Pre-Feasibility Geotechnical Evaluation Phase IV Minto Mine Yukon Territory, Canada

Report Prepared for

Minto Explorations Ltd.

Report Prepared by

SRK Consulting
Engineers and Scientists

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Pre-Feasibility Geotechnical Evaluation for Phase IV
Minto Mine
Yukon Territory, Canada

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Executive Summary

SRK Consulting (US), Inc. (SRK) was requested by Minto Explorations Ltd. (Minto) to carry out a pre-feasibility level geotechnical evaluation for the Area 2, Area 118, Ridgetop and Minto North deposit areas at the Minto Mine in the Yukon Territory, Canada. The following comprised the principle stages of the geotechnical evaluation:

- Discontinuity orientation and geotechnical logging of core;
- Geomechanical laboratory strength testing and geologic materials characterization;
- Development of geotechnical models to provide bases for excavation stability analyses;
- Recommendation of optimal pit slope angles and pit architecture for mine design purposes; and,
- Recommendation of room and pillar dimensions as well as ground support requirements for the alternative underground development of Area 118.

As commissioned, the work reported herein was performed at a pre-feasibility design level.

Geotechnical Data Collection

A geotechnical core logging program was developed to yield information pertinent to modeling of pit slope stability, such as geologic contacts, profiles of rock strength, and characteristics and frequency of discontinuities.

Geotechnical logging, field point load testing and discontinuity orientation of core recovered from a total of eight drill holes were conducted for this investigation. In addition to the eight geotechnical coreholes drilled for this investigation, data from three additional geotechnical coreholes drilled in 2007 as part of the previous SRK (2007) Area 2 Pre-feasibility Pit Slope Evaluation were also considered in the analyses.

Laboratory Testing

Geomechanical testing was conducted at The University of Arizona Rock Mechanics Laboratory in Tucson, Arizona, to determine strength characteristics of the in-situ materials. The overall laboratory program consisted of direct shear, uniaxial and triaxial compressive strength, and direct tensile strength testing and measurement of unit weight and elastic properties. A total of 51 laboratory tests were conducted on samples selected to represent the range of the rock conditions observed in the eight 2009 geotechnical borings.

Laboratory uniaxial axial compressive strength (UCS) testing was conducted on 30 samples, producing the following:

- UCS ranging from 48.9 to 172.3 MPa, with a mean value of 116.0 MPa;
- Young's Moduli ranging from 14.9 to 66.5 GPa, with a mean value of 47.8 GPa; and,
- Poisson's Ratios ranging from 0.084 to 0.302, with a mean value of 0.229.

Triaxial compressive strength (TCS) testing was conducted on six samples of core, yielding compressive strengths (σ_1) ranging between 213.8 and 294 .1MPa with a mean value of 262.1 MPa under confining pressures (σ_3) ranging between 6.9 and 20.7 MPa, with a mean value of 13.8 MPa.

Ten samples of naturally-occurring discontinuities encountered in the core were tested using four-point, small-scale direct shear tests to obtain discontinuity shear strength data, resulting in:

- Calculated friction angles (Φ) ranged from 33° to 46°, with a mean of 36°**;** and,
- Apparent cohesion values ranging from 1 to 22 kPa, with a mean of 10 kPa.

Brazilian disk tension testing was conducted on five samples producing intact tensile strengths ranging from 7.2 to 10.8 MPa, with a mean value of 8.8 MPa.

Prior to actual testing of UCS and TCS core samples, sample dimensions and weights were measured and used to calculate total unit weights for each sample. The combined data set included 36 unit weight measurements ranging from 24.9 to 26.7 kN/m^3 with a 26.2 kN/m3 mean.

Geotechnical Model

For each area under study, a geotechnical model was developed to provide a framework for slope stability modeling by mathematically simulating site geotechnical conditions and then calculating the anticipated response to stress changes resulting from the proposed open pit excavations. A typical geotechnical model is composed of individual regions (domains), each of which is comprised of materials exhibiting internally similar geomechanical properties. Pertinent geotechnical parameters are assigned to each domain defined, based on engineering properties that are determined during field data collection and laboratory testing programs.

To initiate the geotechnical modeling, the basic geotechnical parameters recorded for each core run were applied to the Laubscher (1990) In-situ Rock Mass Rating (IRMR) system, thereby creating a profile of IRMR with depth for each of the eight geotechnical holes drilled for this investigation. Based upon the IRMR as well as upon its individual components, available site geology information and laboratory test results, drill cores were divided into geotechnical intervals or domains that are expected to behave uniformly when exposed to open pit excavation-induced stresses, for each of the deposit areas. Given the relatively consistent nature of geologic materials at Minto, the materials were divided into two basic domains at Area 2, Area 118 and Ridgetop, i.e., weathered and fresh rock. As explained later, the Minto North rock was classified into a single domain.

The weathered rock domain is typically characterized by relatively higher fracture frequencies, consistently lower intact rock strengths and zones of heavy alteration and oxidation as a result of moderate to heavy surface weathering and is typified by core that also typically shows consistently lower RQD and IRMR values. Consequentially, the weathered bedrock is of significantly lower geomechanical quality than is the fresh rock which underlies it.

In general, the fresh rock is consistently a much more competent rock mass than is the weathered bedrock, possessing relatively lower fracture frequencies and higher intact rock strengths. The fresh rock encountered is relatively massive and exhibits fewer signs of alteration and weathering when compared to the weathered rock and, consequently, possesses higher overall RQD and IRMR values.

The fresh rock domains do contain intermittent zones of weaker material which typically correspond to intervals of increased fracturing, weathering and/or alteration, including minor fault zones and surface weathering. However, such intermittent weaker rock zones represent a relatively small portion of the overall fresh rock domain and are not anticipated to adversely impact the performance of the fresh rock mass.

Several zones of foliated granodiorite were encountered in the fresh rock, but those zones exhibited similar intact rock strengths and rock mass properties as did samples of non-foliated granodiorite collected from the same coreholes. The foliated zones are judged to be discontinuous and are not expected to impact overall pit slope stability differently than will the non-foliated zones. Therefore, the foliated and non-foliated rock was grouped together into their respective weathered or fresh domains.

Area 2

A relatively deep soil overburden deposit exists under the northeast portion of the proposed Area 2 pit, consisting primarily of transported silt and fine sand with occasional lenses of clay and coarse sand to gravel. The soil is high in organic content and is known to contain permafrost. It appears that the soil has filled a relatively deep erosional feature on the order of 60 to 90m deep with an invert located between Area 2 and the Main Pit to the north. Previous geotechnical work done by SRK and others have indicated that the material contains permafrost down to near the bedrock contact at its deepest portions and is most likely frozen down to the bedrock contact in shallower portions. Ubiquitously, the upper 1m is "active", i.e., seasonally freezing and thawing.

Based on available information from resource and geotechnical drilling, Area 2 is covered with soil overburden ranging from about 5 to 15m in depth in the southwest portion, with up 20 to 45m along much of the north and east walls, and reaching a maximum depth of 70m at the far north.

While it is possible that the frozen overburden may extend farther south, available information suggests that the overburden at the south and west ends of the proposed Area 2 pit consists of a thin veneer of organic soil underlain by approximately 5m to 15m of completely weathered, in-situ bedrock (granular soil) or residuum.

Based on geotechnical drillhole data, the Area 2 weathered domain is adjudged to extend to depths of approximately 50 to 100m below the current ground surface.

Area 118

The majority of the proposed Area 118 open pit footprint is covered with up to approximately 5m of overburden, except in its southwestern portion, where the soil locally deepens to approximately16m. The depth of bedrock weathering at Area 118 is generally to about 30 to 60m below the current ground surface.

Ridgetop

The western regions of the proposed Ridgetop pits are anticipated to contain 1 to 5m of soil overburden, deepening to the east to from 5 to 15m on the east side and with a maximum depth of 21m at the northeast portion of Ridgetop North and the east portion of Ridgetop South.

The bedrock at Ridgetop is generally weathered to a depth of approximately 45 to 70m below current ground surface.

Minto North

Due to the relatively shallow depth of the Minto North pit and the presence of multiple structures and weaker zones, there was a less significant distinction between the weathered and fresh rock materials and, consequentially, materials at Minto North were combined together into a single domain for modeling.

Model Methodology

Evaluation of the results of the field and laboratory data collection programs indicates a high degree of variation in rock strength and geologic structure at Minto. This natural variability in rock strength and structure suggests that a probability-based method of analyses is most appropriate, yielding less conservative slope angles than would the selection of a unique, potentially over-conservative value, as is typical to strictly deterministic analyses. As such, for this work, model parameters were characterized by statistical distributions of values having a central tendency and some variation around that central tendency, rather than by a single, unique value.

A rock mass shear strength/normal stress relationship was developed for each domain using the Generalized Hoek-Brown strength model (Hoek et al, 2002). Probability density functions (PDF) were selected to represent distributions of Geological Strength Index (GSI), material constant (m_i) and disturbance factor (D). The distributions selected were based on the results of field and laboratory testing as well as on SRK's experience.

Interramp/Overall Slope Stability Analysis

The mathematical geotechnical model was input into the commercially available slope stability modeling software package Slide 5.039 (Slide), developed by Rocscience, Inc. (2003). Slide is a two-dimensional, limit equilibrium slope stability analysis program that analyzes slope stability by various methods of slices, from which Spencer's method was chosen for this evaluation due to its consideration of both force and moment equilibrium.

Results of slope stability modeling generally indicated probabilities of failure (PoF) ranging from near zero to approximately 5%. It should be noted that while a near zero percent probability of failure does demonstrate a very low likelihood of slope instability; it does not imply that slope instability is impossible; rather, a reported zero probability simply indicates that, for the potential failure surfaces characterized by one of 300 samples drawn from the strength distributions defined, no surfaces had a Factor of Safety (FoS) less than 1.0.

Results of Interramp/Overall Slope Stability Modeling

Deposit	Sector	Height (m)	Mean FoS	PoF (%)
Area 2	Northeast	130m	2.5	0.7
Area 2	Southwest	214m	2.1	2.9
Ridgetop	-	130m	2.3	2.4
Minto North	-	130m	2.3	0.0

Given the small size of the proposed Area 118 pit as well as its close proximity and geotechnical similarities to Area 2, additional interramp slope stability modeling was not deemed necessary for Area 118 at the current, pre-feasibility level.

Geologic Discontinuity Analysis

Geologic discontinuities were analyzed at both the pit wall and bench scales. The term discontinuity refers to any break or fracture, ranging from faults at the upper limit to joints at the lower limit, having negligible tensile strength. Discontinuities are formed by a wide range of geological processes and can collectively include most types of joints, faults, fissures, fractures, veins, bedding planes, foliation, shear zones, dikes and contacts.

Major Structures

Major geologic structures are those features, such as faults, dikes, shear zones, and contacts that have dimensions on the same order of magnitude as the area being characterized. These structures are treated as individual elements for design purposes, as opposed to joints, which are handled statistically.

Typically, high angle structures do not adversely impact pit slopes on the overall scale and as such, were not specifically targeted for this pre-feasibility level evaluation. As such, geotechnical drilling at the pre-feasibility evaluation level is targeted to obtain data representative of overall rock mass conditions and, secondarily, to individual structures such as those previously mentioned.

Several faults or shear zones have been identified in resource and geotechnical drilling at all of the subject Minto sites. Most of these structures are not, however, anticipated to significantly impact pit slope stability due to their apparent lack of persistence and to the generally limited degree of rock degradation, e.g., highly plastic gouge development, associated with them. However, the potential for one or more major structures to adversely impact stability of the Area 2 west wall has been identified and, as discussed in the SRK recommendations, should be further investigated as the project advances.

Specifically, both resource and geotechnical drilling in southwestern Area 2 suggest the presence of a major fault or faults, potentially striking sub-parallel to the Area 2 pit west wall, with a moderate to steep northeast dip similar to faults suggested by resource geology in adjacent Area 118. In particular, exploration holes 06SWC082 and 06SWC106 encountered deep brittle structure(s) approximately 279m and 243m, respectively, down hole. Similar indications of fault intercepts were not observed in adjacent holes, thereby suggesting a high dip angle for the structure or structures.

Geotechnical drillholes C09-03 and C07-07 also encountered zones of major rock disturbance at shallower depths that would be consistent with the potential structure(s) and would coincide with the western Area 2 ultimate pit wall.

Major faults at similar orientations are also anticipated through the Area 118 underground mining areas and development.

Rock Fabric

Minor discontinuities such as joints, foliation and bedding planes, represent an infinite population for practical purposes and, due to sampling limitations, are best modeled with stochastic (probabilistic) techniques. A discontinuity set denotes a grouping of discontinuities that are expected to have similar impact upon the proposed design. In open pit design, this criterion is usually modified so that all discontinuities in a similar range of orientations (dip direction and dip) are designated as a single discontinuity set.

Slope angles within an open pit mine are influenced not only by geologic structure, rock mass strength and porewater pressures, but also by pit wall orientation and other operational considerations. The ultimate pits were evaluated for such regions of similar structural characteristics and pit slope orientation called “design sectors” which are expected to exhibit similar response to pit development.

Both the weathered and fresh rock domains at Minto are characterized by relatively strong intact rock strengths and by very similar discontinuity orientations. As such, pit slope design sectors were delineated based primarily on variations in structural (discontinuity) systems relative to mean pit wall orientations.

Field discontinuity measurements were converted into in-situ orientations and the combined data set of discontinuities was divided into categories of which, given sufficient persistence, had the potential to create structurally controlled failures. Plane shear and wedge type failures were evaluated for pit sectors assuming an average orientation of the pit walls in each sector.

Preliminary kinematic analyses indicated that the south and west sectors of Area 2, Area 118 and Ridgetop had potential for bench scale instabilities; consequentially, additional, backbreak analyses were carried out for those sectors. SRK's backbreak analyses use stochastic simulations of discontinuity properties (such as orientation, spacing, persistence, and shear strength) to analyze the likelihood for plane shear and wedge type failures to occur in a given bench configuration and orientation. The analyses yield a distribution of achievable bench face angles and catch bench widths. The interramp/overall and bench stability analyses together yield an optimized pit slope angle, providing of sufficient rock fall containment.

Results indicated that, based on the existing data, achievable mean bench face angles of approximately 64 degrees should be expected for the south and west sectors of Area 2 and Area 118. Due to the flatter discontinuity dips at Ridgetop relative to the anticipated shear strength of the discontinuities, steeper achievable bench face angles, on the order of 73 degrees, are expected for both Ridgetop pits.

While discontinuity analyses indicate that there is a slight potential for bench scale instability in the southwest section of the Minto North pit, the relatively low probability and the relatively small size of the pit, recommendations for Minto North are based on interramp slope angles alone.

Pit Slope Design Recommendations

Based on SRK's experience, interramp/overall slope angles that yield probabilities of failure of up to 30% for slopes with low failure consequences and approximately 5% to 10 % for high failure consequences are appropriate for most open pit mines. Slopes of high failure consequence are generally those slopes that are critical to mine operations, such as those on which major haul roads are established, those providing ingress or egress points to the pit, or those underlying infrastructure such as processing facilities or structures.

In analyses, the interramp angle is typically incrementally increased until a suitable probability of failure equal to or greater than 30% is achieved. The probabilities of instability are plotted against their respective interramp slope angles for each model and the slope angle expected to yield a suitable probability of instability (5% or 30%, depending on failure consequence) is determined.

For certain geologic environments, the combination of the average anticipated bench face angle and the preferred interramp angle, based on global stability considerations, alone, do not provide a sufficiently wide average catch bench width to efficaciously control rockfall and/or overbank slough accumulation. In such instances, recommended interramp angles are flattened sufficiently to provide adequately wide average catch benches.

Based on the criteria described above, pit slope design recommendations for each of the Minto areas are summarized below.

Summary of Pit Slope Design Recommendations

Deposit Area	Sector(s)	Max. Slope Height (m)	Interramp Angle (°)	Bench Face Angle (°)	Bench Height (m)	Berm Width (m)	Stepout Width* (m)
Area 2	Soil Overburden	50	30	30	-	-	15
Area 2	Rock – Northwest and Northeast	170	53	73	18	8	-
Area 2	Rock – South and West	210	47	64	18	8	-
Area 118	Soil Overburden	18	30	30	-	-	15
Area 118	Rock - Northeast	35	53	73	18	8	-
Area 118	Rock - Southwest	36	47	64	18	8	-
Minto North	Soil Overburden	14	30	30	-	-	15
Minto North	Rock	125	52	72	18	8	-
Ridgetop - North	Soil Overburden	13	30	30	-	-	15
Ridgetop - North	Rock	132	53	73	18	8	-
Ridgetop - South	Soil Overburden	19	30	30	-	-	15
Ridgetop - South	Rock	78	53	73	18	8	-

* Where soil overburden depths are anticipated to exceed 7m, a 15m offset or stepout should be incorporated at, or vertically near, the contact between the overburden and the bedrock.

Area 118 Underground Pillar Assessment

In addition to the small open pit at Area 118 previously discussed, underground mining is also planned for Area 118. Based on the geotechnical data previously described, pillar strengths were evaluated in order to recommend suitable pillar dimensions for room and pillar mining. Based on estimates of ore deposit depth and thickness variability, pillar heights of 5m, 10m and 15m were assessed and ore depths, and respective overburden stresses, of 150m, 200m and 250m were considered.

In-situ Rock Mass Rating (IRMR) and Rock Mass Strength (RMS) values were evaluated for the ore zone as well as materials above and below the ore zone in geotechnical drillholes C09-01 and C09-02. An average IRMR and RMS of 55 and 60MPa, respectively, were conservatively estimated for pillar, roof and floor materials. Using Laubscher's (1990) method, the IRMR of 55 was reduced to a Mining Rock Mass Rating (MRMR) of 47 and the 60 MPa RMS to a Design Rock Mass Strength (DRMS) of 51 MPa by applying appropriate reductions for joint orientation, blasting and water.

Based on empirical data presented by Ouchi (2004), assuming a RMR value of 55, the maximum unsupported span distance was estimated to be 6m for all pillar height/deposit depth combinations considered. Subsequently, the tributary area method was used to estimate minimum pillar dimensions required to support 6m x 6m or, if required, lesser, roof spans based on pillar height and overburden stresses. The resultant recommended room and pillar dimensions and extraction ratios are summarized below.

Room and Pillar Size Recommendations

Depth (m)	Pillar Height (m)	Pillar Dimensions (m)	Room Dimensions (m)	Extraction Ratio
150	5	4x4	6x6	84%
150	10	5x5	6x6	79%
150	15	6x6	6x6	75%
200	5	4.5x4.5	6x6	82%
200	10	6x6	6x6	75%
200	15	7.5x7.5	6x6	69%
250	5	5x5	6x6	79%
250	10	7x7	6x6	71%
250	15	8x8	5x5	62%

Based on geotechnical conditions previously described, ground support requirements for development such as declines were estimated as follows:

- Pattern bolting with 2.4m long bolts at a 2m spacing within and between rings; and,
- Welded wire mesh in back and top of walls.

Recommendations for Additional Geotechnical Work

Additional geotechnical characterization and analyses should be conducted at the feasibility and design levels for each of the areas. Analyses and recommendations presented herein are based on ultimate pit designs as described in this report, and, as such, any significant changes to mine plans or pit architecture should be reviewed by SRK to verify that recommendations will remain valid for the new mine plans.

Geologic structure should be further evaluated to more accurately characterize the rock mass which, according to the current mine plans, will comprise the toe of the Area 2 western slope walls and which will better ascertain the likelihood of the existence and orientation of major structures that may adversely impact stability of that western wall. To do so, two additional geotechnical drillholes are recommended at Area 2 to investigate the potential for such major structures and to further characterize the variability in orientation of joint sets.

Additional geotechnical characterization and analysis will also be necessary at Minto North, to better define rock mass conditions and structural impacts on bench stability as the project advances. To accomplish this, one additional geotechnical corehole is recommended at Minto North drilled into the northwest wall for evaluation of rock mass conditions and structure.

The underground portion of Area 118 will also require additional geotechnical drilling for rock mass characterization at the feasibility and design levels. The Area 118 and Ridgetop open pits most likely will not require additional geotechnical drilling unless major changes are made to the current plans.

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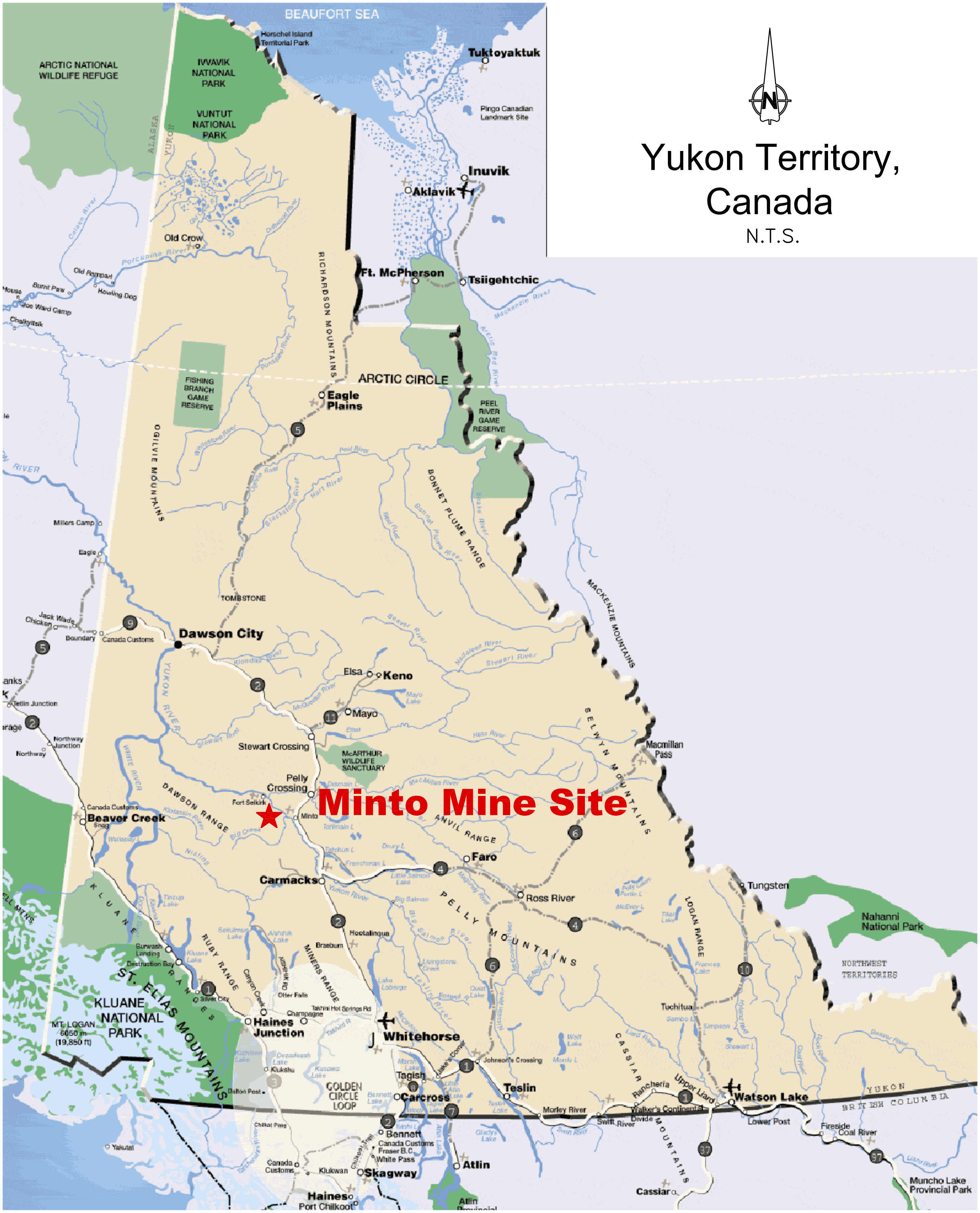
1 Introduction and Background

SRK Consulting (US), Inc. (SRK) was requested by Minto Explorations Ltd. (Minto) to carry out a pre-feasibility level geotechnical evaluation for the Area 2, Area 118, Ridgetop and Minto North deposit areas at the Minto Mine in the Yukon Territory, Canada (Figure 1).

This report presents a complete description of the methods used to collect pertinent information, the information so gathered, the analytical tools employed to produce assessments of the anticipated behavior of the geologic environments to the development of the open pits and, in the case of Area 118, the underground, and the recommendations based upon those assessments.



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SRK JOB NO.: 2CM022.006	MINTO EXPLORATIONS LTD.	PREFEASIBILITY GEOTECHNICAL EVALUATION
FILE NAME: 02CM022.06.Fig.1-1.Rev.A.Site.Location.Map.2009-11-23.dwg	MINTO MINE	SITE LOCATION MAP

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2 Program Objectives and Work Program

2.1 Program Objectives

The primary objectives of the pre-feasibility geotechnical evaluation for each Minto area were:

- To collect and to assimilate geotechnical information pertaining to the in-situ materials;
- To geotechnically characterize the in-situ materials;
- To undertake laboratory testing of geomechanical properties of samples of the in-situ materials;
- To develop a geotechnical model to serve as the basis for geomechanical analyses;
- To conduct geomechanical analyses;
- To make recommendations pertaining to optimal slope angles and pit architecture for mine design purposes; and,
- To make recommendations pertaining to pillar and room dimensions for the potential Area 118 underground development.

2.2 Work Program

The principle stages of the geotechnical evaluation work program were comprised of the following:

- Recommendation of the number, location and orientation of core holes necessary to characterize the in-situ materials in each of the areas;
- Geotechnical core logging and discontinuity orientation of core recovered from the holes;
- Selection of representative drill core samples from the respective lithological units encountered in the geotechnical drill holes;
- Submission of the representative samples to the University of Arizona Rock Mechanics Laboratory in Tucson, Arizona, for geomechanical testing;
- Analyses and interpretation of the geotechnical data and laboratory test results to produce a comprehensive analytical model of in-situ conditions for each of the study areas;
- Examination of the behavior of each geotechnical model to expected mining-induced stresses, using various analytical methods; and,
- The compilation of a pre-feasibility geotechnical evaluation report incorporating recommendations pertaining to optimal pit slope angles and pit architecture for mine design purposes as well as room and pillar dimensions for the Area 118 underground.

As commissioned, the work reported herein was performed at a pre-feasibility design level.

3 Geologic Setting

The Minto region is located within the central portion of the accretionary complex known as the Yukon-Tanana (YT) terrane which lies between continental margin rocks of ancestral North America to the east and arc and oceanic terranes accreted in Mesozoic time to the west. The pericratonic YT terrane is comprised of Proterozoic and Paleozoic metamorphic rock intruded by Mesozoic plutons and covered by extrusive volcanics of Upper Cretaceous and Tertiary age (Colpron 2006).

The YT terrane is located within the western portion of the Omineca Belt of the Cordillera which is composed of variably metamorphosed sedimentary and igneous rocks that have undergone similar geomorphologic processes over the past billion years of geological history, climate and glaciation. Much of the north-western portion of the Omineca Belt including the Minto region was not glaciated during the most recent event resulting in a thicker cover of soil and weathered rock in some areas of the region (Hart 2002).

The Minto Mine site is located within the Klotassin batholith, an intrusive granitic pluton which intruded the YT terrane in early Jurassic time. The Klotassin batholith consists primarily of granodiorite but varies in composition from quartz diorite to quartz monzonite. The area to the south of the Minto mine site is covered with basalt and andesite flows of the Upper Cretaceous, Carmacks Group. The batholith is intruded by basalt and andesite dikes believed to have been feeders of the Carmacks Group volcanics. Quartz-feldspar pegmatite veins and dikes are also common in the Klatossin batholith (Hatch 2006).

Four separate deposits of mineralization were considered for this evaluation. They are the Area 2, Area 118, Ridgetop and Minto North deposits. Each of these deposits has similar shallow dipping copper sulphide mineralized zones. Area 2 and Area 118 area located immediately south of Main Minto deposit which is already exposed in open pit mining. The Ridgetop deposit is located just over 300m south of the Area 2 and Area 118 deposits. The Minto North deposit is located about 700m north of the Main Minto deposit. These deposits define a general north-northwest trend.

Seismically, the Minto deposits lie within an area of moderate to low seismic activity. According to information available from the Canadian Geological Survey (CGS), the Minto area can expect to experience a maximum seismically-induced acceleration of approximately 0.1g (percent of gravity) with a recurrence interval of 50 years. Since each of the Minto deposits are scheduled to be relatively short lived, i.e., on the order of 8 years, the CGS guideline equates to a maximum anticipated acceleration of approximately 0.01g during mine life. This maximum design acceleration is so inconsequential that no seismic loadings were considered in the analyses conducted for this study.

4 Field Data Collection

4.1 Geotechnical Core Logging

Geotechnical logging, field point load testing and discontinuity orientation of core recovered from a total of eight drillholes were conducted for this investigation. Based on the current understanding of the deposits, drillhole locations and orientations were selected to provide the best coverage possible of rock likely to form pit walls in the Ridgetop, Area 118, Area 2 and Minto North areas. The geotechnical drillhole locations were chosen based on preliminary and historic pit shells and, in some instances, drillhole intersections with the final pre-feasibility pit slopes presented herein were not optimal. It is believed, however, that this factor does not adversely impact the analyses conducted to a significant degree.

The geotechnical core drilling program was also designed to collect data for rock mass characterization for potential underground mining at Area 118. In addition to the eight geotechnical coreholes drilled in 2009 for this investigation, data from three additional geotechnical coreholes drilled in 2007 for the previous SRK (2007) Area 2 Pre-feasibility Pit Slope Evaluation were also considered in the analyses.

Drillhole inclinations of approximately 60 degrees below the horizontal were selected since they were judged to be more likely, than would vertical holes, to intersect geologic structures such as joints and fracture systems which, if present, will influence slope stability.

Collar locations and the drillhole azimuths of the eight geotechnical holes drilled for this investigation as well as the three holes considered from the previous (SRK, 2007) investigation are summarized in Table 1 and presented on Figure 2.

Table 1: Drillholes Oriented and Logged for Geotechnical Data

SRK Hole ID	Minto Hole ID	Collar Coordinates			Azimuth (deg)	Inclination (deg)	Length (m)
		Northing	Easting	Elevation			
C09-01	09SWC424	6944462.5	384615.2	876.8	236	-57	325.0
C09-02	09SWC422	6944276.4	384751.3	893.9	239	-58	280.5
C09-03	09SWC420	6944390.8	384933.1	861.4	213	-61	376.5
C09-04	09SWC427	6943813.0	384955.7	890.1	245	-60	175.5
C09-05	09SWC429	6943654.8	384933.1	916.9	058	-59	199.5
C09-06	09SWC431	6943632.3	385112.7	889.2	238	-60	150.0
C09-07	09SWC495	6945925.0	384238.0	951.4	196	-60	153.0
C09-08	09SWC497	6945953.0	384320.0	940.7	047	-55	141.0
C07-06	07SWC206	6944784.8	384609.5	822.6	223	-61	155.1
C07-07	07SWC201	6944506.4	384808.9	861.0	211	-57	243.5
C07-08	07SWC196	6944640.7	384876.9	832.9	070	-60	249.6

4.1.1 Geotechnical Logging Procedures

Core retrieved from the eight geotechnical coreholes were logged on a 24 hour per day basis, at the rig, in the liners, or splits, prior to boxing and transporting. The geotechnical core logging program was developed to yield information pertinent to modeling of pit slope stability, such as geologic contacts, profiles of rock strength, and characterization and frequency of discontinuities. Specific parameters that were logged included:

- General lithology and structures;
- Total core recovery;
- Rock Quality Designation (RQD);
- Rock weathering and intact strength indices;
- Frequency of discontinuities;
- Discontinuity characteristics (type, roughness, infillings and wall condition); and,
- Discontinuity orientation.

Geotechnical corehole logs are presented in Appendix A.

During core logging, samples of the core were collected to provide redundant specimens for laboratory strength testing. Samples were collected at approximately 30 meter intervals, or when significant rock type or strength changes were apparent. Each sample was sealed and safely stored at the time of collection. Upon completion of the drilling, samples were shipped to SRK's office in Denver, Colorado, for test sample selection. Select samples were then repackaged and shipped to the University of Arizona Rock Mechanics Laboratory in Tucson, Arizona, for testing.

4.1.2 Core Drilling Method

The coreholes were drilled by Driftwood Diamond Drilling, Ltd., from Smithers, British Columbia, using a skid mounted drill rig with a 45.1mm I.D.(NQ3), 1.5m long triple-tube sampling barrel. The coreholes were advanced with a face discharge bit system using a polymer mixture to facilitate core recovery. This coring method allowed for the recovery of continuous core samples as the holes advanced.

Downhole surveys were conducted by Driftwood upon completion of drilling; subsequently, the surface casing was pulled and the hole allowed to collapse. Depth to groundwater could not be determined at the time of hole advancement due to the 24 hour per day drilling schedule with continuous fluid injection and circulation.

4.2 Discontinuity Orientation

Orientation of discontinuities in each run was accomplished using an A.C.T. core orientation system manufactured by Reflex Instruments. The depth, alpha angle and beta angle were measured for each discontinuity on all core runs that were successfully oriented. The beta angle, i.e., the angle from the lowest part of the ellipse formed by the intersection of each discontinuity with the core, was measured from the bottom of the core in a clockwise direction when looking down hole. The alpha angle was measured as the maximum angle made by the discontinuity with respect to the core axis.

It was possible to orient a total of 4,328 discontinuities out of the total 5,161 discontinuities logged (84%) in the eight geotechnical coreholes drilled for this evaluation. A summary of oriented core information by hole is presented in Table 2.

Table 2: Summary of Discontinuity Orientation

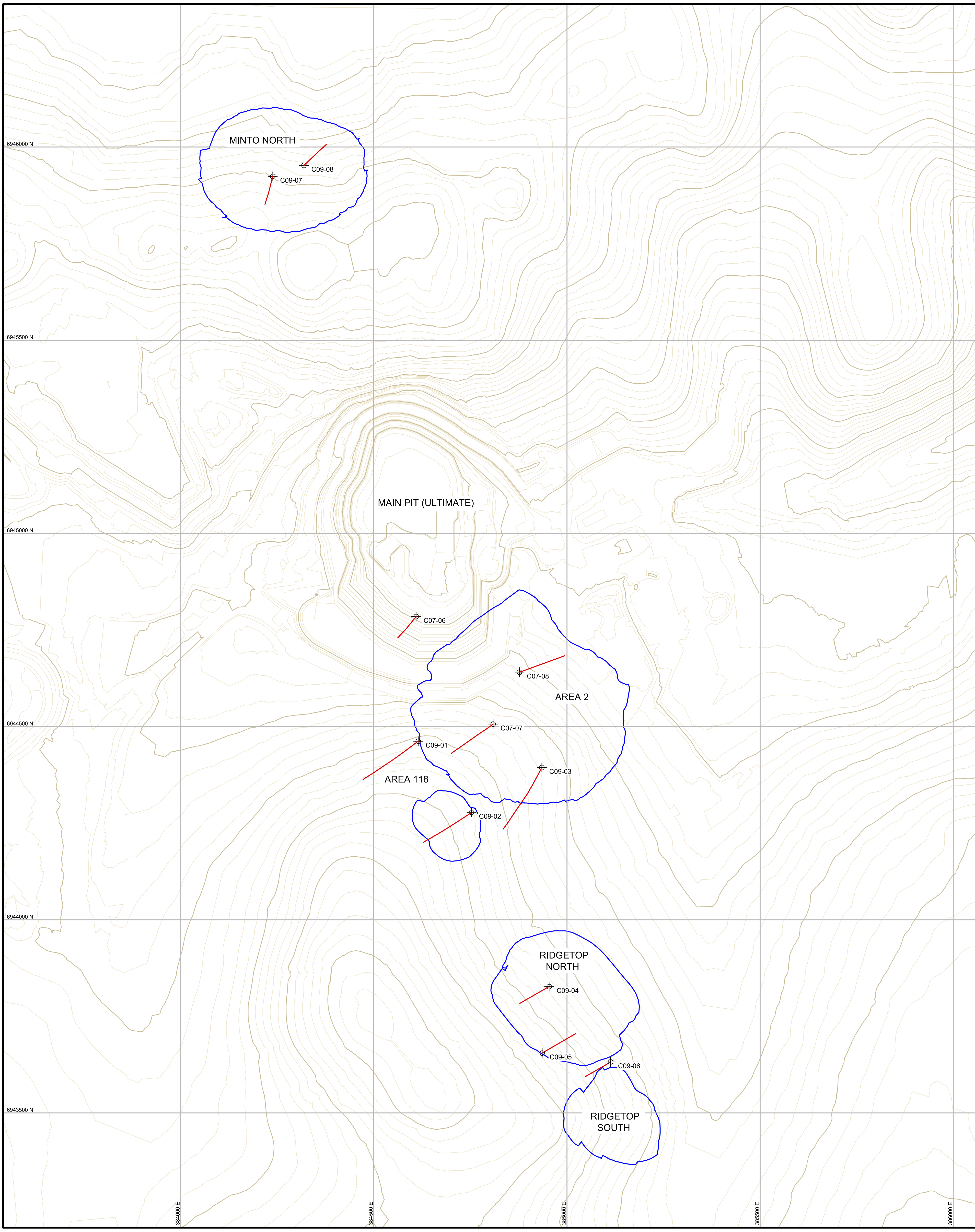
SRK Hole ID	Drillhole Length (m)	Core Length Oriented (m)	Total Discontinuities Logged	Percentage of Discontinuities Oriented
C09-01	325.0	316.5	841	82%
C09-02	280.5	270.5	821	90%
C09-03	376.5	268.5	815	87%
C09-04	175.5	370.4	515	76%
C09-05	199.5	154.5	573	80%
C09-06	150.0	193.5	472	75%
C09-07	153.0	132.0	602	93%
C09-08	141.0	135.0	522	83%
C07-06	155.1	82.1	315	47%
C07-07	243.5	229.9	560	44%
C07-08	249.6	120.6	1194	60%

4.3 Point Load Testing

A Point Load Test (PLT) was performed during core logging at a frequency of approximately one test per every 2 to 3m using a Roctest Pil-7 test machine to provide detailed and nearly continuous profiles of relative rock strength. PLTs were conducted according to International Society for Rock Mechanics (ISRM, 1985) procedures. Both axial (parallel to the long axis of the core) and diametral (perpendicular to the long axis of the core) loading tests were conducted. Axial point load testing was performed as samples suitable for testing in an axial orientation were obtained from coring or were produced by breaking especially long sticks of core in diametral tests.

A combined total of 640 point load tests were conducted on core from the eight geotechnical coreholes; of those, 496 met test criteria for passing test results. Point load indices ($Is_{(50)}$) were calculated from the field PLT data using the ISRM (1985) suggested method. Calculated point load index strengths ($Is_{(50)}$) ranged between 0.1 and 11.1 MPa, with an average of 4.6 MPa.

In addition to the tests routinely conducted at 2 to 3 meter intervals, at least one PLT was also performed adjacent to each UCS sample obtained for laboratory testing. The reason for the paired PLT and UCS samples was for estimation of a correlation factor for conversion of the field PLT tests to laboratory UCS values.



LEGEND

5260	EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
C09-02	GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION
	CURRENT PFS ULTIMATE PIT BOUNDARY

N

0 50 100 150 200 250

Scale in Metres

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Denver, Colorado 80235
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PREFEASIBILITY GEOTECHNICAL EVALUATION

LOCATIONS OF GEOTECHNICAL DRILLHOLES

SRK JOB NO.: 02CM022.06

FILE NAME: 02CM022.06.Fig.4-1.Rev.A.Site.Map.and.Collar.Locations.2009-11-18.dwg

MINTO MINE

DATE:	APPROVED:	FIGURE:	REVISION NO.
DEC. 2009	ML	2	A

5 Laboratory Testing

Geomechanical testing was conducted at The University of Arizona Rock Mechanics Laboratory in Tucson, Arizona, to determine strength characteristics for the in-situ materials. The overall laboratory program consisted of direct shear, uniaxial and triaxial compressive strength, and direct tensile strength testing and measurements of unit weight and elastic properties. A total of 51 laboratory tests were conducted on samples selected to represent the range of the rock conditions observed in the eight 2009 geotechnical borings. After completion of the laboratory testing program, the tested samples were returned to SRK for further evaluation. Raw laboratory test data is included in Appendix B.

5.1 Unconfined Compressive Strength and Elastic Properties

Uniaxial compressive strength (UCS) testing was conducted on 30 samples according to ASTM Method D7012. Elastic properties (Young's Modulus and Poisson's Ratio) were measured for seven of the 30 UCS samples. Test results indicated UCS values ranging from 48.9 to 172.3 MPa, with a mean value of 116.0 MPa; Young's Moduli ranging from 14.9 to 66.5 GPa, with a mean value of 47.8 GPa; and, Poisson's Ratios ranging from 0.084 to 0.302, with a mean value of 0.229. Results of the UCS and elastic properties testing are summarized in Table 3.

Three samples had an L/D ratio of less than 2.0 and, as a result, a correction factor was applied to more properly estimate UCS.

Valid tests produced UCS values ranging from 48.9 to 172.3 MPa, with a mean of 116.0 MPa; Young's Moduli ranging from 14.9 to 66.5 GPa, with a mean value of 47.8 GPa; and, Poisson's Ratios ranging from 0.084 to 0.302, with a mean value of 0.229.

Table 3: Uniaxial Compressive Strength Testing

SRK Hole ID	Sample Depth (m)	UCS (MPa)	Young's Modulus (GPa)	Poisson's Ratio	Unit Wt. (kN/m^3)
C09-01	32.10	88.21	50.5	0.217	26.12
C09-01	89.50	119.56			26.25
C09-01	187.00	150.39			26.34
C09-01	220.30	164.68	66.5	0.302	26.61
C09-01	293.16	156.10			26.31
C09-02	122.67	71.69	49.2	0.214	26.17
C09-02	179.54	128.30			26.59
C09-02	271.90	149.87			26.20
C09-03	38.00	48.94	14.9	0.084	25.79
C09-03	77.33	72.30			24.90
C09-03	130.84	66.03			25.90
C09-03	161.03	104.39	47.3	0.228	26.48
C09-03	282.10	102.63			26.34
C09-03	361.70	149.58*			26.56
C09-04	30.40	63.15			25.32
C09-04	91.10	140.72			26.34
C09-04	150.25	153.42			26.52
C09-05	33.00	70.92			26.01
C09-05	92.70	74.34**			25.67
C09-05	150.11	86.71	53.9	0.262	26.26
C09-06	37.20	121.20			26.08
C09-06	71.22	131.32	52.5	0.294	26.01
C09-06	108.35	122.78*			26.04
C09-06	138.00	100.70*			26.30
C09-07	29.32	172.29			26.70
C09-07	86.34	139.69			26.56
C09-07	124.57	124.68			26.33
C09-08	47.53	157.71			26.53
C09-08	89.15	94.31			26.47
C09-08	129.40	153.60			26.37

* Correction factor applied to account sample L/D ratio of less than 2.0.
** UCS test results considered invalid and excluded from further analysis.

The intact Young's Moduli determined from laboratory testing were used for empirical calculations of a rock mass deformation modulus for each domain by methods presented by Hoek and Diederichs (2006).

5.2 Direct Shear Testing

Direct shear testing is commonly used for estimating the expected shear strength along natural rock discontinuities such as joints, fractures and faults. Since the stress levels developed within open pits are usually much lower than the rock substance or intact strength, displacement frequently occurs along pre-existing geologic discontinuities, making the determination of discontinuity shear strength a necessity. For open pit design, direct shear testing is preferred over other methods of estimating discontinuity shear strength, such as triaxial compression testing, because direct shear testing permits a higher degree of control over the selection of the actual surface tested.

For this project, ten core samples were selected for four-point, small-scale direct shear (SSDS) tests (ASTM Method D5607) to obtain discontinuity shear strength data. Natural core discontinuities preserved in the field were used for direct shear testing.

The range of normal stresses applied during testing was selected to span estimated ranges of in-situ stresses that are expected to develop within the slopes and to reasonably define the characteristics of the shear strength envelopes. The selected normal loads ranged from approximately 170 to 1,700 kPa.

In order to fit a shear strength envelope to the laboratory data points, a linear or curvilinear regression analysis is typically conducted. For a linear fit, the envelope is presented according to the Mohr-Coulomb criterion, i.e., in the form of a friction angle (Φ), which corresponds to the inverse tangent of the slope of the least-squares regression line, and cohesion (c), which corresponds to the shear strength intercept at zero normal stress. When conducting a linear regression with discontinuity shear strength data, the line is commonly forced through the origin simulating zero cohesion.

A curvilinear strength envelope can be presented in terms of a power curve with k and m values as described by Jeager (1971) or other nonlinear relationships such as the Hoek-Brown (Hoek et al, 2002) criterion. For sufficiently strong rock, the curvilinear fit is considered a more realistic representation of the shear strength/normal stress relationship, particularly at relatively low normal stresses, which typify conditions in a majority of open pit mine slopes.

Based on the direct shear testing results, shear strengths were typified using the Mohr-Coulomb and power curve shear strength/normal stress relationships. The results are summarized in Table 4.

Table 4: Summary of Residual Shear Strengths

SRK Hole ID	Sample Depth (m)	Linear Regression			Power Regression		Discontinuity Type
		Φ* (°)	C (kPa)	Φ**(°)	k	m	
C09-01	49.87	40.7	21.6	49.2	4.9745	0.6630	Natural Joint
C09-01	103.00	35.0	20.5	38.7	2.9505	0.7589	Natural Joint
C09-01	212.15	33.4	1.3	33.8	0.7014	0.9911	Natural Joint
C09-02	211.14	32.9	5.7	34.0	0.8961	0.9474	Natural Joint
C09-03	162.55	33.7	10.0	35.7	1.4628	0.8671	Natural Joint
C09-04	52.02	45.8	6.8	48.7	2.0405	0.8603	Natural Joint
C09-05	61.07	37.6	12.7	40.0	1.9037	0.8465	Natural Joint
C09-06	51.94	37.6	6.0	40.2	1.4533	0.8775	Natural Joint
C09-07	137.2	33.7	13.1	36.3	1.6814	0.8462	Natural Joint
C09-08	54.9	34.2	5.0	36.4	1.1906	0.8935	Natural Joint

* Best linear fit friction angle given the apparent cohesion calculated and noted
** Best linear fit friction angle assuming a zero apparent cohesion.

5.3 Triaxial Compressive Strength Testing

For this project, triaxial compressive strength (TCS) tests were conducted on six samples using ASTM Method D7012. The samples were tested at confining pressures selected to range from zero to approximately one-half of the UCS values as suggested by Hoek and Brown (1997).

TCS testing was conducted on six samples of core, yielding compressive strengths (σ_1) ranging between 213.8 and 294.1 MPa with a mean value of 262.1 MPa under confining pressures (σ_3) ranging between 6.9 and 20.7 MPa, with a mean of 13.8 MPa. The results of the TCS testing are summarized in Table 5.

Table 5: Triaxial Compressive Strength Testing

SRK Hole ID	Sample Depth (m)	σ_3 (MPa)	σ_1 (MPa)	Unit Wt. (kN/m3)
C09-01	59.88	6.9	222.1	26.4
C09-01	153.30	17.2	276.8	26.2
C09-02	150.10	10.3	213.8	26.4
C09-02	209.69	13.8	294.1	26.4
C09-03	250.17	13.8	288.2	26.5
C09-04	123.25	20.7	277.5	26.3

5.4 Direct Tensile Strength Testing

Brazilian disk tension testing according to ASTM method D3967 was conducted on five samples indicating intact tensile strengths ranging from 7.2 to 10.8 MPa, with a mean value of 8.8 MPa. Results of the direct tensile strength testing are summarized in Table 6.

Table 6: Direct Tensile Strength Testing

SRK Hole ID	Sample Depth (m)	Tensile Strength (Mpa)
C09-02	150.10	10.8
C09-02	271.90	9.4
C09-03	161.03	7.6
C09-05	150.11	7.2
C09-06	37.20	8.9

5.5 Unit Weight Measurements

Prior to actual testing of UCS and TCS core sample, sample dimensions and weights were measured and used to calculate total unit weights for each sample. The combined data set included 36 unit weight measurements ranging from 24.9 to 26.7 kN/m^3 with a mean value of 26.2 kN/m^3. Unit weights are summarized along with the various strength measurements in the preceding Tables 3 and 5.

6 Rock Mass Assessment

Rock mass models were developed for each of the deposit areas at Minto to provide a framework for interramp/overall slope stability modeling by mathematically simulating site geotechnical conditions. The term “rock mass” refers to the entire body of rock, including discontinuities; in contrast, “intact rock” or “substance strength” refers to the rock between discontinuities in a rock mass. Primary inputs to the rock mass models included intact rock strength, degree of fracturing and strength of fractures.

6.1 Data Analysis

Evaluation of the field and laboratory data collection programs indicates a high degree of variability in rock strength and geologic structure at Minto. This natural variation in rock strength and structure suggests that a probability-based method of analysis is most appropriate, yielding less conservative slope angles than would the selection of a unique, potentially over-conservative value as is typical in strictly deterministic analyses.

Probabilistic methods differ from deterministic methods in that each model parameter is characterized by a statistical distribution of values having a central tendency and some variation around that central tendency, rather than by a single, unique value. Further details of the probabilistic method used in this evaluation follow. Details of the data analysis methods are discussed in subsequent sections.

6.1.1 Intact Rock Strength

Intact rock strengths were assessed in the field qualitatively using ISRM (1978) methods and by conducting point load tests (PLT) as discussed in Section 4.3. Several samples of core were also selected for laboratory uniaxial compressive strength (UCS) and triaxial compressive strength testing as described in Sections 5.1 and 5.3, respectively. UCS and $Is_{(50)}$ values, as well as the field estimates of intact rock strength, are plotted with depth on the geotechnical logs presented in Appendix A.

Each laboratory UCS test was paired with an adjacent field PLT $Is_{(50)}$ value for estimation of a correlation factor for conversion of the field PLT tests to laboratory UCS values. Overall, a relatively linear relationship was apparent between the two variables, yielding a correlation factor of 23 (UCS:$Is_{(50)}$). The correlation between the laboratory UCS tests and the PLTs is demonstrated on Figure 3.

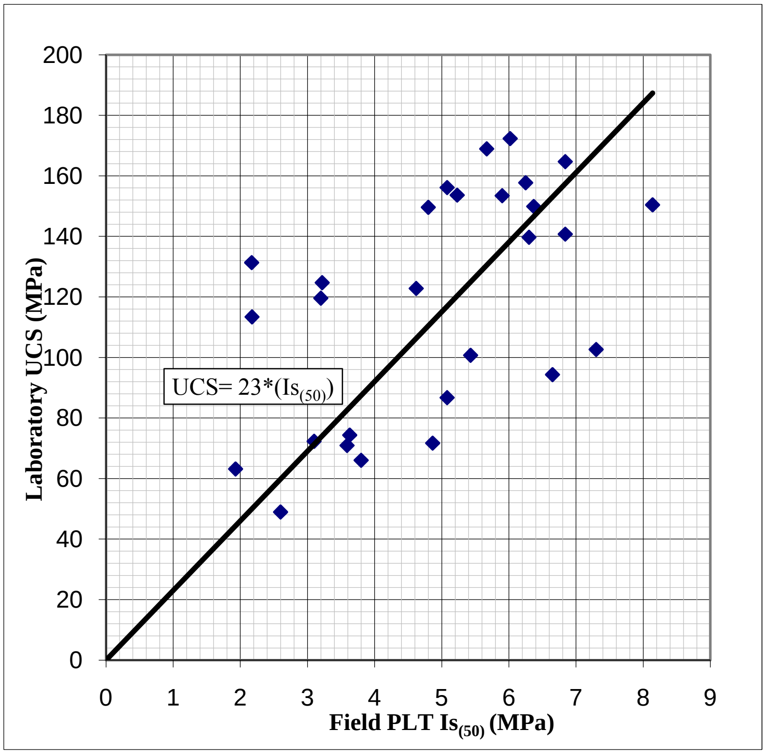


Figure 3: Point Load Index – UCS Correlation Factor

The conversion of the field PLTs to laboratory UCS values allowed nearly continuous profiles of rock strength for each corehole and provided a large population for defining UCS statistical distributions for the probabilistic analyses.

As demonstrated in the plots contained on Figures 4 through 7, the weathered domains have distinctively lower distributions of UCS than do the fresh units. The weathered domains have UCS strengths generally ranging up to about 120 MPa, with the mode (peak concentration) around 20 MPa, while the fresh domains typically have UCS values ranging up to about 240 MPa with the mode around 110 to 140 MPa.

TCS test results, as described in Section 5.3, were used for direct determination of the Hoek-Brown (Hoek, et al, 2002) material coefficient m_i. As described by Hoek (1983), the Hoek-Brown constant m_i is very approximately analogous to the angle of friction of the conventional Mohr-Coulomb failure criterion. Higher m_i values are characteristic of brittle igneous and metamorphic rocks producing relatively steeply inclined strength envelopes and high instantaneous friction angles at lower normal stress levels.

6.1.2 Discontinuity Frequency

The fracture (discontinuity) frequency or its inverse, fracture spacing, is a critical parameter influencing rock mass behavior. Fracture frequency is expressed as the number of fractures per unit length and fracture spacing is defined as the distance between fractures. Fracture frequency per meter was recorded during drilling for each run, thereby enabling calculation of mean fracture spacings for use in rock mass characterization and bench scale analyses, both of which are discussed in more detail in the following sections. For expedience, it was assumed that each measurement began and ended with a fracture, thereby resulting in a maximum possible spacing of about 1.5 meters, the length of the core barrel.

6.1.3 Discontinuity Shear Strength

Discontinuity shear strengths are a function of geologic history as well as rock mass weathering, alteration and/or infilling. Direct shear testing was conducted on a number of rock samples as previously discussed in Section 5.2 to provide information on the distribution of discontinuity shear strengths. Although results of direct shear testing of discontinuities on some of the samples tested demonstrated curvilinear shear strength/normal stress envelopes, most analytical stability models, including those used by SRK for backbreak analyses, utilize linear, Mohr-Coulomb parameters.

Tests results indicate similar shear strengths between the different domains and areas; consequently, discontinuity shear strengths were grouped together into one distribution. For samples tested from the recent 2009 geotechnical coreholes, calculated friction angles (assuming zero apparent cohesion as discussed in Section 5.2) ranged from 33° to 46° with apparent cohesion values ranging from 1 to 22 kPa. The mean friction angle was 36° with an apparent cohesion of 10 kPa. The distribution of friction angles obtained from testing the recent natural fractures as well as six saw cut direct shears from the previous Area 2 (SRK 2007) investigation is shown on Figure 4.

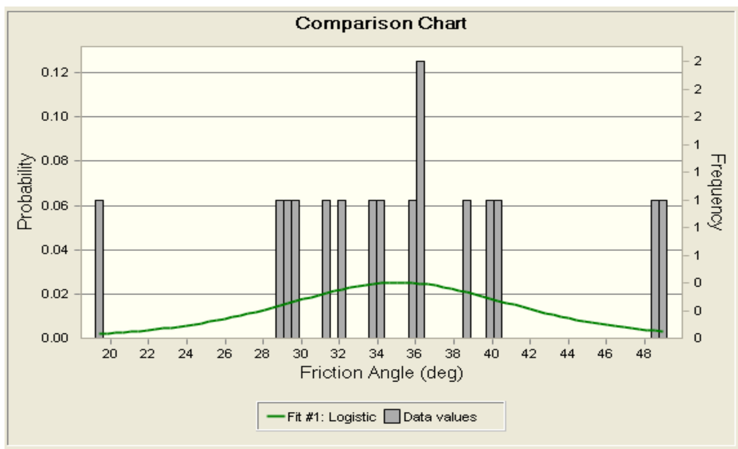


Figure 4: Distribution of measured discontinuity shear strengths

6.2 Rock Mass Classification

Rock mass characterization is a largely empirical process of classification based on information obtained primarily from field data and enhanced with further data analysis and laboratory testing. For typical slope stability applications, materials from ground surface to a depth of approximately 30% of the ultimate slope height below final pit bottom and for a distance approximately two times the ultimate pit height behind the slope crest are characterized and represented within the geotechnical model.

The basic geotechnical parameters recorded for each core run were applied to the Laubscher (1990) In-situ Rock Mass Rating (IRMR) system, thereby creating a profile of IRMR with depth for each of the eight geotechnical holes drilled for this investigation. The Laubscher IRMR system consists of three primary parameters; intact rock strength (IRS), fracture frequency per meter (FF/m) and joint conditions (Jc). The individual parameters as well as the IRMR value out of a total of 100 for each run are displayed on the geotechnical core logs presented in Appendix A. A large scale joint expression of slight undulation and dry conditions were assumed.

The in-situ RMR is typically adjusted to account for the expected mining environment, namely the influence of weathering, structural orientations, induced or changes to stresses and blasting.

The adjustments to the in-situ RMR are introduced in recognition of the type of excavation proposed and the time dependant behavior of the rock mass. These adjustments were not incorporated for the pit slope analyses as they are accounted for in other ways. They were, however, considered for the Area 118 underground, as discussed in Section 9.

Based upon the IRMR as well as upon its individual components, available site geology information and laboratory test results, drill cores were divided into geotechnical intervals or domains that are expected to behave uniformly when exposed to open pit excavation-induced stresses, and, in the case of Area 118, the underground excavation for each of the deposit areas. Given the relatively consistent nature of geologic materials at Minto, the materials were divided into two basic domains at Area 2, Area 118 and Ridgetop, i.e., weathered and fresh rock.

Due to the relatively shallow depth of the Minto North pit and the presence of multiple sub-horizontal structures and weaker zones, there was a less significant distinction between the weathered and fresh rock materials and, consequentially, materials at Minto North were combined together into a single domain for modeling.

A summary of IRMR values per domain is presented in Table 7.

Table 7: In-situ RMR Distributions per Domain

Deposit	Domain	Distribution	Sample No.	Mean	Std. Dev.	Min	Max
Area 2	Weathered	Weibull	162	46.4	8.6	18	68
Area 2	Fresh	Min. Extreme	409	59.8	9.7	29	82
Ridgetop	Weathered	Normal	225	51.8	12.3	18	84
Ridgetop	Fresh	Logistic	99	51.0	10.1	18	76
North	-	Logistic	172	50.5	10.0	19	82
Area 118	Weathered	Logistic	59	50.8	9.2	21	72
Area 118	Fresh	Logistic	334	58.3	10.8	22	81

6.3 Geotechnical Domains

A typical geotechnical model is composed of individual regions (domains), each of which is comprised of materials exhibiting internally similar geomechanical properties. Pertinent geotechnical parameters are assigned to each domain, based on engineering properties that are determined during field data collection and laboratory testing programs.

Based on the results of data analysis and rock mass classification previously described as well as available site geology information, geotechnical domains were delineated for each area. Given the relatively consistent nature of geologic materials at Minto, the materials were divided into two basic domains at Area 2, Area 118 and Ridgetop, i.e., weathered and fresh rock. The weathered and fresh rock domains are very similar in terms of discontinuity orientations; however, they possess distinctly different rock mass properties.

The weathered rock domain is typically characterized by relatively higher fracture frequencies, consistently lower intact rock strengths and zones of heavy alteration and oxidation as a result of moderate to heavy surface weathering and is typified by core that also typically shows consistently lower RQD and IRMR values. Consequentially, the weathered bedrock is of significantly lower geomechanical quality than is the fresh rock which underlies it.

In general, the fresh rock is consistently a much more competent rock mass than is the weathered bedrock, possessing relatively lower fracture frequencies and higher intact rock strengths. The fresh rock encountered is relatively massive and exhibits fewer signs of alteration and weathering when compared to the weathered rock and, consequently, possesses higher overall RQD and IRMR values.

The fresh rock domains do contain intermittent zones of weaker material which typically correspond to intervals of increased fracturing, weathering and/or alteration, including minor fault zones and surface weathering. However, such intermittent weaker rock zones represent a relatively small portion of the overall fresh rock domain and are not anticipated to adversely impact the performance of the fresh rock mass.

Several zones of foliated granodiorite were encountered in the fresh rock, but those zones exhibited similar intact rock strengths and rock mass properties as did samples of non-foliated granodiorite collected from the same coreholes. The foliated zones are judged to be discontinuous and are not expected to impact overall pit slope stability differently than will the non-foliated zones. Therefore, the foliated and non-foliated rock was grouped together into their respective weathered or fresh domains.

6.3.1 Area 2

A relatively deep soil overburden deposit exists under the northeast portion of the proposed Area 2 pit, consisting primarily of transported silt and fine sand with occasional lenses of clay and coarse sand to gravel. The soil is high in organic content and is known to contain permafrost. It appears that the soil has filled a relatively deep erosional feature on the order of 60 to 90m deep with an invert located between Area 2 and the Main Pit to the north. Previous geotechnical work done by SRK and others have indicated that the material contains permafrost down to near the bedrock contact at its deepest portions and is most likely frozen down to the bedrock contact in shallower portions. Ubiquitously, the upper 1m is “active”, i.e., seasonally freezing and thawing.

Based on available information from resource and geotechnical drilling, Area 2 is covered with overburden ranging from about 5 to 15m in depth in the southwest portion, with up 20 to 45m along much of the north and east walls, and reaching a maximum depth of 70m at the far north.

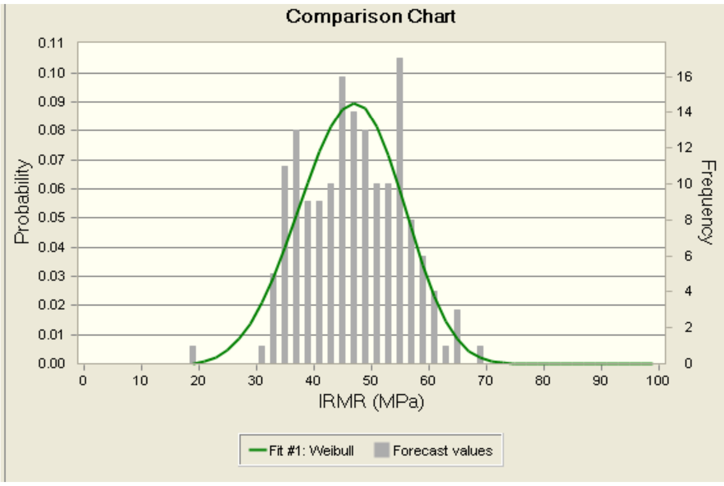
While it is possible that the frozen overburden may extend farther south, available information suggests that the overburden at the south and west ends of the proposed Area 2 pit consists of a thin veneer of organic soil underlain by approximately 5m to 15m of completely weathered, in-situ bedrock (granular soil) or residuum.

Based on geotechnical drillhole data, the Area 2 weathered domain is adjudged to extend to depths of approximately 50 to 100m below the current ground surface.

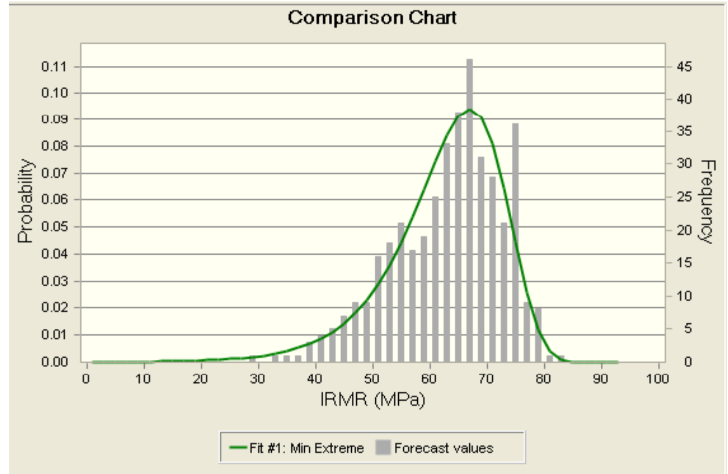
Distributions of UCS, fracture frequency and IRMR for the Area 2 weathered and fresh rock domains are presented on Figure 5. Cross sections showing the geotechnical domains of the Area 2 west and east walls are presented in Figures 6 and 7 respectively.

Area 2 Weathered Rock Domain

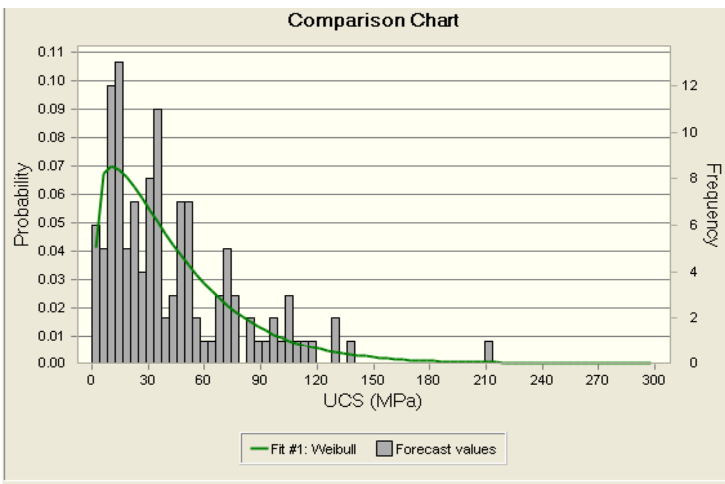
Area 2 Fresh Rock Domain



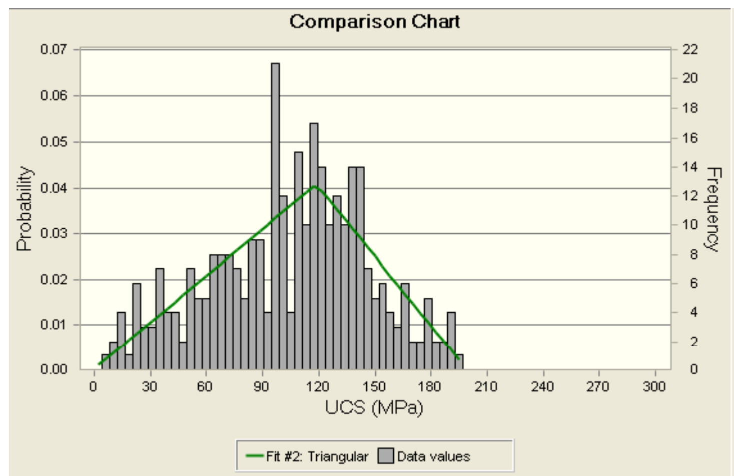
Mean IRMR = 46.4 (162)



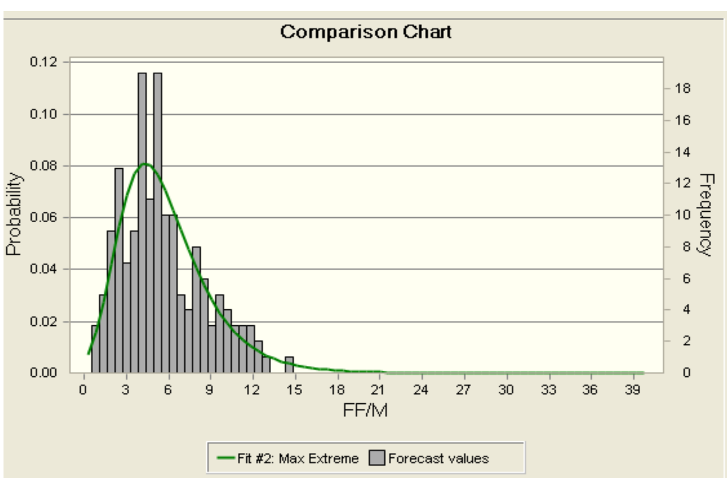
Mean IRMR = 59.8 (409)



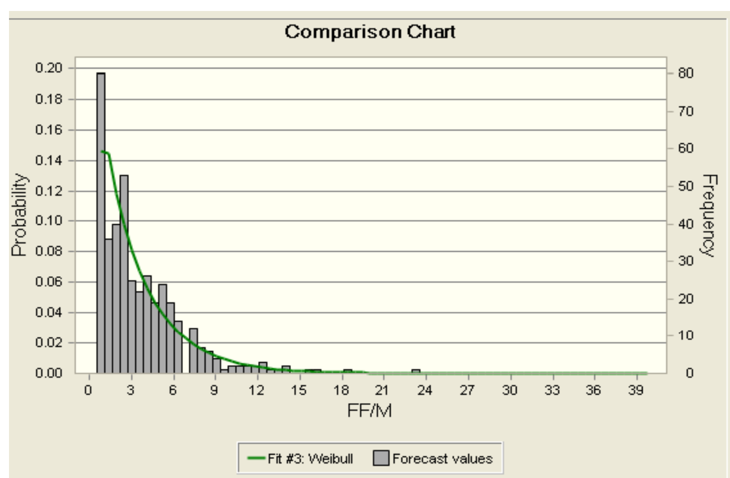
Mean UCS = 42.5 MPa (122)



Mean UCS = 104.2 MPa (314)



Mean ff/m = 5.81 (164)



Mean ff/m = 3.67 (407)

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PREFEASIBILITY GEOTECHNICAL EVALUATION

ROCK MASS PARAMETERS: AREA 2

SRK PROJECT NO.: 2CM022.006

FILE NAME:

MINTO MINE

DATE:	APPROVED:	FIGURE NO.:	REVISION NO.
DEC. 2009	MEL	5	A

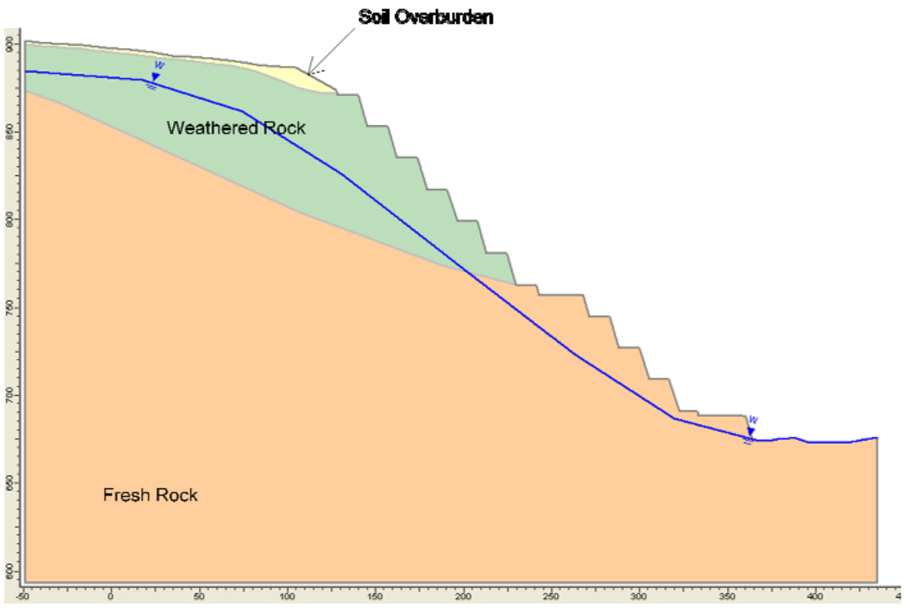


Figure 6: Critical section through Area 2 geotechnical model: west wall

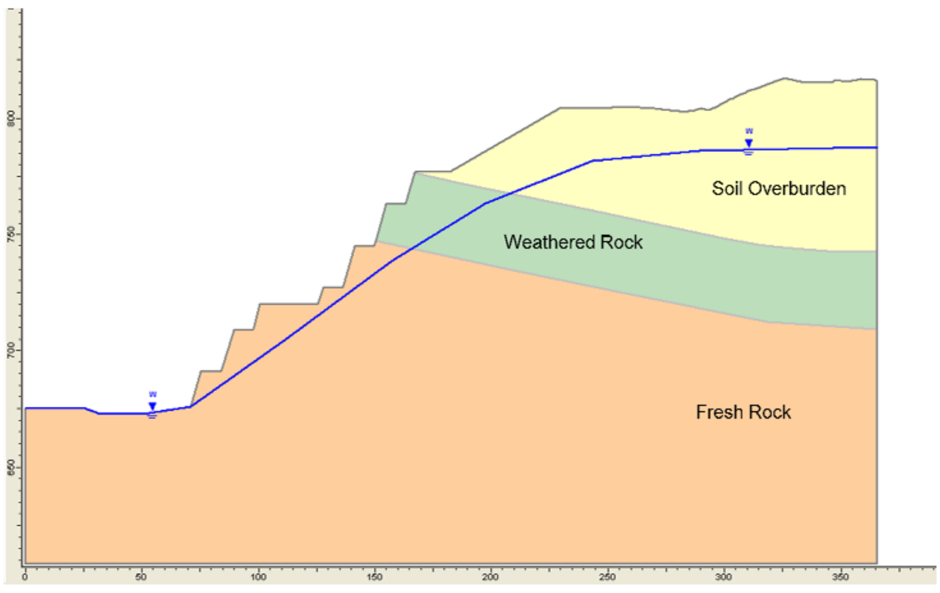


Figure 7: Critical section through Area 2 geotechnical model: east wall

6.3.2 Area 118

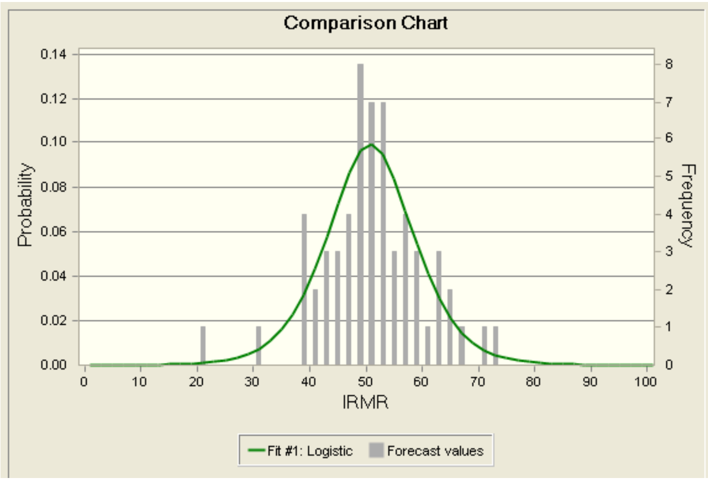
The majority of the proposed Area 118 open pit footprint is covered with up to approximately 5m of soil overburden except the southwest portion where the overburden locally deepens to approximately 16m. The depth of bedrock weathering at Area 118 is generally to about 30 to 60m below ground surface.

Given the small size of the proposed Area 118 pit as well as its close proximity and geotechnical similarities to Area 2, additional interramp slope stability modeling was not deemed necessary for Area 118 at the current, Pre-feasibility level. Consequentially, a detailed geotechnical model cross section was not created for Area 118.

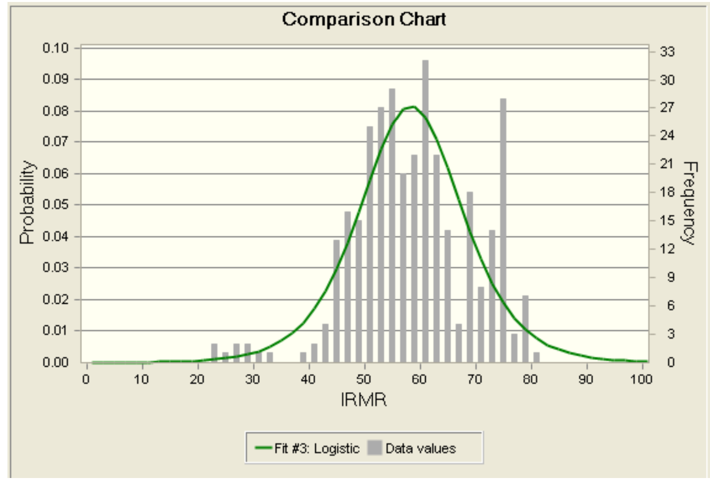
Distributions of UCS, fracture frequency and IRMR for the Area 118 weathered and fresh rock domains are presented on Figure 8.

Area 118 Weathered Rock Domain

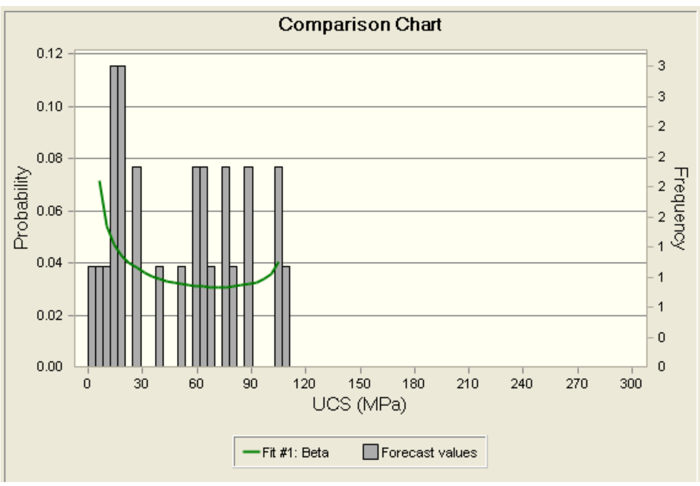
Area 118 Fresh Rock Domain



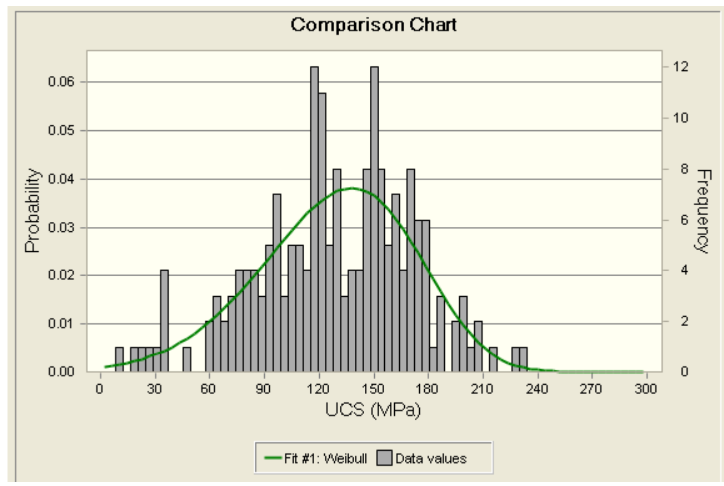
Mean IRMR = 50.8 (59)



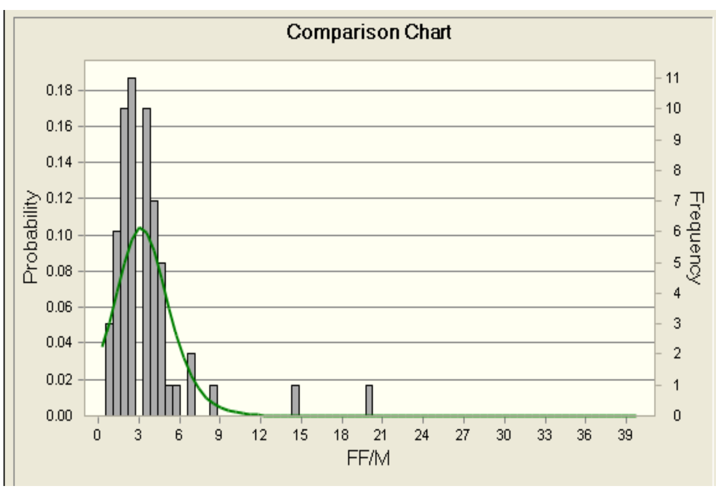
Mean IRMR = 59.3 (334)



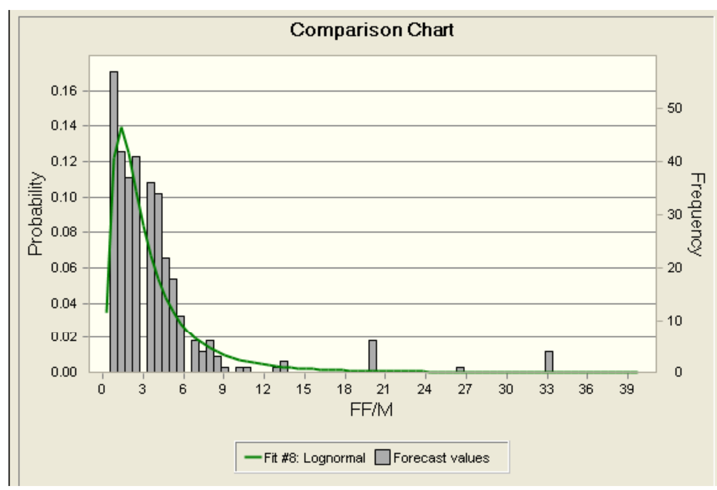
Mean UCS = 50.3 MPa (26)



Mean UCS = 128.3 MPa (190)



Mean ff/m = 3.60 (59)



Mean ff/m = 3.87 (334)

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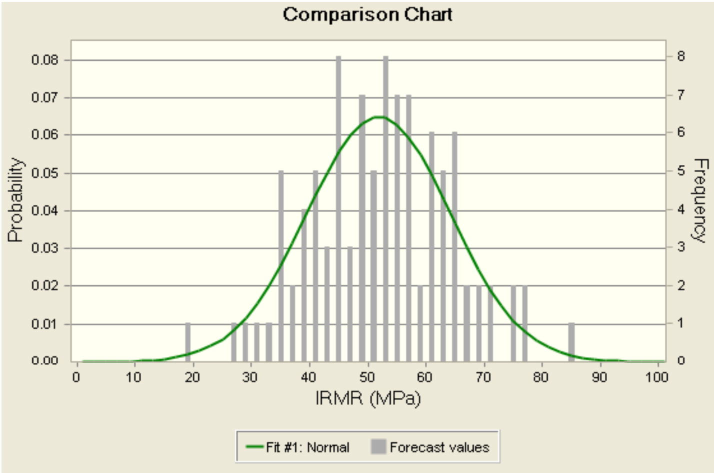
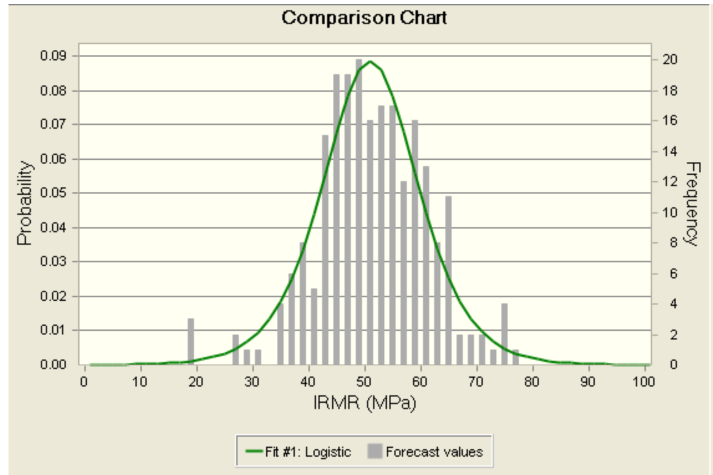
Ridgetop Weathered Rock Domain

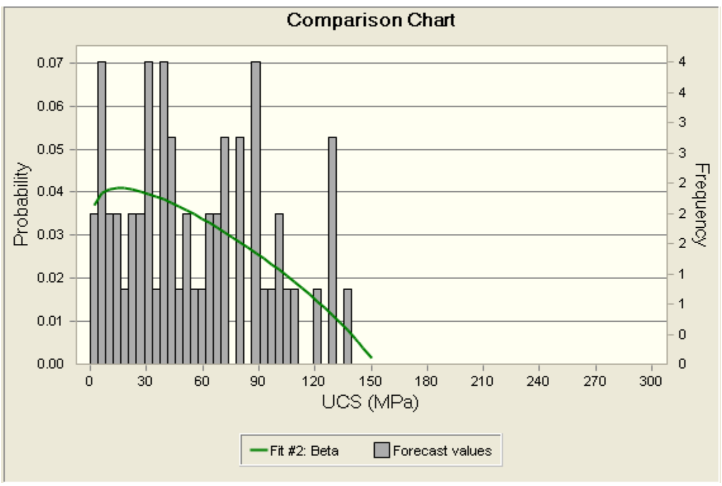
Ridgetop Fresh Rock Domain



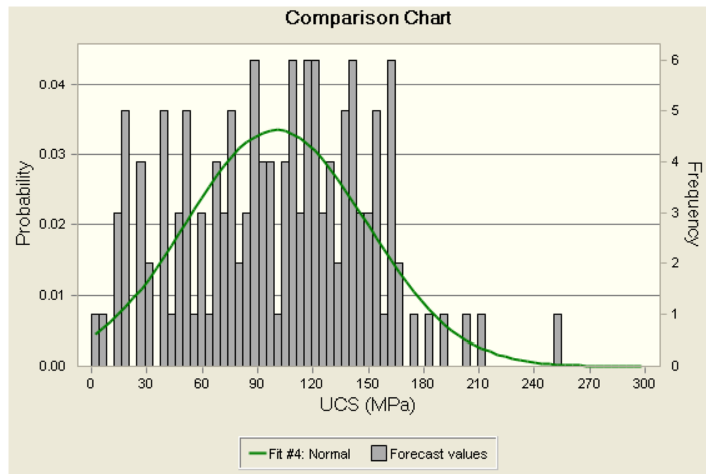
Mean IRMR = 51.8 (99)



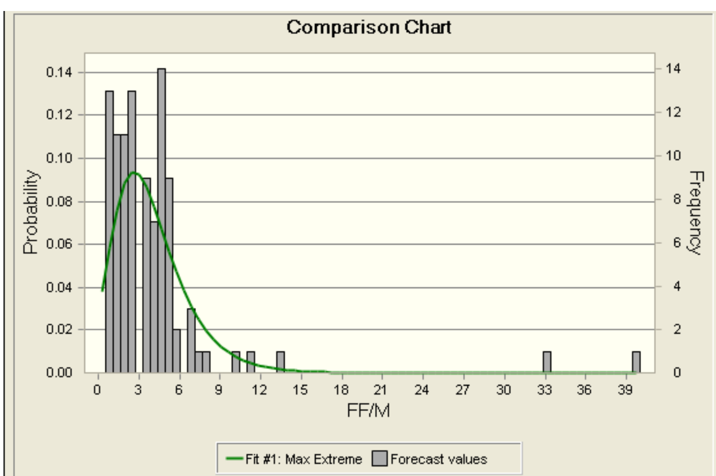
Mean IRMR = 51.0 (225)



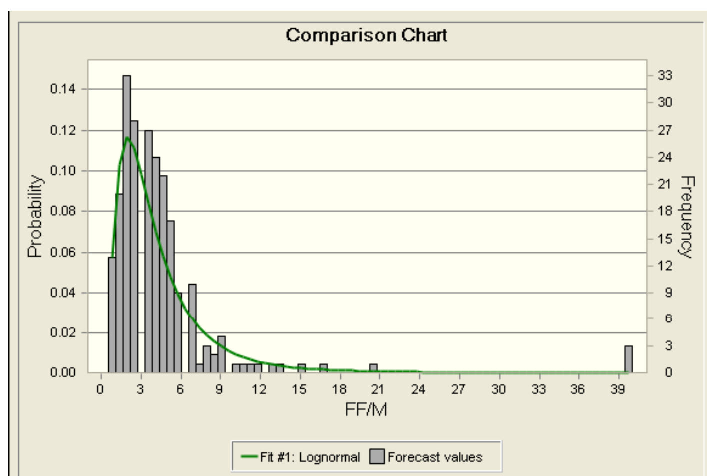
Mean UCS = 56.6 MPa (57)



Mean UCS = 100.0 MPa (138)



Mean ff/m = 4.11 (99)



Mean ff/m = 4.47 (225)

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PREFEASIBILITY GEOTECHNICAL EVALUATION

ROCK MASS PARAMETERS:
RIDGETOP

SRK PROJECT NO.: 2CM022.006

FILE NAME:

MINTO MINE

DATE:	APPROVED:	FIGURE NO.:	REVISION NO.
DEC. 2009	MEL	9	A

6.3.3 Ridgetop

The western portion of the proposed Ridgetop pits are anticipated to contain 1 to 5m of soil overburden deepening to the east to generally about 5 to 15m at the eastern edge, with a maximum depth of 21m at the far northeast portion of Ridgetop North and at the far east portion of Ridgetop South. The bedrock at Ridgetop is generally weathered to a depth of approximately 45 to 70m below ground surface. Distributions of UCS, fracture frequency and IRMR for the weathered and fresh rock domains are presented on Figure 9. A generalized cross section showing the geotechnical domains at Ridgetop is presented in Figure 10.

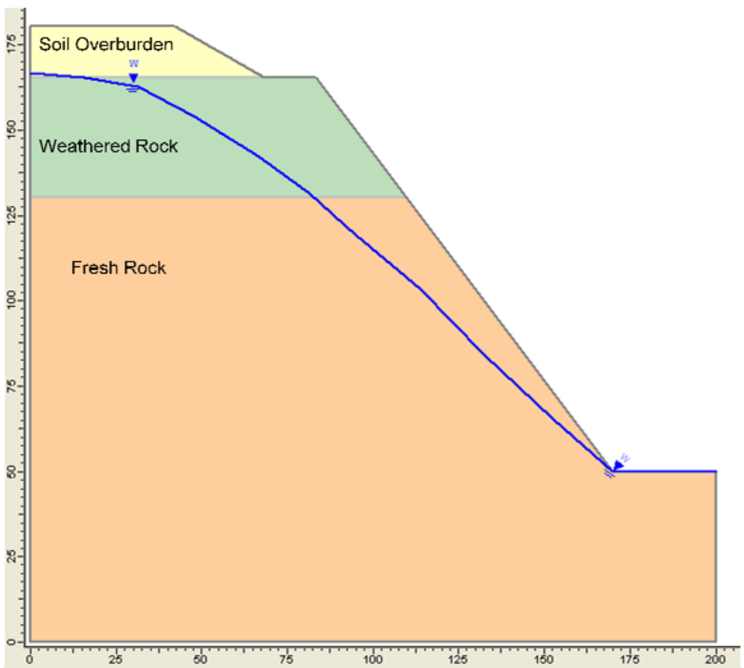


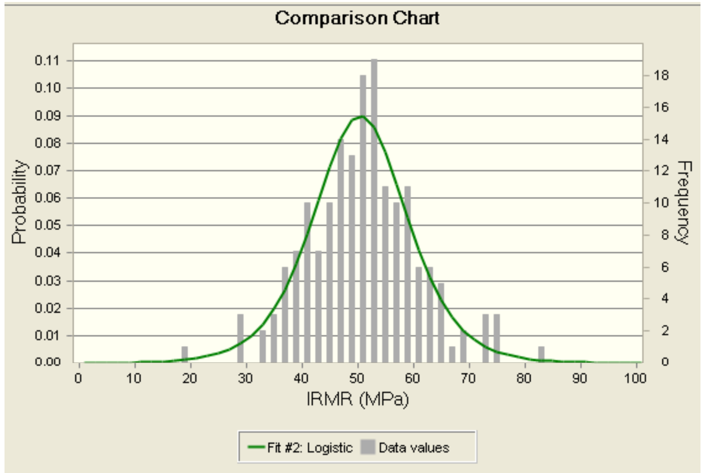
Figure 10: Critical section through generalized Ridgetop geotechnical model

6.3.4 Minto North

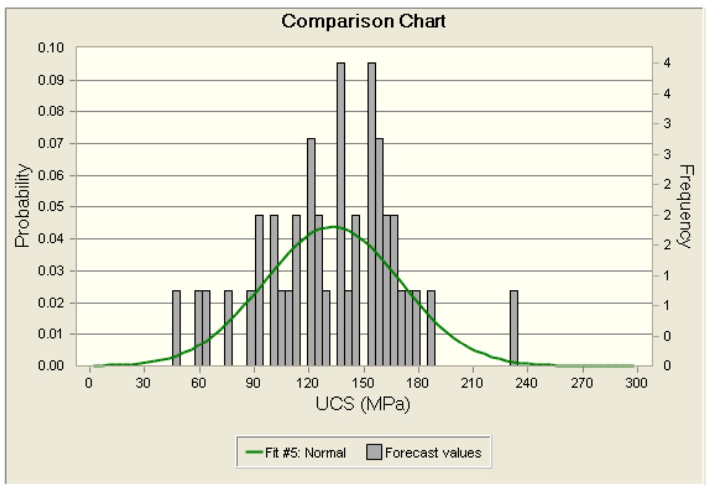
Based on geotechnical drillhole C09-07, bedrock weathering is very shallow at Minto North and fairly competent fresh rock lies beneath the soil overburden. Geotechnical drillhole C09-08 also does not indicate extensive weathering at the bedrock surface but did encounter a relatively thick fault zone beneath the overburden.

Due to the relatively shallow depth of the Minto North pit and the presence of multiple structures, there is a less significant distinction, if any, between the weathered and fresh rock materials;, consequentially, materials at Minto North were combined together into a single domain for modeling. As such, a detailed cross section through the Minto North geotechnical model is not presented. A distribution of UCS, fracture frequency and IRMR for the Minto North domain is presented on Figure 11.

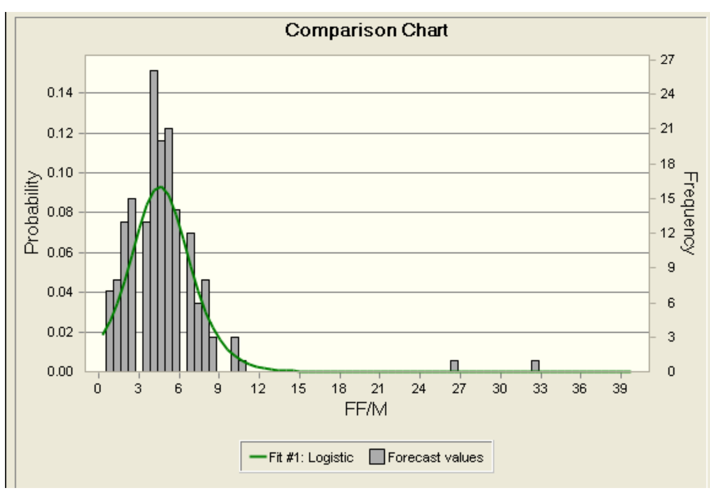
Minto North Domain



Mean IRMR = 50.6 (172)



Mean UCS = 132.8 MPa (42)



Mean ff/m = 4.84 (172)

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		ROCK MASS PARAMETERS: MINTO NORTH			
SRK PROJECT NO.: 2CM022.006	MINTO MINE	DATE: DEC. 2009	APPROVED: MEL	FIGURE NO.: 11	REVISION NO. A
FILE NAME:					

6.4 Rock Mass Shear Strength

The shear strength/normal stress relationship describes the ultimate shear strength available at a given point within a slope as a function of the effective normal stress acting on that point. Rock mass shear strength/normal stress relationships were developed for weathered and fresh rock domains at each area using the Generalized Hoek-Brown criterion (Hoek et al, 2002).

The Generalized Hoek-Brown criterion defines curvilinear shear strength envelopes that are considered effective representations of intact rock and heavily jointed rock mass behavior. Primary input parameters for the Generalized Hoek-Brown jointed rock mass criterion include the Geological Strength Index (GSI), a material constant (m_i) and a disturbance factor (D), as defined by Hoek et al, (2002). Probability density functions (PDF) were selected to represent stochastic (statistical) distributions of each of the primary parameters for each domain. The distributions selected were based upon the results of field and laboratory testing as well as upon SRK's experience.

After the PDFs were selected to represent the three primary Generalized Hoek-Brown parameters (m_i, GSI and D), Crystal Ball 7.3.2 (Crystal Ball), commercial software available from Oracle, was utilized to perform a large number of stochastic simulations, sampling each of the three parameter distributions during each simulation. From each set of primary parameters sampled, respective Hoek-Brown secondary parameters (m_b, s and a) were calculated producing PDFs for each of the secondary parameters.

PDFs representing the UCS for each domain were also defined using a mathematical, "best-fit" technique available in Crystal Ball. The distribution types and defining parameters for the Hoek-Brown secondary parameters and for UCS selected for the analyses are summarized in Table 8.

Table 8: Secondary Hoek-Brown Parameters Stochastic Input

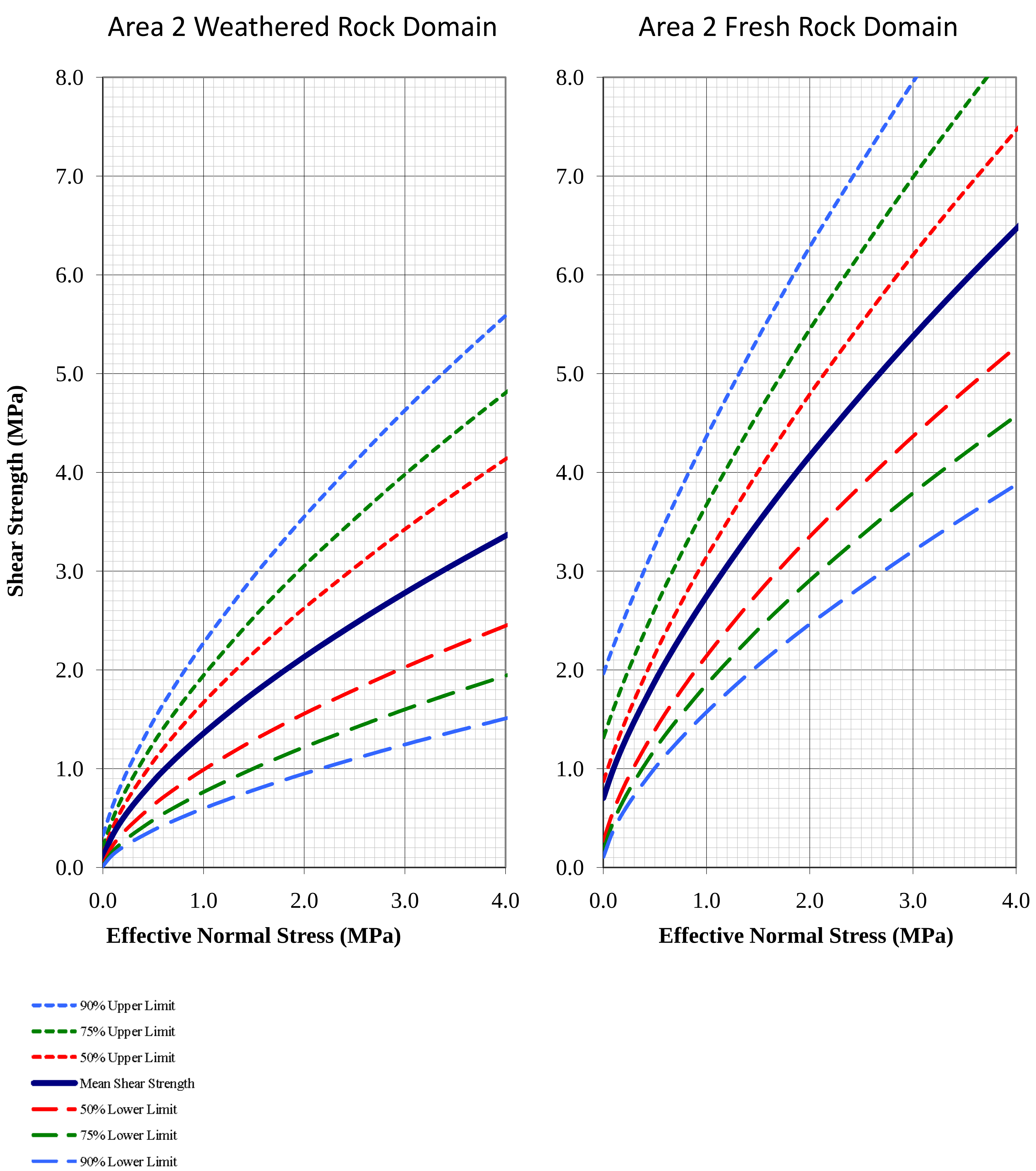
Deposit	Domain	Parameter	Distribution	Mean	Std. Dev.	Min	Max
Area 2	Weathered	Hoek-Brown a parameter	Gamma	0.5087	0.0102	0.5007	0.524
Area 2	Weathered	Hoek-Brown m parameter	Lognormal	1.11	0.64	0.135	3.03
Area 2	Weathered	Hoek-Brown s parameter	Gamma	5.85E-04	1.38E-03	0.00E+00	4.73E-03
Area 2	Weathered	UCS (intact) MPa	Beta	42.51	35.54	0.00	878.22
Area 2	Fresh	Hoek-Brown a parameter	Gamma	0.5036	0.0101	0.5001	0.5108
Area 2	Fresh	Hoek-Brown m parameter	Lognormal	2.69	1.84	0.00	8.21
Area 2	Fresh	Hoek-Brown s parameter	Lognormal	5.86E-03	1.73E-02	0.00E+00	5.78E-02
Area 2	Fresh	UCS (intact) MPa	Triangular	105.68	42.19	0.00	199.77
North	-	Hoek-Brown a parameter	Gamma	0.5072	0.01015	0.5000	0.5228
North	-	Hoek-Brown m parameter	Lognormal	1.41	1.08	0.00	4.65
North	-	Hoek-Brown s parameter	Lognormal	1.65E-03	6.01E-03	0.00E+00	1.97E-02
North	-	UCS (intact) MPa	Normal	132.76	37.34	0.00	282.12
Ridgetop	Weathered	Hoek-Brown a parameter	Lognormal	0.5072	0.0058	0.5000	0.5246
Ridgetop	Weathered	Hoek-Brown m parameter	Lognormal	1.66	1.56	0.00	6.34
Ridgetop	Weathered	Hoek-Brown s parameter	Lognormal	3.37E-03	2.16E-02	0.00E+00	6.82E-02
Ridgetop	Weathered	UCS (intact) MPa	Beta	56.64	37.33	0.00	151.59
Ridgetop	Fresh	Hoek-Brown a parameter	Gamma	0.5068	0.0102	0.5000	0.5209
Ridgetop	Fresh	Hoek-Brown m parameter	Lognormal	1.45	1.1	0.00	4.75
Ridgetop	Fresh	Hoek-Brown s parameter	Lognormal	1.73E-03	6.14E-03	0.00E+00	2.02E-02
Ridgetop	Fresh	UCS (intact) MPa	Normal	100.01	48.94	0.00	246.83

From the repeated, randomized samplings of the secondary Hoek-Brown parameters and UCS, distributions of the shear strength/normal stress relationships were calculated. Graphical representations of the range of shear strength/normal stress envelopes used by the model for each domain are presented on Figures 12 through 15, respectively. In Figures 12 and 15, the 50%, 75% and 90% Upper and Lower Limits represent the ranges within which the shear strength lies, with 50%, 75% and 90% reliability, respectively.

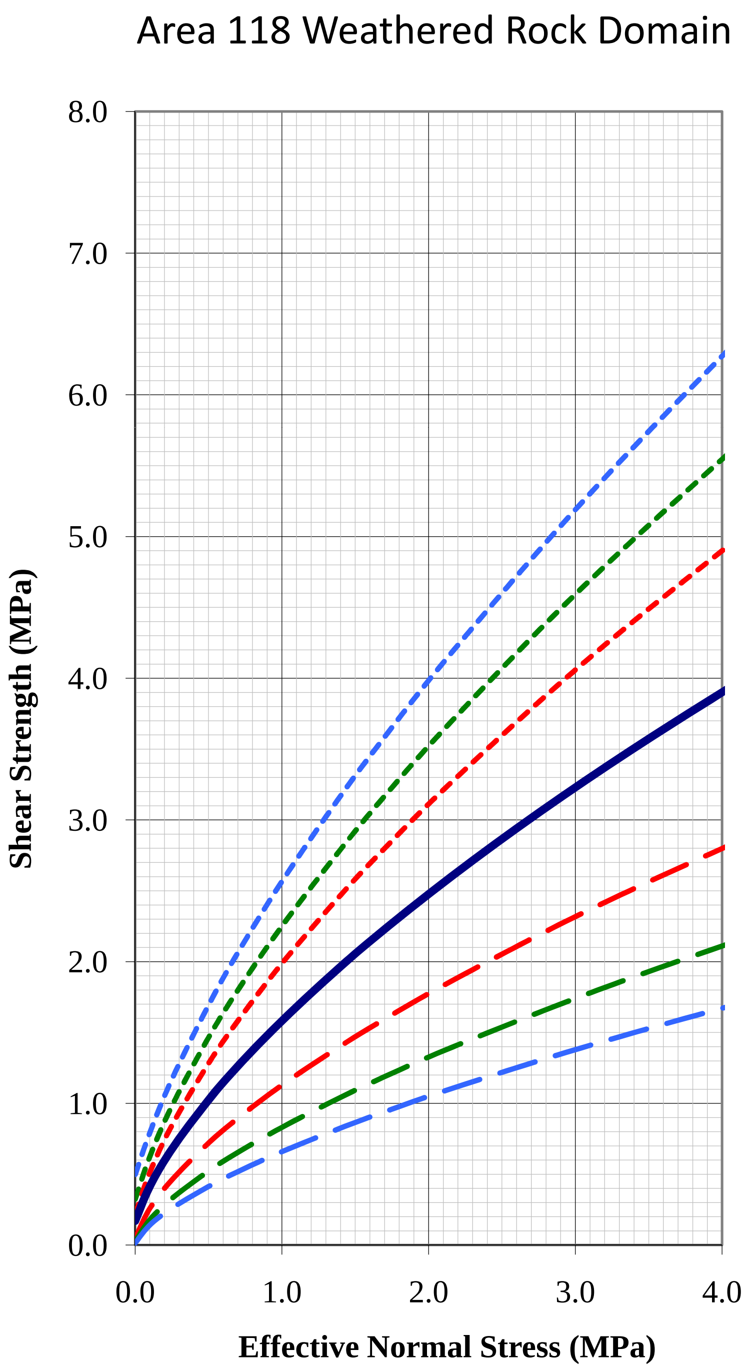
6.5 Groundwater

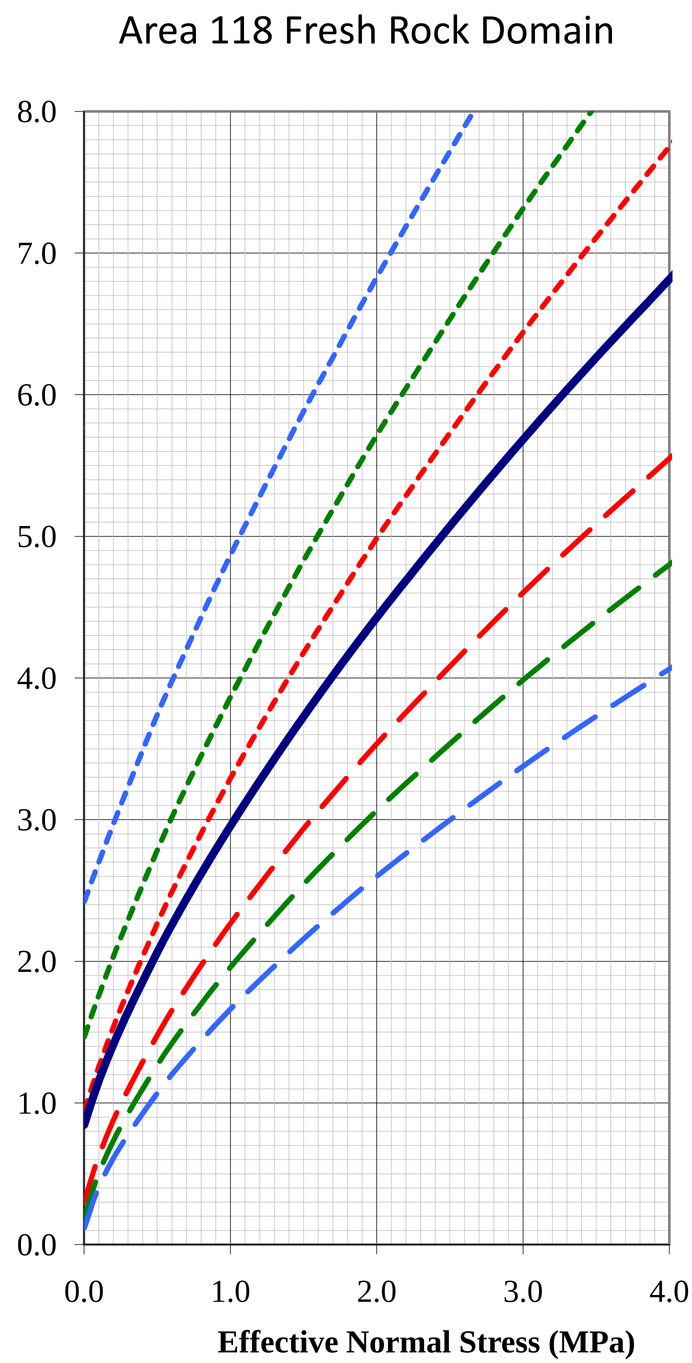
Groundwater (porewater) pressure is an important component of slope stability. Porewater pressures act in direct opposition (as buoyant forces) to stabilizing forces, and as such, must be considered for the results of stability modeling to be realistic. A relatively free-draining slope will typically allow drawdown of the groundwater surface sufficiently deep within the slope so that porewater pressures are of minimal impact to slope stability. Since the rock mass comprising open pit benches has usually been at least moderately disrupted by production blasting, such rock masses are usually free-draining and, in recognition, porewater pressures are seldom considered in bench scale stability analyses. However, deeper within rock masses that have been intensively weathered, altered and/or sheared, clay-filled discontinuities and/or faults are common, compartmentalizing groundwater and resulting in a greatly reduced rock mass permeability. A lower permeability rock mass frequently inhibits free drainage, leading to a much steeper groundwater drawdown surface closer to the pit face. As a result, significant porewater pressures may be present on potential slip surfaces, thereby reducing effective normal stresses which, in turn, reduce resisting forces within the slope, and, consequentially, adversely impact the stability of the slope.

No recent groundwater data is available in the immediate area of the subject deposits. As a result of the lack of available groundwater information and the very difficult nature of groundwater prediction, SRK approximated a relatively high groundwater drawdown surface for use in slope stability modeling. The purpose of this approach is to determine the sensitivity of groundwater levels on the stability of pit slopes in order to provide guidance regarding the extent of groundwater drawdown which may be necessary for global pit slope stability.

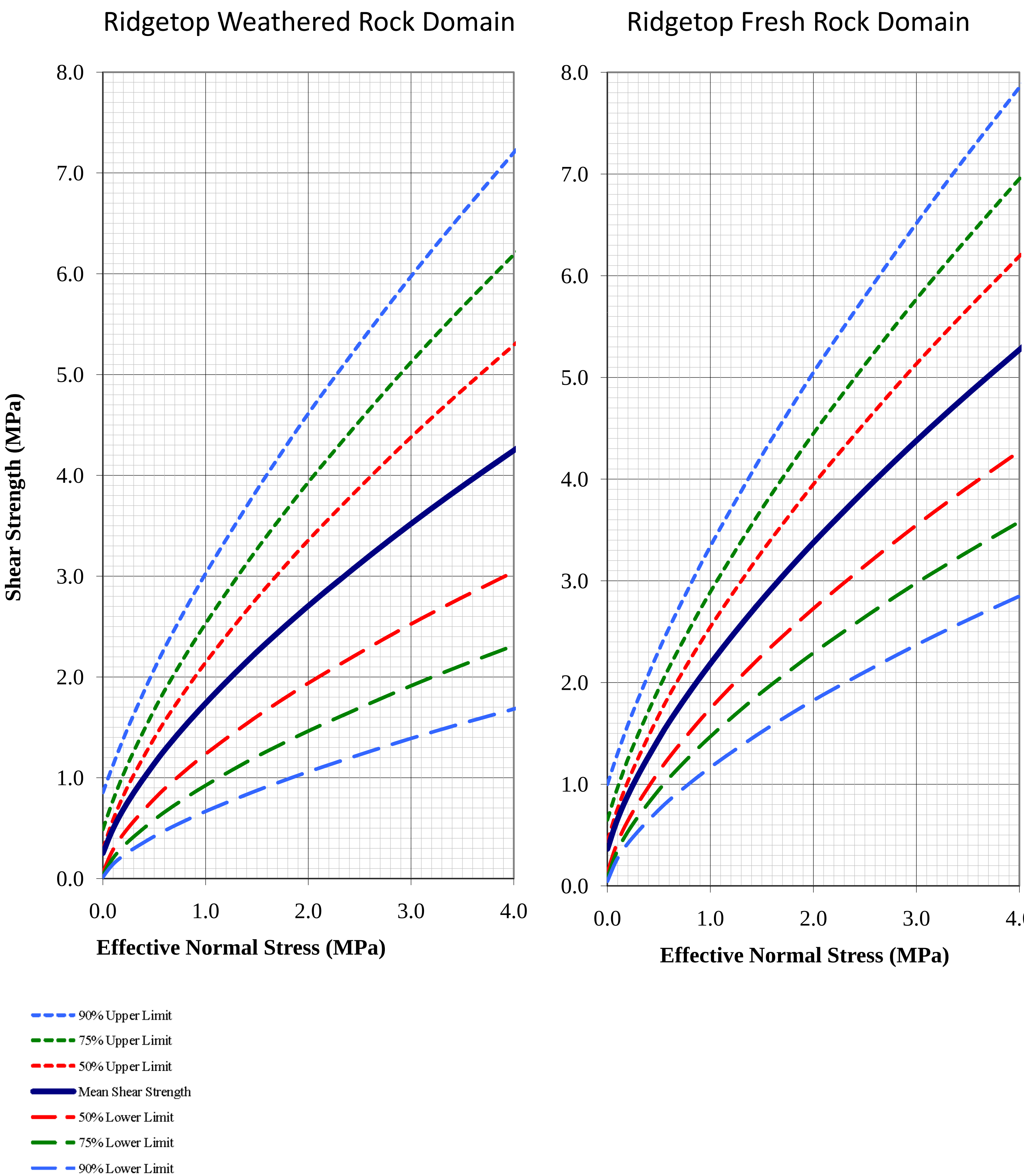


SRK Consulting Engineers and Scientists	MINTO EXPLORATIONS LTD.	PREFEASIBILITY GEOTECHNICAL EVALUATION
		ROCK MASS SHEAR STRENGTH: AREA 2
SRK PROJECT NO.: 2CM022.006	MINTO MINE	DATE: NOV. 2009 / APPROVED: MEL / FIGURE NO.: 12 / REVISION NO. A
FILE NAME:		





SRK Consulting Engineers and Scientists	MINTO EXPLORATIONS LTD.	PREFEASIBILITY GEOTECHNICAL EVALUATION ROCK MASS SHEAR STRENGTH: AREA 118
SRK PROJECT NO.: 2CM022.006 FILE NAME:	MINTO MINE	DATE: NOV. 2009 · APPROVED: MEL · FIGURE NO.: 13 · REVISION NO. A



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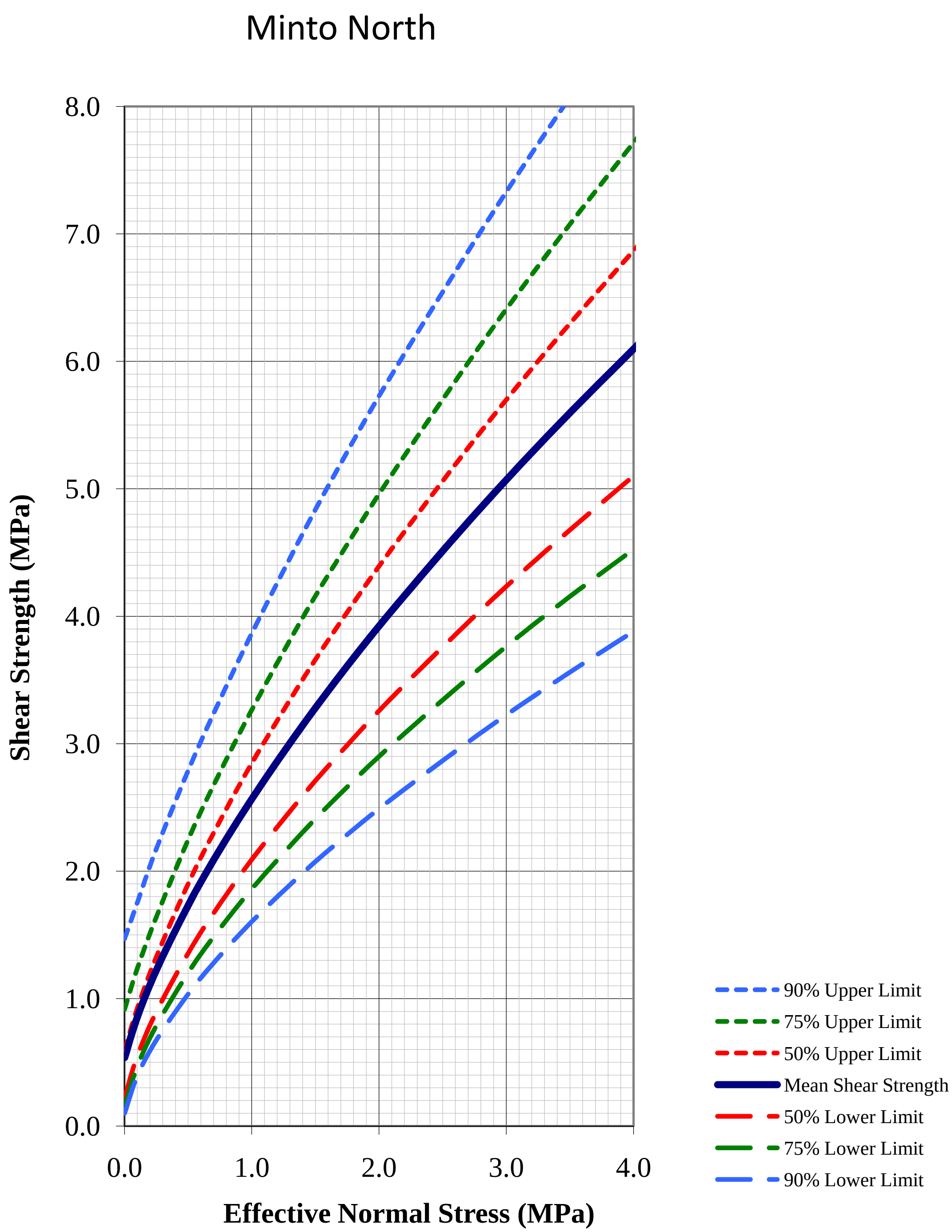
MINTO MINE

PREFEASIBILITY GEOTECHNICAL EVALUATION

ROCK MASS SHEAR STRENGTH: RIDGETOP

DATE:	APPROVED:	FIGURE NO.:	REVISION NO.
NOV. 2009	MEL	14	A



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FILE NAME:	MINTO MINE	ROCK MASS SHEAR STRENGTH: MINTO NORTH

DATE:	APPROVED:	FIGURE NO.:	REVISION NO.
NOV. 2009	MEL	15	A

7 Interramp/Overall Slope Stability Modeling

Slope design involves analysis of the three major components of a pit slope, i.e., bench configuration, interramp angle and overall slope angle, all as defined on Figure 16. The bench configuration, which is controlled by the bench face angle, bench height, and berm width, defines the interramp angle. The overall slope angle consists of interramp sections separated by wide step-outs for haulage roads or mine infrastructure. The overall slope angle at Minto will be approximately equal to the interramp angle except in areas where a wide step-out may be planned, e.g., at the contact between overburden and the underlying rock. In order to refine the recommendations of this study, a range of slope angles was analyzed.

As discussed in Section 3, the maximum anticipated seismic acceleration which any of the Minto pits may be subject to during their relatively short lives is sufficiently low, that no analyses were conducted for seismic conditions.

SRK evaluated both global and bench scale stability for the proposed Minto open pits, where global failure is defined as one that occurs relatively deep through the rock mass, is pseudo-rotational, and is of sufficient scale to impact interramp and/or overall slopes. Bench scale failures typically involve only one or two bench levels and can be described as a block type failure involving the translation of a block delineated by one or more structural features, such as discontinuities, within the rock mass. Techniques used by SRK for the global analyses are presented in the remainder of this section. Details regarding bench scale stability analyses are presented in Section 8.

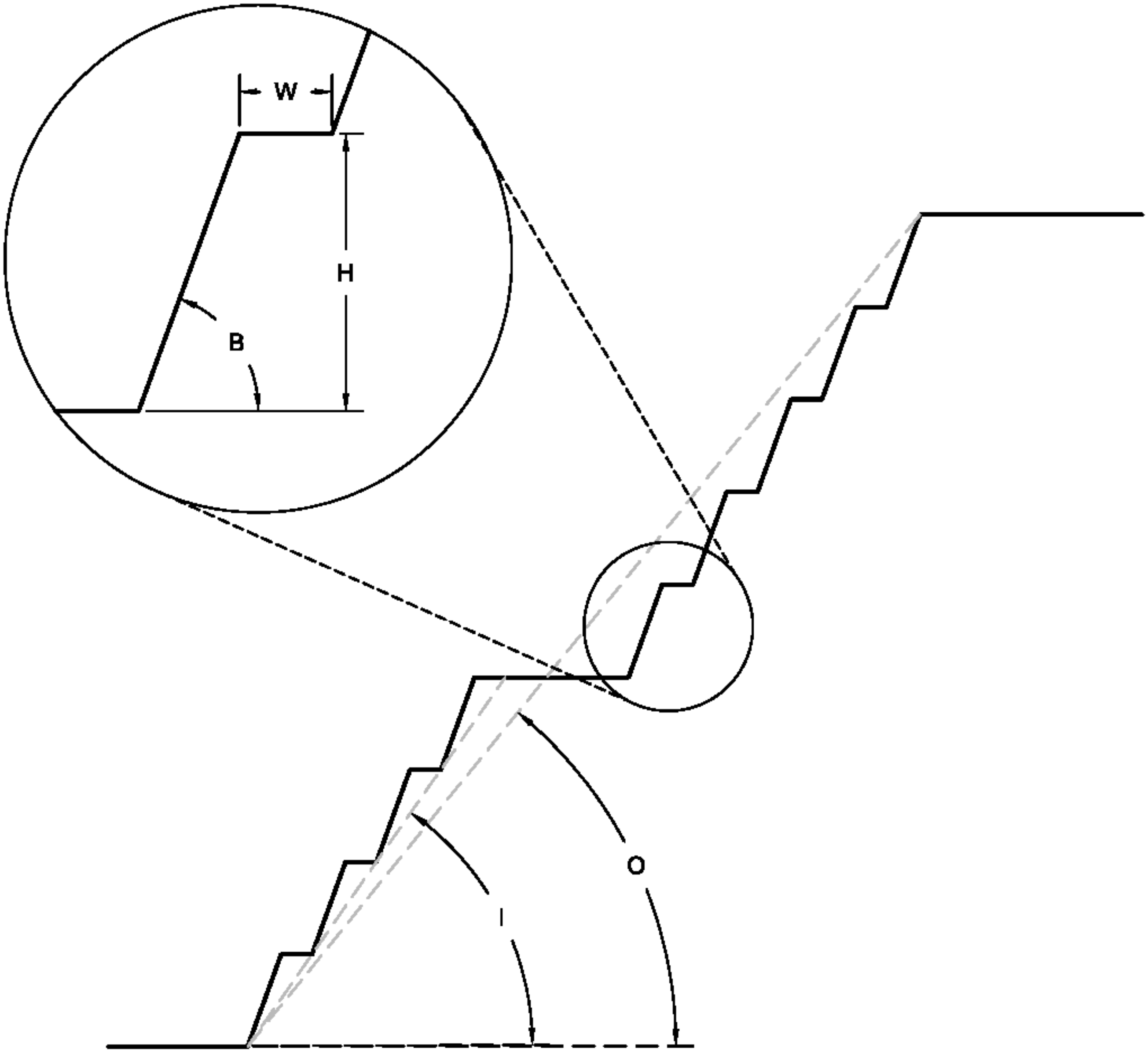
The mathematical geotechnical model was input into the commercially available geotechnical modeling software package Slide 5.039 (Slide), developed by Rocscience, Inc. (2003). Slide is a two-dimensional, limit equilibrium slope stability analysis program that analyzes slope stability by various methods of slices. Spencer's method was selected for the limit equilibrium analyses of this evaluation due to its consideration of both force and moment equilibrium.

Vertical profiles considered most critical and representative of conditions were selected for analysis based on the ultimate pit configurations and the geotechnical model at each deposit location. For Area 2, profiles of the highest sections of the west and east walls were selected for the interramp and overall stability analyses. Given the relatively shallow depths and low interramp slope heights at Ridgetop and Minto North, generalized sections were constructed containing ultimate values for each component. This method represents a conservative or worst case scenario.

The slope angles were optimized in terms of risk, i.e. Probability of Failure (PoF), to ensure that the design slope angles were the optimum based on a quantitative evaluation of alternative designs. The PoF value incorporates the variations associated with the input parameters and the concept of risk into the design.

7.1 Results of Interramp/Overall Stability Analysis

Based on SRK's experience, interramp/overall slope angles that yield probabilities of failure of up to 30% for slopes with low failure consequences and approximately 5% for high failure consequences are appropriate for most open pit mines. Slopes of high failure consequence are generally those slopes that are critical to mine operations, such as those on which major haul roads are established, those providing ingress or egress points to the pit, or those underlying infrastructure such as processing facilities or structures.



O = OVERALL ANGLE

I = INTERRAMP ANGLE

B = BENCH FACE ANGLE

H = BENCH HEIGHT

W = CATCH BENCH WIDTH = $H\left(\frac{1}{\tan I} - \frac{1}{\tan B}\right)$

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FILE NAME:		APPROVED: MEL
		FIGURE NO.: 16
		REVISION NO. A

In analyses, the interramp angle is typically incrementally increased until a suitable probability of failure equal to or greater than 30% is achieved. The probabilities of instability are plotted against their respective interramp slope angles for each model and the slope angle expected to yield a suitable probability of instability (5% or 30% depending on failure consequence) is determined.

Results of slope stability modeling are summarized in Table 9 and generally indicated probabilities of failure (PoF) ranging from near zero to approximately 5%. It should be noted that while a near zero percent probability of failure does demonstrate a very low likelihood of slope instability; it does not imply that slope instability is impossible; rather, a reported zero probability simply indicates that, for the potential failure surfaces characterized by one of 300 samples drawn from the strength distributions defined, no surfaces had a Factor of Safety (FoS) less than 1.0.

Table 9: Results of Interramp/Overall Slope Stability Modeling

Deposit	Sector	Height (m)	Mean FoS	PoF (%)
Area 2	Northeast	130m	2.5	0.7
Area 2	Southwest	214m	2.1	2.9
Ridgetop	-	130m	2.3	2.4
Minto North	-	130m	2.3	0.0

7.1.1 Area 2 and Area 118

Results of the interramp/overall slope stability analysis of the Area 2 east wall are shown graphically in Figure 17. The hatched area is the Critical Deterministic Surface which is defined as the slip surface with the lowest safety factor when all the input parameters are equal to their mean values. The remaining surfaces shown are all of the Global Minimum Surfaces that were located by the analyses when the properties were sampled randomly.

The critical slip surface for the east wall is a circular surface initiating at the base of the weathered bedrock. Surfaces initiating at the toe of the slope were also evaluated.

Although the critical failure surface shown in Figure 17 represent a relatively low interramp slope failure, its location directly above the main haul road and suggests that a failure through weathered bedrock materials could have a significant impact on mine operations. Consequentially, critical surfaces were evaluated both at the toe of the slope and at the interface between weathered and fresh bedrock for this model.

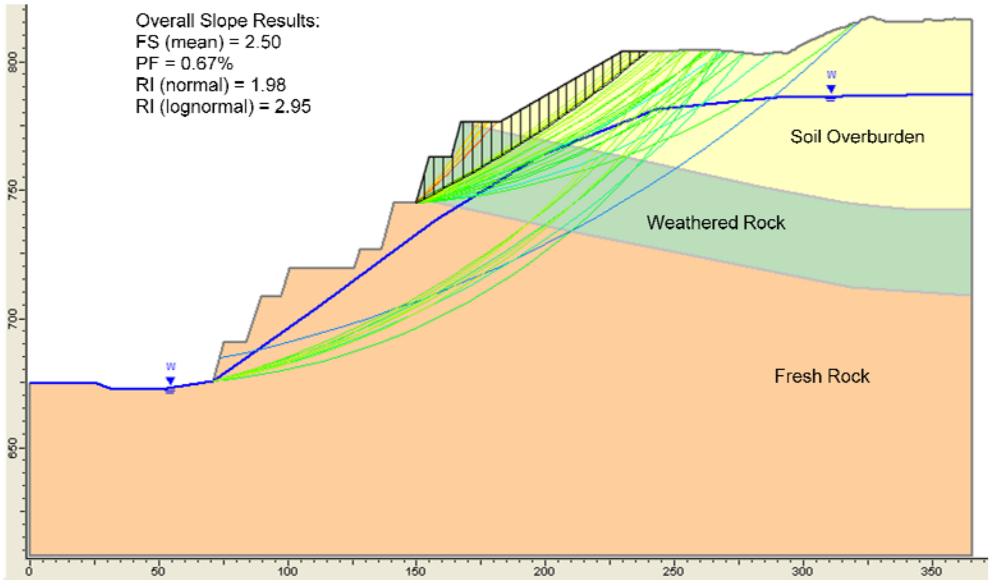


Figure 17: Interramp and overall stability modeling results: Area 2 east wall

Results of interramp/overall slope stability modeling of the Area 2 west wall are shown in Figure 18. Surfaces initiating at the base of the weathered domain and the toe of the overall slope were again considered due to the proximity of the weathered rock to the main haul road. The critical slip surface initiates at the base of the weathered rock.

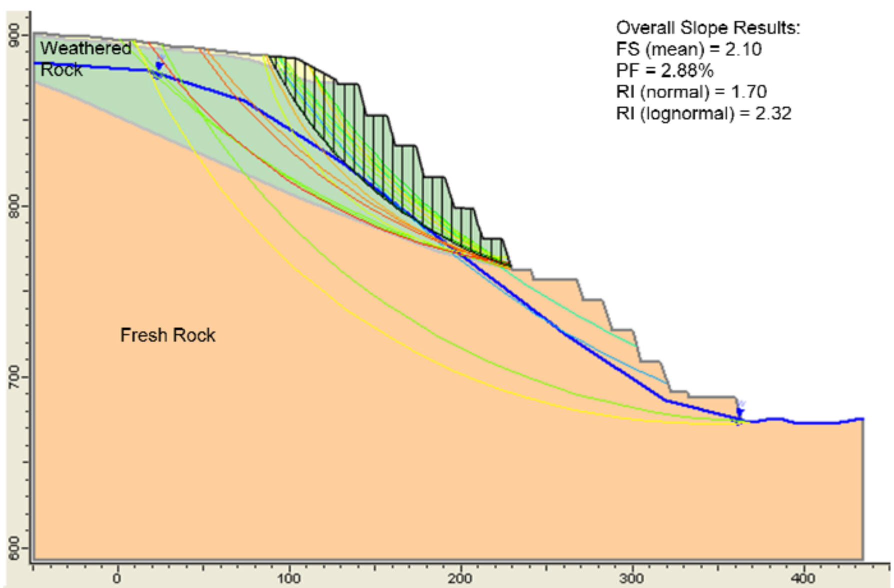


Figure 18: Interramp and overall stability modeling results: Area 2 west wall

Given the small size of the Area 118 pit as well as its close proximity and geotechnical similarities to Area 2, additional interramp slope stability modeling was not deemed necessary for Area 118 at the pre-feasibility level.

7.1.2 Ridgetop

Results of interramp stability modeling of the generalized Ridgetop section indicate a probability of failure of approximately 2.4% and critical slip surface initiating at toe of the slope (Figure 19). Surfaces initiating at the base of the weathered bedrock were also evaluated during the analysis.

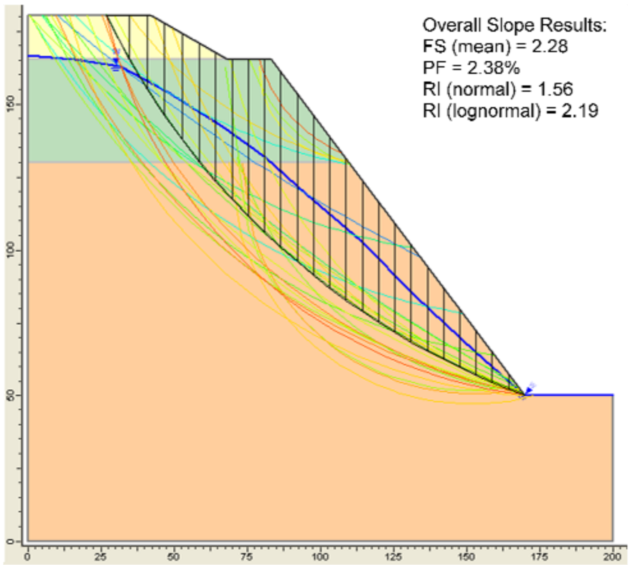


Figure 19: Interramp stability modeling results: Area 2 east wall

7.1.3 Minto North

An interramp slope angle of 52 degrees yields a probability of failure approaching zero percent. Results of the interramp/overall slope stability analysis of the Minto North section are shown graphically in Figure 20.

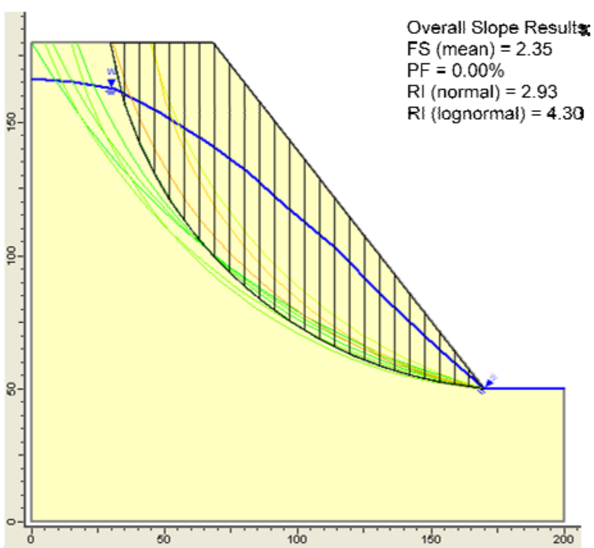


Figure 20: Interramp stability modeling results: Minto North

8 Geologic Discontinuity Analysis

Geologic discontinuity influenced failure mechanisms were analyzed at both the pit wall and bench scales. The term discontinuity refers to any significant mechanical break or fracture having negligible tensile strength in the rock. Discontinuities are formed by a wide range of geological processes and can collectively include most types of joints, faults, fissures, fractures, veins, bedding planes, foliation, shear zones, dikes and contacts.

8.1 Major Geologic Structures

Major geologic structures are those features, such as faults, dikes, shear zones, and contacts that have dimensions on the same order of magnitude as the area being characterized. These structures are treated as individual elements for design purposes, as opposed to joints, which are handled statistically.

Several faults or shear zones have been identified in resource and geotechnical drilling at all of the subject sites. Most of these structures are not anticipated to significantly impact pit slope stability due to their apparent lack of persistence and associated limited degree of rock degradation. However, the potential for one or more major structures to adversely impact stability of the Area 2 west wall has been identified and should be investigated further as the project advances.

Typically, high angle structures do not adversely impact pit slopes on the overall scale and as such, were not specifically targeted for this pre-feasibility level evaluation. For a pre-feasibility level evaluation, geotechnical drilling is targeted to obtain data representative of overall rock mass conditions, and to a lesser extent, individual structures such as those previously mentioned.

8.1.1 Area 2 and Area 118

Both resource and geotechnical drilling in southwestern Area 2 suggest a major fault(s) potentially striking northwest, sub-parallel to the Area 2 pit west wall with a moderate to steep northeast dip, similar to faults suggested by resource geology in adjacent Area 118. In particular, exploration holes 06SWC082 and 06SWC106 encountered disrupted zones at down hole depths of approximately 279m and 243m, respectively. However, the same indications were not observed in adjacent holes, thereby suggesting a high dip angle for the structure.

Geotechnical drillholes C09-03 and C07-07 also intersected major structures at shallower depths that would be consistent with the potential structure(s) and would coincide with the western Area 2 ultimate pit wall.

Major faults at similar orientations are also anticipated through the Area 118 underground mining areas and development.

During the recent geotechnical core logging program, three orientations were measured on different striations contained within two different fault zones in core from drillholes C09-02 and C09-03.

8.1.2 Ridgetop

During logging of geotechnical drillholes C09-04 and C09-05, orientation measurements were obtained on seven different zones believed to be related to faulting. Poles to the discontinuities bounding these zones are shown on Figure 21.

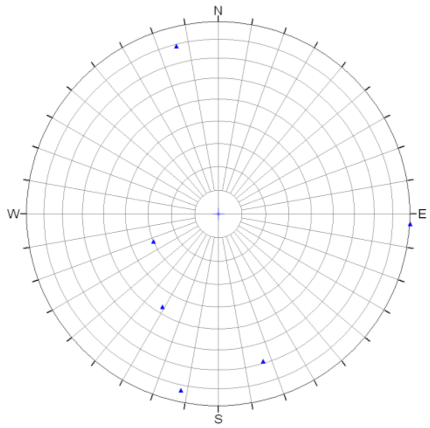


Figure 21: Pole plot of oriented faults at Ridgetop

8.1.3 Minto North

Geotechnical and resource drilling at Minto North suggests multiple sub-horizontal structures above the ore zone as well as a sub-vertical fault striking approximately north-south through the mid portion of the pit. Given the relatively shallow pit depth at Minto North, the fault zones associated with these structures could potentially form a significant portion of the pit walls.

Two orientations were obtained on potential fault zones in geotechnical drillhole C09-08; poles to the two faults logged are shown on Figure 22.

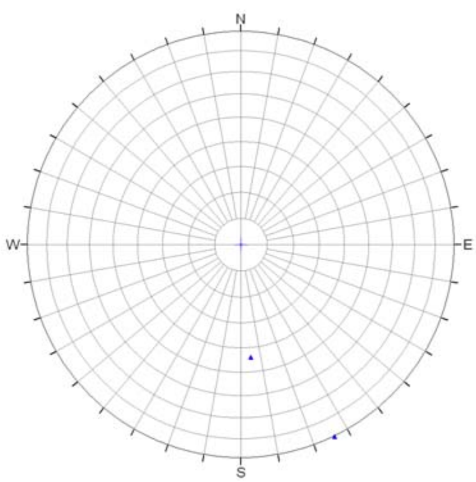


Figure 22: Pole plot of oriented faults at Minto North

8.2 Rock Fabric

Minor discontinuities such as joints, foliation and bedding planes, represent an infinite population for practical purposes and, due to sampling limitations, are best modeled with stochastic (probabilistic) techniques. A discontinuity set denotes a grouping of discontinuities that are expected to have similar impact upon the proposed design. In open pit design, this criterion is usually modified so that all discontinuities in a similar range of orientations, i.e., dip direction and dip, are designated as a single discontinuity set.

8.2.1 Discontinuity Orientation

The depth of intercept and the angles of the discontinuities relative to the core axis and perpendicular to the core axis, (alpha and beta angles, respectively) were measured during logging to enable the calculation of the true dip direction and dip.

Accounting for the plunge and azimuth of each drillhole, discontinuity alpha and beta angles were converted to dip and dip direction using the commercially available software package, Dips developed by Rocscience, Inc. (2003). Discontinuity data from each of the geotechnical coreholes was contoured on an equal area percent plot for analysis of structural stability. In most cases, visual inspection of these plots revealed preferred discontinuity orientations. The contour plots are presented on Figure 23 through 25.

After the discontinuity measurements were converted into in situ orientations, the combined data set of discontinuities was divided into categories of which, given sufficient persistence, had the potential to create structurally controlled failures. Plane shear and wedge type failures were evaluated for pit sectors assuming an average orientation of the pit walls in each sector.

A summary of discontinuity sets delineated and incorporated in the analysis of bench stability is presented in Table 10.

Table 10: Design Discontinuity Sets

Discontinuity Set Information				Dip		DDR	
Deposit	**Sector**	**Set ID**	**No.**	**Mean**	**Stdev.**	**Mean**	**Stdev.**
Ridgetop	-	J1	275	37.1	12.3	104.3	21.8
Ridgetop	-	J2	174	47.4	9.6	35.8	18.9
Area 2	South	J1	135	51.1	8.5	47.9	12.6
Area 2	South	J2	150	46.0	12.9	1.4	13.8
Area 2	West	J3	142	17.7	7.8	25.7	36.0
Area 2	West	J4	107	69.7	11.4	16.4	13.9
Area 2	West	J5	86	48.5	7.8	92.6	17.3
Area 2	North	J6	206	62.5	13.4	13.6	23.8
Area 2	North	J7	123	19.1	9.4	21.3	40.3
Area 2	North	J8	73	50.9	8.1	92.4	16.4

8.2.2 Design Sectors

Slope angles within an open pit mine are influenced not only by geologic structure, rock mass strength and porewater pressures, but also by pit wall orientation and other operational considerations. The ultimate pits were evaluated for such regions of similar structural characteristics and pit slope orientation called “design sectors” which are expected to exhibit similar response to pit development.

Both the weathered and fresh rock domains at Minto are characterized by relatively strong intact rock strengths and by very similar discontinuity orientations. As such, pit slope design sectors were delineated based primarily on variations in structural (discontinuity) systems relative to mean pit wall orientations. Design sectors for Area 2 and Ridgetop are shown on Figures 26 and 27, respectively.

Both the weathered and fresh rock domains at Minto are characterized by relatively strong intact rock strengths and by very similar discontinuity orientations. As such, pit slope design sectors were delineated based primarily on variations in structural (discontinuity) systems relative to mean pit wall orientations.

8.2.3 Backbreak Analysis

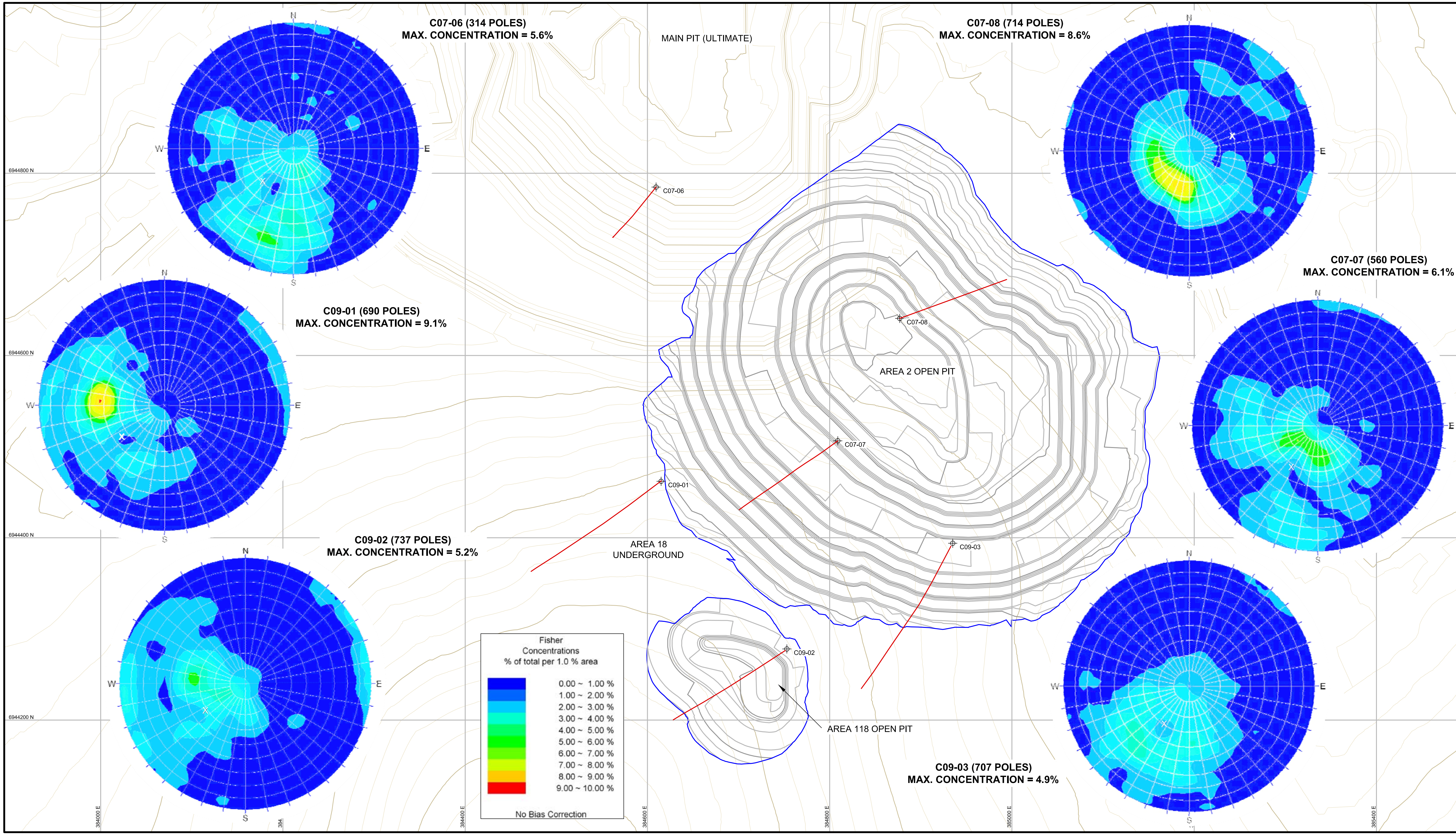
Preliminary kinematic analyses indicated that the south and west sectors of Area 2, Area 118 and Ridgetop had potential for bench scale instabilities; consequentially, additional, backbreak analyses were carried out for those sectors. SRK's backbreak analyses use stochastic simulations of discontinuity properties such as orientation, spacing, persistence, and shear strength to analyze the likelihood for plane shear and wedge type failures to occur in a given bench configuration and orientation. The analyses yield a distribution of achievable bench face angles and catch bench widths. The interramp/overall and bench stability analyses together yield an optimized pit slope angle, providing of sufficient rock fall containment. Pit sectors selected for backbreak analyses and their respective discontinuity sets are summarized in Table 11.

Results indicated that, based on the existing data, achievable mean bench face angles of approximately 64 degrees should be expected for the south and west sectors of Area 2 and Area 118. Due to the shallow discontinuity dip angles relative to the anticipated shear strength of the discontinuities at Ridgetop, steeper achievable bench face angles on the order of 73 degrees are expected for both Ridgetop pits.

While discontinuity analyses indicate that there is a slight potential for bench scale instability in the southwest section of the Minto North pit, the relatively low probability and the relatively small size of the pit, recommendations for Minto North are based on interramp slope angles alone.

Table 11: Summary of backbreak analyses per sector

Area	Sector	Sub-sector	Plane Shear	Wedge
Area 2	Northwest	-	J8	J6/J8
Area 2	West	W1	-	J4/J5
Area 2	West	W2	-	-
Area 2	South	S1	-	J1/J2
Area 2	South	S2	J2	J1/J2
Area 2	Northeast	-	-	-
Ridgetop	West	-	J1	J1/J2
Ridgetop	Southwest	-	J2	-
Ridgetop	Northeast	-	-	-



LEGEND

5280	EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
5280	CURRENT PFS ULTIMATE PIT CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
C09-02	GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION

N

0 20 40 60 80 100
Scale in Metres

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7175 West Jefferson Ave. Suite 3000
Denver, Colorado 80235
303-985-1333

SRK JOB NO.: 2CM022.006
FILE NAME: 02CM022.06.Fig.8-3.Rev.A.Discontinuity.Pole.Plots.A2.and.A118.2009-11-18.dwg

MINTO EXPLORATIONS LTD.

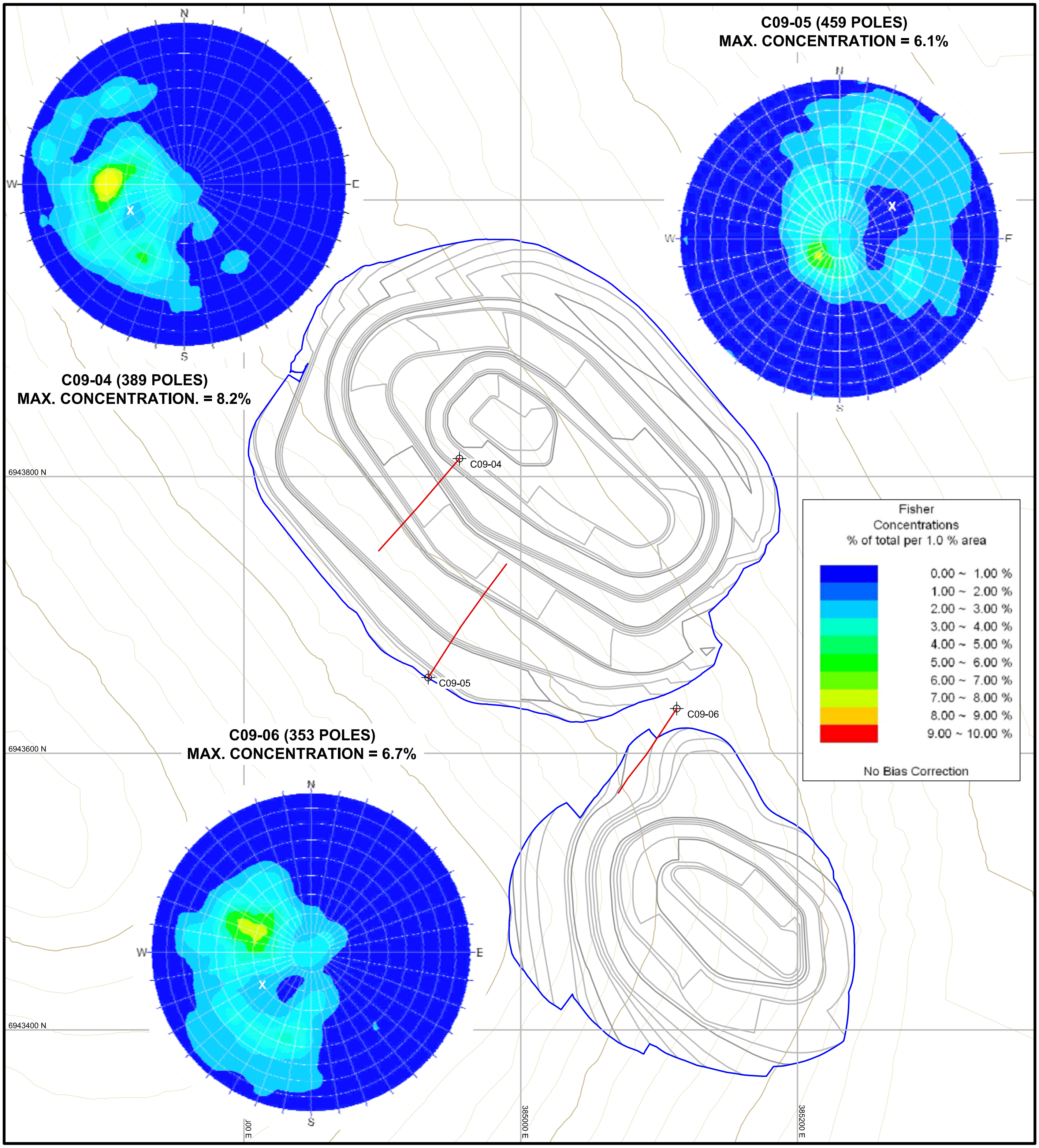
MINTO MINE

PREFEASIBILITY GEOTECHNICAL EVALUATION

DISCONTINUITY POLE PLOTS:
AREA 2 AND AREA 118

DATE:	APPROVED:	FIGURE:	REVISION NO.
DEC. 2009	ML	23	A

T:\Minto Mine Yukon Territory\040_AutoCAD\A118,A2, Ridge Top & N PFS Figures\Figures\02CM022.06.Fig.8-3.Rev.A.Discontinuity.Pole.Plots.A2.and.A118.2009-11-18.dwg



LEGEND

- 5280 — EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
- 5280 — CURRENT PFS ULTIMATE PIT CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
- C09-02 — GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION

0 20 40 60 80 100
Scale in Metres

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PREFEASIBILITY GEOTECHNICAL EVALUATION

DISCONTINUITY POLE PLOTS: RIDGETOP

SRK JOB NO.: 2CM022.006	DATE: DEC. 2009	APPROVED: ML	FIGURE: 24	REVISION NO. A

FILE NAME: 02CM022.06.Fig.8-4.Rev.A.Discontinuity.Pole.Plots.Ridge.Top.2009-11-18.dwg

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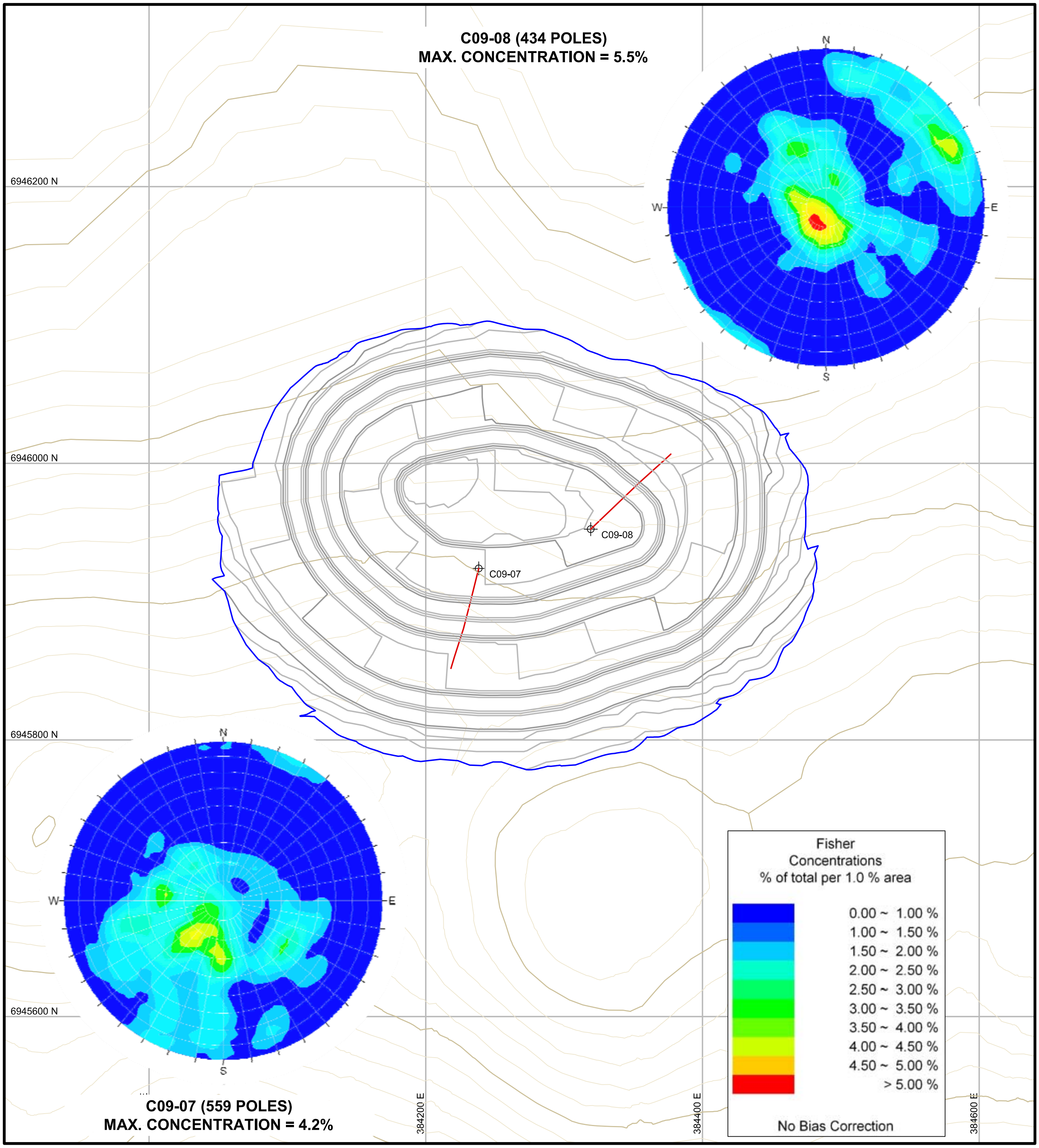

LEGEND

5280	EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
5280	CURRENT PFS ULTIMATE PIT CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
C09-02	GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION

N

0 20 40 60 80 100
Scale in Metres

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DISCONTINUITY POLE PLOTS:
MINTO NORTH

SRK JOB NO.: 2CM022.006

FILE NAME: 02CM022.06.Fig.8-5.Rev.A.Discontinuity.Pole.Plots.North.2009-11-18.dwg

MINTO MINE

DATE:	APPROVED:	FIGURE:	REVISION NO.
DEC. 2009	ML	25	A

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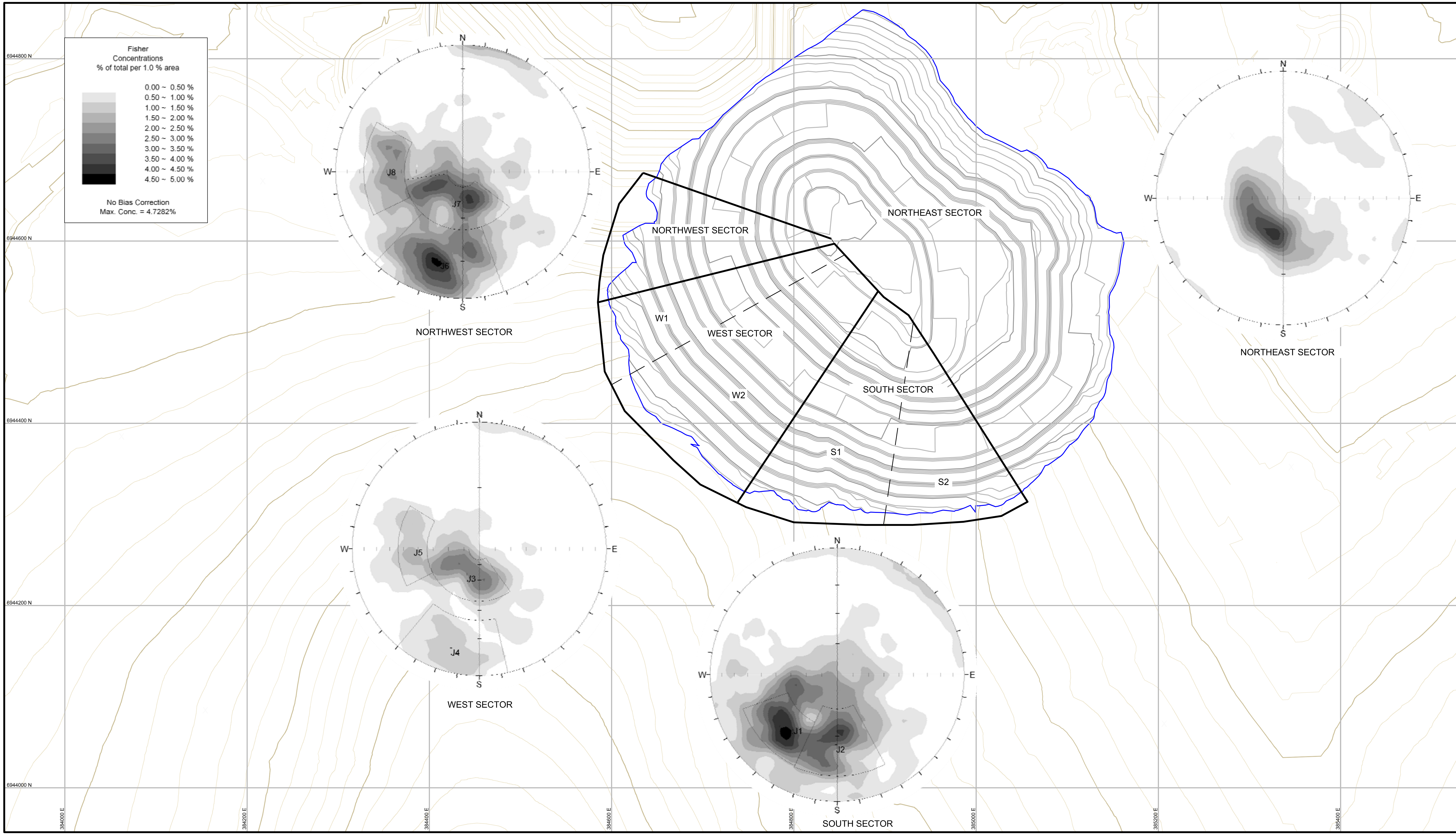

LEGEND

EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL

CURRENT PFS ULTIMATE PIT CONTOURS (MAJOR/MINOR) 5 METER INTERVAL

C09-02 GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION

N

0 20 40 60 80 100

Scale in Metres

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SRK JOB NO.: 2CM022.006	MINTO EXPLORATIONS LTD.	PREFEASIBILITY GEOTECHNICAL EVALUATION
FILE NAME: 02CM022.06.Fig.8-6.Rev.A.Design.Sectors.A2.and.A118.2009-11-23.dwg	MINTO MINE	DESIGN SECTORS: AREA 2

DATE:	APPROVED:	FIGURE:	REVISION NO.
DEC. 2009	ML	26	A

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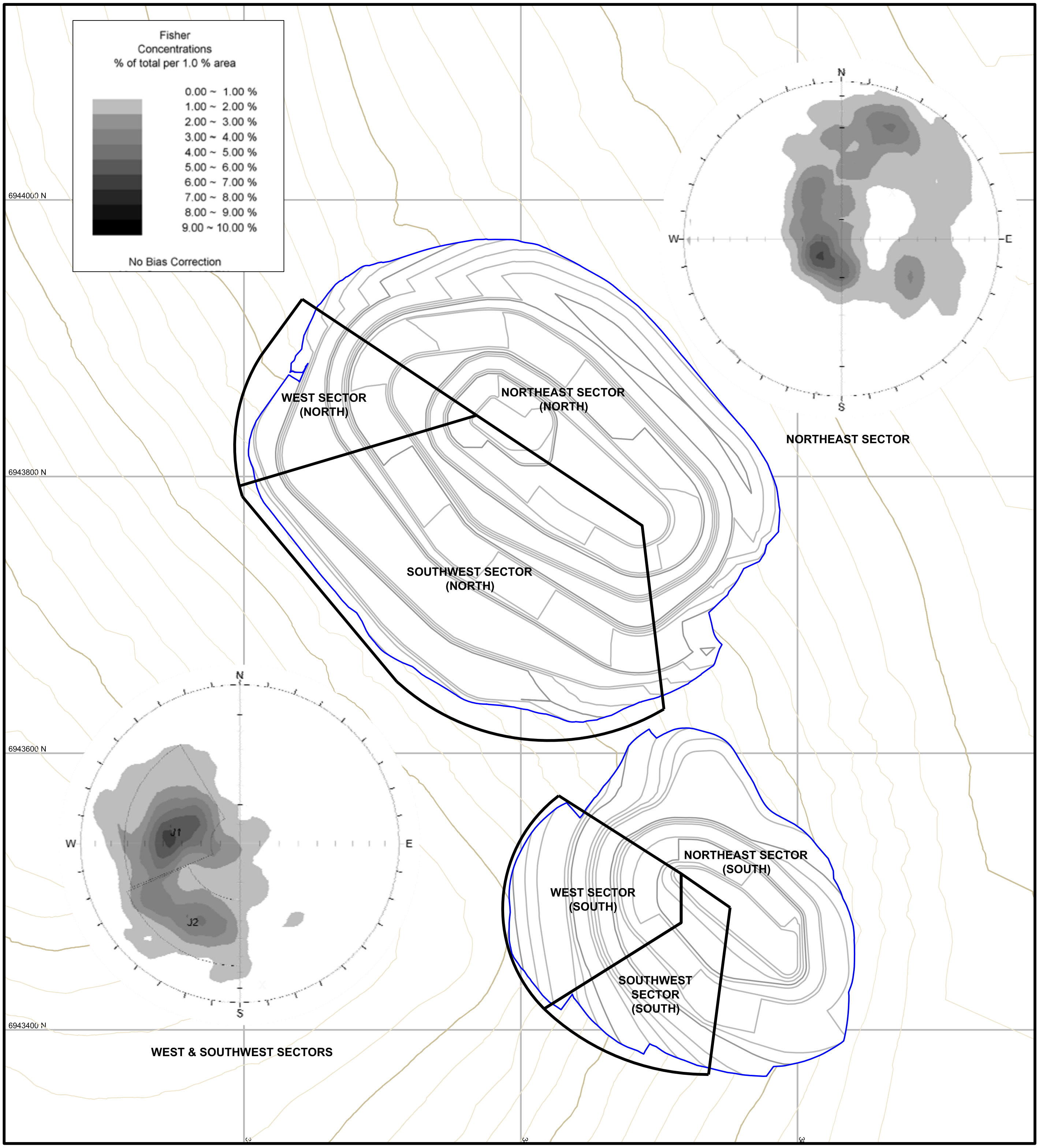

LEGEND

5280	EXISTING GROUND CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
5280	CURRENT PFS ULTIMATE PIT CONTOURS (MAJOR/MINOR) 5 METER INTERVAL
C09-02	GEOTECHNICAL DRILLHOLE COLLAR LOCATION AND HORIZONTAL BOREHOLE PROJECTION

0 20 40 60 80 100
Scale in Metres

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PREFEASIBILITY GEOTECHNICAL EVALUATION

DESIGN SECTORS:
RIDGETOP

SRK JOB NO.: 2CM022.006

FILE NAME: 02CM022.06.Fig.8-7.Rev.A.Design.Sectors.Ridge.Top.2009-11-21.dwg

MINTO MINE

DATE:	APPROVED:	FIGURE:	REVISION NO.
DEC. 2009	ML	27	A

T:\Minto Mine Yukon Territory\040_AutoCAD\A118.A2, Ridge Top & N PFS Figures\Figures\02CM022.06.Fig.8-7.Rev.A.Design.Sectors.Ridge.Top.2009-11-21.dwg

9 Pit Slope Design Recommendations

For certain geologic environments, the combination of the average anticipated bench face angle and the preferred interramp angle, based on global stability considerations, alone, do not provide a sufficiently wide average catch bench width to effectively control rockfall and/or overbank slough accumulation. In such instances, recommended interramp angles are flattened sufficiently to provide adequately wide average catch benches.

Pit slope design recommendations for each area are summarized in Table 12.

Table 12: Summary of Pit Slope Design Recommendations

Deposit Area	Sector(s)	Max. Slope Height (m)	Interramp Angle (°)	Bench Face Angle (°)	Bench Height (m)	Berm Width (m)	Stepout Width* (m)
Area 2	Soil Overburden	50	30	30	-	-	15
Area 2	Rock – Northwest and Northeast	170	53	73	18	8	-
Area 2	Rock – South and West	210	47	64	18	8	-
Area 118	Soil Overburden	18	30	30	-	-	15
Area 118	Rock - Northeast	35	53	73	18	8	-
Area 118	Rock - Southwest	36	47	64	18	8	-
Minto North	Soil Overburden	14	30	30	-	-	15
Minto North	Rock	125	52	72	18	8	-
Ridgetop - North	Soil Overburden	13	30	30	-	-	15
Ridgetop - North	Rock	132	53	73	18	8	-
Ridgetop - South	Soil Overburden	19	30	30	-	-	15
Ridgetop - South	Rock	78	53	73	18	8	-

* Where soil overburden depths are anticipated to exceed 7m, a 15m offset or stepout should be incorporated at, or vertically near, the contact between the overburden and the bedrock.

The Area 2 pit sectors are depicted in Figure 26. A similar delineation of the Area 118 pit, i.e., one based on relative position, is recommended for the Area 118 pit.

10 Area 118 Underground Pillar Assessment

In addition to the small open pit at Area 118 previously discussed, underground mining is also planned for Area 118. Based on the geotechnical data previously described, pillar strengths were evaluated in order to recommend suitable pillar dimensions for room and pillar mining. Based on estimates of ore deposit depth and thickness variability, pillar heights of 5m, 10m and 15m were assessed and ore depths, and respective overburden stresses, of 150m, 200m and 250m were considered.

In-situ Rock Mass Rating (IRMR) and Rock Mass Strength (RMS) values were evaluated for the ore zone as well as materials above and below the ore zone in geotechnical drillholes C09-01 and C09-02. A design IRMR and RMS of 55 and 60 MPa, respectively, were conservatively estimated for pillar, roof and floor materials. Using Laubscher's (1990) method, the IRMR of 55 was reduced to a Mining Rock Mass Rating (MRMR) of 47 and the 60 MPa RMS to a Design Rock Mass Strength (DRMS) of 51 MPa by applying appropriate reductions for joint orientation, blasting and water.

Based on empirical data presented by Ouchi (2004), assuming a RMR value of 55, the maximum unsupported span distance was estimated to be 6m for all pillar height/deposit depth combinations considered, as shown in Figure 28.

Figure 28: Critical span curve (Ouchi 2004)

Subsequently, the tributary area method was used to estimate minimum pillar dimensions required to support 6m x 6m or, if required, lesser, roof spans based on pillar height and overburden stresses. The resultant recommended room and pillar dimensions and extraction ratios are summarized in Table 13.

Table 13: Summary of Room and Pillar Size Recommendations

Depth (m)	Pillar Height (m)	Pillar Dimensions (m)	Room Dimensions (m)	Extraction Ratio
150	5	4x4	6x6	84%
150	10	5x5	6x6	79%
150	15	6x6	6x6	75%
200	5	4.5x4.5	6x6	82%
200	10	6x6	6x6	75%
200	15	7.5x7.5	6x6	69%
250	5	5x5	6x6	79%
250	10	7x7	6x6	71%
250	15	8x8	5x5	62%

Based on geotechnical conditions previously described, ground support requirements for development such as the 5mx5m decline were estimated as follows:

Recommendations for ground support for development include:

- Pattern bolting with 2.4m long bolts at a 2m spacing within and between rings; and,
- Welded wire mesh in back and top of walls.

11 Assessment of Future Geotechnical Work

Additional geotechnical characterization and analyses should be conducted at the feasibility and design levels for each of the areas. Analyses and recommendations presented herein are based on ultimate pit designs as described in this report, and, as such, any significant changes to mine plans or pit architecture should be reviewed by SRK to verify that recommendations will remain valid for the new mine plans.

Geologic structure should be further evaluated to more accurately characterize the rock mass which, according to the current mine plans, will comprise the toe of the Area 2 western slope walls and which will better ascertain the likelihood of the existence and orientation of major structures that may adversely impact stability of that western wall. To do so, two additional geotechnical drillholes are recommended at Area 2 to investigate the potential for such major structures and to further characterize the variability in orientation of joint sets.

Additional geotechnical characterization and analysis will also be necessary at Minto North, to better define rock mass conditions and structural impacts on bench stability as the project advances. To accomplish this, one additional geotechnical corehole is recommended at Minto North drilled into the northwest wall for evaluation of rock mass conditions and structure.

The underground portion of Area 118 will also require additional geotechnical drilling for rock mass characterization at the feasibility and design levels. The Area 118 and Ridgetop open pits most likely will not require additional geotechnical drilling unless major changes are made to the current plans.

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Appendices

Appendix A: Geotechnical Core Logs

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Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
COORDINATES: 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth markings: 25, 50, 75, 100, 125, 150 ft; 25 m

Stratigraphy (top to bottom): OVB, pG, fG, pG, fG, pG, Peg, pG, Peg, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	6	37	2
3.3	19	50	32
4.7	21	46	28
6.0	11	30	10
6.7	22	43	26
8.7	21	40	24
6.7	18	41	25
3.3	22	50	32
2.7	26	55	35
2.0	16	43	12
20.0	7	21	5
4.7	24	49	31
3.3	25	53	34
2.7	22	51	32
2.7	20	49	31
1.3	18	52	33
2.0	17	48	30
3.3	21	49	31
4.0	19	46	28
3.3	21	57	68
2.0	11	52	60
1.3	9	56	66
3.3	21	57	68
1.3	21	68	88
2.0	17	58	70
2.7	9	48	52
7.3	21	51	58
4.7	18	51	58

SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
COORDINATES: 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

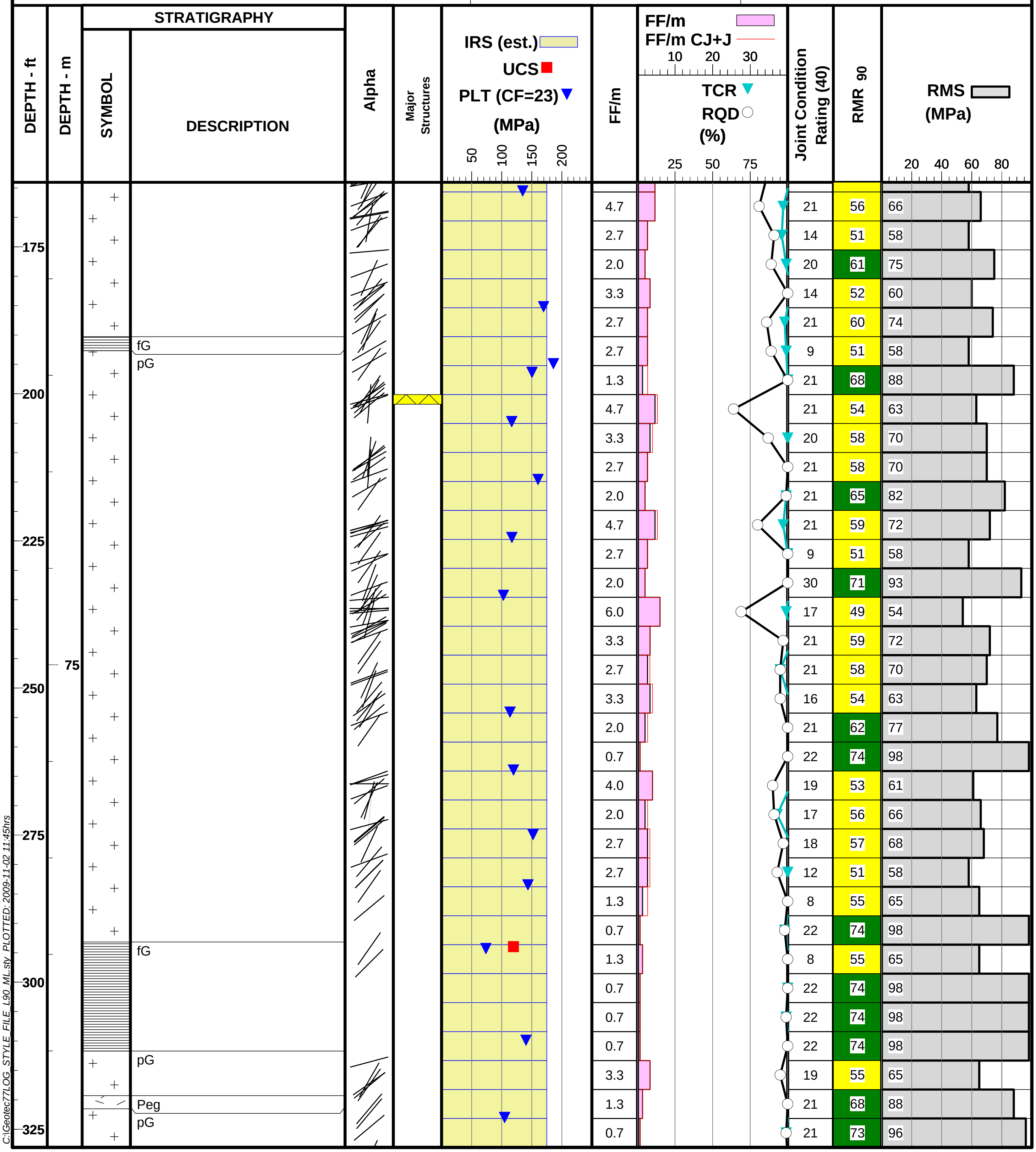
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
4.7	21	56	66
2.7	14	51	58
2.0	20	61	75
3.3	14	52	60
2.7	21	60	74
2.7	9	51	58
1.3	21	68	88
4.7	21	54	63
3.3	20	58	70
2.7	21	58	70
2.0	21	65	82
4.7	21	59	72
2.7	9	51	58
2.0	30	71	93
6.0	17	49	54
3.3	21	59	72
2.7	21	58	70
3.3	16	54	63
2.0	21	62	77
0.7	22	74	98
4.0	19	53	61
2.0	17	56	66
2.7	18	57	68
2.7	12	51	58
1.3	8	55	65
0.7	22	74	98
1.3	8	55	65
0.7	22	74	98
0.7	22	74	98
0.7	22	74	98
3.3	19	55	65
1.3	21	68	88
0.7	21	73	96

GEOTECHNICAL CORE LOG

SRK Consulting
Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
COORDINATES: 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01
PAGE: 3 **OF** 7
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.) UCS PLT (CF=23) (MPa): 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J: 10, 20, 30; TCR, RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80

Depth - ft: 350, 375, 400, 425, 450, 475
Depth - m: 125

Stratigraphy: fG, pG, fG, pG, fG, eG, fG, eG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	9	61	75
0.7	8	60	74
1.3	8	52	60
0.7	26	78	105
2.0	19	63	79
0.7	10	62	77
0.7	22	74	98
5.3	21	58	70
0.7	22	74	98
1.3	22	69	89
2.0	19	60	74
0.7	19	71	93
1.3	19	63	79
0.7	24	76	102
2.0	26	70	91
0.7	19	71	93
3.3	21	57	68
0.7	26	78	105
3.3	23	61	75
4.0	25	62	77
1.3	19	66	84
2.7	19	61	75
3.3	22	60	74
5.3	24	58	70
4.7	23	58	70
2.7	16	55	65
0.7	22	68	59
0.7	22	64	39
0.7	22	74	98
1.3	19	66	84
0.7	22	74	98
0.7	29	81	110
0.7	22	74	98

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
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BOREHOLE: C09-01
PAGE: 4 **OF** 7
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
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RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth marks (ft): 500, 525, 550, 575, 600, 625, 650; (m): 175

Stratigraphy (top to bottom): Peg; eG; fG; eG; fG; AND – And; fG; eG; fG; pG; fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	23	64	80
0.7	19	71	93
1.3	21	68	88
1.3	9	56	66
1.3	21	65	82
1.3	19	63	79
2.7	8	50	56
2.0	7	48	52
0.7	21	73	96
1.3	7	51	58
0.7	22	70	74
2.0	8	50	51
3.3	12	48	48
3.3	13	43	30
1.3	8	51	50
33.3	10	24	12
33.3	10	30	21
20.0	10	26	10
20.0	10	22	2
33.3	10	28	18
20.0	10	26	10
20.0	10	22	2
33.3	10	28	18
4.7	9	47	51
5.3	19	53	61
10.7	24	51	58
10.0	25	45	30
13.3	24	40	24
8.0	26	46	28
8.0	23	53	54
4.0	16	53	61
3.3	22	63	79
5.3	26	60	74
4.7	16	49	54

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
COORDINATES: 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01
PAGE: 5 **OF** 7
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
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LEGEND OF MAJOR STRUCTURES
Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)
0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY (SYMBOL, DESCRIPTION) | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth markers: 675, 700, 725, 750, 775, 800 (ft); 225 (m)

Stratigraphy (top to bottom): pG, fG, pG, fG, pG, fG, pG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
4.0	22	56	66
5.3	21	55	65
4.0	21	55	65
6.0	18	50	56
4.7	21	54	63
4.0	21	58	70
2.0	17	58	70
4.7	23	58	70
1.3	14	58	70
2.0	21	62	77
3.3	24	60	74
4.7	22	55	65
4.0	21	55	65
4.0	11	48	52
5.3	17	51	58
1.3	21	68	88
6.0	12	44	46
2.0	13	54	63
4.0	21	60	74
4.7	21	56	66
4.0	21	55	65
8.0	21	56	66
8.7	21	52	60
8.0	21	53	61
4.7	12	45	47
5.3	21	55	65
5.3	21	55	65
5.3	25	59	72
6.7	19	50	56
12.7	21	47	51
1.3	15	62	77
2.7	22	61	75
3.3	14	52	60

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-04 **TO** 2009-03-08
DIP: -57.00 **AZIMUTH:** 236.00
COORDINATES: 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

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Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY (SYMBOL, DESCRIPTION) | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 850, 875, 900, 925, 950, 975
Depth - m: 275

Stratigraphy (top to bottom): pG, fG, pG, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	16	60	74
1.3	20	67	86
0.7	22	74	98
1.3	21	68	88
2.7	21	60	74
1.3	20	67	86
2.0	22	66	84
0.7	20	72	94
1.3	24	71	93
3.3	22	60	74
2.0	21	62	77
0.7	24	76	102
1.3	20	67	86
1.3	21	68	88
1.3	26	73	96
0.7	26	78	105
0.7	22	74	98
0.7	21	73	96
1.3	21	68	88
0.7	26	78	105
0.7	22	74	98
0.7	26	78	105
1.3	21	68	88
1.3	17	64	80
2.0	12	56	66
2.0	17	61	75
0.7	21	73	96
0.7	22	74	98
2.0	21	65	82
2.0	17	58	70
1.3	6	53	61
2.7	12	54	63
1.3	18	62	77

SRK Consulting — Engineers and Scientists	**PROJECT:** Minto PFS Geotechnical Evaluation
	LOCATION: Yukon Territory, Canada
	SITE & PROJECT No: MINTO (2CM022.006)
	BORING DATE: 2009-03-04 **TO** 2009-03-08
	DIP: -57.00 **AZIMUTH:** 236.00
GEOTECHNICAL CORE LOG	**COORDINATES:** 6944462.53N 384615.22E **DATUM:** Nad83

BOREHOLE: C09-01
PAGE: 7 **OF** 7
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC424
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
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RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) — 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J — 10, 20, 30; TCR, RQD (%) — 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) — 20, 40, 60, 80

Depth - ft: 1000, 1025, 1050, 1075, 1100, 1125
Depth - m: 325

Description: fG, pG, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	8	55	65
1.3	13	57	68
0.7	22	74	98
1.3	12	56	66
2.0	7	48	52
0.7	26	78	105
0.7	7	59	72
0.7	21	73	96
0.7	22	74	98
0.7	26	78	105
0.7	29	81	110
0.7	22	74	98
0.7	22	74	98
1.3	21	68	88
1.3	16	63	79
0.7	22	74	98
1.3	24	71	93

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-01 **TO** 2009-03-04
DIP: -58.00 **AZIMUTH:** 239.00
COORDINATES: 6944276.36N 384751.29E **DATUM:** Nad83

BOREHOLE: C09-02

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC422
PLAN No:

DEFINITIONS

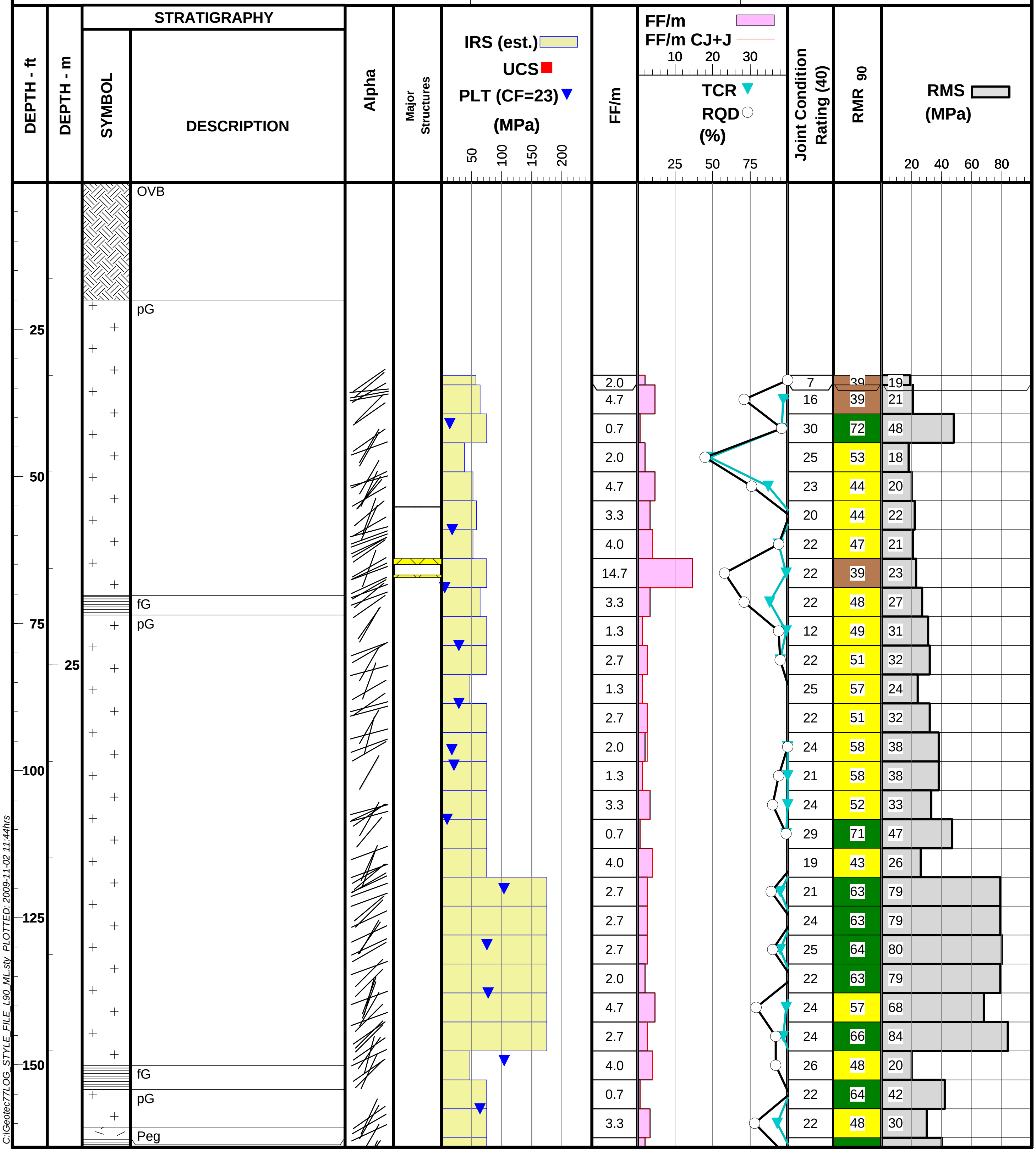
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	7	39	19
4.7	16	39	21
0.7	30	72	48
2.0	25	53	18
4.7	23	44	20
3.3	20	44	22
4.0	22	47	21
14.7	22	39	23
3.3	22	48	27
1.3	12	49	31
2.7	22	51	32
1.3	25	57	24
2.7	22	51	32
2.0	24	58	38
1.3	21	58	38
3.3	24	52	33
0.7	29	71	47
4.0	19	43	26
2.7	21	63	79
2.7	24	63	79
2.7	25	64	80
2.0	22	63	79
4.7	24	57	68
2.7	24	66	84
4.0	26	48	20
0.7	22	64	42
3.3	22	48	30

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GEOTECHNICAL CORE LOG

SRK Consulting
Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-01 **TO** 2009-03-04
DIP: -58.00 **AZIMUTH:** 239.00
COORDINATES: 6944276.36N 384751.29E **DATUM:** Nad83

BOREHOLE: C09-02

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC422
PLAN No:

DEFINITIONS

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Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY (SYMBOL, DESCRIPTION) | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 175, 200, 225, 250, 275, 300, 325
Depth - m: 75

Stratigraphy (top to bottom): fG, pG, fG, pG, fG, pG, fG, pG, fG, pG, fG, eG, fG, pG, And (AND), fG, pG, fG, pG, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	27	61	40
2.0	25	56	36
2.7	24	53	34
2.0	23	54	34
3.3	24	52	33
1.3	23	57	37
5.3	23	45	28
2.0	26	57	37
2.0	24	55	35
4.0	26	53	34
4.0	24	51	32
4.0	22	46	28
3.3	20	48	30
3.3	21	49	31
3.3	25	63	79
1.3	21	62	55
0.7	21	73	96
6.0	17	51	58
2.0	6	47	51
4.7	13	38	23
2.0	5	36	23
2.0	12	51	58
1.3	16	60	74
0.7	9	61	75
2.0	8	49	54
4.0	9	48	52
3.3	25	59	60
4.7	16	45	42
2.7	8	47	51
1.3	15	59	72
2.0	12	47	38
3.3	22	58	70
2.7	21	63	79
0.7	22	74	98

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-01 **TO** 2009-03-04
DIP: -58.00 **AZIMUTH:** 239.00
COORDINATES: 6944276.36N 384751.29E **DATUM:** Nad83

BOREHOLE: C09-02

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC422
PLAN No:

DEFINITIONS

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UCS: Uniaxial Compressive Strength (MPa)
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LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23), (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 350, 375, 400, 425, 450, 475
Depth - m: 125

Stratigraphy descriptions (top to bottom): fG, pG, fG, Peg, pG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	8	49	54
2.0	7	48	52
2.7	8	47	51
2.7	10	49	54
1.3	4	51	58
0.7	22	74	98
0.7	22	74	98
3.3	18	54	63
1.3	21	68	88
0.7	22	74	98
1.3	26	70	91
4.0	22	59	72
4.0	24	58	70
3.3	14	52	60
6.0	22	56	66
5.3	17	49	54
3.3	23	61	75
4.0	15	52	60
2.7	26	65	82
5.3	24	56	66
4.0	21	58	70
0.7	16	68	88
6.0	20	52	60
2.7	21	58	70
3.3	22	60	74
3.3	24	62	77
2.7	24	63	79
2.0	23	64	80
2.0	18	59	72
3.3	22	60	74
2.0	19	63	79
0.7	22	74	98
0.7	22	74	98

SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

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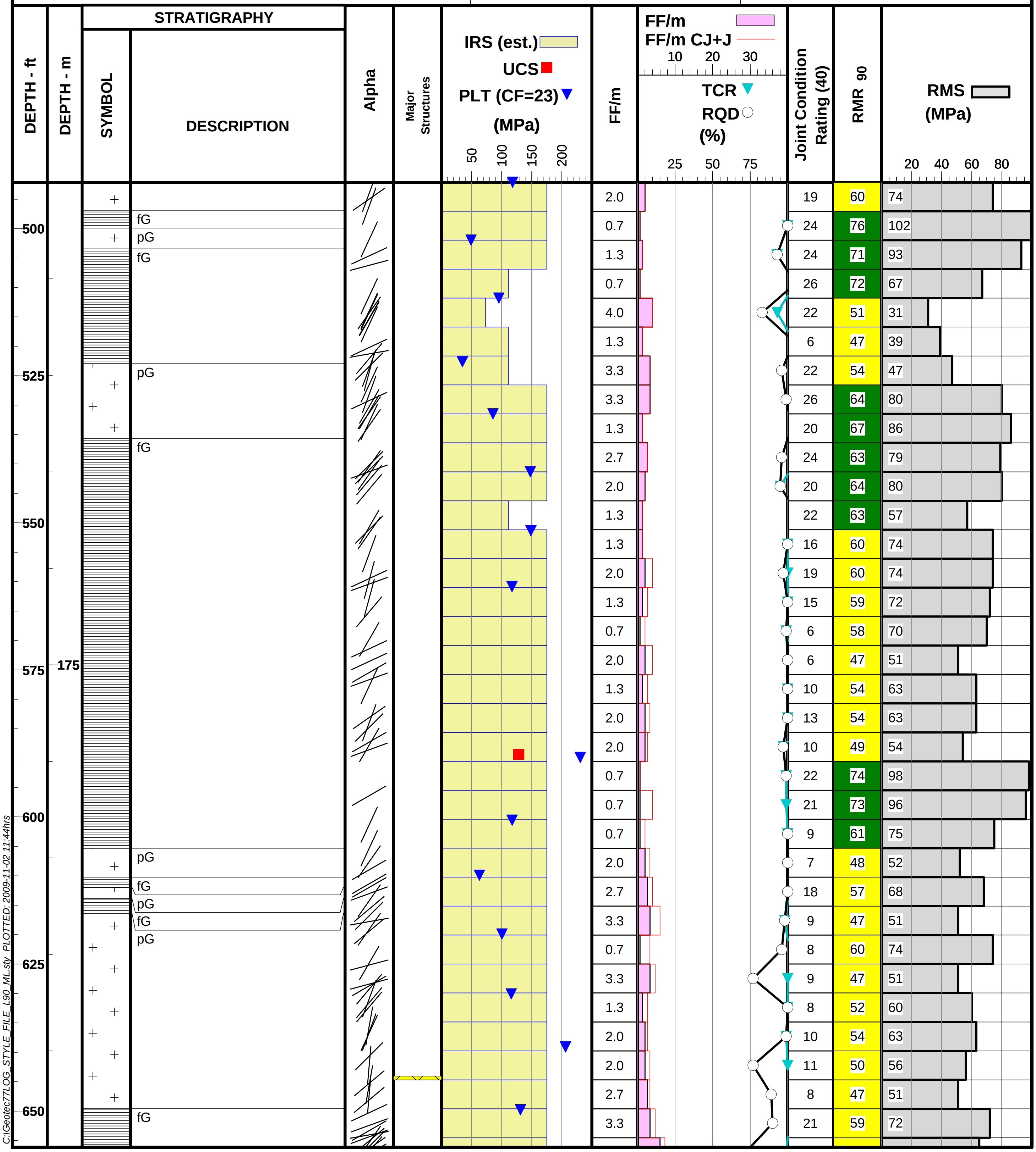
LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	19	60	74
0.7	24	76	102
1.3	24	71	93
0.7	26	72	67
4.0	22	51	31
1.3	6	47	39
3.3	22	54	47
3.3	26	64	80
1.3	20	67	86
2.7	24	63	79
2.0	20	64	80
1.3	22	63	57
1.3	16	60	74
2.0	19	60	74
1.3	15	59	72
0.7	6	58	70
2.0	6	47	51
1.3	10	54	63
2.0	13	54	63
2.0	10	49	54
0.7	22	74	98
0.7	21	73	96
0.7	9	61	75
2.0	7	48	52
2.7	18	57	68
3.3	9	47	51
0.7	8	60	74
3.3	9	47	51
1.3	8	52	60
2.0	10	54	63
2.0	11	50	56
2.7	8	47	51
3.3	21	59	72

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-01 **TO** 2009-03-04
DIP: -58.00 **AZIMUTH:** 239.00
COORDINATES: 6944276.36N 384751.29E **DATUM:** Nad83

BOREHOLE: C09-02
PAGE: 5 **OF** 6
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC422
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
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FF/m: Fracture Frequency per m
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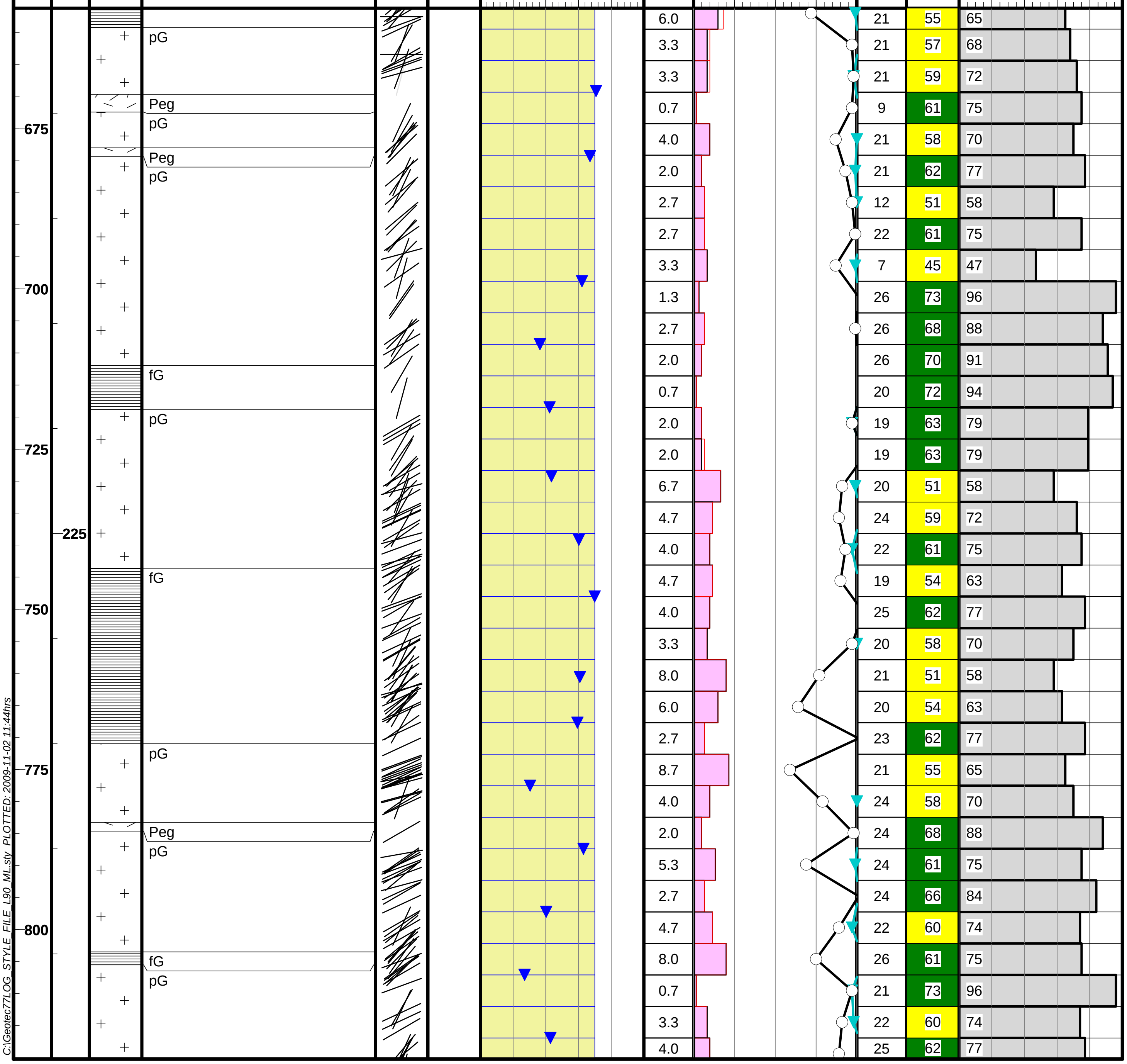
LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) | FF/m | FF/m, FF/m CJ+J, TCR, RQD (%) | Joint Condition Rating (40) | RMR 90 | RMS (MPa)



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
6.0	21	55	65
3.3	21	57	68
3.3	21	59	72
0.7	9	61	75
4.0	21	58	70
2.0	21	62	77
2.7	12	51	58
2.7	22	61	75
3.3	7	45	47
1.3	26	73	96
2.7	26	68	88
2.0	26	70	91
0.7	20	72	94
2.0	19	63	79
2.0	19	63	79
6.7	20	51	58
4.7	24	59	72
4.0	22	61	75
4.7	19	54	63
4.0	25	62	77
3.3	20	58	70
8.0	21	51	58
6.0	20	54	63
2.7	23	62	77
8.7	21	55	65
4.0	24	58	70
2.0	24	68	88
5.3	24	61	75
2.7	24	66	84
4.7	22	60	74
8.0	26	61	75
0.7	21	73	96
3.3	22	60	74
4.0	25	62	77

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-01 **TO** 2009-03-04
DIP: -58.00 **AZIMUTH:** 239.00
COORDINATES: 6944276.36N 384751.29E **DATUM:** Nad83

BOREHOLE: C09-02
PAGE: 6 **OF** 6
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC422
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

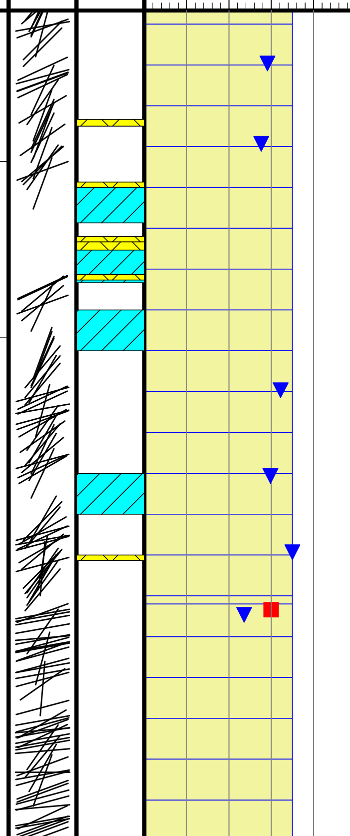
LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

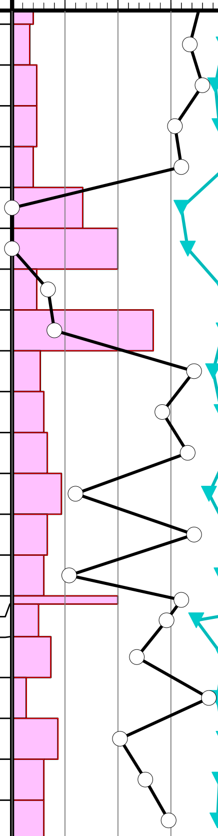
DEPTH - ft: 850, 875, 900, 925, 950, 975
DEPTH - m: 275

STRATIGRAPHY — SYMBOL / DESCRIPTION: fG, pG

Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa): 50, 100, 150, 200



FF/m, FF/m CJ+J: 10, 20, 30 | TCR, RQD (%): 25, 50, 75



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
3.3	16	52	60
4.7	18	51	58
4.7	13	48	52
4.0	13	47	51
13.3	14	45	47
20.0	14	42	42
4.7	21	54	63
26.7	21	47	51
5.3	9	43	44
6.0	17	49	54
6.7	21	52	60
9.3	21	54	63
6.7	21	52	60
6.0	21	53	61
20.0	21	[illegible]	54
5.0	21	56	66
7.3	21	53	61
2.7	18	55	65
8.7	18	52	60
6.0	21	55	65
6.0	21	58	70

RMS scale: 20, 40, 60, 80

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03
PAGE: 1 **OF** 8
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

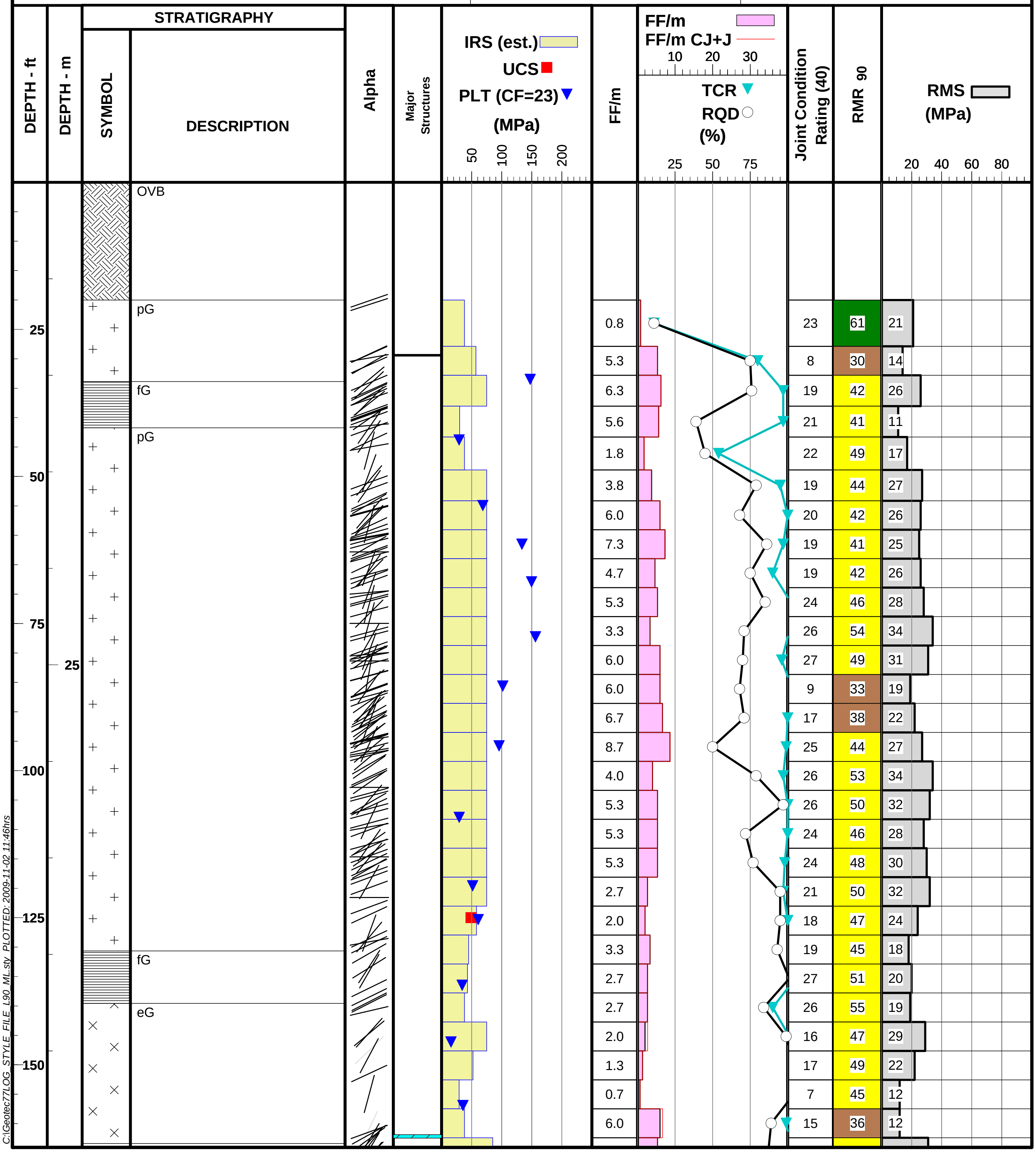
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.8	23	61	21
5.3	8	30	14
6.3	19	42	26
5.6	21	41	11
1.8	22	49	17
3.8	19	44	27
6.0	20	42	26
7.3	19	41	25
4.7	19	42	26
5.3	24	46	28
3.3	26	54	34
6.0	27	49	31
6.0	9	33	19
6.7	17	38	22
8.7	25	44	27
4.0	26	53	34
5.3	26	50	32
5.3	24	46	28
5.3	24	48	30
2.7	21	50	32
2.0	18	47	24
3.3	19	45	18
2.7	27	51	20
2.7	26	55	19
2.0	16	47	29
1.3	17	49	22
0.7	7	45	12
6.0	15	36	12

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Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03
PAGE: 2 **OF** 8
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY (SYMBOL, DESCRIPTION) | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 175, 200, 225, 250, 275, 300, 325
Depth - m: 75

Stratigraphy (top to bottom): Peg, eG, fG, eG, Peg, eG, fG, eG, Peg, eG, fG, eG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
5.3	18	47	31
4.0	14	36	14
6.0	14	34	13
1.3	12	47	19
3.3	10	34	13
6.0	22	41	14
1.3	26	63	41
2.7	16	45	28
0.7	16	58	38
4.7	14	37	22
6.7	11	32	12
8.0	15	33	13
2.7	17	46	28
5.3	14	38	22
4.0	18	40	17
10.7	7	18	1
10.0	21	35	3
2.7	13	42	14
2.0	22	51	21
5.3	15	35	17
3.3	12	36	17
3.3	12	36	17
2.0	10	39	19
3.3	21	52	33
1.3	26	63	41
2.7	19	48	30
4.0	17	44	27
3.3	8	33	11
4.0	15	39	23
6.7	22	36	1
4.0	14	36	17
2.7	12	39	19
3.3	12	40	22
2.0	12	44	22

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

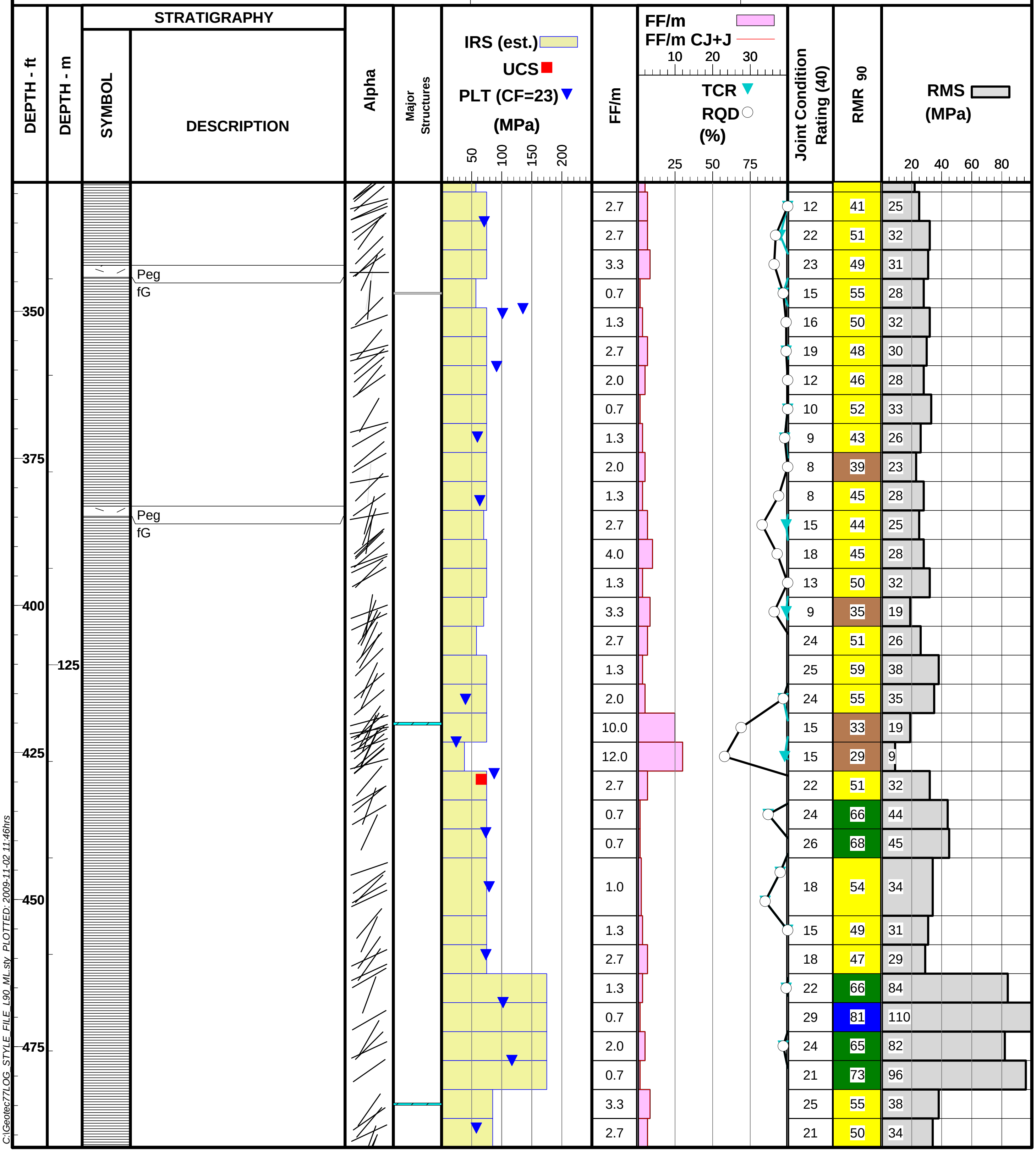
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.7	12	41	25
2.7	22	51	32
3.3	23	49	31
0.7	15	55	28
1.3	16	50	32
2.7	19	48	30
2.0	12	46	28
0.7	10	52	33
1.3	9	43	26
2.0	8	39	23
1.3	8	45	28
2.7	15	44	25
4.0	18	45	28
1.3	13	50	32
3.3	9	35	19
2.7	24	51	26
1.3	25	59	38
2.0	24	55	35
10.0	15	33	19
12.0	15	29	9
2.7	22	51	32
0.7	24	66	44
0.7	26	68	45
1.0	18	54	34
1.3	15	49	31
2.7	18	47	29
1.3	22	66	84
0.7	29	81	110
2.0	24	65	82
0.7	21	73	96
3.3	25	55	38
2.7	21	50	34

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03
PAGE: 4 **OF** 8
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.) UCS PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
3.3	19	57	68
0.7	15	67	86
2.0	24	65	82
1.3	18	62	77
1.3	22	69	89
0.7	20	72	94
0.7	22	74	98
0.7	22	74	98
2.0	8	49	54
1.3	15	59	72
0.7	15	67	86
2.0	18	59	72
2.7	21	60	74
2.7	17	54	63
2.7	18	55	65
3.3	16	52	60
0.7	21	73	96
2.7	14	51	58
1.3	13	57	68
0.7	22	74	98
1.3	13	57	68
1.3	19	66	84
0.7	7	59	72
2.7	12	54	63
3.3	7	45	47
2.0	12	53	61
0.7	22	70	75
1.3	12	59	72
1.3	10	54	63
0.7	9	61	75
2.0	12	56	66
1.3	4	51	58
2.7	15	54	63

Stratigraphy descriptions (top to bottom): Peg, fG, eG, fG, pG, fG, pG

Depth marks: 500, 525, 550, 575 (175 m), 600, 625, 650 ft

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Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Columns: DEPTH - ft | DEPTH - m | STRATIGRAPHY (SYMBOL, DESCRIPTION) | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth marks: 675, 700, 725, 750, 775, 800 ft; 225 m

Stratigraphy (top to bottom): fG, Peg, fG, pG, fG, pG, Peg, eG, fG, eG, fG, eG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.7	15	54	63
0.7	22	74	98
3.3	8	49	54
4.0	14	51	58
4.7	21	56	66
4.0	18	52	60
8.7	24	53	61
8.7	26	60	74
3.3	10	42	38
1.3	23	70	91
0.7	26	78	105
4.7	22	57	68
6.0	23	51	43
1.3	17	61	75
2.0	24	68	88
0.7	26	78	105
0.7	19	71	93
2.0	21	62	77
1.3	20	64	80
0.7	22	74	98
0.7	22	74	98
0.7	24	76	102
0.7	22	74	98
0.7	22	74	98
0.7	20	72	94
0.7	22	74	98
1.3	21	68	88
2.0	21	65	82
0.7	22	74	98
0.7	20	72	94
0.7	22	74	98
1.3	26	70	91
2.0	21	65	82
1.3	21	65	82

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03
PAGE: 6 **OF** 8
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth (ft): 850, 875, 900, 925, 950, 975
Depth (m): 275

Stratigraphy (top to bottom): fG, eG, Peg, eG, fG, eG, AND And, eG, Peg, eG, fG, eG, fG, eG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	22	74	98
2.0	21	62	77
2.0	22	63	79
3.3	15	53	61
0.8	22	73	96
2.7	10	49	54
3.3	12	[illegible]	61
1.3	9	53	61
1.3	8	52	60
2.0	7	48	52
0.7	22	74	98
0.7	21	73	96
1.3	5	52	60
0.7	21	73	96
0.7	15	67	86
0.7	22	74	98
2.0	9	50	56
1.3	21	68	88
2.7	19	61	75
2.7	21	60	74
2.7	20	57	68
5.3	22	54	63
2.0	19	58	70
2.7	24	61	75
0.7	24	76	102
2.0	23	64	80
1.3	19	63	79
0.7	22	74	98
0.7	18	70	91
3.3	6	42	42
0.7	22	74	98
0.7	24	76	102
0.7	24	76	102
0.7	26	78	105

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth marks: 1000, 1025, 1050, 1075, 1100, 1125 ft; 325 m

Stratigraphy (top to bottom): pG, fG, pG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	21	73	96
0.7	22	74	98
0.7	22	74	98
0.7	22	74	98
0.7	20	72	94
0.7	22	74	98
1.3	9	56	66
1.3	9	56	66
0.7	22	74	98
0.7	22	74	98
0.7	22	74	98
3.3	8	44	46
0.7	22	74	98
0.7	22	74	98
0.7	22	74	98
1.3	12	56	66
0.7	21	73	96
0.7	22	74	98
0.7	22	74	98
0.7	21	73	96
0.7	26	78	105
0.7	22	74	98
2.7	9	51	58
0.7	22	74	98
0.7	22	74	98
1.3	9	56	66
0.7	30	82	112
1.3	14	58	70
0.7	22	74	98
0.7	21	73	96
0.7	6	58	70
1.3	13	57	68
0.7	26	78	105

SRK Consulting Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-02-24 **TO** 2009-03-01
DIP: -61.00 **AZIMUTH:** 213.00
COORDINATES: 6944390.77N 384933.12E **DATUM:** Nad83

BOREHOLE: C09-03

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC420
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23), (MPa): 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J: 10, 20, 30; TCR, RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80

Stratigraphy descriptions (top to bottom): pG, fG, pG, fG

Depth - ft markers: 1175, 1200, 1225, 1250, 1275, 1300
Depth - m marker: 375

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	22	74	98
0.7	21	73	96
0.7	22	74	98
0.7	22	74	98
0.7	24	76	102
0.7	22	74	98
0.7	22	74	98
0.7	24	76	102
0.7	26	78	105
0.7	22	74	98
2.7	22	64	80
0.7	22	74	98
0.7	21	73	96
0.7	7	59	72
0.7	22	74	98
0.7	22	74	98
0.7	21	73	96
2.0	7	48	52

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-10 **TO** 2009-10-11
DIP: -60.00 **AZIMUTH:** 245.00
COORDINATES: 6943813.04N 384955.72E **DATUM:** Nad83

BOREHOLE: C09-04
PAGE: 1 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC427
PLAN No:

DEFINITIONS

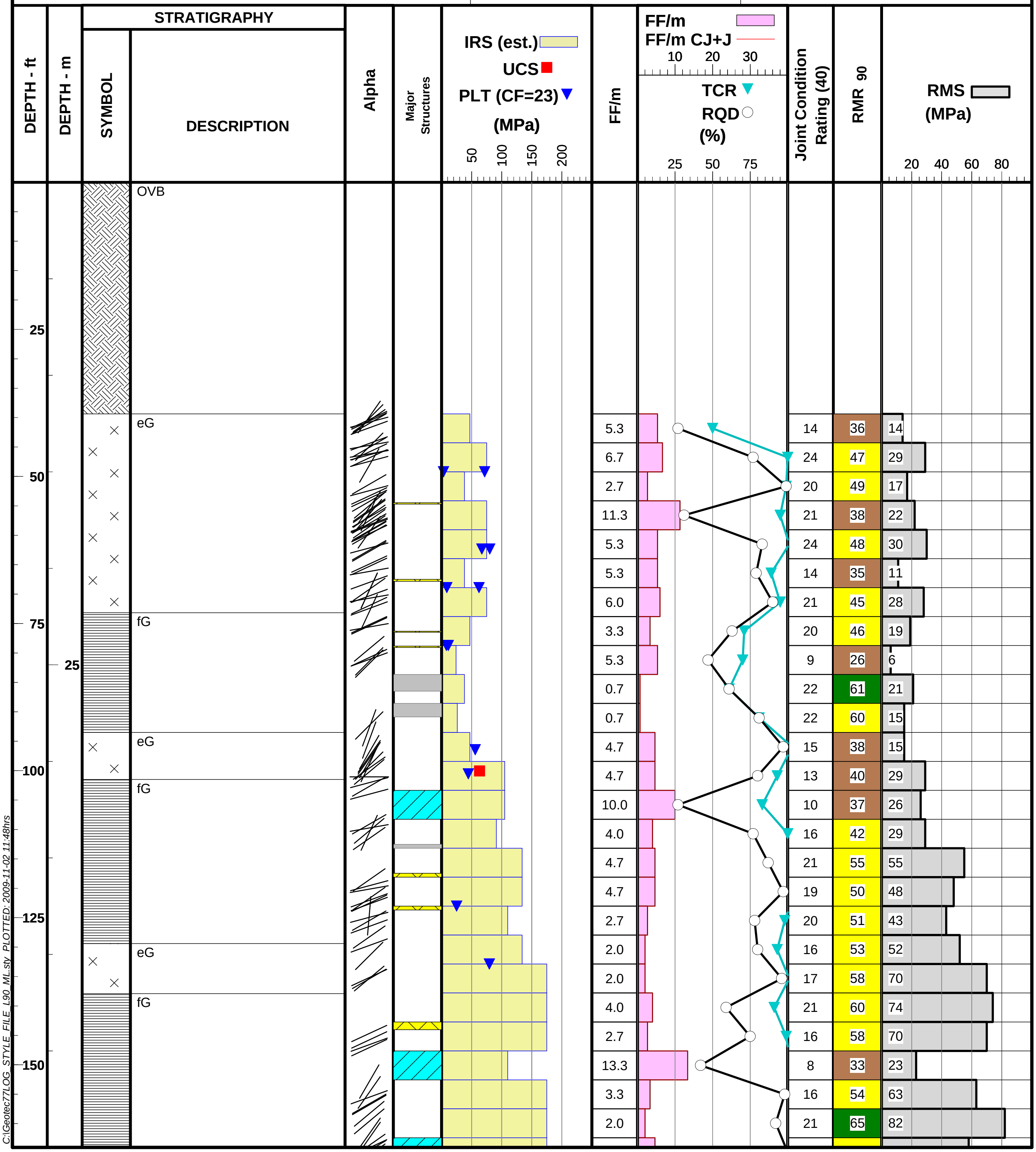
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
5.3	14	36	14
6.7	24	47	29
2.7	20	49	17
11.3	21	38	22
5.3	24	48	30
5.3	14	35	11
6.0	21	45	28
3.3	20	46	19
5.3	9	26	6
0.7	22	61	21
0.7	22	60	15
4.7	15	38	15
4.7	13	40	29
10.0	10	37	26
4.0	16	42	29
4.7	21	55	55
4.7	19	50	48
2.7	20	51	43
2.0	16	53	52
2.0	17	58	70
4.0	21	60	74
2.7	16	58	70
13.3	8	33	23
3.3	16	54	63
2.0	21	65	82

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-10 **TO** 2009-10-11
DIP: -60.00 **AZIMUTH:** 245.00
COORDINATES: 6943813.04N 384955.72E **DATUM:** Nad83

BOREHOLE: C09-04

DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC427
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Columns: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 175, 200, 225, 250, 275, 300, 325
Depth - m: 75

Stratigraphy: Peg, fG, pG, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
4.7	16	51	58
4.0	13	50	56
2.7	19	58	70
4.7	26	64	80
2.7	15	54	63
3.3	18	56	66
3.3	16	52	60
4.7	16	51	58
2.0	11	52	60
2.7	9	48	52
0.7	8	60	74
4.0	11	45	47
1.3	11	55	65
5.3	21	53	61
3.3	15	51	58
1.3	13	57	68
4.0	16	50	56
2.7	20	59	72
2.7	22	61	75
6.0	20	52	60
2.7	19	56	66
2.7	21	63	79
2.7	22	59	72
3.3	11	49	54
4.0	7	44	46
0.7	22	74	98
0.7	22	74	98
1.3	17	61	75
2.0	9	50	56
2.7	22	64	80
2.0	17	58	70
3.3	13	47	44
1.3	21	68	88
2.0	16	60	74

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-10 **TO** 2009-10-11
DIP: -60.00 **AZIMUTH:** 245.00
COORDINATES: 6943813.04N 384955.72E **DATUM:** Nad83

BOREHOLE: C09-04
PAGE: 3 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC427
PLAN No:

DEFINITIONS

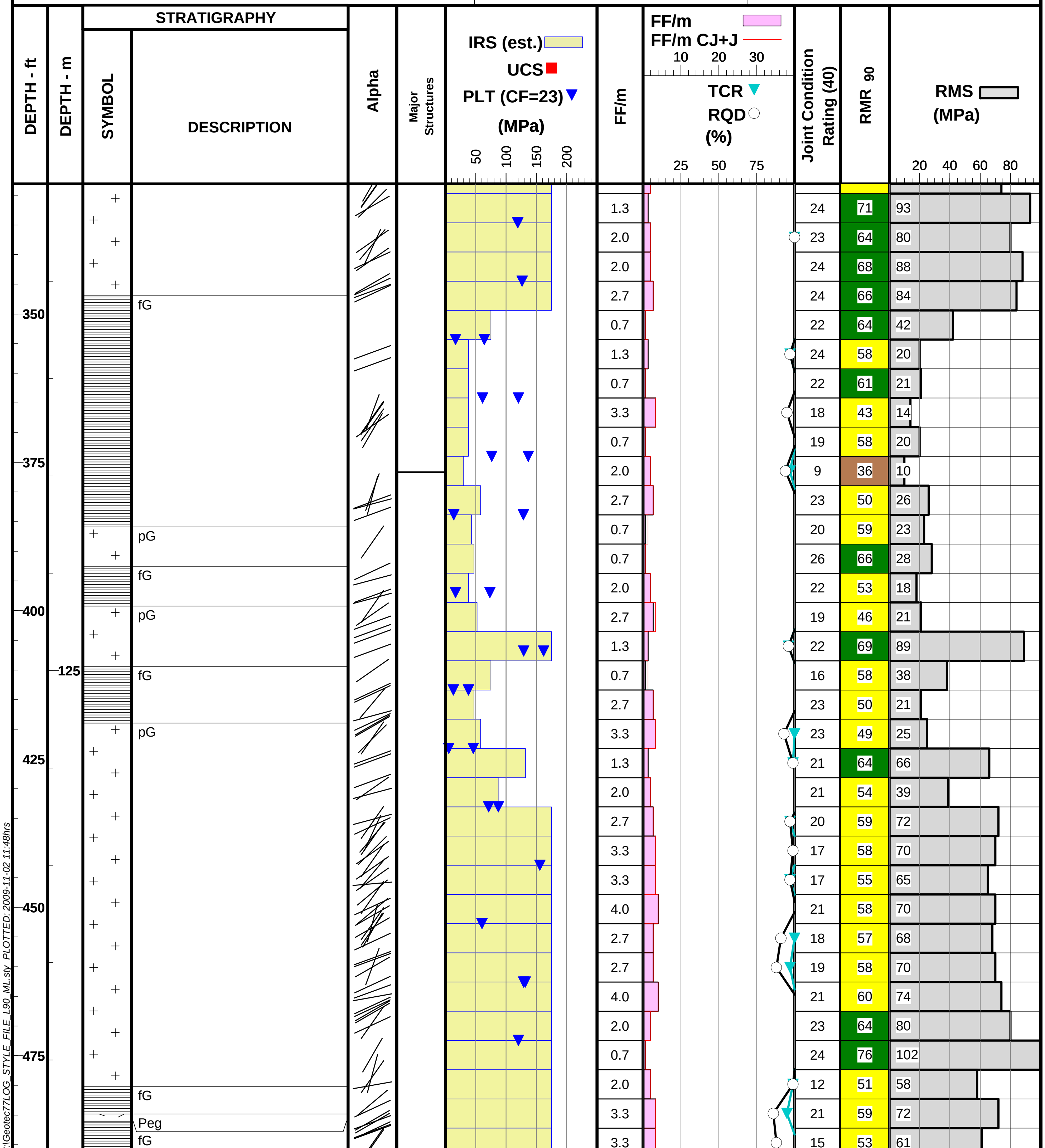
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	24	71	93
2.0	23	64	80
2.0	24	68	88
2.7	24	66	84
0.7	22	64	42
1.3	24	58	20
0.7	22	61	21
3.3	18	43	14
0.7	19	58	20
2.0	9	36	10
2.7	23	50	26
0.7	20	59	23
0.7	26	66	28
2.0	22	53	18
2.7	19	46	21
1.3	22	69	89
0.7	16	58	38
2.7	23	50	21
3.3	23	49	25
1.3	21	64	66
2.0	21	54	39
2.7	20	59	72
3.3	17	58	70
3.3	17	55	65
4.0	21	58	70
2.7	18	57	68
2.7	19	58	70
4.0	21	60	74
2.0	23	64	80
0.7	24	76	102
2.0	12	51	58
3.3	21	59	72
3.3	15	53	61

SRK Consulting Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-10 **TO** 2009-10-11
DIP: -60.00 **AZIMUTH:** 245.00
COORDINATES: 6943813.04N 384955.72E **DATUM:** Nad83

BOREHOLE: C09-04
PAGE: 4 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC427
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

Column headings: DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 500, 525, 550, 575, 600, 625, 650
Depth - m: 175

Stratigraphy: pG, fG, pG, fG, pG, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	9	61	75
2.7	15	52	60
0.7	22	74	98
2.0	11	52	60
2.7	8	47	51
6.0	14	46	49
4.0	9	46	49
3.3	9	50	56
2.0	16	57	68
2.7	8	47	51
6.0	17	49	54
12.0	22	49	54
13.3	26	57	68
10.0	6	35	28
4.7	14	43	39
9.3	15	43	44
7.3	8	38	35

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GEOTECHNICAL CORE LOG

SRK Consulting
Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-12 **TO** 2009-03-13
DIP: -59.00 **AZIMUTH:** 58.00
COORDINATES: 6943654.77N 384933.13E **DATUM:** Nad83

BOREHOLE: C09-05
PAGE: 1 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC429
PLAN No:

DEFINITIONS

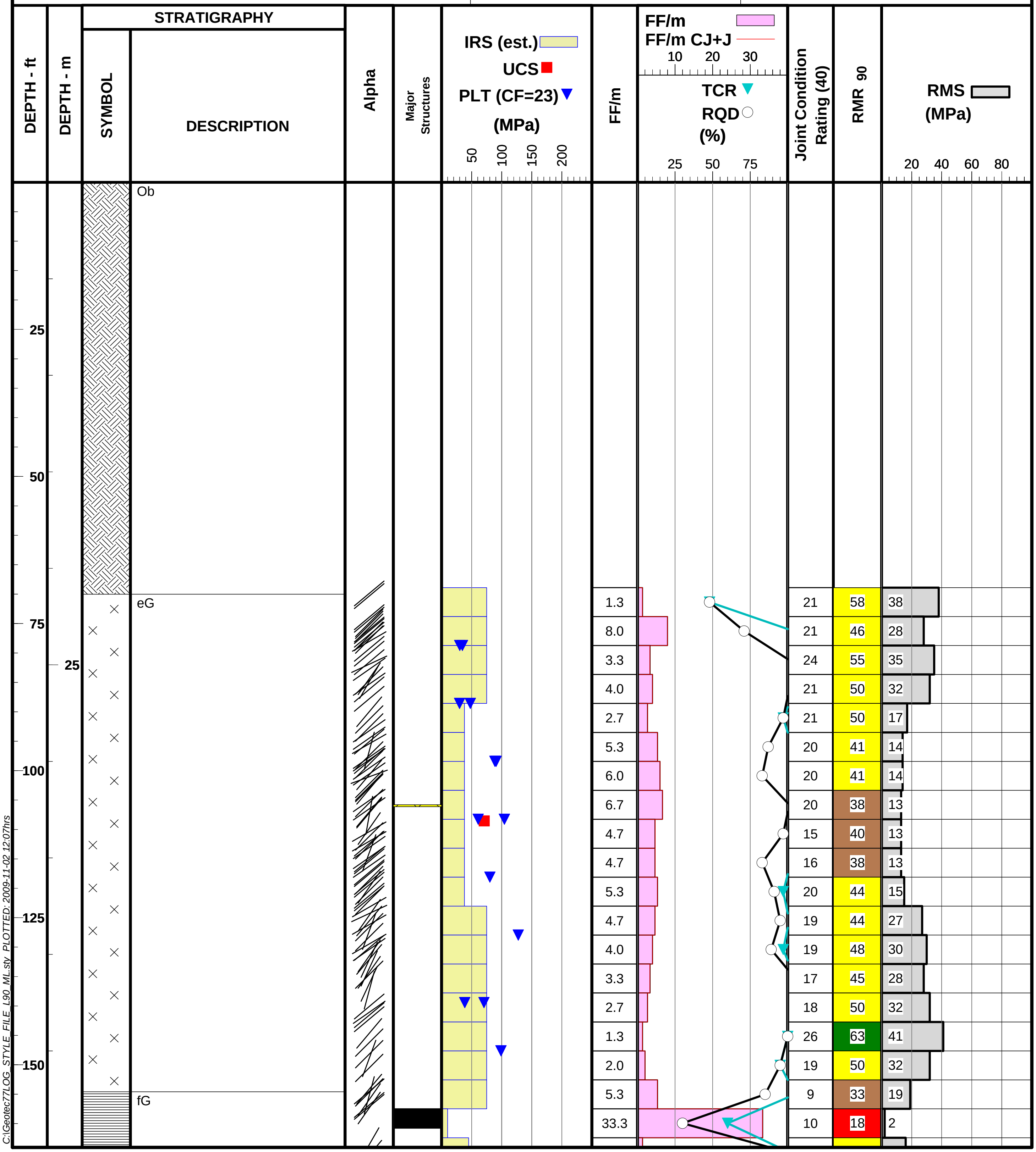
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

- Gouge
- Sheared
- Jointed
- Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	21	58	38
8.0	21	46	28
3.3	24	55	35
4.0	21	50	32
2.7	21	50	17
5.3	20	41	14
6.0	20	41	14
6.7	20	38	13
4.7	15	40	13
4.7	16	38	13
5.3	20	44	15
4.7	19	44	27
4.0	19	48	30
3.3	17	45	28
2.7	18	50	32
1.3	26	63	41
2.0	19	50	32
5.3	9	33	19
33.3	10	18	2

GEOTECHNICAL CORE LOG

SRK Consulting — Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-12 **TO** 2009-03-13
DIP: -59.00 **AZIMUTH:** 58.00
COORDINATES: 6943654.77N 384933.13E **DATUM:** Nad83

BOREHOLE: C09-05
PAGE: 2 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC429
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft: 175, 200, 225, 250, 275, 300, 325
DEPTH - m: 75

STRATIGRAPHY — SYMBOL, DESCRIPTION: eG

Columns: Alpha; Major Structures; IRS (est.), UCS, PLT (CF=23) (MPa) [50, 100, 150, 200]; FF/m; FF/m, FF/m CJ+J [10, 20, 30]; TCR, RQD (%) [25, 50, 75]; Joint Condition Rating (40); RMR 90; RMS (MPa) [20, 40, 60, 80]

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	10	42	16
2.7	8	41	32
4.7	8	31	15
3.3	16	44	27
1.3	16	53	34
4.7	11	34	20
4.0	8	47	51
3.3	11	47	51
8.0	16	45	39
2.0	21	65	82
4.0	15	49	54
5.3	10	38	32
0.7	8	54	44
1.3	16	60	74
2.7	14	53	61
2.0	7	38	24
4.0	9	48	52
1.3	9	53	61
2.0	9	50	56
2.0	8	49	54
5.3	14	48	52
4.7	13	48	52
2.7	10	47	51
1.3	10	57	68
10.0	10	43	44
2.0	7	39	19
13.3	12	43	44
3.3	13	49	54
3.3	7	45	47
3.3	7	45	47
1.3	14	50	34
2.0	8	52	60
3.3	9	47	51
3.3	10	51	58

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-12 **TO** 2009-03-13
DIP: -59.00 **AZIMUTH:** 58.00
COORDINATES: 6943654.77N 384933.13E **DATUM:** Nad83

BOREHOLE: C09-05
PAGE: 3 **OF** 4
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC429
PLAN No:

DEFINITIONS

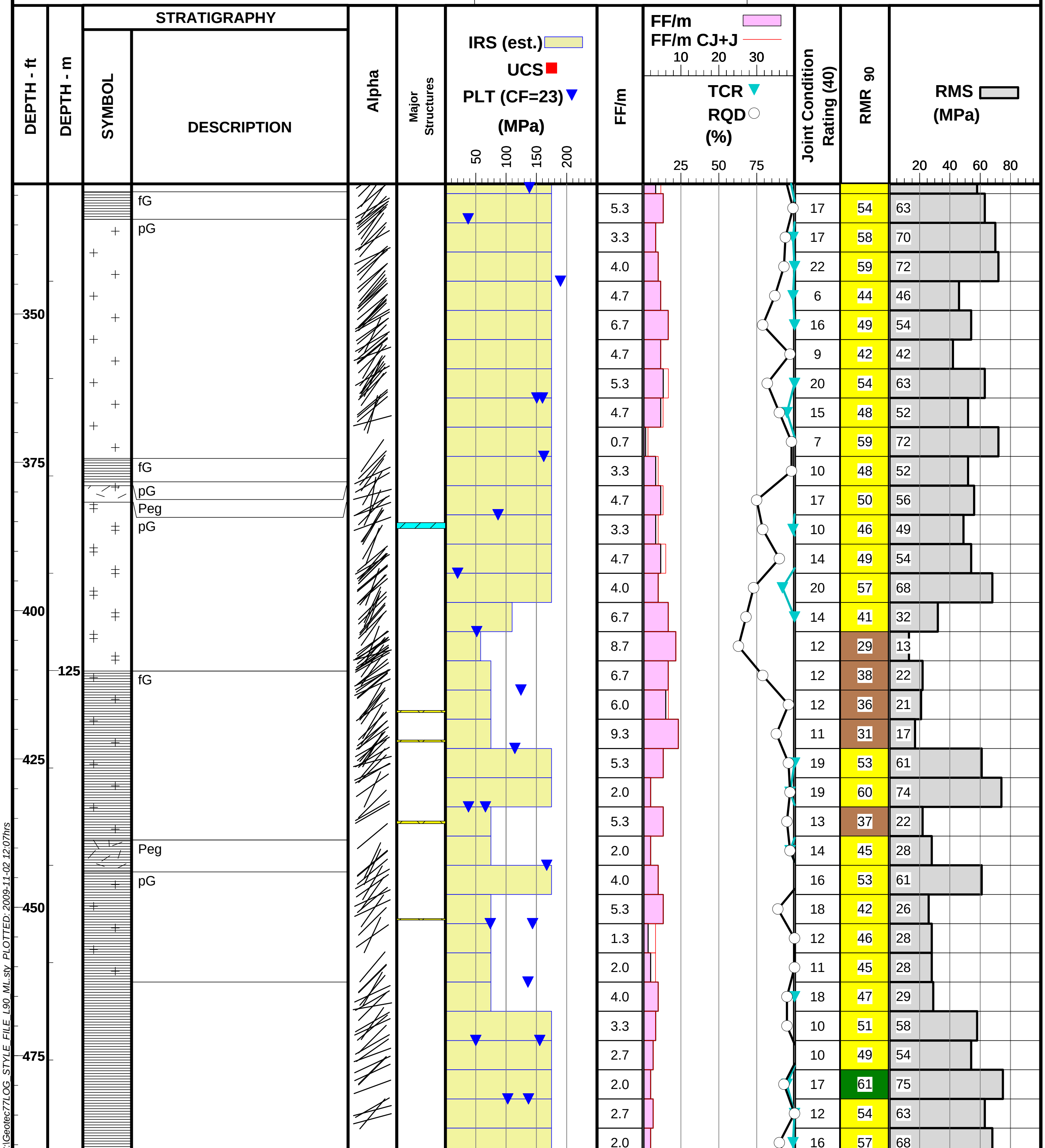
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
5.3	17	54	63
3.3	17	58	70
4.0	22	59	72
4.7	6	44	46
6.7	16	49	54
4.7	9	42	42
5.3	20	54	63
4.7	15	48	52
0.7	7	59	72
3.3	10	48	52
4.7	17	50	56
3.3	10	46	49
4.7	14	49	54
4.0	20	57	68
6.7	14	41	32
8.7	12	29	13
6.7	12	38	22
6.0	12	36	21
9.3	11	31	17
5.3	19	53	61
2.0	19	60	74
5.3	13	37	22
2.0	14	45	28
4.0	16	53	61
5.3	18	42	26
1.3	12	46	28
2.0	11	45	28
4.0	18	47	29
3.3	10	51	58
2.7	10	49	54
2.0	17	61	75
2.7	12	54	63
2.0	16	57	68

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation	**BOREHOLE:** C09-05
LOCATION: Yukon Territory, Canada	**PAGE:** 4 **OF** 4
SITE & PROJECT No: MINTO (2CM022.006)	**DRILL TYPE:**
BORING DATE: 2009-03-12 **TO** 2009-03-13	**DRILL:**
DIP: -59.00 **AZIMUTH:** 58.00	**CLIENT HOLE ID:** 09SWC429
COORDINATES: 6943654.77N 384933.13E **DATUM:** Nad83	**PLAN No:**

DEFINITIONS

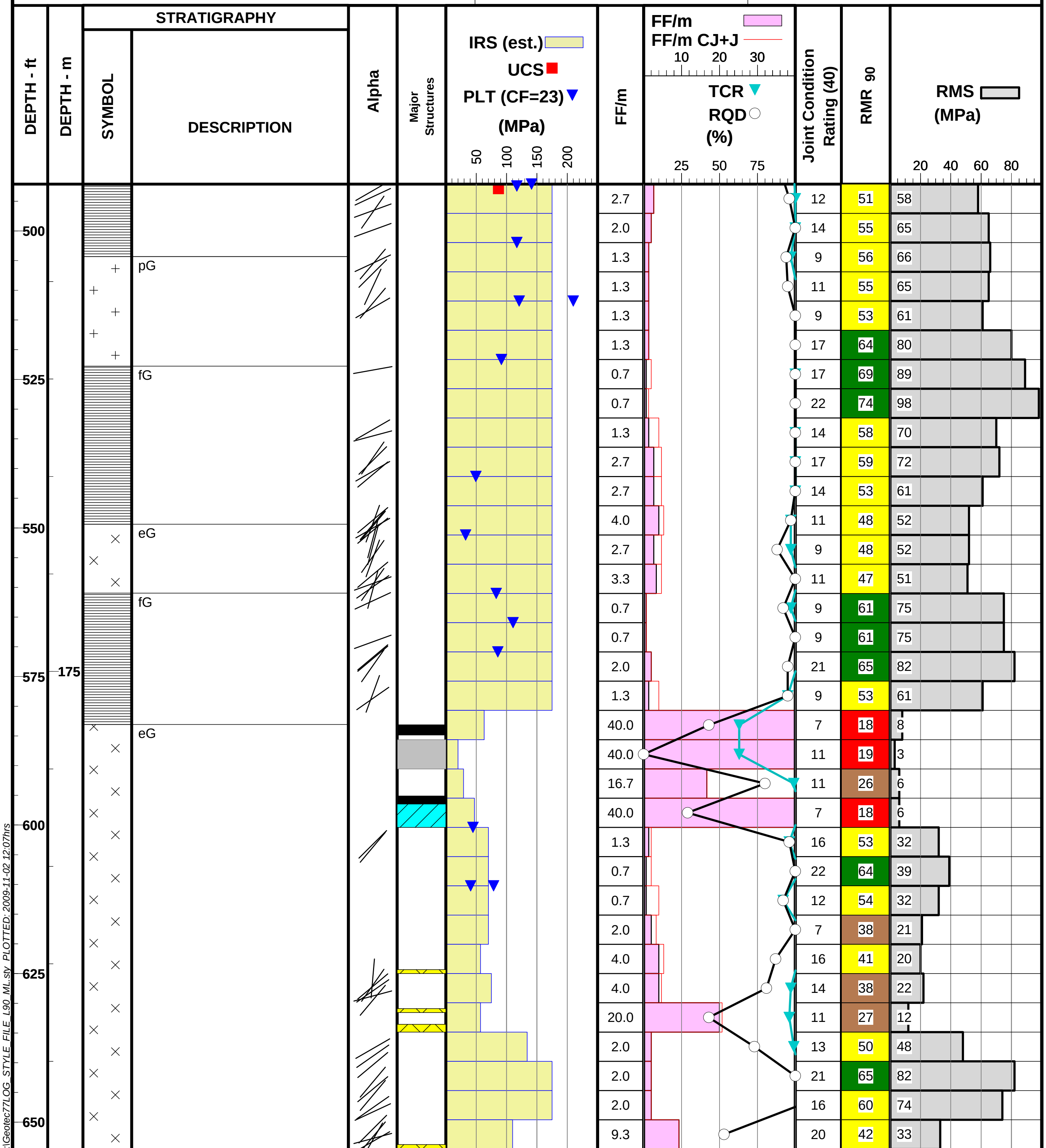
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.7	12	51	58
2.0	14	55	65
1.3	9	56	66
1.3	11	55	65
1.3	9	53	61
1.3	17	64	80
0.7	17	69	89
0.7	22	74	98
1.3	14	58	70
2.7	17	59	72
2.7	14	53	61
4.0	11	48	52
2.7	9	48	52
3.3	11	47	51
0.7	9	61	75
0.7	9	61	75
2.0	21	65	82
1.3	9	53	61
40.0	7	18	8
40.0	11	19	3
16.7	11	26	6
40.0	7	18	6
1.3	16	53	32
0.7	22	64	39
0.7	12	54	32
2.0	7	38	21
4.0	16	41	20
4.0	14	38	22
20.0	11	27	12
2.0	13	50	48
2.0	21	65	82
2.0	16	60	74
9.3	20	42	33

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-14 **TO** 2009-03-14
DIP: -60.00 **AZIMUTH:** 238.00
COORDINATES: 6943632.33N 385112.67E **DATUM:** Nad83

BOREHOLE: C09-06
PAGE: 1 **OF** 3
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC431
PLAN No:

DEFINITIONS

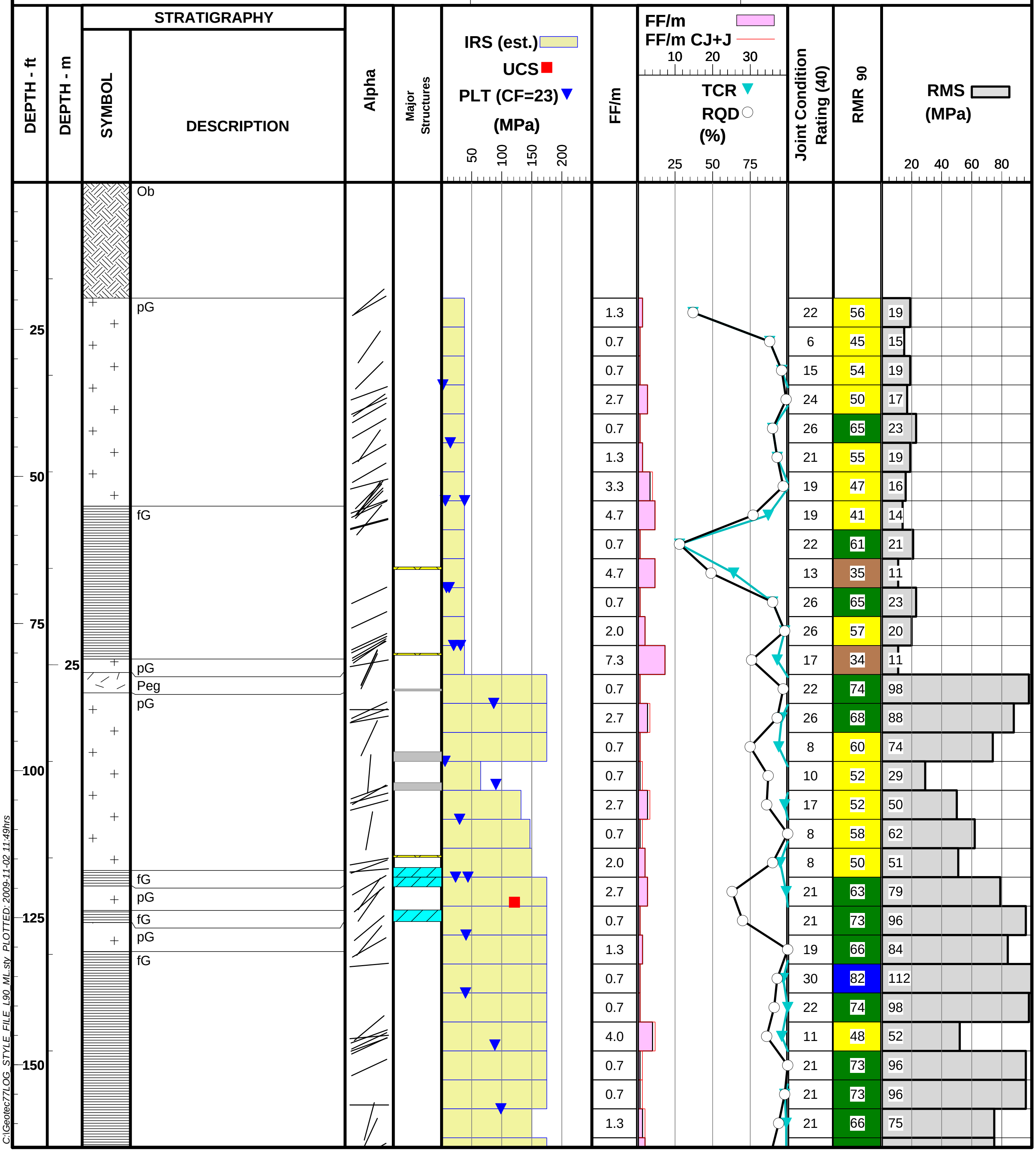
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
1.3	22	56	19
0.7	6	45	15
0.7	15	54	19
2.7	24	50	17
0.7	26	65	23
1.3	21	55	19
3.3	19	47	16
4.7	19	41	14
0.7	22	61	21
4.7	13	35	11
0.7	26	65	23
2.0	26	57	20
7.3	17	34	11
0.7	22	74	98
2.7	26	68	88
0.7	8	60	74
0.7	10	52	29
2.7	17	52	50
0.7	8	58	62
2.0	8	50	51
2.7	21	63	79
0.7	21	73	96
1.3	19	66	84
0.7	30	82	112
0.7	22	74	98
4.0	11	48	52
0.7	21	73	96
0.7	21	73	96
1.3	21	66	75

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Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-14 **TO** 2009-03-14
DIP: -60.00 **AZIMUTH:** 238.00
COORDINATES: 6943632.33N 385112.67E **DATUM:** Nad83

BOREHOLE: C09-06
PAGE: 2 **OF** 3
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC431
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft: 175, 200, 225, 250, 275, 300, 325
DEPTH - m: 75

STRATIGRAPHY

SYMBOL	DESCRIPTION
	pG
	fG
	pG
	fG

Alpha | Major Structures | IRS (est.) | UCS | PLT (CF=23) (MPa): 50, 100, 150, 200 | FF/m | FF/m CJ+J: 10, 20, 30 | TCR | RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	20	61	75
2.0	21	65	82
2.7	22	59	69
2.7	21	60	74
2.0	24	65	82
4.0	20	57	68
0.7	21	73	96
1.3	9	56	66
2.0	15	52	51
5.3	21	55	65
3.3	21	57	68
1.3	10	54	63
0.7	16	62	55
0.7	17	69	89
2.7	8	47	51
2.7	8	47	51
1.3	16	60	74
40.0	7	26	16
2.0	17	58	70
0.7	12	64	80
3.3	15	53	61
4.0	12	49	54
6.0	9	43	44
4.7	21	59	72
3.3	26	67	86
7.3	21	53	61
3.3	17	53	61
4.0	22	59	72
4.0	18	57	68
3.3	18	56	66
2.0	21	62	77
3.3	14	39	13
6.0	20	44	15
6.7	24	44	17

SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-03-14 **TO** 2009-03-14
DIP: -60.00 **AZIMUTH:** 238.00
COORDINATES: 6943632.33N 385112.67E **DATUM:** Nad83

BOREHOLE: C09-06
PAGE: 3 **OF** 3
DRILL TYPE:
DRILL:
CLIENT HOLE ID: 09SWC431
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa): 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J: 10, 20, 30; TCR, RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80

Depth marks: 350, 375, 400, 425, 450, 475 (ft); 125 (m)

Stratigraphy (top to bottom): Peg, fG, Peg, fG, eG, fG, eG, fG, pG, fG, pG, fG, pG, fG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
5.3	20	39	13
6.7	20	41	18
9.3	22	40	24
8.7	21	42	26
4.7	18	44	22
5.3	15	37	22
4.7	21	43	14
8.0	20	39	13
4.0	21	45	15
3.3	21	49	18
4.0	19	46	28
6.7	20	43	26
5.3	21	48	30
5.3	22	44	27
12.7	19	35	20
10.7	21	38	22
4.7	22	45	28
6.0	20	44	27
4.0	19	46	28
6.0	19	46	28
2.0	20	54	34
5.3	20	42	26
4.7	21	55	52
3.3	21	62	77
2.7	21	63	79
2.7	21	63	79
5.3	17	51	58
2.7	21	63	79
3.3	21	59	72
1.3	6	53	61
2.0	21	62	77
0.7	22	74	98
1.3	7	54	63

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-26 **TO** 2009-09-27
DIP: -60.00 **AZIMUTH:** 196.00
COORDINATES: 6945925.00N 384238.00E **DATUM:** Nad83

BOREHOLE: C09-07
PAGE: 1 **OF** 4
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC495
PLAN No:

DEFINITIONS

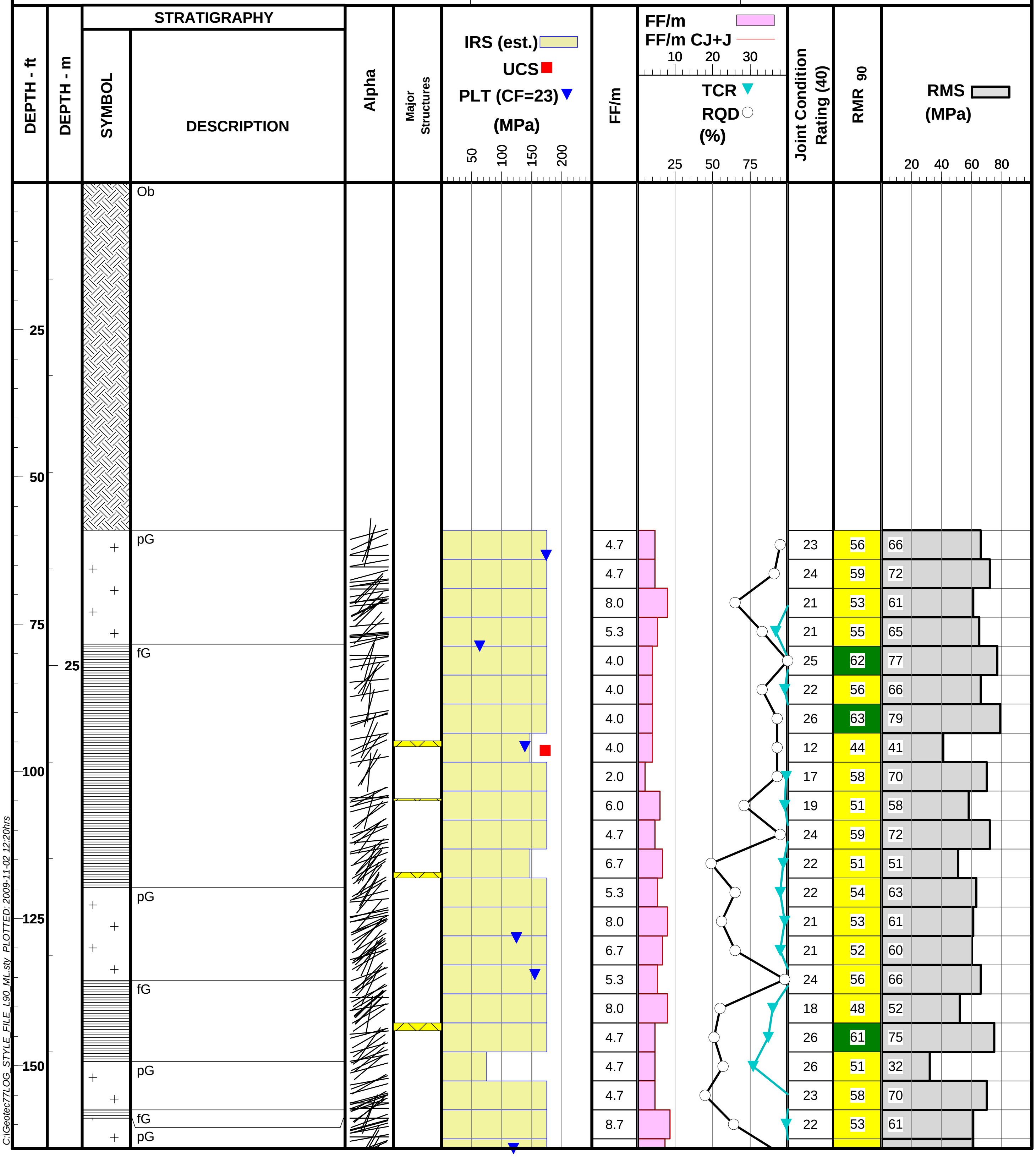
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
4.7	23	56	66
4.7	24	59	72
8.0	21	53	61
5.3	21	55	65
4.0	25	62	77
4.0	22	56	66
4.0	26	63	79
4.0	12	44	41
2.0	17	58	70
6.0	19	51	58
4.7	24	59	72
6.7	22	51	51
5.3	22	54	63
8.0	21	53	61
6.7	21	52	60
5.3	24	56	66
8.0	18	48	52
4.7	26	61	75
4.7	26	51	32
4.7	23	58	70
8.7	22	53	61

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GEOTECHNICAL CORE LOG

SRK Consulting
Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-26 **TO** 2009-09-27
DIP: -60.00 **AZIMUTH:** 196.00
COORDINATES: 6945925.00N 384238.00E **DATUM:** Nad83

BOREHOLE: C09-07
PAGE: 2 **OF** 4
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC495
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa) 50 100 150 200 | FF/m | FF/m, FF/m CJ+J 10 20 30; TCR, RQD (%) 25 50 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa) 20 40 60 80

Depth - ft: 175, 200, 225, 250, 275, 300, 325
Depth - m: 75

Stratigraphy (top to bottom): fG, Ap, pG, fG, Ap, fG, pG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
7.3	23	53	61
5.3	17	49	54
4.7	19	54	63
5.3	11	43	44
5.3	17	49	54
6.7	10	41	40
4.0	21	52	44
5.3	23	55	65
6.0	18	52	60
2.7	24	63	79
6.0	16	48	52
6.0	11	45	47
2.7	21	60	74
26.7	7	33	26
4.0	18	55	65
4.0	14	51	58
5.3	13	47	51
2.0	17	56	66
6.7	16	49	54
4.7	15	50	56
3.3	15	51	58
4.0	10	47	51
3.3	20	58	70
0.7	21	73	96
4.0	17	54	63
2.0	21	65	82
4.0	15	52	60
0.7	26	78	105
4.0	12	49	54
4.0	25	62	77
2.7	13	52	60
3.3	25	63	79
4.0	24	58	70
2.7	21	60	74

GEOTECHNICAL CORE LOG

SRK Consulting
Engineers and Scientists

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-26 **TO** 2009-09-27
DIP: -60.00 **AZIMUTH:** 196.00
COORDINATES: 6945925.00N 384238.00E **DATUM:** Nad83

BOREHOLE: C09-07
PAGE: 3 **OF** 4
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC495
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa): 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J: 10, 20, 30; TCR, RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80

Depth - ft: 350, 375, 400, 425, 450, 475
Depth - m: 125

Stratigraphy: And, pG, fG, eG

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	21	65	82
2.7	19	58	70
4.7	12	47	51
4.7	16	41	24
8.7	10	39	37
3.3	22	53	34
5.3	9	28	4
5.3	10	29	6
4.7	11	29	6
5.3	10	32	12
32.0	7	20	6
5.3	14	46	49
5.3	17	43	34
5.3	15	41	32
5.3	15	46	37
7.3	8	38	35
4.7	15	53	61
6.0	9	37	31
3.3	28	66	84
4.7	16	51	58
6.7	10	39	33
4.0	17	49	53
4.0	13	50	54
4.0	7	44	46
2.0	9	53	61
4.0	21	58	70
4.7	20	51	51
3.3	15	49	49
5.3	10	37	22
4.0	13	50	56
1.3	13	60	74
4.0	13	50	56
1.3	9	56	66

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-26 **TO** 2009-09-27
DIP: -60.00 **AZIMUTH:** 196.00
COORDINATES: 6945925.00N 384238.00E **DATUM:** Nad83

BOREHOLE: C09-07
PAGE: 4 **OF** 4
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC495
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft	DEPTH - m	SYMBOL	DESCRIPTION	Alpha	Major Structures	IRS (est.) / UCS / PLT (CF=23) (MPa)	FF/m	FF/m, FF/m CJ+J; TCR, RQD (%)	Joint Condition Rating (40)	RMR 90	RMS (MPa)
			Ap				2.7		12	54	63
500			fG				5.3		19	53	61
525											
550											
575	175										
600											
625											
650											

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-27 **TO** 2009-06-27
DIP: -55.00 **AZIMUTH:** 47.00
COORDINATES: 6945953.00N 384320.00E **DATUM:** Nad83

BOREHOLE: C09-08

DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC497
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100

DEPTH - ft	DEPTH - m	STRATIGRAPHY: SYMBOL	STRATIGRAPHY: DESCRIPTION	Alpha	Major Structures	IRS (est.) / UCS / PLT (CF=23) (MPa)	FF/m	FF/m, FF/m CJ+J / TCR, RQD (%)	Joint Condition Rating (40)	RMR 90	RMS (MPa)

Ob (to approx. 58 ft); pG; And; pG

Depth scale: 25, 50, 75, 100, 125, 150 ft; 25 m

FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
0.7	23	65	43
4.7	14	41	32
2.0	11	40	16
4.7	12	39	30
7.3	11	39	34
6.0	14	46	49
10.7	19	36	21
6.0	20	42	26
5.3	10	34	20
8.0	21	51	58
7.3	24	56	66
8.0	13	43	44
6.0	21	53	61
6.7	25	48	37
6.0	26	48	19
6.0	17	43	32
9.3	21	45	39
10.0	22	48	47
6.0	23	57	68
8.0	21	53	61
4.7	21	59	72

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GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-27 **TO** 2009-06-27
DIP: -55.00 **AZIMUTH:** 47.00
COORDINATES: 6945953.00N 384320.00E **DATUM:** Nad83

BOREHOLE: C09-08
PAGE: 2 **OF** 3
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC497
PLAN No:

DEFINITIONS

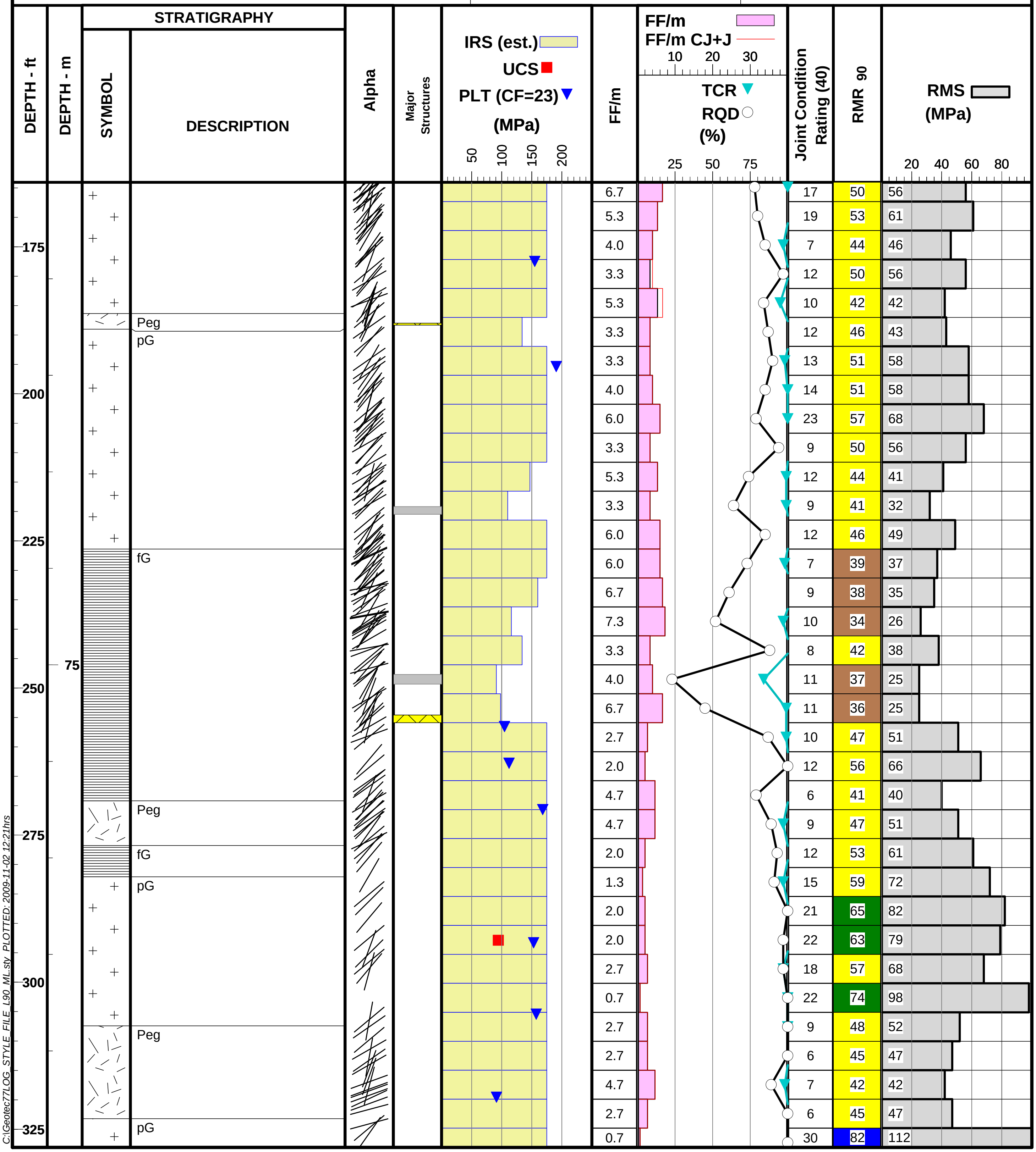
IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20, 21 - 40, 41 - 60, 61 - 80, 81 - 100



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
6.7	17	50	56
5.3	19	53	61
4.0	7	44	46
3.3	12	50	56
5.3	10	42	42
3.3	12	46	43
3.3	13	51	58
4.0	14	51	58
6.0	23	57	68
3.3	9	50	56
5.3	12	44	41
3.3	9	41	32
6.0	12	46	49
6.0	7	39	37
6.7	9	38	35
7.3	10	34	26
3.3	8	42	38
4.0	11	37	25
6.7	11	36	25
2.7	10	47	51
2.0	12	56	66
4.7	6	41	40
4.7	9	47	51
2.0	12	53	61
1.3	15	59	72
2.0	21	65	82
2.0	22	63	79
2.7	18	57	68
0.7	22	74	98
2.7	9	48	52
2.7	6	45	47
4.7	7	42	42
2.7	6	45	47
0.7	30	82	112

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SRK Consulting
Engineers and Scientists

GEOTECHNICAL CORE LOG

PROJECT: Minto PFS Geotechnical Evaluation
LOCATION: Yukon Territory, Canada
SITE & PROJECT No: MINTO (2CM022.006)
BORING DATE: 2009-06-27 **TO** 2009-06-27
DIP: -55.00 **AZIMUTH:** 47.00
COORDINATES: 6945953.00N 384320.00E **DATUM:** Nad83

BOREHOLE: C09-08
PAGE: 3 **OF** 3
DRILL TYPE:
DRILL: DD
CLIENT HOLE ID: 09SWC497
PLAN No:

DEFINITIONS

IRS: Intact Rock Strength (subjective)
UCS: Uniaxial Compressive Strength (MPa)
Pt LOAD: Point Load Test (MPa)
FF/m: Fracture Frequency per m
TCR: Total Core Recovery
RQD: Rock Quality Designation
RMR: Rock Mass Rating
RMS: Rock Mass Strength

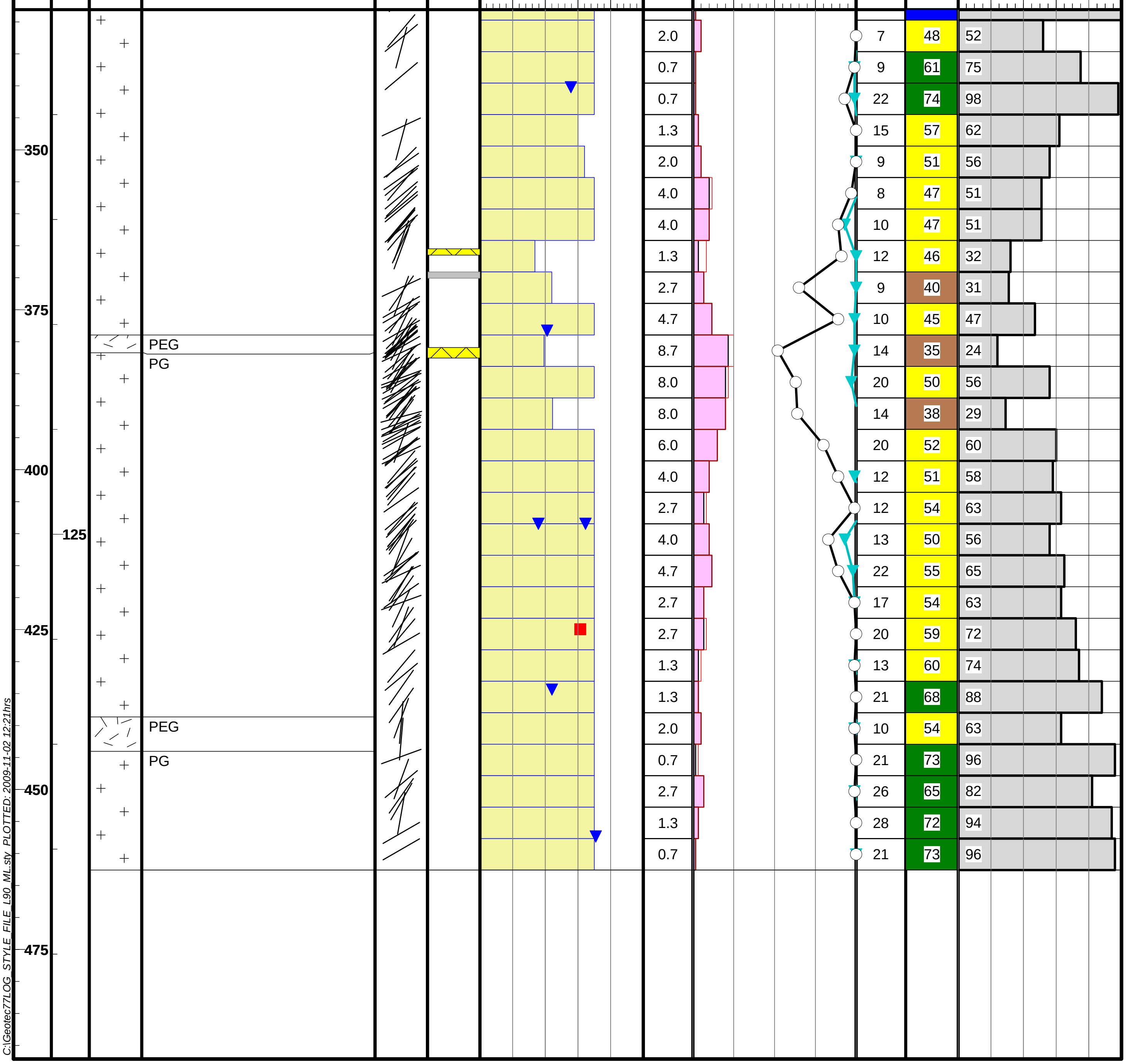
LEGEND OF MAJOR STRUCTURES

Gouge
Sheared
Jointed
Broken

LEGEND OF RMR (90)

0 - 20 | 21 - 40 | 41 - 60 | 61 - 80 | 81 - 100

DEPTH - ft | DEPTH - m | STRATIGRAPHY: SYMBOL, DESCRIPTION | Alpha | Major Structures | IRS (est.), UCS, PLT (CF=23) (MPa): 50, 100, 150, 200 | FF/m | FF/m, FF/m CJ+J: 10, 20, 30; TCR, RQD (%): 25, 50, 75 | Joint Condition Rating (40) | RMR 90 | RMS (MPa): 20, 40, 60, 80



FF/m	Joint Condition Rating (40)	RMR 90	RMS (MPa)
2.0	7	48	52
0.7	9	61	75
0.7	22	74	98
1.3	15	57	62
2.0	9	51	56
4.0	8	47	51
4.0	10	47	51
1.3	12	46	32
2.7	9	40	31
4.7	10	45	47
8.7	14	35	24
8.0	20	50	56
8.0	14	38	29
6.0	20	52	60
4.0	12	51	58
2.7	12	54	63
4.0	13	50	56
4.7	22	55	65
2.7	17	54	63
2.7	20	59	72
1.3	13	60	74
1.3	21	68	88
2.0	10	54	63
0.7	21	73	96
2.7	26	65	82
1.3	28	72	94
0.7	21	73	96

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Appendix B: Laboratory Testing

Uniaxial Compressive Strength Testing

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**01-003U**
Rock Type	GRANIT E
Density :	167.1 (pcf)
	2,677.0 (kg/m^3)

Sample #	**01-003U**	
Fail Stress	**17,336**	psi
	119.56	Mpa
Modulus		psi
Poisson's		

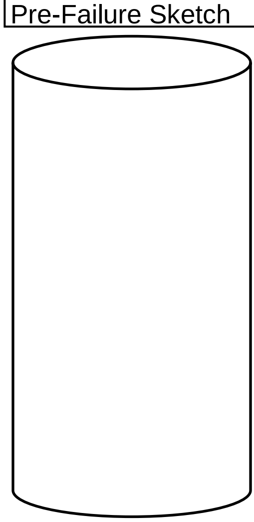
Sample Data :	
Sample # :	**01-003U**
Rock Type:	GRANIT E
Hole # :	C09-01
Depth :	89.5
Alterations:	
Diameter :	1.775 (in)
Height :	3.834 (in)
Weight :	416.25 (gm)
Area :	2.475 (in^2)
Volume :	9.488 (in^3)

Fail Stress	17,336 (psi)
	119.6 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	42,900 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

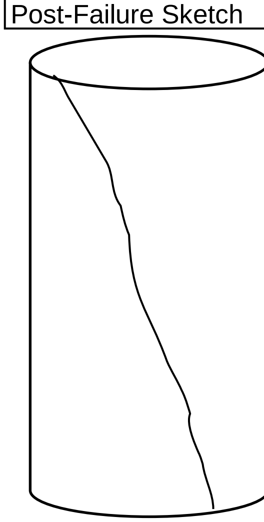
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.779	Ht. 1	3.834
Dia. 2	1.777	Ht. 2	3.835
Dia. 3	1.773	Ht. 3	3.835
Dia. 4	1.772	Ht. 4	3.835
Dia. 5	1.773	Weight (gm)	416.25
Dia. 6	1.777	Sample #	**01-003U**

Fail Load	42900	lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**01-007U**

Sample # **01-007U**

Rock Type	GRANITE		
Density :	167.7 (pcf)		
	2,685.7 (kg/m^3)		

Fail Stress	**21,807**	psi
	150.39	Mpa
Modulus		psi
Poisson's		

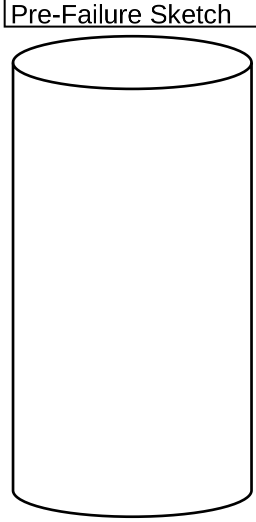
Sample Data :	
Sample # :	**01-007U**
Rock Type:	GRANITE
Hole # :	C09-01
Depth :	187
Alterations:	
Diameter :	1.772 (in)
Height :	3.878 (in)
Weight :	421.13 (gm)
Area :	2.467 (in^2)
Volume :	9.569 (in^3)

Fail Stress	21,807 (psi)
	150.4 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	53,800 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

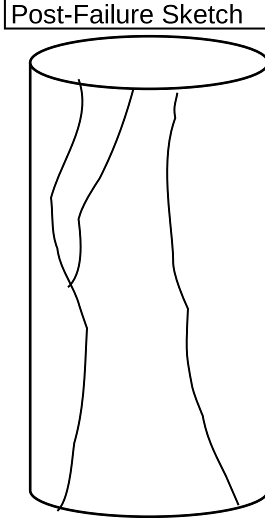
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.771	Ht. 1	3.877
Dia. 2	1.773	Ht. 2	3.875
Dia. 3	1.771	Ht. 3	3.883
Dia. 4	1.771	Ht. 4	3.879
Dia. 5	1.771	Weight (gm)	421.13
Dia. 6	1.779	Sample #	**01-007U**

Fail Load 53800 lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**01-010U**
Rock Type	GRANITE
Density :	167.5 (pcf)
	2,683.3 (kg/m^3)

Sample #	**01-010U**	
Fail Stress	**22,634**	psi
	156.10	Mpa
Modulus		psi
Poisson's		

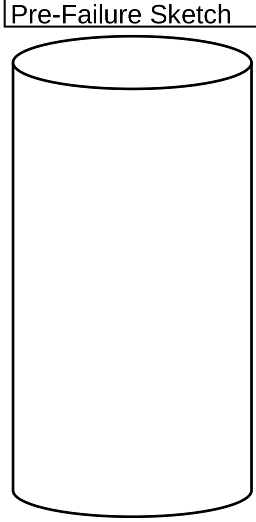
Fail Stress	22,634 (psi)
	156.1 Mpa

Sample Data :	
Sample # :	**01-010U**
Rock Type:	GRANITE
Hole # :	C09-01
Depth :	293.16
Alterations:	
Diameter :	1.780 (in)
Height :	3.876 (in)
Weight :	423.95 (gm)
Area :	2.487 (in^2)
Volume :	9.641 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	56,300 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

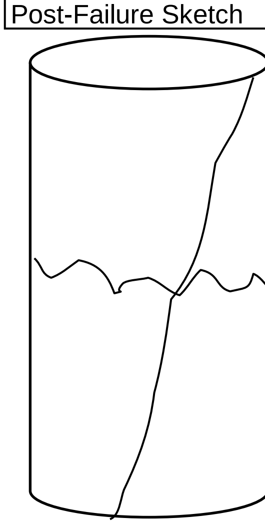
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.785	Ht. 1	3.876
Dia. 2	1.775	Ht. 2	3.877
Dia. 3	1.779	Ht. 3	3.877
Dia. 4	1.782	Ht. 4	3.875
Dia. 5	1.777	Weight (gm)	423.95
Dia. 6	1.780	Sample #	**01-010U**

Fail Load	56300	lbs

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GEOMECHANICAL LABORATORY

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Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**02-006U**
		Sample # **02-006U**	Rock Type	GRANITE
			Density :	169.3 (pcf)
				2,711.4 (kg/m^3)

Fail Stress	**18,603**	psi
	128.30	Mpa
Modulus		psi
Poisson's		

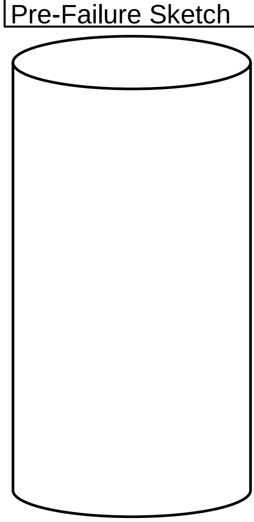
Sample Data :	
Sample # :	**02-006U**
Rock Type:	GRANITE
Hole # :	C09-02
Depth :	179.54
Alterations:	
Diameter :	1.774 (in)
Height :	3.855 (in)
Weight :	423.52 (gm)
Area :	2.473 (in^2)
Volume :	9.532 (in^3)

Fail Stress	18,603 (psi)
	128.3 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	46,000 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

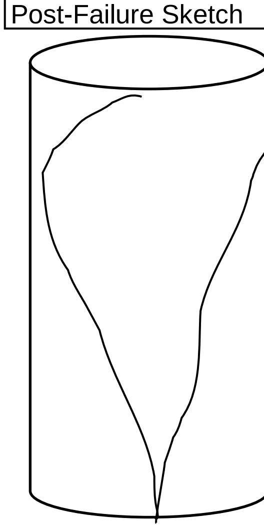
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.774	Ht. 1	3.855
Dia. 2	1.774	Ht. 2	3.855
Dia. 3	1.775	Ht. 3	3.856
Dia. 4	1.777	Ht. 4	3.855
Dia. 5	1.773	Weight (gm)	423.52
Dia. 6	1.774	Sample #	**02-006U**

Fail Load	46000	lbs

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GEOMECHANICAL LABORATORY

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Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**02-009U**
			Rock Type	GRANITE
			Density :	166.8 (pcf)
				2,671.7 (kg/m^3)

Sample #	**02-009U**	
Fail Stress	**21,731**	psi
	149.87	Mpa
Modulus		psi
Poisson's		

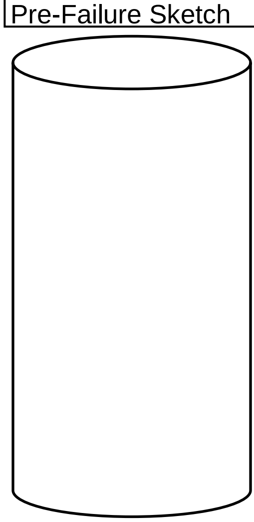
Sample Data :	
Sample # :	**02-009U**
Rock Type:	GRANITE
Hole # :	C09-02
Depth :	271.9
Alterations:	
Diameter :	1.775 (in)
Height :	3.768 (in)
Weight :	408.47 (gm)
Area :	2.476 (in^2)
Volume :	9.330 (in^3)

Fail Stress	21,731 (psi)
	149.9 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	53,800 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

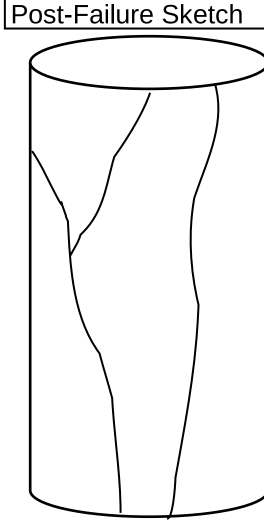
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.774	Ht. 1	3.768
Dia. 2	1.772	Ht. 2	3.771
Dia. 3	1.777	Ht. 3	3.768
Dia. 4	1.783	Ht. 4	3.768
Dia. 5	1.776	Weight (gm)	408.47
Dia. 6	1.771	Sample #	**02-009U**

Fail Load	53800	lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**03-003U**
Rock Type	PK GRANITE
Density :	158.5 (pcf)
	2,539.1 (kg/m^3)

Sample #	**03-003U**	
Fail Stress	**10,483**	psi
	72.30	Mpa
Modulus		psi
Poisson's		

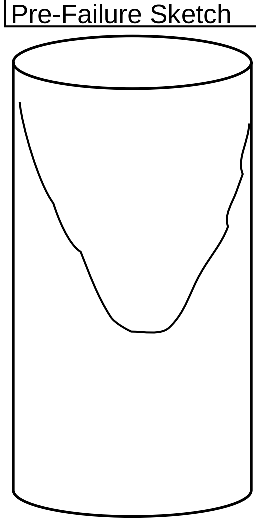
Sample Data :	
Sample # :	**03-003U**
Rock Type:	PK GRANITE
Hole # :	C09-03
Depth :	77.33
Alterations:	
Diameter :	1.773 (in)
Height :	3.876 (in)
Weight :	398.03 (gm)
Area :	2.468 (in^2)
Volume :	9.566 (in^3)

Fail Stress	10,483 (psi)
	72.3 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	25,870 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

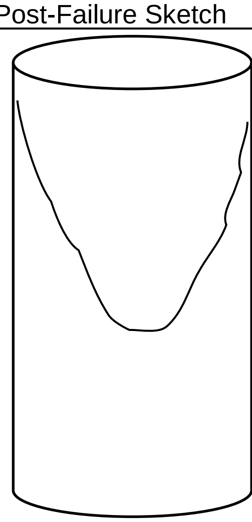
Pre-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Post-Failure Sketch



Dia. 1	1.772	Ht. 1	3.785
Dia. 2	1.772	Ht. 2	4.160
Dia. 3	1.772	Ht. 3	3.788
Dia. 4	1.775	Ht. 4	3.773
Dia. 5	1.773	Weight (gm)	398.03
Dia. 6	1.772	Sample #	**03-003U**

Fail Load 25870 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**03-006U**
		Sample # **03-006U**	Rock Type	GRANITE
			Density :	164.9 (pcf)
				2,641.0 (kg/m^3)

Fail Stress	**9,574**	psi
	66.03	Mpa
Modulus		psi
Poisson's		

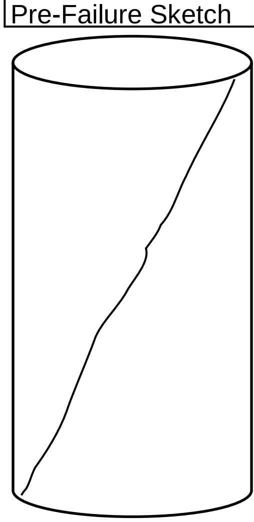
Sample Data :	
Sample # :	**03-006U**
Rock Type:	GRANITE
Hole # :	C09-03
Depth :	130.84
Alterations:	
Diameter :	1.772 (in)
Height :	3.833 (in)
Weight :	408.90 (gm)
Area :	2.465 (in^2)
Volume :	9.448 (in^3)

Fail Stress	9,574 (psi)
	66.0 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	23,600 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

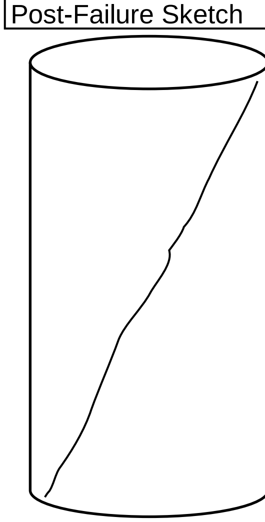
Pre-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Post-Failure Sketch



Dia. 1	1.777	Ht. 1	3.814
Dia. 2	1.768	Ht. 2	3.840
Dia. 3	1.768	Ht. 3	3.852
Dia. 4	1.770	Ht. 4	3.825
Dia. 5	1.770	Weight (gm)	408.90
Dia. 6	1.776	Sample #	**03-006U**

Fail Load 23600 lbs

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Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**03-011U**
		Sample # **03-011U**	Rock Type	GRANITE
			Density :	167.7 (pcf)
				2,686.1 (kg/m^3)

Fail Stress	**14,881**	psi
	102.63	Mpa
Modulus		psi
Poisson's		

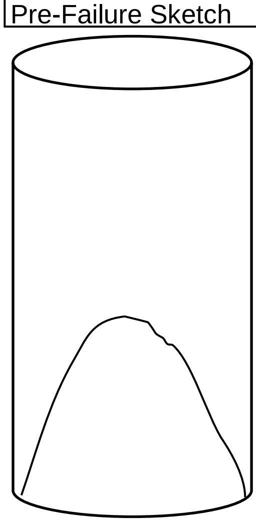
Sample Data :	
Sample # :	**03-011U**
Rock Type:	GRANITE
Hole # :	C09-03
Depth :	282.1
Alterations:	
Diameter :	1.774 (in)
Height :	3.953 (in)
Weight :	430.35 (gm)
Area :	2.473 (in^2)
Volume :	9.777 (in^3)

Fail Stress	14,881 (psi)
	102.6 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	36,800 (lbs)
Mode of Failure	Both
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

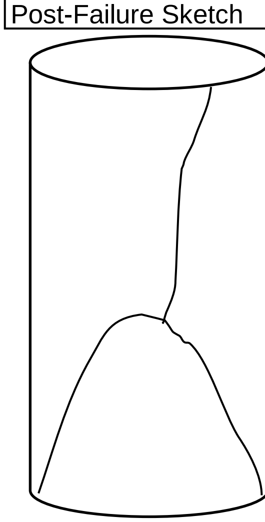
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	
Both	XX

Post-Failure Sketch



Dia. 1	1.772	Ht. 1	3.957
Dia. 2	1.775	Ht. 2	3.953
Dia. 3	1.773	Ht. 3	3.951
Dia. 4	1.775	Ht. 4	3.953
Dia. 5	1.777	Weight (gm)	430.35
Dia. 6	1.775	Sample #	**03-011U**

Fail Load	36800	lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**03-014U**
Rock Type	GRANITE
Density :	169.1 (pcf)
	2,709.0 (kg/m^3)

Sample # **03-014U**

Fail Stress **21,690** psi

149.58 Mpa

Modulus psi

Poisson's

Sample Data :	
Sample # :	**03-014U**
Rock Type:	GRANITE
Hole # :	C09-03
Depth :	361.7
Alterations:	
Diameter :	1.771 (in)
Height :	1.991 (in)
Weight :	217.79 (gm)
Area :	2.464 (in^2)
Volume :	4.906 (in^3)

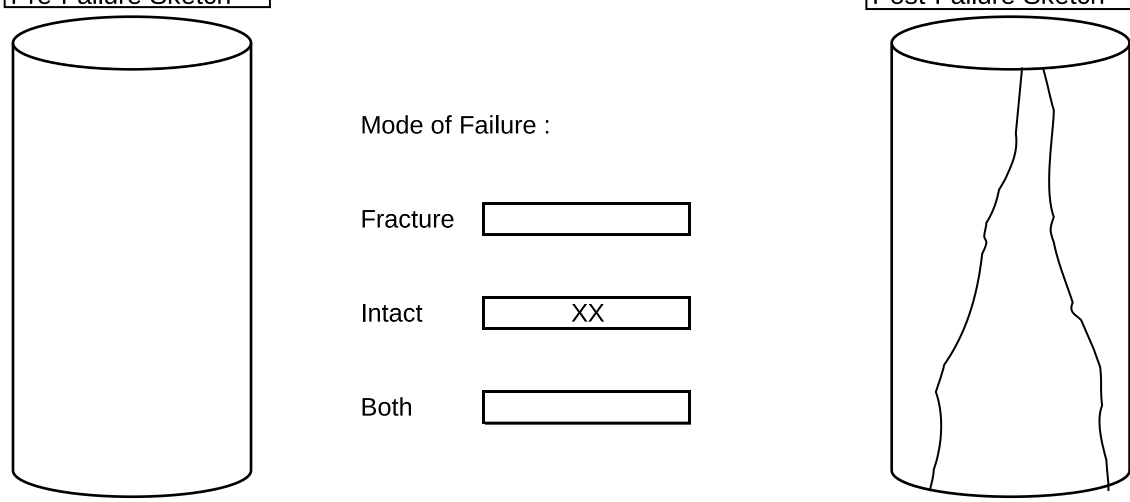
Fail Stress	21,690 (psi)
	149.6 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	58,400 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	0.915

Worksheet

Pre-Failure Sketch

Post-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Dia. 1	1.773	Ht. 1	1.989
Dia. 2	1.771	Ht. 2	1.992
Dia. 3	1.771	Ht. 3	1.993
Dia. 4	1.771	Ht. 4	1.992
Dia. 5	1.770	Weight (gm)	217.79
Dia. 6	1.772	Sample #	**03-014U**

Fail Load 58400 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022	Client	SRK
Date	5/4/2009	Location	
Technician	D.Streeter	Sample #	**04-001U**
		Rock Type	LT GRANITE
		Density :	161.2 (pcf)
			2,581.4 (kg/m^3)

Sample # **04-001U**

Fail Stress **9,157** psi

63.15 Mpa

Modulus psi

Poisson's

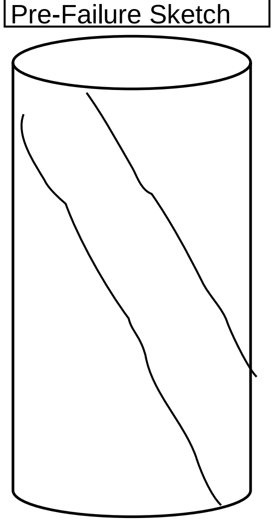
Sample Data :	
Sample # :	**04-001U**
Rock Type:	LT GRANITE
Hole # :	C09-04
Depth :	30.4
Alterations:	
Diameter :	1.777 (in)
Height :	3.653 (in)
Weight :	383.03 (gm)
Area :	2.479 (in^2)
Volume :	9.055 (in^3)

Fail Stress	9,157 (psi)
	63.2 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	22,700 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

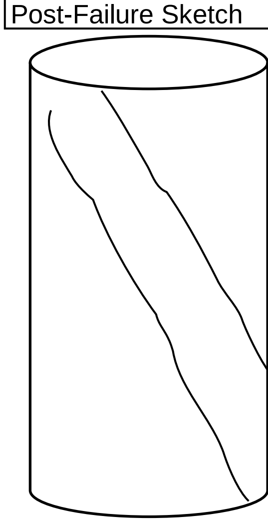
Pre-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Post-Failure Sketch



Dia. 1	1.772	Ht. 1	3.653
Dia. 2	1.772	Ht. 2	3.653
Dia. 3	1.771	Ht. 3	3.653
Dia. 4	1.795	Ht. 4	3.652
Dia. 5	1.773	Weight (gm)	383.03
Dia. 6	1.776	Sample #	**04-001U**

Fail Load 22700 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**04-003U**
		Sample # **04-003U**	Rock Type	GRANITE
			Density :	167.7 (pcf)
		Fail Stress **20,404** psi		2,686.2 (kg/m^3)
		140.72 Mpa		

Sample Data :	
Sample # :	**04-003U**
Rock Type:	GRANITE
Hole # :	C09-04
Depth :	91.1
Alterations:	
Diameter :	1.777 (in)
Height :	3.911 (in)
Weight :	426.91 (gm)
Area :	2.480 (in^2)
Volume :	9.698 (in^3)

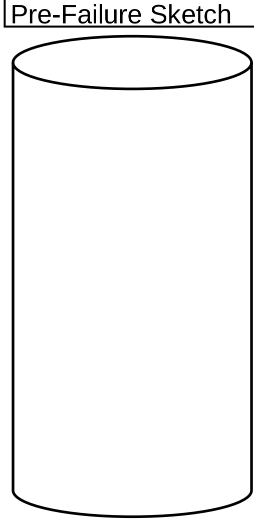
Modulus		psi
Poisson's		

Fail Stress	20,404 (psi)
	140.7 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	50,600 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

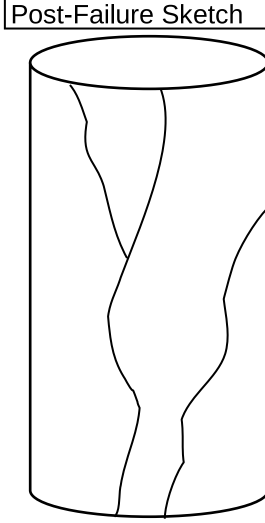
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.782	Ht. 1	3.912
Dia. 2	1.775	Ht. 2	3.910
Dia. 3	1.775	Ht. 3	3.910
Dia. 4	1.776	Ht. 4	3.911
Dia. 5	1.775	Weight (gm)	426.91
Dia. 6	1.779	Sample #	**04-003U**

Fail Load	50600	lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**04-005U**
		Sample # **04-005U**	Rock Type	GRANITE
			Density :	168.8 (pcf)
		Fail Stress **22,246** psi		2,703.6 (kg/m^3)
		153.42 Mpa		

Sample Data :	
Sample # :	**04-005U**
Rock Type:	GRANITE
Hole # :	C09-04
Depth :	150.25
Alterations:	
Diameter :	1.773 (in)
Height :	3.921 (in)
Weight :	428.69 (gm)
Area :	2.468 (in^2)
Volume :	9.676 (in^3)

Modulus [ ] psi

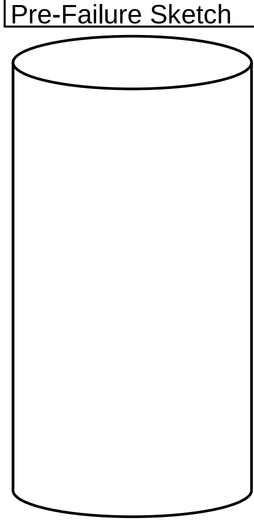
Poisson's [ ]

Fail Stress	22,246 (psi)
	153.4 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	54,900 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

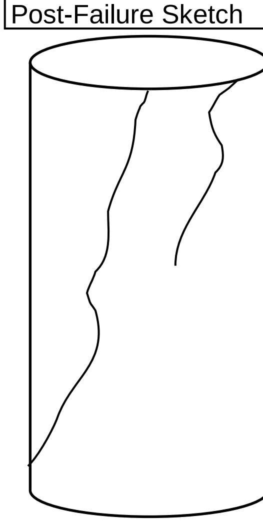
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.772	Ht. 1	3.923
Dia. 2	1.774	Ht. 2	3.921
Dia. 3	1.771	Ht. 3	3.920
Dia. 4	1.775	Ht. 4	3.919
Dia. 5	1.774	Weight (gm)	428.69
Dia. 6	1.770	Sample #	**04-005U**

Fail Load	54900	lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**05-001U**
Rock Type	GRANITE
Density :	165.6 (pcf)
	2,653.4 (kg/m^3)

Sample # **05-001U**

Fail Stress **10,284** psi

70.92 Mpa

Modulus psi

Poisson's

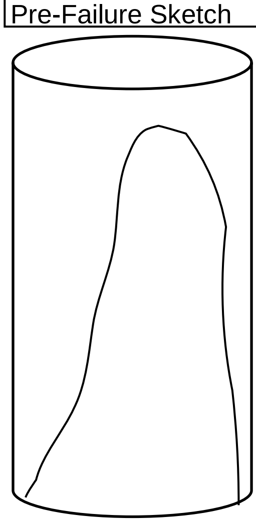
Sample Data :	
Sample # :	**05-001U**
Rock Type:	GRANITE
Hole # :	C09-05
Depth :	33
Alterations:	
Diameter :	1.773 (in)
Height :	3.892 (in)
Weight :	417.99 (gm)
Area :	2.470 (in^2)
Volume :	9.613 (in^3)

Fail Stress	10,284 (psi)
	70.9 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	25,400 (lbs)
Mode of Failure	Both
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

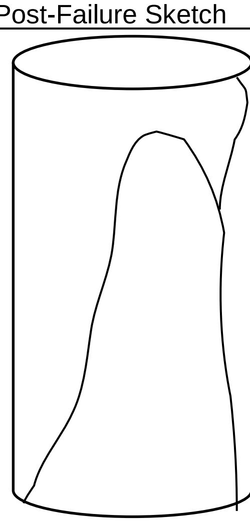
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	
Both	XX

Post-Failure Sketch



Dia. 1	1.772	Ht. 1	3.893
Dia. 2	1.767	Ht. 2	3.893
Dia. 3	1.789	Ht. 3	3.892
Dia. 4	1.775	Ht. 4	3.891
Dia. 5	1.768	Weight (gm)	417.99
Dia. 6	1.770	Sample #	**05-001U**

Fail Load 25400 lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**05-003U**
Rock Type	GRANITE
Density :	163.4 (pcf)
	2,616.6 (kg/m^3)

Sample # **05-003U**

Fail Stress **10,780** psi

74.34 Mpa

Modulus psi

Poisson's

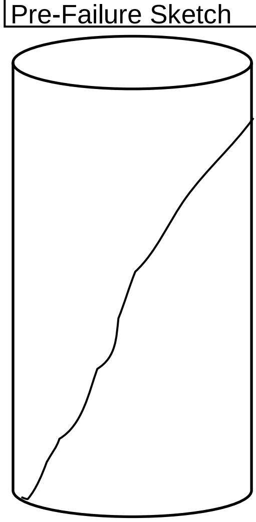
Sample Data :	
Sample # :	**05-003U**
Rock Type:	GRANITE
Hole # :	C09-05
Depth :	92.7
Alterations:	
Diameter :	1.769 (in)
Height :	3.818 (in)
Weight :	402.49 (gm)
Area :	2.458 (in^2)
Volume :	9.387 (in^3)

Fail Stress	10,780 (psi)
	74.3 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	26,500 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

Pre-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Post-Failure Sketch

Dia. 1	1.771	Ht. 1	3.819
Dia. 2	1.767	Ht. 2	3.819
Dia. 3	1.767	Ht. 3	3.818
Dia. 4	1.773	Ht. 4	3.818
Dia. 5	1.771	Weight (gm)	402.49
Dia. 6	1.767	Sample #	**05-003U**

Fail Load 26500 lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**06-001U**
		Sample # **06-001U**	Rock Type	GRANITE
			Density :	166.0 (pcf)
				2,659.8 (kg/m^3)

Fail Stress	**17,574**	psi
	121.20	Mpa
Modulus		psi
Poisson's		

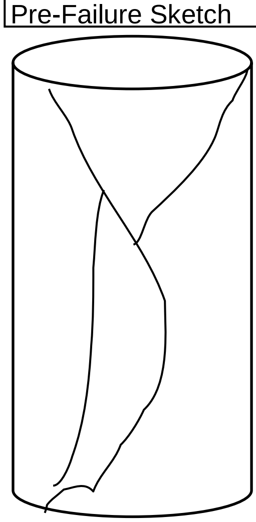
Sample Data :	
Sample # :	**06-001U**
Rock Type:	GRANITE
Hole # :	C09-06
Depth :	37.2
Alterations:	
Diameter :	1.771 (in)
Height :	3.841 (in)
Weight :	412.53 (gm)
Area :	2.464 (in^2)
Volume :	9.464 (in^3)

Fail Stress	17,574 (psi)
	121.2 Mpa

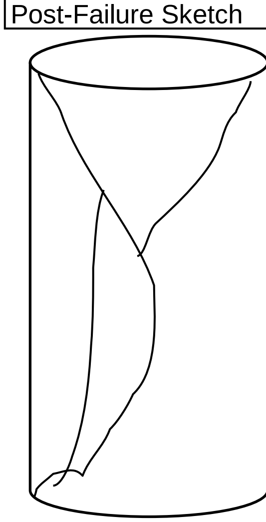
Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	43,300 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

Pre-Failure Sketch



Post-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Dia. 1	1.770	Ht. 1	3.839
Dia. 2	1.768	Ht. 2	3.843
Dia. 3	1.777	Ht. 3	3.841
Dia. 4	1.772	Ht. 4	3.843
Dia. 5	1.770	Weight (gm)	412.53
Dia. 6	1.771	Sample #	**06-001U**

Fail Load	43300	lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**06-003U**
Rock Type	GRANITE
Density :	165.8 (pcf)
	2,655.7 (kg/m^3)

Sample #	**06-003U**	
Fail Stress	**17,803**	psi
	122.78	Mpa
Modulus		psi
Poisson's		

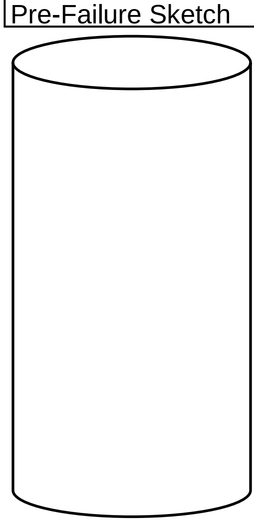
Fail Stress	17,803 (psi)
	122.8 Mpa

Sample Data :	
Sample # :	**06-003U**
Rock Type:	GRANITE
Hole # :	C09-06
Depth :	108.35
Alterations:	
Diameter :	1.774 (in)
Height :	3.309 (in)
Weight :	355.87 (gm)
Area :	2.472 (in^2)
Volume :	8.177 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	44,400 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	0.991

Worksheet

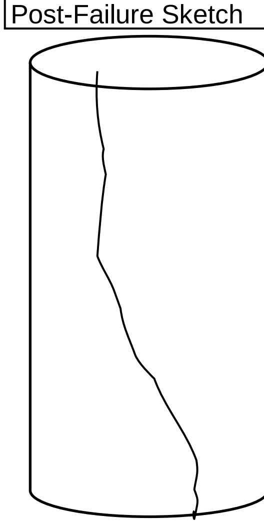
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.773	Ht. 1	3.308
Dia. 2	1.773	Ht. 2	3.309
Dia. 3	1.774	Ht. 3	3.310
Dia. 4	1.775	Ht. 4	3.309
Dia. 5	1.778	Weight (gm)	355.87
Dia. 6	1.772	Sample #	**06-003U**

Fail Load	44400	lbs

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GEOMECHANICAL LABORATORY

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Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**06-004U**
Rock Type	GRANITE
Density :	167.4 (pcf)
	2,680.8 (kg/m^3)

Sample #	**06-004U**	
Fail Stress	**14,601**	psi
	100.70	Mpa
Modulus		psi
Poisson's		

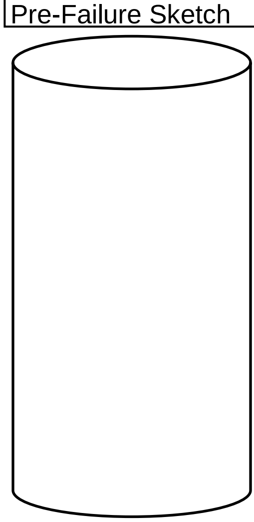
Fail Stress	14,601 (psi)
	100.7 Mpa

Sample Data :	
Sample # :	**06-004U**
Rock Type:	GRANITE
Hole # :	C09-06
Depth :	138
Alterations:	
Diameter :	1.776 (in)
Height :	2.154 (in)
Weight :	234.59 (gm)
Area :	2.479 (in^2)
Volume :	5.340 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	39,000 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	0.928

Worksheet

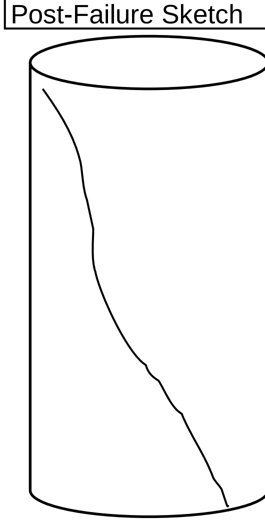
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.779	Ht. 1	2.156
Dia. 2	1.774	Ht. 2	2.155
Dia. 3	1.780	Ht. 3	2.154
Dia. 4	1.780	Ht. 4	2.153
Dia. 5	1.774	Weight (gm)	234.59
Dia. 6	1.773	Sample #	**06-004U**

Fail Load	39000	lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022_006	Uniaxial Compression Test Results	Client	SRK
Date	7/22/2009		Location	MINTO
Technician	D.Streeter		Sample #	**C09-07-01U**
			Rock Type	GRANITE
			Density :	170.0 (pcf)
				2,723.5 (kg/m^3)

Sample # **C09-07-01U**

Fail Stress **24,982** psi

172.29 Mpa

Modulus psi

Poisson's

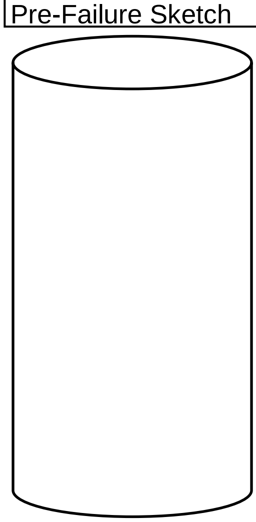
Sample Data :	
Sample # :	**C09-07-01U**
Rock Type:	GRANITE
Hole # :	C09-07
Depth :	29.32-29.48
Alterations:	
Diameter :	1.772 (in)
Height :	3.812 (in)
Weight :	419.54 (gm)
Area :	2.466 (in^2)
Volume :	9.400 (in^3)

Fail Stress	24,982 (psi)
	172.3 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	61,600 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

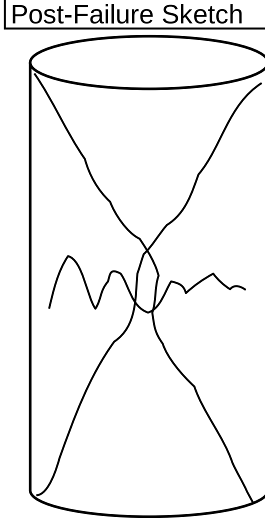
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.771	Ht. 1	3.812
Dia. 2	1.770	Ht. 2	3.811
Dia. 3	1.770	Ht. 3	3.813
Dia. 4	1.779	Ht. 4	3.814
Dia. 5	1.771	Weight (gm)	419.54
Dia. 6	1.771	Sample #	C09-07-01U

Fail Load 61600 lbs

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GEOMECHANICAL LABORATORY

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Project #	2CM022_006	Uniaxial Compression Test Results	Client	SRK
Date	7/22/2009		Location	MINTO
Technician	D.Streeter		Sample #	**C09-07-03U**
			Rock Type	GRANITE
			Density :	169.1 (pcf)
				2,707.8 (kg/m^3)

Sample #	**C09-07-03U**	
Fail Stress	**20,255**	psi
	139.69	Mpa
Modulus		psi
Poisson's		

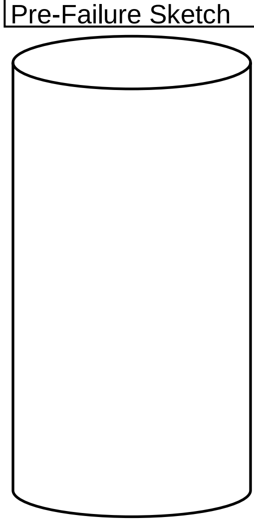
Fail Stress	20,255 (psi)
	139.7 Mpa

Sample Data :	
Sample # :	**C09-07-03U**
Rock Type:	GRANITE
Hole # :	C09-07
Depth :	86.34-86.52
Alterations:	
Diameter :	1.775 (in)
Height :	3.858 (in)
Weight :	423.39 (gm)
Area :	2.473 (in^2)
Volume :	9.541 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	50,100 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

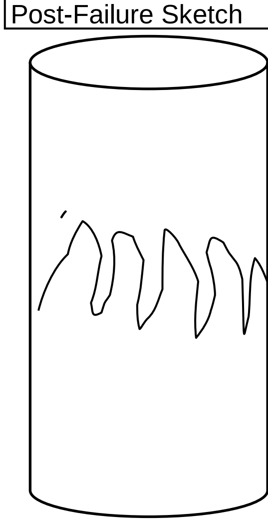
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.781	Ht. 1	3.857
Dia. 2	1.773	Ht. 2	3.858
Dia. 3	1.772	Ht. 3	3.859
Dia. 4	1.777	Ht. 4	3.858
Dia. 5	1.772	Weight (gm)	423.39
Dia. 6	1.773	Sample #	C09-07-03U

Fail Load	50100	lbs

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GEOMECHANICAL LABORATORY

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Uniaxial Compression Test Results

Project #	2CM022_006	Client	SRK
Date	7/22/2009	Location	MINTO
Technician	D.Streeter	Sample #	**C09-07-05U**
		Rock Type	GRANITE
		Density :	167.6 (pcf)
			2,685.0 (kg/m^3)

Sample # **C09-07-05U**

Fail Stress **18,078** psi

124.68 Mpa

Modulus psi

Poisson's

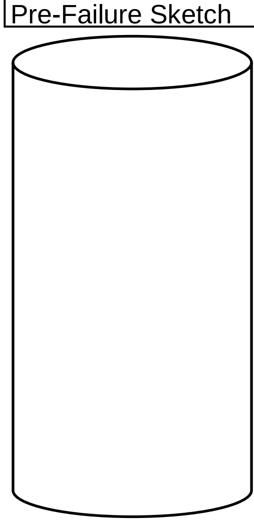
Sample Data :	
Sample # :	**C09-07-05U**
Rock Type:	GRANITE
Hole # :	C09-07
Depth :	124.57-124.76
Alterations:	
Diameter :	1.766 (in)
Height :	3.872 (in)
Weight :	417.48 (gm)
Area :	2.450 (in^2)
Volume :	9.488 (in^3)

Fail Stress	18,078 (psi)
	124.7 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	44,300 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

Pre-Failure Sketch



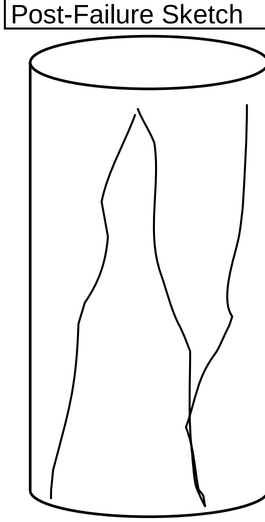
Mode of Failure :

Fracture [ ]

Intact [XX]

Both [ ]

Post-Failure Sketch



Dia. 1	1.766	Ht. 1	3.873
Dia. 2	1.765	Ht. 2	3.874
Dia. 3	1.767	Ht. 3	3.876
Dia. 4	1.765	Ht. 4	3.866
Dia. 5	1.767	Weight (gm)	417.48
Dia. 6	1.769	Sample #	C09-07-05U

Fail Load 44300 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022_006	Uniaxial Compression Test Results	Client	SRK
Date	7/22/2009		Location	MINTO
Technician	D.Streeter		Sample #	**C09-08-01U**
			Rock Type	GRANITE
			Density :	168.9 (pcf)
				2,704.7 (kg/m^3)

Sample #	**C09-08-01U**	
Fail Stress	**22,867**	psi
	157.71	Mpa
Modulus		psi
Poisson's		

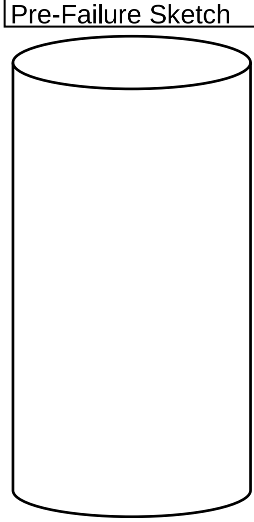
Sample Data :	
Sample # :	**C09-08-01U**
Rock Type:	GRANITE
Hole # :	C09-08
Depth :	47.53-47.74
Alterations:	
Diameter :	1.769 (in)
Height :	3.863 (in)
Weight :	420.80 (gm)
Area :	2.458 (in^2)
Volume :	9.494 (in^3)

Fail Stress	22,867 (psi)
	157.7 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	56,200 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

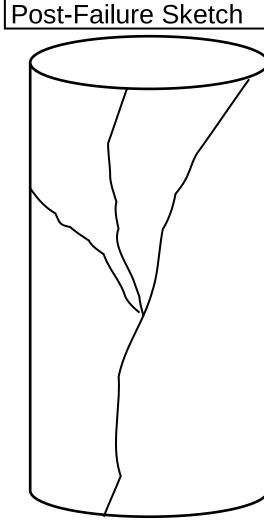
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.771	Ht. 1	3.864
Dia. 2	1.769	Ht. 2	3.865
Dia. 3	1.767	Ht. 3	3.861
Dia. 4	1.773	Ht. 4	3.862
Dia. 5	1.767	Weight (gm)	420.80
Dia. 6	1.767	Sample #	C09-08-01U

Fail Load 56200 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022_006	Uniaxial Compression Test Results	Client	SRK
Date	7/22/2009		Location	MINTO
Technician	D.Streeter		Sample #	**C09-08-04U**
		Sample # **C09-08-04U**	Rock Type	GRANITE
			Density :	168.5 (pcf)
		Fail Stress **13,676** psi		2,698.7 (kg/m^3)
		94.31 Mpa		

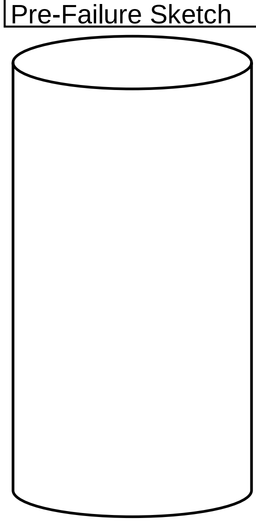
Sample Data :				
Sample # :	**C09-08-04U**	Modulus		psi
Rock Type:	GRANITE	Poisson's		
Hole # :	C09-08			
Depth :	89.15-89.39			
Alterations:				
Diameter :	1.774 (in)			
Height :	3.916 (in)			
Weight :	428.04 (gm)			
Area :	2.472 (in^2)			
Volume :	9.679 (in^3)			

Fail Stress	13,676 (psi)
	94.3 Mpa

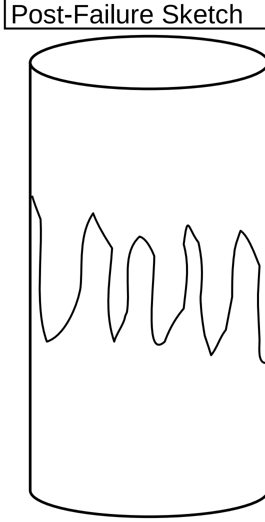
Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	33,800 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

Pre-Failure Sketch



Post-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Dia. 1	1.773	Ht. 1	3.915
Dia. 2	1.772	Ht. 2	3.915
Dia. 3	1.776	Ht. 3	3.919
Dia. 4	1.777	Ht. 4	3.916
Dia. 5	1.773	Weight (gm)	428.04
Dia. 6	1.774	Sample #	C09-08-04U

Fail Load 33800 lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022_006
Date	7/22/2009
Technician	D.Streeter

Client	SRK
Location	MINTO
Sample #	**C09-08-07U**
Rock Type	GRANITE
Density :	167.9 (pcf)
	2,689.5 (kg/m^3)

Sample #	**C09-08-07U**	
Fail Stress	**22,273**	psi
	153.60	Mpa
Modulus		psi
Poisson's		

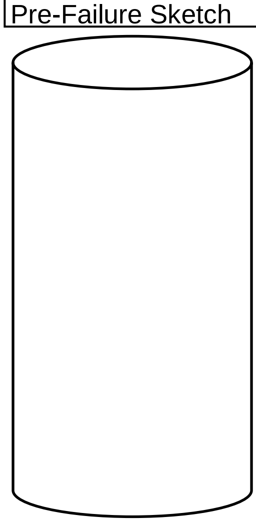
Sample Data :	
Sample # :	**C09-08-07U**
Rock Type:	GRANITE
Hole # :	C09-08
Depth :	129.4-129.65
Alterations:	
Diameter :	1.770 (in)
Height :	3.884 (in)
Weight :	421.15 (gm)
Area :	2.460 (in^2)
Volume :	9.555 (in^3)

Fail Stress	22,273 (psi)
	153.6 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	54,800 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

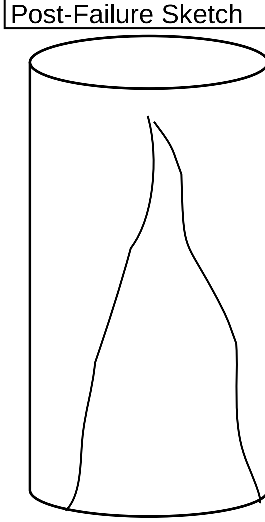
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.767	Ht. 1	3.883
Dia. 2	1.770	Ht. 2	3.884
Dia. 3	1.772	Ht. 3	3.885
Dia. 4	1.774	Ht. 4	3.884
Dia. 5	1.770	Weight (gm)	421.15
Dia. 6	1.768	Sample #	C09-08-07U

Fail Load	54800	lbs

University of Arizona

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Uniaxial Compression Test Results

Project #	2CM022	Client	SRK
Date	5/4/2009	Location	
Technician	D.Streeter	Sample #	**01-001E**
		Rock Type	GRANITE
		Density :	166.3 (pcf)
			2,663.7 (kg/m^3)

Sample #	**01-001E**	
Fail Stress	**12,790**	psi
	88.21	Mpa
Modulus	**7.32E+06**	psi
Poisson's	0.217	

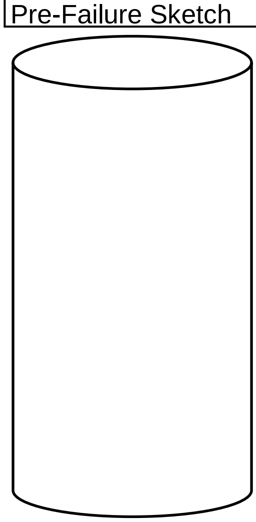
Sample Data :	
Sample # :	**01-001E**
Rock Type:	GRANITE
Hole # :	C09-01
Depth :	32.1
Alterations:	
Diameter :	1.774 (in)
Height :	3.830 (in)
Weight :	413.02 (gm)
Area :	2.471 (in^2)
Volume :	9.462 (in^3)

Fail Stress	12,790 (psi)
	88.2 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	31,600 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

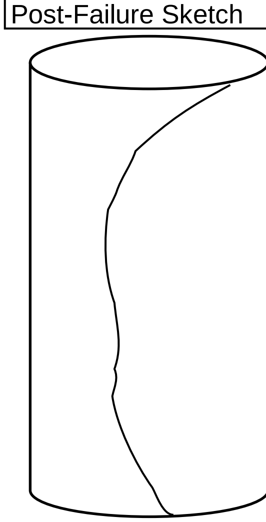
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.770	Ht. 1	3.840
Dia. 2	1.774	Ht. 2	3.835
Dia. 3	1.779	Ht. 3	3.823
Dia. 4	1.778	Ht. 4	3.822
Dia. 5	1.771	Weight (gm)	413.02
Dia. 6	1.771	Sample #	**01-001E**

Fail Load	31600	lbs

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**01-008E**
			Rock Type	GRANITE
			Density :	169.4 (pcf)
				2,713.3 (kg/m^3)

Sample #	**01-008E**	
Fail Stress	**23,878**	psi
	164.68	Mpa
Modulus	**9.65E+06**	psi
Poisson's	0.302	

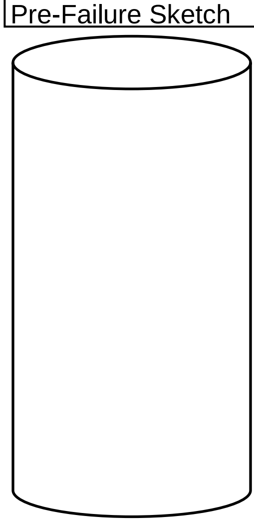
Sample Data :	
Sample # :	**01-008E**
Rock Type:	GRANITE
Hole # :	C09-01
Depth :	220.3
Alterations:	
Diameter :	1.775 (in)
Height :	4.038 (in)
Weight :	444.35 (gm)
Area :	2.475 (in^2)
Volume :	9.993 (in^3)

Fail Stress	23,878 (psi)
	164.7 Mpa

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	59,100 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

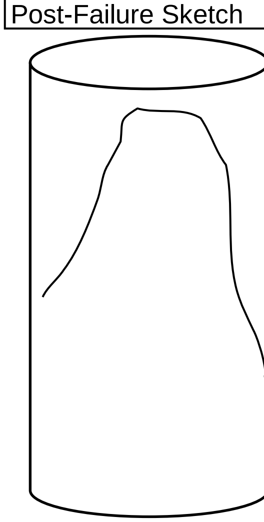
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.774	Ht. 1	4.048
Dia. 2	1.775	Ht. 2	4.046
Dia. 3	1.775	Ht. 3	4.033
Dia. 4	1.773	Ht. 4	4.025
Dia. 5	1.778	Weight (gm)	444.35
Dia. 6	1.776	Sample #	**01-008E**

Fail Load	59100	lbs

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GEOMECHANICAL LABORATORY

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Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**02-004E**
Rock Type	GRANITE
Density :	166.6 (pcf)
	2,668.0 (kg/m^3)

Sample #	**02-004E**	
Fail Stress	**10,395**	psi
	71.69	Mpa
Modulus	**7.14E+06**	psi
Poisson's	0.214	

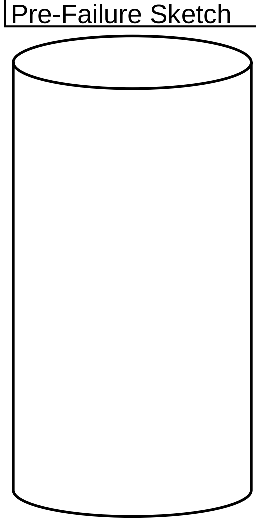
Fail Stress	10,395 (psi)
	71.7 Mpa

Sample Data :	
Sample # :	**02-004E**
Rock Type:	GRANITE
Hole # :	C09-02
Depth :	122.67
Alterations:	
Diameter :	1.771 (in)
Height :	3.905 (in)
Weight :	420.48 (gm)
Area :	2.463 (in^2)
Volume :	9.617 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	25,600 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

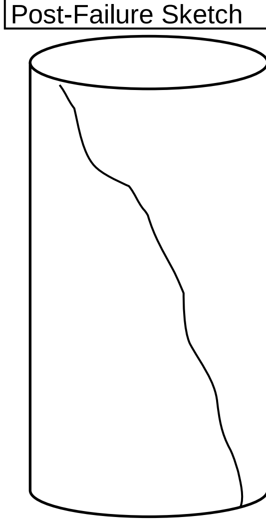
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.769	Ht. 1	3.907
Dia. 2	1.773	Ht. 2	3.906
Dia. 3	1.773	Ht. 3	3.905
Dia. 4	1.768	Ht. 4	3.904
Dia. 5	1.768	Weight (gm)	420.48
Dia. 6	1.774	Sample #	**02-004E**

Fail Load	25600	lbs

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Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**03-002E**
Rock Type	LT GRANITE
Density :	164.2 (pcf)
	2,630.8 (kg/m^3)

Sample #	**03-002E**	
Fail Stress	**7,096**	psi
	48.94	Mpa
Modulus	**2.16E+06**	psi
Poisson's	0.084	

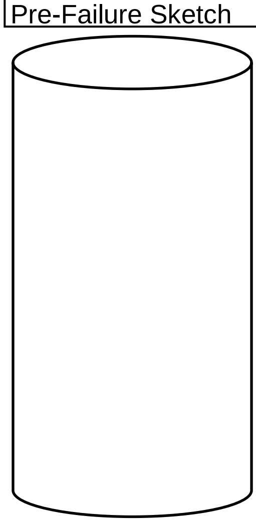
Fail Stress	7,096 (psi)
	48.9 Mpa

Sample Data :	
Sample # :	**03-002E**
Rock Type:	LT GRANITE
Hole # :	C09-03
Depth :	38
Alterations:	
Diameter :	1.767 (in)
Height :	3.699 (in)
Weight :	391.01 (gm)
Area :	2.452 (in^2)
Volume :	9.070 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	17,400 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

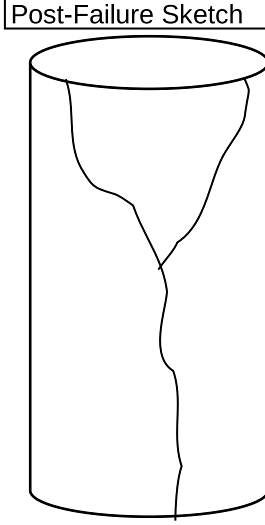
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.766	Ht. 1	3.681
Dia. 2	1.765	Ht. 2	3.688
Dia. 3	1.767	Ht. 3	3.710
Dia. 4	1.770	Ht. 4	3.717
Dia. 5	1.767	Weight (gm)	391.01
Dia. 6	1.767	Sample #	**03-002E**

Fail Load	17400	lbs

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Uniaxial Compression Test Results

Project #	2CM022
Date	5/4/2009
Technician	D.Streeter

Client	SRK
Location	
Sample #	**03-007E**
Rock Type	GRANITE
Density :	168.6 (pcf)
	2,700.3 (kg/m^3)

Sample #	**03-007E**	
Fail Stress	**15,136**	psi
	104.39	Mpa
Modulus	**6.86E+06**	psi
Poisson's	0.228	

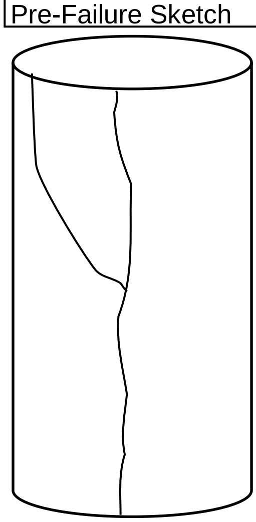
Fail Stress	15,136 (psi)
	104.4 Mpa

Sample Data :	
Sample # :	**03-007E**
Rock Type:	GRANITE
Hole # :	C09-03
Depth :	161.03
Alterations:	
Diameter :	1.774 (in)
Height :	3.890 (in)
Weight :	425.37 (gm)
Area :	2.471 (in^2)
Volume :	9.613 (in^3)

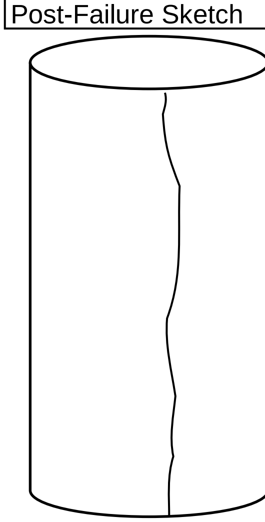
Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	37,400 (lbs)
Mode of Failure	Fracture
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

Pre-Failure Sketch



Post-Failure Sketch



Mode of Failure :

Fracture	XX
Intact	
Both	

Dia. 1	1.776	Ht. 1	3.892
Dia. 2	1.773	Ht. 2	3.890
Dia. 3	1.772	Ht. 3	3.890
Dia. 4	1.774	Ht. 4	3.890
Dia. 5	1.772	Weight (gm)	425.37
Dia. 6	1.775	Sample #	**03-007E**

Fail Load	37400	lbs

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Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**05-005E**

Sample #	**05-005E**		
Fail Stress	**12,573**	psi	
	86.71	Mpa	
Modulus	**7.82E+06**	psi	
Poisson's	0.262		

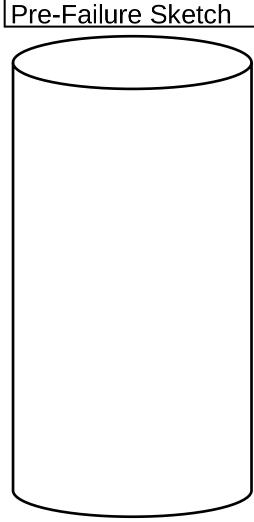
Rock Type	PK GRANITE
Density :	167.2 (pcf)
	2,677.7 (kg/m^3)
Fail Stress	12,573 (psi)
	86.7 Mpa

Sample Data :	
Sample # :	**05-005E**
Rock Type:	PK GRANITE
Hole # :	C09-05
Depth :	150.11
Alterations:	
Diameter :	1.769 (in)
Height :	3.879 (in)
Weight :	418.29 (gm)
Area :	2.458 (in^2)
Volume :	9.532 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	30,900 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

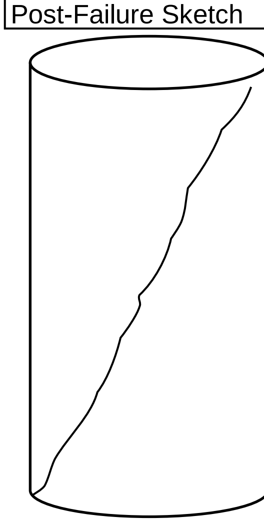
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	XX
Both	

Post-Failure Sketch



Dia. 1	1.768	Ht. 1	3.879
Dia. 2	1.769	Ht. 2	3.879
Dia. 3	1.772	Ht. 3	3.879
Dia. 4	1.768	Ht. 4	3.878
Dia. 5	1.770	Weight (gm)	418.29
Dia. 6	1.768	Sample #	**05-005E**

Fail Load 30900 lbs

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Project #	2CM022	Uniaxial Compression Test Results	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**06-002E**
		Sample # **06-002E**	Rock Type	PK GRANITE
			Density :	165.6 (pcf)
				2,652.7 (kg/m^3)

Fail Stress	**19,041**	psi
	131.32	Mpa
Modulus	**7.61E+06**	psi
Poisson's	0.294	

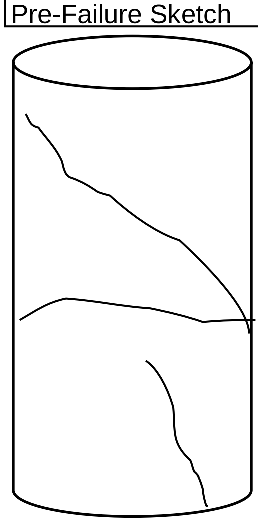
Fail Stress	19,041 (psi)
	131.3 Mpa

Sample Data :	
Sample # :	**06-002E**
Rock Type:	PK GRANITE
Hole # :	C09-06
Depth :	71.22
Alterations:	
Diameter :	1.773 (in)
Height :	3.942 (in)
Weight :	423.02 (gm)
Area :	2.468 (in^2)
Volume :	9.731 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	47,000 (lbs)
Mode of Failure	Both
Test Duration :	(sec)
2:1 Correction :	1

Worksheet

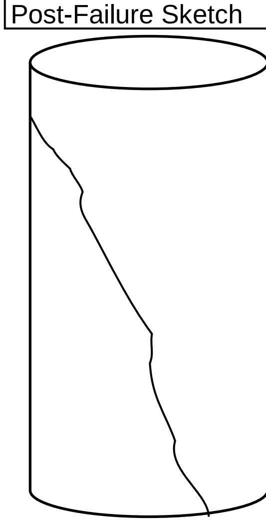
Pre-Failure Sketch



Mode of Failure :

Fracture	
Intact	
Both	XX

Post-Failure Sketch



Dia. 1	1.777	Ht. 1	3.940
Dia. 2	1.772	Ht. 2	3.943
Dia. 3	1.772	Ht. 3	3.946
Dia. 4	1.774	Ht. 4	3.941
Dia. 5	1.770	Weight (gm)	423.02
Dia. 6	1.773	Sample #	**06-002E**

Fail Load	47000	lbs

Triaxial Compressive Strength Testing

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GEOMECHANICAL LABORATORY

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Project #	2CM022	Triaxial Compression Test Results	Client	SRK
Date	5/7/2009		Location	
Technician	D.Streeter	**Failure Data:**	Sample #	**01-002T**
		Sample # 01-002T	Rock Type	GRANITE
			Density :	168.3 (pcf)
				2,696.0 (kg/m^3)

Sample Data :

Sample # :	01-002T
Rock Type	GRANITE
Hole # :	C09-01
Depth :	59.88
Alterations	
Diameter :	1.773 (in)
Height :	3.939 (in)
Weight :	429.42 (gm)
Area :	2.468 (in^2)
Volume :	9.720 (in^3)

U.S. Standard

Sigma 3 (psi)	**Sigma 1** (psi)	
1,000	32,214	**Peak**
	0	**Residuals**
	0	
	0	
	0	

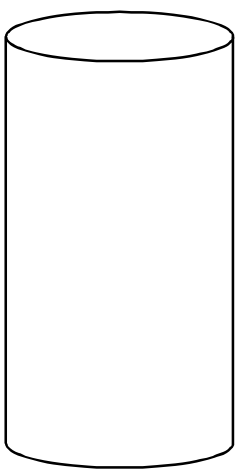
Test Data:

Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	79,500 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

Metric Standard

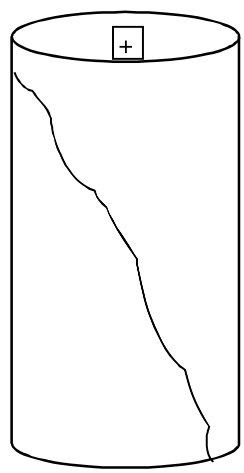
Sigma 3 (MPa)	**Sigma 1** (MPa)	
6.90	222.2	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

Worksheet



Mode of Failure :

Fracture	
Intact	XX
Both	



Pre-Failure Sketch

Post-Failure

Dia. 1	1.774	Ht. 1	3.938
Dia. 2	1.774	Ht. 2	3.940
Dia. 3	1.772	Ht. 3	3.940
Dia. 4	1.771	Ht. 4	3.937
Dia. 5	1.773	Weight (gm)	429.42
Dia. 6	1.772	Sample #	**01-002T**

Sigma 3 (psi)	**Fail Load** gage (lbs)
1,000	79,500
	0
	0
	0
	0

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Triaxial Compression Test Results

Project #	2CM022	Client	SRK
Date	5/7/2009	Location	
Technician	D.Streeter	Sample #	**01-005T**
		Rock Type	GRANITE
		Density :	167.1 (pcf)
			2,677.3 (kg/m^3)

Failure Data:

Sample # 01-005T

Sample Data :

Sample # :	01-005T
Rock Type	GRANITE
Hole # :	C09-01
Depth :	153.3
Alterations	
Diameter :	1.776 (in)
Height :	3.796 (in)
Weight :	412.81 (gm)
Area :	2.479 (in^2)
Volume :	9.409 (in^3)

U.S. Standard

Sigma 3 (psi)	Sigma 1 (psi)	
2,500	40,141	**Peak**
	0	**Residuals**
	0	
	0	
	0	

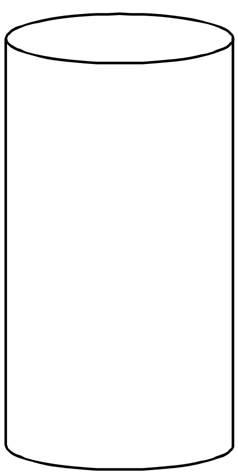
Metric Standard

Sigma 3 (MPa)	Sigma 1 (MPa)	
17.24	276.8	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

Test Data:

Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	99,500 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

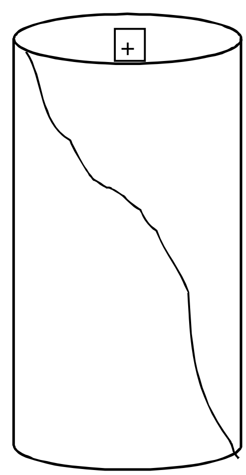
Worksheet



Pre-Failure Sketch

Mode of Failure :

Fracture	
Intact	XX
Both	



Post-Failure

Dia. 1	1.775	Ht. 1	3.797
Dia. 2	1.775	Ht. 2	3.796
Dia. 3	1.779	Ht. 3	3.795
Dia. 4	1.775	Ht. 4	3.796
Dia. 5	1.779	Weight (gm)	412.81
Dia. 6	1.777	Sample #	**01-005T**

Sigma 3 (psi)	Fail Load gage (lbs)
2,500	99,500
	0
	0
	0
	0

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TUCSON, ARIZONA USA

Project #	2CM022	Triaxial Compression Test Results	Client	SRK
Date	5/7/2009		Location	
Technician	D.Streeter	**Failure Data:**	Sample #	**02-005T**
		Sample # 02-005T	Rock Type	GRANITE
			Density :	167.8 (pcf)
				2,688.3 (kg/m^3)

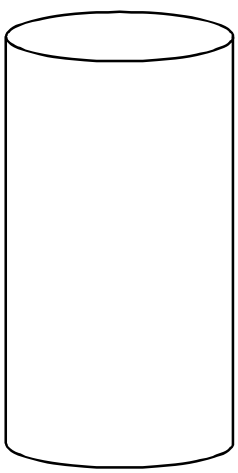
Sample Data :	
Sample # :	02-005T
Rock Type	GRANITE
Hole # :	C09-02
Depth :	150.1
Alterations	
Diameter :	1.775 (in)
Height :	3.349 (in)
Weight :	365.03 (gm)
Area :	2.474 (in^2)
Volume :	8.286 (in^3)

U.S. Standard		
Sigma 3 (psi)	**Sigma 1** (psi)	
1,500	31,004	**Peak**
	0	**Residuals**
	0	
	0	
	0	

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	76,700 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

Metric Standard		
Sigma 3 (MPa)	**Sigma 1** (MPa)	
10.34	213.8	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

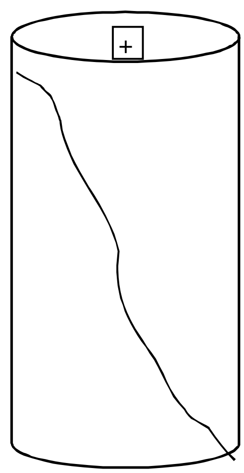
Worksheet



Pre-Failure Sketch

Mode of Failure :

Fracture	
Intact	XX
Both	



Post-Failure

Dia. 1	1.774	Ht. 1	3.350
Dia. 2	1.774	Ht. 2	3.350
Dia. 3	1.775	Ht. 3	3.349
Dia. 4	1.773	Ht. 4	3.350
Dia. 5	1.779	Weight (gm)	365.03
Dia. 6	1.774	Sample #	**02-005T**

Sigma 3 (psi)	**Fail Load** gage (lbs)
1,500	76,700
	0
	0
	0
	0

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Project #	2CM022	Triaxial Compression Test Results	Client	SRK
Date	5/7/2009		Location	
Technician	D.Streeter	**Failure Data:**	Sample #	**02-007T**
		Sample # 02-007T	Rock Type	GRANITE
			Density :	168.2 (pcf)
				2,693.6 (kg/m^3)

U.S. Standard

Sigma 3 (psi)	Sigma 1 (psi)	
2,000	42,659	**Peak**
	0	**Residuals**
	0	
	0	
	0	

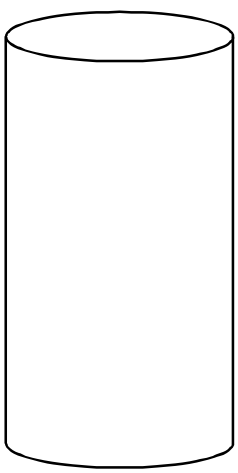
Sample Data :	
Sample # :	02-007T
Rock Type	GRANITE
Hole # :	C09-02
Depth :	209.69
Alterations	
Diameter :	1.770 (in)
Height :	3.926 (in)
Weight :	426.55 (gm)
Area :	2.461 (in^2)
Volume :	9.663 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	105,000 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

Metric Standard

Sigma 3 (MPa)	Sigma 1 (MPa)	
13.79	294.2	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

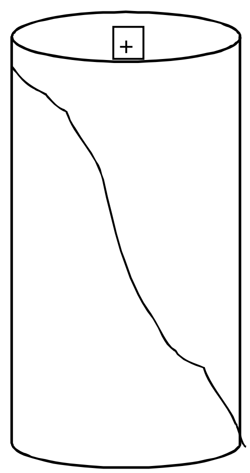
Worksheet



Pre-Failure Sketch

Mode of Failure :

Fracture	
Intact	XX
Both	



Post-Failure

Dia. 1	1.772	Ht. 1	3.926
Dia. 2	1.771	Ht. 2	3.925
Dia. 3	1.770	Ht. 3	3.927
Dia. 4	1.771	Ht. 4	3.927
Dia. 5	1.770	Weight (gm)	426.55
Dia. 6	1.769	Sample #	**02-007T**

Sigma 3 (psi)	**Fail Load** gage (lbs)
2,000	105,000
	0
	0
	0
	0

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GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	Triaxial Compression Test Results	Client	SRK
Date	5/7/2009		Location	
Technician	D.Streeter	**Failure Data:**	Sample #	**03-010T**
		Sample # 03-010T	Rock Type	GRANITE
			Density :	168.9 (pcf)
				2,706.0 (kg/m^3)

U.S. Standard

Sigma 3 (psi)	Sigma 1 (psi)	
2,000	41,796	**Peak**
	0	**Residuals**
	0	
	0	
	0	

Sample Data :

Sample # :	03-010T
Rock Type	GRANITE
Hole # :	C09-03
Depth :	250.17
Alterations	
Diameter :	1.771 (in)
Height :	3.972 (in)
Weight :	434.02 (gm)
Area :	2.464 (in^2)
Volume :	9.788 (in^3)

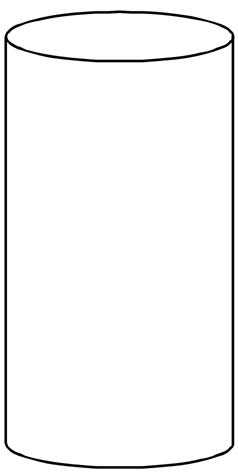
Test Data:

Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	103,000 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

Metric Standard

Sigma 3 (MPa)	Sigma 1 (MPa)	
13.79	288.2	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

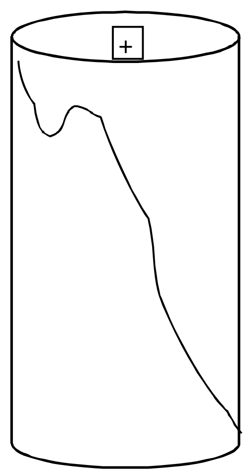
Worksheet



Pre-Failure Sketch

Mode of Failure :

Fracture	
Intact	XX
Both	



Post-Failure

Dia. 1	1.771	Ht. 1	3.971
Dia. 2	1.770	Ht. 2	3.972
Dia. 3	1.776	Ht. 3	3.974
Dia. 4	1.770	Ht. 4	3.971
Dia. 5	1.771	Weight (gm)	434.02
Dia. 6	1.772	Sample #	**03-010T**

Sigma 3 (psi)	**Fail Load** gage (lbs)
2,000	103,000
	0
	0
	0
	0

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TUCSON, ARIZONA USA

Project #	2CM022	Triaxial Compression Test Results	Client	SRK
Date	5/7/2009		Location	
Technician	D.Streeter	**Failure Data:**	Sample #	**04-004T**
		Sample # 04-004T	Rock Type	GRANITE
			Density :	167.7 (pcf)
				2,687.0 (kg/m^3)

U.S. Standard

Sigma 3 (psi)	Sigma 1 (psi)	
3,000	40,250	**Peak**
	0	**Residuals**
	0	
	0	
	0	

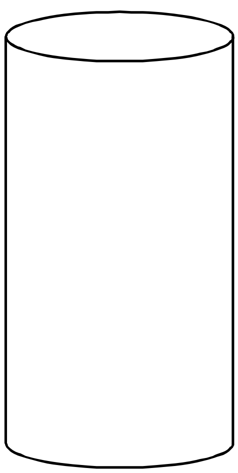
Sample Data :	
Sample # :	04-004T
Rock Type	GRANITE
Hole # :	C09-04
Depth :	123.25
Alterations	
Diameter :	1.768 (in)
Height :	3.835 (in)
Weight :	414.51 (gm)
Area :	2.455 (in^2)
Volume :	9.414 (in^3)

Test Data:	
Disp. Rate :	0.0003 (in/sec)
Load Rate :	(lbs/sec)
Gage Reading :	98,800 (lbs)
Mode of Failure	Intact
Test Duration :	(sec)

Metric Standard

Sigma 3 (MPa)	Sigma 1 (MPa)	
20.69	277.6	**Peak**
#VALUE!	0.0	**Residuals**
#VALUE!	0.0	
#VALUE!	0.0	
#VALUE!	0.0	

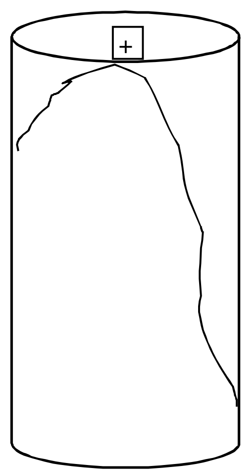
Worksheet



Pre-Failure Sketch

Mode of Failure :

Fracture	
Intact	XX
Both	



Post-Failure

Dia. 1	1.768	Ht. 1	3.838
Dia. 2	1.768	Ht. 2	3.834
Dia. 3	1.767	Ht. 3	3.832
Dia. 4	1.771	Ht. 4	3.837
Dia. 5	1.765	Weight (gm)	414.51
Dia. 6	1.770	Sample #	**04-004T**

Sigma 3 (psi)	**Fail Load** gage (lbs)
3,000	98,800
	0
	0
	0
	0

Direct Shear Testing

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Geomechanical Laboratory

Tucson, Arizona USA

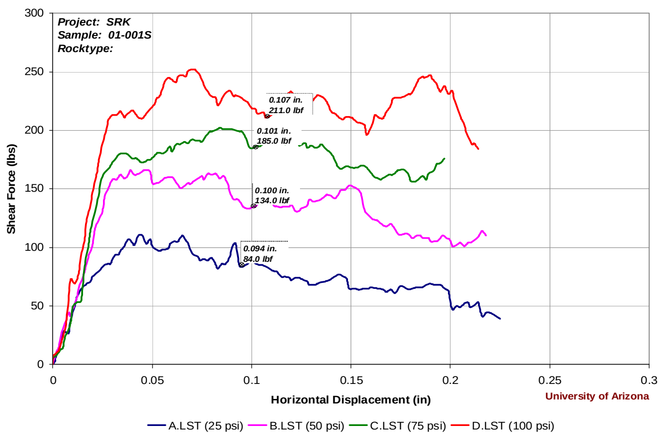
Date	05/06/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

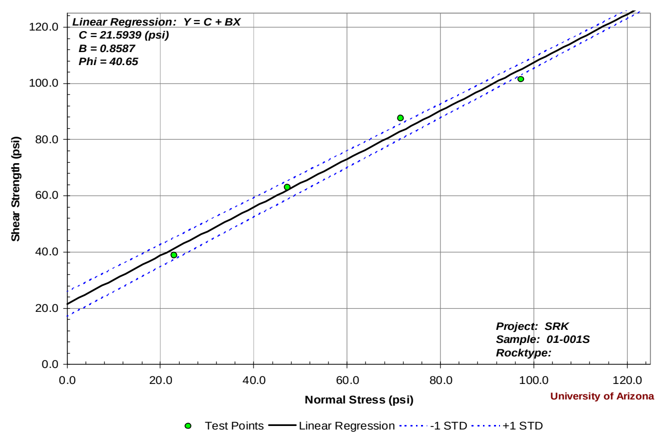
Sample Data		
Location		
Sample #	**01-001S**	
Rock Type		
Drill Hole	C09-01	
Depth	49.87	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.365	in^2
Diameter	1.735	*in*
Radius	0.868	*in*
Tilt Correction	4.778	*deg*

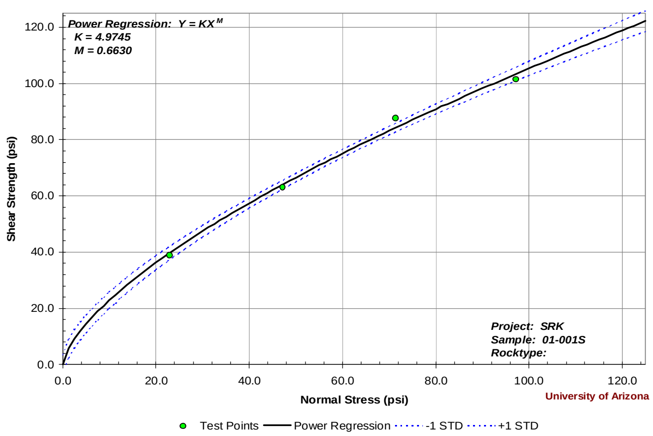
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	59	26.8	01-001S A
50	118	53.6	01-001S B
75	177	80.5	01-001S C
100	237	107.3	01-001S D

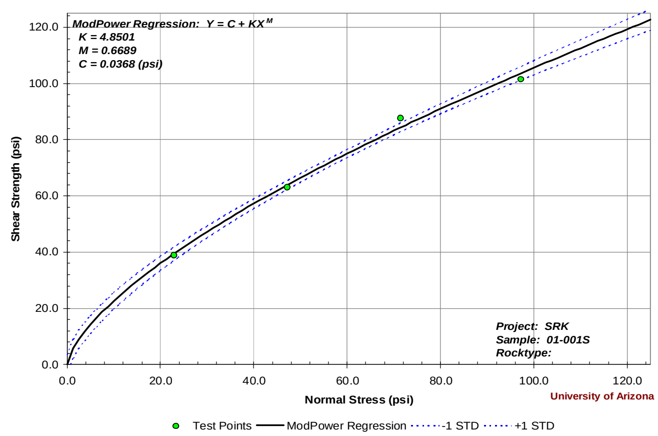
Results		
Linear: Y = BX + C		
Friction Angle	40.65	*deg*
Cohesion	21.59	*psi*
Power: $Y = KX^M$		
K	4.9745	*(for X in psi)*
M	0.6630	
Modified Power: $Y = KX^M + C$		
K	4.8501	*(for X in psi)*
M	0.6689	
C	0.0368	*psi*

Plot of Raw Trace Data









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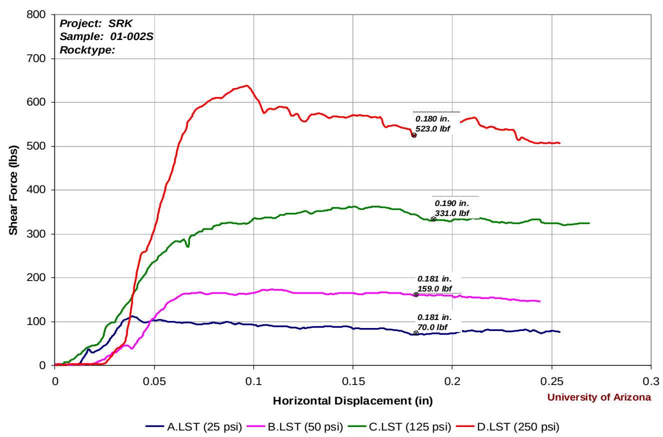
Date	05/05/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

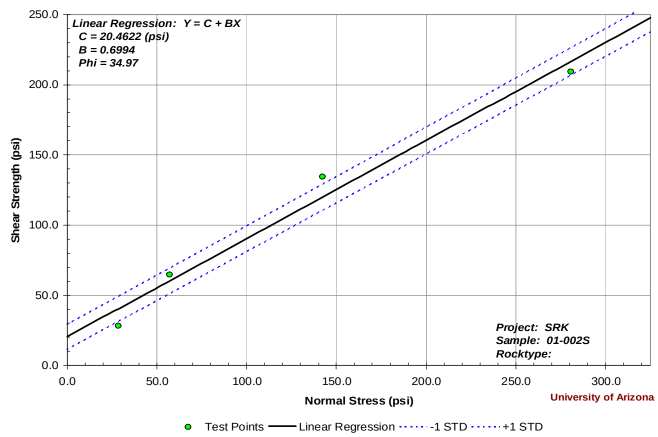
Sample Data		
Location		
Sample #	**01-002S**	
Rock Type		
Drill Hole	C09-01	
Depth	103	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Area/Circular	
Test Speed	0.025	*in/min*
Area	2.596	*in²*
Diameter	1.818	*in*
Radius	0.909	*in*
Tilt Correction	-2.066	*deg*

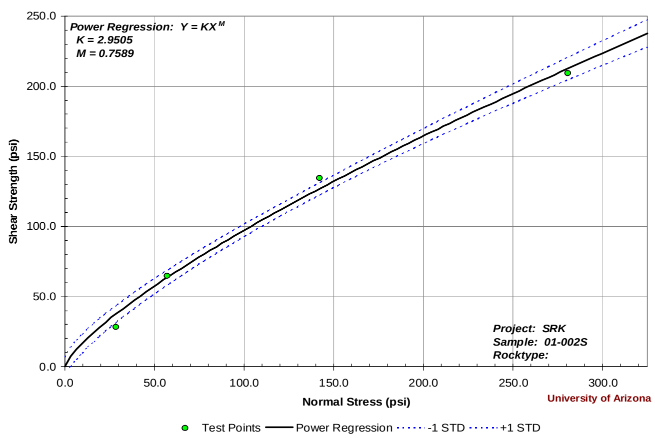
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	65	29.4	01-002S A
50	130	58.9	01-002S B
125	325	147.2	01-002S C
250	649	294.4	01-002S D

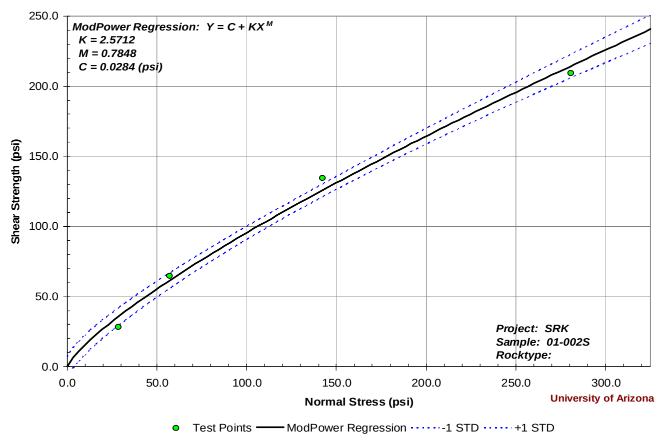
Results		
Linear: Y = BX + C		
Friction Angle	34.97	*deg*
Cohesion	20.46	*psi*
Power: $Y = KX^M$		
K	2.9505	*(for X in psi)*
M	0.7589	
Modified Power: $Y = KX^M + C$		
K	2.5712	*(for X in psi)*
M	0.7848	
C	0.0284	*psi*

Plot of Raw Trace Data









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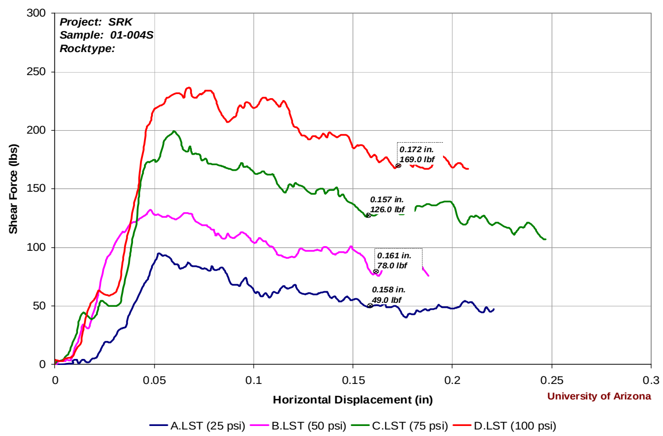
Date	05/06/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

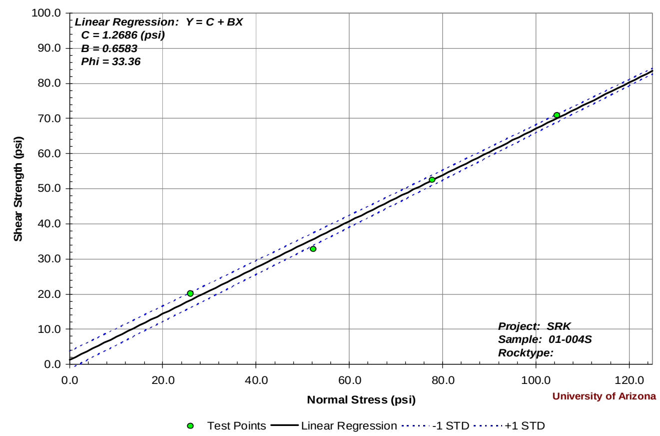
Sample Data		
Location		
Sample #	**01-004S**	
Rock Type		
Drill Hole	C09-01	
Depth	212.15	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.835	*in^2*
Diameter	1.900	*in*
Radius	0.950	*in*
Tilt Correction	3.425	*deg*

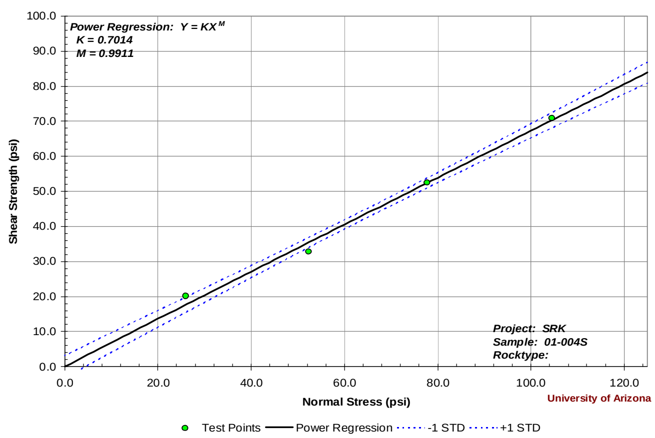
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	71	32.1	01-004S A
50	142	64.3	01-004S B
75	213	96.4	01-004S C
100	284	128.6	01-004S D

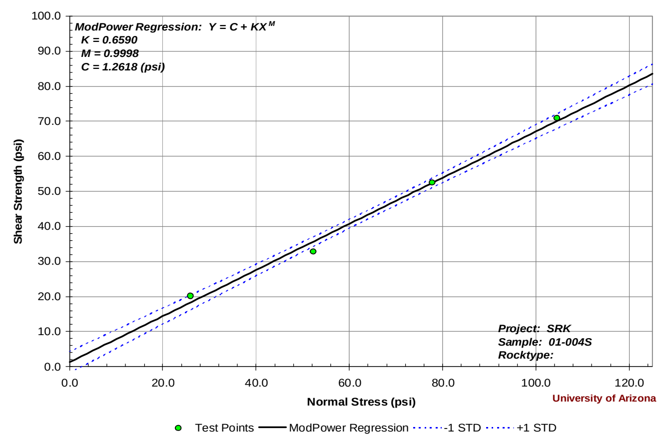
Results		
Linear: Y = BX + C		
Friction Angle	33.36	*deg*
Cohesion	1.27	*psi*
Power: $Y = KX^M$		
K	0.7014	*(for X in psi)*
M	0.9911	
Modified Power: $Y = KX^M + C$		
K	0.6590	*(for X in psi)*
M	0.9998	
C	1.2618	*psi*

Plot of Raw Trace Data









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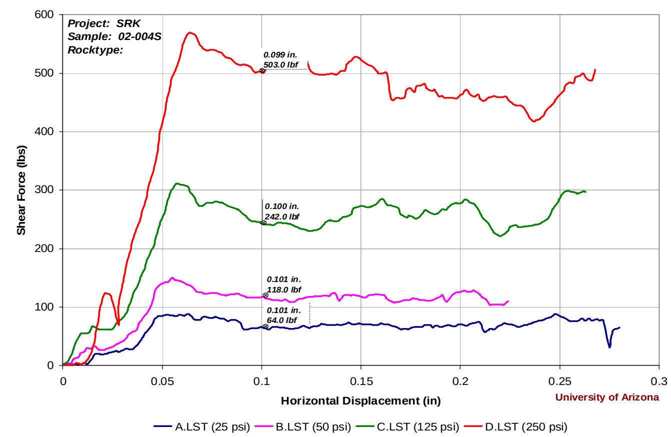
Date	05/06/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

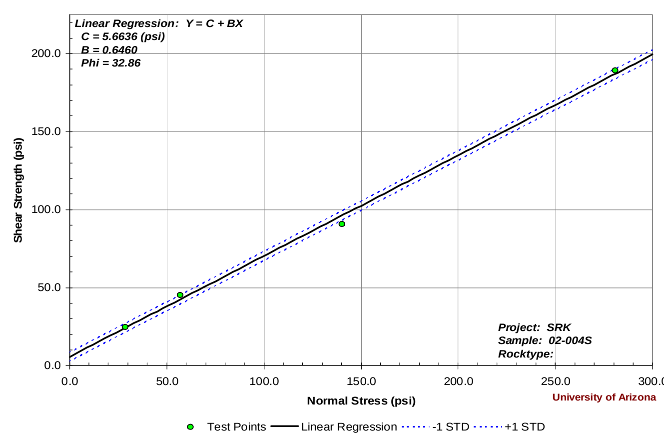
Sample Data		
Location		
Sample #	**02-004S**	
Rock Type		
Drill Hole	C09-02	
Depth	211.14	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.440	*in* ^{2}
Diameter	1.763	*in*
Radius	0.881	*in*
Tilt Correction	-5.294	*deg*

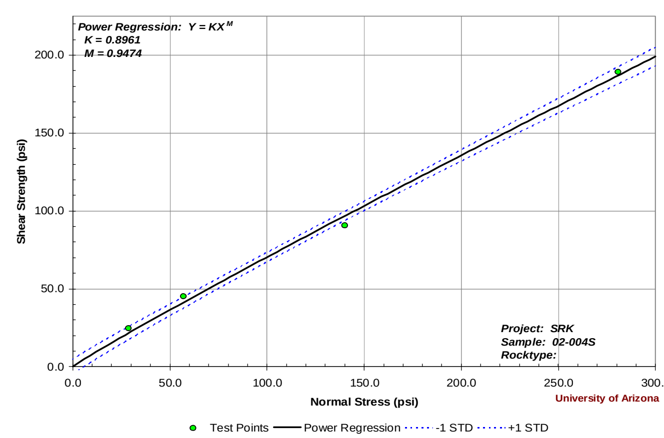
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	61	27.7	02-004S A
50	122	55.3	02-004S B
125	305	138.3	02-004S C
250	610	276.7	02-004S D

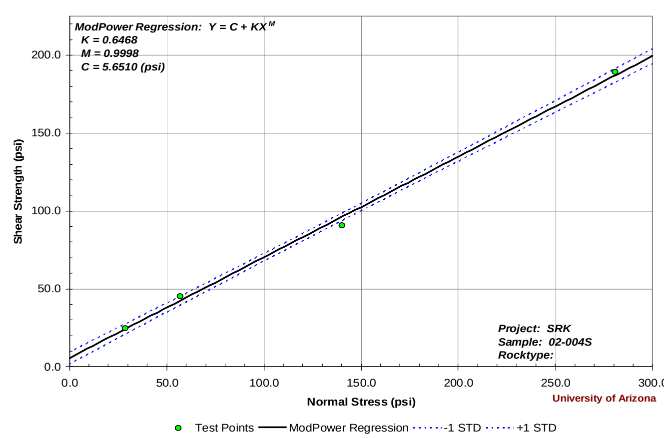
Results		
Linear: Y = BX + C		
Friction Angle	32.86	*deg*
Cohesion	5.66	*psi*
Power: $Y = KX^M$		
K	0.8961	*(for X in psi)*
M	0.9474	
Modified Power: $Y = KX^M + C$		
K	0.6468	*(for X in psi)*
M	0.9998	
C	5.6510	*psi*

Plot of Raw Trace Data









Notes :

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Sample: 02-004S

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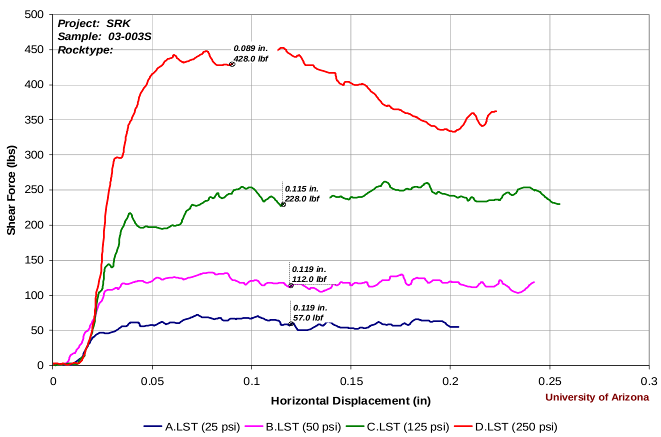
Date	05/05/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

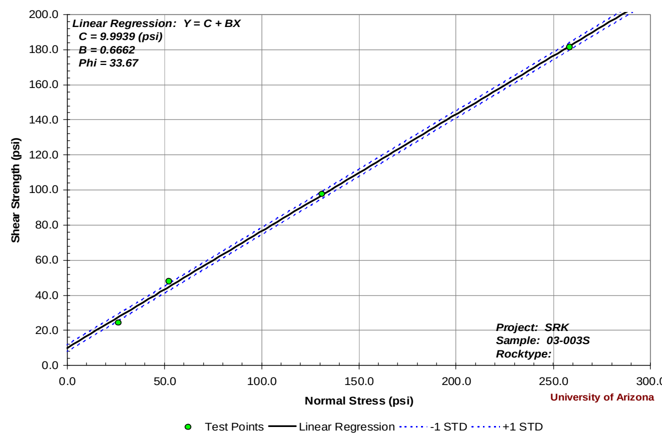
Sample Data		
Location		
Sample #	**03-003S**	
Rock Type		
Drill Hole	C09-03	
Depth	162.55	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.501	*in* ^{2}
Diameter	1.784	*in*
Radius	0.892	*in*
Tilt Correction	0.687	*deg*

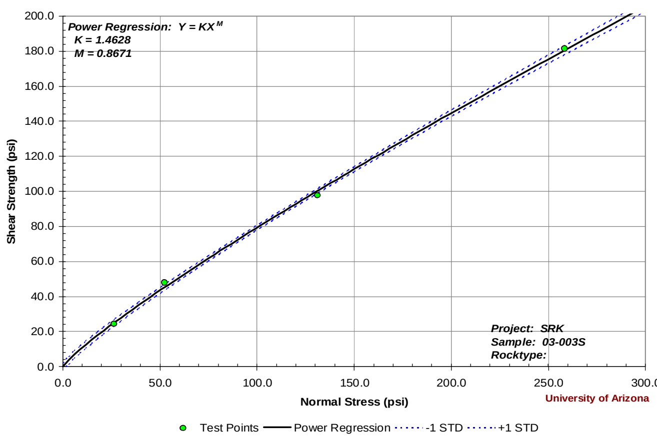
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	63	28.4	03-003S A
50	125	56.7	03-003S B
125	313	141.8	03-003S C
250	625	283.6	03-003S D

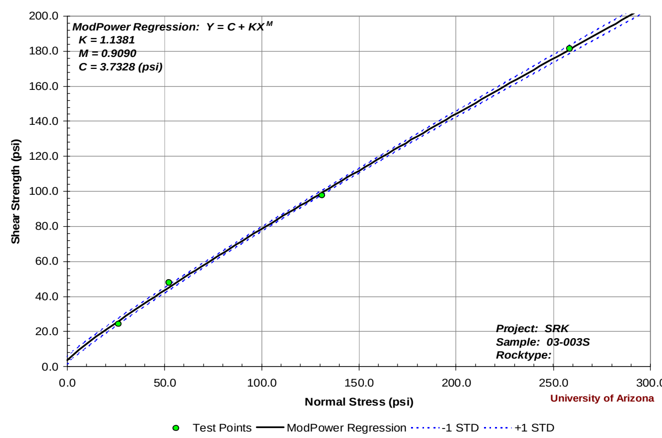
Results		
Linear: Y = BX + C		
Friction Angle	33.67	*deg*
Cohesion	9.99	*psi*
Power: $Y = KX^M$		
K	1.4628	*(for X in psi)*
M	0.8671	
Modified Power: $Y = KX^M + C$		
K	1.1381	*(for X in psi)*
M	0.9090	
C	3.7328	*psi*

Plot of Raw Trace Data









Notes :

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Sample: 03-003S

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Tucson, Arizona USA

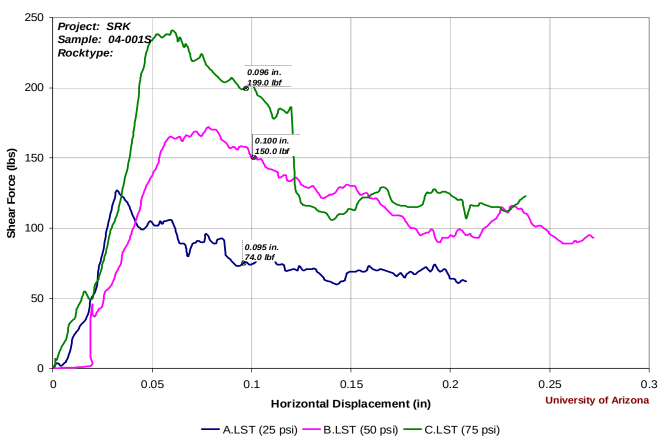
Date	05/05/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

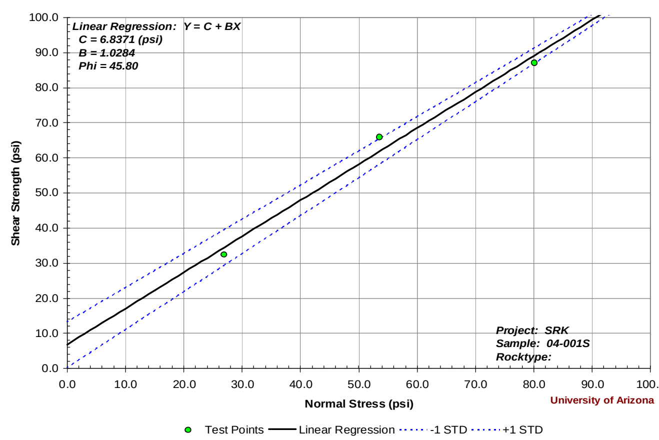
Sample Data		
Location		
Sample #	**04-001S**	
Rock Type		
Drill Hole	C09-04	
Depth	52.02	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.347	*in* ^{2}
Diameter	1.729	*in*
Radius	0.864	*in*
Tilt Correction	-1.082	*deg*

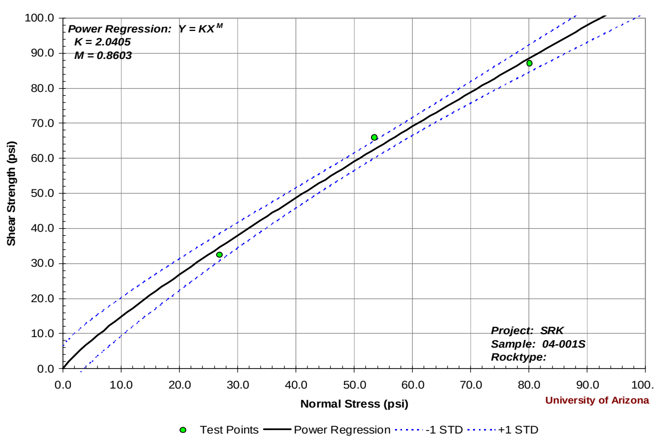
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	59	26.6	04-001S A
50	117	53.2	04-001S B
75	176	79.8	04-001S C
100	235	106.5	04-001S D

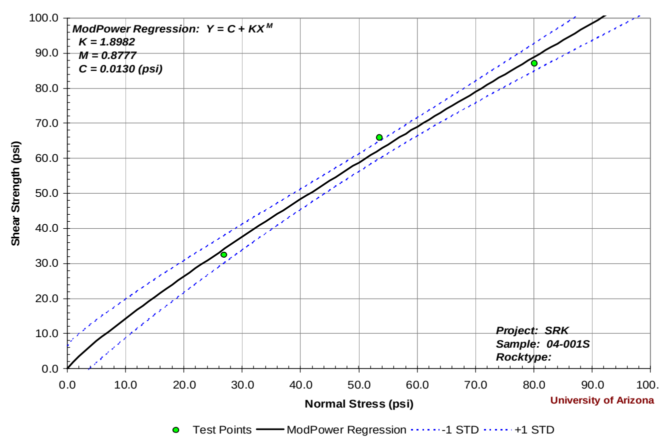
Results		
Linear: Y = BX + C		
Friction Angle	45.80	*deg*
Cohesion	6.84	*psi*
Power: $Y = KX^M$		
K	2.0405	*(for X in psi)*
M	0.8603	
Modified Power: $Y = KX^M + C$		
K	1.8982	*(for X in psi)*
M	0.8777	
C	0.0130	*psi*

Plot of Raw Trace Data









Notes :

Trace four was not plotted as sample broke during end of trace three

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Tucson, Arizona USA

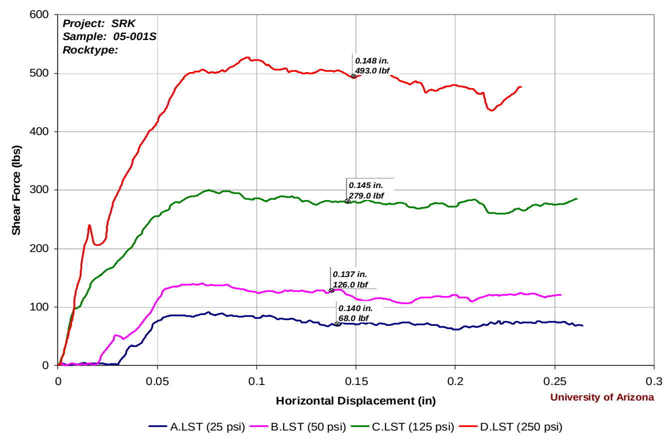
Date	05/05/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

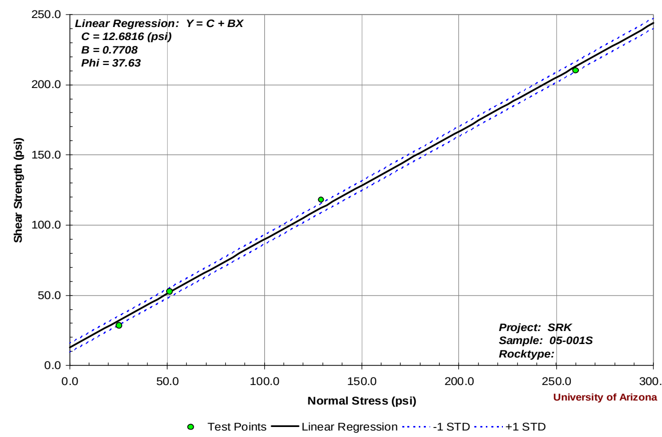
Sample Data		
Location		
Sample #	**05-001S**	
Rock Type		
Drill Hole	C09-05	
Depth	61.07	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.654	*in²*
Diameter	1.838	*in*
Radius	0.919	*in*
Tilt Correction	2.443	*deg*

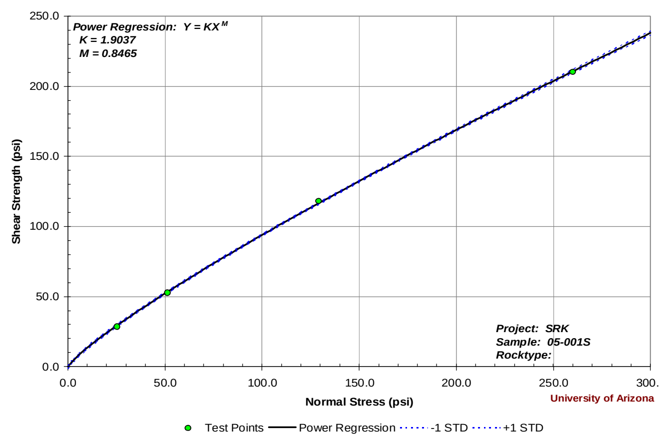
Trace Information			
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*
25	66	30.1	05-001S A
50	133	60.2	05-001S B
125	332	150.5	05-001S C
250	664	301.0	05-001S D

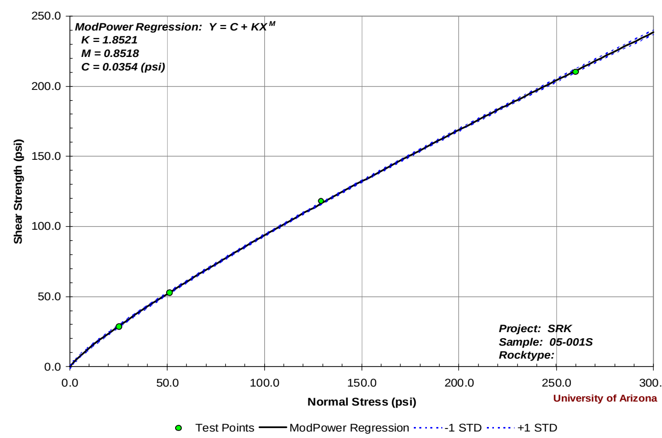
Results		
Linear: Y = BX + C		
Friction Angle	37.63	*deg*
Cohesion	12.68	*psi*
Power: $Y = KX^M$		
K	1.9037	*(for X in psi)*
M	0.8465	
Modified Power: $Y = KX^M + C$		
K	1.8521	*(for X in psi)*
M	0.8518	
C	0.0354	*psi*

Plot of Raw Trace Data









Notes :

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Geomechanical Laboratory

Tucson, Arizona USA

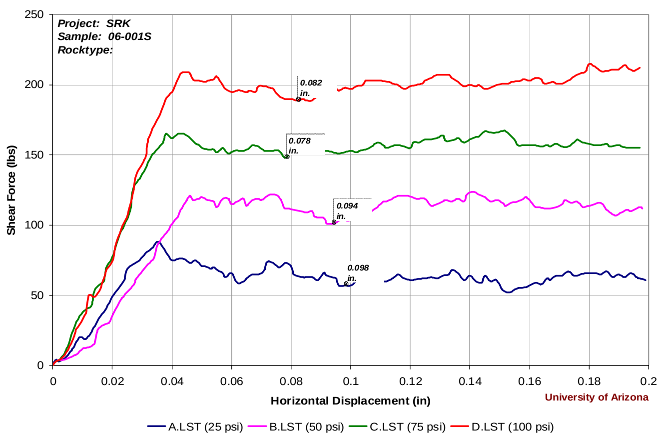
Date	05/06/09	Area & Load Data for SSDS	*Project #*	2CM022
Technician	D.STREETER		*Client*	SRK

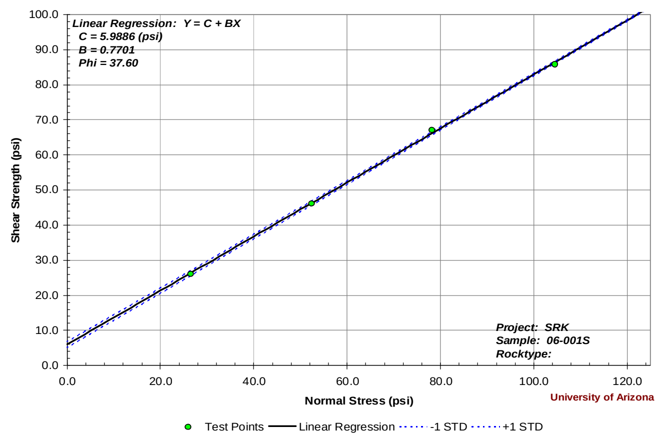
Sample Data		
Location		
Sample #	**06-001S**	
Rock Type		
Drill Hole	C09-06	
Depth	51.94	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.269	*in^2*
Diameter	1.700	*in*
Radius	0.850	*in*
Tilt Correction	-0.374	*deg*

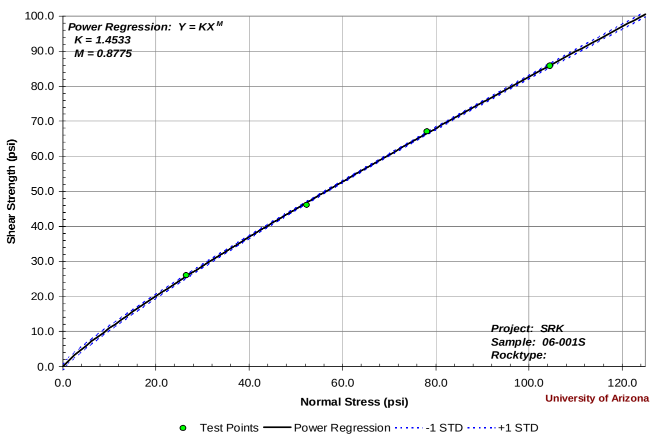
Trace Information				
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*	
25	57	25.7	06-001S	A
50	113	51.5	06-001S	B
75	170	77.2	06-001S	C
100	227	102.9	06-001S	D

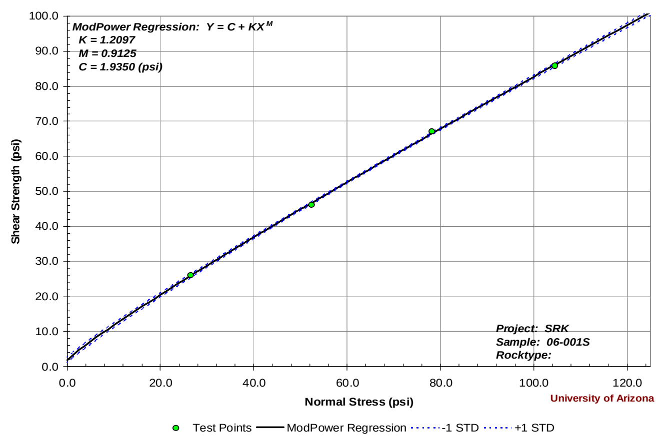
Results		
Linear: Y = BX + C		
Friction Angle	37.60	*deg*
Cohesion	5.99	*psi*
Power: $Y = KX^M$		
K	1.4533	*(for X in psi)*
M	0.8775	
Modified Power: $Y = KX^M + C$		
K	1.2097	*(for X in psi)*
M	0.9125	
C	1.9350	*psi*

Plot of Raw Trace Data









Notes :

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University of Arizona

Geomechanical Laboratory

Tucson, Arizona USA

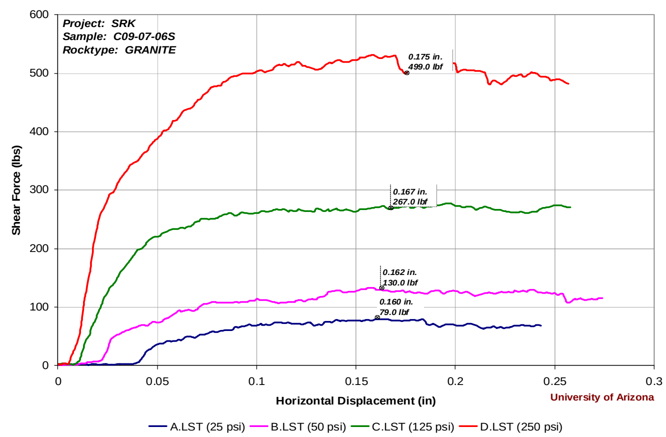
Date	07/21/09	Area & Load Data for SSDS	*Project #*	2CM022_006
Technician	D.STREETER		*Client*	SRK

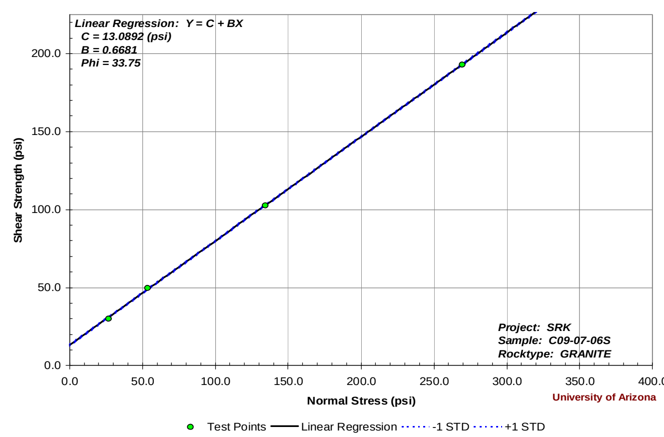
Sample Data		
Location	MINTO	
Sample #	**C09-07-06S**	
Rock Type	GRANITE	
Drill Hole	C09-07	
Depth	137.2-137.3	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	*in/min*
Area	2.877	*in^2*
Diameter	1.914	*in*
Radius	0.957	*in*
Tilt Correction	0.865	*deg*

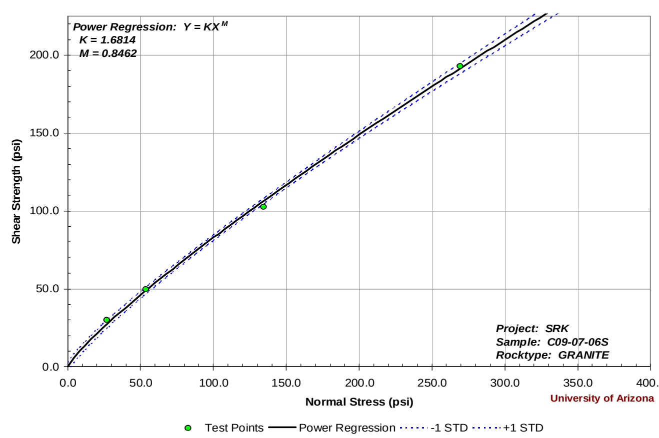
Trace Information				
Normal Stress (psi)	*Normal Load (Lbs) / (kgs)*		*Filename (.dat)*	
25	72	32.6	C09-07-06S	A
50	144	65.2	C09-07-06S	B
125	360	163.1	C09-07-06S	C
250	719	326.2	C09-07-06S	D

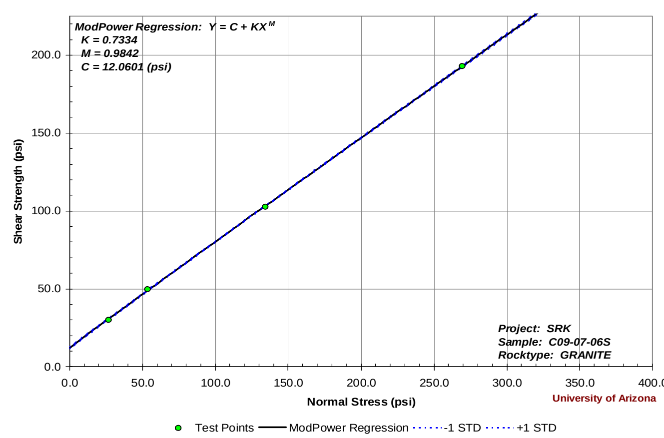
Results		
Linear: Y = BX + C		
Friction Angle	33.75	*deg*
Cohesion	13.09	*psi*
Power: $Y = KX^M$		
K	1.6814	*(for X in psi)*
M	0.8462	
Modified Power: $Y = KX^M + C$		
K	0.7334	*(for X in psi)*
M	0.9842	
C	12.0601	*psi*

Plot of Raw Trace Data









Notes :

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University of Arizona
Geomechanical Laboratory
Tucson, Arizona USA

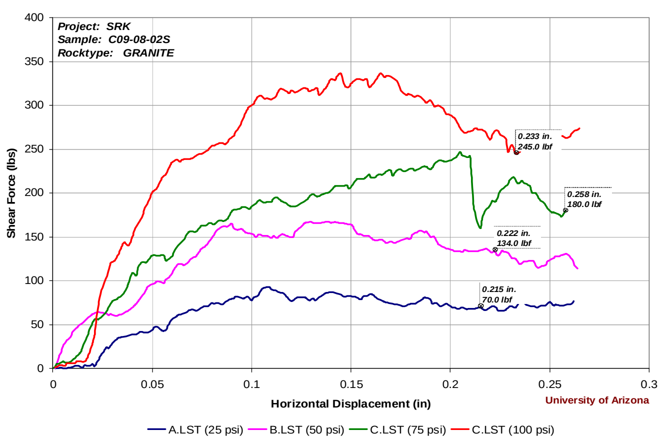
Date	07/21/09	Area & Load Data for SSDS	Project #	2CM022_006
Technician	D.STREETER		Client	SRK

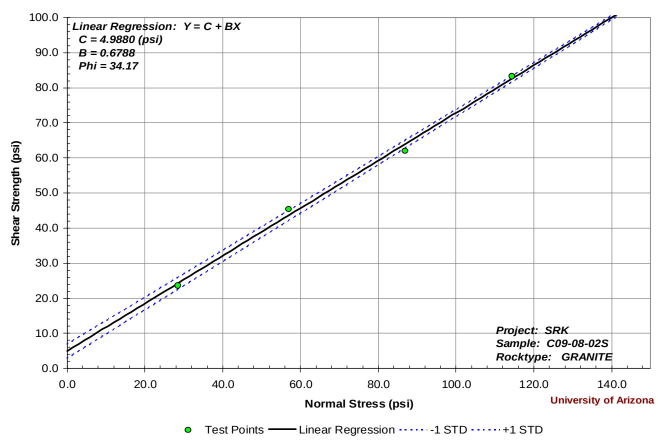
Sample Data		
Location	MINTO	
Sample #	**C09-08-02S**	
Rock Type	GRANITE	
Drill Hole	C09-08	
Depth	54.9-55.07	
Test Data		
Shear Plane	Joint	
Surface Prep	Insitu	
Shape	Digitized/Circular	
Test Speed	0.025	in/min
Area	3.203	in^2
Diameter	2.019	in
Radius	1.010	in
Tilt Correction	-1.338	deg

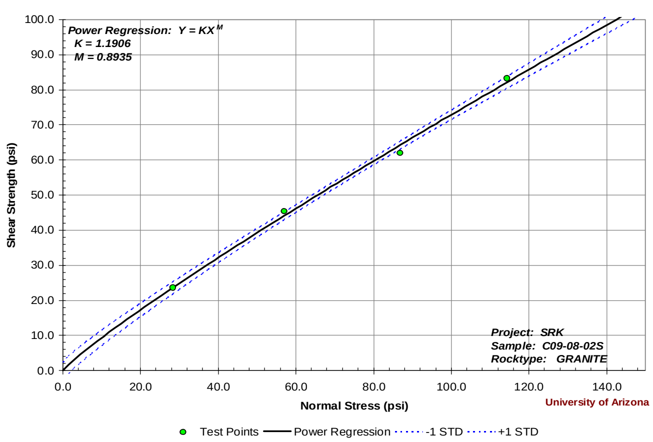
Trace Information				
Normal Stress (psi)	Normal Load (Lbs) / (kgs)		Filename (.dat)	
25	80	36.3	C09-08-02S	A
50	160	72.6	C09-08-02S	B
75	240	109.0	C09-08-02S	C
100	320	145.3	C09-08-02S	D

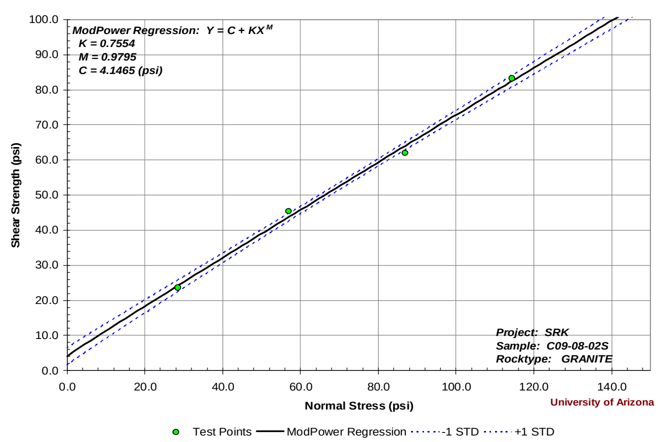
Results		
Linear: Y = BX + C		
Friction Angle	34.17	deg
Cohesion	4.99	psi
Power: $Y = KX^M$		
K	1.1906	(for X in psi)
M	0.8935	
Modified Power: $Y = KX^M + C$		
K	0.7554	(for X in psi)
M	0.9795	
C	4.1465	psi

Plot of Raw Trace Data









Notes :

Large Drop in shear load for trace three was due to plaster on top mold cracking and relieving stress.

Brazilian Disk Tension Testing

CALL & NICHOLAS, INC.

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	**Brazilian Disk Test Results**	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**02-005B**
		Sample # **02-005B**	Rock Type	GRANITE

T psi **1,566** psi

10.80 Mpa

T psi	1,566 (psi)
	10.8 Mpa

T= Indirect tensile strength

Sample Data :	
Sample # :	**02-005B**
Rock Type:	GRANITE
Hole # :	C09-02
Depth :	150.1
Alterations:	
Diameter :	1.776 (in)
Length:	1.058 (in)

Test Data:	
Disp. Rate :	
Load Rate :	54 (lbs/sec)
Gage Reading :	4,620 (lbs)

Worksheet

Pre-Failure Sketch w

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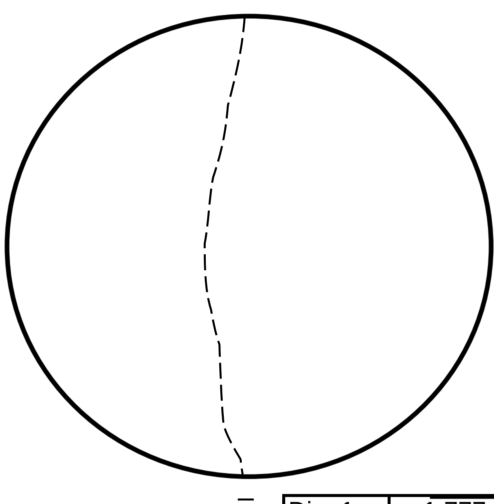

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Post-Failure Sketch

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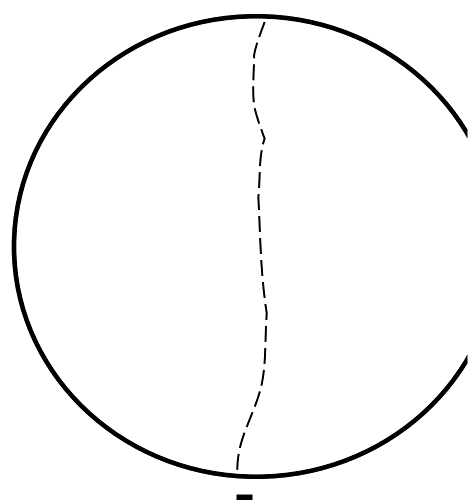

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Pre-existing Weakness Plane

Post Failure Fracture

Dia. 1	1.777	Ht. 1	1.061
Dia. 2	1.777	Ht. 2	1.069
Dia. 3	1.773	Ht. 3	1.045

Fail Load 4620 lbs Force

Sample #	**02-005B**

CALL & NICHOLAS, INC.

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	**Brazilian Disk Test Results**	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**02-009B**
		Sample # **02-009B**	Rock Type	GRANITE

T psi	**1,357**	psi
	9.36	Mpa

Sample Data :	
Sample # :	**02-009B**
Rock Type:	GRANITE
Hole # :	C09-02
Depth :	271.9
Alterations:	
Diameter :	1.773 (in)
Length:	1.022 (in)

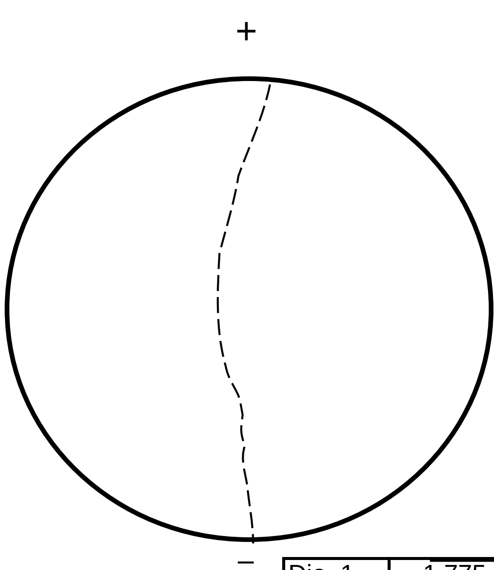
T= Indirect tensile strength

T psi	1,357 (psi)
	9.4 Mpa

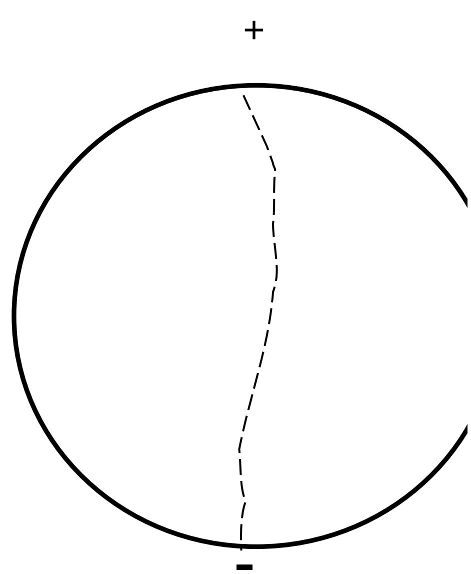
Test Data:	
Disp. Rate :	
Load Rate :	52 (lbs/sec)
Gage Reading :	3,860 (lbs)

Worksheet

Pre-Failure Sketch w



Post-Failure Sketch



Pre-existing Weakness Plane

Post Failure Fracture

Dia. 1	1.775	Ht. 1	1.028
Dia. 2	1.774	Ht. 2	1.026
Dia. 3	1.772	Ht. 3	1.012

Fail Load	3860	lbs Force

Sample #	**02-009B**

CALL & NICHOLAS, INC.

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	**Brazilian Disk Test Results**	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**03-007B**
		Sample # **03-007B**	Rock Type	GRANITE

T psi **1,107** psi

7.63 Mpa

Sample Data :	
Sample # :	**03-007B**
Rock Type:	GRANITE
Hole # :	C09-03
Depth :	161.03
Alterations:	
Diameter :	1.773 (in)
Length:	0.932 (in)

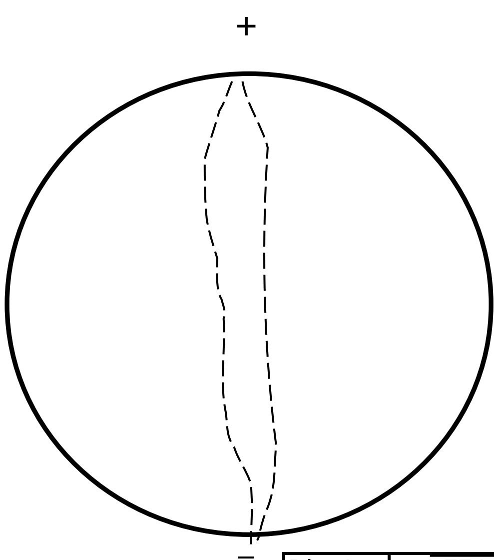
T= Indirect tensile strength

T psi	1,107 (psi)
	7.6 Mpa

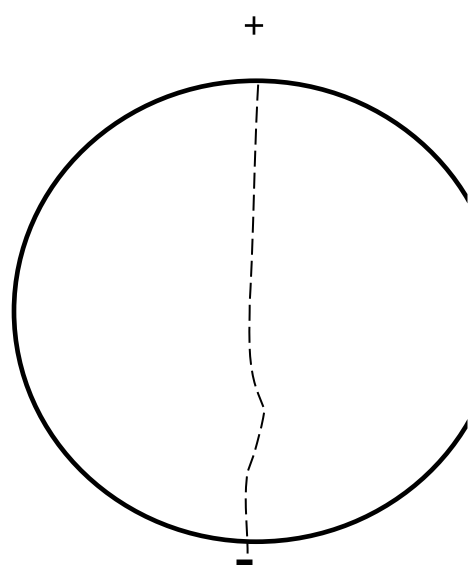
Test Data:	
Disp. Rate :	
Load Rate :	47 (lbs/sec)
Gage Reading :	2,870 (lbs)

Worksheet

Pre-Failure Sketch w



Post-Failure Sketch



Pre-existing Weakness Plane

Post Failure Fracture

Dia. 1	1.774	Ht. 1	0.934
Dia. 2	1.773	Ht. 2	0.928
Dia. 3	1.772	Ht. 3	0.933

Fail Load 2870 lbs Force

Sample #	**03-007B**

CALL & NICHOLAS, INC.

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Brazilian Disk Test Results

Project #	2CM022	Client	SRK
Date	5/4/2009	Location	
Technician	D.Streeter	Sample #	**05-005B**
		Rock Type	GRANITE

Sample # **05-005B**

T psi	**1,045**	psi
	7.20	Mpa

Sample Data :	
Sample # :	**05-005B**
Rock Type:	GRANITE
Hole # :	C09-05
Depth :	150.11
Alterations:	
Diameter :	1.772 (in)
Length:	0.922 (in)

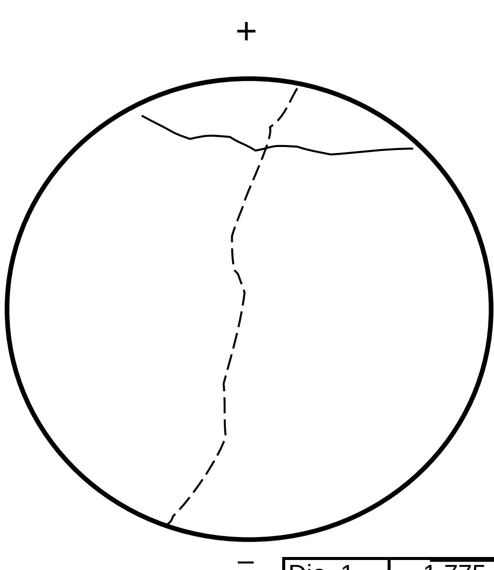
T= Indirect tensile strength

T psi	1,045 (psi)
	7.2 Mpa

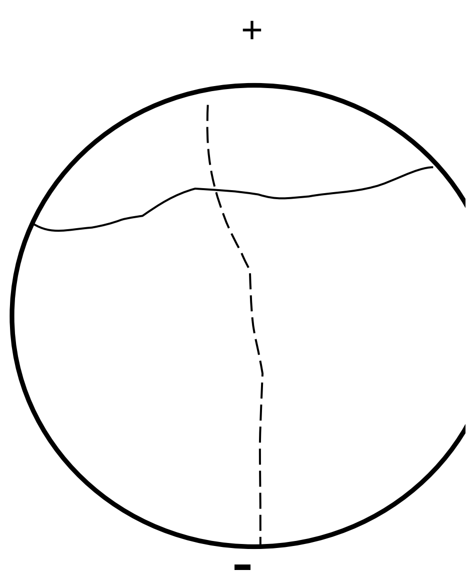
Test Data:	
Disp. Rate :	
Load Rate :	47 (lbs/sec)
Gage Reading :	2,680 (lbs)

Worksheet

Pre-Failure Sketch w



Post-Failure Sketch



Pre-existing Weakness Plane

Post Failure Fracture

Dia. 1	1.775	Ht. 1	0.927
Dia. 2	1.770	Ht. 2	0.925
Dia. 3	1.772	Ht. 3	0.915

Fail Load 2680 lbs Force

Sample #	**05-005B**

CALL & NICHOLAS, INC.

GEOMECHANICAL LABORATORY

TUCSON, ARIZONA USA

Project #	2CM022	**Brazilian Disk Test Results**	Client	SRK
Date	5/4/2009		Location	
Technician	D.Streeter		Sample #	**06-001B**
		Sample # **06-001B**	Rock Type	GRANITE

T psi **1,291** psi

8.90 Mpa

T psi	1,291 (psi)
	8.9 Mpa

T= Indirect tensile strength

Sample Data :	
Sample # :	**06-001B**
Rock Type:	GRANITE
Hole # :	C09-06
Depth :	37.2
Alterations:	
Diameter :	1.772 (in)
Length:	0.980 (in)

Test Data:	
Disp. Rate :	
Load Rate :	50 (lbs/sec)
Gage Reading :	3,520 (lbs)

Worksheet

Pre-Failure Sketch w

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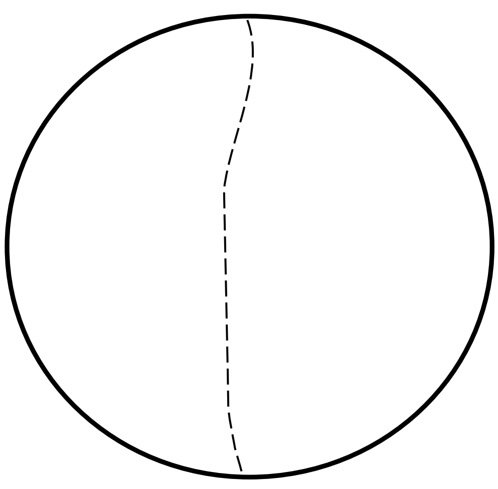

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Post-Failure Sketch

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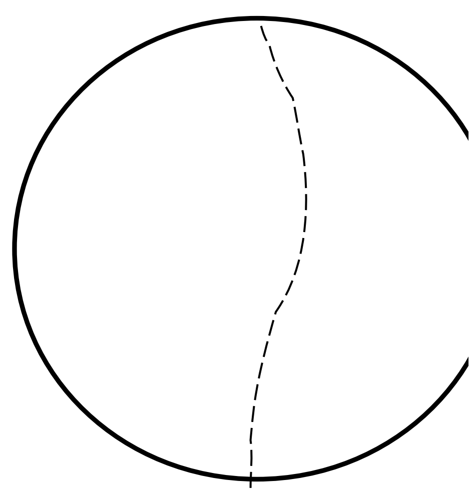

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Pre-existing Weakness Plane

Post Failure Fracture

Dia. 1	1.771	Ht. 1	0.986
Dia. 2	1.772	Ht. 2	0.980
Dia. 3	1.773	Ht. 3	0.975

Fail Load 3520 lbs Force

Sample #	**06-001B**