure 12), especially considering the elapsed time since excavation. These observations indicate that the batters were formed on defects during excavation, rather than being the result of later bench crest failures.

Toward the right-hand-side of Figure 11 the wall alignment changes toward northeast and the faces become saw-toothed. This observation indicates that for this wall alignment a pair of defects are exposed such that small-scale wedges are formed in most benches. Again, the observation that berms are maintained at a relatively constant width around these wedges (Figure 12) indicates that they formed during excavation rather than as later failure events.

Aerial photography and survey data are available from prior to pit flooding (Figure 13).

Figure 10
The existing open pit viewed toward the east.

Figure 11
The north wall of the existing open pit viewed from the southern side of the pit. Most batters on this wall are controlled by the dip of planar to undulating geological structures.

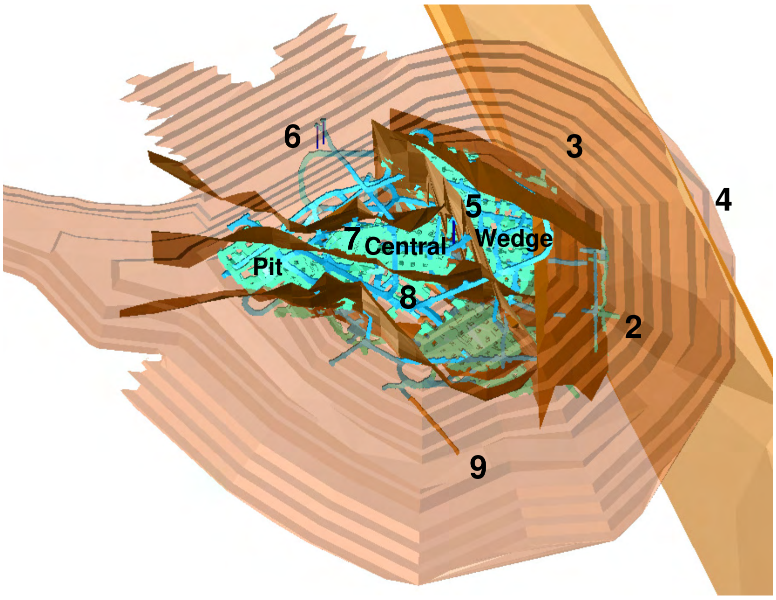
Figure 12
Profile of the north wall of the existing open pit viewed from the western end of the pit wall.

Figure 13
Aerial photograph of the existing open pit in 1987.

3.3 Underground workings

The underground mine workings were identified as separate areas bounded by the major faults (Figure 14). Three important mining blocks were the Pit Area (between Central, Swan and Decline faults), Central Area (between No. 3, Wedge and Decline faults) and Wedge Area (between North Boundary, Wedge and Decline Faults). The data below is derived from measurements in Mine Series rocks in mine workings and country rocks in the decline and other access excavations.

Figure 14
Underground workings (blue). Underground mining areas are named and structural domains are numbered. Faults (brown) and proposed 10-year pit (transparent pale brown) are also shown.

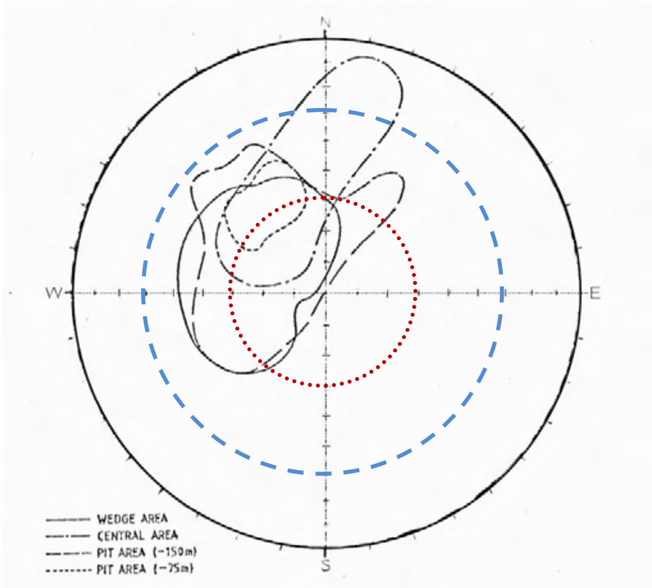


3.3.1 Bedding

The orientation of bedding is important geotechnically as in some rock types it can allow the formation of regular and persistent defects. Underground mapping has shown that in the underground mining areas bedding generally dips gently to moderately southeast (Figure 15). In the Central area (structural domain 7) bedding is steeper and dip direction is more southerly. If bedding-parallel defects are exposed on an pit wall and the dip exceeds the friction angle then sliding may occur. A nominal friction angle of 30^{o} is illustrated on Figure 15 to illustrate the proportion of bedding surfaces that may be prone to sliding. The feasibility of sliding on defects is also influenced by the angle of the batter slope. The steeper the batter slope the greater the number of dipping structures that can daylight in the slope and cause failure of the bench crest (Figure 15).

The spacing of bedding varies according to rock type for example 0.2-2m spacing in banded garnet hornfels and 0.02-0.06m spacing in the banded footwall beds (Miller, 1980). Typically, the higher the grade of metamorphism the greater the degree of "healing" of weaknesses such as bedding.

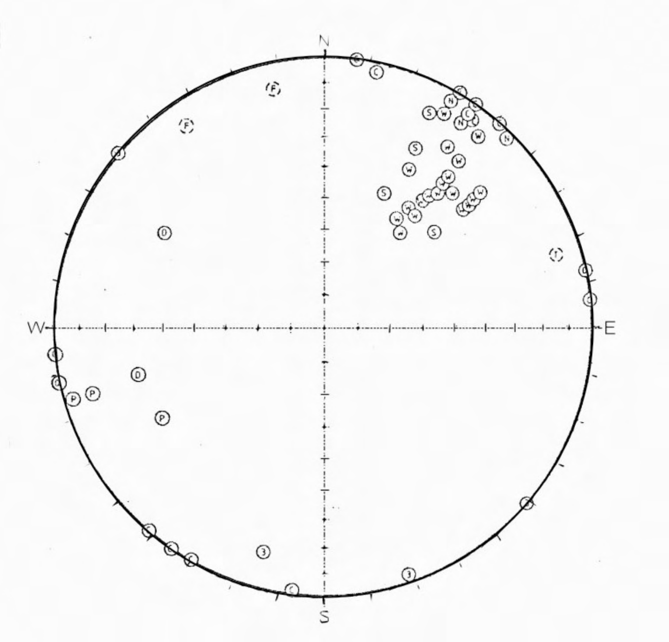
Figure 15
Orientations of bedding plane poles measured in underground exposures (Miller, 1980; equal area stereograph). The red dotted circle shows the position of a 30° friction angle. Beds outside this circle would be steep enough to slide for that value of friction. The blue dashed circle shows the position of a 60° dip angle. Beds with poles within the blue circle would daylight on a slope 60°.



3.3.2 Major Faults

The major faults are all exposed in some part of the underground workings except for the Grassy River fault which was investigated by underground drilling. Figure 16 shows a stereographic compilation of the major fault orientations as they appear in underground exposures.

Figure 16
Orientations of major faults measured in underground exposures (Miller, 1980; equal area stereograph). G=Grassy River fault, W=Wedge fault, N=North Boundary fault, C=Central fault, 3=No. 3 fault, D=decline fault, S=Swan fault, Q='Q' or Quail fault, P=Pheasant fault, T=Teal fault, F=Footwall fault.



3.3.3 Minor Faults

In addition to the major faults, numerous smaller faults are recorded in underground mapping and in the geological logs of drill holes. These minor faults are important geotechnically as they are on a scale that can potentially affect multiple benches while being more difficult to identify and predict than the major faults. Underground mapping shows that these minor faults have a similar range of orientations to the major faults (Figure 17).

The minor fault typically have displacements of less than 2m and their persistence in the Wedge stope was observed to be 8-50m along strike and up to 20m down dip (Miller, 1980). The spacing of the faults, while difficult to assess in limited exposures, was found to be highly variable with modal populations at around 4m and 14m (Figure 18).

Figure 17
Orientations of minor faults measured in underground exposures (Miller, 1980; equal area stereograph).

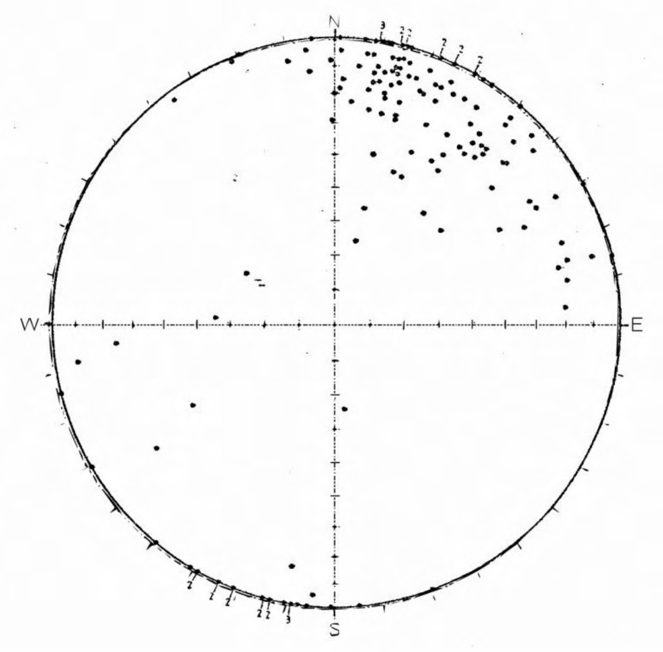
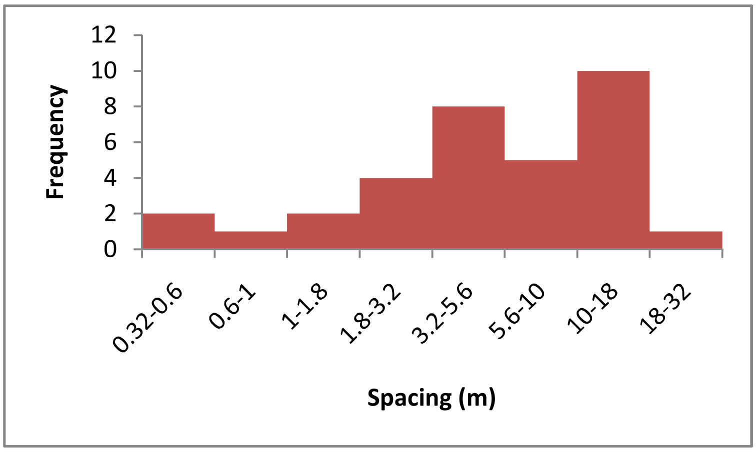


Figure 18
Frequency histogram of minor fault spacings (metres) measured in the Wedge area at -130mL (Miller, 1980).

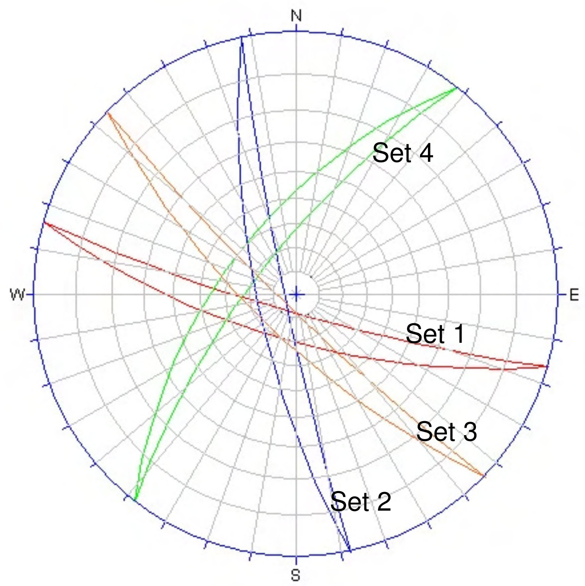


3.3.4 Joints

<u>Joint Orientation</u>

A survey of joint orientations recorded by level mapping between -63.5 and -150mL obtained 646 joint orientation measurements (Miller, 1980). Four main orientation populations were identified and had approximately normal distributions with approximately 11^{o} standard deviation for dip (Figure 19). The joints appear to have a similar range of orientations to the faults (Miller,1980).

Figure 19
Joint sets defined from measurement of 646 joints in underground mapping of the Dolphin mine (Miller, 1980). The mean orientation and the orientation with 1 standard deviation lower dip angle are shown for each set.



Joint Spacing

Joint spacing measurements in the underground workings gave the mean values shown in Table 7.

Table 7
Mean joint spacing (Miller, 1980)

Joint Set	Spacing (m)
1	0.64
2	0.32
3	0.44
4	0.87

Joint Persistence

Typically, between 60-75% of joints from all four joint sets were observed to have lengths exceeding the 5m observation limitations imposed by the height and width of workings. Joint set 1 had the least observed terminations indicating its tendency to persist beyond other joints. Set 3 had the most observed terminations indicating a tendency to lower persistence.

Joint Roughness

A survey of roughness of joints in underground exposures using the method of combined large scale and small scale observations showed that 74% of joints were planar or undulating in their large-scale shape and smooth on the small scale (Miller, 1980). A further 18% were also planar or undulating but with rough surfaces (Miller, 1980). These data are compared with roughness data from logging of the core from the recent drilling program which shows similar roughness type distributions (Table 8).

Table 8
Roughness data

	Planar/undulating smooth		Planar/undulating rough		Total
	No.	**%**	**No.**	**%**	**No.**
Miller 1980	165	74	40	18	224
G045	217	73	45	15	296
G048	56	85	9	14	66
G049	61	63	8	8	97
G050	222	66	96	28	337
G051	186	64%	79	27%	291
*Total**	*742*	*68%*	*237*	*22%*	*1087*

*=Total of G-series drill holes shown in table.

Joint Infill

Joint infilling in the Mine Series rocks was observed to be mainly calcite coatings or clean joints with a minor amount of gouge and other infilling materials being present (Miller, 1980).

3.4 Rock Strength Testing

A small amount of uniaxial compressive strength testing was conducted on Mine Series rocks from underground pillars (Miller, 1980). These test results, summarised in Table 9, show a similar range of values to the tests on volcanic rocks reported above.

Table 9
UCS Test Results from Underground Pillars (Miller, 1980)

UCS (MPa)	Lithology
103.6	Pyroxene-garnet hornfels
195.5	Pyroxene-garnet hornfels
122.6	Garnet hornfels massive
96.6	Garnet hornfels massive
161.9	Marble marker

3.5 Rock Mass Rating

A summary of rock mass rating factors from observations in the underground workings was compiled by Miller (1980). The data was compiled based on the scheme of Bieniawski (1974) and has been translated to the equivalent later rating adjustments (Bieniawski, 1989) in Table 10. The main variant in rock mass quality was observed to be the presence of bedded versus massive rocks.

Table 10
Rock Mass Rating

	A1 (strength)	A2 (RQD)	A3 (spacing)	A4 (condition)	A5 (water)	RMR	MRMR*
bedded	12	13	8	26	7	66	45
massive	12	17	8	26	7	70	47

*Note: MRMR adjustment factors are the same as those used in the data analysis of the recent drilling program.

3.6 Stress Measurements

Stress measurements were conducted by overcoring techniques in the underground Dolphin mine at the -75mL (Barrett et al., 1978). The results are summarised in Table 11.

Table 11
Stress measurements (Virgin stress field)
Dolphin Mine (-75mL)

Drill hole	MPa
Maximum principal stress (N-S)	4.5
Intermediate principal stress (E-W)	3.1
Minimum principal stress (vertical)	2.0

4 STRUCTURAL DOMAINS

It is proposed that the known faults represent an appropriate set of boundaries for structural domains within the proposed mining area. Table 12 summarises the domains and their bounding structures. The numbering of domains is similar to that of Rosengren (2006) except that his domain 4 (sediments) has been renamed domain 1 and the name domain 4 has been reassigned to the zone east of the Grassy River fault which has not previously been designated as a separate domain.

Table 12
Structural Domains

Domain	Location
1	Sediments
2	East of the Decline fault and west of Grassy River fault
3	North Boundary fault, west of Grassy River fault
4	East of Grassy River fault
5	Between Wedge, Decline and Northern Boundary faults
6	West of Wedge fault, North of No. 3 fault
7	Between Central fault and No. 3 fault
8	Between Swan fault and Central fault
9	South of Swan fault, west of Decline fault

4.1 Structural Domain 1

A 3D geological model (Surpac) of the top of basement, base of sand and base of waste rock fill, integrated with topography and bathymetry, was presented at a meeting with Dolphin Joint Venture representatives (5^{th} May 2009). The model was developed from the drill hole database, including the recent drilling program, and allowed an interpretation of basement topography and sediment thicknesses in the vicinity of the proposed seawall. The 3D model of the base of the base of the waste rock fill, base of the sand layer, top of the basement (volcanic) and Grassy River fault, based on recent drilling, are illustrated in Figure 20.

4.1.1 Waste Rock

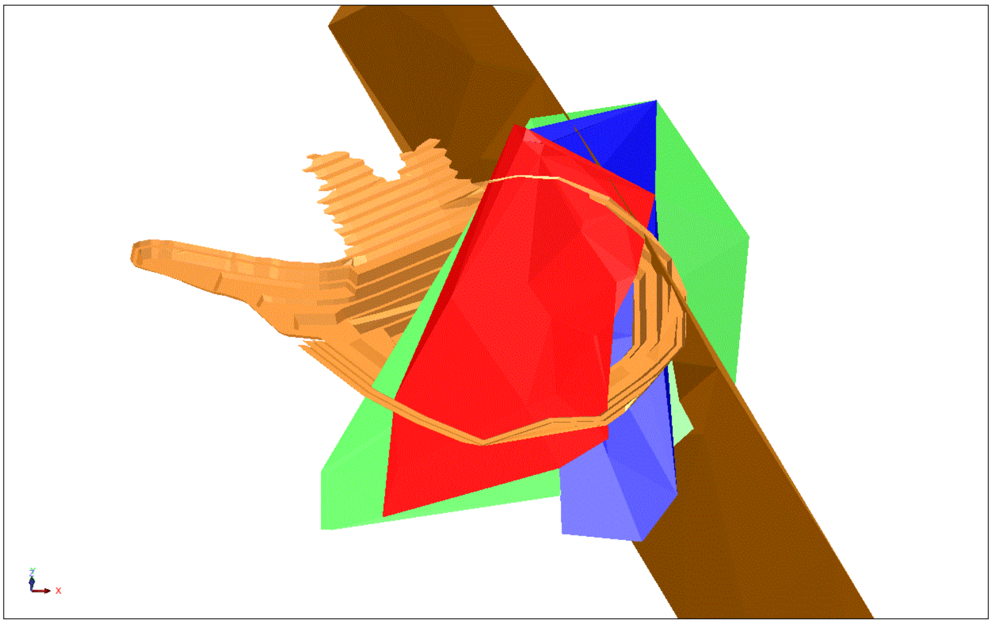
The characteristics and extent of the waste rock dump have been investigated in previous reports (e.g. GHD 2006). A surface representing the base of the waste rock has been constructed from data in those reports supplemented by the recent drilling (file name: fill_base). The surface has also been combined with the existing seafloor topography and former coastline to produce a model approximating the former seafloor as extends under the waste dump (file name: pre_mining_seafloor).

Limit-equilibrium analysis of the waste rock (GHD 2007a) led to recommendations of a 33^{o} slope in the waste rock.

4.1.2 Sand Layer

Due to the separation of the drill holes, interpolation and extrapolation has been required to develop and extend the model of the base of the sand layer. The base of the sand layer slopes eastward at an angle of approximately 15^{o} and is inferred to form a valley at the northern approach to the existing coastline. The 3D model of the surface is provided as a separate file (file name: bot_sand_extended.dxf).

Figure 20
3D models of base of waste rock fill (red), base of sand layer (blue), top of volcanic basement (green) and Grassy River fault (brown), viewed northward. The proposed pit is shown in pale brown for reference.



Permeability data derived from the sand layer in the WB series drill holes is summarised in Table 13.

Table 13
Permeability data

Hole ID	Permeability	Notes
1	$4x10^{-5}$m/s to $4x10^{-6}$m/s	Variable results with time. Water was black in colour
3	$1x10^{-5}$m/s	Unusual, inconsistent behaviour
7	$5x10^{-5}$m/s	
9	$2x10^{-5}$m/s	Permeability increased with time

GHD Report on Seawall, May, 2006

Limit equilibrium analyses were conducted by GHD (2007a) to compare the stability slopes in sand with and without the effects of seepage in 10m high slopes. In those analyses, a slope of 37° was found to be marginally stable without the effect of seepage slope. With the introduction of seepage into the analysis, even a reduction of slope to 27° was insufficient to create stability in the sand. Introduction of a 1m thick, 4m high crushed rock layer at the toe of the 27° sand slope improved the factor of safety to 1.45 (GHD, 2007a). Based on these analyses, GHD (2007a) recommended a design with 27° slopes in sand with a toe protection layer constructed of crushed rock. That study did not investigate stabilisation methods which could be used to achieve steeper slopes in the sand.

4.1.3 Sediment Grading

Twenty-six samples were selected from CB1A-4A for particle size analysis (GHD, August, 2007).

4.1.4 Standard Penetration Test

The sand in drill holes CB1A to CB6 was tested using SPT (GHD, 2007). High values were inferred in that report to be influenced by the presence of pebbles. Low values were inferred in the report to be influenced by suction related water pressure difference between the borehole and the sand. By inspection of Figure 21, it appears that the range 10 to 30 (blows per 300mm) is most representative of the sand properties. Plotting the values in this range, according to depth (converted to effective vertical stress) indicates friction angles in the range typical of well-sorted sands (Figure 22).

Figure 21
SPT data from sand in holes CB1A to CB6 (GHD, 2007). High values are inferred in the report to be influenced by the presence of pebbles.

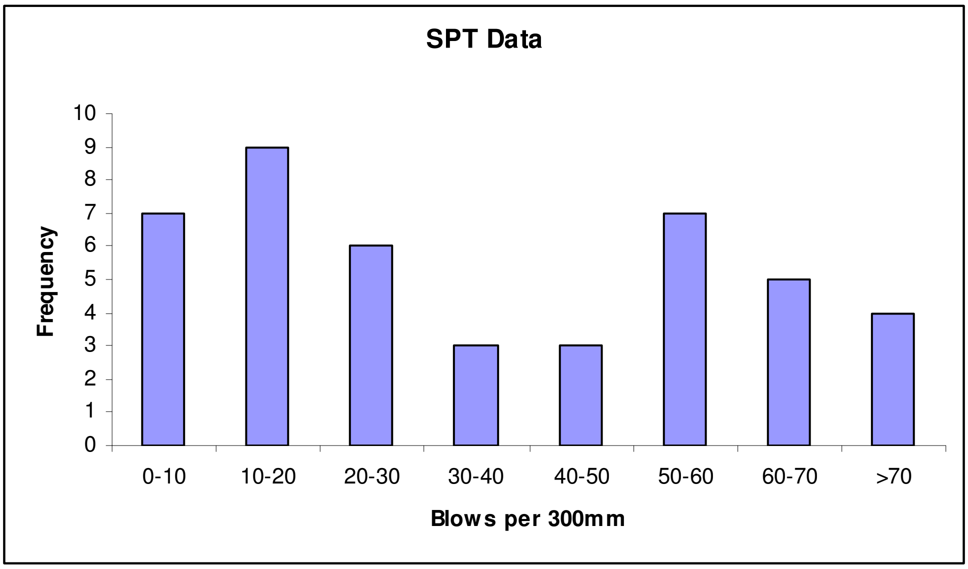
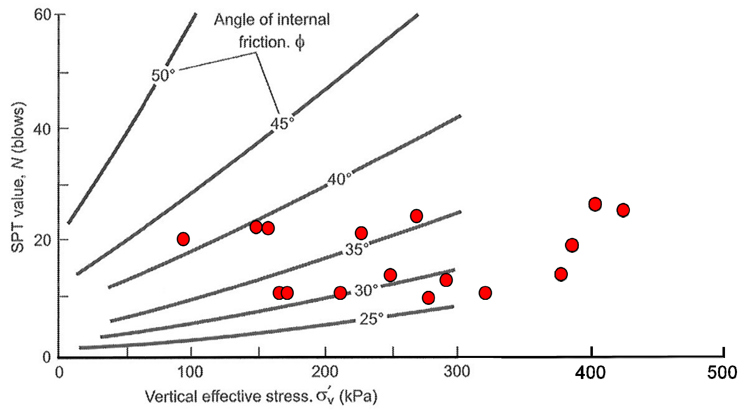


Figure 22
SPT data from holes CB1A to CB6 in the range of 10-30 (see Figure X) plotted on friction angle correlation chart (Schnaid, 2009).



4.1.5 Gravel/Clay layer

Between the base of the sand and the top of the basement (volcanic rock) the sediment is known to contain significant amounts of gravel and clay. Thickness isopachs of the gravel/clay layer (Map 4) have been inferred manually from the contours of the top of basement and base of sand layer.

The gravel is generally observed to be of the clast-support type, meaning that the gravel particles are sufficiently abundant to be in contact with most neighbouring gravel particles. The permeability of the gravel layer will be primarily controlled by the grainsize of the matrix sediment that fills the voids between gravel particles.

The internal stratigraphy of the ‘gravel/clay’ layer has been investigated based on the recent drilling program. Quantitative textural characteristics were logged for three of the most recent drill holes, which intersected the gravel/clay layer. The parameters logged were maximum clast size and relative percentages of clay, silt, sand and gravel. These particle sizes were defined according to the Wentworth particle size scale and standard field tests were used. First the percentage of gravel (>2mm) was assessed visually then matrix material was sampled using a pen knife to scrape away drilling mud. The relative percentages of silt and sand were assessed by feel and the percent clay was assessed by adding water to observe plastic and dispersive behaviours. The four components were scaled to a total of 100%.

The results of this logging are shown along with the inferred gravel/clay layer isopachs in Map 4. The maximum clast size data show that internal layering is present in the gravel-clay deposit. The base is typically coarse-grained overlain by a fine-grained layer and most of the deposit is a layer which gets progressively finer upward. The clay-silt-sand-gravel textural distribution is more variable. Drill hole G051 contains clay-rich, sand-free matrix, which can be inferred to have very low permeability. Drill hole G049 contains 10 to 20% sand in the matrix and may have higher permeability than G051. Drill hole G048 contains 15 to 20% sand in the upper 18m of the 24m thick layer, whereas the lower 5m are clay-rich and sand-free.

Existing descriptive logs and photographs of other drill holes have been used to develop a more comprehensive model of the lateral variation of the gravel/clay layer (Map 4). These previous intersections were typically closer to the existing shoreline and represent thinner intervals than those in the recent drilling program. The existing logs indicate that most of these intervals contain gravels with clayey matrix, an exception being sandy gravel in BHC1.

It is recommended that inferences of permeability, interpretation of test results and planning of future test work should take into consideration the known heterogeneity of the gravel/clay layer.

A summary of the data from domain 1 can be seen in Table 14.

Table 14
Domain 1: Data Summary

Parameter	**Notes**
Lithology	Waste rock, sand, clay/gravel
Strength	SPT in sand layer indicates ~25° -35°
Permeability	4 tests in sand, Logging of clay/gravel shows matrix clay content highly variable
Limit-equilibrium analysis	Waste rock: 33° slope Sand: • 37° slope just stable without seepage • 27° slope unstable with seepage • 1mx4m crushed rock toe required to stabilise (FoS 1.45) 27° slope with seepage Gravel-clay: no data, expected to be more stable than sand

4.2 Structural Domain 2

Nine point load test results are reported in a previous study (GHD, 2007). Six of the tests were in domain 2 (CB2) and three were from domain 9 (CB1B). Both these drill holes are south of the proposed pit and the data are discussed together in this section. The tests were all conducted on volcanic rocks and show a high degree of variation (Table 15). Adjustment by a factor of 24, which is commonly applied to hard rocks, to find an estimate of UCS gives a value high above the range of UCS tests in similar rocks (see domain 9). These results indicate that the PLI data are not a reliable source of strength data in this case.

Table 15 Point Load Index Test Results				
PLT	**Depth (m)**	**PLI**	**PLI * 24**	**Lithology**
CB1B	10.85	13.44	322.6	VOLCANICS
CB1B	12.35	18.07	433.7	VOLCANICS
CB1B	19.95	15.13	363.1	VOLCANICS
CB2	36.2	4.85	116.4	VOLCANICS
CB2	36.2	5.78	138.7	VOLCANICS
CB2	36.4	14.48	347.5	VOLCANICS
CB2	36.4	15.8	379.2	VOLCANICS
CB2	37.35	3.07	73.7	VOLCANICS
CB2	37.35	3.15	75.6	VOLCANICS
AVERAGE		10.4	250.1	
STDEV		6.1	145.7	

Previously drilled hole G046 is 160m long and entirely within domain 2. The weighted median RQD for basement rocks in this drill is 8%. The median weighted by interval length is chosen as it indicates the value for which half the volume of rock is of lower quality and half the volument of rock is higher quality. The weighted average RQD for this drill hole was 18% and the unweighted average was 23%, showing the importance of carefully stating the selection of representative statistical values.

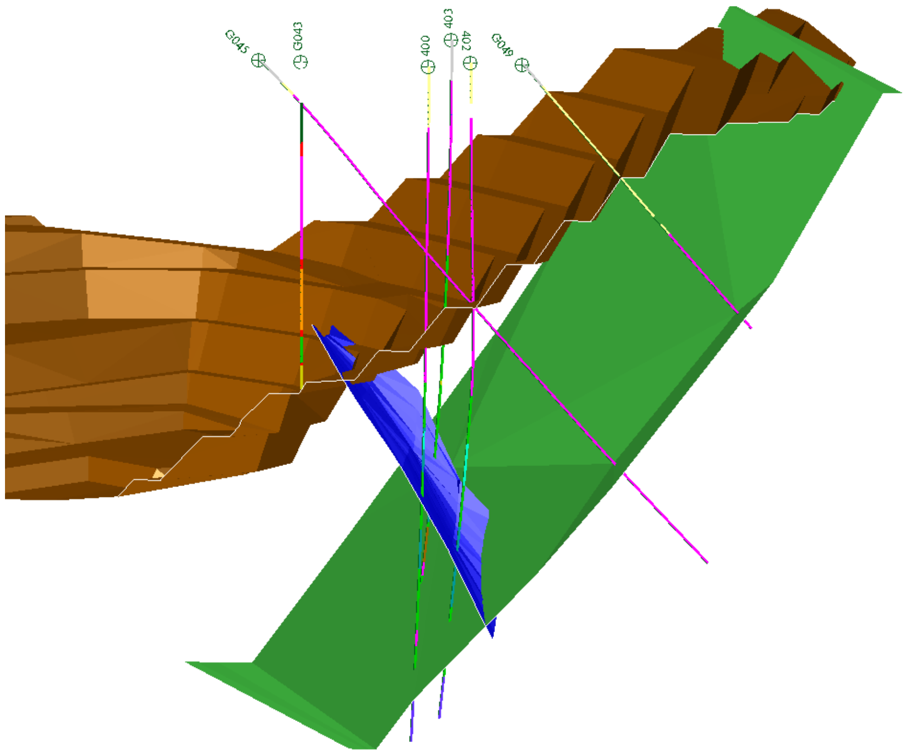
The recent drilling program provided the only detailed geotechnical data available for the eastern part of this domain. The logged geotechnical parameters are summarised as RQD and RMR values weighted according to interval length (Table 16 and 17, Appendix E). Previous surface and underground drill holes do not contain detailed geotechnical logging, however, the geological logs have been reviewed to expand on the geotechnical interpretation within this domain (Figure 23).

Table 16 Domain 2 - RQD	
RQD	**Mean**
Domain 2	**14**
G045 (22-239m)	2
G048 (124-174m)	16
G049 (99-145m)	47

Table 17 Domain 2 - RMR					
RMR	**Minimum**	**25% Quartile**	**Median**	**75% Quartile**	**Maximum**
Domain 2	**22**	**32**	**36**	**39**	**60**
G045 (22-239m)	22	30	33	36	52
G048 (124-174m)	33	36	37	39	55
G049 (99-145m)	34	38	44	50	60

G043 was drilled vertical and just south of G045. The G043 log shows competent rock with local fault zones. It is possible that the highly faulted character of G045 could be the result of drilling along east-dipping fault zones.

Figure 23
Selected drill holes in structural domain 2: bounded by the Grassy River fault (green) and the Decline fault (blue).



Underground drill hole 280 comprises a cluster of six holes which cross the domain 2-domain 5 boundary, i.e. the Decline fault (Figure 24). The parts of the holes in domain 2 have a median RMR of 57 (Table 18).

Figure 24
Underground drill holes 280/1-6. The 10-year pit (brown) and Decline fault (blue) are shown.

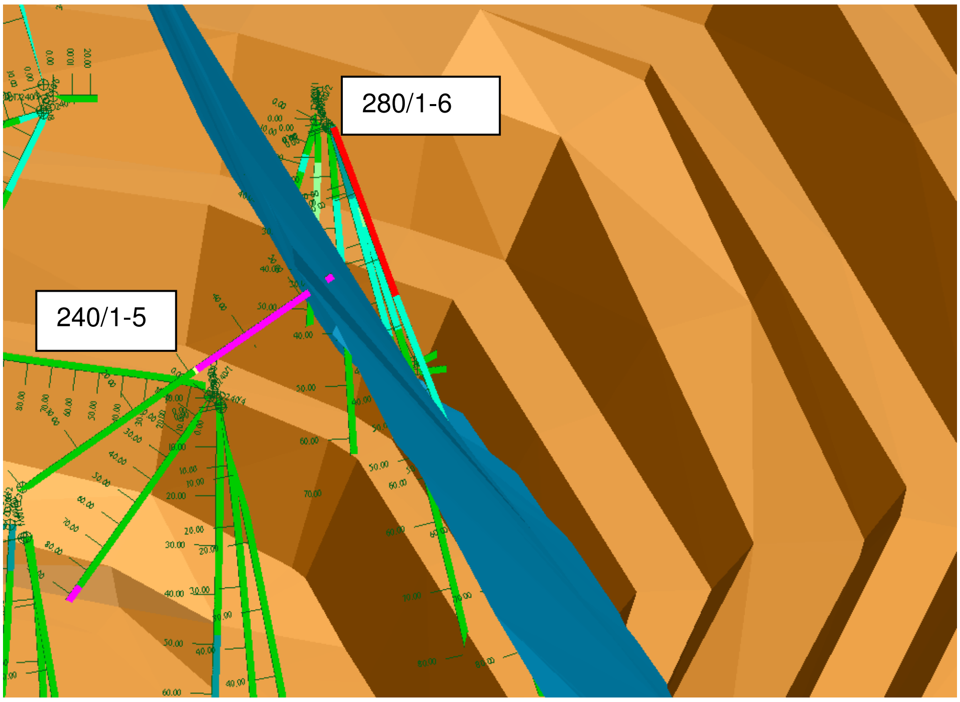


Table 18
Underground drill hole RMR data for 280/1-6 in domain 2

Hole ID	Median RMR
280/1	52
280/2	57
280/3	56
280/4	57
280/5	56
280/6	61
Domain 2	**57**

A model surface of the volcanic-hornfels contact was made (file name: hornfels_volcanic boundarystr6) and was found to have a dip of 55 degrees toward a bearing of 114. This surface is steeper than the dips recorded in the hornfels and Mine Series rocks in the vertical drill hole 409 (Figure 25, Table 19) which may be caused by local variations in dip or disruption by faulting.

A summary of the data from domain 2 can be seen in Table 20.

Figure 25
Drill hole 409 in structural domain 2. The 10-year pit (brown), volcanic-hornfels contact (yellow),Swan fault (red) and Decline fault (blue) are shown. Drill hole 407 in domain 9 is also shown.

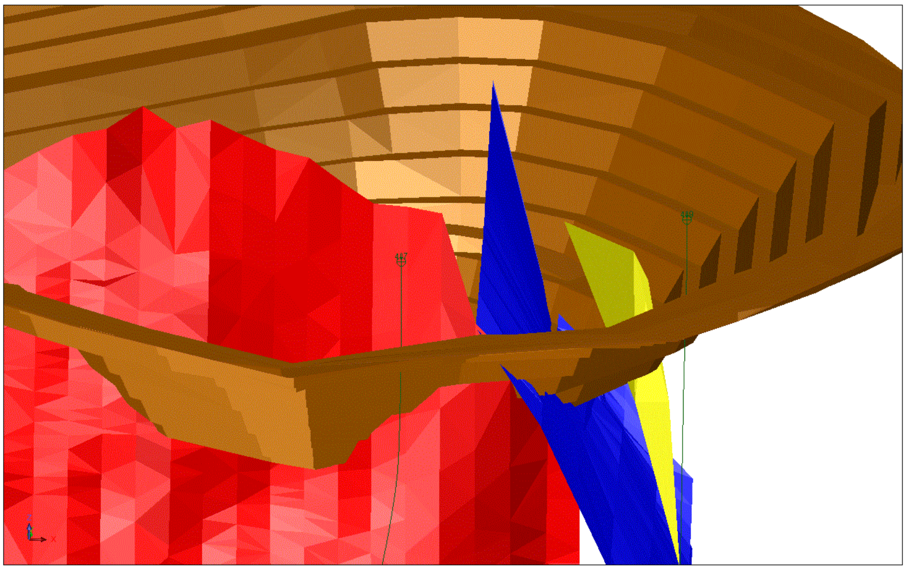


Table 19
Dip data from vertical drill hole 409

Depth (m)	Rocktype	Dip (°)
233	Hornfels	50
233	Hornfels	45
242	Hornfels	34
284	Skarn	30
286	Skarn	26
288	Banded Footwall Beds	32
292	Banded Footwall Beds	38

Table 20
Domain 2: Data Summary

Parameter	Notes
Lithology	Basement volcanic and hornfels
Strength	PLI highly variable
Excavation experience	Nil
Previous drilling	G046 160m RQD: 8%
Recent drilling	313m, RQD: 14%, RMR36
Defect orientation	Moderate SE dipping bedding inferred from drill hole model and non-oriented vertical drill holes.

4.3 Structural Domain 3

Domain 3 was the subject of detailed investigation for the purpose of design of the proposed pit north wall and the location of mine infrastructure (Rosengren, 2006). The geotechnical drill holes in that investigation mainly intersected quartzite. Volcanic rocks are also present in the vicinity of planned pit walls in the eastern part of this domain. The RQD values for the geotechnical drill holes in that investigation are summarised in Table 21.

The final drill hole of the recent drilling program, G052, was collared in this domain (Map 3). The ground encountered was extremely fractured and boundaries between layers cannot be determined from the log of this hole. Drill hole G052 was terminated in highly fracturered basement at 47m and clearly indicates the presence of some very poor ground conditions within this domain. The eastern part of the domain is a significant data gap in the project site. D461 is a 103m vertical hole located in this area (Map 1) but its log does not contain information that assists in geotechnical analysis.

A summary of the data from domain 3 can be seen in Table 22.

Table 21
RQD values in previous work (Rosengren, 2006)

Drill hole	Average RQD
G040 (150m)	25%
G041 (121m)	23%
G042 (80m)	23%

Table 22
Domain 3: Data Summary

Parameter	Notes
Lithology	Basement quartzite and volcanics
Strength	No measurements
Excavation experience	Nil
Previous drilling	351m geotech, RQD: 23-25%
Recent drilling	G052 hole abandoned due to extreme fracturing
Defect orientations	Moderate SE dipping bedding

4.4 Structural Domain 4

The recent drilling program provided the only detailed geotechnical data available for this domain. The logged geotechnical parameters are summarised as RQD and RMR values all weighted according to interval length (Table 23 and 24, Appendix E). One underground drill hole was previously drilled through the Grassy River fault but the intersection was at a depth not expected to be close to the wall of even the largest proposed pit.

Table 23
Domain 4 - RQD

Domain 4	**52**
G045 (239-297m)	63
G049 (145-152m)	10
G050 (10-112m)	45
G051 (93-153m)	53

Table 24
Domain 4 - RMR

RMR	Minimum	25% Quartile	Median	75% Quartile	Maximum
Domain 4	**22**	**45**	**49**	**51**	**61**
G045 (239-297m)	33	48	51	56	57
G049 (145-152m)	38	38	38	55	55
G050 (10-112m)	22	41	48	51	61
G051 (93-153m)	30	47	51	51	57

The relatively low rock mass quality observed in G049 (Table 24) may be related to the drill hole passing through the projected intersection of the Northern Boundary fault and the Grassy River fault, an area expected to have a particularly wide zone of faulting.

A summary of the data from domain 4 can be seen in Table 25.

Table 25
Domain 4: Data Summary

Parameter	Notes
Lithology	Basement volcanic and hornfels
Strength	No measurements
Excavation experience	Nil
Previous drilling	Limited underground intersections, below depth of proposed pit.
Recent drilling	227m, RQD: 52%, RMR: 49
Defect orientations	No measurements

4.5 Structural Domain 5

This structural domain is located in the centre of the proposed pit. Eastern walls of interim pits would be located within this domain. In the underground workings this area was known as the Wedge Area. Strike of the marble marker within the ore-body in the underground workings in this domain is 20 degrees east of north.

An RMR analysis of the parts of underground drill holes 280/1-6 which are in domain 5 together with data from underground drill holes 200/7-10 and 240/1-5 gave a median RMR value of 57. The similarity of the domain 2 and domain 5 RMR values may indicate that the western part of domain 2 is similar to domain 5 or may indicate that the assumptions required to complete the analysis make the results relatively insensitive to variations.

A map of the engineering geology of the decline at the time of its design (Geopeko 1973) shows a zone of poor ground spanning domain 5. The same map also shows zones of fair to good ground in domain 5 indicating that significant local variations in rock mass quality occur.

Selected vertical drill holes in domain 5 were investigated to interpret variations in the angle of dip (Figure 26). Core photographs of all of these vertical drill holes show the presence of moderately dipping bedding-parallel defects in some lithologies (Figure 27). Underground mapping described above shows that these defects typically dip SE in this domain.

A summary of the data from domain 5 can be seen in Table 26.

Figure 26
Vertical drill holes in Structural Domain 5 viewed toward the northeast with the Northern Boundary fault in brown. G019 is not shown but is very close to G018.

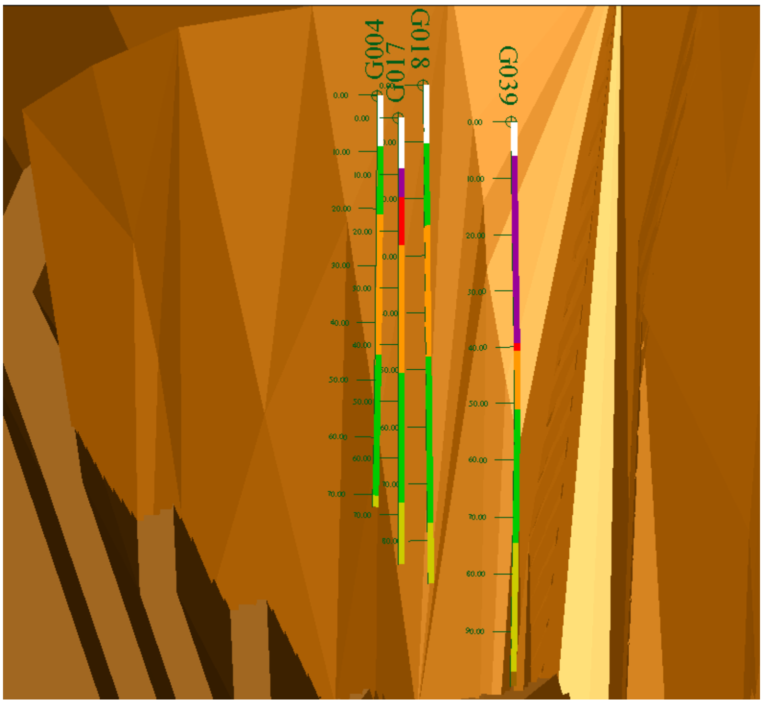
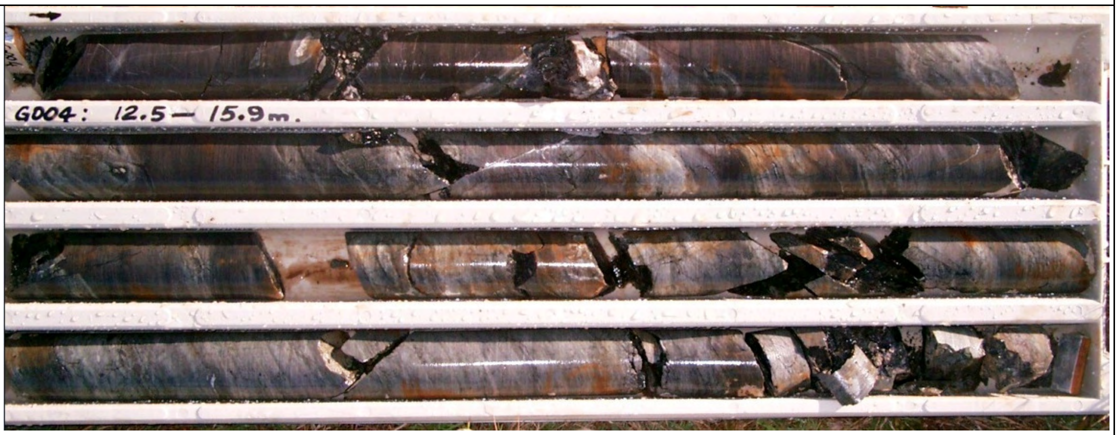


Figure 27
Photographs from vertical drill holes in Structural Domain 5 showing the presence of breaks on moderately dipping bedding structures.



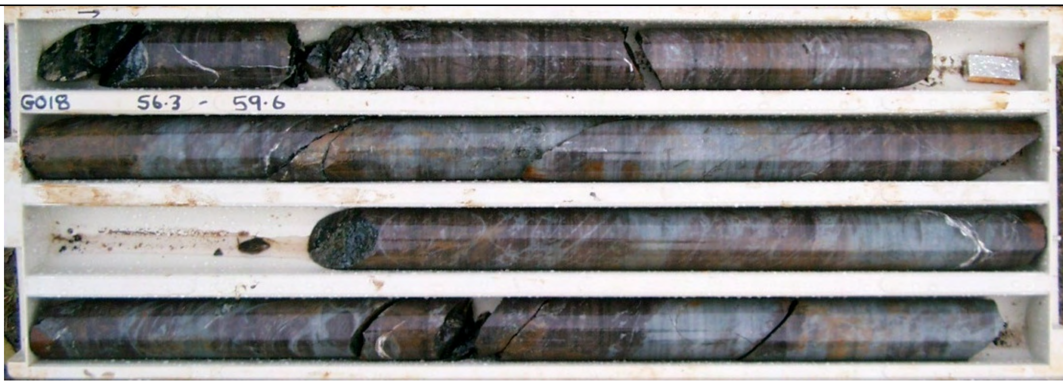


Table 26
Domain 5: Data Summary

Parameter	Notes
Lithology	Basement volcanic and Mine Series
Strength	5 UCS tests: 97-195MPa (Domains 5, 7, 8)
Excavation experience	Underground workings (Wedge area), estimated RMR 66-70 in Mine Series
Previous drilling	RMR 57 estimated from selected underground drill hole logs.
Recent drilling	Nil
Defect orientations	Moderate SE dipping bedding. 4 joint sets dipping steeply NW to SW.

4.6 Structural Domain 6

This structural domain is located in the north-western sector of the proposed pit. Walls in this domain are likely to be affected by moderately SE dipping bedding structures striking sub-parallel to the wall.

The Wedge fault forms the eastern boundary to this structural domain. The SW dip of the Wedge fault could combine with other structures to form a large sliding wedge failure in pit walls in this domain.

A summary of the data from domain 6 can be seen in Table 27.

Table 27
Domain 6: Data Summary

Parameter	Notes
Lithology	Basement volcanic and Mine Series
Strength	5 UCS tests: 97-195MPa (Domains 5, 7, 8)
Excavation experience	NE of existing pit slopes ~30^{o} Minor underground workings
Previous drilling	Limited geotechnical data not collated
Recent drilling	Nil
Defect orientations	Moderate SE dipping bedding

4.7 Structural Domain 7

This structural domain extends to the centre of the proposed pit and has not been investigated in detail in this report. The bounding No. 3 and Central faults become close at the eastern end of the existing pit such that the domain comprises a western part along the northern wall of the existing pit.

Geometric data was systematically collected from the survey model (which pre-dates the pit flooding) in order to have a database of slope performance (Figure 28, Appendix F). These measurements show that the overall slope achieved in the western part of the north wall was approximately 35^{o} and in the higher eastern part of the north wall, approximately 30^{o}. The batter angles are highly variable (Figure 29) which may be a result of the aerial surveying accuracy but is also likely to be related to the structural control of batters.

Figure 28
Slope profiles of the north wall of the existing open pit.

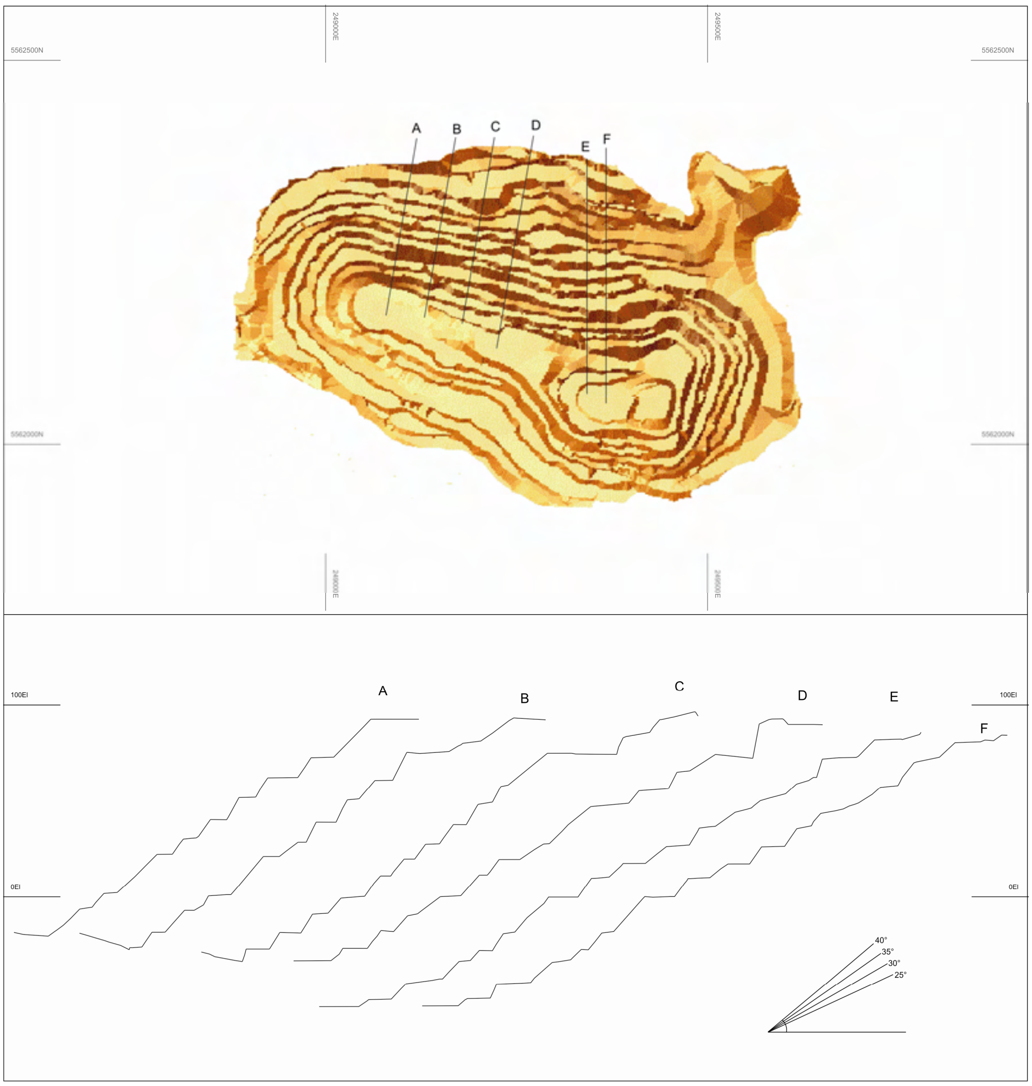
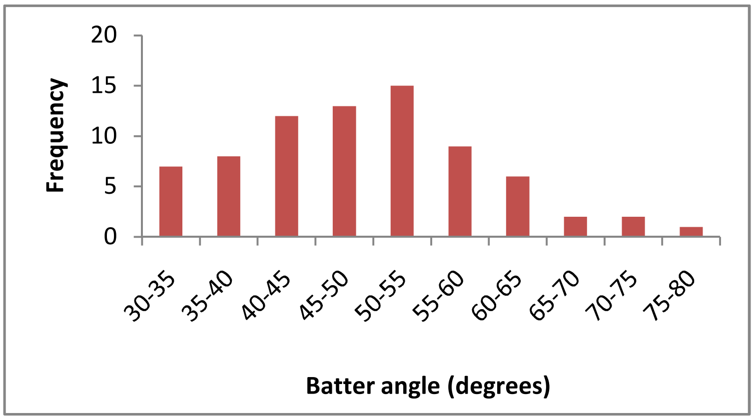


Figure 29
Histogram of measured batter angles from north wall of existing pit.



The eastern part of domain 7 was known as the Central Area in the underground workings. The strike of the marble marker zone within the orebody in this area is 65 degrees east of north.

The No. 3 fault dips SW and can also potentially form wedge failures in the western part of this domain.

A summary of the data from domain 7 can be seen in Table 28.

Table 28
Domain 7: Data Summary

Parameter	**Notes**
Lithology	Basement volcanic and Mine Series
Strength	5 UCS tests: 97-195MPa (domains 5, 7, 8)
Excavation experience	N and E walls of existing pit slopes ~ 30-35^o Underground workings (Central area), estimated RMR 66-70 in Mine Series
Previous drilling	Limited geotechnical data not collated
Recent drilling	Nil
Defect orientations	Moderate SSE dipping bedding. 4 joint sets dipping steeply NW to SW.

4.8 Structural Domain 8

This structural domain is mainly located in the vicinity of the existing pit and the lower part of the western wall of the proposed pit. The domain has not been investigated in detail in this report. A summary of the data from domain 8 can be seen in Table 29.

Table 29
Domain 8: Data Summary

Parameter	**Notes**
Lithology	Basement volcanic and Mine Series
Strength	5 UCS tests: 97-195MPa (domains 5, 7, 8)
Excavation experience	SW and E of existing pit Underground workings (Pit area), estimated RMR 66-70 in Mine Series
Previous drilling	Limited geotechnical data not collated
Recent drilling	Nil
Defect orientations	Moderate SE dipping bedding. 4 joint sets dipping steeply NW to SW.

4.9 Structural Domain 9

The proposed pit wall angle in domain 9 is parallel to part of the existing pit wall in domain 8 and that experience may be relevant to analysis of the southwest wall of the proposed pit.

Domain 9 also contains the relatively high quality rocks encountered in drill holes G028 and G029 which are a possible source of armourstone for seawall works.

In the eastern part of the domain, drill hole 407 is one of the few surface holes with comprehensive RQD data (Table 30), which suggests that further good quality rock occurs within the eastern part of this domain. The generally higher rock mass quality in this domain may be due to the effects of contact metamorphism because of the relative proximity to the granite.

Seven uniaxial compressive strength test results are reported in a previous study (GHD, 2007). Of the tests, two were in granite and five were in volcanic rocks (Table 31). The average of the volcanic rock tests was 154MPa and the standard deviation was 35MPa, which is an acceptable variability for this test. This average value (rounded to 150MPa) will be used as the volcanic rock strength in rock mass strength calculations. However, it is noted that the location of the samples (CB1B) is from one of the southernmost surface drill holes and outside the anticipated pit limits.

A summary of the data from domain 9 can be seen in Table 32.

Table 30
RQD data from drill hole 407

Depth From (m)	Depth To (m)	Rocktype	RQD (%)
36	45	Volcanics	69
45	48	Volcanics	10
48	49	Volcanics	83
49	51.2	Volcanics	23
51.2	53	Volcanics	61
53	59	Volcanics	81
59	82	Volcanics	80
82	106	Volcanics	87
106	118	Volcanics	82
118	121	Volcanics	28
121	129	Volcanics	94
129	153	Volcanics	84
153	177	Hornfels	90
177	200	Hornfels	63
200	219	Hornfels	84
219	223.45	Hornfels	38

Table 31
UCS Test Results

Hole	Depth (m)	UCS (MPa)	Lithology
CB1A	16.15	238.9	GRANITE
CB1A	16.75	174.5	GRANITE
CB1B	8.3	166.8	VOLCANICS
CB1B	10.8	125.9	VOLCANICS
CB1B	12.2	111.7	VOLCANICS
CB1B	17.2	198.1	VOLCANICS
CB1B	19.9	166.7	VOLCANICS
AVERAGE		153.8	VOLCANICS
STDEV		34.8	VOLCANICS

Table 32
Domain 9: Data Summary

Parameter	Notes
Lithology	Basement volcanic and Mine Series
Strength	5 UCS tests volcanic rock: 111-198MPa
Excavation experience	SE of existing pit, not measured
Previous drilling	Limited geotechnical data not collated
Recent drilling	Nil
Defect orientations	Moderate SE dipping bedding.

5 GEOTECHNICAL CONSIDERATIONS FOR PIT OPTIMISATION

5.1 Seawall

A letter report was provided on 2nd June, 2009 covering geotechnical restraints that should be applied for future pit optimizations. In particular the location of the cut off trench for the sea wall requires geotechnical consideration. Previously its location was set as 50 metres outside the 10 year pit boundary. That optimization was generally unconstrained by geotechnical parameters. Recent drilling has however exposed significantly more complex ground conditions (faulting and significantly deeper sediments than originally thought) which mean that the location of the cut off must be located to minimise the geotechnical impacts and a revised optimal pit be designed within this limit.

This letter report briefly outlined the revised geotechnical constraints, based on preliminary results from analysis of the recent geotechnical drilling and recommends a range of locations for the optional interim on-land hydraulic cut-off structure based on these geotechnical constraints. The Grassy River fault is included as a major boundary which should not be intersected by an interim pit shell. The Grassy River fault varies in width with core from drill holes G045 and G049, both of which intersect the fault, showing that within approximately 10m either side of the fault the rock mass quality is significantly reduced from background levels. It is recommended that a 10 metre buffer from the fault be maintained for the open pit development. The current interpretation of the fault alignment and a fault surface displaced 10m toward the hanging wall from the fault are shown in Figure 30 and on Map 5.

The sediment-basement contact is considerably deeper than previously thought. The top of the basement (volcanics) has been modelled from the recent drilling and that surface is shown in Figure 30. Above that surface the pit walls will be developed in unconsolidated sediments and a lower overall slope angle (than that adopted for the volcanics) is warranted.

It is considered unfavourable to locate a cut-off structure directly above where the trace of the Grassy River fault intersects the sediment-basement contact. Therefore a vertical boundary has been generated above the line of intersection of the sediment-basement contact and the Grassy River fault (displaced 10m into hanging wall) model. The fault model was supplied by King Island Scheelite and has been modified slightly to conform to data from drill holes G045 and G049.

The off-shore sediments include a sand layer overlying a clay-gravel layer. Some form of hydraulic cut-off is expected to be required to the base of the sand layer. Various cut off options have been canvassed and each has physical depth limits in which they are practical. For the purpose of the interim optimization study, three separate limits are provided for comparative investigation. These limits are at 20m, 30m and 50m maximum depth to the base of the sand layer. The 20m maximum depth boundary is close to the line marking the absence of gravel below the sand layer. The 50m maximum depth boundary is close to the previous Stage 3 pit outline and close to the current shore line (Map 5).

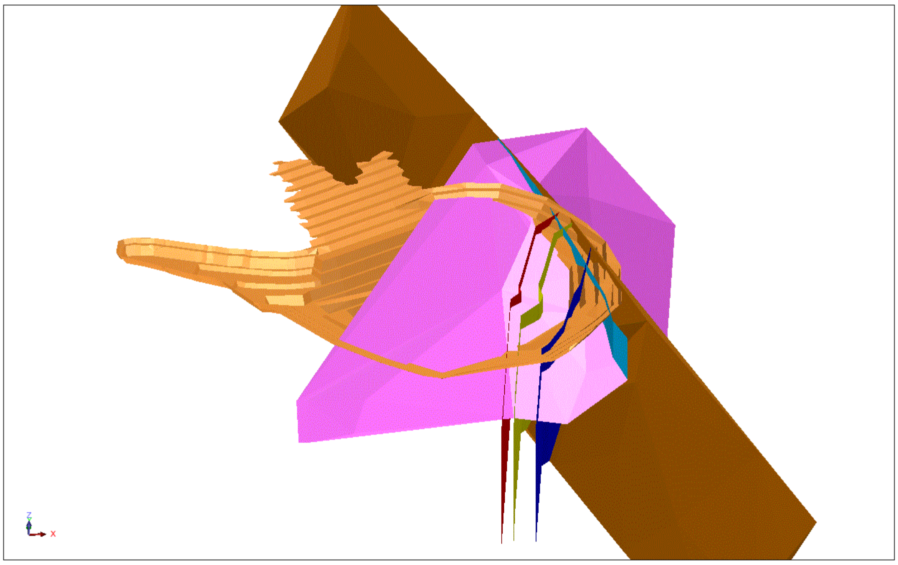
To allow further pit optimizations to proceed Coffey Mining has prepared a number of surface DTMs representing these geotechnical constraints as set out in Table 33 below: All other surfaces developed for this investigation are listed in Appendix G.

Table 33.

Geotechnical limits for pit optimization

Surface	Constraint	File Name
Grassy River Fault – displaced 10m toward Hanging wall	Pit wall in basement must be west of boundary	grf-10mhw.dtm (Fig. 1, brown)
Sediment-basement contact	35^{o} slope above contact, 43^{o} slope below contact	Top_volc_extended.dtm (Fig. 1, pink)
Vertical boundary above intersection of GRF (displaced 10m to hanging wall) and sediment-basement contact	Pit wall must be west of boundary	Volcanic_grf_intersect_vertical (Fig. 1, pale blue)
Depth of cut-off structure 20m	Pit wall must be west of boundary	Sandbase_contours_20.dtm (Fig. 1, red)
Depth of cut-off structure 30m	Pit wall must be west of boundary	Sandbase_contours_30.dtm (Fig. 1, yellow)
Depth of cut-off structure 50m	Pit wall must be west of boundary	Sandbase_contours_50.dtm (Fig. 1, dark blue)

Figure 30
Oblique northward view of surfaces outlined in Table 24. The proposed pit is shown in pale brown for reference.



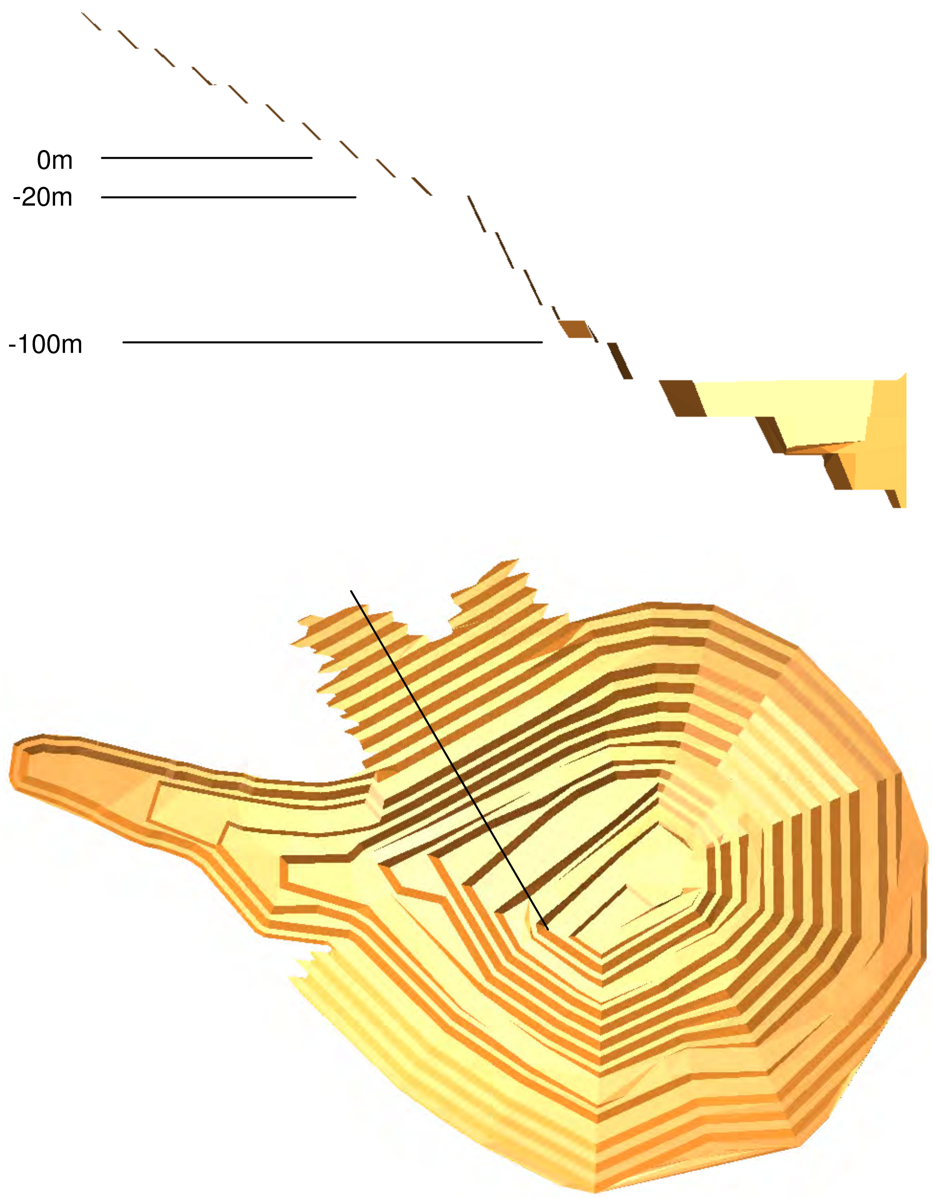
5.2 Water Conditions

The underground mine was known to be wet indicating connectivity of faults and joints to the overlying water. Controlling and monitoring groundwater flow and groundwater pressure will be a key engineering design consideration. It is essential that all slope stability analyses conducted are reviewed for their consistency with the groundwater conditions expected to be achieved by cut-off wall construction, and/or other means of water management used in the project. The preliminary stability analyses below include an assumption that the ground is wet but substantially depressurised.

5.3 Pit Slopes

The current proposed 10-year pit geometry comprises an upper slope in domains 6 and 3 which is similar to slopes on the northern side of the existing pit (Figure 31) and steeper slopes in the main shell of the pit, below -20m. These selected slopes are based on very limited geotechnical data, however selection of appropriate pit slopes and bench-berm geometry during pit optimisation is an important consideration in resource estimation. The current data and analysis are inadequate for a detailed pit slope design, however, preliminary slope stability analysis has been undertaken in some domains and extrapolated to other domains for the purpose of pit optimisation studies.

Figure 31
The current proposed 10-year pit geometry.



5.3.1 Empirical Method

The Haines and Tebrugge chart (Haines and Terbrugge, 1991) summarises experience of slopes of various heights with respect to the mining rock mass rating (MRMR). The angles derived from the chart are inter-ramp slope angles and the overall slopes will be lower angles depending on the width and number of haul road passes. MRMR values were determined by adjusting the RMR values in domains 2 and 4 according to the procedure of Haines and Terbrugge (1991). The MRMR values and recommended slope angles for selected wall heights are shown in Table 34 and the Haines and Terbrugge charts are shown in Appendix H.

Table 25
King Island Scheelite
Domains 2 & 4: Haines and Terbrugge MRMR Slope Chart Data

Domain	MRMR median	Slope height (m)	Slope angle (deg.) (FoS = 1.2)	Slope angle (deg.) (FoS = 1.5)
2	24	150	45	35
2	24	200	42	32
4	33	150	48	38
4	33	200	44	34

5.3.2 Rock Mass Strength

In order to conduct non-empirical analyses such as limit-equilibrium and numerical modelling it is necessary to determine appropriate rock mass strength parameters. Although non-empirical slope stability analyses have not been conducted in this investigation appropriate strength parameters have been calculated to support further work.

The Hoek-Brown (Hoek 1990) rock mass strength criterion provides a method for evaluating strength parameters by downgrading the intact rock strength according to the geological strength index (GSI). GSI ranges from 0-100 and is commonly approximated as 5 less than RMR (Bienawski 1989). Cai (et al., 2004) also provide a method for evaluating GSI which includes calculation of a joint condition factor (Jc). Both these methods have been used to determine GSI for domains 2 and 4 at King Island Scheelite mine (Figure 32, .33 and 34).

Figure 32
Distribution of Jc (joint condition (Cai et al) values in Domain 2. The mode is in the GSI "fair" joint condition category.

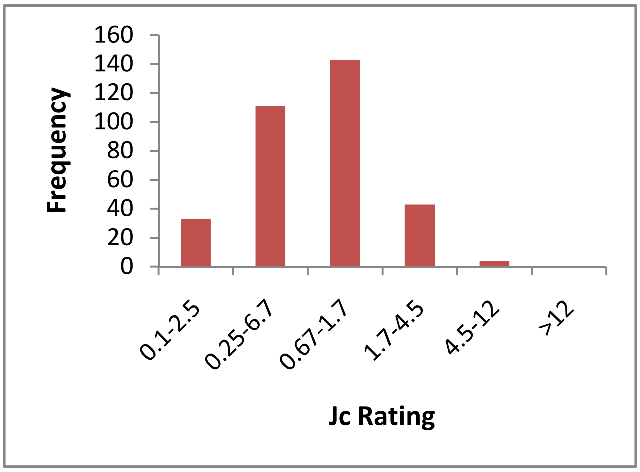


Figure 33
Distribution of Jc (joint condition (Cai et al) values in Domain 4. The mode is in the GSI "good" joint condition category.

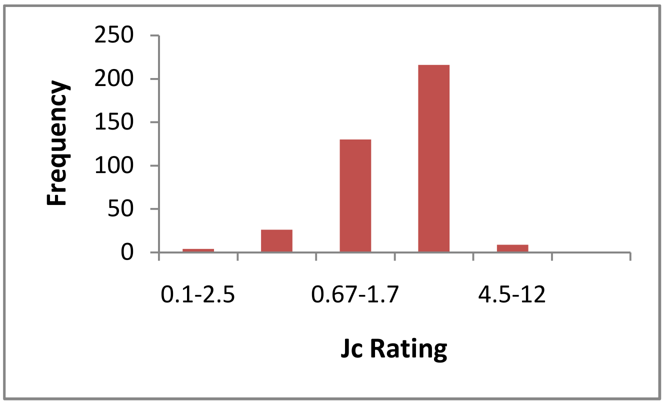
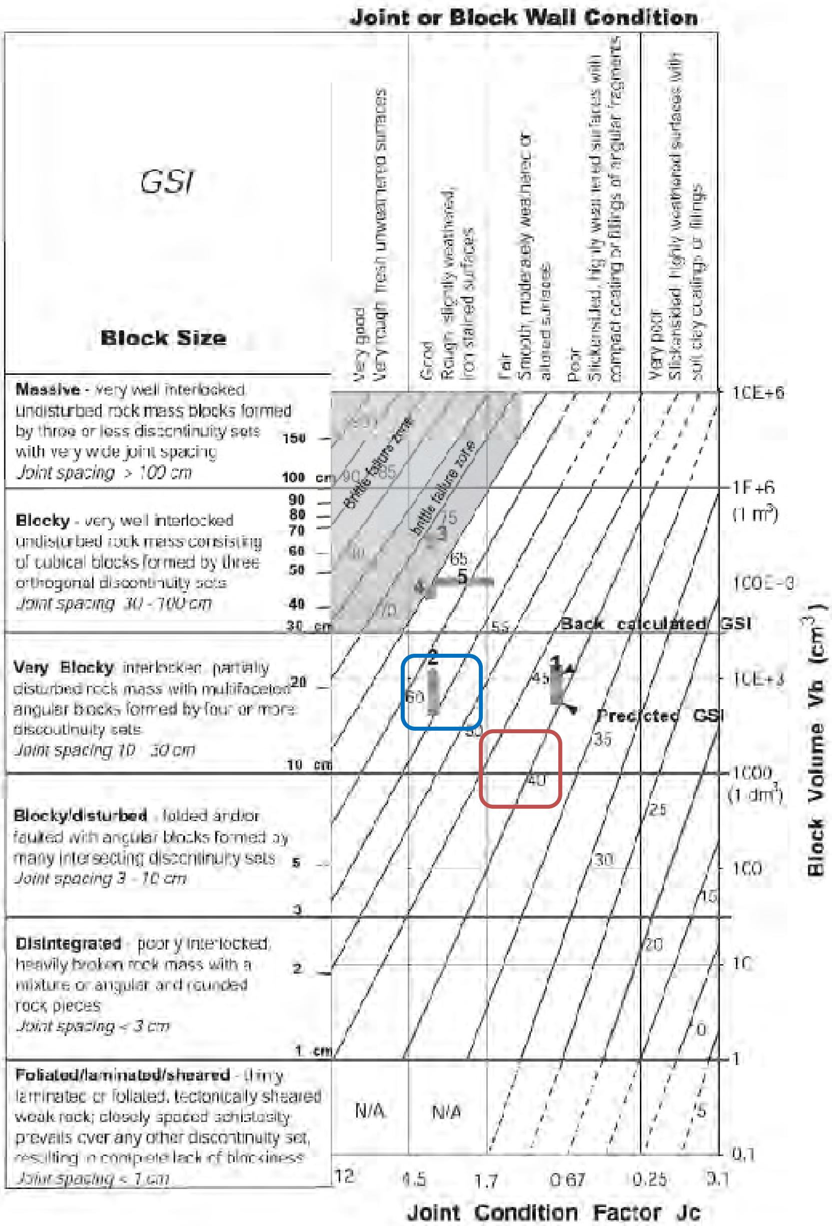


Figure 34
Determination of GSI using Jc (joint condition (Cai et al) values in Domain 2 (red) and Domain 4 (blue).



Based on the data summarised in this report appropriate values have been entered into the software RocLab to calculate cohesion and friction angle for the rock mass in domains 2 and 4 (Table 26). The complete listing of values used in the analysis is in Appendix I).

Table 35
Rock mass cohesion and friction angle estimates using RocLab

Domain	Method	Cohesion (MPa)	Friction angle (degrees)
2	Cai et al 2004	1.19	44.7
2	RMR-5	0.94	40.1
4	Cai et al 2004	1.74	51.3
4	RMR-5	1.32	46.6

6 RECOMMENDATIONS

6.1 Preliminary Slope Recommendations

Detailed slope recommendations can only be made for specific wall locations and orientations. The location of the wall will determine which domains and lithologies are intersected by the wall. The orientation of the wall will determine which geological structures (faults, bedding, joint systems) may form kinematically feasible sliding planes for that wall sector.

The 10-year pit provided by KIS has been used as a reference for the data in this report however, a detailed analysis of the slopes has not been conducted as the general pit layout may be changed as a result of re-optimising the pit shape to minimise geotechnical problems associated with the presence of thick sediments to the east.

The purpose of the preliminary slope recommendations made here is to provide slope angles that are within geotechnical expectations for the purpose of on-going pit optimisation calculations. New pit shells, when developed, can be re-evaluated geotechnically, according to their location and orientation.

Tables 36 and 37 summarise the pit wall lithologies expected and slope geometry recommendations made by Rosengren (2006).

Table 36
Pit Wall Lithology Summary (Rosengren, 2006)

Domain	Wall Part	Lithology
2 & 9	upper	Upper volcanics
	lower	Mine Series
3	upper	Quartzite north of Northern Boundary Fault
	lower	Mine Series
4	upper	Volcanics east of Grassy River Fault
	lower	Mine Series/volcanics

Table 37
Previous slope recommendations (Rosengren, 2006)

	Domain		
	1	**2, 3 & 4**	**5**
Bench height (m)	10	20	20
Batter slope (deg)	45	60	65
Berm width (m)	10	10	6
Inter-ramp slope (deg)	27	43	54

On the basis of the data in this report, new slope recommendations are presented. It is emphasised that these recommendations are not specific wall designs as wall location and orientation have not been taken into account.

6.1.1 Sediment

It is recommended that a non-benched continuous slope be planned for the sediments (domain 1) to avoid unnecessary steep-sloped sections between benches. Analysis by GHD (2007a) showed that slope angles as low as 27^o are unstable when the expected seepage conditions are included. The stability achieved by adding crushed rock toe protection to the analysis indicates that increased slope angles may be achievable with suitable engineering. The final angle selected will depend on the trade-off between the cost of stabilisation and the benefits of minimising the seaward projection of the pit outline achieved by steeper slopes. The slope angle in sand should not exceed 35^o as this represents the maximum slope angle of the sand without the effects of seepage water pressure. A 20m wide berm at the unconformity is also currently recommended for pit optimisation planning purposes. The depth at which the unconformity is exposed in the pit will depend on the pit location relative to the wedge of sediment which thickens to the east. The stability of the slope in the sediments requires further data and analysis. It is expected that some parts of the sediment may require stabilisation. A detailed slope design would require an analysis of the trade-offs between steeper slopes, stabilisation costs and risk management.

6.1.2 Basement

The slope recommendation for domain 3 is unchanged from that of Rosengren (2006) as no substantive new data was obtained from this domain (Table 38). As noted in the recommendations of this report, the eastern part of domain 3 is lacking in geotechnical data. It is also noted that some wall orientations in this domain may be strongly affected by sliding on planar defects – a mechanism requiring more investigation.

Slopes in domain 2 are recommended to have the same geometry as domain 3 (Table 38), as was recommended by Rosengren and as is supported by the Haines and Terbrugge chart.

Data to date, indicates that the rock mass in domain 4 is superior to domains 2 and 3 and the Haines and Terbrugge chart analysis suggests it may sustain a slope approximately 3 degrees steeper than domain 2. The steeper inter-ramp slope angle could be achieved by a steeper batter angle, as shown in Table 38 or by decreasing the berm width.

Domain 5 does not contain a large amount of geotechnical data appropriate for slope design. Rosengren (2006) recommended an inter-ramp slope angle of 54^{o} which is compatible with the Haines & Terbrugge chart analysis for a 150m high slope using the RMR from the underground mine rock mass assessment (Miller, 1980). The same analysis for a 200m high slope gives 47^{o}. Since domain 5 is likely to be the location of the lowest parts of the pit wall it is recommended that the greater pit height value be taken. For simplicity, the slope geometry recommended for this domain is the same as given for domain 2 (Table 38).

The remaining domains have only received limited geotechnical investigation at this stage. As indicated in Table 38, it is considered appropriate for current purposes to use the domain 3 geometry for domain 6 and the domain 5 geometry for domains 7, 8, and 9. However, the high RQD values reported from some drill holes in domain 9 suggest that steeper slopes may be acceptable with further analysis of this domain.

Table 38
Preliminary slope recommendations

	Domain			
	2	**3, 6**	**4**	**5, 7, 8, 9**
Bench height (m)	20	20	20	20
Batter slope (deg)	60	60*	65	65
Berm width (m)	10	10	10	10
Inter-ramp slope (deg)	43	43	46	46

*=Note E-W to NE-SW striking walls in this domain will potentially be subject to sliding failure on defects for which insufficient data is currently available. Lower batter angle may be required for such wall in this domain.

6.2 Electronic database development

A large amount of information on the location of minor faults is contained in the geological logs from resource and geotechnical drill holes. This data has not been entered into the electronic database. Entering the minor fault locations into the database would allow a three-dimensional model of minor fault distribution to be developed. This would be very useful for geotechnical work as minor faults are expected to be a significant influence on wall stability.

All RQD data from surface and underground drill holes should be entered into the electronic database to allow its interpretation in three-dimensions and provide additional information on the geotechnical characteristics of the structural domains.

All bedding and defect dip data recorded in vertical drill holes should be entered into the electronic database to allow its interpretation in three-dimensions and provide additional information on the potential for sliding failure mechanisms in the structural domains.

6.3 Field investigations

Geotechnical data can be collected from existing pit walls including mapping of structures and structural failure mechanisms.

Additional logging of older and recent drill core is recommended to check the rock mass rating estimates and structural interpretations in this report. For example core from G045 should be inspected for signs of faults parallel to the drill hole and core from G049 should be inspected for signs that it is located at the intersection of the Northern Boundary and Grassy River faults.

6.4 Analysis

Conduct limit-equilibrium and numerical slope stability analyses using the rock mass parameters (including rock mass cohesion and friction angle) defined in this report. If new optimised pit shells are planned, the analysis should be conducted on the new pit walls.

6.5 Data gaps

Any future drilling campaigns should attempt to obtain oriented structural data from basement rocks. This data is necessary to predict the occurrence of planar and wedge type structural failures which are a primary influence on pit wall geometry design.

The only geotechnical data from the eastern part of domain 3 is from G052 which encountered extremely broken ground and was abandoned. Any future drilling campaigns should include investigation of this area.

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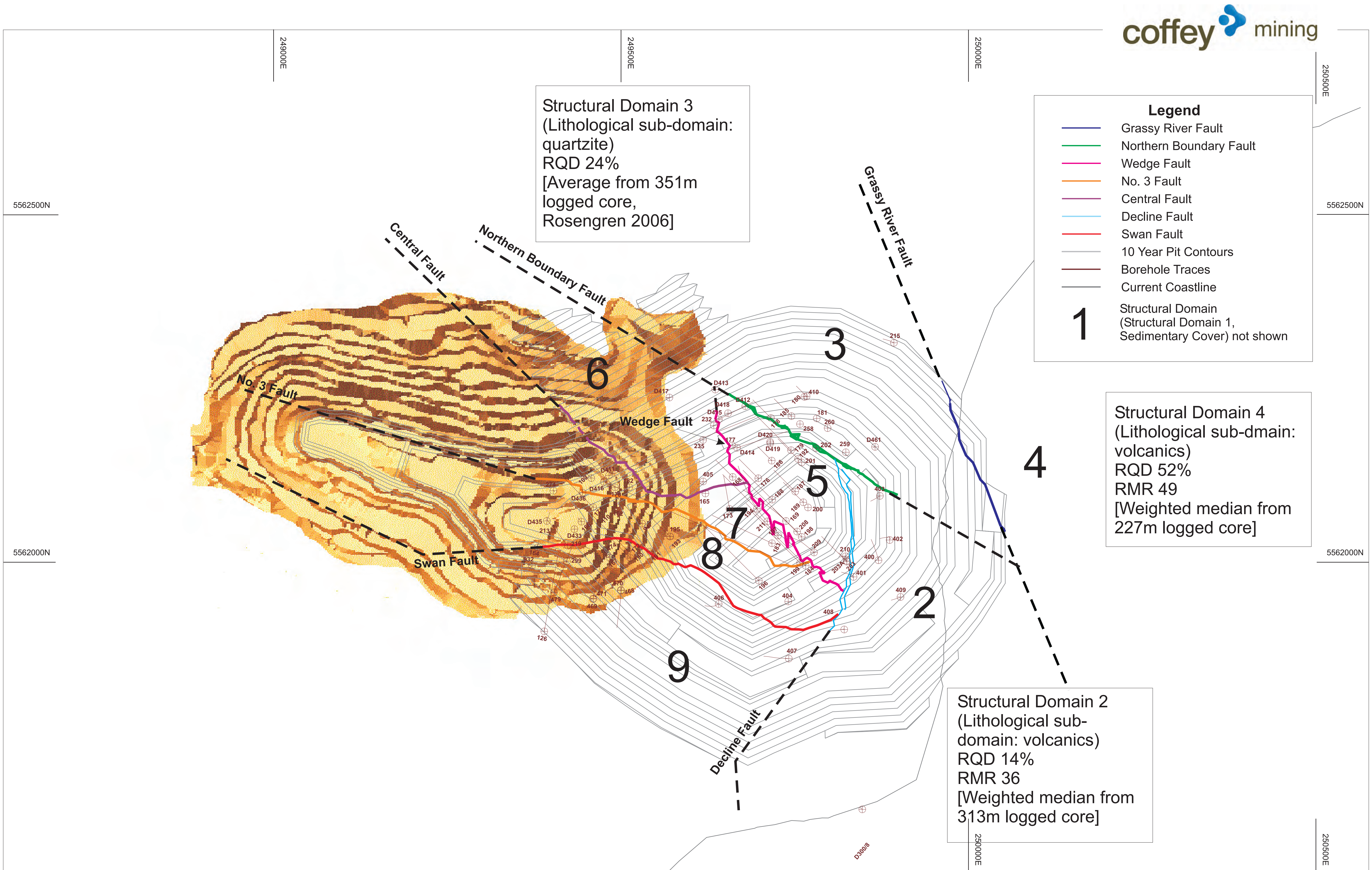
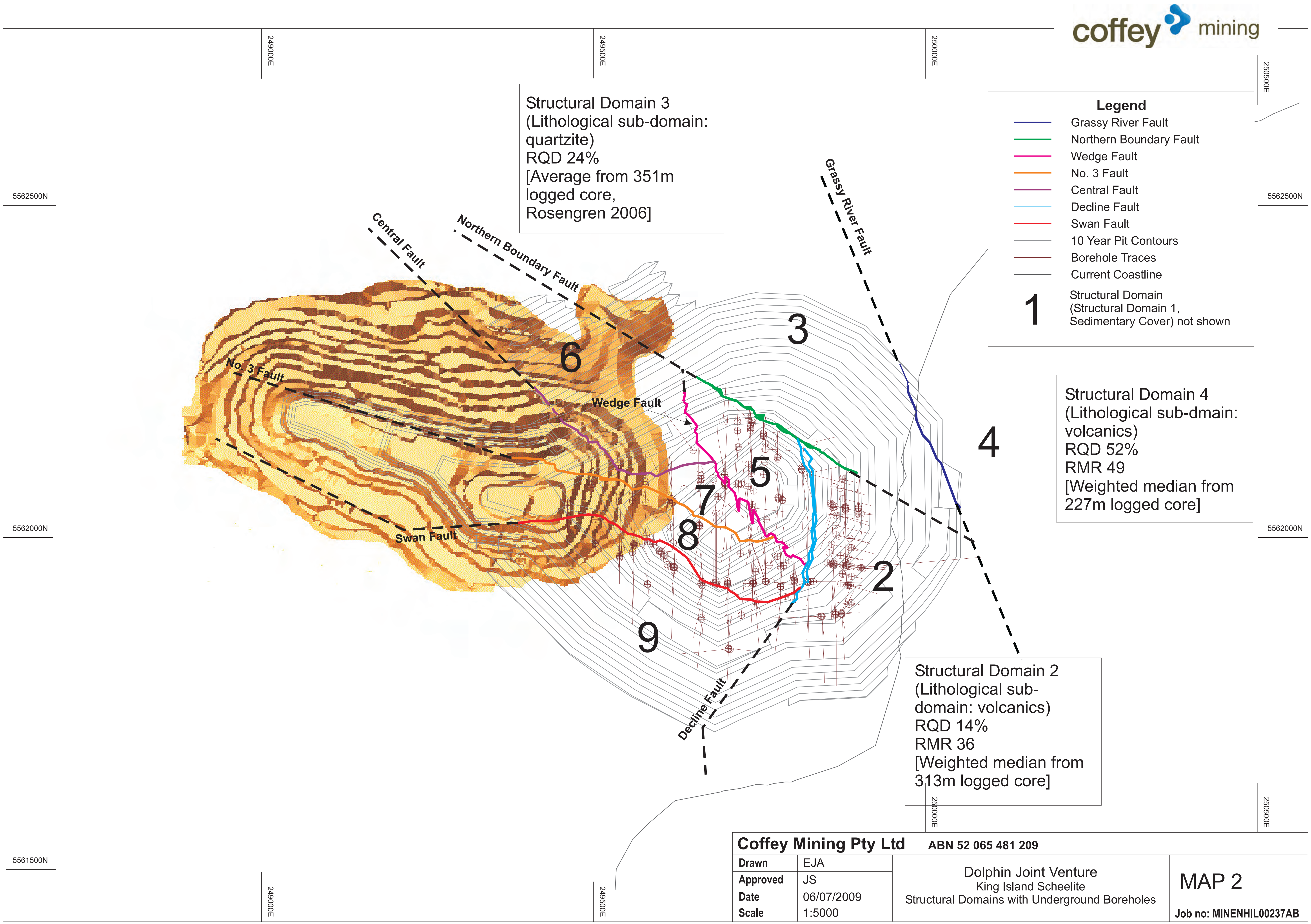
A bibliography of King Island Scheelite reports is provided in Appendix J.

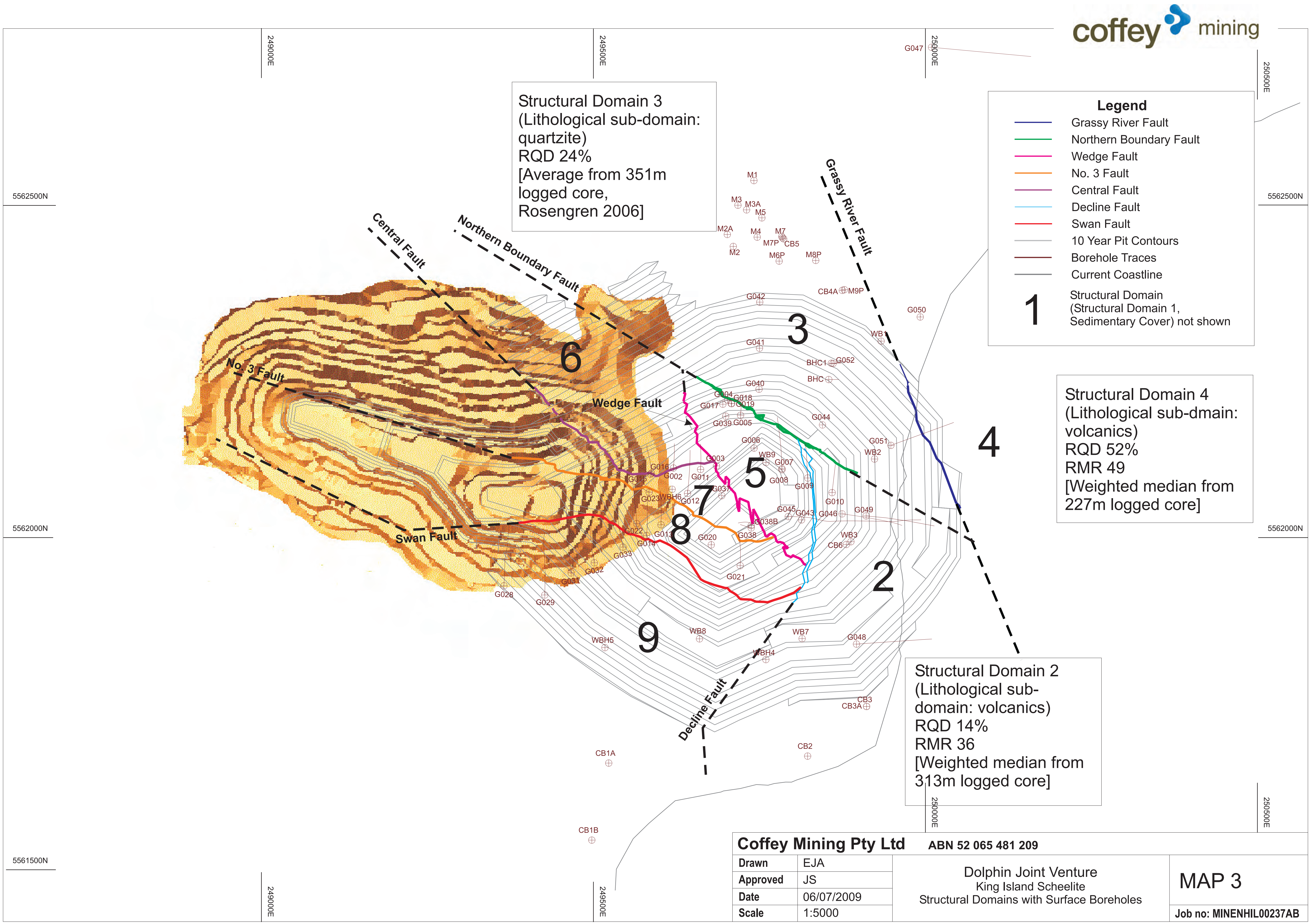
Maps



Coffey Mining Pty Ltd	ABN 52 065 481 209		
Drawn	EJA	Dolphin Joint Venture King Island Scheelite Structural Domains with Surface Boreholes (Early Data)	MAP 1
Approved	JS		
Date	06/07/2009		
Scale	1:5000		Job no: MINENHIL00237AB



coffey mining
Structural Domain 3
(Lithological sub-domain:
quartzite)
RQD 24%
[Average from 351m
logged core,
Rosengren 2006]
Legend
Grassy River Fault
Northern Boundary Fault
Wedge Fault
No. 3 Fault
Central Fault
Decline Fault
Swan Fault
10 Year Pit Contours
Borehole Traces
Current Coastline
1
Structural Domain
(Structural Domain 1,
Sedimentary Cover) not shown
Structural Domain 4
(Lithological sub-dmain:
volcanics)
RQD 52%
RMR 49
[Weighted median from
227m logged core]
Structural Domain 2
(Lithological sub-
domain: volcanics)
RQD 14%
RMR 36
[Weighted median from
313m logged core]
Central Fault
Northern Boundary Fault
Grassy River Fault
No. 3 Fault
Wedge Fault
Swan Fault
Decline Fault
2
3
4
5
6
7
8
9
249000E
249500E
250000E
250500E
5562500N
5562000N
5561500N
Coffey Mining Pty Ltd
ABN 52 065 481 209
Drawn
EJA
Approved
JS
Date
06/07/2009
Scale
1:5000
Dolphin Joint Venture
King Island Scheelite
Structural Domains with Underground Boreholes
MAP 2
Job no: MINENHIL00237AB



coffey mining
Structural Domain 3
(Lithological sub-domain: quartzite)
RQD 24%
[Average from 351m logged core, Rosengren 2006]
Legend
Grassy River Fault
Northern Boundary Fault
Wedge Fault
No. 3 Fault
Central Fault
Decline Fault
Swan Fault
10 Year Pit Contours
Borehole Traces
Current Coastline
1 Structural Domain (Structural Domain 1, Sedimentary Cover) not shown
Structural Domain 4
(Lithological sub-dmain: volcanics)
RQD 52%
RMR 49
[Weighted median from 227m logged core]
Structural Domain 2
(Lithological sub-domain: volcanics)
RQD 14%
RMR 36
[Weighted median from 313m logged core]
Central Fault
Northern Boundary Fault
Grassy River Fault
No. 3 Fault
Wedge Fault
Swan Fault
Decline Fault
1
2
3
4
5
6
7
8
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250500E
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5562000N
5561500N
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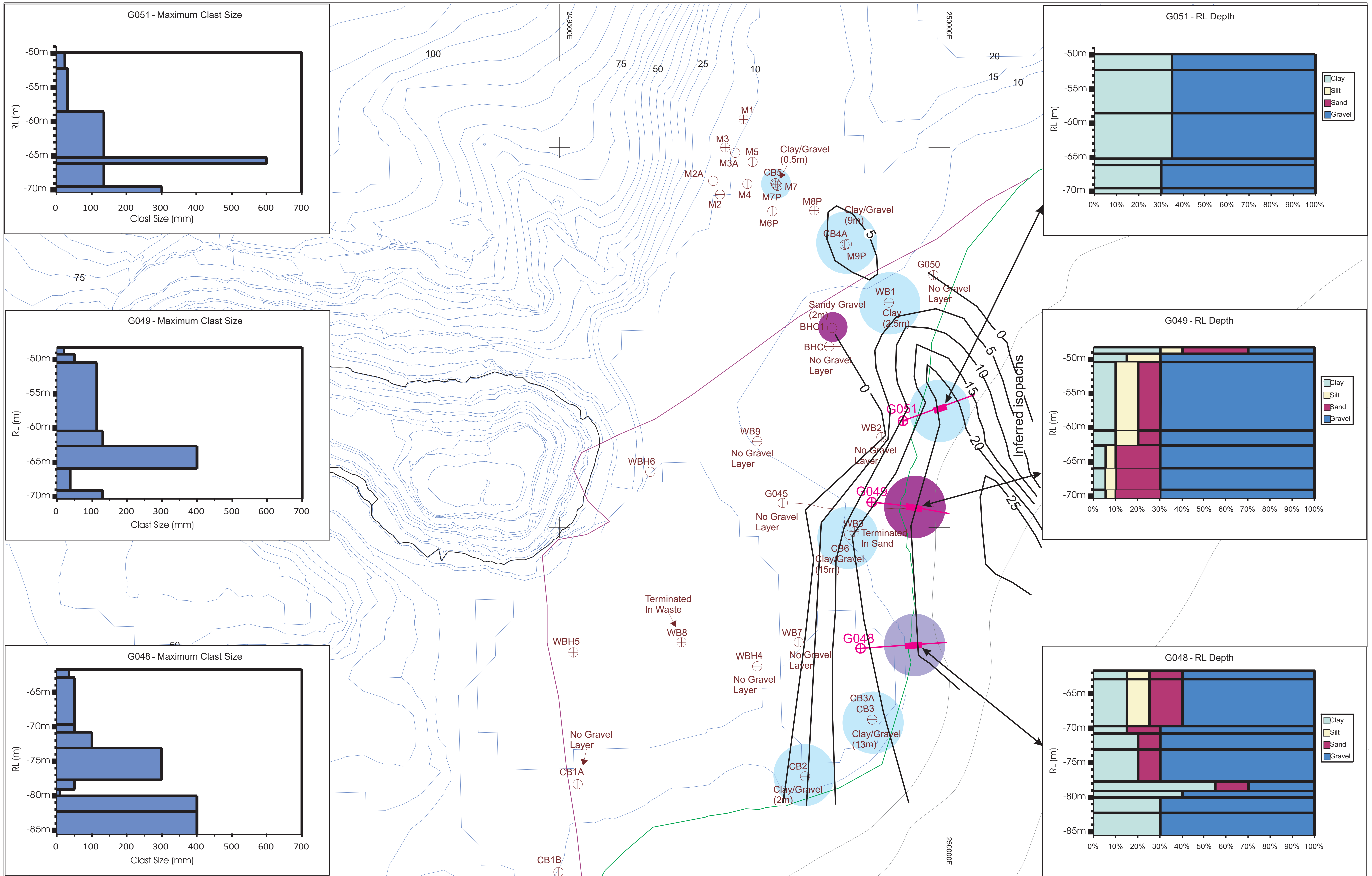
M3
M3A
M5
M2A
M4
M7
M7P
CB5
M2
M6P
M8P
CB4A
M9P
G042
G050
G041
WB1
BHC1
G052
BHC
G040
G004
G018
G017
G019
G039
G005
G044
G006
G051
WB2
WB9
G003
G007
G016
G002
G011
G015
G008
G009
G037
G023
WBH6
G012
G010
G045
G043
G046
G049
G038B
G022
G013
G014
G020
G038
WB3
CB6
G033
G032
G031
G021
G028
G029
WBH5
WB8
WB7
G048
WBH4
CB3
CB3A
CB1A
CB2
CB1B
Coffey Mining Pty Ltd
ABN 52 065 481 209
Drawn EJA
Approved JS
Date 06/07/2009
Scale 1:5000
Dolphin Joint Venture
King Island Scheelite
Structural Domains with Surface Boreholes
MAP 3
Job no: MINENHIL00237AB

coffey mining



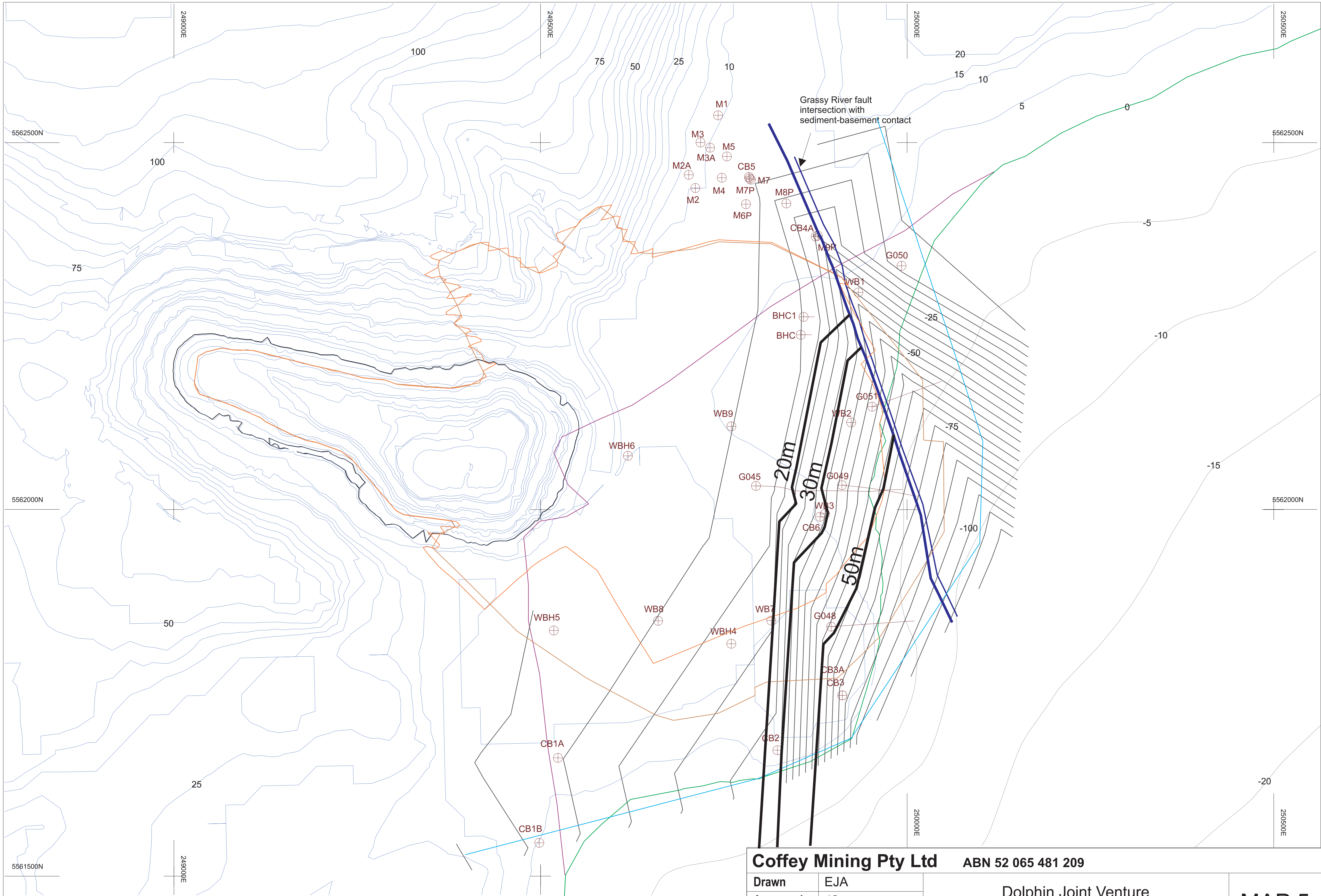
Old Coastline	Existing Pit Outline
Current Coastline	Clay/gravel
Sand/gravel	Topography Contour Lines
Clay & sand/gravel	Gravel Layer Isopachs

Coffey Mining Pty Ltd **ABN 52 065 481 209**

Drawn	EJA / PJP	Dolphin Joint Venture King Island Scheelite Mine Gravel sediment textures
Approved	JS	
Date	15/06/2009	
Scale	1:5000	

MAP 4

Job no: MINENHIL00237AB



Old Coastline	Existing Pit Outline	Topography Contour Lines	Previously proposed Cut Off Wall
Current Coastline	Previous Stage 3 Pit Outline	Top of Volcanics Contour Lines	Sand Base Depth Domains
	Previous Stage 4 Pit Outline	Grassy River Fault	Grassy River Fault Hanging Wall 10m

Coffey Mining Pty Ltd **ABN 52 065 481 209**

Drawn	EJA	Dolphin Joint Venture King Island Scheelite Mine Topography & Base of Volcanics	MAP 5
Approved	JS		
Date	2/6/2009		
Scale	1:5000		Job no: MINENHIL00237AB

Appendix A

Database Collar Accuracy Checks

1. DATA ASSUMPTIONS:

- The grid azimuth is assumed to be the same as GDA azimuth for all holes given except those found in the file "K1 drillhole data.xls" which are G002-G040 as they already have azimuth data in GDA94
- The Easting for drillhole 405 has been changed from **205366.3 to 249619.3** as this drill hole plots in the ocean and closer examination of the original grid data co-ordinates shows that borehole 235 has the same easting co-ordinate therefore the converted co-ordinate of 405 should be the same as 235. This change is supported by comparisons in the graphs below.
- Due to the above point a quick quality control of the drilling database has been undertaken (see below) which highlights that something has affected the conversion of the data that was obtained during the 1960's and the 1970's.

2. CO-ORDINATE DATA COMPARISON

Whilst viewing the data in SURPAC it was noticed that drillhole 405 plotted in the ocean. A close examination of the co-ordinates in the database suggests that this problem occurred as the data was converted to the GDA94 co-ordinate system.

A quality control check of the database has been conducted in order to find any other errors in the electronic data. This check consisted of plotting the original easting/northing co-ordinates against their respective GDA94 converted values.The data is expected to plot on a line as there is a linear relation between the 2 data values.

The comparison of Easting values (Figure 1) had a very consistent trend although there is one erroneous point identifed as the surface drillhole 405 which explains why this drillhole plotted in the ocean when looking at it in SURPAC (this value has now been corrected).

The comparison of Northing values (Figure 2) has a high level of scatter indicating that there is a slight error in some of the data conversions. Due to the scatter presentin the data it was decided to break the drillholes into known groups to see if there was a pattern to the scatter.

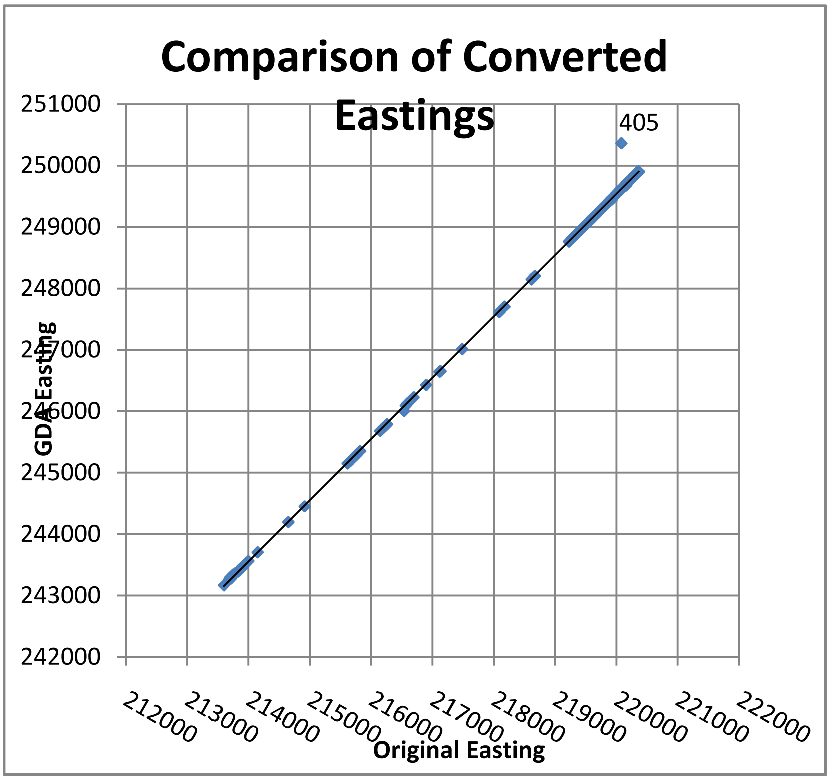


Figure 1. Comparison of Eastings

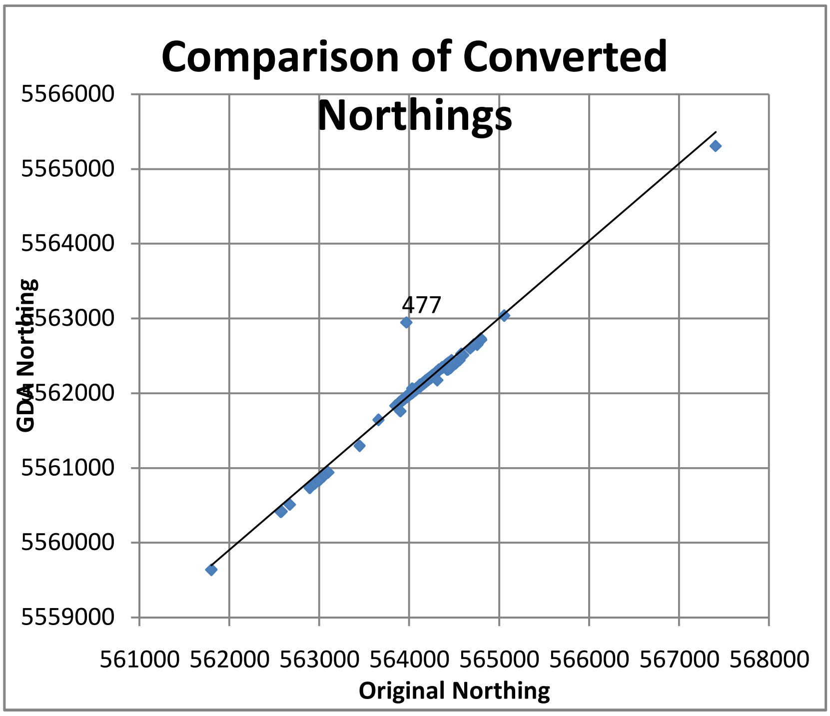


Figure 2. Comparison of Northings

The data was further separated into surface and underground drill holes (Figure 3), showing that the Eastings and the Northings of the underground holes have a linear trend with very little visible variation indicating that the co-ordinate conversion is consistent for the underground holes. The surface holes show a high level of variation from the linear trend line. This suggests that the erroneous points are surface holes rather than underground holes.

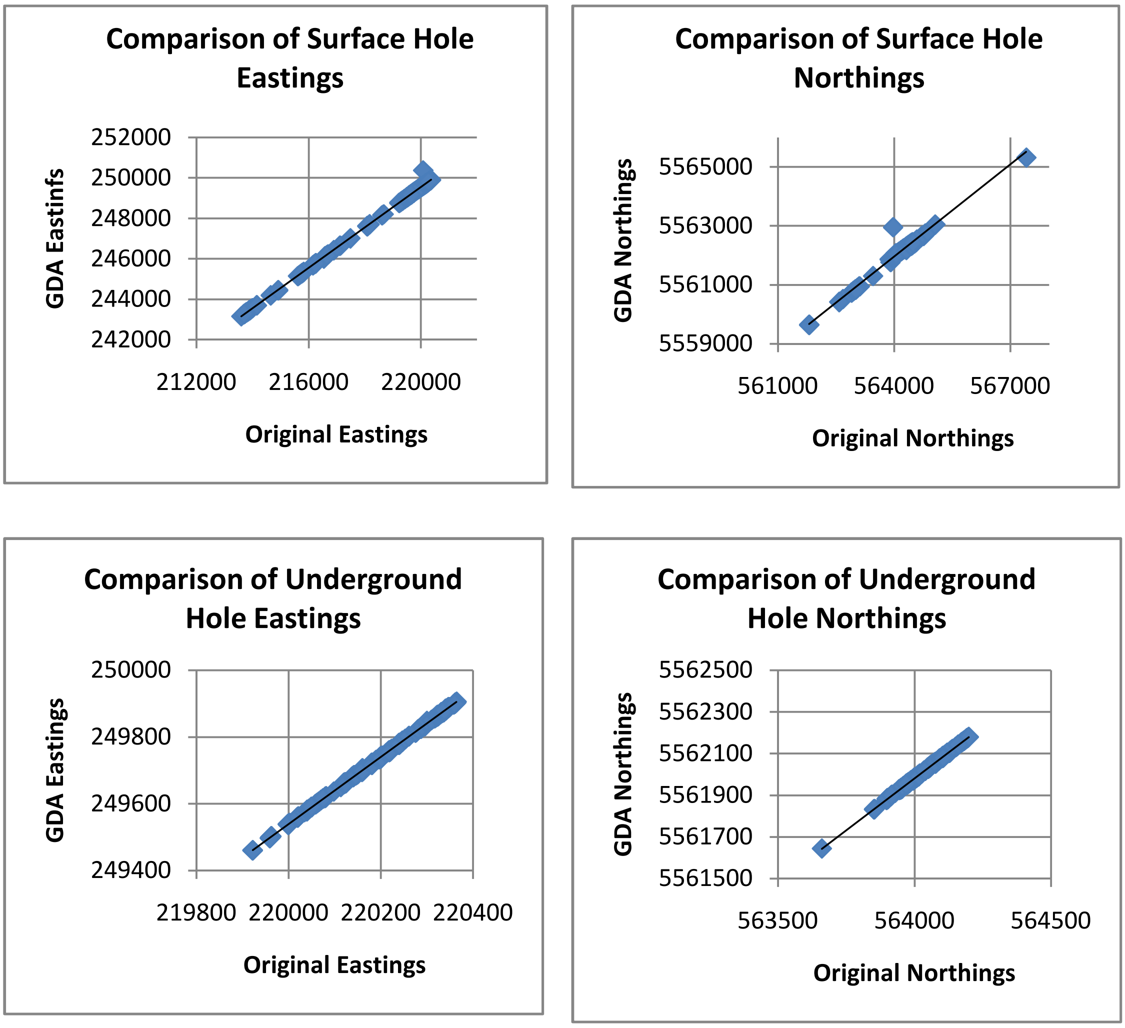
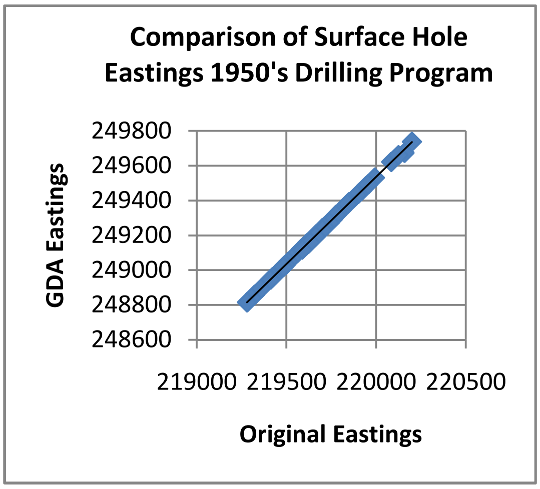
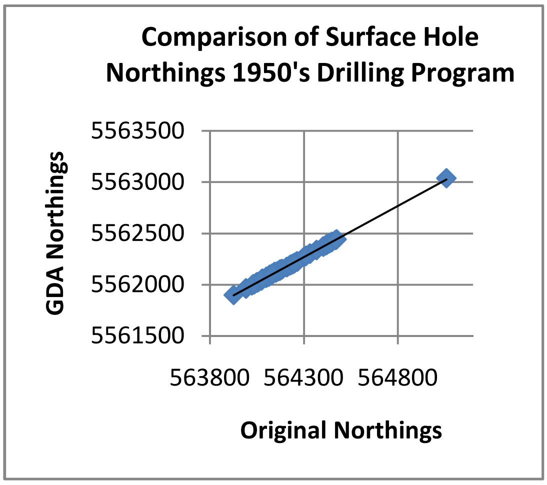


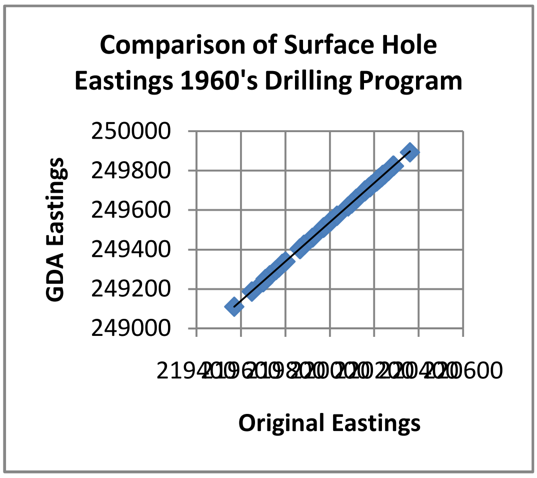
Figure 3. Comparison of surface and Underground Collar Conversions.

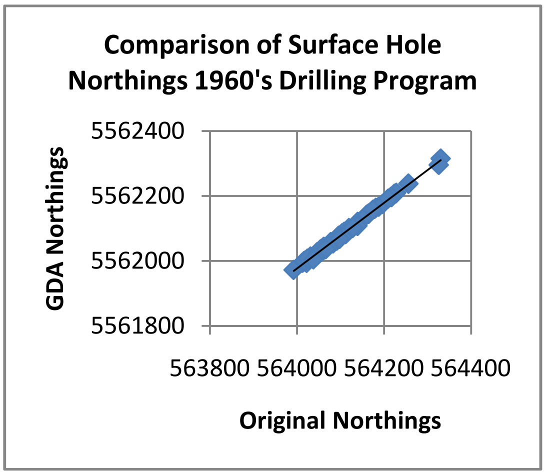
In an effort to try and narrow down the source of the error we have split the data into a number of known groups, drilling dates, hole series name and the company completing the drilling (Figure 4).

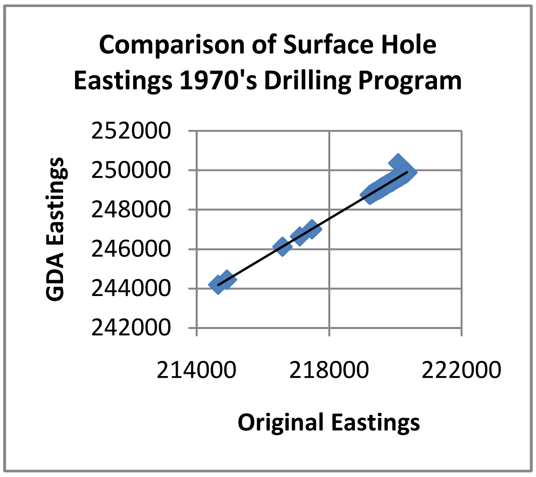
When split out into decades there is it a high amount of scatter in the northings throughout the 1960’s and 1970’s every other decade has a minimal amount of scatter present on the plots.

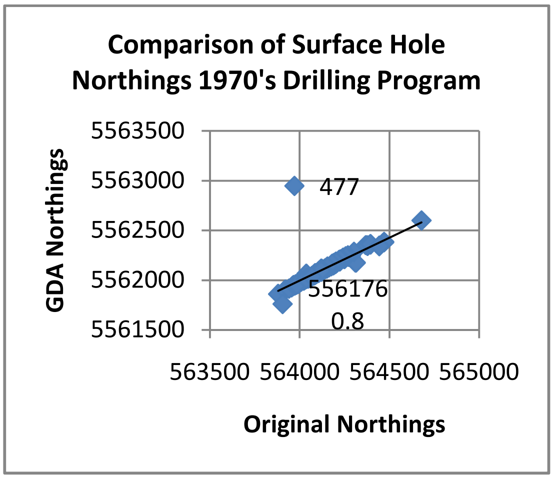


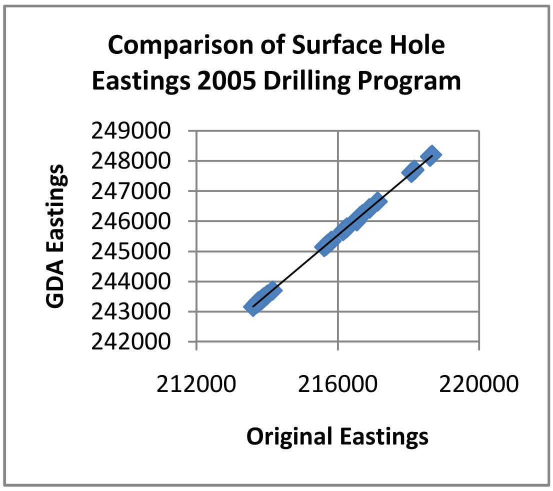












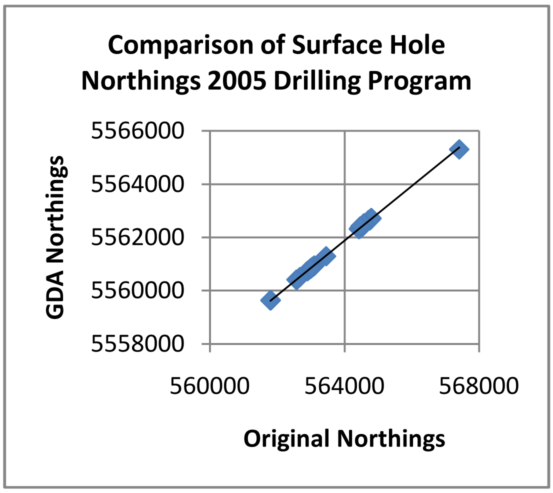
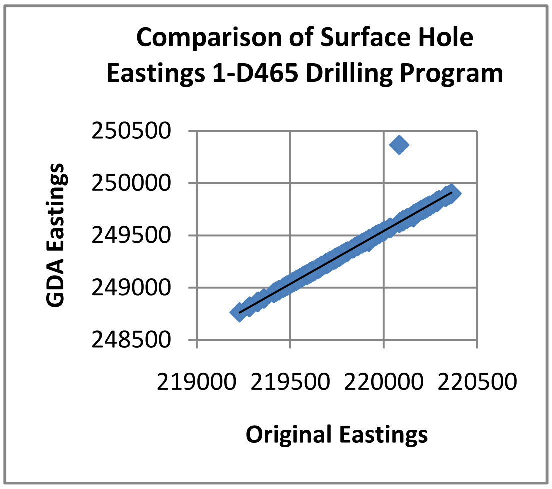
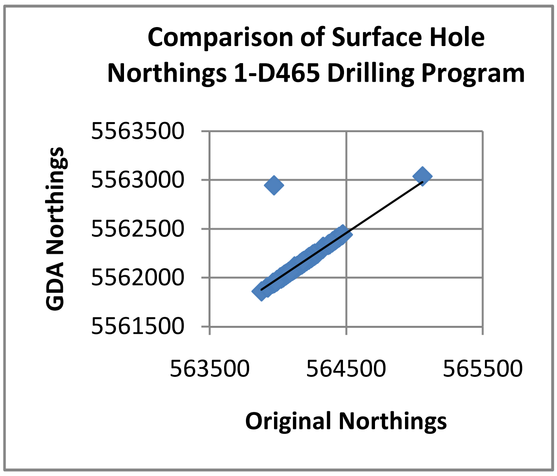


Figure 4. Further Data Comparisons.

The next step was to see if the error was related to a particular drilling series (Figure 5). There is a high level of scatter in both the number series that goes from 1-D465 and the G series and as most of this drilling was commenced in the 1970's matching the observations from the decade graphs





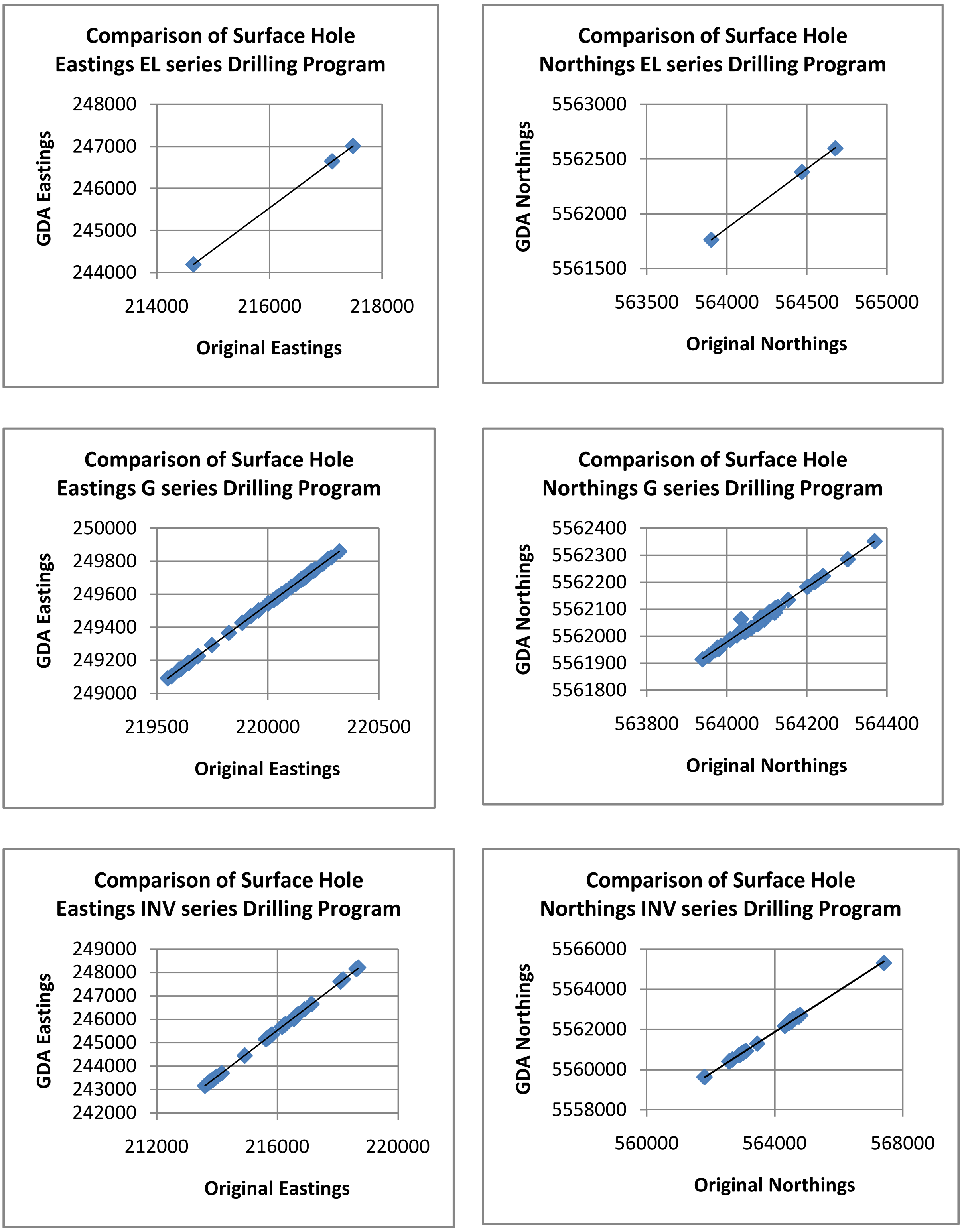
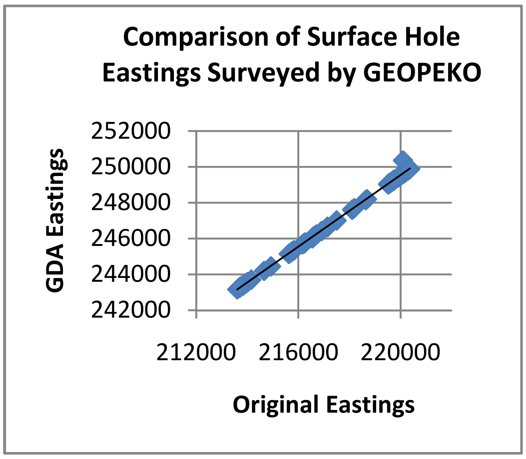
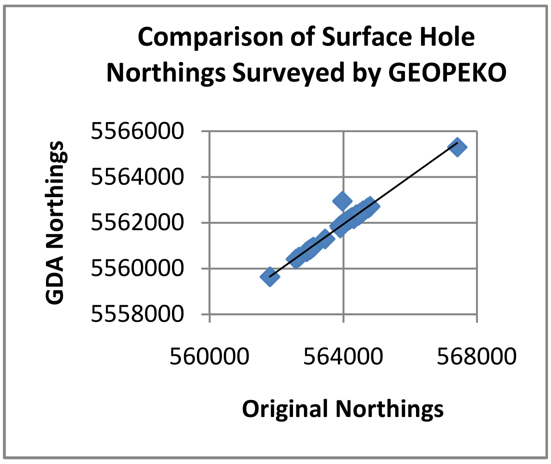
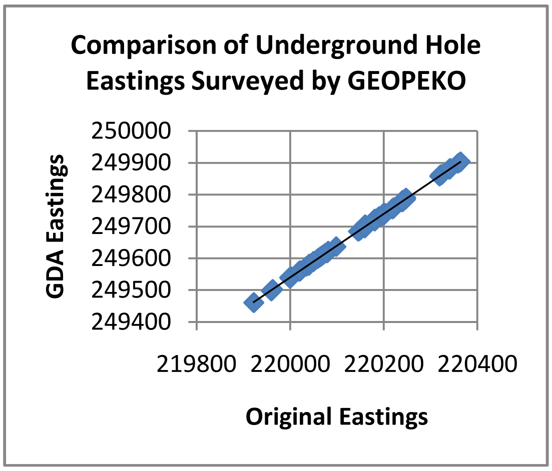


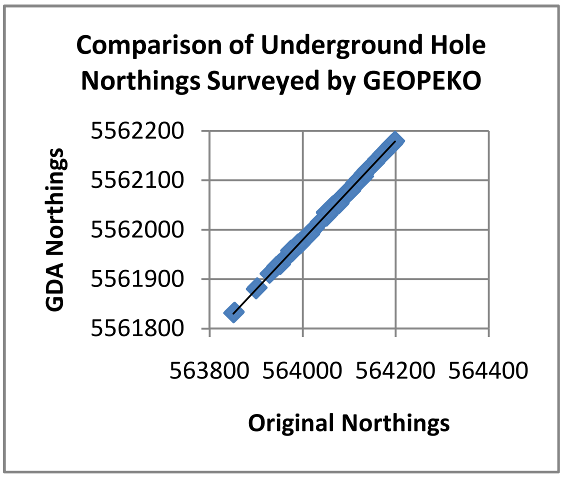
Figure 5. Data Comparison by Drill Hole Series.

Finally the data was seperated into the different companies involved with the drilling (Figure 6). Companies surveying the data and all of these graphs depict scattered data as the drilling companies were utilised throughout all of the decades and so the scatter from the 1960's & 1970's is influencing this data









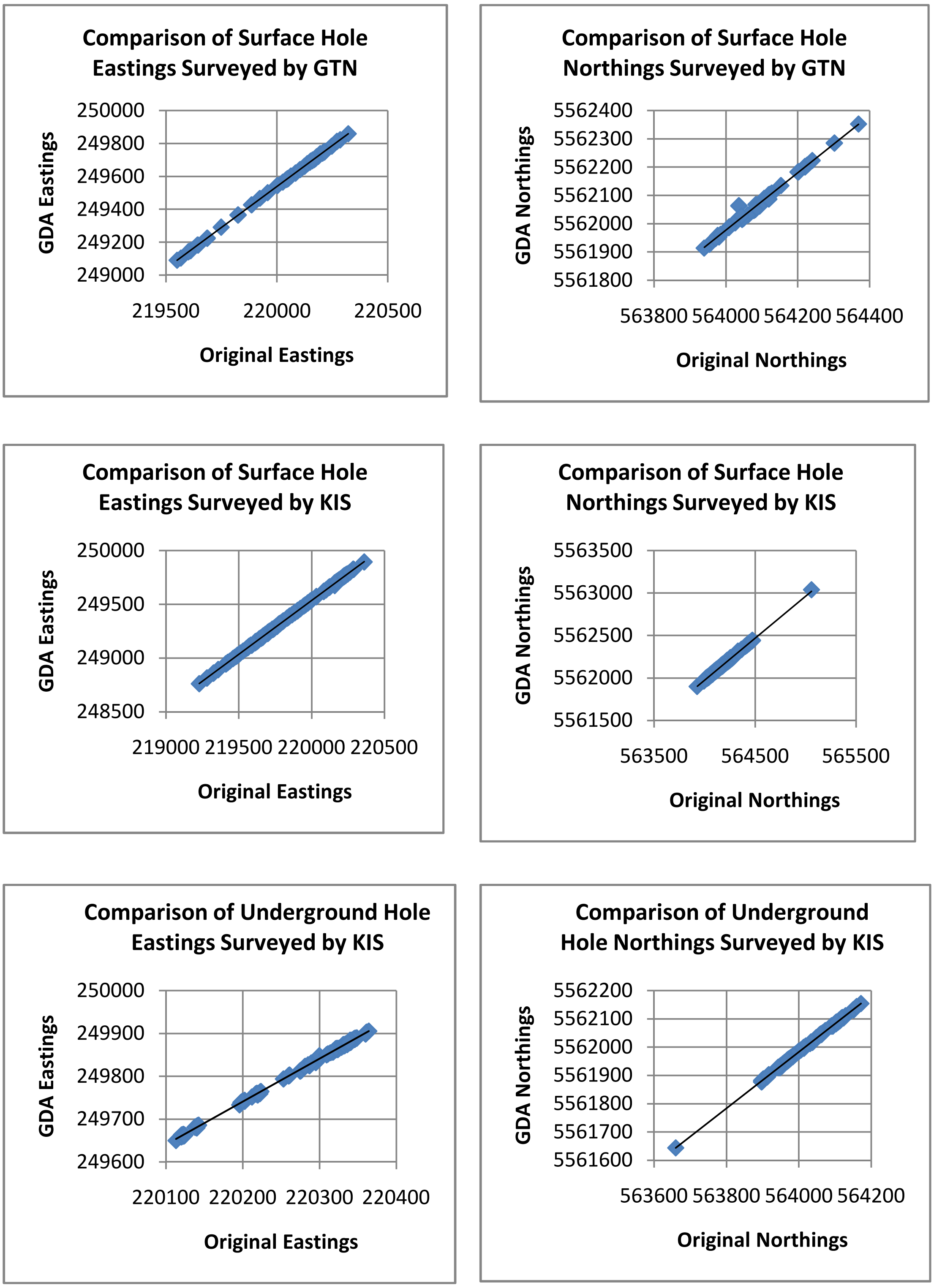


Figure 6. Data Comparison by Drilling Companies.

From the graphs of all of the data it appears that the data obtained throughout the 1960's and 1970's have been inaccurately converted to GDA94 due to unknown conversion factors that have introduced an increased level of error in the location of the drillhole collars.

The resulting inaccuracy is only in the order of metres which has not been condsidered critical to the current investigation. However, the inaccuracy may be considered significant for some resource estimation studies.

Appendix B

Geotechnical Logging Manual

KING ISLAND SCHEELITE GEOTECHNICAL CORE LOGGING PROCEDURE

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Name	Position	Role	Signature	Date Issued
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D Miller	Principal Engineering Geologist	Reviewer		3/3/09

CONTENTS

PART A) BACKGROUND

1 INTRODUCTION

Geotechnical data collection forms a vital part of any geotechnical study. The smooth transfer of knowledge from field observation, measurement and testing through to the development of a geotechnical model is an essential part of understanding how a rock mass behaves.

Coffey Mining has developed two geotechnical logging sheets on which the information from these two sources can be recorded. The sheet in landscape format is intended for recording of data representative of intervals of core. The sheet in portrait format is intended for logging of all individual defects. Each sheet is designed for data entry into a computer database where interpretation of defect sets, mean orientations, surface characteristics and rock mass classification can be more easily determined. Conforming to the recommended entries (numbers and symbols) will avoid problems with later processing. Any queries or uncertainties should be noted in the comments column. Do not use question marks (e.g. CY?) or multiple entries (e.g. CY/FE) in log columns.

During geotechnical logging it is important to be consistent and maintain rigorous procedures throughout the drill core log. The logs are for the recording of engineering data. They are not designed to replace geological logs.

An appreciation of the geology should be acquired before engineering logging commences and the engineering log should reflect this understanding. It is normal practice to append the full geological log to the engineering core log.

2 GEOTECHNICAL CORE LOGGING

Collection of geotechnical data from drill core is often difficult because of the size of "exposure" (drill core diameter) and the artificial fracturing of the core resulting from the drilling process and/or subsequent handling.

Often, geotechnical interpretations made from drill core logs are ***conservative*** *and* ***under estimate*** *the* ***quality*** *of the rock mass. The exception is extremely to lightly weathered material which if it dries out before logging or sampling can give artificially high strength.*

It is important when logging drill core to try and "see through" the artificial fractures and imagine what the rock mass would look like without them. This technique takes time to acquire and only comes after logging a lot of drill core, examination and logging of open pit batter faces and an appreciation of the drilling technique and how it influences the appearance of the natural rock mass in drill core. The technique can be developed more quickly by logging core next to the drilling rig and observing drilling practices and core handling methods as the core is being recovered.

Ideally the drill core log should only include information on naturally occurring open fractures. In reality, weakly healed discontinuities which have broken as a result of the drilling action and some drill induced fractures are almost always recorded. In some instances it is valuable to record healed discontinuities, however, these features should be clearly identified in the comments column as <u>healed</u> and not <u>open</u> discontinuities.

The explanation of geotechnical logging includes a description of the orientation line and drill core orientation techniques which form an integral part of this method. Descriptions of the fields contained in the log sheet follow the discussion on core orientation techniques.

2.1 Geotechnical Core Log

The detailed geotechnical core log is designed to provide, where possible, a complete geotechnical understanding of the rock mass. The collected data would include:

- discontinuity types and orientation,
- rock fabric descriptions, and
- discontinuity surface roughness and infill.

The first step in geotechnical logging, if time permits, is to re - assemble the broken pieces of core so that they fit together into continuous lengths. This allows RQD and core loss to be measured more accurately. During examination the core can be quickly assessed. At this stage you should begin to separate different intervals of the core based on fracture intensity, strength, rock type and alteration. You should also be trying to identify major structures. Intervals of the core which are not slake sensitive can be washed to remove excess drilling muds in order to examine the rock fabric.

During geotechnical logging, the drill core is separated into these intervals of similar rock mass conditions and is described, usually by completing a single "summary" line of the log sheet. If appropriate, discontinuities (defects) could be individually described according to defect type or if recognised, logged according to orientation.

The selection of size of the logged interval (>depth from' to 'depth to=) will depend on the nature of the rock mass. Ideally the interval should contain similar geotechnical features that can be accurately summarised and are generally representative of the **whole** interval. Alternatively the logged interval could be based on the length of the drill run (core block to core block). This is convenient for estimating core loss.

Logging of structures is only possible with oriented drill core, requiring that the core is marked with a known reference or orientation line.

From the detailed geotechnical log a geotechnical model would be developed which should complement the geological interpretations. Typically, detailed geotechnical logging is undertaken for geotechnical studies of open pit slopes and underground openings where the discontinuity orientations need to be identified and potential modes of failure determined.

2.1.1 Orientation Line

Core orientation can be determined during drilling using a variety of orientation tools. Currently, the ACE tool is recommended as the most effective method available.

Marking of the orientation line is a very time consuming process but the result pays dividends when the data is processed for interpretation of structural sets and mean orientations. Too often the orientation line is inaccurate and the resulting structural pattern is very difficult to interpret or not meaningful. It is quite common to find that it takes longer to assess the reliability of the orientation marks and mark the core correctly than it does to complete the detailed geotechnical log. The most accurate way in which to geotechnically log core is described as follows:

When the inner split tube assembly is extruded from the holding tube a grease crayon (e.g. "Chinagraph" pencil) should be drawn on the core signifying the bottom or top of core line while the core is still in the split. While the core is still in the split any drill induced fractures should be marked clearly with an "X" on either side of the break. These fractures will often result from rod vibration, stripping of the bit, or breaking off bottom at the end of a run. Any handling induced fractures should also be marked on the core with an "X" either side of the break.

After removing the core from the split tubes, it should be assembled into continuous runs on 'v channel' (angle iron) on a bench next to the drilling rig. This procedure allows drilling and handling induced fractures to be easily identified and so the recording of such features is avoided. For oriented core, the orientation marks can be correlated between drill runs and a reliable orientation line can be drawn on the core using a permanent marker such as texta or a paint pen. The core should be logged on the angle iron before it is placed into the core trays, with the orientation line "face-up" ready to be photographed.

2.2 Description of the fields on the Core Log Sheet

The following is a description of each of the fields on the geotechnical core log sheets.

Depth From (m)	The down-hole depth at the start of a logged interval. Also the depth of an individual feature for the detailed geotechnical log.
Depth To (m)	The down-hole depth at the end of a logged interval.
Core Loss (m)	Core loss over the logged interval.
Rock Type	An abbreviation of the lithology.
Weathering	An abbreviation of the weathering intensity. Refer to Table 3 and the back of the log sheets.
Alteration	An abbreviation of the alteration intensity.
Rock Strength	An abbreviation of the inferred rock strength determined by applying simple field index tests to the drill core is listed in Table 4 and 4a. Abbreviations appear on the back of the log sheet.
Intact length >0.1m	This is the basic measurement required to calculate RQD. The lengths should be measured by the centre line method which means measuring from the centre of one structure to the centre of the next structure.

RQD

Rock Quality Designation, expressed as a percentage from 0% to 100%. The RQD is calculated for a logged interval using the following formula:

RQD = (sum of core lengths > 100 mm) x 100 / length drilled.

- Thus, for 50mm diameter core (NQ2) the minimum length of core to be added to the cumulative total is 100mm. This length is also commonly adopted for NQ3 (45 mm diam.), HQ3 (61 mm diam.) and HQ2 (64 mm diam.) drill cores.

RQD is theoretically simple to measure/estimate, however it has become one of the most abused parameters in geotechnical work. Inaccurate use of RQD can involve:

- Often it is difficult to differentiate between drill induced and natural fractures, resulting in an artificially low estimate of rock mass quality. This inaccuracy can be significantly reduced by logging the drill core when it is reassembled and placed in continuous runs of ‘v channel’ (angle iron).
- Material that is obviously weaker than the surrounding rock, such as over-consolidated gouge, is discounted, even if it appears that the intact pieces are more than two core diameters in length.
- Where a core loss has been recorded in an interval this must be included in the RQD estimate.
- Observations of drilling practices confirm that many drill induced fractures occur at the end and the start of each drill run. This fracturing is associated with removing the core from the "core-lifter", breaking off bottom, and the potential for dropping a length of core at the end of the run into the bottom of the hole. These short lengths of core which occur at the ends of a run due to drill induced breakage, should be included in the RQD even when their length is less than two core diameters as they have been broken from sound core.
- Drill induced fracturing and discing commonly occurs on discontinuities which intersect the core at a high angle to the drill-core axis (i.e. perpendicular to the core). This problem is intensified if the core is also intersected by a structure which is sub-parallel to the core axis.
- RQD should only be recorded in materials which contain competent rock (i.e. not highly weathered or weak rock) unless there is good reason (e.g. feruginised or recemented highly weathered rock).

No. of Defects

The number of natural, open discontinuities (defects) occurring over the logged interval. Drill induced fractures should not be included. A naturally occurring broken zone e.g. shear, breccia or fault could be represented by a 99 to highlight its significance.

No. of Defect Sets

An estimate of the number of discontinuity sets over the logged interval as determined by the defect type and orientation. If there are specific sets

	recognised together with random discontinuities an additional 0.5 should be added, e.g. 3.5 indicates three discontinuity sets plus random. A naturally occurring broken zone resulting from shearing, faulting, or brecciation could be represented by a 20 to highlight its significance. Refer to Table 5.
Defect Type	An abbreviation of the discontinuity (defect) type. All defects are assumed to be open and, if logged, healed features should be noted in the comments column. Refer to Table 6. The difference between a joint with infill and a vein is subjective. If the infill thickness is greater than the roughness amplitude, the discontinuity should be logged as a vein.
Alpha, Beta	These angles are used to calculate the true orientation of a discontinuity. Measurement of alpha and beta angles is shown in Figure 2. • The alpha angle is the maximum angle which the discontinuity makes with the long-axis of the drill core. • The beta angle is a circumferential angle measured clockwise from the orientation line to the maximum dip vector (down-hole apex) of the discontinuity. • Alpha angles are always two characters. Beta angles are always three characters. Beta angles of 000 degrees should always be expressed as 360 degrees to avoid confusion with a "null" entry.

As described previously, it is very important that the orientation line/reference line is correctly marked. If a beta angle is measured it must be measured with respect to the correct reference line.

Recording of uncertain beta angles results in corruption of the orientation database and makes interpretation very difficult. Even worse, spurious discontinuity sets could be generated as a result of incorrect logging.

Profile/Roughness — An estimate of the profile and roughness of a discontinuity. A complete description is presented Figure 3. The first character describes the profile. The second character describes the roughness. Abbreviations are listed on the back of the log sheet and summarised below:

Infill — An abbreviation of the infill type on a discontinuity surface. The infill should cover the entire surface. Abbreviations for common infill types are given on the back of the log sheet and repeated below:

Additional infill types not listed should have an appropriate two character abbreviation. If an infill cannot be identified it could, however, be classified by its inferred frictional properties either as a high-friction non-softening infill (HF) or low-friction softening infill (LF).

Where low friction minerals are present these take precedence in the log. As an example, if an infill contains iron oxide and clay, the infill type should be CY and not FE. Appropriate notes could be made in the comments field to elaborate on the description.

Infill Width (mm) — The width or thickness of infill, expressed in mm.

Comments — Use precise abbreviations to convey information on:

- There are some occasions when it is appropriate to record a structure orientation such as rock fabric, even though no open discontinuity exists. A healed (H) abbreviation could be used to identify these features.
- Notes on whether the defect surfaces are striated, the pitch of the striation and an interpreted movement direction.
- To emphasise geotechnically poor rock mass conditions such as broken zones; shears/shear zones; faults/fault zones; weak and very weak rock; the presence of swelling clays or slake sensitive materials.

The back of the log sheet is comprised of a brief legend and additional fields which are not compulsory to fill out. It may be used to highlight specific intervals of the drill core. There is provision for additional descriptive logs as well as a graphic log, histograms for rock strength and fracture spacing as well as sampling and testing.

3 CORE SAMPLING

Samples will be taken of the core to gain an understanding of the rock mass. Core samples will be tested for strength, using the Uniaxial Compressive Strength Test (UCS), or the shear strength along a structure using the Direct Shear Test.

4 CORE PHOTOGRAPHY

Core photographs form an essential part of the geotechnical data collection process and core photography should be routinely undertaken. The object of the photographs is to provide as clear a picture as possible of the condition of the drill core. The photographs provide an essential record of the rock mass, particularly if the drill core is split or destroyed for assaying/testing. It is even possible to do geotechnical logging from good core photos and they are certainly used for check-logging and discussion/review purposes.

It may be possible to co-ordinate with core photography undertaken for geological logging to minimise repetition.

An example of good core photography is presented in Figure 4.

The following points may help in taking good core photographs:

- Core photographs should be taken using a digital camera with at least 5.0 Mega Pixels.
- The image of the core tray with a neutral background should "fill-the-frame" of the photograph with no objects (e.g. work boots) visible around the tray.
- The photograph should be taken from as close to a **vertical** position as possible above the middle of the core tray to minimise distortion and "oblique" views.
- Be careful not to include shadows across the core, e.g. your own shadow or that of a field assistant. You should be careful what time of the day you take the photographs. If possible avoid early mornings or late afternoons. It may be possible to still take a photo at these times but the tray would need to be turned "end-on" to the sun to minimise the shadows cast from adjacent channels of core within the tray.
- The drill hole name and drill run depths should be the correct way up and clearly visible.
- Where oriented drill core is to be photographed the orientation line should be on top of the core, clearly visible and **labelled** with arrows pointing to the bottom of the hole.
- Drill core photographs for geotechnical purposes should be taken with the drill core **dry**. This is to emphasise the **open** structures in the core and make the fracturing more obvious. Where the rock fabric is expected to influence the mechanical behaviour of the rock mass (e.g. well foliated or bedded rocks, breccias, porphyries) another set of photographs should be taken with the core **wet**.
- Ideally the core photographs should include colour and grey scale cards and a length scale.
- Where a lot of core photography is done, many mining/exploration companies have the camera suspended on a frame above a core photograph bench that is set up with a board for the hole name, date, orientation, location etc. This system is often setup inside with artificial lighting (daylight balanced) which makes the core photography fast, efficient and with good repeatability of high quality results. If a system like this is already in operation you should co-ordinate with geological and technical staff to make use of it.

REFERENCES

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2. ISRM Suggested Method for Determining Point Load Strength (to replace original document published in 1972). Int. J. Rock Mech. Min. Sci. & Geomech., Abstr. 22, pp 51-62, 1985

PART B) PROCEDURE

The following descriptions are in the order of works to be performed. If core orientation tools are not being used ignore the orientation-related steps.

1 MARKING OF NATURAL BREAKS

Drilling induced breaks should be marked with a cross (x). This is generally carried out by the driller however the core should be re-checked by the logger.

2 ORIENTATION LINE

The Ace Drilling Tool (Attachment A) will be used for obtaining orientation. This is a digital tool and is said to be the most accurate method of obtaining orientation currently on the market. Therefore all orientation marks should be reliable. The core will be orientated to the <u>bottom of hole</u> and in 3m runs. Wait for 3 runs (9m of core) to be drilled before running an orientation line.

1. Connect the core together so that any breaks are snugly fitted together.
2. Rotate the core for each orientation mark so that it is in line with the v channel.
3. Use a **<u>pencil</u>** to draw a line along the core. (3 orientation marks – 3 pencil lines).
4. If the marks do not line up, use the beta tape to measure off the centre of the marks so that an average orientation line can be drawn (see Table 1 for Orientation Quality). See example below.
5. Mark the orientation line an metre interval lines. (Be aware that the pen can be up to 5^{o} wide on beta tape, therefore it is important to draw the orientation line with the centre of the Paint Pen line being 0^{o}.
6. Write the core orientation quality on the core at the start and end of the orientation section and at each orientation mark, for example CO=+/-5.
7. Write the orientation quality number in the column in log sheet along with the +/- degrees in the comments.

<u>Example:</u> Refer to the sketches in Figure 1.

- If the 1st and 3rd marks line up, draw the orientation line to connect the 1st and 3rd runs. The 2nd run is assumed to have been incorrect (Figure 1 – A).
- If the 1st and 2nd run marks line up, draw the orientation line on the 1st and 2nd runs only. Leave the 3rd run for the next 6m of core to be drilled (Figure 1 – B).
- If all 3 marks for each of the runs do not line up, and are within 20^{o}, that is +/-10^{o}, take the average line through the centre and mark the +/- distance from the orientation line on the core (Figure 1 – C). If for example, it was +/-15°, it would be better to wait for the next run of core to get better orientation.

Figure 1: Examples of Core Orientation line marking

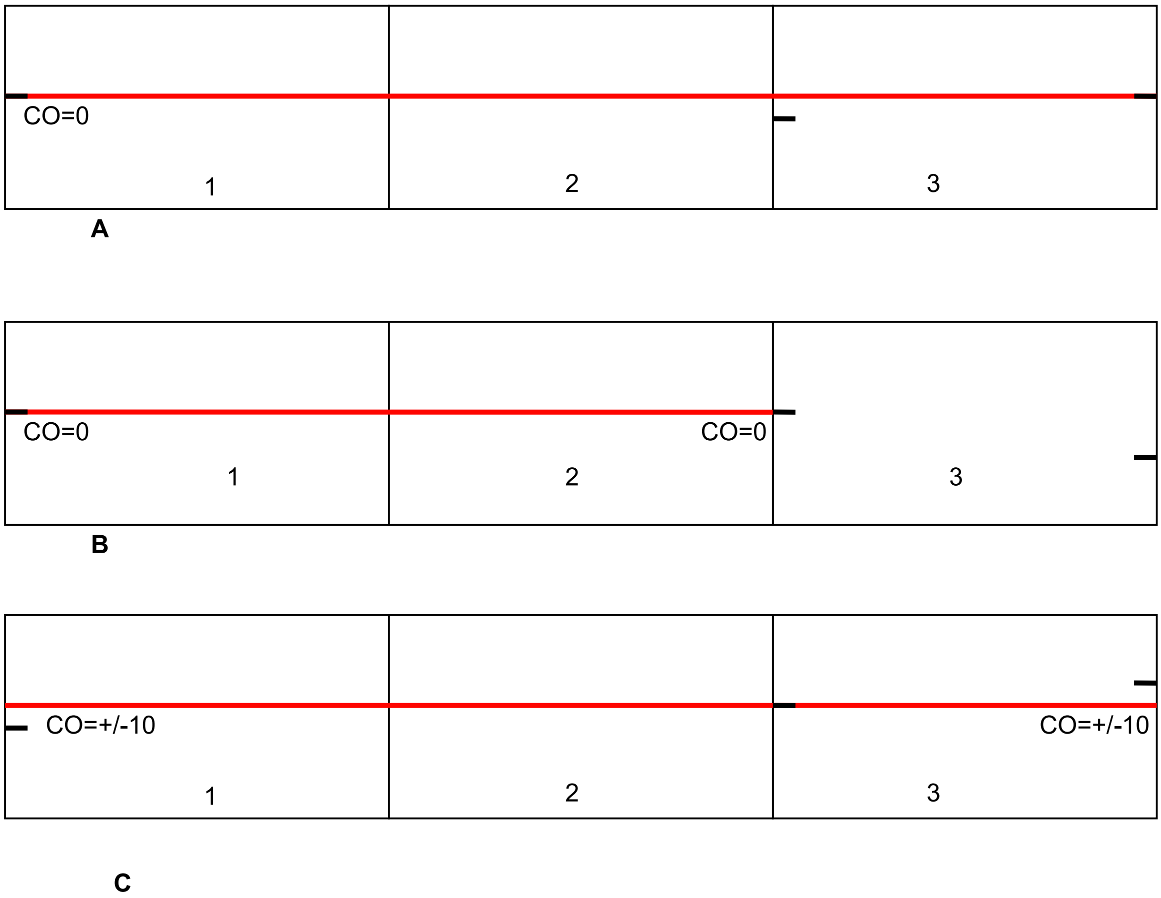


Table 1 - Orientation Quality

Orientation	Quality	Example
$0^o – 5^o$	1	CO = +/-2.5^o
$6^o – 10^o$	2	CO = +/-5^o
$11^o – 20^o$	3	CO = +/-10^o

3 FIELD DESCRIPTIONS

Table 2 - Field descriptions for the log sheet

Field	Description
Depth From (m)	The down-hole depth at the start of a logged interval. Also the depth of an individual feature for the detailed geotechnical log.
Depth To (m)	The down-hole depth at the end of a logged interval.
Core Loss (m)	The core lost within a geotechnical domain usually due to broken ground.
Rock Type	An abbreviation of the lithology. This should be consistent with the lithology codes in use at the particular site.
Weathering	Weathering is described in relation to the presence of weathered minerals and the effect on the defects (Refer to Table 3).
Alteration	Alteration is described in relation to the presence of alteration minerals and the effect on the defects. Descriptions are similar to weathering but use NA (not altered) rather than fresh.
Strength	Inferred Rock Strength (Refer to Table 4).
Intact > 0.1 m	RQD – the sum of the intact core lengths greater than 10cm occurring over the logged interval. Only “sound” rock is recorded.
Number of Defects	The number of natural, open discontinuities (defects) occurring over the logged interval. Drill induced fractures are not to be included.
Number of Defect Sets	An estimate of the number of defect sets over the logged interval as determined by the defect type and orientation. (Refer to Table 5)
Defect Type	Defect type (Refer Table 6).
Alpha*	The bottom of hole angle which the defect makes with the long-axis of the core. (Refer to Figure 2)
Beta*	The beta angle is a circumferential angle measured clockwise around the core looking down the hole from the orientation line to the down-hole point of the defect ellipse. (Refer to Figure 2)
Profile/Roughness	An estimate of the profile planarity and roughness of a defect (Refer to Table 7 & 8 and Figure 3).
Infill Type	The main Infill mineral on the defect surface (Refer to Table 9).
Infill Width (mm)	The width or thickness of infill in mm.
Orientation Quality*	Quality of the orientation line (Refer to Table 1).
Comments	Comment on any features that may effect the rockmass, for example, broken – faulted zones, depths and thickness, grain size of fault breccia (fine to coarse), healed veins, oxidation etc.

* For oriented core only

4 ROCK TYPE

Rock type (lithology) codes appropriate to local geology should be used and documented. The following codes are recommended based on discussions with the site geologist. Additional codes used should be documented.

Table 2 - Field logging codes for lithology

Code	Lithology
COCY	Conglomerate with clay present in the matrix (sand may also be present in the matrix
COSA	Conglomerate with sand matrix
BXFT	Fault breccia, mixed lithology or lithology not identifiable
BXGR	Fault breccia with granitic clasts
BXMS	Fault breccia with metasediment clasts
BXQZ	Fault breccia with quartzite clasts
BXVO	Fault breccia with volcanic rock clasts
GRAN	Granitic rocks
MARB	Marble
MSED	Metasedimentary rocks
SKAR	Skarn
SAND	Sand
VOLC	Volcanic rocks
VOBX	Volcanic breccia (inferred volcanic processes not later mechanical becciation)

5 WEATHERING

Table 3 - Weathering Classification

Term	Symbol	Weathering Definition
Completely Weathered	CW	Rock substance affected by weathering to the extent that the rock exhibits soil properties.
Extremely Weathered	EW	It can be remoulded by hand but the texture of the original rock is till evident.
Highly Weathered	HW	Rock substance affected to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. More than 50% and less than 100% of the rock is disintegrated by open discontinuities. The rock mass is partially friable. The colour of the fresh rock is no longer evident.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining extends throughout the rock substance. The colour of the fresh rock is no longer evident. Up to 50% of the rock is disintegrated by open discontinuities. The rock mass is not friable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance by limonite has taken place. The colour and texture of the fresh rock is evident.
Fresh	FR	Rock substance unaffected by weathering

6 ROCK STRENGTH

Table 4 - Rock Strength

Classification	Symbol	Field Index Strength Test	Approximate UCS (MPa)
Extremely Weak (Soil Strengths)	EW	Can be indented with thumb nail, or cut with a knife. Refer to Table 2a for more detailed index test classifications (R0)	0.0 - 0.5
Very Weak	VW	Can be scratched by fingernail. Can be peeled by penknife and crumbled by hand. The point of a geological pick makes a 5mm diameter indentation. The core can be broken by single light blow of a geological hammer. (R1)	0.5 - 3.0
Weak	W	Can be scratched with difficulty with a fingernail. Cannot be peeled but can is scratched easily by a penknife. Cannot be crumbled. Hammer point makes 3-4mm diameter indentation. (R2)	3.0 - 10
Medium Strong	MS	Can be scratched by thumbnail only with difficulty but moderately easily by penknife. A hammer point makes a 2-3mm diameter indentation. (R3)	10 - 30
Strong	S	Can be scratched with moderate difficulty with a penknife. Hammer point makes 1-2mm indentations. A single firm hammer blow is required to break the core. (R4)	30 -50
Very Strong	VS	Can be scratched with difficulty by a penknife. Hammer point causes only superficial damage. A single very firm hammer blow is required to break the core. (R5)	50 - 150
Extremely Strong	ES	Cannot be scratched with a penknife. Several very firm blows with a geological hammer may be required to break the core. Often a hammer blow will only chip core. A high pitched "ting" can be heard when tapped with geological hammer. (R6)	> 150

Table 4a - Extremely Weak Rock - Soil Strengths

Term	Symbol	Undrained Shear Strength (kPa)	Field Guide to Consistency
Very Soft	VSf	< 12	Exudes between the fingers when squeezed in hand
Soft	Sf	> 12 to 25	Can be moulded by light finger pressure
Firm	Fm	> 25 to 50	Can be moulded by strong finger pressure
Stiff	St	> 50 to 100	Cannot be moulded by fingers, can be indented by thumb
Very Stiff	VSt	> 100 to 200	Can be indented by thumb nail
Hard	Hd	> 200	Can be indented with difficulty with thumb nail

7 RQD

Log the RQD in geotechnical intervals. These intervals will be based on rock type or heavily structured areas. Logging by the rig and the available length of ‘V’ channel racks to hold the core runs may influence the size of the geotechnical intervals.

8 DEFECT SETS

Table 5 - Defect Set codes

Term	Defect Sets
1	1 Set
1.5	1 Set + Random
2	2 Sets
2.5	2 Sets + Random
3	3 Sets
3.5	3 Sets + Random
4	4 Sets
20	Faulted/Sheared Ground

9 DEFECT TYPE

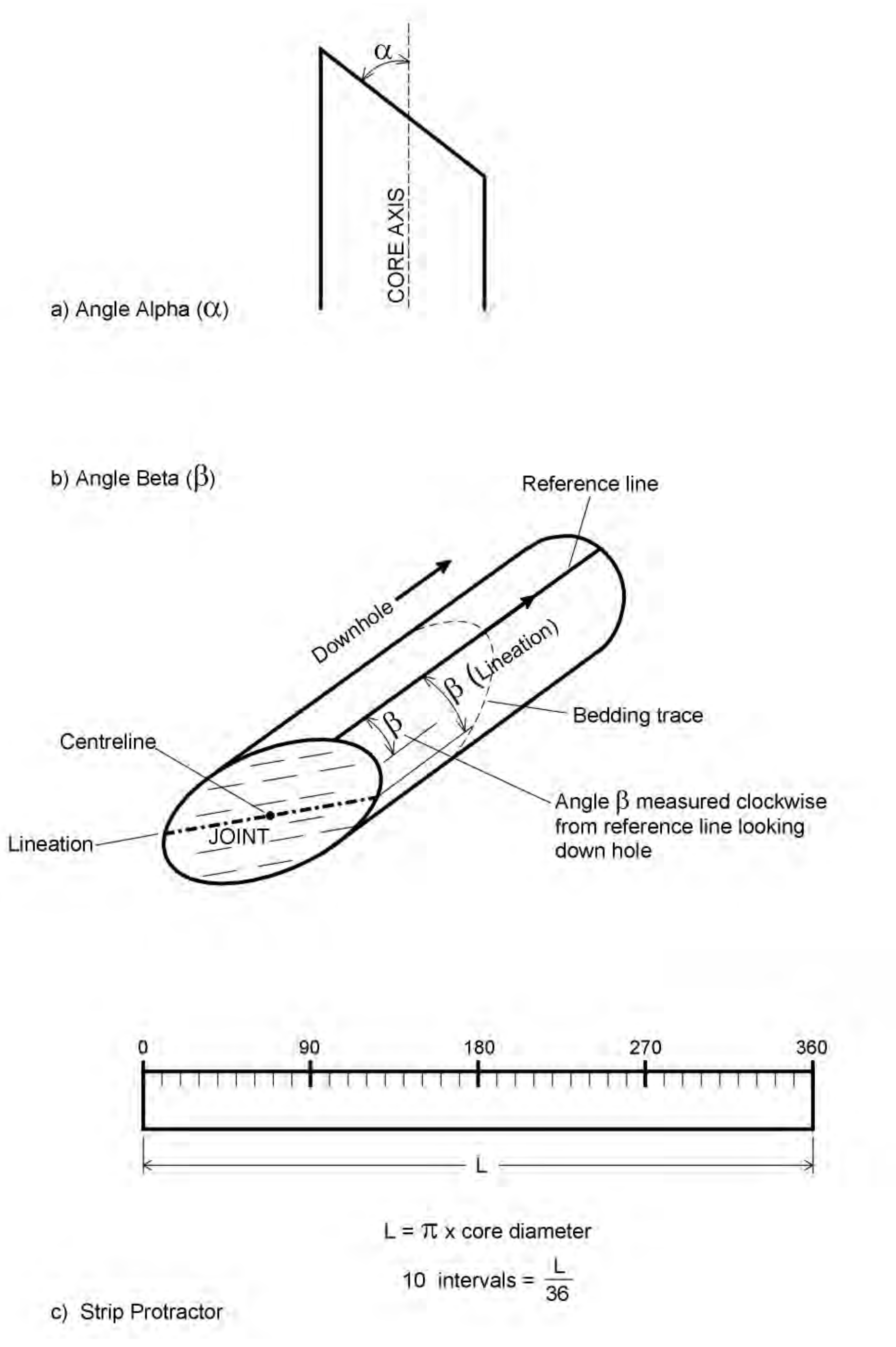
Table 6 - Defect Codes

Term	Defect Code
JN	Joint
FO	Foliation
SH	Shear
FL	Fault
BG	Bedding
VN	Vein

10 ALPHA & BETA MEASUREMENTS

Alpha and Beta measurements are taken on a separate logging sheet to the RQD. The planarity, roughness and infill is recorded for each structure measured.

Figure 2 – Alpha and Beta Angles



11 PROFILE/ROUGHNESS

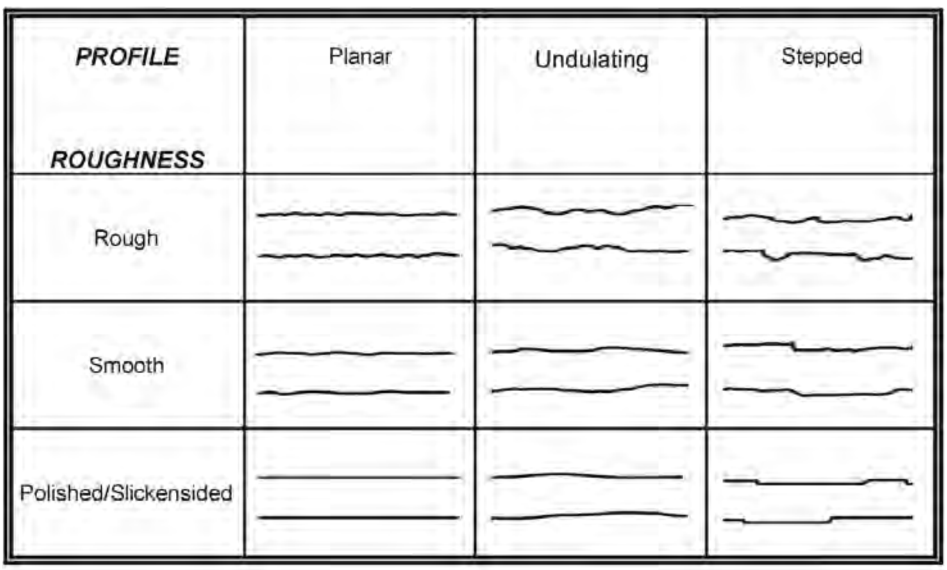
Table 6 - Defect Profile Codes

Term	Profile Code
P	Planar
U	Undulating
S	Stepped

Table 7 - Defect Roughness Codes

Term	Roughness Code
K	Slickensided/polished
S	Smooth
R	Rough

Figure 3 - Discontinuity Profile and Roughness



12 INFILL

Table 9 - Defect Infill Codes

Term	Infill Code
CY	Clay
QZ	Quartz
FE	Iron Oxide
CA	Calcite
CB	Carbonate
CH	Chlorite
SE	Sericite
BO	Biotite
KO	Kaolin
TC	Talc
MO	Molybdenum sulphide
HF	High friction infill
LF	Low friction infill

Note: Define other codes as required by local geology.

13 SAMPLING

Place a wooden or plastic chock at the location of where the sample is being taken so that it is visible in the photographs and in the future.

Label the sample with:

- Hole Number
- To and From Depth
- Rock Type
- Test that is required, for example UCS

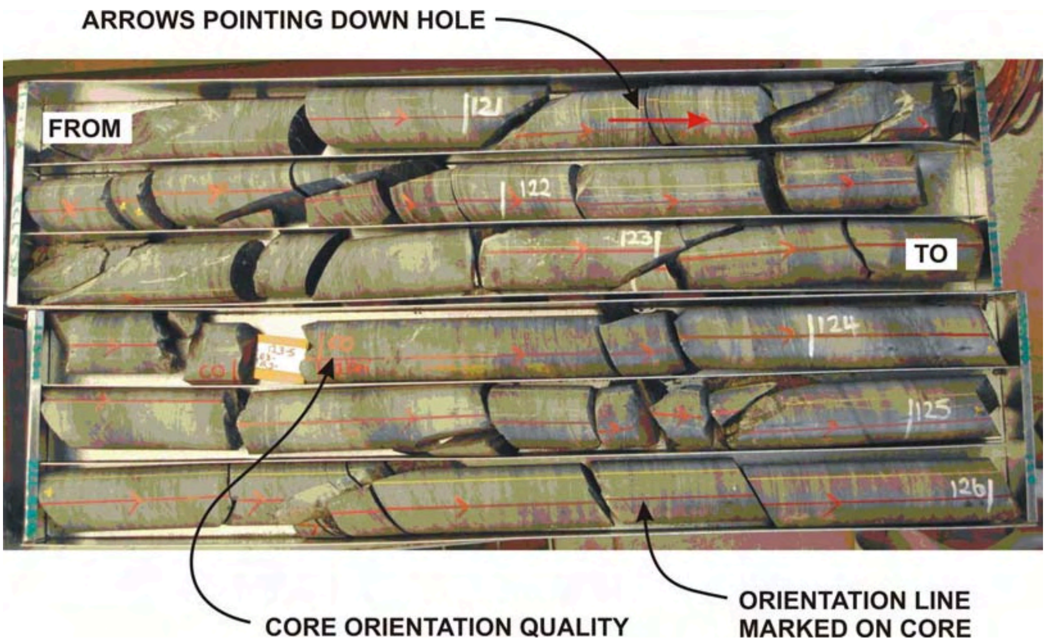
Samples will need to be transported and will therefore require careful wrapping for transportation.

- It is recommended that samples are wrapped in following way:
- Cover sample in plastic, for example 'Glad Wrap'. In the Direct Shear Test it is particularly important to retain the samples moisture.
- Bubble wrap the sample
- Cut plastic splits to the length of the core and sticky tape together or place the core sample in a core tray. In the latter method it is important to ensure that the core cannot move around freely.

14 PHOTOGRAPHY

Photographs will be taken as per the Cannington Mining Company standard. Core should be neatly put back together with metre marks and the orientation line facing upwards. Core blocks should also be visible within the core trays. Geotechnical core photographs are usually taken with the core dry.

Figure 4 - Core Photography



Appendix C

Geological Drilling Logs

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. G045
Sheet 1
Office Job No.:

Client: **King Island Scheelite**
Project: **King Island Scheelite**
Date started:
Principal:
Borehole Location:
Date Completed:
Logged by:
Checked by:

drill model & mounting:
Easting:
Angle:
R.L. Surface:
hole diameter: mm
drilling fluid:
Northing:
Azimuth:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0	15	NC														Mine waste, FILL, cobbles to boulders mixed provenance with clay infill
15	22	NC	SAND													Marine sand, course grained
22	24.7	0	VOLC	HW												Clay with sub-rounded basaltic pebbles bed at base of sand. Moly within clay.
24.7	26.7	0	VOLC	SW												Fine grained basalt with some calcite vns, moly in veins
26.7	27.0	0		EW												Clay with disseminated moly.
27	28	0	VOLC	SW												Highly broken, clay lined fractures.
28	29	0	"	EW												Clay
29	32	0	"	EW												Highly fractured, clay matrix, moly blebs in calcite vns.
32	33	0	"	HW												Clay zone then highly fractured basalt
33	34	0	"	SW												Moly traces on fractures.
34	36	0	"	FR												Highly fractured volcs.
36	42	0	"	SW												" " " with clay matrix
42	47	0	"	FR												Fractured volcs. Trace moly 45-46
47	48	0	"	FR												Minor clay matrix in fract. volc.
48	51	0	"	FR												Mostly as angular gravel
51	60	0	"	FR												Highly fractured, clay lined fractures.
60	62	0	"	FR												Highly fractured clay matrix.
62	66	0	"	FR												Some competent rock with bands of fractured rock in clay matrix
66	71	0	"	FR												Highly fractured with clay matrix.
71	73	0	"	FR												Trace moly
73	79	0	"	FR												Minor calcite vng.
79	94	0	"	FR												Brecciated, highly fractured minor calcite vng.
94	95	0	"	FR	H											Bleached due alteration.
95	103	0	"	FR												Brecciated trace moly along calcite veins
103	108	0	"	FR												Disseminated moly in breccia

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. GC ~~43~~ 45
Sheet ~~1~~ 2
Office Job No.:

Client: **King Island Scheelite**
Principal:

Project: **King Island Scheelite**
Borehole Location:
Logged by:

Date started:
Date Completed:
Checked by:

drill model & mounting:
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle:
Azimuth:
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
~~112~~	118	0	VOLC	FR												Calcite vns. slickensided fractures. minor moly.
118	127	0	"	FR												Brecciated clay matrix
127	132	0	"	FR												Slickensided fractures.
132	139	0	"	FR												Brecciated calcite + clay matrix, trace moly
139	140	0	"	FR												Trace chalcopyrite
140	142	0	"	FR												Very few calcite vns
142	152	0	"	FR												Brecciated texture. disseminated moly.
152	174	0	"	FR												Brecciated, clay zones. trace moly.
174	176	0	"	HW												Gritty clay.
176	178	0	"	FR												Brecciated trace moly
178	190	0	"	FR												Highly fractured angular gravel, clay matrix
190	191	0	"	FR												Gravel in clay matrix
191	197	0	"	FR												Clay matrix trace moly
197	200	0	"	FR												Minor calcite vns.
200	201	0.2	"	FR												Highly fractured clay matrix
201	204	0	"	FR												Clay lined fractures. trace moly
204	226	0	"	FR												Brecciated clay lined fractures
226	227	0	"	FR												Trace pyrite
227	230	0	"	FR												Fine disseminated pyrite, trace chalcopyrite.
230	237	0	"	FR												Brecciated & fractured clay zones
237	238	0	"	FR												Coarse gravel
238	239	0	"	FR												Fault gouge
239	246	0	"	FR												Fine breccia
246	247	0	"	FR												Fine gravel clay zones
247	248	0	"	FR												Iron stained fractures

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. GO 45
Sheet 3
Office Job No.:

Client: **King Island Scheelite**
Principal:

Project: **King Island Scheelite**
Borehole Location:
Logged by:

Date started:
Date Completed:
Checked by:

drill model & mounting:
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle:
Azimuth:
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
248	256	0	VULC	FR	M											Calcite vng. minor altered zones.
256	282	0	VULC	FR												Calcite vng some vuggy, minor alt zones, generally competent trace chalcopyrite.
282	300	0	VULC	FR												Reasonably competent rock.

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Geological Log - Cored Borehole

Borehole No. G048
Sheet
Office Job No.:

Client: **King Island Scheelite**
Principal:
Project: **King Island Scheelite**
Borehole Location: 249897 55 61843
Logged by: AC
Date started: 13/2/09
Date Completed: 3/3/09
Checked by:

drill model & mounting:
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle:
Azimuth:
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	max. Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0	20.9	0	FILL													Mine waste, gravel to boulders
20.9	30.3	7.8	SAND													Fine grained, grey
30.3	46.5	14.9	SAND													Some intervals very loose 2-3m - indicated by rapid penetration rates
46.5	48	0	SAND									15	85			Basalt cobbles within coarse sand
48	53.5	0	SAND										95	5		~~Sandy~~ silt, grey to black, 50mm silt bed @ 53.5m
53.5	58.4	0	SAND										100			Coarse angular sand
58.4	66.3	0	SAND										100			Fine grained sand Organic silt bed @ 66.3m
66.3	81.3		SAND										100			Fine grained sand
81.3	93		SAND										100			Med grained sand.
93	94.6		~~Sandy clay~~ CONG	COLY						30		60	15	10	15	Fragments of highly weathered volcanics
94.6	103.5		~~Clay~~ CONG							50		60	15	10	15	Initially graded sand then grading to weathered worn grey pebbles to 50mm
103.5	105		~~Sandy clay~~ CONG							50		70	15	0	15	Minor sandy beds
105	108		Conglomerate							100		70	10		20	Clay containing pebbles to cobbles
108	113.8		Conglomerate							300		70	10		20.	Clast size gradually increasing to boulders within clay
113.8	115.9		~~Clay~~ CONG							50		30	15		55.	Blue clay trace weathered water worn pebbles
115.9	117.0		~~Clay~~ CONG							8		60			40	Brown clay, red & yellow mottled - containing water worn pebbles
117.0	120		~~Clay~~ CONG							400		70			30	Boulders of volc within brown clay
120	124.3		~~Clay~~ CONG							400		70			30	Pebbles to boulders within brown clay, some boulders fresh
124.3	125.8		Volc	HW												Highly weathered volc.
125.8	131.1		Volc	HW →												Weathered volc - gradual decrease in weathering to fresh.
131.1	146		Volc	FR												Highly fractured slickensided fractures
146	148.9		Volc	FR												Clay zones, possible fault
148.9	175.5		Volc	FR												General increase in rock strength, minor alt zones breccia textures.

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. G049
Sheet 1
Office Job No.:

Client: **King Island Scheelite**
Principal:
Project: **King Island Scheelite**
Borehole Location: 249 912
Logged by: AL 55 620 32
Date started: 6/3/09
Date Completed: 20/3/09
Checked by:

drill model & mounting:
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle:
Azimuth:
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0	13	0	FILL													Mine waste cobbles to boulders
13	21.4	5.4	SAND									0	100	0	0	Fine to med grained
21.4	33	8.9	SAND									30	70	0	0	Gradual change to water worn gravel within sand, some cobbles
33	34.8	0.3	SAND									30	35	35	0	Water worn pebbles within sandy silt
34.8	35.8	0	SAND									60	5	20	15	Pebbles to cobbles within sand
35.8	69.4		SAND									0	100	0	0	Fine to med. grained in beds.
69.4	70.9		COCY							20		30	30	10	30	Some carbonaceous mat'l rotted wood? Some pebbles some pebbles clay
70.9	72.4	0	COCY							50		70		15	15	Grey sandy clay some water worn pebbles mixed provenance
72.4	85.9	0	COCY							110		70	10	5/10	10	Sandy clay matrix, water worn pebbles to cobbles
85.9	88.9	0	COCY							130		70	10	5/10	10	Pebbles to cobbles water worn within silty clay matrix
88.9	93.4	0	COCY							400		70	20	5	5	Cobbles to boulders within dry clay matrix
93.4	97.7	0	COCY							40		70	20	5	5	Clay, grey-green minor component of water worn pebbles
97.7	99.3	0	COCY							130		70	20	5	5	Clay matrix enclosing water worn pebbles to cobbles
99.3	102.2	0	VOLC	HW												Transition to weathered volc. clay bands + water worn sandy gravels
102.2	107.8	0	VOLC	FR												Basaltic volcs.
107.8	111	0	VOLC	FR												Minor clay zones
111	127.8	0	VOLC	FR												Brecciated textures, fine disseminated pyrite, clay zones
127.8	138.2	0	VOLC	FR												Brecciated textures, clay matrix, clay zones
138.2	150.2	0	VOLC	FR												Generally sound, brecciated texture, diss. pyrite
150.2	157.6	0	VOLC	FR												Calcite vng. Shattered zone 151–151.7

WF
UF

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. 6050
Sheet 1
Office Job No.:

Client: **King Island Scheelite**
Project: **King Island Scheelite**
Date started: 31/3/09
Principal:
Borehole Location:
Date Completed:
Logged by: AC
Checked by:

drill model & mounting:
Easting:
Angle:
R.L. Surface:
hole diameter: mm
drilling fluid:
Northing:
Azimuth:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0	0.9	0	SAND										100%			Fine grained river wash
0.9	6.6	0	FILL													Mine waste gravel to cobbles
6.6	9.8	2.8	SAND										100%			Beach deposits.
9.8	10.1	0	SAND										80	20		Black, due organic content.
10.1	11.9	0	VOLC	EW								40			60	Texture destroyed during drilling, remnants visible.
11.9	13.0	0	VOLC	HW												Broke to gravel during drilling
13.0	15.5	0	VOLC	SW												Highly fractured basalt.
15.5	20.4	0	VOLC	FR												Veined with calcite to 20mm width.
20.4	21.6	0	VOLC	FR												Brecciated healed with calcite matrix
21.6	23.2	0	VOLC	FR												Brecciated healed with calcite matrix
23.2	24.2	1.0	VOLC	[illegible]												Core loss Probably ground away due to blunt bit.
24.2	25.8	0	VOLC	FR	ST	CH										Slickensided fractures.
25.8	30.6	0.6	VOLC	FR	ST											Alteration bleached, sections reduced to clay
30.6	35.3	0	VOLC	FR	SL											Minor calcite vnig. minor breccia zones within calcite vns to 50mm wide
35.3	38.3	0	VOLC	FR	ST											Altered in zones to 100mm breccia zones within calcite vns.
38.3	40.2	0	VOLC	FR	SL											Fine calcite vnig with some Fe staining
40.2	42.4	0	VOLC	FR	SL											Calcite vns parallel to core axis forming narrow breccia zones, healed, core fractured along these zones.
42.4	44.9	0	VOLC	FR	SL											— Random calcite vnig.
44.9	50.1	0	VOLC	FR	SL											Volc - widely spaced calcite veins
50.1	51.7	0	VOLC	FR	SL											Closely spaced network calcite veins, at least 2 generations (?)
51.7	52.9	0	VOLC	FR	SL											Zone intense alt. Thin fine widely spaced calcite veins
52.9	55	0	VOLC	FR	SL											Brecciated zone, clay + calcite matrix
55	58.5	0	VOLC	FR	M											Zones of intense alteration widely spaced calcite vns.
58.5	63.5	0	VOLC	FR	SL											Minor calcite vnig. vns [illegible] - now healed.
63.5	65.2	0	VOLC	FR	SL											Closely spaced 25-50 fractures gradually parallel zones of intense fracturing.

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. GU50
Sheet 2
Office Job No.:

Client: **King Island Scheelite**
Project: **King Island Scheelite**
Date started:
Principal:
Borehole Location:
Date Completed:
Logged by:
Checked by:

drill model & mounting:
Easting:
Angle:
R.L. Surface:
hole diameter: mm
drilling fluid:
Northing:
Azimuth:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
65.2	67.6	0	VULC	FR	SL											Brecciated texture small intervals (10cm) fragmented rock
67.6	71	0.3	VULC	FR	SL											Brecciated texture healed by calcite.
71	71.3	0	VULC	HW	MA										100	Clay zone slickensided fracture on lower side
71.3	75.8	0	VULC	FR												Brecciated textures, altered with increasing intensity till 75.8 some calcite veining.
75.8	81.8	0	VULC	FR	NA											Widely spread calcite veins, many forming fractures, minor breccia zones.
81.8	83.4	0	VULC	FR	Mod	CH										Patchy alteration minor calcite veining minor breccia zones with calcite matrix
83.4	86.4	3.0													100	Indications zone clay (washed out) Remnants of clay on bit & in tube
86.4	91.4	0	VULC	FR	Mod	CH										Minor calcite veining, minor breccia zones with calcite matrix, patchy alteration
91.4	93.8	0	VULC	FR	Minor											Minor calcite veins, zones of weak alteration
93.8	95.8	0	VULC	FR	Intense											Zones of intense alteration generally within breccia alteration to clay in places
95.8	99.8	0	VULC	FR	SL											Calcite veining, minor zones of healed breccia with calcite matrix
99.8	101.3	0	VULC	FR	SL											Zones of intense alteration, breccia zones weakened by alteration.
101.3	104.8	0	VULC	FR	MOD											Weak pervasive alteration, fine healed breccia with calcite matrix
104.8	108	0	VULC	FR	INT											Minor calcite veining Alteration in zones, clay for 10mm due alteration
108	111.8	0	VULC	FR	SL											Breccia throughout, zones with clay matrix & fine breccia, some calcite veining
111.8	114.5	0	VULC	FR	SL											Very fine breccia, forms fine gravel, some calcite veining EOH

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. GC51
Sheet 1
Office Job No.:

Client: **King Island Scheelite**
Principal:
Project: **King Island Scheelite**
Borehole Location: 556 0243952 55 62140
Logged by: AC
Date started: 16/4/09
Date Completed: 26/4/09
Checked by:

drill model & mounting: UDR 200 Skid
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle: 50°
Azimuth: 080° mag
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0	12.8	0	FILL													Mine waste, gravel to boulders 3.1m total - voids
12.8	16.5	2.9	SAND										100			Marine sand med. grained
16.5	17.8	0.7	SAND							200		50	50			Cobbles only recovered.
17.8	32	14.1	SAND										100			Recovered cobbles possible cave
32	33.8	0	SILT											100		Organic matter, leaves, wood within silt as thin beds, strong H_2S odour
33.8	36.1	1.5	SAND							200		35	65			Cobbles within sand
36.1	39.8	2.5	SAND							500		40	60			Cobbles within sand
39.8	63.8	24	SAND										100			Inferred sand from return flow
~~63.8~~	~~66.8~~	~~1.2~~	~~CONG~~													
~~66.8~~	~~69.4~~		~~CONG~~													
63.8	65.1	1.2	SAND										100			
65.1	66.5	0	SILT											100		Sharp sand/silt and silt/~~clay~~ gravel boundaries
66.5	69.4		CONG							25		65	~~35~~		35	
69.4	77.7	4.5	CONG							30		60 65	~~30~~		30 35	Clay largely washed out. Grey clay.
77.7	86.8	8.7	CONG							130		60 65			30 35	" " " " Brown clay.
68 ~~86.8~~	87.6	0	CONG							600		70			30	Boulder in clay.
87.6	92.1	0.7	CONG							130		70			30	
92.1	93.1	0	CONG							300		70			30	Pebbles to boulders in clay
93.1	94.3	0	VOLC	HW												
94.3	96	0	VOLC	HW												Brecciated textures, calcite veins
96	101.1	0	VOLC	SW												Brecciated texture calcite matrix
101.1	101.7	0	VOLC	SW											60	Clay zone
101.7	104.5	0	VOLC	FR												Minor calcite veins, minor clay zones
104.5	106.7	0	VOLC	FR	~~ST~~											~~Intense alteration zone~~ Fractured along calcite veins
106.7	108.6	0.3	VOLC	FR	ST											Intense alteration zone

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. G051
Sheet 2
Office Job No.:

Client: **King Island Scheelite**
Principal:
Project: **King Island Scheelite**
Borehole Location:
Logged by:
Date started:
Date Completed:
Checked by:

drill model & mounting:
hole diameter: mm
drilling fluid:
Easting:
Northing:
Angle:
Azimuth:
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments	
108.6	110.6	0	VOLC	FR	ST											Brecciated texture in parts, alteration in zones	F
110.6	112.6	0	VOLC	FR	ST											~~[illegible]~~ Alt zones, intense fracturing over short lengths.	F
112.6	115.4	1.0	VOLC	FR												Shattered zone - core recovered med gravel	F
115.4	119.3	0	VOLC	FR												Regular calcite filled joints 0.1 spacing parallel	
119.3	129.6	0	VOLC	FR												Calcite veins at least two generations, minor breccia zones calcite matrix	
129.6	138.6	0	VOLC	FR	ST											Zones of strong alteration network of calcite veins	
138.6	141.6	0	VOLC	FR	SL											Zones of multi-coloured calcite + network of calcite veins.	
141.6	143.1	0	VOLC	FR	MA											Heavily calcite veined, CH alt. shattered in places.	
143.1	145.8	0	VOLC	FR	SL											Widely spaced calcite veins	
145.8	146.1	0	VOLC	FR	SL											Brecciated texture, calcite matrix, Ch. alteration.	F
146.1	150	0	VOLC	FR	SL											Widely spaced calcite veins of two generations	
150	153.1	0	VOLC	FR	SL											Minor brecciation healed with calcite	
153.1	156.6	0	VOLC	FR	SL											Widely spaced calcite veins ECH	

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Geological Log - Cored Borehole

Borehole No. G052
Sheet 1
Office Job No.:

Client: **King Island Scheelite**
Principal:

Project: **King Island Scheelite**
Borehole Location: Grassy
Logged by: AC

Date started: 6-May-09
Date Completed: 28-May-09
Checked by:

drill model & mounting: UDR 200 skid
hole diameter: mm
drilling fluid:
GDA 94
Easting: 249861
Northing: 62262
Angle: 50
Azimuth: 080M
R.L. Surface:
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alt Intensity	Alt Mineral 1	Alt Mineral 2	Alt Mineral 3	Fault Intensity	Clast Size mm	Fault Gouge %	Gravel %	Sand %	Silt %	Clay %	Comments
0.00	9.50	3.1	Fill													Clay top, mine waste, gravel to boulders, some sand
9.50	18.50	7.9	Sand							300		5	95			Marine sand with scattered volc. Cobbles
18.50	18.70	0	Qzit	HW												Fractured quartzite with sand infill, possible ridge in palaeosurface
18.70	23.30	4.2	Sand									30	50	10	10	Some clayey sand & minor gravel, possible infill channel in palaeosurface
23.30	24.80	0	Qzit	HW								40	60			Fractured quartzite, sand infill to crevices
24.80	27.50	1.5	Qzit	HW								80	20			Interp., top of uneven palaeosurface, sand filled crevices
27.50	28.50	0	Volc	HW												Appears as fine to coarse gravel upon release from splits
28.50	29.50	0	Volc	FR												Coarse angular gravel in appearance
29.50	29.80	0	Volc	FR												Coarse to very fine angular in beds, trace chalcopyrite on fractures
29.80	30.50	0	Volc	FR												Appears as medium to coarse gravel
30.50	32.00	1.2	Volc	FR												Lost core possibly clay
32.00	36.70	4.3	Volc	FR												Too little core retrieved to reliably classify
36.70	38.90	1.6	Volc	FR												Very difficult to drill, grouted. Barrel stuck
																Hole re-entered with PQ
38.00	39.70	0	Volc	FR												Minor quartz vein
39.70	41.50	0	Volc	FR												Trace pyrite
41.50	44.70	0.9	Volc	FR												
44.70	45.80	0	Volc	FR												
45.80	46.70	0.8	Volc	FR												Minor clay band
46.70	47.30	0	Volc	FR												Trace pyrite, very fine fragmentation, rods stuck, barrel belled, EOH

Appendix D

Geotechnical Drilling Logs

coffey mining SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

Client:	**King Island Scheelite**	Project:	**King Island Scheelite**	Borehole No.	G045
				Sheet	
				Office Job No.:	MINENHIL00237AB
Principal:		Borehole Location:		Date started:	1/12/2008
		Logged by:	AC	Date Completed:	20/01/2008
				Checked by:	

drill model & mounting:		Easting:	249793.654	Angle:	-45	R.L. Surface:	4.344
hole diameter: mm	drilling fluid:	Northing:	5562031.979	Azimuth:	89.91	datum:	

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
22.50	23.70	0	VOLC	HW	SL	EW	0.1	**8**	99	20	SH						Partly unconsolidated
23.70	24.40	0	VOLC	EW	SL	EW	0.0	**0**	99	20	SH						Clay Matrix
24.40	26.50	0	VOLC	HW	SL	W	0.2	**10**	17	25	JN						Clay Zones
24.60								**0**			JN	S	R	CY	1		
24.90								**0**			JN	U	R	CY	1.5		
25.10								**0**			JN	S	R	CY	1		
25.30								**0**			JN	U	R	CY	1.5		
26.00								**0**			JN	S	R	CY	0.5		
26.10								**0**			JN	U	R	CY	1.5		
26.40								**0**			JN	S	S	CY	0.5		
26.50	27.40	0	VOLC	EW	SL	EW	0.0	**0**	99	20							Clay matrix
27.40	28.30	0	VOLC	SW	SL	W	0.1	**11**	99	2.5							
27.50								**0**			JN	U	R	CH	0.5		
27.70								**0**			JN	U	R	CH	0.5		
28.10								**0**			JN	U	R	CH	0.5		
28.30	31.80	0	VOLC	EW	SL	EW	0.0	**0**	99	20							Fine angular gravel in clay matrix
31.80	33.20	0	VOLC	EW	SL	EW	0.2	**14**	99	20							
32.00								**0**			JN	U	R	CY	2		
32.30								**0**			JN	U	S	CH	0.5		
33.20	34.40	0	VOLC	SW	NA	MS	0.7	**58**	8	3.5							
33.50								**0**			JN	U	S	CH	0.5		
33.60								**0**			JN	S	S	CY	0.5		
34.00								**0**			JN	P	S	CH	0.5		
34.20								**0**			JN	P	S	CH	0.5		
34.40	35.60	0	VOLC	FR	SL	MS	0.4	**33**	10	2.5							
34.50								**0**			JN	U	S	CY	0.5		
34.80								**0**			JN	U	R	CY	0.5		
35.00								**0**			JN	U	S	CY	0.5		
35.10								**0**			JN	U	S	CY	0.5		
35.20								**0**			JN	U	S	CH	0.5		
35.30								**0**			JN	U	S	CH	1		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
35.50								**0**			JN	U	R	CY	1		
35.60	38.50	0	VOLC	EW	SL	EW	0	**0**	99	20							Frangmented rock in clay matrix
38.50	41.00	0	VOLC	FR	SL	EW	0.1	**4**	99	2.5							
39.00								**0**			JN	S	S	CH	0.1		
39.20								**0**			JN	U	S	CH	0.1		
39.40								**0**			JN	S	S	CH	0.1		
40.60								**0**			JN	U	S	CY	0.5		
40.80								**0**			JN	U	R	CY	0.5		
41.00	46.00	0	VOLC	FR	SL	EW	0	**0**	99	20							Fragmneted rock in clay matrix
46.00	50.40	0	VOLC	FR	SL	EW	0.1	**2**	99	20							
49.40								**0**			JN	U	S	CY	2		Fragmneted rock in clay matrix
50.40	56.00	0	VOLC	FR	SL	EW	0.1	**2**	99	20							
50.70								**0**			JN	P	S	CY	3		
52.20								**0**			JN	U	S	CY	2		
54.50								**0**			JN	U	S	CY	2		
56.00	58.90	0	VOLC	FR	Sl	W	0.5	**17**	99	20							Zones of clay
57.20								**0**									
58.90	64.30	0	VOLC	FR	M	W	1.4	**26**	99	20							Clay zones,breccia zones,alt. with competent rock
60.10								**0**			JN	P	S	CY	5		
60.40								**0**			JN	P	S	CH	0.5		
63.40								**0**			JN	U	R	CY	1		
64.30	67.30	0	VOLC	FR	M	EW	0	**0**	99	20							Clay lined breccia
67.30	69.80	0	VOLC	FR	M	EW	0	**0**	99	20							
68.50								**0**			JN	U	S	CY	3		
69.80	73.90	0	VOLC	FR	SL	W	1	**24**	99	20							Clay lined breccia zones
70.80								**0**			JN	U	S	CH	0.5		
70.90								**0**			JN	U	S	CY	5		
71.70								**0**			JN	U	S	CY	2		
71.80								**0**			JN	U	S	CH	0.5		
72.70								**0**			JN	U	S	CY	1		
73.90	78.40	0	VOLC	FR	SL	W	1.9	**42**	99	20							Minor calcite veins
74.00								**0**			JN	U	S	CH	0.5		
74.10								**0**			JN	U	S	CY	4		
74.20								**0**			JN	P	S	CH	1		
74.30								**0**			JN	P	S	CY	10		
75.00								**0**			JN	U	S	CY	1		
75.90								**0**			JN	U	R	CA	3		
76.10								**0**			JN	U	R	CA	1		
76.30								**0**			JN	U	R	CA	1		
76.70								**0**			JN	P	S	CY	10		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
78.40	81.80	0	VOLC	FR	SL	EW	0	**0**	99	20							Clay lined breccia, minor moly?
81.30								**0**			JN	P	S	CH	0.5		
81.80	87.00	0	VOLC	FR	SL	EW	0.5	**10**	99	20							Clay lined breccia zone
82.50								**0**			VN	U	R	CA	3		
82.70								**0**			VN	U	R	CA	2		
83.10								**0**			JN	U	S	CH	1		
83.60								**0**			JN	S	R	CA	2		
83.70								**0**			JN	P	S	CH	1		
84.20								**0**			JN	U	S	CH	0.5		
85.40								**0**			JN	P	S	CY	1		
87.00								**0**			JN	P	S	CY	1		
87.00	90.00	0	VOLC	FR	SL	W	0	**0**	99	20							
87.20								**0**			JN	U	S	CY	1		
89.40								**0**			JN	P	S	CH	0.5		
89.90								**0**			JN	U	S	CH	0.5		
90.00	95.70	0	VOLC	FR	M	EW	0	**0**	99	20							Brecciated clay matrix, CH alt
90.40								**0**			JN	P	S	CH	0.5		
90.50								**0**			JN	U	S	CH	0.5		
94.20								**0**			JN	P	S	CY	3		
95.70	99.70	0	VOLC	FR	M	W	0	**0**	99	20							
96.30								**0**			JN	U	S	CH	0.5		
96.80								**0**			JN	U	S	CH	0.5		
98.10								**0**			JN	U	S	CY	5		
99.70	101.00	0	VOLC	FR	M	EW	0	**0**	99	20							Minor Moly, Brecciated
101.00	102.90	0	VOLC	FR	MD	M	0.8	**42**	99	20							
101.30								**0**			JN	U	S	CH	0.5		
101.90								**0**			JN	U	S	CH	0.5		
102.80								**0**			JN	P	S	CY	2		
102.90	104.70	0	VOLC	FR	SL	M	.4	**22**	99	20							
103.50								**0**			JN	U	S	CA	1		
102.90								**0**			JN	U	R	CH	0.5		
103.90								**0**			JN	U	R	CY	1.5		
104.70	106.90	0	VOLC	FR	SL	M	.5	**23**	12	3.5							
105.00								**0**			JN	U	R	CY	1		
105.10								**0**			JN	U	S	CY	2		
105.50								**0**			JN	P	S	CH	0.5		
106.70								**0**			JN	U	S	CY	1.5		
106.90	108.80	0	VOLC	FR	ST	M	0	**0**	99	20							Moly in Vein
106.90								**0**			JN	U	S	CH	0.5		
107.30								**0**			JN	P	S	CH	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
108.30								**0**			JN	P	S	CH	0.5		
108.40								**0**			JN	P	S	CH	0.5		
108.70								**0**			JN	S	S	CH	0.5		
108.80	110.60	0	VOLC	FR	SL	M	.3	**17**	17	2.5							
109.10								**0**			JN	U	S	CH	0.5		
109.30								**0**			JN	U	S	CH	1		
109.60								**0**			JN	U	S	CH	0.5		
109.70								**0**			JN	U	S	CY	2		
110.40								**0**			JN	U	S	CH	0.5		
110.60	113.70	0	VOLC	FR	MD	M	.5	**16**	99	20							
111.00								**0**			JN	U	S	CH	0.5		
111.30								**0**			JN	S	S	CH	0.5		
111.50								**0**			JN	P	S	CA	1		
112.50								**0**			JN	P	S	CH	1		
113.70	116.70	0	VOLC	FR	MD	EW	0	**0**	99	20							Highly fractured clay matrix
116.70	117.30	0	VOLC	EW	SL	EW	0	**0**	99	20							Clay Zone
117.20								**0**			JN	P	S	CH	1		
117.30	120.50	0	VOLC	FR	SL	M	2.7	**84**	12	2.5							
118.10								**0**			JN	P	S	CY	2		
118.20								**0**			JN	P	S	CY	2.5		
118.70								**0**			JN	P	S	CY	1.5		
119.40								**0**			JN	U	S	CY	1		
119.70								**0**			JN	S	R	CY	3		
119.90								**0**			JN	P	S	CY	1		
120.10								**0**			JN	P	S	CY	2		
120.30								**0**			JN	P	S	CY	1		
120.50	125.50	0	VOLC	FR	SL	M	2.1	**42**	99	20							
122.50								**0**			JN	U	R	CH	0.5		
123.40								**0**			JN	P	S	CH	0.5		
124.70								**0**			JN	P	S	CY	1		
125.20								**0**			JN	P	S	CH	0.5		
125.50	128.60	0	VOLC	FR	SL	EW	0	**0**	99	20							Highly fractured clay matrix
128.60	133.00	0	VOLC	FR	SL	EW	0	**0**	99	20							Brecciated clay matrix, some calcite
133.00	139.40	0	VOLC	FR	M	W	0	**0**	99	20							chlorite alteration, Brecciated
139.40	141.40	0	VOLC	FR	SL	M	.8	**40**	12	2.5							
139.90								**0**			JN	U	S	CH	0.5		
140.20								**0**			JN	U	R	CY	1		
140.30								**0**			JN	U	R	CY	1		
140.60								**0**			JN	U	S	CY	0.5		
140.70								**0**			JN	U	S	CY	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
141.00								**0**			JN	P	K	CH	0.5		
141.40								**0**			JN	U	S	CY	1		
141.40	144.50	0	VOLC	FR	SL	W	0.6	**19**	99	20							
142.70								**0**			JN	U	K	CH	0.5		
144.50	151.50	0	VOLC	FR	M	M	2.9	**41**	99	20							
144.60								**0**			JN	P	K	CY	2		
145.00								**0**			JN	U	R	CY	5		
146.30								**0**			JN	U	R	CH	0.5		
146.40								**0**			JN	U	K	CH	0.5		
146.60								**0**			JN	U	R	CH	0.5		
150.10								**0**			JN	U	S	CY	1		
151.00								**0**			JN	U	S	CH	1		
151.50	156.00	0	VOLC	FR	SL	M	1.2	**27**	99	20							Open joint, partly infilled with sparse calcite
151.60								**0**			JN	U	S	CY	0.5		
153.60								**0**			JN	U	R	CA	2		
153.80								**0**			JN	P	S	CY	1		
155.40								**0**			JN	U	S	CY	2		
155.50								**0**			JN	P	S	CY	1		
155.90								**0**			JN	U	S	CA	1		
156.00	161.20	0	VOLC	FR	SL	W	.8	**15**	99	20							Brecciated, clay matrix
156.80								**0**			VN	U	S	CA	3		
157.00								**0**			VN	U	S	CA	3		
158.20								**0**			JN	U	S	CH	0.5		
160.60								**0**			JN	U	R	CY	2		
161.20	161.80	0	VOLC	FR	NA	M	0	**0**	99	20							Brecciated texture
161.80	162.90	0	VOLC	FR	SL	EW	0	**0**	99	20							fine gravel in clay matarix
162.90	164.60	0	VOLC	FR	NA	W	0.8	**47**	99	20							
164.50								**0**			VN	U	R	CA	3		
164.70								**0**			JN	P	S	CY	3		
164.80								**0**			JN	P	S	CH	0.5		
164.60	168.20	0	VOLC	FR	SL	EW	0.3	**8**	99	20							
167.20								**0**			JN	U	K	CH	0.5		
168.20	170.50	0	VOLC	FR	SL	M	0.6	**26**	99	20							
168.50								**0**			JN	U	K	CH	0.5		
169.20								**0**			JN	P	S	CA	1		
170.50	174.00	0	VOLC	FR	SL	L	0.6	**17**	99	20							
171.20								**0**			JN	U	S	CH	0.5		
171.50								**0**			JN	P	S	CH	0.5		
171.70								**0**			JN	U	S	CY	2		
174.00	176.50	0	VOLC	FR	M	EW	0	**0**	99	20							Brecciated, Clay matrix

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
176.50	180.20	0	VOLC	FR	SL	EW	0.2	**5**	99	20							Brecciated, Clay matrix
180.20	190.70	0	VOLC	FR	M	EW	0.2	**2**	99	20							Fine gravel, chlorite alt
190.70	198.70	0	VOLC	FR	SL	EW	0	**0**	99	20							Fine gravel, clay matrix
198.70	203.80	0	VOLC	FR	SL	EW	0.8	**16**	99	20							Coarse gravel, clay matrix, minor moly
203.80	205.10	0	VOLC	FR	SL	EW	0	**0**	99	20							Fine gravel, clay matrix
205.10	209.40	0	VOLC	FR	SL	W	0	**0**	99	20							Brecciated, Clay matrix
207.10								**0**			JN	P	S	CH	0.5		
207.70								**0**			JN	P	S	CY	2		
209.40	212.50	0	VOLC	FR	SL	W	0	**0**	99	20							Brecciated
210.60								**0**			JN	P	K	CH	5		
211.90								**0**			JN	U	K	CH	2		
212.00								**0**			JN	U	S	CH	0.5		
212.50	214.50	0	VOLC	FR	ST	W	0	**0**	99	20							Brecciated, chlorite alt
214.50								**0**			JN	P	S	CY	20		
214.50	215.20	0	VOLC	FR	M	M	0.4	**57**	8	2							
214.90								**0**			JN	P	S	CH	0.5		
214.91								**0**			JN	P	S	CH	0.5		
215.20								**0**			JN	U	S	CH	0.5		
215.20	217.60	0	VOLC	FR	SL	W	0.0	**0**	99	20							
217.10								**0**			JN	P	K	CH	0.5		
217.20								**0**			JN	U	S	CY	1		
217.30								**0**			JN	U	S	CH	0.5		
217.60	219.50	0	VOLC	FR	SL	W	0.3	**16**	99	20							
219.50	225.00	0	VOLC	FR	M	M	2.1	**38**	99	20							
219.60								**0**			JN	U	S	CH	2		
220.00								**0**			JN	U	S	CY	0.5		
220.80								**0**			JN	U	S	CY	1		
221.50								**0**			JN	P	R	CY	3		
222.80								**0**			JN	P	S	CY	10		
223.00								**0**			JN	P	S	CY	3		
223.20								**0**			JN	U	S	CH	0.5		
223.40								**0**			JN	U	S	CY	3		
225.00	228.00	0	VOLC	FR	MD	EW	0.0	**0**	99	20							
225.60								**0**			JN	P	S	CY	1		
228.00	228.80	0	VOLC	FR	ST	EW	0.0	**0**	99	20							Clay Zone
228.80	231.00	0	VOLC	FR	MD	W	0.3	**14**	9	20							
231.00	234.20	1.2	VOLC	FR	MD	W	0.0	**0**	9	20							Gravel, clay matrix
234.20	235.10	0	VOLC	FR	M	W	0.0	**0**	9	20							Brecciated, clay matrix
235.10	238.00	0	VOLC	FR	SL	W	0.0	**0**	9	20							Brecciated, clay matrix
238.00	241.00	0	VOLC	SL	M	EW	0.0	**0**	9	20							Fine breccia, clay matrix, chlorite alt

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
241.00	245.30	0	VOLC	SL	MD	EW	0.0	**0**	9	20							Brecciated, clay matrix, chlorite alt
245.30	247.60	0	VOLC	SL	MD	W	0.0	**0**	9	20							Fine breccia
247.60	253.60	0	VOLC	FR	SL	M	3.1	**52**	37	2.5							Pervasive calcite vain
247.70								**0**			JN	U	S	CY	2		
247.80								**0**			JN	U	S	CA	0.5		
247.90								**0**			JN	U	S	CA	0.1		
248.20								**0**			JN	P	S	CH	0.5		
248.30								**0**			JN	U	S	CH	1		
248.40								**0**			JN	U	S	CH	0.5		
248.50								**0**			JN	U	S	CH	0.1		
248.80								**0**			JN	U	S	CA	0.1		
249.60								**0**			JN	U	S	CA	0.5		
249.70								**0**			JN	U	S	CH	0.5		
250.70								**0**			JN	U	S	CH	0.1		
250.90								**0**			JN	U	S	CA	0.1		
251.40								**0**			JN	P	S	CA	0.5		
251.50								**0**			JN	P	S	CA	0.5		
252.30								**0**			JN	P	S	CA	0.5		
252.40								**0**			JN	P	S	CA	0.5		
253.50								**0**			JN	U	R	CA	0.5		
253.60	257.70	0	VOLC	FR	SL	M	2.1	**51**	99	20							
254.10								**0**			JN	P	R	CA	1		
254.20								**0**			JN	U	R	CA	0.5		
255.00								**0**			JN	U	K	CH	0.5		
255.30								**0**			JN	U	K	CH	0.1		
255.40								**0**			JN	P	K	CH	0.1		
256.30								**0**			JN	P	S	CA	0.5		
256.70								**0**			JN	P	S	CA	0.1		
256.80								**0**			JN	P	S	CA	0.5		
257.10								**0**			JN	U	S	CA	0.1		
257.20								**0**			JN	U	S	CA	0.1		
257.50								**0**			JN	P	S	CA	0.5		
257.70	265.40	0	VOLC	FR	SL	M	5.3	**69**	32	2.5							
258.40								**0**			JN	U	S	CH	0.1		
258.90								**0**			JN	P	S	CA	2.0		
259.00								**0**			JN	P	S	CA	1.0		
260.10								**0**			JN	P	S	CH	0.1		
260.40								**0**			JN	P	S	CA	0.5		
260.70								**0**			JN	P	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
261.80								**0**			JN	P	S	CA	0.5		
263.20								**0**			JN	P	S	CH	0.1		
263.70								**0**			JN	U	S	CA	0.1		
265.40	267.00	0	VOLC	FR	ST	W	0.8	**50**	99	20							Zone of breccia 100mm
267.00	271.60	0	VOLC	FR	SL	M	3.4	**74**	20	2.5							
267.50								**0**			JN	P	K	CH	0.1		
267.60								**0**			JN	P	S	CA	0.5		
267.70								**0**			JN	U	S	CA	0.5		
268.40								**0**			JN	P	S	CY	2.0		
268.90								**0**			JN	P	S	CH	0.5		
269.00								**0**			JN	U	R	CA	0.5		
269.70								**0**			JN	U	R	CA	0.5		
270.20								**0**			JN	P	R	CA	3.0		
270.50								**0**			JN	P	S	CH	1.0		
270.60								**0**			JN	U	S	CY	0.5		
270.70								**0**			JN	P	K	CH	1.0		
271.00								**0**			JN	P	S	CA	0.5		
271.40								**0**			JN	U	S	CA	0.5		
271.50								**0**			JN	P	S	CA	0.1		
271.60	274.20	0	VOLC	FR	MD	M	2	**77**	7	2.5							
271.90								**0**			JN	U	S	CH	0.5		
272.10								**0**			JN	P	S	CA	0.5		
272.40								**0**			JN	U	S	CA	0.1		
273.00								**0**			JN	U	S	CA	0.5		
273.20								**0**			JN	U	S	CH	0.5		
274.00								**0**			JN	U	S	CA	1		
274.20	274.70	0	VOLC	FR	NA	EW	0	**0**	99	20							
274.70	277.30	0	VOLC	FR	SL	M	2.3	**88**	7	2.5							
275.10								**0**			JN	U	S	CA	0.5		
275.90								**0**			JN	U	S	CH	0.1		
276.40								**0**			JN	P	S	CH	0.1		
276.50								**0**			JN	P	S	CA	0.5		
277.30	277.60	0	VOLC	FR	ST	W	0	**0**	99	20							
277.60	282.70	0	VOLC	FR	SL	M	4.4	**86**	9	1.5							
277.90								**0**			JN	U	S	CH	0.5		
279.00								**0**			JN	U	S	CH	0.5		
280.80								**0**			JN	U	S	CA	0.5		
281.20								**0**			JN	U	S	CA	0.1		
282.70	290.90	0	VOLC	FR	SL	M	5.2	**63**	34	3.5							
284.00								**0**			VN	U	S	CA	3		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
284.10								**0**			VN	P	S	CA	1.5		
284.50								**0**			VN	U	S	CA	2		
285.40								**0**			JN	P	S	CH	0.5		
285.70								**0**			JN	P	S	CH	0.5		
288.50								**0**			JN	U	S	CH	0.5		
289.60								**0**			JN	U	S	CA	0.5		
290.40								**0**			JN	U	R	CH	1		
290.90								**0**			JN	U	S	CH	0.5		
290.90	295.90	0	VOLC	FR	MD	M	4.1	**82**	19	2.5							
291.90								**0**			JN	U	S	CA	0.1		
292.80								**0**			JN	S	R	CA	0.1		
293.00								**0**			JN	S	R	CA	0.1		
293.30								**0**			JN	S	R	CA	0.5		
293.60								**0**			JN	P	S	CY	10		
293.80								**0**			JN	P	R	CA	0.5		
294.30								**0**			JN	P	R	CA	0.5		
294.60								**0**			JN	P	R	CY	1		
294.90								**0**			JN	P	S	CA	0.5		
295.20								**0**			JN	U	S	CY	0.5		
295.60								**0**			JN	U	S	CH	0.5		
295.70								**0**			JN	U	K	CH	0.5		
295.80								**0**			JN	P	K	CH	0.5		
295.90	297.30	0	VOLC	FR	SL	W	0	**0**	99	20							Shattered section, wide calcite vein
297.30	300.00	0	VOLC	FR	SL	M	0.6	**22**	20	2.5							
297.30								**0**			JN	S	R	CA	0.5		
297.40								**0**			JN	P	S	CH	0.5		
297.50								**0**			JN	P	S	CA	0.5		
297.70								**0**			JN	U	S	CA	2		
297.90								**0**			JN	U	S	CH	0.5		
298.00								**0**			JN	P	S	CA	1		
298.10								**0**			JN	P	S	CA	0.5		
298.20								**0**			JN	U	S	CA	0.5		
298.50								**0**			JN	P	S	CA	0.5		
298.80								**0**			JN	U	S	CA	0.5		
298.90								**0**			JN	P	S	CH	0.5		
299.00								**0**			JN	P	R	CA	0.5		
299.20								**0**			JN	P	S	CA	0.5		
299.40								**0**			JN	P	S	CA	0.5		
299.60								**0**			JN	P	S	CA	0.5		EOH

coffey mining SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

Borehole No. G048
Sheet
Office Job No.:

Client: **King Island Scheelite** Project: **King Island Scheelite** Date started: 13/02/2009
Principal: Borehole Location: Date Completed: 3/03/2009
Logged by: AC Checked by:

drill model & mounting: Easting: 249896.234 Angle: -49 R.L. Surface: 8.863
hole diameter: mm drilling fluid: Northing: 5561840.261 Azimuth: 84.82 datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
0.00	20.80	0	FILL					**0**									Mine waste
20.80	46.80	22	SAND					**0**									Marine sand, fine to med grained
46.80	47.90	0	SAND					**0**									coarse grained to fine gravel with volc cobbles
47.90	53.60	2.8	SAND					**0**									volc cobbles in sand matrix
53.60	72.30	10.5	SAND					**0**									fine to med grained, brown
72.30	75.00	0	SAND					**0**									fine to med grained, brown
75.00	92.90	14.4	SAND	CW		EW	0.0	**0**	99	20							unconsolidated
92.90	100.55	2.85	COCY	HW	SA	EW		**0**	99	20							core loss mainly at start of interval
100.55	105.70	0	COCY	HW	SA	EW		**0**	99	20							some sandy matrix, joints in large clasts
105.70	113.00	0	COCY	HW	SA	EW	0.3	**4**	99	20							some silty matrix, clasts supported, max clast 200mm
113.00	115.30	0	COCY	HW	SA	EW	0.0	**0**	99	20							clast supported, max clast 75mm
115.30	117.00	0	COCY	HW	SA	EW	0.0	**0**	99	20							oxidised granule conglomerate
117.00	124.30	0	COCY	HW	SA	EW	0.6	**8**	99	20							slightly weathered clasts, max clast 300mm
124.30	127.80	0	VOLC	SW	MA	VW	1.4	**40**	5	2.5							mud, chlorite alt veined and healed, brecciation
125.40								**0**			JN	P	R	CY	0.5		
125.90								**0**			JN	P	R	CH	0.5		
126.60								**0**			JN	P	R	CY	2		
126.80								**0**			JN	P	R	CH	2		
127.30								**0**			JN	U	S	CY	3		chlorite also present
127.80	131.10	0	VOLC	HW	HA	VW	0.7	**21**	7	2.5							chlorite slickensides on brown surfaces
137.85								**0**			JN	U	S	CH	0.5		
138.30								**0**			JN	U	S	CY	1.5		chlorite also present
129.20								**0**			JN	U	S	CH	0.5		fe stained
129.70								**0**			JN	U	S	CH	0.5		fe stained
129.80								**0**			JN	U	S	CH	0.5		fe stained
130.30								**0**			JN	U	R	CY	1		
130.40								**0**			JN	U	S	CH	0.5		fe stained
130.70								**0**			JN	U	S	CH	3		clay also present
131.10	136.30	0	VOLC	FR	SL	W	0.4	**8**	99	20							
131.60								**0**			JN	P	S	CH	0.5		
135.40								**0**			JN	U	R	KI	0		
136.30	147.80	0.3	VOLC	FR	SL	VW	0.0	**0**	99	20							some clay bands, fault zone
146.00								**0**			JN	U	S	CH	0.1		
147.80	151.50	0	VOLC	FR	SL	W	0.6	**16**	99	20							brecciated texture, clay zone 200mm
148.40								**0**			JN	P	S	CH	0.1		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
148.70								**0**			JN	P	R	FE	0.1		
149.60								**0**			JN	U	R	CY	0.5		
151.50	154.60	0	VOLC	FR	SL	W	0.5	**16**	26	3.5							brecciated texture, clay matrix
153.40								**0**			JN	U	S	CY	0.5		
154.60	162.40	0	VOLC	FR	SL	MS	1.5	**19**	54	3.5							brecciated texture, calcite matrix
155.10								**0**			JN	U	S	CY	1		
155.50								**0**			JN	U	S	CA	1		
155.90								**0**			JN	U	S	CA	0.5		
156.00								**0**			JN	U	S	CA	0.5		
156.10								**0**			JN	P	S	CA	1		
156.40								**0**			JN	U	S	CA	0.5		
156.70								**0**			JN	P	S	CA	0.5		
156.80								**0**			JN	P	S	CA	0.5		
157.60								**0**			JN	U	S	CY	0.5		
157.80								**0**			JN	U	S	CA	0.5		
158.20								**0**			JN	U	S	CA	4		
158.40								**0**			JN	U	S	CH	2		
158.50								**0**			JN	U	S	CH	0.1		
158.70								**0**			JN	U	S	CH	0.5		
169.20								**0**			JN	U	S	CH	0.1		
159.30								**0**			JN	U	S	CA	0.5		
159.40								**0**			JN	P	S	CA	4		
160.10								**0**			JN	U	S	CH	0.1		
160.40								**0**			JN	P	S	CA	0.5		
161.00								**0**			JN	P	S	CY	2		
161.10								**0**			JN	P	S	CH	0.1		
161.20								**0**			JN	P	S	CH	0.1		
161.40								**0**			JN	P	S	CY	2		
161.60								**0**			JN	P	S	CH	0.1		
161.90								**0**			JN	P	S	CA	0.5		
162.40	163.60	0	VOLC	FR	SL	W	0.2	**17**	99	20							
162.40											JN	P	S	CA	0.5		
163.60	167.90	0	VOLC	FR	SL	MS	3.5	**81**	22	3.5							
163.80								**0**			JN	P	S	CH	0.1		
163.90								**0**			JN	U	S	CA	0.5		
164.70								**0**			JN	P	S	CA	0.5		
164.80								**0**			JN	U	S	CA	0.5		
165.20								**0**			JN	U	S	CA	0.5		
165.40								**0**			JN	U	S	CA	0.1		
165.60								**0**			JN	U	R	CA	0.5		
166.00								**0**			JN	U	S	CA	0.5		
166.20								**0**			JN	U	S	CA	0.5		
166.30								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
166.70								**0**			JN	P	S	CA	0.5		
166.90								**0**			JN	P	S	CA	0.5		
167.40								**0**			JN	U	S	CA	2		
167.90	173.60	0	VOLC	FR	SL	W	0.8	**14**	42	3.5							brecciated sections, minor clay bands
168.30								**0**			JN	P	S	CH	0.5		
168.40								**0**			JN	P	S	CH	0.5		
169.00								**0**			JN	U	S	CA	0.5		
169.30								**0**			JN	U	K	CH	0.1		
169.60								**0**			JN	U	S	CY	2		
170.90								**0**			JN	P	S	CH	0.1		
173.60	175.50	0	VOLC	FR	SL	W	0.3	**16**	18	3.5							
173.70								**0**			JN	P	S	CH	0.1		

coffey mining SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

				Borehole No.	G049
				Sheet	
				Office Job No.:	MINENHIL00237AB
Client:	**King Island Scheelite**	Project:	**King Island Scheelite**	Date started:	6/03/2009
Principal:		Borehole Location:		Date Completed:	20/03/2009
		Logged by:	AC	Checked by:	

drill model & mounting: | Easting: 249910.789 | Angle: -49 | R.L. Surface: 3.825

hole diameter: mm | drilling fluid: | Northing: 5562032.91 | Azimuth: 94.08 | datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
91.90	99.20	0	COCY			W		**0**									boulders to pebbles, clast supported in brown clay matrix
99.20	102.40	0	VOLC	MW	SL	W	0.9	**28**	23	2.5							trace moly
99.20								**0**			JN	U	R	FE	0.5		
99.30								**0**			JN	U	S	CY	3		
100.50								**0**			JN	P	K	CY	2		
100.90								**0**			JN	P	S	CY	2		
101.10								**0**			JN	P	K	CY	0.5		
101.40								**0**			JN	P	K	CY	0.5		
101.60								**0**			JN	P	K	CY	0.5		
101.90								**0**			JN	U	K	CY	0.5		
102.00								**0**			JN	P	K	CY	0.5		
102.40	104.30	0	VOLC	SW	NA	MS	0.5	**26**	19	2.5							
102.70						MS		**0**			JN	P	K	CY	0.5		
102.75						MS		**0**			JN	P	K	CY	0.5		
103.10						MS		**0**			JN	P	K	CY	2		
103.20						MS		**0**			JN	P	S	CY	1		
103.60						MS		**0**			JN	P	S	CY	1		
103.70						MS		**0**			JN	U	S	CY	1		
103.80						MS		**0**			JN	P	K	CY	1		
104.30	107.40	0	VOLC	FR	SL	MS	2.0	**65**	15	2.5							
104.40						MS		**0**			JN	P	S	CY	1		
105.50						MS		**0**			JN	P	S	CA	2		
106.30						MS		**0**			JN	P	S	CY	1		
106.35						MS		**0**			JN	P	S	CY	0.5		
106.50						MS		**0**			JN	U	S	CY	0.5		
106.70						MS		**0**			JN	P	K	CH	0.5		
107.40	109.00	0	VOLC	SW	SL	MS	0.0	**0**	99	20							claybands, green clay
107.50						MS		**0**			JN	P	K	CH	0.5		
107.70						MS		**0**			JN	U	K	CH	0.5		
108.20						MS		**0**			JN	U	K	CH	0.5		
108.60						MS		**0**			JN	U	S	CY	2		
109.00	110.10	0	VOLC	FR	NA	MS	0.3	**27**	99	20							brecciated zone 100mm
109.50						MS		**0**			JN	P	S	CY	1		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
109.70						MS		**0**			JN	P	K	CY	1		
109.90						MS		**0**			JN	P	K	CY	2		
110.00						MS		**0**			JN	U	S	CY	0.5		
110.10	112.90	0	VOLC	FR	SL	MS	1.2	**43**	22	2.5							brecciated texture and zones
110.10						MS					JN	U	S	CY	0.5		
112.90	114.20	0	VOLC	FR	SL	MS	0.7	**54**	7	2.5							clay zones brecciated. Trace moly
112.90						MS					JN	U	S	CH	0.5		
114.20	117.20	0	VOLC	FR	SL	MS	1.7	**57**	14	2.5							Brecciated texture
114.50						MS		**0**			JN	U	S	CH	0.5		
114.80						MS		**0**			JN	U	S	CA	0.5		
115.20						MS		**0**			JN	U	S	CY	1		
115.30						MS		**0**			JN	P	S	CY	0.5		
115.80						MS		**0**			JN	P	S	CH	0.5		
116.00						MS		**0**			JN	P	K	CH	0.5		
116.20						MS		**0**			JN	P	K	CH	0.5		
116.30						MS		**0**			JN	U	K	CH	0.5		
116.50						MS		**0**			JN	U	K	CH	0.5		
117.10						MS		**0**			JN	P	S	CY	2		
117.20	118.00	0	VOLC	FR	SL	MS	0.0	**0**	99	20							brecciated clay/clacite matrix
117.20						MS					JN	P	S	CH	0.5		
118.00	120.60	0	VOLC	FR	SL	MS	2.2	**85**	3	2.5							
118.30						MS		**0**			JN	P	S	CH	0.5		
118.80						MS		**0**			VN	U	S	CA	5		
119.00						MS		**0**			JN	U	S	CH	0.5		
120.60	122.60	0	VOLC	FR	NA	MS	1.5	**75**	6	2.5							
120.90						MS		**0**			JN	P	S	CA	0.1		
121.10						MS		**0**			JN	U	K	CH	0.1		
121.20						MS		**0**			JN	P	K	CH	0.1		
122.10						MS		**0**			JN	S	S	CY	1		
122.60	127.70	0	VOLC	FR	M	MS	2.4	**47**	35	2.5							brecciated, trace pyrite
122.80						MS		**0**			JN	U	S	CY	5		
123.40						MS		**0**			JN	U	S	CH	0.1		
123.50						MS		**0**			JN	U	S	CY	0.5		
125.50						MS		**0**			JN	U	S	CH	0.1		
126.10						MS		**0**			JN	U	K	CH	0.1		
126.80						MS		**0**			JN	U	K	CH	0.1		
127.70	131.00	0	VOLC	FR	M	MS	1.8	**55**	11	3.5							Zones brecciated clay matrix to 100mm
128.60						MS		**0**			JN	P	S	CY	15		
129.20						MS		**0**			JN	P	S	CY	3		
129.80						MS		**0**			JN	U	S	CY	1		
131.00	133.40	0	VOLC	FR	SL	MS	2.1	**87**	4	1.5							
131.50						MS		**0**			JN	P	S	CY	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
132.40						MS		**0**			JN	S	S	CY	0.1		
132.50						MS		**0**			JN	S	S	CY	0.5		
132.60						MS		**0**			JN	U	S	CH	0.1		
133.20						MS		**0**			JN	U	S	CY	0.5		
133.40	134.40	0	VOLC	FR	MD	MS	0.2	**20**	99	20							
133.40						MS					JN	P	S	CY	0.5		
134.40	136.80	0	VOLC	FR	SL	MS	2.0	**83**	6	2.5							
134.70						MS		**0**			JN	P	S	CY	0.5		
134.90						MS		**0**			JN	P	S	CY	0.5		
135.00						MS		**0**			JN	U	S	CY	0.5		
135.50						MS		**0**			JN	U	R	CY	0.5		
136.10						MS		**0**			JN	U	R	CY	0.5		
136.80	140.10	0	VOLC	FR	SL	MS	1.1	**33**	19	3.5							brecciated zones and highly fractured zones
137.30						MS		**0**			JN	U	R	CY	0.5		
137.40						MS		**0**			JN	U	R	CY	0.5		
137.60						MS		**0**			JN	U	R	PY	1		
140.10	149.30	0	VOLC	FR	SL	MS	2.3	**25**	47	3.5							brecciated clay, 146.3 qtz vein 70wide?
142.60						MS		**0**			JN	U	S	CH	3		
143.80						MS		**0**			JN	P	S	CH	0.5		
144.00						MS		**0**			JN	P	S	CY	3		
144.40						MS		**0**			JN	U	S	CY	3		
144.80						MS		**0**			JN	U	S	CA	0.5		
145.00						MS		**0**			JN	P	S	PY	1		
145.80						MS		**0**			JN	P	S	PY	0.5		
145.90						MS		**0**			JN	U	S	CY	1		
146.20						MS		**0**			JN	P	S	PY	0.5		
146.70						MS		**0**			VN	P	S	CY	5		
146.90						MS		**0**			JN	U	S	CY	3		
147.40						MS		**0**			JN	P	S	CA	0.5		
148.10						MS		**0**			JN	U	S	CY	1		
148.70						MS		**0**			JN	P	K	CH	0.5		
148.80						MS		**0**			JN	U	S	CH	0.5		
149.30	151.60	0	VOLC	FR	SL	MS	1.8	**78**	8	2.5							
149.90								**0**			JN	U	S	CY	0.5		
150.40								**0**			JN	U	S	CY	1		
150.50								**0**			JN	P	S	CH	0.5		
150.80								**0**			JN	U	S	CH	0.5		
150.90								**0**			JN	U	S	CH	0.5		
151.00								**0**			JN	U	S	CA	1.5		
151.20								**0**			JN	U	R	CY	0.5		
151.60	154.60	0	VOLC	FR	SL	W	0.3	**10**	18	2.5							Breccia zone
151.70								**0**			VN	U	R	CY	4		
153.40								**0**			JN	U	S	CH	0.5		EOH

coffey mining SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

Borehole No.	G050				
Sheet					
Office Job No.:	MINENHIL00237AB				
Client:	**King Island Scheelite**	Project:	**King Island Scheelite**	Date started:	31/03/2009
Principal:		Borehole Location:		Date Completed:	
		Logged by:	AC	Checked by:	

drill model & mounting:		Easting: 249992.148	Angle: 0	R.L. Surface: 3.212	
hole diameter: mm	drilling fluid:	Northing: 5562331.985	Azimuth: -90	datum:	

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
0.0	0.9	0	SAND					**0**									River wash fine gravel sand
0.9	6.6	0	FILL					**0**									Mine waste gravel to robbles
6.6	9.8	0	SAND					**0**									Beach deposits
9.8	10.1	0	SAND					**0**									Black high organic content
10.1	11.9	0	VOLC	EW		EW	0.0	**0**	99	20							structure destroyed during drilling
10.1											JN	U	S	CY	0.5		
11.9	13.0	0	VOLC	HW		VW	0.0	**0**	99	20							
11.9											JN	U	S	CY	0.5		
13.0	15.5	0	VOLC	SW		W	0.0	**0**	99	20							
15.5								**0**			JN	U	S	CA	0.5		
15.5	20.4	0	VOLC	FR		S	2.3	**47**	26	3.5							
15.7								**0**			JN	U	S	CA	0.5		
15.8								**0**			JN	U	S	CA	0.5		
15.9								**0**			JN	U	S	CA	0.5		
16.0								**0**			JN	U	S	CA	2		
16.2								**0**			JN	U	S	CA	1		
16.5								**0**			JN	U	S	CA	0.5		
17.1								**0**			JN	U	R	CA	0.5		
17.2								**0**			JN	P	S	CA	0.5		
17.5								**0**			JN	U	S	CA	0.5		
17.6								**0**			JN	U	S	CA	0.5		
17.8								**0**			JN	S	R	CA	0.5		
18.0								**0**			JN	U	R	CA	0.5		
18.1								**0**			JN	U	S	CA	0.5		
18.2								**0**			JN	U	R	CA	0.5		
18.7								**0**			JN	U	R	CA	1		
18.9								**0**			JN	U	R	CA	0.5		
20.4	21.6	0	VOLC	FR	STA	MS	0.4	**33**	8	2.5							
20.5								**0**			JN	U	R	CY	0.5		
20.9								**0**			JN	U	R	CY	1		
21.6	24.2	1	VOLC	FR	STA	MS	0.7	**27**	8	2.5							Brecciation healed by calcite,core loss ground away due blunt bit
21.6											JN	U	R	CY	0.5		
24.2	25.8	0	VOLC	FR	STA	MS	0.2	**13**	15	3.5							
24.4								**0**			JN	U	R	CA	1		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
24.5								**0**			JN	U	S	CA	0.5		
25.0								**0**			JN	U	K	CH	0.1		
25.1								**0**			JN	U	S	CH	0.1		
25.2								**0**			JN	U	S	CA	2		
25.8	30.6	0.6	VOLC	FR	STA	VW	2.3	**48**	26	2.5							Core loss possibly clay
25.9								**0**			JN	U	R	CA	0.5		
26.1								**0**			JN	U	R	CA	0.1		
26.2								**0**			JN	U	R	CH	0.1		
26.5								**0**			JN	U	S	CH	0.5		
26.7								**0**			JN	U	S	CH	0.1		
26.9								**0**			JN	U	R	CA	0.5		
27.7								**0**			JN	U	S	CH	0.1		
28.0								**0**			JN	S	R	CA	0.1		
28.6								**0**			JN	U	R	CA	2		
28.8								**0**			JN	P	S	CH	0.1		
28.9								**0**			JN	P	S	CH	0.1		
29.1								**0**			JN	P	K	CH	0.1		
29.3								**0**			JN	U	R	CY	10		
29.5								**0**			JN	U	R	CY	5		
29.6								**0**			JN	U	R	CY	5		
29.8								**0**			JN	U	R	CY	3		
30.6	35.3	0	VOLC	FR	SL	MS	2.1	**45**	28	2.5							
31.3								**0**			JN	P	S	CA	0.5		
31.4								**0**			JN	U	S	CA	0.5		
31.6								**0**			JN	P	S	CA	2		
31.7								**0**			JN	U	S	CA	1		
32.0								**0**			JN	U	S	CA	1		
32.2								**0**			JN	U	S	CA	0.5		
32.5								**0**			JN	U	S	CA	0.5		
32.6								**0**			JN	U	S	CA	0.5		
32.7								**0**			JN	U	S	CA	0.5		
32.8								**0**			JN	U	S	CA	0.5		
32.9								**0**			JN	P	S	CA	0.5		
33.0								**0**			JN	P	S	CA	3		
33.3								**0**			JN	U	S	CA	0.5		
33.4								**0**			JN	U	S	CA	1		
33.6								**0**			JN	U	S	CA	1		
33.9								**0**			JN	U	S	CA	1		
34.1								**0**			JN	U	S	CA	0.5		
34.2								**0**			JN	U	S	CA	0.5		
34.5								**0**			JN	U	S	CA	2		
34.8								**0**			JN	U	S	CA	1		
34.9								**0**			JN	U	S	CA	1		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
35.3	38.3	0	VOLC	FR	STA	MS	1.6	**53**	19	2.5							
35.4								**0**			JN	U	S	CA	0.1		
35.6								**0**			JN	S	S	CA	2		
35.9								**0**			JN	U	R	CA	0.5		
36.1								**0**			JN	U	R	CA	0.5		
36.2								**0**			JN	U	S	CA	0.1		
36.3								**0**			JN	U	S	CA	0.5		
36.6								**0**			JN	U	S	CA	1		
36.7								**0**			JN	U	S	CA	0.5		
37.1								**0**			JN	S	R	CA	0.5		
37.3								**0**			JN	U	S	CA	2		
37.6								**0**			JN	U	S	CA	2		
37.8								**0**			JN	U	R	CA	1		
37.9								**0**			JN	U	R	CA	2		
38.3	40.2	0	VOLC	FR	SL	MS	1.2	**63**	10	2.5							
38.6								**0**			JN	U	R	CA	0.5		
38.8								**0**			JN	U	R	CY	1		
39.1								**0**			JN	U	R	CA	0.1		
39.3								**0**			JN	U	S	CA	0.1		
39.4								**0**			JN	U	S	CA	0.1		
39.7								**0**			JN	P	S	CA	2		
39.9								**0**			JN	U	S	CA	0.5		Fractured calcite parallel to core axis
40.2	42.4	0	VOLC	FR	SL	W	0.7	**32**	10	2.5							Narrow breccia zones parallel to core axis
40.3								**0**			JN	U	S	CA	0.5		
40.4								**0**			JN	U	S	CA	0.5		Core shattered, series of uni parallel to core up to 41.3m
41.3								**0**			JN	U	S	CA	1		
41.5								**0**			JN	S	S	CA	0.5		
42.0								**0**			JN	U	S	CA	0.5		
42.1								**0**			JN	U	S	CA	0.5		
42.4	44.9	0	VOLC	FR	SL	MS	2.1	**84**	10	2.5							
42.6								**0**			JN	U	S	CA	0.5		
43.1								**0**			JN	U	S	CA	0.5		
43.3								**0**			JN	U	S	CA	2		
43.5								**0**			JN	U	S	CA	0.5		
43.6								**0**			JN	P	S	CA	0.5		
43.9								**0**			JN	U	S	CA	0.5		
44.0								**0**			JN	U	R	CA	0.1		
44.3								**0**			JN	U	S	CA	0.5		
44.5								**0**			JN	U	R	CA	0.5		
44.9	50.1	0	VOLC	FR	SL	MS	3.6	**69**	31	3.5							
45.1								**0**			JN	U	S	CA	0.5		
45.2								**0**			JN	P	S	CA	0.5		
45.3								**0**			JN	P	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
45.4								**0**			JN	U	S	CA	0.5		
45.6								**0**			JN	U	S	CA	0.5		
45.7								**0**			JN	U	S	CA	0.5		
45.8								**0**			JN	S	S	CA	0.5		
46.2								**0**			JN	U	S	CA	0.5		
46.3								**0**			JN	U	S	CA	1		
46.5								**0**			JN	U	S	CA	0.5		
46.6								**0**			JN	P	S	CA	0.5		
46.8								**0**			JN	U	S	CA	0.5		
47.0								**0**			JN	U	S	CA	0.5		
47.4								**0**			JN	U	S	CA	0.1		
47.6								**0**			JN	U	S	CA	0.5		
47.7								**0**			JN	P	S	CA	1		
48.1								**0**			JN	P	S	CA	0.5		
18.3								**0**			JN	U	S	CA	0.5		
48.5								**0**			JN	U	S	CA	1		
48.8								**0**			JN	U	S	CA	0.1		
49.1								**0**			JN	P	S	CA	2		
49.3								**0**			JN	U	S	CA	0.5		
49.6								**0**			JN	U	S	CA	0.5		
49.7								**0**			JN	U	S	CA	0.5		
49.8								**0**			JN	U	R	CA	0.5		
49.9								**0**			JN	U	R	CA	0.5		
50.0								**0**			JN	U	R	CA	0.5		
50.1	51.7	0	VOLC	FR	SL	MS	1.3	**81**	4	2.5							
50.8								**0**			JN	S	R	CA	0.5		
50.9								**0**			JN	U	R	CA	0.5		
51.2								**0**			JN	U	S	CA	0.5		
51.4								**0**			JN	U	R	CA	0.1		
51.7	52.9	0	VOLC	FR	SL	MS	1.0	**83**	5	3.5							
52.0								**0**			JN	U	S	CA	0.1		
52.1								**0**			JN	U	S	CA	1		
52.6								**0**			JN	S	R	CY	1		
52.7								**0**			JN	U	R	CA	0.5		
52.9	55.0	0	VOLC	FR	SI	W	1.3	**62**	99	20							Brecciated,clay+calcite matric
53.5								**0**			JN	U	R	CY	1		
53.9								**0**			JN	S	R	CY	1		
54.0								**0**			JN	S	R	CY	1		
54.7								**0**			JN	U	R	CA	0.5		
54.8								**0**			JN	U	R	CA	0.5		
55.0	58.5	0	VOLC	FR	M	MS	1.4	**40**	27	2.5							
55.1								**0**			JN	U	R	CA	0.5		
55.2								**0**			JN	U	R	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
55.3								**0**			JN	U	R	CY	1		
55.4								**0**			JN	U	R	CY	1		
55.5								**0**			JN	U	R	CY	0.5		
55.6								**0**			JN	U	R	CY	3		
55.7								**0**			JN	U	R	CY	1		
55.9								**0**			JN	U	S	CY	1		
56.5								**0**			JN	U	S	CA	0.5		
56.8								**0**			JN	U	S	CA	3		
56.9								**0**			JN	U	S	CA	0.5		
57.1								**0**			JN	U	S	CA	0.5		
57.2								**0**			JN	U	S	CA	0.5		
57.5								**0**			JN	P	S	CA	0.5		
57.6								**0**			JN	U	R	CA	1		
57.9								**0**			JN	U	S	CA	1		
58.0								**0**			JN	U	S	CA	0.5		
58.1								**0**			JN	P	S	CA	1		
58.3								**0**			JN	P	S	CA	1		
58.5	63.5	0	VOLC	FR	SL	MS	1.4	**28**	21								
58.8								**0**			JN	P	S	CY	0.5		
59.1								**0**			JN	U	R	CA	0.1		
59.2								**0**			JN	U	R	CA	0.5		
59.8								**0**			JN	U	S	CA	0.5		
60.0								**0**			JN	U	S	CA	0.5		
60.2								**0**			JN	P	S	CA	0.5		
60.3								**0**			JN	U	S	CA	0.5		
60.6								**0**			JN	U	S	CA	0.5		
61.0								**0**			JN	P	S	CA	0.5		
61.2								**0**			JN	P	S	CA	0.5		
61.3								**0**			JN	S	S	CA	0.5		
61.5								**0**			JN	U	S	CA	0.5		
61.6								**0**			JN	U	S	CA	0.5		
61.7								**0**			JN	U	S	CA	1		
61.9								**0**			JN	U	R	CA	0.5		
62.3								**0**			JN	P	S	CA	1		
62.6								**0**			JN	P	S	CA	0.5		
63.0								**0**			JN	P	S	CA	1		
63.1								**0**			JN	U	S	CA	1		
63.3								**0**			JN	P	S	CA	1		
63.4								**0**			JN	U	S	CA	0.5		
63.5	65.2	0	VOLC	FR		W	0.3	**18**	34	3.5							Closely spread parallel fractures, small highly fractured zones
63.6								**0**			JN	U	S	CA	0.5		
63.9								**0**			JN	U	S	CA	0.5		
64.1								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
64.3								**0**			JN	U	S	CA	1		
64.6								**0**			JN	P	S	CA	0.5		
64.7								**0**			JN	P	S	CA	0.5		
64.8								**0**			JN	U	S	CA	0.5		
64.9								**0**			JN	U	S	CA	0.5		
65.2	67.6	0	VOLC	FR	SL	W	0.8	**33**	11	2.5							Brecciated texture, 100mm section highly fractured.
65.4								**0**			JN	U	R	CA	0.5		
66.5								**0**			JN	U	R	CY	2		
67.6	71.0	0.3	VOLC	FR	SL	W	2.2	**65**	15	2.5							
67.9								**0**			JN	U	S	CY	1		
68.2								**0**			JN	U	R	CY	2		
68.6								**0**			JN	U	R	CY	1		
68.7								**0**			JN	U	R	CY	0.5		
68.8								**0**			JN	U	S	CY	0.5		
69.1								**0**			JN	P	S	CA	0.5		
69.2								**0**			JN	U	R	CY	0.5		
69.7								**0**			JN	U	S	CA	1		
70.0								**0**			JN	U	R	CA	0.5		
70.2								**0**			JN	U	R	CA	0.5		
70.5								**0**			JN	U	S	CA	0.5		
70.6								**0**			JN	U	S	CA	0.5		
70.7								**0**			JN	U	R	CA	0.5		
71.0	71.3	0	VOLC	HW		VW	0.0	**0**									Clay interval
71.0											JN	U	R	CA	0.5		
71.3	75.8	0	VOLC	FR		MS	3.5	**78**	16	3.5							Short shattered zone, healed breccia
71.6								**0**			JN	U	R	CA	0.5		
71.7								**0**			JN	U	R	CA	0.5		
71.9								**0**			JN	U	R	CA	0.5		
72.0								**0**			JN	U	R	CA	0.5		
72.6								**0**			JN	U	R	CA	0.5		
73.7								**0**			JN	U	R	CA	0.1		
73.8								**0**			JN	U	R	CA	0.1		
73.9								**0**			JN	U	S	CA	0.5		
74.1								**0**			JN	U	S	CA	0.5		
74.3								**0**			BZ	U	S	CA	0.1		Shattered zone
74.5								**0**			JN	U	K	CH	0.1		
75.0								**0**			JN	U	R	CY	1		
75.6								**0**			JN	U	R	CY	2		
75.8	81.8	0	VOLC	FR	NA	MS	2.8	**47**	44	3.5							
75.8								**0**			JN	U	R	CY	4		
75.9								**0**			JN	P	S	CA	3		
76.0								**0**			JN	P	S	CA	1		
76.3								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
76.4								**0**			JN	P	S	CA	1		
76.5								**0**			JN	U	S	CA	0.5		
76.9								**0**			JN	U	S	CA	1		
77.1								**0**			JN	P	S	CA	0.5		
77.2								**0**			JN	U	S	CA	0.5		
77.4								**0**			JN	U	R	CA	2		
77.5								**0**			JN	U	S	CA	0.5		
77.6								**0**			JN	U	S	CA	0.5		
77.7								**0**			JN	U	S	CA	0.5		
77.8								**0**			JN	U	S	CA	1		
77.9								**0**			JN	U	R	CA	1		
78.3								**0**			JN	P	S	CA	1		
78.4								**0**			JN	U	S	CA	0.5		
78.5								**0**			JN	U	R	CA	0.5		
78.6								**0**			JN	U	R	CA	1		
78.9								**0**			JN	U	R	CA	0.5		
80.1								**0**			JN	U	R	CA	1		
80.2								**0**			JN	U	S	CA	0.5		
80.3								**0**			JN	U	S	CA	1		
80.4								**0**			JN	U	S	CA	1		
80.8								**0**			JN	P	S	CA	0.5		
80.9								**0**			JN	P	S	CA	1		
81.2								**0**			JN	P	S	CA	0.5		
81.3								**0**			JN	P	S	CA	1		
81.4								**0**			JN	U	S	CA	0.5		
81.7								**0**			JN	U	R	CA	0.5		
81.8	83.4	0	VOLC	FR	Minor	MS	0.9	**56**	9	2.5							Minor zones brecciated texture, calcite matrix
82.0								**0**			JN	U	S	CA	0.5		
82.3								**0**			JN	U	S	CA	1		
82.5								**0**			JN	U	S	CA	1		
82.6								**0**			JN	U	S	CA	0.5		
82.7								**0**			JN	U	S	CA	1		
82.8								**0**			JN	U	S	CA	0.5		
82.9								**0**			JN	U	S	CA	1		
83.1								**0**			JN	U	S	CA	0.5		
83.3								**0**			JN	U	S	CA	0.5		
83.4	86.4	3	VOLC	EW		EW	0	**0**	99	20							Indicated zone mostly clay
83.4											JN	P	K	CY	3		
86.4	91.4	0	VOLC	FR	Minor	MS	1.4	**28**	18	3.5							
86.5								**0**			JN	U	S	CY	0.5		
86.7								**0**			JN	U	R	CA	0.1		
86.8								**0**			JN	U	S	CA	0.5		
87.5								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
87.6								**0**			JN	U	S	CA	0.5		
87.9								**0**			JN	U	S	CA	0.5		
88.1								**0**			JN	U	S	CY	2		
88.2								**0**			JN	U	S	CA	0.5		
88.3								**0**			JN	U	S	CA	0.5		
88.6								**0**			JN	U	S	CA	0.5		
89.0								**0**			JN	U	S	CA	1		
89.2								**0**			JN	U	S	CA	1		
89.3								**0**			JN	P	S	CA	1		
89.6								**0**			JN	U	R	CA	0.5		
90.0								**0**			JN	S	R	CA	0.5		
90.2								**0**			JN	U	S	CA	0.5		
91.1								**0**			JN	U	R	CA	0.5		
91.4	93.8	0	VOLC	FR	Minor	MS	1.4	**58**	14	2.5							
91.6								**0**			JN	P	S	CA	0.5		
91.7								**0**			JN	P	S	CA	0.1		
91.8								**0**			JN	P	S	CA	1		
92.1								**0**			JN	U	R	CA	0.5		
92.2								**0**			JN	P	S	CA	0.5		
92.5								**0**			JN	P	S	CA	0.5		
92.6								**0**			JN	U	S	CA	0.5		
92.7								**0**			JN	U	S	CA	0.5		
92.8								**0**			JN	U	S	CA	0.5		
92.9								**0**			JN	U	R	CA	1		
93.5								**0**			JN	S	R	CA	0.5		
93.6								**0**			VN	U	R	CA	10		
93.8	95.8	0	VOLC	FR	INT	W	0.6	**30**	99	20							Fine breccation before alteration
93.8											JN	U	R	CY	1.5		
95.8	99.8	0	VOLC	FR	SL	MS	1.8	**45**	20	3.5							
96.2								**0**			JN	U	R	CA	0.5		
96.4								**0**			JN	U	S	CA	0.5		
96.7								**0**			JN	U	S	CA	0.5		
97.0								**0**			JN	U	R	CA	0.5		
97.3								**0**			JN	S	R	CA	0.5		
97.4								**0**			JN	U	R	CA	0.5		
97.9								**0**			JN	U	R	CA	0.5		
98.0								**0**			JN	U	S	CA	0.5		
98.3								**0**			JN	U	R	CA	0.5		Top of fine breccia with calcite material, zone 50mm
98.7								**0**			JN	U	S	CA	0.5		
98.9								**0**			JN	U	S	CA	0.5		
99.1								**0**			JN	P	S	CA	1		
99.5								**0**			JN	U	S	CA	0.5		
99.6								**0**			JN	U	S	CA	0.3		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
99.8	101.3	0	VOLC	FR	SL	W	0.2	**13**	18	3.5							Minor clay zones 30mm wide
100.0								**0**			JN	U	S	CA	0.1		
100.1								**0**			JN	U	S	CH	0.1		
100.2								**0**			JN	U	S	CH	0.1		
100.6								**0**			JN	P	S	CY	50		Top of it minor clay zone
101.1								**0**			JN	U	S	CY	1		
101.3	104.8	0	VOLC	FR	MOD	MS	2.4	**69**	15	3.5							Breccia zones with calcite matrix, clay zone 100mm wide
101.6								**0**			JN	U	R	CA	0.1		
101.7								**0**			JN	P	S	CA	0.5		
101.9								**0**			JN	U	R	CA	0.5		
102.1								**0**			JN	U	S	CY	0.5		
102.2								**0**			JN	U	R	CA	0.5		
102.6								**0**			JN	U	R	CY	0.5		
103.1								**0**			JN	U	R	CH	0.1		
103.3								**0**			JN	U	R	CY	0.5		
103.5								**0**			JN	U	R	CY	0.5		
103.8								**0**			JN	U	R	CY	50		Top of clay zone
104.0								**0**			JN	U	S	CH	0.1		
104.2								**0**			JN	P	S	CA	0.5		
104.8	108.0	0	VOLC	FR	INT	W	0.7	**22**	99	20							Clay zones to 100mm
106.1								**0**			JN	U	S	CY	0.5		
106.8								**0**			JN	U	K	CH	0.1		
108.0	111.8	0	volc	FR	SL	W	1.3	**34**	99	20							Brecciated, clay lined fractures
108.1								**0**			JN	U	S	CA	1		
108.3								**0**			JN	U	S	CA	0.5		
108.4								**0**			JN	U	S	CY	1		
109.1								**0**			JN	U	R	CY	0.5		Breccia zone
109.3								**0**			JN	U	S	CY	0.5		
109.4								**0**			JN	P	S	CY	0.5		
109.5								**0**			JN	U	S	CA	0.5		
109.5								**0**			JN	U	S	CY	0.5		
109.6								**0**			JN	P	S	CY	1		
109.6								**0**			JN	P	S	CA	0.5		
109.7								**0**			JN	U	S	CA	0.5		
109.8								**0**			JN	U	S	CY	1		
109.9								**0**			JN	P	S	CY	0.5		
110.7								**0**			JN	U	S	CA	0.5		
110.8								**0**			JN	U	R	CY	1		
111.1								**0**			JN	P	S	CA	0.5		
111.7								**0**			JN	P	S	CA	0.5		
111.8	114.5	0	VOLC	FR	SL	VW	0.6	**22**	99	20							Fine breccia, fine gravel
114.4								**0**			JN	U	S	CA	0.5		EOH

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

Borehole No. G051
Sheet
Office Job No.: MINENHIL00237AB

Client: **King Island Scheelite**
Project: **King Island Scheelite**
Date started: 16/04/2009
Principal:
Borehole Location:
Date Completed: 26/04/2009
Logged by: AC
Checked by:

drill model & mounting:
Easting: 249952
Angle: -50
R.L. Surface: 1
hole diameter: mm
drilling fluid:
Northing: 6E+06
Azimuth: 70
datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
93.10	94.30	0	VOLC	HW		EW	0.2	**17**	10	99							
93.10											JN	U	R	CY	0.5		
94.30	96.00	0	VOLC	MW		EW	1.4	**82**	99	20							brecciated textures
94.30											JN	U	R	CY	0.5		
96.00	101.10	0	VOLC	SW		W	2.0	**39**	33	20							breaciated textures, calcite matrix
96.10								**0**			JN	U	S	CA	0.5		
96.70								**0**			JN	U	R	CA	0.5		
96.80								**0**			JN	U	R	CA	0.5		
96.90								**0**			JN	S	R	CA	0.5		
97.00								**0**			JN	U	S	CA	0.5		
97.10								**0**			JN	U	R	CA	0.5		
97.20								**0**			JN	U	R	CA	0.5		
97.40								**0**			JN	U	R	CA	0.5		
97.50								**0**			JN	U	R	CA	0.5		
97.60								**0**			JN	U	R	CA	0.5		
97.70								**0**			JN	U	R	CA	0.5		
97.80								**0**			JN	U	R	CA	0.5		
97.90								**0**			JN	U	R	CA	0.5		
98.00								**0**			JN	U	R	CA	0.5		
98.20								**0**			JN	U	R	CA	0.5		
98.40								**0**			JN	U	S	CA	0.5		
98.50								**0**			JN	S	R	CA	0.5		
98.70								**0**			JN	U	S	CA	0.5		
98.90								**0**			JN	U	S	CY	2		
99.90								**0**			JN	S	R	CY	1		
101.10	101.70	0	VOLC	SW		EW	0.0	**0**	99	20							
101.10											JN	U	S	CA	1		
101.70	104.50	0	VOLC	FR		W	1.2	**43**	24	3.5							
102.00								**0**			JN	U	S	CA	0.5		
102.20								**0**			JN	U	S	CA	0.5		
102.30								**0**			JN	U	S	CY	2		
102.50								**0**			JN	U	S	CA	0.5		
102.60								**0**			JN	U	S	CA	0.5		
102.90								**0**			JN	U	S	CA	0.5		
103.00								**0**			JN	U	S	CY	2		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
103.10								**0**			JN	U	S	CY	1		
103.20								**0**			JN	U	S	CY	1		
103.50								**0**			JN	U	S	CA	0.5		
103.60								**0**			JN	U	S	CA	0.5		
103.80								**0**			JN	P	S	CA	0.5		
104.00								**0**			JN	U	S	CA	0.5		
104.20								**0**			JN	U	R	CA	0.5		
104.30								**0**			VN	U	R	CA	0.5		
104.40								**0**			JN	S	R	CA	0.5		
104.50	106.70	0	VOLC	FR		MS	0.7	**32**	21	3.5							
104.60								**0**			JN	U	S	CA	0.5		
104.70								**0**			JN	U	S	CA	0.1		
104.80								**0**			JN	U	S	CA	0.5		
105.50								**0**			JN	U	S	CA	0.5		
105.60								**0**			JN	U	R	CA	0.5		
105.70								**0**			JN	U	R	CA	1		
105.80								**0**			JN	P	S	CA	0.5		
106.00								**0**			JN	U	S	CA	0.5		
106.10								**0**			JN	U	R	CA	0.5		
106.30								**0**			JN	U	S	CA	0.5		
106.40								**0**			JN	U	R	CA	0.5		
106.60								**0**			JN	U	S	CA	0.5		
106.70	108.60	0.3	VOLC	FR	ST	W	0.6	**32**	8	2.5							broken zone 0.3 long
106.80								**0**			JN	U	R	CH	0.1		
107.00								**0**			JN	P	S	CH	0.1		
107.20								**0**			JN	S	R	CH	0.1		
107.30								**0**			JN	P	S	CH	0.1		
108.50								**0**			JN	U	R	CY	0.5		
108.60	110.60	0	VOLC	FR	ST	W	1.6	**80**	14	2.5							Alteration in zones
108.70								**0**			JN	U	R	CA	0.5		
108.90								**0**			JN	P	S	CA	0.5		
109.00								**0**			JN	P	S	CA	0.5		
109.10								**0**			JN	U	S	CA	0.5		
109.30								**0**			JN	U	R	CA	0.5		
109.40								**0**			JN	U	S	CA	0.5		
109.60								**0**			JN	U	S	CH	0.1		
109.70								**0**			JN	U	S	CH	0.1		
109.80								**0**			JN	U	R	CA	0.5		
110.00								**0**			JN	U	S	CA	0.5		
110.30								**0**			JN	U	S	CH	0.1		
110.50								**0**			JN	P	S	CA	0.5		
110.60	112.60	0	VOLC	FR	ST	W	1.0	**50**	23	3.5							Two fragmented zones 0.2 long
110.70								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
110.80								**0**			JN	U	S	CA	0.5		
110.90								**0**			JN	U	R	CA	1		
111.10								**0**			JN	U	R	CY	1		
111.20								**0**			JN	U	S	CY	1		
111.60								**0**			JN	U	S	CA	0.5		
111.70								**0**			JN	U	K	CA	1		
111.80								**0**			JN	U	S	CA	0.5		
112.10								**0**			JN	P	S	CA	0.5		
112.30								**0**			JN	U	R	CY	0.5		
112.60	115.40	1.9	VOLC	FR		EW	0.0	**0**	99	20							Core retreived as medium gravel
112.60											JN	U	R	CY	1.5		
115.40	119.30	0	VOLC	FR		MS	2.4	**62**	27	2.5							first 0.6 brecciated ? With calcite
115.60								**0**			JN	U	S	CA	0.5		
116.00								**0**			JN	U	S	CA	0.5		
116.20								**0**			JN	U	S	CA	0.5		
116.30								**0**			JN	P	S	CA	0.5		
116.40								**0**			JN	P	S	CY	1		
116.50								**0**			JN	P	S	CA	0.5		
116.70								**0**			JN	U	R	CA	0.5		
117.00								**0**			JN	U	S	CA	0.5		
117.10								**0**			JN	U	S	CA	0.5		
117.20								**0**			JN	U	S	CA	0.5		
117.30								**0**			JN	U	S	CA	0.5		
117.60								**0**			JN	U	R	CA	1		
117.70								**0**			JN	P	S	CA	2		
117.80								**0**			JN	U	S	CA	1		
118.10								**0**			JN	U	R	CA	1		
118.30								**0**			JN	U	S	CA	1		
118.60								**0**			JN	P	S	CA	0.5		
118.70								**0**			JN	P	S	CA	0.5		
119.00								**0**			JN	P	S	CA	0.5		
119.30	129.60	0	VOLC	FR	NA	MS	7.0	**68**	68	3.5							
119.50								**0**			JN	P	S	CA	0.5		
119.60								**0**			JN	U	S	CA	2		
119.70								**0**			JN	U	R	CA	0.5		
119.75								**0**			JN	U	S	CA	0.5		
119.80								**0**			JN	U	S	CA	0.5		
119.85								**0**			JN	U	S	CA	0.5		
120.05								**0**			JN	P	S	CA	0.5		
120.15								**0**			JN	U	R	CA	0.5		
120.20								**0**			JN	U	R	CA	0.5		
120.40								**0**			JN	U	R	CA	2		
120.80								**0**			JN	U	S	CA	3		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
120.95								**0**			JN	U	S	CA	1		
121.00								**0**			JN	U	S	CA	0.5		
121.05								**0**			JN	U	S	CA	0.5		
121.20								**0**			JN	P	S	CA	0.5		
121.35								**0**			JN	U	S	CA	0.5		
121.45								**0**			JN	U	S	CA	0.5		
121.60								**0**			JN	U	R	CA	0.5		
121.65								**0**			JN	U	S	CA	2		
121.70								**0**			JN	U	S	CA	0.5		
121.90								**0**			JN	P	S	CA	1		
122.50								**0**			JN	U	S	CA	1		
122.70								**0**			JN	P	S	CA	1		
122.80								**0**			JN	U	S	CA	0.5		
123.00								**0**			JN	U	S	CA	0.5		
123.15								**0**			JN	U	S	CA	0.5		
123.20								**0**			JN	U	S	CA	0.5		
123.40								**0**			JN	P	S	CA	0.5		
123.50								**0**			JN	U	R	CA	0.5		
123.70								**0**			JN	U	S	CA	0.5		
123.90								**0**			JN	U	S	CA	0.5		
124.05								**0**			JN	P	S	CA	1		
124.20								**0**			JN	U	S	CA	0.5		
124.60								**0**			JN	U	S	CA	0.5		
124.70								**0**			JN	U	S	CH	0.1		
124.85								**0**			JN	U	S	CH	0.1		
125.00								**0**			JN	U	R	CA	0.1		
125.20								**0**			JN	U	R	CA	0.1		
125.30								**0**			JN	U	R	CA	0.1		
125.40								**0**			JN	U	R	CA	0.5		
125.60								**0**			JN	U	S	CA	0.5		
125.80								**0**			JN	U	R	CA	1		
126.00								**0**			JN	U	R	CA	1		
126.40								**0**			JN	U	R	CA	0.5		
126.50								**0**			JN	U	R	CA	0.5		
126.75								**0**			JN	U	R	CA	0.5		
127.00								**0**			JN	U	S	CA	0.5		
127.30								**0**			JN	U	S	CA	0.5		
127.50								**0**			JN	U	S	CA	0.1		
127.70								**0**			JN	U	S	CA	2		
127.90								**0**			JN	U	R	CA	0.5		
128.00								**0**			JN	U	S	CA	0.5		
128.10								**0**			JN	U	S	CA	0.1		
128.30								**0**			JN	S	R	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
128.70								**0**			JN	U	S	CA	0.5		Beginning of fracture zone, 0.3 long
129.60	138.60	0	VOLC	FR	ST	MS	4.8	**53**	64	3.5							Alteration in puteles? ~0.2 long. Minor crushed zones
129.65								**0**			JN	U	S	CA	0.5		
129.70								**0**			JN	U	S	CA	0.5		Healed breccia, calcite matrix, over 50mm
129.90								**0**			JN	U	S	CA	0.5		
130.00								**0**			JN	S	S	CA	0.5		
130.10								**0**			JN	U	S	CA	0.5		
130.30								**0**			JN	U	S	CA	0.5		
130.35								**0**			JN	U	K	CA	0.1		
130.50								**0**			JN	P	S	CA	0.5		
130.60								**0**			JN	U	S	CA	2		
130.80								**0**			JN	U	S	CA	0.5		
131.10								**0**			JN	U	K	CH	0.1		
131.30								**0**			JN	U	S	CA	0.5		
131.35								**0**			JN	U	S	CA	0.5		
132.10								**0**			JN	S	S	CA	3		
132.20								**0**			JN	U	S	CA	0.5		
132.70								**0**			JN	P	S	CA	0.5		
132.75								**0**			JN	U	R	CA	0.5		
132.85								**0**			JN	U	S	CA	0.5		
132.90								**0**			JN	U	S	CA	0.5		
133.10								**0**			JN	U	S	CA	0.5		
133.20								**0**			JN	P	S	CA	0.1		
133.22								**0**			JN	U	S	CA	1		
133.30								**0**			JN	U	R	CA	1		
133.70								**0**			JN	P	S	CA	4		
133.90								**0**			JN	U	S	CA	1		
134.00								**0**			JN	P	S	CA	1		
134.20								**0**			JN	S	S	CA	1		
134.25								**0**			JN	U	S	CA	0.1		
134.50								**0**			JN	U	R	CH	0.1		
134.60								**0**			JN	U	S	CA	0.5		
134.70								**0**			JN	P	S	CA	0.5		
134.75								**0**			JN	U	S	CA	0.5		
134.90								**0**			JN	U	S	CA	0.5		
135.00								**0**			JN	S	S	CA	0.5		
135.10								**0**			JN	U	R	CA	1		
135.20								**0**			JN	U	S	CA	0.5		
135.30								**0**			JN	U	R	CA	0.5		
135.35								**0**			JN	P	S	CA	1		
135.60								**0**			JN	U	S	CA	1		
135.80								**0**			JN	U	S	CA	0.5		
135.90								**0**			JN	U	R	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
136.00								**0**			JN	S	R	CA	0.5		
136.10								**0**			JN	P	K	CA	2		
136.70								**0**			JN	S	R	CA	0.5		
136.80								**0**			JN	U	K	CH	0.1		
136.90								**0**			JN	U	S	CA	0.5		
137.20								**0**			JN	S	R	CA	1		
137.80								**0**			JN	S	S	CA	0.5		
137.90								**0**			JN	U	S	CA	0.5		
138.30								**0**			BZ	U	S	CA	0.3		Crush zone, slickensided surfaces up to 138.60m
138.60	141.60	0	VOLC	FR	SL	MS	1.5	**50**	25	2.5							Zones of calcite with SC CH alt, minor crusted zones
138.70								**0**			JN	P	S	CA	2		
139.00								**0**			JN	U	S	CA	0.5		
139.10								**0**			JN	U	R	CH	0.1		
139.20								**0**			JN	U	R	CA	0.1		
139.40								**0**			JN	U	R	CH	0.1		
139.60								**0**			JN	U	R	CH	0.1		
139.70								**0**			JN	P	S	CA	0.5		
139.80								**0**			JN	U	S	CA	0.5		
139.85								**0**			JN	S	S	CA	0.5		
139.90								**0**			JN	U	R	CA	1		Calcite sugary crystals
140.00								**0**			JN	P	S	CH	0.1		
140.20								**0**			JN	U	R	CA	0.1		
140.30								**0**			JN	U	R	CA	0.5		Start of crushed zone, intense alt and calcite filled
140.60								**0**			JN	U	R	CA	0.5		
140.70								**0**			JN	U	R	CA	0.5		
140.90								**0**			JN	U	R	CA	0.5		breccia texture, healed with calcite
141.00								**0**			JN	P	S	CA	0.5		
141.20								**0**			JN	U	R	CA	1		
141.30								**0**			JN	U	R	CA	0.5		
141.50								**0**			JN	P	K	CH	0.1		
141.60	143.10	0	VOLC	FR	M	W	0.5	**33**	16	3.5							0.3 zone crushed fragments
141.90								**0**			JN	U	S	CA	0.1		
142.50								**0**			JN	U	K	CH	0.1		
142.60								**0**			JN	U	R	CA	0.5		
142.70								**0**			JN	U	R	CA	0.1		
142.80								**0**			JN	U	R	CA	0.1		
142.90								**0**			JN	P	S	CA	1		
143.00								**0**			JN	U	S	CA	0.5		
143.10	145.80	0	VOLC	FR	SL	MS	2.1	**78**	16	3.5							
143.40								**0**			JN	U	S	CA	0.5		
143.80								**0**			JN	U	S	CA	1		
143.90								**0**			JN	U	S	CA	0.5		
144.00								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
144.15								**0**			JN	P	S	CA	0.5		
144.20								**0**			JN	U	S	CA	0.5		
144.40								**0**			JN	U	S	CA	0.5		
144.45								**0**			JN	U	R	CA	0.5		
144.50								**0**			JN	U	S	CA	0.5		
144.60								**0**			JN	U	S	CA	0.1		
144.90								**0**			JN	U	S	CA	1		
145.10								**0**			JN	U	S	CA	0.5		
145.20								**0**			JN	U	S	CA	0.5		
145.40								**0**			JN	U	R	CH	0.1		
145.70								**0**			JN	U	R	CY	0.5		
145.80	146.10	0	VOLC	FR	SL	W	0.1	**33**	8	2.5							Brecciated calcite matrix
145.90								**0**			JN	U	S	CH	0.1		
146.10								**0**			JN	U	R	CH	0.1		
146.10								**0**			JN	P	K	CH	0.1		
146.10	150.00	0	VOLC	FR	SL	MS	3.5	**90**	15	3.5							
146.20								**0**			JN	U	S	CA	0.1		
146.30								**0**			JN	U	R	CA	0.1		
146.40								**0**			JN	U	S	CA	0.1		
146.70								**0**			JN	U	S	CA	0.5		
147.10								**0**			JN	U	S	CA	0.5		
147.20								**0**			JN	U	S	CA	0.5		
147.30								**0**			JN	U	S	CA	1.0		
147.50								**0**			JN	U	S	CA	0.1		
147.60								**0**			JN	P	S	CA	1.0		
147.70								**0**			JN	U	R	CA	0.1		
148.10								**0**			JN	U	S	CA	0.5		
148.30								**0**			JN	P	S	CA	0.5		
148.50								**0**			JN	U	S	CH	0.1		
149.60								**0**			JN	U	S	CA	0.1		
150.00	153.10	0	VOLC	FR	SL	MS	2.6	**84**	17	2.5							Minor brecciation healed with calcite
150.50								**0**			JN	U	S	CA	0.5		
150.80								**0**			JN	S	R	CA	0.5		
151.40								**0**			JN	U	R	CA	0.5		
151.60								**0**			JN	U	S	CA	0.5		
151.70								**0**			JN	U	S	CA	0.5		
152.00								**0**			JN	U	S	CA	0.5		
152.10								**0**			JN	U	S	CA	0.5		
152.20								**0**			JN	U	S	CA	0.5		
152.30								**0**			JN	U	S	CH	0.1		
152.40								**0**			JN	U	R	KI	0		
152.50								**0**			JN	U	S	CA	0.1		
152.60								**0**			JN	U	S	CA	0.5		

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Planarity	Roughness	Infill	Infill Thickness (mm)	Core Orientation Quality	Comments
152.80								**0**			JN	U	S	CA	0.1		
152.90								**0**			JN	U	S	CA	0.5		
153.00								**0**			JN	U	S	CA	0.5		
153.10	156.60	0	VOLC	FR	SL	MS	2.8	**80**	13	2.5							
153.30								**0**			JN	U	S	CA	1		
153.60								**0**			JN	U	S	CA	1		
153.70								**0**			JN	U	S	CA	0.5		
154.10								**0**			JN	U	S	CA	0.5		
154.40								**0**			JN	U	S	CA	0.5		
154.60								**0**			JN	U	R	CA	1		
154.80								**0**			JN	S	R	CA	0.5		
154.90								**0**			JN	U	S	CA	0.5		
155.10								**0**			JN	S	R	CA	0.5		
156.00								**0**			JN	P	S	CA	0.5		
156.10								**0**			JN	U	S	CA	0.5		
156.30								**0**			JN	P	S	CA	0.5		
156.40								**0**			JN	P	S	CA	0.5		
156.50								**0**			JN	U	R	CA	0.5		

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Geotechnical Log - Cored Borehole

Borehole No. G052
Sheet 1
Office Job No.:

Client: **King Island Scheelite** | Project: **King Island Scheelite** | Date started: 6-May-09
Principal: | Borehole Location: Grassy | Date Completed: 28-May-09
Logged by: AC | Checked by:

drill model & mounting: UDR 200 skid | GDA 94 | Eastin 249 861 | Angle: 50 | R.L. Surface:
hole diameter: mm | drilling fluid: | Northi 622 62 | Azimuth: 080M | datum:

Interval Depth From (m)	Interval Depth To (m)	Core Loss (m)	Rock Type	Weathering	Alteration	Strength	Length of Core > 0.1 (m)	RQD (%)	No. of Defects	No. of Defect Sets	Defect Type	Profile	Roughness	Infill	Infill Thickness (mm)	Comments
0.00	9.50	3.1	Fill				0									Clay top, mine waste, gravel to boulders, some sand
9.50	18.50	7.9	Sand				0									Minor content volc. Boulders
18.50	18.70	0	Qzit	HW		EW	0		99	20						Sand infill to crevices
18.70	23.30	4.2	Sand													Clayey sand, minor gravel
23.30	24.80	0	Qzit	HW		EW	0		99	20						Silty sand infill to crevices
24.80	27.50	1.5	Qzit	HW		EW	0		99	20						Some sand intervals, interp. Top of uneven palaeosurface
27.50	28.50	0	Volc	HW		EW	0		99	20						Fine to coarse gravel upon release from splits
28.50	29.50	0	Volc	FR		EW	0		99	20						Appearance coarse angular gravel
29.50	29.80	0	Volc	FR		EW	0		99	20						Coarse gravel with some very fine beds
29.80	30.50	0	Volc	FR		EW	0		99	20						Appearance medium to coarse gravel
30.50	32.00	1.2	Volc	FR		EW	0		99	20						Minor clay bed
32.00	36.70	4.3	Volc	FR		EW	0		99	20						Retrieved core held by grouting, possibly some clay
36.70	38.90	1.6	Volc	FR		EW	0		99	20						Beds of clay between fractured rock, appears as coarse to fine gravel
38.90	39.10	0	Volc	FR		EW	0		99	20						Rods bogged, barrel stuck in grout
																Hole re-entered with PQ
38.00	39.70	0	Volc	FR		EW	0		99	20						Minor quartz vein
39.70	41.50	0	Volc	FR		EW	0		99	20						Trace pyrite
41.50	44.70	0.9	Volc	FR		EW	0		99	20						
44.70	45.80	0	Volc	FR		EW	0		99	20						
45.80	46.70	0.8	Volc	FR		EW	0		99	20						Minor clay bed
46.70	47.30	0	Volc	FR		EW	0		99	20						Trace pyrite, very fine fragmentation, EOH

Appendix E

Geotechnical Analysis – (M)RMR

Geotechnical Analysis

RMR & MRMR

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	22.5	1.2	Domain	0.5	0	3	83	5	4	1	0	2	1	8	4	20	**20**	**20**	**20**	90%	94%	80%	100%	14	**14**	**14**	**14**
G045	22.5	1.2	Core Loss		0	3		5	4	1	0	2	1	8	4	20				90%	94%	80%	100%	14			
G045	23.7	0.7	Domain	0.5	0	3	141	5	4	1	0	2	0	7	4	19	**19**	**19**	**19**	90%	94%	80%	100%	13	**13**	**13**	**13**
G045	23.7	0.7	Core Loss		0	3		5	4	1	0	2	0	7	4	19				90%	94%	80%	100%	13			
G045	24.4	2.1	Domain	10	2	3	8	8	4				1		4		**29**	**30**	**33**	90%	94%	80%	100%		**20**	**20**	**22**
G045	24.6	2.1	Single		2	3		8	4	1	5	2	1	13	4	30				90%	94%	80%	100%	20			
G045	24.9	2.1	Single		2	3		8	4	1	5	2	1	13	4	30				90%	94%	80%	100%	20			
G045	25.1	2.1	Single		2	3		8	4	1	5	2	1	13	4	30				90%	94%	80%	100%	20			
G045	25.3	2.1	Single		2	3		8	4	1	5	2	1	13	4	30				90%	94%	80%	100%	20			
G045	26	2.1	Single		2	3		8	4	4	5	2	1	16	4	33				90%	94%	80%	100%	22			
G045	26.1	2.1	Single		2	3		8	4	1	5	2	1	13	4	30				90%	94%	80%	100%	20			
G045	26.4	2.1	Single		2	3		8	4	4	1	2	1	12	4	29				90%	94%	80%	100%	20			
G045	26.5	0.9	Domain	0.5	0	3	110	5	4				0		4		**27**	**27**	**27**	90%	94%	80%	100%		**18**	**18**	**18**
G045	26.5	0.9	Single		0	3		5	4	4	5	2	0	15	4	27				90%	94%	80%	100%	18			
G045	27.4	0.9	Domain	10	2	3	110	5	4				5		4		**34**	**34**	**34**	90%	94%	80%	100%		**23**	**23**	**23**
G045	27.5	0.9	Single		2	3		5	4	4	5	2	5	20	4	34				90%	94%	80%	100%	23			
G045	27.7	0.9	Single		2	3		5	4	4	5	2	5	20	4	34				90%	94%	80%	100%	23			
G045	28.1	0.9	Single		2	3		5	4	4	5	2	5	20	4	34				90%	94%	80%	100%	23			
G045	28.3	3.5	Domain	0.5	0	3	28	5	4				0		4		**27**	**27**	**27**	90%	94%	80%	100%		**18**	**18**	**18**
G045	28.3	3.5	Single		0	3		5	4	4	5	2	0	15	4	27				90%	94%	80%	100%	18			
G045	31.8	1.4	Domain	0.5	0	3	71	5	4				0		4		**23**	**24**	**24**	90%	94%	80%	100%		**16**	**16**	**16**
G045	32	1.4	Single		0	3		5	4	1	5	2	0	12	4	24				90%	94%	80%	100%	16			
G045	32.3	1.4	Single		0	3		5	4	4	1	2	0	11	4	23				90%	94%	80%	100%	16			
G045	33.2	1.2	Domain	20	4	13	7	8	4				5		4		**45**	**45**	**45**	90%	94%	80%	100%		**30**	**30**	**30**
G045	33.5	1.2	Single		4	13		8	4	4	1	2	5	16	4	45				90%	94%	80%	100%	30			
G045	33.6	1.2	Single		4	13		8	4	4	1	2	5	16	4	45				90%	94%	80%	100%	30			
G045	34	1.2	Single		4	13		8	4	4	1	2	5	16	4	45				90%	94%	80%	100%	30			
G045	34.2	1.2	Single		4	13		8	4	4	1	2	5	16	4	45				90%	94%	80%	100%	30			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	34.4	1.2	Domain	20	4	8	8	8	4				6		4		**38**	**41**	**45**	90%	94%	80%	100%		**26**	**28**	**30**
G045	34.5	1.2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	34.8	1.2	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G045	35	1.2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	35.1	1.2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	35.2	1.2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	35.3	1.2	Single		4	8		8	4	1	1	2	6	14	4	38				90%	94%	80%	100%	26			
G045	35.5	1.2	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G045	35.6	2.9	Domain	0.5	0	3	34	5	4				0		4		**20**	**20**	**20**	90%	94%	80%	100%		**14**	**14**	**14**
G045	35.6	2.9	Single		0	3		5	4	1	1	2	0	8	4	20				90%	94%	80%	100%	14			
G045	38.5	2.5	Domain	0.5	0	3	40	5	4				6		4		**29**	**29**	**33**	90%	94%	80%	100%		**20**	**20**	**22**
G045	39	2.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	39.2	2.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	39.4	2.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	40.6	2.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	40.8	2.5	Single		0	3		5	4	4	5	2	6	21	4	33				90%	94%	80%	100%	22			
G045	41	5	Domain	0.5	0	3	20	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	41	5	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	46	4.4	Domain	0.5	0	3	23	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	49.4	4.4	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	50.4	5.6	Domain	0.5	0	3	18	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	50.7	5.6	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	52.2	5.6	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	54.5	5.6	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	56	2.9	Domain	10	2	3	34	5	4				6		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G045	57.2	2.9	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	58.9	5.4	Domain	10	2	8	18	5	4				6		4		**30**	**36**	**37**	90%	94%	80%	100%		**20**	**24**	**25**
G045	60.1	5.4	Single		2	8		5	4	0	1	0	6	11	4	30				90%	94%	80%	100%	20			
G045	60.4	5.4	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	63.4	5.4	Single		2	8		5	4	1	5	2	6	18	4	37				90%	94%	80%	100%	25			
G045	64.3	3	Domain	0.5	0	3	33	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	64.3	3	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	67.3	2.5	Domain	0.5	0	3	40	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	68.5	2.5	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	69.8	4.1	Domain	10	2	3	24	5	4				6		4		**25**	**28**	**31**	90%	94%	80%	100%		**17**	**19**	**21**
G045	70.8	4.1	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	70.9	4.1	Single		2	3		5	4	0	1	0	6	11	4	25				90%	94%	80%	100%	17			
G045	71.7	4.1	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			
G045	71.8	4.1	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	72.7	4.1	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	73.9	4.5	Domain	10	2	8	22	5	4				6		4		**30**	**33**	**39**	90%	94%	80%	100%		**20**	**22**	**26**
G045	74	4.5	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	74.1	4.5	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	74.2	4.5	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	74.3	4.5	Single		2	8		5	4	0	1	0	6	11	4	30				90%	94%	80%	100%	20			
G045	75	4.5	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	75.9	4.5	Single		2	8		5	4	1	5	4	6	20	4	39				90%	94%	80%	100%	26			
G045	76.1	4.5	Single		2	8		5	4	1	5	4	6	20	4	39				90%	94%	80%	100%	26			
G045	76.3	4.5	Single		2	8		5	4	1	5	4	6	20	4	39				90%	94%	80%	100%	26			
G045	76.7	4.5	Single		2	8		5	4	0	1	0	6	11	4	30				90%	94%	80%	100%	20			
G045	78.4	3.4	Domain	0.5	0	3	29	5	4				6		4		**29**	**29**	**29**	90%	94%	80%	100%		**20**	**20**	**20**
G045	81.3	3.4	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	81.8	5.2	Domain	0.5	0	3	19	5	4				6		4		**26**	**28**	**32**	90%	94%	80%	100%		**18**	**19**	**22**
G045	82.5	5.2	Single		0	3		5	4	1	5	4	6	20	4	32				90%	94%	80%	100%	22			
G045	82.7	5.2	Single		0	3		5	4	1	5	4	6	20	4	32				90%	94%	80%	100%	22			
G045	83.1	5.2	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	83.6	5.2	Single		0	3		5	4	1	5	4	6	20	4	32				90%	94%	80%	100%	22			
G045	83.7	5.2	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	84.2	5.2	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	85.4	5.2	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	87	5.2	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	87	3	Domain	10	2	3	33	5	4				6		4		**28**	**31**	**31**	90%	94%	80%	100%		**19**	**21**	**21**
G045	87.2	3	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			
G045	89.4	3	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	89.9	3	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	90	5.7	Domain	0.5	0	3	17	5	4				6		4		**26**	**29**	**29**	90%	94%	80%	100%		**18**	**20**	**20**
G045	90.4	5.7	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	90.5	5.7	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	94.2	5.7	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	95.7	4	Domain	10	2	3	25	5	4				6		4		**25**	**31**	**31**	90%	94%	80%	100%		**17**	**21**	**21**
G045	96.3	4	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	96.8	4	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	98.1	4	Single		2	3		5	4	0	1	0	6	11	4	25				90%	94%	80%	100%	17			
G045	99.7	1.3	Domain	0.5	0	3	76	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	99.7	1.3	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	101	1.9	Domain	20	4	8	52	5	4				6		4		**35**	**38**	**38**	90%	94%	80%	100%		**24**	**26**	**26**
G045	101.3	1.9	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	101.9	1.9	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	102.8	1.9	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	102.9	1.8	Domain	20	4	3	55	5	4				6		4		**32**	**34**	**37**	90%	94%	80%	100%		**22**	**23**	**25**

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	103.5	1.8	Single		4	3		5	4	1	1	4	6	16	4	32				90%	94%	80%	100%	22			
G045	102.9	1.8	Single		4	3		5	4	4	5	2	6	21	4	37				90%	94%	80%	100%	25			
G045	103.9	1.8	Single		4	3		5	4	1	5	2	6	18	4	34				90%	94%	80%	100%	23			
G045	104.7	2.2	Domain	20	4	3	5	8	4				6		4		**33**	**35**	**37**	90%	94%	80%	100%		**22**	**23**	**25**
G045	105	2.2	Single		4	3		8	4	1	5	2	6	18	4	37				90%	94%	80%	100%	25			
G045	105.1	2.2	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	105.5	2.2	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	106.7	2.2	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	106.9	1.9	Domain	20	4	3	52	5	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G045	106.9	1.9	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	107.3	1.9	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	108.3	1.9	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	108.4	1.9	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	108.7	1.9	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	108.8	1.8	Domain	20	4	3	9	8	4				6		4		**33**	**36**	**36**	90%	94%	80%	100%		**22**	**24**	**24**
G045	109.1	1.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	109.3	1.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	109.6	1.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	109.7	1.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	110.4	1.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	110.6	3.1	Domain	20	4	3	32	5	4				6		4		**30**	**33**	**33**	90%	94%	80%	100%		**20**	**22**	**22**
G045	111	3.1	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	111.3	3.1	Single		4	3		5	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G045	111.5	3.1	Single		4	3		5	4	1	1	4	6	16	4	32				90%	94%	80%	100%	22			
G045	112.5	3.1	Single		4	3		5	4	1	1	2	6	14	4	30				90%	94%	80%	100%	20			
G045	113.7	3	Domain	0.5	0	3	33	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	113.7	3	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	116.7	0.6	Domain	0.5	0	3	165	5	4				0		4		**20**	**20**	**20**	90%	94%	80%	100%		**14**	**14**	**14**
G045	117.2	0.6	Single		0	3		5	4	1	1	2	0	8	4	20				90%	94%	80%	100%	14			
G045	117.3	3.2	Domain	20	4	17	4	10	4				6		4		**49**	**49**	**53**	90%	94%	80%	100%		**33**	**33**	**36**
G045	118.1	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	118.2	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	118.7	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	119.4	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	119.7	3.2	Single		4	17		10	4	1	5	2	6	18	4	53				90%	94%	80%	100%	36			
G045	119.9	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	120.1	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	120.3	3.2	Single		4	17		10	4	1	1	2	6	14	4	49				90%	94%	80%	100%	33			
G045	120.5	5	Domain	20	4	8	20	5	4				6		4		**35**	**38**	**42**	90%	94%	80%	100%		**24**	**26**	**28**
G045	122.5	5	Single		4	8		5	4	4	5	2	6	21	4	42				90%	94%	80%	100%	28			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	123.4	5	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	124.7	5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	125.2	5	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	125.5	3.1	Domain	0.5	0	3	32	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	125.5	3.1	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	128.6	4.4	Domain	0.5	0	3	23	5	4				6		4		**30**	**30**	**30**	90%	94%	80%	100%		**20**	**20**	**20**
G045	128.6	4.4	Single		0	3		5	4	1	5	2	6	18	4	30				90%	94%	80%	100%	20			
G045	133	6.4	Domain	10	2	3	15	8	4				6		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G045	133	6.4	Single		2	3		8	4	1	1	2	6	14	4	31				90%	94%	80%	100%	21			
G045	139.4	2	Domain	20	4	8	6	8	4				6		4		**38**	**41**	**42**	90%	94%	80%	100%		**26**	**28**	**28**
G045	139.9	2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	140.2	2	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G045	140.3	2	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G045	140.6	2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	140.7	2	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G045	141	2	Single		4	8		8	4	4	0	2	6	16	4	40				90%	94%	80%	100%	27			
G045	141.4	2	Single		4	8		8	4	1	1	2	6	14	4	38				90%	94%	80%	100%	26			
G045	141.4	3.1	Domain	10	2	3	32	5	4				6		4		**30**	**30**	**30**	90%	94%	80%	100%		**20**	**20**	**20**
G045	142.7	3.1	Single		2	3		5	4	4	0	2	6	16	4	30				90%	94%	80%	100%	20			
G045	144.5	7	Domain	20	4	8	14	8	4				6		4		**37**	**39**	**45**	90%	94%	80%	100%		**25**	**26**	**30**
G045	144.6	7	Single		4	8		8	4	1	0	2	6	13	4	37				90%	94%	80%	100%	25			
G045	145	7	Single		4	8		8	4	0	5	0	6	15	4	39				90%	94%	80%	100%	26			
G045	146.3	7	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G045	146.4	7	Single		4	8		8	4	4	0	2	6	16	4	40				90%	94%	80%	100%	27			
G045	146.6	7	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G045	150.1	7	Single		4	8		8	4	1	1	2	6	14	4	38				90%	94%	80%	100%	26			
G045	151	7	Single		4	8		8	4	1	1	2	6	14	4	38				90%	94%	80%	100%	26			
G045	151.5	4.5	Domain	20	4	8	22	5	4				6		4		**35**	**36**	**41**	90%	94%	80%	100%		**24**	**24**	**28**
G045	151.6	4.5	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	153.6	4.5	Single		4	8		5	4	1	5	4	6	20	4	41				90%	94%	80%	100%	28			
G045	153.8	4.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	155.4	4.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	155.5	4.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	155.9	4.5	Single		4	8		5	4	1	1	4	6	16	4	37				90%	94%	80%	100%	25			
G045	156	5.2	Domain	10	2	3	19	5	4				6		4		**30**	**31**	**32**	90%	94%	80%	100%		**20**	**21**	**22**
G045	156.8	5.2	Single		2	3		5	4	1	1	4	6	16	4	30				90%	94%	80%	100%	20			
G045	157	5.2	Single		2	3		5	4	1	1	4	6	16	4	30				90%	94%	80%	100%	20			
G045	158.2	5.2	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	160.6	5.2	Single		2	3		5	4	1	5	2	6	18	4	32				90%	94%	80%	100%	22			
G045	161.2	0.6	Domain	20	4	3	165	5	4				6		4		**34**	**34**	**34**	90%	94%	80%	100%		**23**	**23**	**23**

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	161.2	0.6	Single		4	3		5	4	1	5	2	6	18	4	34				90%	94%	80%	100%	23			
G045	161.8	1.1	Domain	0.5	0	3	90	5	4				6		4		**30**	**30**	**30**	90%	94%	80%	100%		**20**	**20**	**20**
G045	161.8	1.1	Single		0	3		5	4	1	5	2	6	18	4	30				90%	94%	80%	100%	20			
G045	162.9	1.7	Domain	10	2	8	58	5	4				6		4		**33**	**36**	**39**	90%	94%	80%	100%		**22**	**24**	**26**
G045	164.5	1.7	Single		2	8		5	4	1	5	4	6	20	4	39				90%	94%	80%	100%	26			
G045	164.7	1.7	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	164.8	1.7	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	164.6	3.6	Domain	0.5	0	3	28	5	4				6		4		**28**	**28**	**28**	90%	94%	80%	100%		**19**	**19**	**19**
G045	167.2	3.6	Single		0	3		5	4	4	0	2	6	16	4	28				90%	94%	80%	100%	19			
G045	168.2	2.3	Domain	20	4	8	43	5	4				6		4		**37**	**37**	**37**	90%	94%	80%	100%		**25**	**25**	**25**
G045	168.5	2.3	Single		4	8		5	4	4	0	2	6	16	4	37				90%	94%	80%	100%	25			
G045	169.2	2.3	Single		4	8		5	4	1	1	4	6	16	4	37				90%	94%	80%	100%	25			
G045	170.5	3.5	Domain	0.5	0	3	28	5	4				6		4		**26**	**29**	**29**	90%	94%	80%	100%		**18**	**20**	**20**
G045	171.2	3.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	171.5	3.5	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	171.7	3.5	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	174	2.5	Domain	0.5	0	3	40	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	174	2.5	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	176.5	3.7	Domain	0.5	0	3	27	5	4				6		4		**29**	**29**	**29**	90%	94%	80%	100%		**20**	**20**	**20**
G045	176.5	3.7	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	180.2	10.5	Domain	0.5	0	3	9	8	4				6		4		**29**	**29**	**29**	90%	94%	80%	100%		**20**	**20**	**20**
G045	180.2	10.5	Single		0	3		8	4	1	1	2	6	14	4	29				90%	94%	80%	100%	20			
G045	190.7	8	Domain	0.5	0	3	12	8	4				6		4		**32**	**32**	**32**	90%	94%	80%	100%		**22**	**22**	**22**
G045	190.7	8	Single		0	3		8	4	4	1	2	6	17	4	32				90%	94%	80%	100%	22			
G045	198.7	5.1	Domain	0.5	0	3	19	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	198.7	5.1	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	203.8	1.3	Domain	0.5	0	3	76	5	4				6		4		**29**	**29**	**29**	90%	94%	80%	100%		**20**	**20**	**20**
G045	203.8	1.3	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	205.1	4.3	Domain	10	2	3	23	5	4				6		4		**28**	**30**	**31**	90%	94%	80%	100%		**19**	**20**	**21**
G045	207.1	4.3	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	207.7	4.3	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			
G045	209.4	3.1	Domain	10	2	3	32	5	4				6		4		**24**	**27**	**31**	90%	94%	80%	100%		**16**	**18**	**21**
G045	210.6	3.1	Single		2	3		5	4	0	0	0	6	10	4	24				90%	94%	80%	100%	16			
G045	211.9	3.1	Single		2	3		5	4	1	0	2	6	13	4	27				90%	94%	80%	100%	18			
G045	212	3.1	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	212.5	2	Domain	10	2	3	50	5	4				6		4		**25**	**25**	**25**	90%	94%	80%	100%		**17**	**17**	**17**
G045	214.5	2	Single		2	3		5	4	0	1	0	6	11	4	25				90%	94%	80%	100%	17			
G045	214.5	0.7	Domain	20	4	13	11	8	4				6		4		**46**	**46**	**46**	90%	94%	80%	100%		**31**	**31**	**31**
G045	214.9	0.7	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	214.9	0.7	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	215.2	0.7	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	215.2	2.4	Domain	10	2	3	41	5	4				6		4		**28**	**30**	**31**	90%	94%	80%	100%		**19**	**20**	**21**
G045	217.1	2.4	Single		2	3		5	4	4	0	2	6	16	4	30				90%	94%	80%	100%	20			
G045	217.2	2.4	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			
G045	217.3	2.4	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G045	217.6	1.9	Domain	10	2	3	52	5	4				6		4		**28**	**28**	**28**	90%	94%	80%	100%		**19**	**19**	**19**
G045	217.6	1.9	Single		2	3		5	4	1	1	2	6	14	4	28				90%	94%	80%	100%	19			
G045	219.5	5.5	Domain	20	4	8	18	5	4				6		4		**32**	**35**	**39**	90%	94%	80%	100%		**22**	**24**	**26**
G045	219.6	5.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	220	5.5	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	220.8	5.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	221.5	5.5	Single		4	8		5	4	1	5	2	6	18	4	39				90%	94%	80%	100%	26			
G045	222.8	5.5	Single		4	8		5	4	0	1	0	6	11	4	32				90%	94%	80%	100%	22			
G045	223	5.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	223.2	5.5	Single		4	8		5	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G045	223.4	5.5	Single		4	8		5	4	1	1	2	6	14	4	35				90%	94%	80%	100%	24			
G045	225	3	Domain	0.5	0	3	33	5	4				6		4		**26**	**26**	**26**	90%	94%	80%	100%		**18**	**18**	**18**
G045	225.6	3	Single		0	3		5	4	1	1	2	6	14	4	26				90%	94%	80%	100%	18			
G045	228	0.8	Domain	0.5	0	3	124	5	4				6		4		**29**	**29**	**29**	90%	94%	80%	100%		**20**	**20**	**20**
G045	228	0.8	Single		0	3		5	4	4	1	2	6	17	4	29				90%	94%	80%	100%	20			
G045	228.8	2.2	Domain	10	2	3	4	10	4				6		4		**36**	**36**	**36**	90%	94%	80%	100%		**24**	**24**	**24**
G045	228.8	2.2	Single		2	3		10	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	231	3.2	Domain	10	2	3	3	10	4				6		4		**36**	**36**	**36**	90%	94%	80%	100%		**24**	**24**	**24**
G045	231	3.2	Single		2	3		10	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	234.2	0.9	Domain	10	2	3	10	8	4				6		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G045	234.2	0.9	Single		2	3		8	4	1	1	2	6	14	4	31				90%	94%	80%	100%	21			
G045	235.1	2.9	Domain	10	2	3	3	10	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G045	235.1	2.9	Single		2	3		10	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G045	238	3	Domain	0.5	0	3	3	10	4				5		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G045	238	3	Single		0	3		10	4	4	1	2	5	16	4	33				90%	94%	80%	100%	22			
G045	241	4.3	Domain	0.5	0	3	2	10	4				5		4		**30**	**30**	**30**	90%	94%	80%	100%		**20**	**20**	**20**
G045	241	4.3	Single		0	3		10	4	1	1	2	5	13	4	30				90%	94%	80%	100%	20			
G045	245.3	2.3	Domain	10	2	3	4	10	4				5		4		**35**	**35**	**35**	90%	94%	80%	100%		**24**	**24**	**24**
G045	245.3	2.3	Single		2	3		10	4	4	1	2	5	16	4	35				90%	94%	80%	100%	24			
G045	247.6	6	Domain	20	4	13	6	8	4				6		4		**43**	**48**	**52**	90%	94%	80%	100%		**29**	**32**	**35**
G045	247.7	6	Single		4	13		8	4	1	1	2	6	14	4	43				90%	94%	80%	100%	29			
G045	247.8	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	247.9	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	248.2	6	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	248.3	6	Single		4	13		8	4	1	1	2	6	14	4	43				90%	94%	80%	100%	29			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	248.4	6	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	248.5	6	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	248.8	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	249.6	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	249.7	6	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	250.7	6	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G045	250.9	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	251.4	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	251.5	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	252.3	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	252.4	6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G045	253.5	6	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G045	253.6	4.1	Domain	20	4	13	24	5	4				6		4		**42**	**45**	**49**	90%	94%	80%	100%		**28**	**30**	**33**
G045	254.1	4.1	Single		4	13		5	4	1	5	4	6	20	4	46				90%	94%	80%	100%	31			
G045	254.2	4.1	Single		4	13		5	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G045	255	4.1	Single		4	13		5	4	4	0	2	6	16	4	42				90%	94%	80%	100%	28			
G045	255.3	4.1	Single		4	13		5	4	4	0	2	6	16	4	42				90%	94%	80%	100%	28			
G045	255.4	4.1	Single		4	13		5	4	4	0	2	6	16	4	42				90%	94%	80%	100%	28			
G045	256.3	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	256.7	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	256.8	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	257.1	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	257.2	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	257.5	4.1	Single		4	13		5	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G045	257.7	7.7	Domain	20	4	13	4	10	4				6		4		**47**	**48**	**50**	90%	94%	80%	100%		**32**	**32**	**34**
G045	258.4	7.7	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	258.9	7.7	Single		4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G045	259	7.7	Single		4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G045	260.1	7.7	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	260.4	7.7	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	260.7	7.7	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	261.8	7.7	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	263.2	7.7	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	263.7	7.7	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	265.4	1.6	Domain	10	2	8	62	5	4				6		4		**38**	**38**	**38**	90%	94%	80%	100%		**26**	**26**	**26**
G045	265.4	1.6	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	267	4.6	Domain	20	4	13	4	10	4				6		4		**44**	**50**	**54**	90%	94%	80%	100%		**30**	**34**	**37**
G045	267.5	4.6	Single		4	13		10	4	4	0	2	6	16	4	47				90%	94%	80%	100%	32			
G045	267.6	4.6	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	267.7	4.6	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	268.4	4.6	Single		4	13		10	4	1	1	2	6	14	4	45				90%	94%	80%	100%	30			
G045	268.9	4.6	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	269	4.6	Single		4	13		10	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G045	269.7	4.6	Single		4	13		10	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G045	270.2	4.6	Single		4	13		10	4	1	5	4	6	20	4	51				90%	94%	80%	100%	35			
G045	270.5	4.6	Single		4	13		10	4	1	1	2	6	14	4	45				90%	94%	80%	100%	30			
G045	270.6	4.6	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	270.7	4.6	Single		4	13		10	4	1	0	2	6	13	4	44				90%	94%	80%	100%	30			
G045	271	4.6	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	271.4	4.6	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	271.5	4.6	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G045	271.6	2.6	Domain	20	4	17	3	10	4				6		4		**51**	**53**	**54**	90%	94%	80%	100%		**35**	**36**	**37**
G045	271.9	2.6	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	272.1	2.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	272.4	2.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	273	2.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	273.2	2.6	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	274	2.6	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G045	274.2	0.5	Domain	0.5	0	3	198	5	4				6		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G045	274.2	0.5	Single		0	3		5	4	4	1	4	6	19	4	31				90%	94%	80%	100%	21			
G045	274.7	2.6	Domain	20	4	17	3	10	4				6		4		**52**	**53**	**54**	90%	94%	80%	100%		**35**	**36**	**37**
G045	275.1	2.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	275.9	2.6	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	276.4	2.6	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	276.5	2.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	277.3	0.3	Domain	10	2	3	330	5	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G045	277.3	0.3	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G045	277.6	5.1	Domain	20	4	17	2	10	4				6		4		**52**	**53**	**54**	90%	94%	80%	100%		**35**	**36**	**37**
G045	277.9	5.1	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	279	5.1	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	280.8	5.1	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	281.2	5.1	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	282.7	8.2	Domain	20	4	13	4	10	4				6		4		**47**	**48**	**50**	90%	94%	80%	100%		**32**	**32**	**34**
G045	284	8.2	Single		4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G045	284.1	8.2	Single		4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G045	284.5	8.2	Single		4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G045	285.4	8.2	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	285.7	8.2	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	288.5	8.2	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	289.6	8.2	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G045	290.4	8.2	Single		4	13		10	4	1	5	2	6	18	4	49				90%	94%	80%	100%	33			
G045	290.9	8.2	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G045	290.9	5	Domain	20	4	17	4	10	4				6		4		**46**	**54**	**58**	90%	94%	80%	100%		**31**	**37**	**39**
G045	291.9	5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	292.8	5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G045	293	5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G045	293.3	5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G045	293.6	5	Single		4	17		10	4	0	1	0	6	11	4	46				90%	94%	80%	100%	31			
G045	293.8	5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G045	294.3	5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G045	294.6	5	Single		4	17		10	4	1	5	2	6	18	4	53				90%	94%	80%	100%	36			
G045	294.9	5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G045	295.2	5	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	295.6	5	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G045	295.7	5	Single		4	17		10	4	4	0	2	6	16	4	51				90%	94%	80%	100%	35			
G045	295.8	5	Single		4	17		10	4	4	0	2	6	16	4	51				90%	94%	80%	100%	35			
G045	295.9	1.4	Domain	10	2	3	71	5	4				6		4		**37**	**37**	**37**	90%	94%	80%	100%		**25**	**25**	**25**
G045	295.9	1.4	Single		2	3		5	4	4	5	4	6	23	4	37				90%	94%	80%	100%	25			
G045	297.3	2.7	Domain	20	4	3	7	8	4				6		4		**35**	**38**	**42**	90%	94%	80%	100%		**24**	**26**	**28**
G045	297.3	2.7	Single		4	3		8	4	4	5	4	6	23	4	42				90%	94%	80%	100%	28			
G045	297.4	2.7	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	297.5	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	297.7	2.7	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G045	297.9	2.7	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	298	2.7	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G045	298.1	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	298.2	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	298.5	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	298.8	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	298.9	2.7	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G045	299	2.7	Single		4	3		8	4	4	5	4	6	23	4	42				90%	94%	80%	100%	28			
G045	299.2	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	299.4	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G045	299.6	2.7	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			

coffey mining

Geotechnical Analysis

RMR & MRMR

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G048	124.3	3.5	Domain	2	1	8	1	15	4				5		4		**41**	**45**	**48**	90%	94%	80%	100%		**28**	**30**	**32**
G048	125.4	3.5	Single		1	8		15	4	4	5	2	5	20	4	48				90%	94%	80%	100%	32			
G048	125.9	3.5	Single		1	8		15	4	4	5	2	5	20	4	48				90%	94%	80%	100%	32			
G048	126.6	3.5	Single		1	8		15	4	1	5	2	5	17	4	45				90%	94%	80%	100%	30			
G048	126.8	3.5	Single		1	8		15	4	1	5	2	5	17	4	45				90%	94%	80%	100%	30			
G048	127.3	3.5	Single		1	8		15	4	1	1	2	5	13	4	41				90%	94%	80%	100%	28			
G048	127.8	3.3	Domain	2	1	3	2	10	4				1		4		**27**	**30**	**31**	90%	94%	80%	100%		**18**	**20**	**21**
G048	137.85	3.3	Single		1	3		10	4	4	1	2	1	12	4	30				90%	94%	80%	100%	20			
G048	138.3	3.3	Single		1	3		10	4	1	1	2	1	9	4	27				90%	94%	80%	100%	18			
G048	129.2	3.3	Single		1	3		10	4	4	1	2	1	12	4	30				90%	94%	80%	100%	20			
G048	129.7	3.3	Single		1	3		10	4	4	1	2	1	12	4	30				90%	94%	80%	100%	20			
G048	129.8	3.3	Single		1	3		10	4	4	1	2	1	12	4	30				90%	94%	80%	100%	20			
G048	130.3	3.3	Single		1	3		10	4	1	5	2	1	13	4	31				90%	94%	80%	100%	21			
G048	130.4	3.3	Single		1	3		10	4	4	1	2	1	12	4	30				90%	94%	80%	100%	20			
G048	130.7	3.3	Single		1	3		10	4	1	1	2	1	9	4	27				90%	94%	80%	100%	18			
G048	131.1	5.2	Domain	10	2	3	19	5	4				6		4		**31**	**36**	**41**	90%	94%	80%	100%		**21**	**24**	**28**
G048	131.6	5.2	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G048	135.4	5.2	Single		2	3		5	4	6	5	6	6	27	4	41				90%	94%	80%	100%	28			
G048	136.3	11.5	Domain	2	1	3	9	8	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G048	146	11.5	Single		1	3		8	4	4	1	2	6	17	4	33				90%	94%	80%	100%	22			
G048	147.8	3.7	Domain	10	2	3	27	5	4				6		4		**31**	**35**	**37**	90%	94%	80%	100%		**21**	**24**	**25**

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G048	148.4	3.7	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G048	148.7	3.7	Single		2	3		5	4	4	5	4	6	23	4	37				90%	94%	80%	100%	25			
G048	149.6	3.7	Single		2	3		5	4	4	5	2	6	21	4	35				90%	94%	80%	100%	24			
G048	151.5	3.1	Domain	10	2	3	8	8	4				6		4		**34**	**34**	**34**	90%	94%	80%	100%		**23**	**23**	**23**
G048	153.4	3.1	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			
G048	154.6	7.8	Domain	20	4	3	7	8	4				6		4		**33**	**36**	**38**	90%	94%	80%	100%		**22**	**24**	**26**
G048	155.1	7.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G048	155.5	7.8	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G048	155.9	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	156	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	156.1	7.8	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G048	156.4	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	156.7	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	156.8	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	157.6	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	157.8	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	158.2	7.8	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G048	158.4	7.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G048	158.5	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	158.7	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	169.2	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	159.3	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	159.4	7.8	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G048	160.1	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	160.4	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	161	7.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G048	161.1	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	161.2	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	161.4	7.8	Single		4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G048	161.6	7.8	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G048	161.9	7.8	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G048	162.4	1.2	Domain	10	2	3	83	5	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**22**	**22**	**22**
G048	162.4	1.2	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G048	163.6	4.3	Domain	20	4	17	5	8	4				6		4		**49**	**52**	**56**	90%	94%	80%	100%		**33**	**35**	**38**
G048	163.8	4.3	Single		4	17		8	4	4	1	2	6	17	4	50				90%	94%	80%	100%	34			
G048	163.9	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	164.7	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	164.8	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	165.2	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	165.4	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	165.6	4.3	Single		4	17		8	4	4	5	4	6	23	4	56				90%	94%	80%	100%	38			
G048	166	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	166.2	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	166.3	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	166.7	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	166.9	4.3	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G048	167.4	4.3	Single		4	17		8	4	1	1	4	6	16	4	49				90%	94%	80%	100%	33			
G048	167.9	5.7	Domain	10	2	3	7	8	4				6		4		**31**	**34**	**36**	90%	94%	80%	100%		**21**	**23**	**24**
G048	168.3	5.7	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			
G048	168.4	5.7	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			
G048	169	5.7	Single		2	3		8	4	4	1	4	6	19	4	36				90%	94%	80%	100%	24			
G048	169.3	5.7	Single		2	3		8	4	4	0	2	6	16	4	33				90%	94%	80%	100%	22			
G048	169.6	5.7	Single		2	3		8	4	1	1	2	6	14	4	31				90%	94%	80%	100%	21			
G048	170.9	5.7	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			
G048	173.6	1.9	Domain	10	2	3	9	8	4				6		4		**34**	**34**	**34**	90%	94%	80%	100%		**23**	**23**	**23**
G048	173.7	1.9	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			

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Geotechnical Analysis

RMR & MRMR

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G049	99.2	3.2	Domain	10	2	8	7	8	4				3		4		**32**	**35**	**42**	90%	94%	80%	100%		**22**	**26**	**32**
G049	99.2	3.2	Single		2	8		8	4	4	5	4	3	20	4	42				100%	94%	80%	100%	32			
G049	99.3	3.2	Single		2	8		8	4	1	1	2	3	11	4	33				90%	94%	80%	100%	22			
G049	100.5	3.2	Single		2	8		8	4	1	0	2	3	10	4	32				100%	94%	80%	100%	24			
G049	100.9	3.2	Single		2	8		8	4	1	1	2	3	11	4	33				90%	94%	80%	100%	22			
G049	101.1	3.2	Single		2	8		8	4	4	0	2	3	13	4	35				100%	94%	80%	100%	26			
G049	101.4	3.2	Single		2	8		8	4	4	0	2	3	13	4	35				100%	94%	80%	100%	26			
G049	101.6	3.2	Single		2	8		8	4	4	0	2	3	13	4	35				100%	94%	80%	100%	26			
G049	101.9	3.2	Single		2	8		8	4	4	0	2	3	13	4	35				100%	94%	80%	100%	26			
G049	102	3.2	Single		2	8		8	4	4	0	2	3	13	4	35				100%	94%	80%	100%	26			
G049	102.4	1.9	Domain	20	4	8	10	8	4				5		4		**36**	**37**	**39**	100%	94%	80%	100%		**25**	**27**	**29**
G049	102.7	1.9	Single	20	4	8		8	4	4	0	2	5	15	4	39				100%	94%	80%	100%	29			
G049	102.8	1.9	Single	20	4	8		8	4	4	0	2	5	15	4	39				90%	94%	80%	100%	26			
G049	103.1	1.9	Single	20	4	8		8	4	1	0	2	5	12	4	36				100%	94%	80%	100%	27			
G049	103.2	1.9	Single	20	4	8		8	4	1	1	2	5	13	4	37				90%	94%	80%	100%	25			
G049	103.6	1.9	Single	20	4	8		8	4	1	1	2	5	13	4	37				100%	94%	80%	100%	28			
G049	103.7	1.9	Single	20	4	8		8	4	1	1	2	5	13	4	37				100%	94%	80%	100%	28			
G049	103.8	1.9	Single	20	4	8		8	4	1	0	2	5	12	4	36				100%	94%	80%	100%	27			
G049	104.3	3.1	Domain	20	4	13	5	10	4				6		4		**45**	**47**	**48**	90%	94%	80%	100%		**32**	**34**	**36**
G049	104.4	3.1	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			
G049	105.5	3.1	Single	20	4	13		10	4	1	1	4	6	16	4	47				90%	94%	80%	100%	32			
G049	106.3	3.1	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G049	106.4	3.1	Single	20	4	13		10	4	4	1	2	6	17	4	48				100%	94%	80%	100%	36			
G049	106.5	3.1	Single	20	4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G049	106.7	3.1	Single	20	4	13		10	4	4	0	2	6	16	4	47				100%	94%	80%	100%	35			
G049	107.4	1.6	Domain	20	4	3	62	5	4				5		4		**29**	**31**	**31**	100%	94%	80%	100%		**21**	**23**	**23**
G049	107.5	1.6	Single	20	4	3		5	4	4	0	2	5	15	4	31				100%	94%	80%	100%	23			
G049	107.7	1.6	Single	20	4	3		5	4	4	0	2	5	15	4	31				100%	94%	80%	100%	23			
G049	108.2	1.6	Single	20	4	3		5	4	4	0	2	5	15	4	31				90%	94%	80%	100%	21			
G049	108.6	1.6	Single	20	4	3		5	4	1	1	2	5	13	4	29				100%	94%	80%	100%	22			
G049	109	1.1	Domain	20	4	8	90	5	4				6		4		**34**	**35**	**38**	100%	94%	80%	100%		**26**	**26**	**29**
G049	109.5	1.1	Single	20	4	8		5	4	1	1	2	6	14	4	35				100%	94%	80%	100%	26			
G049	109.7	1.1	Single	20	4	8		5	4	1	0	2	6	13	4	34				100%	94%	80%	100%	26			
G049	109.9	1.1	Single	20	4	8		5	4	1	0	2	6	13	4	34				100%	94%	80%	100%	26			
G049	110	1.1	Single	20	4	8		5	4	4	1	2	6	17	4	38				100%	94%	80%	100%	29			
G049	110.1	2.8	Domain	20	4	8	8	8	4				6		4		**41**	**41**	**41**	100%	94%	80%	100%		**28**	**28**	**28**
G049	110.1	2.8	Single	20	4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G049	112.9	1.3	Domain	20	4	13	5	8	4				6		4		**46**	**46**	**46**	100%	94%	80%	100%		**31**	**31**	**31**
G049	112.9	1.3	Single	20	4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G049	114.2	3	Domain	20	4	13	5	10	4				6		4		**45**	**47**	**50**	100%	94%	80%	100%		**32**	**35**	**38**
G049	114.5	3	Single	20	4	13		10	4	4	1	2	6	17	4	48				100%	94%	80%	100%	36			
G049	114.8	3	Single	20	4	13		10	4	4	1	4	6	19	4	50				100%	94%	80%	100%	38			
G049	115.2	3	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			
G049	115.3	3	Single	20	4	13		10	4	4	1	2	6	17	4	48				100%	94%	80%	100%	36			
G049	115.8	3	Single	20	4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G049	116	3	Single	20	4	13		10	4	4	0	2	6	16	4	47				100%	94%	80%	100%	35			
G049	116.2	3	Single	20	4	13		10	4	4	0	2	6	16	4	47				90%	94%	80%	100%	32			
G049	116.3	3	Single	20	4	13		10	4	4	0	2	6	16	4	47				100%	94%	80%	100%	35			
G049	116.5	3	Single	20	4	13		10	4	4	0	2	6	16	4	47				90%	94%	80%	100%	32			
G049	117.1	3	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			
G049	117.2	0.8	Domain	20	4	3	124	5	4				6		4		**33**	**33**	**33**	100%	94%	80%	100%		**25**	**25**	**25**
G049	117.2	0.8	Single	20	4	3		5	4	4	1	2	6	17	4	33				100%	94%	80%	100%	25			
G049	118	2.6	Domain	20	4	17	1	15	4				6		4		**53**	**57**	**57**	90%	94%	80%	100%		**36**	**43**	**43**
G049	118.3	2.6	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	118.8	2.6	Single	20	4	17		15	4	0	1	2	6	13	4	53				90%	94%	80%	100%	36			
G049	119	2.6	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G049	120.6	2	Domain	20	4	13	3	10	4				6		4		**45**	**47**	**50**	100%	94%	80%	100%		**30**	**34**	**38**
G049	120.9	2	Single	20	4	13		10	4	4	1	4	6	19	4	50				100%	94%	80%	100%	38			
G049	121.1	2	Single	20	4	13		10	4	4	0	2	6	16	4	47				90%	94%	80%	100%	32			
G049	121.2	2	Single	20	4	13		10	4	4	0	2	6	16	4	47				100%	94%	80%	100%	35			
G049	122.1	2	Single	20	4	13		10	4	1	1	2	6	14	4	45				90%	94%	80%	100%	30			
G049	122.6	5.1	Domain	20	4	8	7	8	4				6		4		**35**	**41**	**41**	100%	94%	80%	100%		**24**	**30**	**31**
G049	122.8	5.1	Single	20	4	8		8	4	0	1	0	6	11	4	35				90%	94%	80%	100%	24			
G049	123.4	5.1	Single	20	4	8		8	4	4	1	2	6	17	4	41				100%	94%	80%	100%	31			
G049	123.5	5.1	Single	20	4	8		8	4	4	1	2	6	17	4	41				100%	94%	80%	100%	31			
G049	125.5	5.1	Single	20	4	8		8	4	4	1	2	6	17	4	41				100%	94%	80%	100%	31			
G049	126.1	5.1	Single	20	4	8		8	4	4	0	2	6	16	4	40				100%	94%	80%	100%	30			
G049	126.8	5.1	Single	20	4	8		8	4	4	0	2	6	16	4	40				100%	94%	80%	100%	30			
G049	127.7	3.3	Domain	20	4	13	3	10	4				6		4		**42**	**45**	**45**	90%	94%	80%	100%		**32**	**34**	**34**
G049	128.6	3.3	Single	20	4	13		10	4	0	1	0	6	11	4	42				100%	94%	80%	100%	32			
G049	129.2	3.3	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			
G049	129.8	3.3	Single	20	4	13		10	4	1	1	2	6	14	4	45				100%	94%	80%	100%	34			
G049	131	2.4	Domain	20	4	17	2	15	4				6		4		**57**	**57**	**57**	100%	94%	80%	100%		**43**	**43**	**43**
G049	131.5	2.4	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	132.4	2.4	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	132.5	2.4	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	132.6	2.4	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	133.2	2.4	Single	20	4	17		15	4	4	1	2	6	17	4	57				100%	94%	80%	100%	43			
G049	133.4	1	Domain	20	4	3	99	5	4				6		4		**33**	**33**	**33**	90%	94%	80%	100%		**25**	**25**	**25**
G049	133.4	1	Single	20	4	3		5	4	4	1	2	6	17	4	33				100%	94%	80%	100%	25			
G049	134.4	2.4	Domain	20	4	17	2	10	4				6		4		**52**	**52**	**56**	90%	94%	80%	100%		**39**	**39**	**42**
G049	134.7	2.4	Single	20	4	17		10	4	4	1	2	6	17	4	52				100%	94%	80%	100%	39			
G049	134.9	2.4	Single	20	4	17		10	4	4	1	2	6	17	4	52				100%	94%	80%	100%	39			
G049	135	2.4	Single	20	4	17		10	4	4	1	2	6	17	4	52				100%	94%	80%	100%	39			
G049	135.5	2.4	Single	20	4	17		10	4	4	5	2	6	21	4	56				100%	94%	80%	100%	42			
G049	136.1	2.4	Single	20	4	17		10	4	4	5	2	6	21	4	56				100%	94%	80%	100%	42			
G049	136.8	3.3	Domain	20	4	8	6	8	4				6		4		**44**	**45**	**45**	100%	94%	80%	100%		**30**	**34**	**34**
G049	137.3	3.3	Single	20	4	8		8	4	4	5	2	6	21	4	45				100%	94%	80%	100%	34			
G049	137.4	3.3	Single	20	4	8		8	4	4	5	2	6	21	4	45				100%	94%	80%	100%	34			
G049	137.6	3.3	Single	20	4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G049	140.1	9.2	Domain	20	4	3	5	8	4				6		4		**30**	**35**	**38**	100%	94%	80%	100%		**22**	**26**	**29**
G049	142.6	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				100%	94%	80%	100%	25			
G049	143.8	9.2	Single	20	4	3		8	4	4	1	2	6	17	4	36				100%	94%	80%	100%	27			
G049	144	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G049	144.4	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				100%	94%	80%	100%	25			
G049	144.8	9.2	Single	20	4	3		8	4	4	1	4	6	19	4	38				100%	94%	80%	100%	29			
G049	145	9.2	Single	20	4	3		8	4	1	1	4	6	16	4	35				100%	94%	80%	100%	26			
G049	145.8	9.2	Single	20	4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G049	145.9	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				100%	94%	80%	100%	25			
G049	146.2	9.2	Single	20	4	3		8	4	4	1	4	6	19	4	38				100%	94%	80%	100%	29			
G049	146.7	9.2	Single	20	4	3		8	4	0	1	0	6	11	4	30				100%	94%	80%	100%	23			
G049	146.9	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G049	147.4	9.2	Single	20	4	3		8	4	4	1	4	6	19	4	38				100%	94%	80%	100%	29			
G049	148.1	9.2	Single	20	4	3		8	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G049	148.7	9.2	Single	20	4	3		8	4	4	0	2	6	16	4	35				100%	94%	80%	100%	26			
G049	148.8	9.2	Single	20	4	3		8	4	4	1	2	6	17	4	36				100%	94%	80%	100%	27			
G049	149.3	2.3	Domain	20	4	17	3	10	4				6		4		**49**	**52**	**56**	100%	94%	80%	100%		**35**	**38**	**42**
G049	149.9	2.3	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G049	150.4	2.3	Single		4	17		10	4	1	1	2	6	14	4	49				100%	94%	80%	100%	37			
G049	150.5	2.3	Single		4	17		10	4	4	1	2	6	17	4	52				100%	94%	80%	100%	39			
G049	150.8	2.3	Single		4	17		10	4	4	1	2	6	17	4	52				100%	94%	80%	100%	39			
G049	150.9	2.3	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G049	151	2.3	Single		4	17		10	4	1	1	4	6	16	4	51				100%	94%	80%	100%	38			
G049	151.2	2.3	Single		4	17		10	4	4	5	2	6	21	4	56				100%	94%	80%	100%	42			
G049	151.6	3	Domain	10	2	3	6	8	4				6		4		**34**	**35**	**35**	100%	94%	80%	100%		**23**	**25**	**26**
G049	151.7	3	Single		2	3		8	4	1	5	2	6	18	4	35				100%	94%	80%	100%	26			
G049	153.4	3	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			

coffey mining

Geotechnical Analysis

RMR & MRMR

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	10.1	1.8	Domain	0.5	0	3	55	5	4				0		4		**23**	**23**	**23**	90%	94%	80%	100%		**16**	**16**	**16**
G050	10.1	1.8	Single		0	3		5	4	4	1	2	0	11	4	23				90%	94%	80%	100%	16			
G050	11.9	1.1	Domain	2	1	3	90	5	4				1		4		**25**	**25**	**25**	90%	94%	80%	100%		**17**	**17**	**17**
G050	11.9	1.1	Single		1	3		5	4	4	1	2	1	12	4	25				90%	94%	80%	100%	17			
G050	13	2.5	Domain	10	2	3	40	5	4				5		4		**32**	**32**	**32**	90%	94%	80%	100%		**22**	**22**	**22**
G050	15.5	2.5	Single		2	3		5	4	4	1	4	5	18	4	32				90%	94%	80%	100%	22			
G050	15.5	4.9	Domain	75	7	8	5	8	4				6		4		**43**	**46**	**50**	90%	94%	80%	100%		**29**	**31**	**34**
G050	15.7	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	15.8	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	15.9	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	16	4.9	Single		7	8		8	4	1	1	4	6	16	4	43				90%	94%	80%	100%	29			
G050	16.2	4.9	Single		7	8		8	4	1	1	4	6	16	4	43				90%	94%	80%	100%	29			
G050	16.5	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	17.1	4.9	Single		7	8		8	4	4	5	4	6	23	4	50				90%	94%	80%	100%	34			
G050	17.2	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	17.5	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	17.6	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	17.8	4.9	Single		7	8		8	4	4	5	4	6	23	4	50				90%	94%	80%	100%	34			
G050	18	4.9	Single		7	8		8	4	4	5	4	6	23	4	50				90%	94%	80%	100%	34			
G050	18.1	4.9	Single		7	8		8	4	4	1	4	6	19	4	46				90%	94%	80%	100%	31			
G050	18.2	4.9	Single		7	8		8	4	4	5	4	6	23	4	50				90%	94%	80%	100%	34			
G050	18.7	4.9	Single		7	8		8	4	1	5	4	6	20	4	47				90%	94%	80%	100%	32			
G050	18.9	4.9	Single		7	8		8	4	4	5	4	6	23	4	50				90%	94%	80%	100%	34			
G050	20.4	1.2	Domain	20	4	8	7	8	4				6		4		**42**	**44**	**45**	90%	94%	80%	100%		**28**	**29**	**30**
G050	20.5	1.2	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G050	20.9	1.2	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	21.6	2.6	Domain	20	4	8	3	10	4				6		4		**47**	**47**	**47**	90%	94%	80%	100%		**32**	**32**	**32**
G050	21.6	2.6	Single		4	8		10	4	4	5	2	6	21	4	47				90%	94%	80%	100%	32			
G050	24.2	1.6	Domain	20	4	3	9	8	4				6		4		**35**	**36**	**39**	90%	94%	80%	100%		**24**	**24**	**26**
G050	24.4	1.6	Single		4	3		8	4	1	5	4	6	20	4	39				90%	94%	80%	100%	26			
G050	24.5	1.6	Single		4	3		8	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	25	1.6	Single		4	3		8	4	4	0	2	6	16	4	35				90%	94%	80%	100%	24			
G050	25.1	1.6	Single		4	3		8	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G050	25.2	1.6	Single		4	3		8	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G050	25.8	4.8	Domain	2	1	8	5	8	4				6		4		**36**	**38**	**44**	90%	94%	80%	100%		**24**	**26**	**30**
G050	25.9	4.8	Single		1	8		8	4	4	5	4	6	23	4	44				90%	94%	80%	100%	30			
G050	26.1	4.8	Single		1	8		8	4	4	5	4	6	23	4	44				90%	94%	80%	100%	30			
G050	26.2	4.8	Single		1	8		8	4	4	5	2	6	21	4	42				90%	94%	80%	100%	28			
G050	26.5	4.8	Single		1	8		8	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G050	26.7	4.8	Single		1	8		8	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G050	26.9	4.8	Single		1	8		8	4	4	5	4	6	23	4	44				90%	94%	80%	100%	30			
G050	27.7	4.8	Single		1	8		8	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G050	28	4.8	Single		1	8		8	4	4	5	4	6	23	4	44				90%	94%	80%	100%	30			
G050	28.6	4.8	Single		1	8		8	4	1	5	4	6	20	4	41				90%	94%	80%	100%	28			
G050	28.8	4.8	Single		1	8		8	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	28.9	4.8	Single		1	8		8	4	4	1	2	6	17	4	38				90%	94%	80%	100%	26			
G050	29.1	4.8	Single		1	8		8	4	4	0	2	6	16	4	37				90%	94%	80%	100%	25			
G050	29.3	4.8	Single		1	8		8	4	0	5	0	6	15	4	36				90%	94%	80%	100%	24			
G050	29.5	4.8	Single		1	8		8	4	0	5	0	6	15	4	36				90%	94%	80%	100%	24			
G050	29.6	4.8	Single		1	8		8	4	0	5	0	6	15	4	36				90%	94%	80%	100%	24			
G050	29.8	4.8	Single		1	8		8	4	1	5	2	6	18	4	39				90%	94%	80%	100%	26			
G050	30.6	4.7	Domain	20	4	8	6	8	4				6		4		**40**	**43**	**43**	90%	94%	80%	100%		**27**	**29**	**29**
G050	31.3	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	31.4	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	31.6	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	31.7	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	32	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	32.2	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	32.5	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	32.6	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	32.7	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	32.8	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	32.9	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	33	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	33.3	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	33.4	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	33.6	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	33.9	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	34.1	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	34.2	4.7	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	34.5	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	34.8	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	34.9	4.7	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	35.3	3	Domain	20	4	13	6	8	4				6		4		**45**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	35.4	3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	35.6	3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	35.9	3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	36.1	3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	36.2	3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	36.3	3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	36.6	3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	36.7	3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	37.1	3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	37.3	3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	37.6	3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	37.8	3	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G050	37.9	3	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G050	38.3	1.9	Domain	20	4	13	5	8	4				6		4		**45**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**
G050	38.6	1.9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	38.8	1.9	Single		4	13		8	4	1	5	2	6	18	4	47				90%	94%	80%	100%	32			
G050	39.1	1.9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	39.3	1.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	39.4	1.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	39.7	1.9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	39.9	1.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	40.2	2.2	Domain	10	2	8	5	10	4				6		4		**40**	**43**	**43**	90%	94%	80%	100%		**27**	**29**	**29**
G050	40.3	2.2	Single		2	8		10	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	40.4	2.2	Single		2	8		10	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	41.3	2.2	Single		2	8		10	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	41.5	2.2	Single		2	8		10	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	42	2.2	Single		2	8		10	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	42.1	2.2	Single		2	8		10	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	42.4	2.5	Domain	20	4	17	4	10	4				6		4		**51**	**54**	**58**	90%	94%	80%	100%		**35**	**37**	**39**

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	42.6	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	43.1	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	43.3	2.5	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G050	43.5	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	43.6	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	43.9	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	44	2.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	44.3	2.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	44.5	2.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	44.9	5.2	Domain	20	4	13	6	8	4				6		4		**45**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**
G050	45.1	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.2	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.3	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.4	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.6	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.7	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	45.8	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	46.2	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	46.3	5.2	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	46.5	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	46.6	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	46.8	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	47	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	47.4	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	47.6	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	47.7	5.2	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	48.1	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	18.3	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	48.5	5.2	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	48.8	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	49.1	5.2	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	49.3	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	49.6	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	49.7	5.2	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	49.8	5.2	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	49.9	5.2	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	50	5.2	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	50.1	1.6	Domain	20	4	17	3	10	4				6		4		**54**	**58**	**58**	90%	94%	80%	100%		**37**	**39**	**39**
G050	50.8	1.6	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	50.9	1.6	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	51.2	1.6	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	51.4	1.6	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	51.7	1.2	Domain	20	4	17	4	10	4				6		4		**51**	**54**	**58**	90%	94%	80%	100%		**35**	**36**	**39**
G050	52	1.2	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	52.1	1.2	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G050	52.6	1.2	Single		4	17		10	4	1	5	2	6	18	4	53				90%	94%	80%	100%	36			
G050	52.7	1.2	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	52.9	2.1	Domain	10	2	13	47	5	4				6		4		**42**	**42**	**47**	90%	94%	80%	100%		**28**	**28**	**32**
G050	53.5	2.1	Single		2	13		5	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	53.9	2.1	Single		2	13		5	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	54	2.1	Single		2	13		5	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	54.7	2.1	Single		2	13		5	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	54.8	2.1	Single		2	13		5	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	55	3.5	Domain	20	4	8	8	8	4				6		4		**38**	**43**	**47**	90%	94%	80%	100%		**26**	**29**	**32**
G050	55.1	3.5	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	55.2	3.5	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	55.3	3.5	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	55.4	3.5	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	55.5	3.5	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G050	55.6	3.5	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	55.7	3.5	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	55.9	3.5	Single		4	8		8	4	1	1	2	6	14	4	38				90%	94%	80%	100%	26			
G050	56.5	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	56.8	3.5	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	56.9	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	57.1	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	57.2	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	57.5	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	57.6	3.5	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G050	57.9	3.5	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	58	3.5	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	58.1	3.5	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	58.3	3.5	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	58.5	5	Domain	20	4	8	4	10	4				6		4		**42**	**45**	**49**	90%	94%	80%	100%		**28**	**30**	**33**
G050	58.8	5	Single		4	8		10	4	4	1	2	6	17	4	43				90%	94%	80%	100%	29			
G050	59.1	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	59.2	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	59.8	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	60	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	60.2	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	60.3	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	60.6	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	61	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	61.2	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	61.3	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	61.5	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	61.6	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	61.7	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	61.9	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	62.3	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	62.6	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	63	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	63.1	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	63.3	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	63.4	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	63.5	1.7	Domain	10	2	3	20	5	4				6		4		**30**	**33**	**33**	90%	94%	80%	100%		**20**	**22**	**22**
G050	63.6	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	63.9	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	64.1	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	64.3	1.7	Single		2	3		5	4	1	1	4	6	16	4	30				90%	94%	80%	100%	20			
G050	64.6	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	64.7	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	64.8	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	64.9	1.7	Single		2	3		5	4	4	1	4	6	19	4	33				90%	94%	80%	100%	22			
G050	65.2	2.4	Domain	10	2	8	5	10	4				6		4		**42**	**45**	**47**	90%	94%	80%	100%		**28**	**30**	**32**
G050	65.4	2.4	Single		2	8		10	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	66.5	2.4	Single		2	8		10	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	67.6	3.4	Domain	10	2	13	4	10	4				6		4		**43**	**48**	**52**	90%	94%	80%	100%		**29**	**32**	**35**
G050	67.9	3.4	Single		2	13		10	4	1	1	2	6	14	4	43				90%	94%	80%	100%	29			
G050	68.2	3.4	Single		2	13		10	4	1	5	2	6	18	4	47				90%	94%	80%	100%	32			
G050	68.6	3.4	Single		2	13		10	4	1	5	2	6	18	4	47				90%	94%	80%	100%	32			
G050	68.7	3.4	Single		2	13		10	4	4	5	2	6	21	4	50				90%	94%	80%	100%	34			
G050	68.8	3.4	Single		2	13		10	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G050	69.1	3.4	Single		2	13		10	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	69.2	3.4	Single		2	13		10	4	4	5	2	6	21	4	50				90%	94%	80%	100%	34			
G050	69.7	3.4	Single		2	13		10	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	70	3.4	Single		2	13		10	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	70.2	3.4	Single		2	13		10	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	70.5	3.4	Single		2	13		10	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	70.6	3.4	Single		2	13		10	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	70.7	3.4	Single		2	13		10	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	71	0.3	Domain	2	1	3	330	5	4				1		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G050	71	0.3	Single		1	3		5	4	4	5	4	1	18	4	31				90%	94%	80%	100%	21			
G050	71.3	4.5	Domain	20	4	17	4	10	4				6		4		**51**	**58**	**58**	90%	94%	80%	100%		**35**	**39**	**39**
G050	71.6	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	71.7	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	71.9	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	72	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	72.6	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	73.7	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	73.8	4.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G050	73.9	4.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	74.1	4.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G050	74.3	4.5	Zone (natural)		4	17		10	4	4	1	4	6	19	4					90%	94%	80%	100%				
G050	74.5	4.5	Single		4	17		10	4	4	0	2	6	16	4	51				90%	94%	80%	100%	35			
G050	75	4.5	Single		4	17		10	4	1	5	2	6	18	4	53				90%	94%	80%	100%	36			
G050	75.6	4.5	Single		4	17		10	4	1	5	2	6	18	4	53				90%	94%	80%	100%	36			
G050	75.8	6	Domain	20	4	8	7	8	4				6		4		**40**	**43**	**47**	90%	94%	80%	100%		**27**	**29**	**32**
G050	75.8	6	Single		4	8		8	4	1	5	2	6	18	4	42				90%	94%	80%	100%	28			
G050	75.9	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	76	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	76.3	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	76.4	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	76.5	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	76.9	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	77.1	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	77.2	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	77.4	6	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G050	77.5	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	77.6	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	77.7	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	77.8	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	77.9	6	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G050	78.3	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	78.4	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	78.5	6	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	78.6	6	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G050	78.9	6	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	80.1	6	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G050	80.2	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	80.3	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	80.4	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	80.8	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	80.9	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	81.2	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	81.3	6	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G050	81.4	6	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G050	81.7	6	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G050	81.8	1.6	Domain	20	4	13	6	8	4				6		4		**45**	**48**	**48**	90%	94%	80%	100%		**30**	**32**	**32**
G050	82	1.6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	82.3	1.6	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	82.5	1.6	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	82.6	1.6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	82.7	1.6	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	82.8	1.6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	82.9	1.6	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	83.1	1.6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	83.3	1.6	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	83.4	3	Domain	0.5	0	3	33	5	4				0		4		**19**	**19**	**19**	90%	94%	80%	100%		**13**	**13**	**13**
G050	83.4	3	Single		0	3		5	4	1	0	2	0	7	4	19				90%	94%	80%	100%	13			
G050	86.4	5	Domain	20	4	8	4	10	4				6		4		**40**	**45**	**49**	90%	94%	80%	100%		**27**	**30**	**33**
G050	86.5	5	Single		4	8		10	4	4	1	2	6	17	4	43				90%	94%	80%	100%	29			
G050	86.7	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	86.8	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	87.5	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	87.6	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	87.9	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	88.1	5	Single		4	8		10	4	1	1	2	6	14	4	40				90%	94%	80%	100%	27			
G050	88.2	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	88.3	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	88.6	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	89	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	89.2	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	89.3	5	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	89.6	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	90	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	90.2	5	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	91.1	5	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	91.4	2.4	Domain	20	4	13	6	8	4				6		4		**45**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**
G050	91.6	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	91.7	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	91.8	2.4	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G050	92.1	2.4	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	92.2	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	92.5	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	92.6	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	92.7	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	92.8	2.4	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G050	92.9	2.4	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G050	93.5	2.4	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G050	93.6	2.4	Single		4	13		8	4	0	5	2	6	17	4	46				90%	94%	80%	100%	31			
G050	93.8	2	Domain	10	2	8	50	5	4				6		4		**37**	**37**	**37**	90%	94%	80%	100%		**25**	**25**	**25**
G050	93.8	2	Single		2	8		5	4	1	5	2	6	18	4	37				90%	94%	80%	100%	25			
G050	95.8	4	Domain	20	4	8	5	10	4				6		4		**42**	**45**	**49**	90%	94%	80%	100%		**28**	**30**	**33**
G050	96.2	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	96.4	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	96.7	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	97	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	97.3	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	97.4	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	97.9	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	98	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	98.3	4	Single		4	8		10	4	4	5	4	6	23	4	49				90%	94%	80%	100%	33			
G050	98.7	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	98.9	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	99.1	4	Single		4	8		10	4	1	1	4	6	16	4	42				90%	94%	80%	100%	28			
G050	99.5	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	99.6	4	Single		4	8		10	4	4	1	4	6	19	4	45				90%	94%	80%	100%	30			
G050	99.8	1.5	Domain	10	2	3	12	8	4				6		4		**28**	**34**	**36**	90%	94%	80%	100%		**19**	**23**	**24**
G050	100	1.5	Single		2	3		8	4	4	1	4	6	19	4	36				90%	94%	80%	100%	24			
G050	100.1	1.5	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			
G050	100.2	1.5	Single		2	3		8	4	4	1	2	6	17	4	34				90%	94%	80%	100%	23			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	100.6	1.5	Single		2	3		8	4	0	1	0	6	11	4	28				90%	94%	80%	100%	19			
G050	101.1	1.5	Single		2	3		8	4	1	1	2	6	14	4	31				90%	94%	80%	100%	21			
G050	101.3	3.5	Domain	20	4	13	4	10	4				6		4		**46**	**52**	**54**	90%	94%	80%	100%		**31**	**35**	**37**
G050	101.6	3.5	Single		4	13		10	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G050	101.7	3.5	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G050	101.9	3.5	Single		4	13		10	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G050	102.1	3.5	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G050	102.2	3.5	Single		4	13		10	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G050	102.6	3.5	Single		4	13		10	4	4	5	2	6	21	4	52				90%	94%	80%	100%	35			
G050	103.1	3.5	Single		4	13		10	4	4	5	2	6	21	4	52				90%	94%	80%	100%	35			
G050	103.3	3.5	Single		4	13		10	4	4	5	2	6	21	4	52				90%	94%	80%	100%	35			
G050	103.5	3.5	Single		4	13		10	4	4	5	2	6	21	4	52				90%	94%	80%	100%	35			
G050	103.8	3.5	Single		4	13		10	4	0	5	0	6	15	4	46				90%	94%	80%	100%	31			
G050	104	3.5	Single		4	13		10	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G050	104.2	3.5	Single		4	13		10	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G050	104.8	3.2	Domain	10	2	3	31	5	4				6		4		**30**	**31**	**31**	90%	94%	80%	100%		**20**	**21**	**21**
G050	106.1	3.2	Single		2	3		5	4	4	1	2	6	17	4	31				90%	94%	80%	100%	21			
G050	106.8	3.2	Single		2	3		5	4	4	0	2	6	16	4	30				90%	94%	80%	100%	20			
G050	108	3.8	Domain	10	2	8	26	5	4				6		4		**33**	**37**	**40**	90%	94%	80%	100%		**22**	**25**	**27**
G050	108.1	3.8	Single		2	8		5	4	1	1	4	6	16	4	35				90%	94%	80%	100%	24			
G050	108.3	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	108.4	3.8	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G050	109.1	3.8	Single		2	8		5	4	4	5	2	6	21	4	40				90%	94%	80%	100%	27			
G050	109.3	3.8	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G050	109.4	3.8	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G050	109.5	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	109.5	3.8	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G050	109.6	3.8	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G050	109.6	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G050	109.7	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	109.8	3.8	Single		2	8		5	4	1	1	2	6	14	4	33				90%	94%	80%	100%	22			
G050	109.9	3.8	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G050	110.7	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	110.8	3.8	Single		2	8		5	4	1	5	2	6	18	4	37				90%	94%	80%	100%	25			
G050	111.1	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	111.7	3.8	Single		2	8		5	4	4	1	4	6	19	4	38				90%	94%	80%	100%	26			
G050	111.8	2.7	Domain	2	1	3	37	5	4				6		4		**32**	**32**	**32**	90%	94%	80%	100%		**22**	**22**	**22**
G050	114.4	2.7	Single		1	3		5	4	4	1	4	6	19	4	32				90%	94%	80%	100%	22			

coffey mining

Geotechnical Analysis

RMR & MRMR

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	93.1	1.2	Domain	0.5	0	3	8	8	4				1		4		**31**	**31**	**31**	90%	94%	80%	100%		**21**	**21**	**21**
G051	93.1	1.2	Single		0	3		8	4	4	5	2	1	16	4	31				90%	94%	80%	100%	21			
G051	94.3	1.7	Domain	0.5	0	17	58	5	4				3		4		**44**	**44**	**44**	90%	94%	80%	100%		**30**	**30**	**30**
G051	94.3	1.7	Single		0	17		5	4	4	5	2	3	18	4	44				90%	94%	80%	100%	30			
G051	96	5.1	Domain	10	2	8	6	8	4				5		4		**35**	**44**	**44**	90%	94%	80%	100%		**24**	**30**	**30**
G051	96.1	5.1	Single		2	8		8	4	4	1	4	5	18	4	40				90%	94%	80%	100%	27			
G051	96.7	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	96.8	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	96.9	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97	5.1	Single		2	8		8	4	4	1	4	5	18	4	40				90%	94%	80%	100%	27			
G051	97.1	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.2	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.4	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.5	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.6	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.7	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	97.8	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	97.9	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	98	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	98.2	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	98.4	5.1	Single		2	8		8	4	4	1	4	5	18	4	40				90%	94%	80%	100%	27			
G051	98.5	5.1	Single		2	8		8	4	4	5	4	5	22	4	44				90%	94%	80%	100%	30			
G051	98.7	5.1	Single		2	8		8	4	4	1	4	5	18	4	40				90%	94%	80%	100%	27			
G051	98.9	5.1	Single		2	8		8	4	1	1	2	5	13	4	35				90%	94%	80%	100%	24			
G051	99.9	5.1	Single		2	8		8	4	1	5	2	5	17	4	39				90%	94%	80%	100%	26			
G051	101.1	0.6	Domain	0.5	0	3	165	5	4				5		4		**27**	**27**	**27**	90%	94%	80%	100%		**18**	**18**	**18**
G051	101.1	0.6	Single		0	3		5	4	1	1	4	5	15	4	27				90%	94%	80%	100%	18			
G051	101.7	2.8	Domain	10	2	8	9	8	4				6		4		**36**	**41**	**45**	90%	94%	80%	100%		**24**	**28**	**30**
G051	102	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	102.2	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	102.3	2.8	Single		2	8		8	4	1	1	2	6	14	4	36				90%	94%	80%	100%	24			
G051	102.5	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	102.6	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	102.9	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	103	2.8	Single		2	8		8	4	1	1	2	6	14	4	36				90%	94%	80%	100%	24			
G051	103.1	2.8	Single		2	8		8	4	1	1	2	6	14	4	36				90%	94%	80%	100%	24			
G051	103.2	2.8	Single		2	8		8	4	1	1	2	6	14	4	36				90%	94%	80%	100%	24			
G051	103.5	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	103.6	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	103.8	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	104	2.8	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	104.2	2.8	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	104.3	2.8	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	104.4	2.8	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	104.5	2.2	Domain	20	4	8	10	8	4				6		4		**43**	**43**	**47**	90%	94%	80%	100%		**29**	**29**	**32**
G051	104.6	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	104.7	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	104.8	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	105.5	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	105.6	2.2	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	105.7	2.2	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G051	105.8	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	106	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	106.1	2.2	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	106.3	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	106.4	2.2	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	106.6	2.2	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	106.7	1.9	Domain	10	2	8	4	10	4				6		4		**41**	**45**	**45**	90%	94%	80%	100%		**28**	**30**	**30**
G051	106.8	1.9	Single		2	8		10	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G051	107	1.9	Single		2	8		10	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G051	107.2	1.9	Single		2	8		10	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G051	107.3	1.9	Single		2	8		10	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G051	108.5	1.9	Single		2	8		10	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G051	108.6	2	Domain	10	2	17	7	8	4				6		4		**48**	**50**	**54**	90%	94%	80%	100%		**32**	**34**	**37**
G051	108.7	2	Single		2	17		8	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G051	108.9	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	109	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	109.1	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	109.3	2	Single		2	17		8	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G051	109.4	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	109.6	2	Single		2	17		8	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G051	109.7	2	Single		2	17		8	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			
G051	109.8	2	Single		2	17		8	4	4	5	4	6	23	4	54				90%	94%	80%	100%	37			
G051	110	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	110.3	2	Single		2	17		8	4	4	1	2	6	17	4	48				90%	94%	80%	100%	32			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	110.5	2	Single		2	17		8	4	4	1	4	6	19	4	50				90%	94%	80%	100%	34			
G051	110.6	2	Domain	10	2	8	12	8	4				6		4		**36**	**41**	**43**	90%	94%	80%	100%		**24**	**28**	**29**
G051	110.7	2	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	110.8	2	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	110.9	2	Single		2	8		8	4	1	5	4	6	20	4	42				90%	94%	80%	100%	28			
G051	111.1	2	Single		2	8		8	4	1	5	2	6	18	4	40				90%	94%	80%	100%	27			
G051	111.2	2	Single		2	8		8	4	1	1	2	6	14	4	36				90%	94%	80%	100%	24			
G051	111.6	2	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	111.7	2	Single		2	8		8	4	1	0	4	6	15	4	37				90%	94%	80%	100%	25			
G051	111.8	2	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	112.1	2	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	112.3	2	Single		2	8		8	4	4	5	2	6	21	4	43				90%	94%	80%	100%	29			
G051	112.6	2.8	Domain	0.5	0	3	35	5	4				6		4		**30**	**30**	**30**	90%	94%	80%	100%		**20**	**20**	**20**
G051	112.6	2.8	Single		0	3		5	4	1	5	2	6	18	4	30				90%	94%	80%	100%	20			
G051	115.4	3.9	Domain	20	4	13	7	8	4				6		4		**43**	**48**	**52**	90%	94%	80%	100%		**29**	**32**	**35**
G051	115.6	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	116	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	116.2	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	116.3	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	116.4	3.9	Single		4	13		8	4	1	1	2	6	14	4	43				90%	94%	80%	100%	29			
G051	116.5	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	116.7	3.9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	117	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	117.1	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	117.2	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	117.3	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	117.6	3.9	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	117.7	3.9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	117.8	3.9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	118.1	3.9	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	118.3	3.9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	118.6	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	118.7	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	119	3.9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	119.3	10.3	Domain	20	4	13	7	8	4				6		4		**45**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**
G051	119.5	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	119.6	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	119.7	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	119.8	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	119.8	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	119.9	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	120.1	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	120.2	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	120.2	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	120.4	10.3	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	120.8	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	121	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	121	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.1	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.2	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.4	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.5	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.6	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	121.7	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	121.7	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	121.9	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	122.5	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	122.7	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	122.8	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123.2	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123.2	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123.4	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123.5	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	123.7	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	123.9	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	124.1	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	124.2	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	124.6	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	124.7	10.3	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G051	124.9	10.3	Single		4	13		8	4	4	1	2	6	17	4	46				90%	94%	80%	100%	31			
G051	125	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	125.2	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	125.3	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	125.4	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	125.6	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	125.8	10.3	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	126	10.3	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	126.4	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	126.5	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	126.8	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	127	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	127.3	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	127.5	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	127.7	10.3	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	127.9	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	128	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			

Hole ID	**From (m)**	**Interval (m)**	**Row Type**	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	128.1	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	128.3	10.3	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	128.7	10.3	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	129.6	9	Domain	20	4	13	7	8	4				6		4		**44**	**48**	**52**	90%	94%	80%	100%		**30**	**32**	**35**
G051	129.7	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	129.7	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	129.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	130	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	130.1	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	130.3	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	130.4	9	Single		4	13		8	4	4	0	4	6	18	4	47				90%	94%	80%	100%	32			
G051	130.5	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	130.6	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	130.8	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	131.1	9	Single		4	13		8	4	4	0	2	6	16	4	45				90%	94%	80%	100%	30			
G051	131.3	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	131.4	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	132.1	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	132.2	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	132.7	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	132.8	9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	132.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	132.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	133.1	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	133.2	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	133.2	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	133.3	9	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	133.7	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	133.9	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	134	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	134.2	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	134.3	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	134.5	9	Single		4	13		8	4	4	5	2	6	21	4	50				90%	94%	80%	100%	34			
G051	134.6	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	134.7	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	134.8	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	134.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	135	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	135.1	9	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	135.2	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	135.3	9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	135.4	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	135.6	9	Single		4	13		8	4	1	1	4	6	16	4	45				90%	94%	80%	100%	30			
G051	135.8	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	135.9	9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	136	9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	136.1	9	Single		4	13		8	4	1	0	4	6	15	4	44				90%	94%	80%	100%	30			
G051	136.7	9	Single		4	13		8	4	4	5	4	6	23	4	52				90%	94%	80%	100%	35			
G051	136.8	9	Single		4	13		8	4	4	0	2	6	16	4	45				90%	94%	80%	100%	30			
G051	136.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	137.2	9	Single		4	13		8	4	1	5	4	6	20	4	49				90%	94%	80%	100%	33			
G051	137.8	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	137.9	9	Single		4	13		8	4	4	1	4	6	19	4	48				90%	94%	80%	100%	32			
G051	138.3	9	Zone (natural)		4	13		8	4	4	1	4	6	19	4					90%	94%	80%	100%				
G051	138.6	3	Domain	20	4	8	8	8	4				6		4		**40**	**45**	**47**	90%	94%	80%	100%		**27**	**30**	**32**
G051	138.7	3	Single		4	8		8	4	1	1	4	6	16	4	40				90%	94%	80%	100%	27			
G051	139	3	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	139.1	3	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	139.2	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	139.4	3	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G051	139.6	3	Single		4	8		8	4	4	5	2	6	21	4	45				90%	94%	80%	100%	30			
G051	139.7	3	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	139.8	3	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	139.9	3	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	139.9	3	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G051	140	3	Single		4	8		8	4	4	1	2	6	17	4	41				90%	94%	80%	100%	28			
G051	140.2	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	140.3	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	140.6	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	140.7	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	140.9	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	141	3	Single		4	8		8	4	4	1	4	6	19	4	43				90%	94%	80%	100%	29			
G051	141.2	3	Single		4	8		8	4	1	5	4	6	20	4	44				90%	94%	80%	100%	30			
G051	141.3	3	Single		4	8		8	4	4	5	4	6	23	4	47				90%	94%	80%	100%	32			
G051	141.5	3	Single		4	8		8	4	4	0	2	6	16	4	40				90%	94%	80%	100%	27			
G051	141.6	1.5	Domain	10	2	8	11	8	4				6		4		**38**	**41**	**45**	90%	94%	80%	100%		**26**	**28**	**30**
G051	141.9	1.5	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	142.5	1.5	Single		2	8		8	4	4	0	2	6	16	4	38				90%	94%	80%	100%	26			
G051	142.6	1.5	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	142.7	1.5	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	142.8	1.5	Single		2	8		8	4	4	5	4	6	23	4	45				90%	94%	80%	100%	30			
G051	142.9	1.5	Single		2	8		8	4	1	1	4	6	16	4	38				90%	94%	80%	100%	26			
G051	143	1.5	Single		2	8		8	4	4	1	4	6	19	4	41				90%	94%	80%	100%	28			
G051	143.1	2.7	Domain	20	4	17	6	8	4				6		4		**49**	**52**	**56**	90%	94%	80%	100%		**33**	**35**	**38**
G051	143.4	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	143.8	2.7	Single		4	17		8	4	1	1	4	6	16	4	49				90%	94%	80%	100%	33			
G051	143.9	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	144	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.2	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.2	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.4	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.5	2.7	Single		4	17		8	4	4	5	4	6	23	4	56				90%	94%	80%	100%	38			
G051	144.5	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.6	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	144.9	2.7	Single		4	17		8	4	1	1	4	6	16	4	49				90%	94%	80%	100%	33			
G051	145.1	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	145.2	2.7	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	145.4	2.7	Single		4	17		8	4	4	5	2	6	21	4	54				90%	94%	80%	100%	37			
G051	145.7	2.7	Single		4	17		8	4	4	5	2	6	21	4	54				90%	94%	80%	100%	37			
G051	145.8	0.3	Domain	10	2	8	27	5	4				6		4		**35**	**36**	**40**	90%	94%	80%	100%		**24**	**24**	**27**
G051	145.9	0.3	Single		2	8		5	4	4	1	2	6	17	4	36				90%	94%	80%	100%	24			
G051	146.1	0.3	Single		2	8		5	4	4	5	2	6	21	4	40				90%	94%	80%	100%	27			
G051	146.1	0.3	Single		2	8		5	4	4	0	2	6	16	4	35				90%	94%	80%	100%	24			
G051	146.1	3.9	Domain	20	4	17	4	10	4				6		4		**51**	**54**	**58**	90%	94%	80%	100%		**35**	**37**	**39**
G051	146.2	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	146.3	3.9	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G051	146.4	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	146.7	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	147.1	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	147.2	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	147.3	3.9	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G051	147.5	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	147.6	3.9	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G051	147.7	3.9	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G051	148.1	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	148.3	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	148.5	3.9	Single		4	17		10	4	4	1	2	6	17	4	52				90%	94%	80%	100%	35			
G051	149.6	3.9	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	150	3.1	Domain	20	4	17	5	8	4				6		4		**50**	**52**	**60**	90%	94%	80%	100%		**34**	**35**	**41**
G051	150.5	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	150.8	3.1	Single		4	17		8	4	4	5	4	6	23	4	56				90%	94%	80%	100%	38			
G051	151.4	3.1	Single		4	17		8	4	4	5	4	6	23	4	56				90%	94%	80%	100%	38			
G051	151.6	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	151.7	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.1	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.2	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.3	3.1	Single		4	17		8	4	4	1	2	6	17	4	50				90%	94%	80%	100%	34			
G051	152.4	3.1	Single		4	17		8	4	6	5	6	6	27	4	60				90%	94%	80%	100%	41			
G051	152.5	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.6	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.8	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	152.9	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	153	3.1	Single		4	17		8	4	4	1	4	6	19	4	52				90%	94%	80%	100%	35			
G051	153.1	3.5	Domain	20	4	17	4	10	4				6		4		**51**	**54**	**58**	90%	94%	80%	100%		**35**	**37**	**39**
G051	153.3	3.5	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G051	153.6	3.5	Single		4	17		10	4	1	1	4	6	16	4	51				90%	94%	80%	100%	35			
G051	153.7	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	154.1	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	154.4	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	154.6	3.5	Single		4	17		10	4	1	5	4	6	20	4	55				90%	94%	80%	100%	37			
G051	154.8	3.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G051	154.9	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	155.1	3.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			
G051	156	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			

Hole ID	From (m)	Interval (m)	Row Type	Est/Tested UCS	Factor A1	Factor A2	Fractures per metre	Factor A3	Defect Length E1	Separation E2	Roughness E3	Infill E4	Weathering E5	Factor A4	Factor A5	RMR (defect/set)	RMR Min	RMR Median	RMR Max	Weathering	Blasting	Orientation	Stress	MRMR	MRMR Min	MRMR Median	MRMR Max
G051	156.1	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	156.3	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	156.4	3.5	Single		4	17		10	4	4	1	4	6	19	4	54				90%	94%	80%	100%	37			
G051	156.5	3.5	Single		4	17		10	4	4	5	4	6	23	4	58				90%	94%	80%	100%	39			

Appendix F

Existing Pit Slope Data

Section	Bench	Bench Height(m)	Batter Angle(°)	Berm Width (m)	Overall angle(°)
A	1	19.69	44.923	12.045	33.368
	2	10.293	55.474	15.985	
	3	10.113	57.705	8.915	
	4	11.535	60.577	8.677	
	5	9.54	51.525	6.827	
	6	7.838	53.345	8.184	
	7	19.975	43.311	7.05	
	8	7.199	48.839	6.616	
	9	14.064	40.043		
B	1	11.745	34.363	9.605	30.554
	2	4.255	30.322	22.38	
	3	14.479	61.938	9.213	
	4	9.612	49.037	6.268	
	5	11.591	62.612	10.545	
	6	10.381	63.204	4.52	
	7	7.285	36.756	8.514	
	8	19.942	49.259	11.923	
	9	7.501	44.76	5.099	
	10	11.299	47.705	7	
	11	7.653	55.092		
C	1	6.621	50.937	14.126	29.565
	2	8.576	68.284	36.809	
	3	16.568	38.463	3.615	
	4	7.386	61.487	7.603	
	5	10.526	59.06	6.269	
	6	10.003	53.545	7.405	
	7	7.67	53.082	5.644	
	8	8.768	51.059	5.417	
	9	10.666	51.665	12.573	
	10	7.807	48.682	8.292	
	11	9.778	57.648	11.208	
	12	8.591	57.571	12.385	
	13	6.509	72.596		
D	1	17.829	79.076	19.845	28.411
	2	8.524	32.005	6.85	
	3	8.609	62.257	15.625	
	4	6.553	49.828	20.072	
	5	19.229	41.123	3.128	
	6	8.022	32.507	11.041	
	7	8.099	52.254	4.245	
	8	10.808	47.719	10.915	
	9	8.868	36.367	5.321	
	10	8.132	47.75	6.731	
	11	9.241	52.038	13.043	
	12	6.411	41.265		

	1.1	9.074	43.182	18.623	
	2	9.466	72.558	11.003	
	3	5.133	41.597	13.768	
	4	3.815	39.114	8.78	
	5	7.302	35.133	8.897	
	6	8.82	55.135	12.047	
	7	8.706	38.363	11.643	
E	8	7.047	43.798	9.319	27.225
	9	9.848	54.413	15.418	
	10	18.174	45.797	6.145	
	11	8.801	57.098	6.894	
	12	5.161	47.823	5.931	
	13	9.074	46.294	19.311	
	14	8.152	46.544	11.875	
	15	3.627	34.994		
	1	2.918	34.669	20.286	
	2	7.582	42.494	13.675	
	3	11.909	54.767	9.294	
	4	11.332	30.252	12.091	
	5	6.454	52.856	7.861	
	6	9.143	55.228	12.161	
	7	8.88	54.642	11.338	
F	8	7.126	36.868	11.525	26.386
	9	9.544	53.555	15.654	
	10	18.182	48.077	6.338	
	11	8.719	50.852	3.7	
	12	5.384	44.058	9.807	
	13	10.561	43.158	18.015	
	14	7.461	66.436	12.039	
	15	3.786	38.028		

* Note Berm width refers to the berm below the slope

** Benches numbered from the top to the bottom of the slope

Appendix G

List of Three-dimensional Surface Files

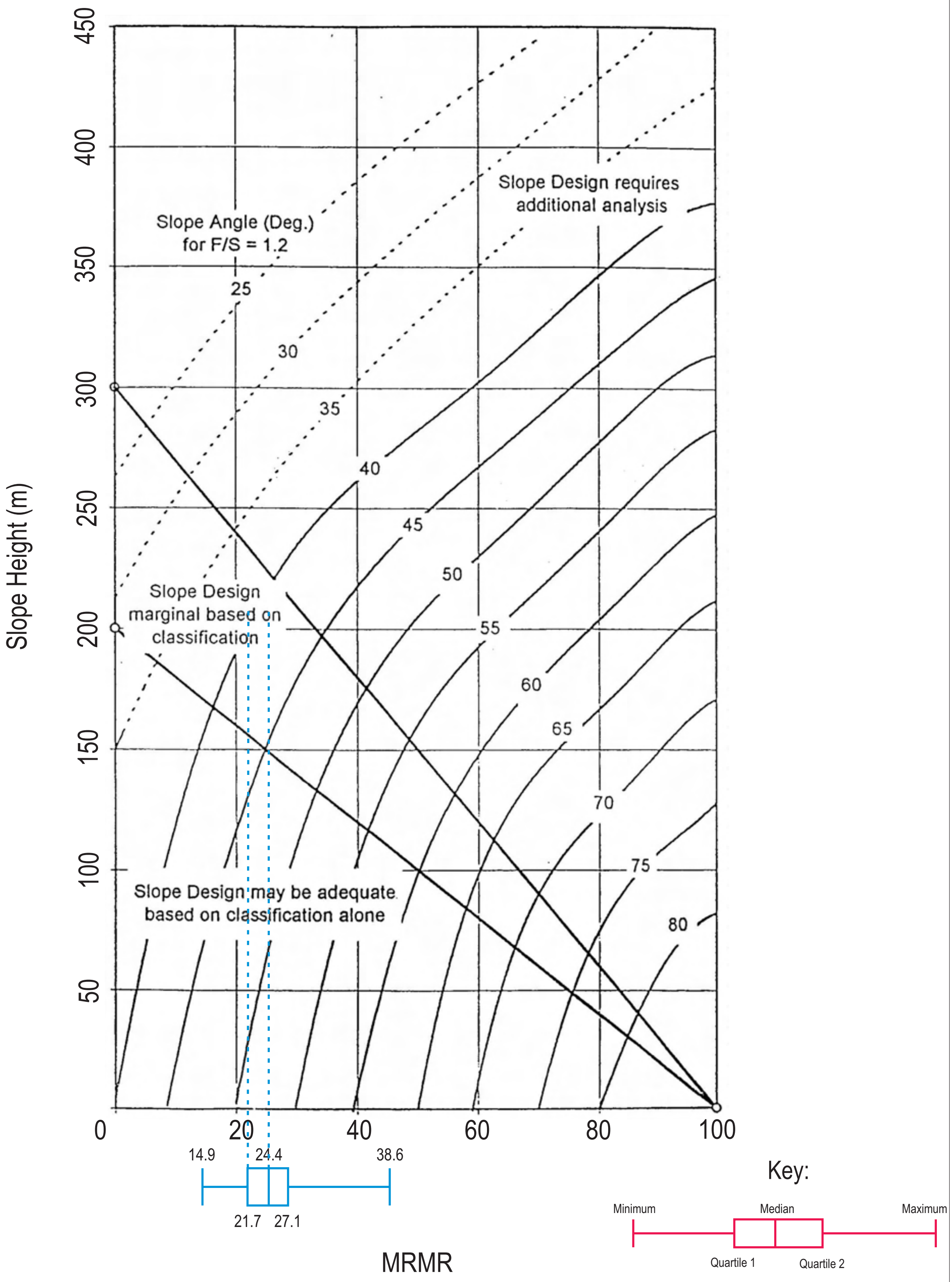
Folder Name	File Name	Description
Basement	basement_contour.str	10m Contours of the seafloor
Basement	bot_sand _extended.dtm	Bottom of sand plane extended out using data from BHC, CB, G0, M, WB drillholes only
Basement	bot_sand with resource holes.str	Base of sand intersection points from all drillholes
Basement	cong_top.dtm	Top of the conglomerate plane
Basement	hnfl_volc_bound_southwest.dtm	Hornfels/Volcanics boundary identified from drillhole database located in the SW
Basement	hornfels_volcanic boundarystr6.dtm	Hornfels/Volcanics boundary identified from drillhole database located between the Decline and Grassy River faults
Basement	sandbase_contours_5m.str	5m contours of the sand base layer
Basement	top_volc with resource holes.str	Top of volcanic intersections from all holes in the database
Basement	top_volc_extended.dtm	Top of volcanics extended plane from BHC, CB, G0, M, WB drillholes only
Basement	volcanics_top_contours_5m.str	5m contours of the top_volc_extended plane
Drillhole Database	Complete_Drillhole_DB_SURPAC.ddb	SURPAC Database recognition file
Drillhole Database	Complete_Drillhole_DB_SURPAC.mdb	Drillhole database contains all received data
Faults	Swan_Splay.dtm	Small splay from swan fault
Faults	q-fault.dtm	New fault defined by borehole intersection
Faults	3f pit intersect.str	No. 3 Fault intersection line with 10 year pit
Faults	central fault.dtm	Central Fault plane
Faults	cf pit intersect.str	Central Fault intersection line with 10 year pit
Faults	decline fault 1.dtm	Decline Fault plane 1
Faults	decline fault 2.dtm	Decline Fault plane 2
Faults	decline hanging wall fault.dtm	Fault plane that was identified from drillhole information located parallel with decline fault
Faults	df 1 pit intersect.str	Decline Fault 1 intersection line with 10 year pit
Faults	df 2 pit intersect.str	Decline Fault 2 intersection line with 10 year pit
Faults	grf pit intersect.str	Grassy River Fault intersection line with 10 year pit
Faults	grf_edited.dtm	GRF edited to include new information from borehole intersections
Faults	nf1 pit intersect.str	North Fault 1 intersection line with 10 year pit
Faults	nf2 pit intersect.str	North Fault 2 intersection line with 10 year pit
Faults	no 3 fault.dtm	No. 3 Fault Plane
Faults	swan fault1.dtm	Swan Fault Plane
Faults	swan_pit5_intersection1.str	Swan Fault intersection line with 10 year pit
Faults	wedge fault.dtm	Wedge Fault plane
Faults	wf pit intersect.str	Wedge Fault intersection line with 10 year pit
Pit_Constraints	bot_sand_extended.dtm	Bottom of sand plane extended out using data from BHC, CB, G0, M, WB drillholes only
Pit_Constraints	fill_base.dtm	Base of fill
Pit_Constraints	grf_10mhw.dtm	Plane 10m away from the GRF on the hanging wall
Pit_Constraints	grf_edited.dtm	GRF edited to include new information from borehole intersections
Pit_Constraints	sandbase_contours.str	20m, 30m, 50m Base of sand contours
Pit_Constraints	sandbase_contours_20m.dtm	Plane depicting location of the 20m contour of the base of sand
Pit_Constraints	sandbase_contours_30m.dtm	Plane depicting location of the 30m contour of the base of sand
Pit_Constraints	sandbase_contours_50m.dtm	Plane depicting location of the 50m contour of the base of sand
Pit_Constraints	sandbase_contours_5m.dtm	Base of sand Plane

Folder Name	File Name	Description
Pit_Constraints	volcanic_grf_intersect_vertical.dtm	Vertical plane of the GRF
Sea Wall	cut_off_wall_cl3.dtm	Plane of the planned cut off wall
Sea Wall	original shoreline.str	Line depicting the location of the original shoreline
Stage Designs	s1-4_v8a_gda.str	Outlines of pit stages 1-5
Stage Designs	s5_v8a_gda.dtm	DTM of the 10 year pit design
Stage Designs	s5_v8a_gda_boundary.str	Outline of the 10 year pit
Topo	coastline.str	Coastline outline
Topo	fill_base.dtm	Base of fill
Topo	original pit.dtm	Topography of the area around the original pit
Topo	pre_mining_seafloor.dtm	Original seafloor before mining began
Topo	pre_mining_seafloor_contourlines.str	Contours of the original seafloor
Topo	sea floor.dtm	Sea floor topography
Topo	topo_contours_5m.str	5m topography contours not including seafloor
Topo	topo_gda.dtm	DTM of the land topography to the shoreline

Appendix H

Haines Charts

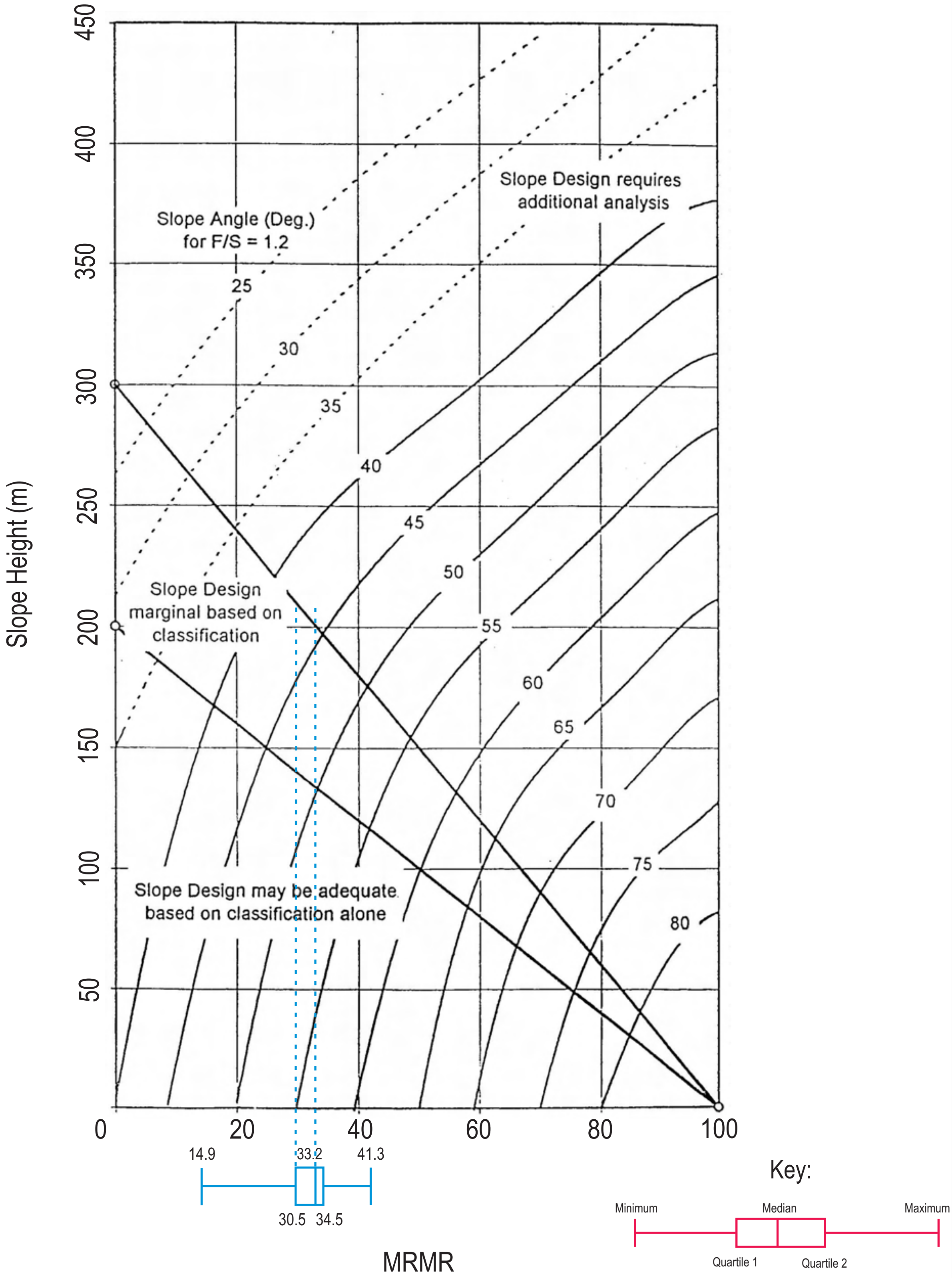
DESIGN CHART FOR THE DETERMINATION OF SLOPE ANGLE USING MRMR CLASSIFICATION DATA



Reference: Preliminary estimatation of rock slope stability using rock mass classification systems. 7th Int. Cong. on Rock Mech. ISRM Rachen 1991. Haines, A.;Terbrugge, P.J.

Coffey Mining Pty Ltd	ABN 52 065 481 209		
Drawn	SE	Dolphin Joint Venture King Island Scheelite Mine Domain 2 Haines Chart	FIGURE H1
Approved	JS		
Date	02/06/2009		
Scale	N/A		Job no: MINENHIL00237AB

DESIGN CHART FOR THE DETERMINATION OF SLOPE ANGLE USING MRMR CLASSIFICATION DATA



Reference: Preliminary estimatation of rock slope stability using rock mass classification systems. 7th Int. Cong. on Rock Mech. ISRM Rachen 1991. Haines, A.;Terbrugge, P.J.

Coffey Mining Pty Ltd	**ABN 52 065 481 209**		
Drawn	SE	Dolphin Joint Venture King Island Scheelite Mine Domain 4 - Haines Chart	FIGURE H2
Approved	JS		
Date	02/06/2009		
Scale	N/A		**Job no: MINENHIL00237AB**

Appendix I

Geotechnical Analysis – GSI

Domain 2		
Hoek Brown Classification		
sigci	150	MPa
GSI	40	
mi	25	
D	0.7	
Ei	12000	
Hoek Brown Criterion		
mb	0.925124	
s	0.000167	
a	0.511368	
Failure Envelope Range		
Application	Slopes	
sig3max	3.67628	MPa
Unit Weight	0.03	MN/m3
Slope Height	150	m
Mohr-Coulomb Fit		
c	**1.19**	**MPa**
phi	**44.7**	**degrees**
Rock Mass Parameters		
sigt	-0.02713	MPa
sigc	1.75761	MPa
sigcm	18.3151	MPa
Erm	698.764	MPa

Domain 4		
Hoek Brown Classification		
sigci	150	MPa
GSI	55	
mi	25	
D	0.7	
Ei	12000	
Hoek Brown Criterion		
mb	2.10928	
s	0.001471	
a	0.504048	
Failure Envelope Range		
Application	Slopes	
sig3max	3.83029	MPa
Unit Weight	0.03	MN/m3
Slope Height	150	m
Mohr-Coulomb Fit		
c	**1.74**	**MPa**
phi	**51.3**	**degrees**
Rock Mass Parameters		
sigt	-0.10462	MPa
sigc	5.60335	MPa
sigcm	28.8966	MPa
Erm	1771.74	MPa

Domain 2 GSI=RMR-5		
Hoek Brown Classification		
sigci	150	MPa
GSI	31	
mi	25	
D	0.7	
Ei	12000	
Hoek Brown Criterion		
mb	0.564208	
s	4.54E-05	
a	0.520889	
Failure Envelope Range		
Application	Slopes	
sig3max	3.57749	MPa
Unit Weight	0.03	MN/m3
Slope Height	150	m
Mohr-Coulomb Fit		
c	**0.94**	**MPa**
phi	**40.1**	**degrees**
Rock Mass Parameters		
sigt	-0.01207	MPa
sigc	0.82016	MPa
sigcm	13.5318	MPa
Erm	449.3	MPa

Domain 4 GSI=RMR-5		
Hoek Brown Classification		
sigci	150	MPa
GSI	44	
mi	25	
D	0.7	
Ei	12000	
Hoek Brown Criterion		
mb	1.15252	
s	0.000299	
a	0.508658	
Failure Envelope Range		
Application	Slopes	
sig3max	3.71796	MPa
Unit Weight	0.03	MN/m3
Slope Height	150	m
Mohr-Coulomb Fit		
c	**1.32**	**MPa**
phi	**46.6**	**degrees**
Rock Mass Parameters		
sigt	-0.03888	MPa
sigc	2.41669	MPa
sigcm	20.7593	MPa
Erm	883.36	MPa

Appendix J

Bibliography of Previous Reports

Report #	Date	Title	Author	Company	Comments	Filename	File Location
1	1/07/1973	Engineering Geology of the Dolphin Orebody	D.H. Moore	Geopeko Limited	Stability assessment of decline and C Lens hanging wall	Engineering Geology 93-3462.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\4. Underground Mine Geotech
2	1/09/1978	Stress Measurement in a Post Pillar Operation, Wedge Area, Dolphin Mine	J.R. Barrett, M. Wical, and I. Hulls	CSIRO	Post pillar stresses and analysis	Stress Measurement, Wedge Area, Dolphin Mine CSIRO 1978.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\4. Underground Mine Geotech
3	1/07/1991	King Island Scheelite Rehabilitation Plan		John Miedecke and Partners Pty Ltd	Analysis of environment and water quality at KI	J.Miedecke.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
4	13/11/1995	Experience with Different Underground Mining Methods at Dolphin Mine of King Island Scheelite	A. Fudge and D k. Nag		Discusses the mining methods used at KI. Summary of mining costs	Appendix_3_PaperOnDifferent MiningMethods_Kalgoorlie_951113.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\4. Underground Mine Geotech
5	1/04/2002	Tungsten from King Island Scheelite		Clough Engineering Limited	Uses and prices of Tungsten, world needs for tungsten and other mines extracting tungsten.	Clough RPT April 2002 Scan.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
6	1/10/2005	Dewatering Management Plan	SEB, JMC	GTN Resources Pty Ltd		SEMF Dewatering Plan Oct 05.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
7	1/01/2006	King Island Seawall Proposal for Engineering Services		GHD	Proposal to design Seawall	GHD Jan 06 Proposal.doc	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
8	1/04/2006	Draft Report on Sea Wall		GHD	Draft version of the May Seawall report	GHD Seawall Report April 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
9	4/04/2006	Laboratory Work		Analytical Services Tasmania	Lab assay results on water samples	Report28284_1_Fax_4744.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
10	1/05/2006	Report on Sea Wall		GHD	Seawall design, WB series boreholes	GHD Seawall May 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
11	1/05/2006	Report on Sea Wall		GHD	Final version of May Seawall report	GHD Seawall Report May 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
12	2/05/2006	Drawings	MRH	GHD	Technical drawings of mine site focusing on the design and specifications of seawall	GHD May 2006 drawings.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
13	2/05/2006	G003 Pit (Memo)	Lindsay Newnham	Newnham Exploration and Mining Services	Discussing Test pit excavated next to G003, discusses issues excavating through mill sands	Lindsay's G003 Test Pit.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
14	5/05/2006	Mercury on King Island			Mercury levels on KI, Assay results of metals present within pit		J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
15	1/07/2006	King Island Sea Wall Addendum Report on Seawall		GHD	Links to May 2006 report. Lists changes to the seawall design	GHD SeaWall Addendum July 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
16	1/07/2006	Preliminary Costing for Dolphin Opencut Mine Operations		Mine Consult	Estimates the costs required to open and run an open cut mine	Mine Consult July 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
17	24/07/2006	King island Scheelite Tailings Storage Facility Geotechnical Investigation and Design Report	Tanya Ford	Coffey Geosciences Pty Ltd	CPT Testing through tailings and overburden, Tailings details. Shallow boreholes of tailings and top of sand. CPT logs	Tailing Report.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\6. Tailings
18	1/09/2006	Preliminary Costing for Dolphin Opencut Mine Operations		Mine Consult	Investigates 2 different production schedules investigating the different costs involved	Mine Consult Sep 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
19	26/09/2006	King Island Scheelite Project Groundwater Studies		Peter Dundon and Associates Pty Ltd	Location of Piezometers, Water level monitoring, Hydraulic testing	Peter Dundon Hydrology Report Sep 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
20	1/10/2006	Pit Optimisation Study and Ore Reserve Estimation	R. Webster	AMC	Optimisation for first 5 pit stages up to 10yr pit, wall angles,	AMC resource and pit Report Final October 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
21	28/11/2006	King Island Scheelite Project Review	Kevin Rosengren	Kevin Rosengren & Associates Pty Ltd	Old Pit design parameters, Location & comments on GRF & DF from old BH data	KIS26016final.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\3. Open Cut Geotech
22	28/11/2006	Mine Redevelopment Feasibility Study Geotechnical Report		Kevin Rosengren & Associates Pty Ltd	Same as report No. 21 with the figures attached	Rosengren_Open Pit Geotech Feasibility Study Nov2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\3. Open Cut Geotech
23	1/12/2006	King Island Scheelite Initial Drill and Blast Review with Respect to Plant Locations and the Township		Peter Bellairs Consulting	Discusses plant locations, blasting issues, managing of blasting processes	King Island Scheelite Blasting Review Nov 2006.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
24	12/12/2006	Prospects for Re-Opening the Dolphin Mine, Grassy, King Island, Tasmania	CE James	Cercaph James & Associates	Discusses possibility of re-opening mine as an underground mine, desk top study using AMC reserve calculations	KIS_ProspectsForRe-openingTheDolphinMine_061212Rev2.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
25	1/01/2007	GHD KI presentation	John Phillips	GHD	Presentation of the proposed seawall info	GHD Presentation Jan 07	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
26	1/01/2007	Review of Potential for Selective Mining		Mine Consult	Discusses options of selective mining or bulk mining	Mineconsult selective mining Jan 07.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study

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27	1/01/2007	Review of Potential for Selective Mining		Mine Consult	Same as report No. 26 with the figures attached	Mine Consult Selective Mining Jan 2007.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
28	13/02/2007	Feasibility Study Executive Summary			Feasibility study , ore zone parameters, Resource figures, Pit design	20070213 BFS Draft Report Exec Summ ML v3marked up AFM.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
29	1/03/2007	Summary Report on Seawall		GHD	Summary of Seawall report details. Seawall design, WB series boreholes, Pit slope stabilities, slope geometries within sand	GHD Seawall Summary Report March 2007.doc	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
30	2/03/2007	Mine Site and Environs		KIS	Location plan of mine and its environs	SEMF Site plan.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
31	1/04/2007	Update for King Island Scheelite	Peter Flood	Mine Consult	Presentation of the mining schedule highlight extraction issues	Mine Consult presentation April 2007.ppt	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
32	24/07/2007	Seawall Drilling - King Island Brief Report	Lindsay Newnham		Brief report on the CB series holes	NEMS Report on CB Holes 07	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
33	1/08/2007	Seawall Development Factual Report on Geotechnical Investigation		GHD	CB Series Borehole Data, SPT data through sands, marine sand lab results	GHD Seawall - Factual Geotech Report Aug 07.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
34	1/08/2007	Preliminary Costing - Update		Minarco-Mine Consult	Comparing bulk mining methods and selective mining methods. Mining costs and equipment required to reopen mine	Mineconsult Aug 2007.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\1. Feasibility Study
35	27/08/2007	Progress Report, Borehole A, Grassy King Island			Summary of Borehole A from 55m-158m	BHA Progress Report.doc	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
36	17/09/2007	Bauer Machine Pictures			Pictures of a dredging machine	Bauer bild8.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
37	22/05/2008	Technical Report on the Geological Interpretation of Airborne Magnetic and Radiometric Data, Grassy, King Island	R. Miller, W. Crowe	Fugro Airborne Surveys Pty Ltd	Geophysical Data, interpreted location of faults and geology, regional radiometric and landsat imaging	1942_Grassy_King Island_Technical_Report_Final.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\7. Geophysics
38	1/06/2008	Open Pit Mining Through Underground Workings Guideline		Government of Western Australia	Hazards of mining open pit in areas where underground mining has occurred, legislative requirements, general hazard ID	Op Mining thru Old Workings Guideline.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\3. Open Cut Geotech
39		Test Locations			Contour Map showing mine location and all borehole/test pits and other test sites.	test locations mga .pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\5. Environment
40		Dam Technology for King Canute	J. Phillips, Y. Sheng, J. Henderson	GHD	Investigation of building dam at Cockatoo Island to keep sea out of mining area.	GHD Cockatoo Island Report.pdf	J:\COFFEY\Melb - Mining\MINENHIL00237AB_King_Island_Scheelite_Geotech\Data\1. Existing Reports\2. Sea Wall
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