

**IDM MINING LTD.
RED MOUNTAIN PROJECT**



2016 GEOTECHNICAL SITE INVESTIGATION REPORT

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Knight Piésold
CONSULTING
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EXECUTIVE SUMMARY

The Red Mountain Project is a gold deposit being developed by IDM Mining Ltd.. (IDM). The project is located northeast of Stewart in northwestern British Columbia. Knight Piésold Ltd. (KP) completed a geotechnical site investigation program in August and September of 2016. The key objectives of this investigation were to evaluate the geotechnical and hydrogeological conditions to support the feasibility level design of the Tailings Management Facility (TMF) and Process Plant Site, as well as to provide information to support environmental studies for the Project.

This report summarizes the 2016 site investigation, which involved the following activities:

- Drilling and logging of 14 geotechnical drillholes, including:
 - Standard Penetration Testing (SPT)
 - In-situ hydraulic conductivity testing
 - Installation of 4 standpipe piezometers
 - Installation of 4 groundwater monitoring wells
 - Installation of vibrating wire piezometers in 6 drillholes
- Logging of drill core from 4 historical drillholes in the Bromley Humps area from the 1996 site investigation program by Golder Associates (Golder)
- Laboratory index testing of select SPT samples
- Laboratory strength testing of select bedrock core samples

The TMF has two embankments. The TMF North Embankment is located between a bedrock ridge and a steep mountain slope to the east. The TMF South Embankment is located between two bedrock ridges. The Process Plant Site is situated on a bedrock outcrop to the south of the TMF South Embankment, near Otter Creek.

The surficial geology of the study area is characterized by landforms that reflect a history of glacial retreat. Drilling and mapping concluded that bedrock exposure is prevalent throughout the area. Colluvium and glacial till are the predominant surficial materials (where present) and are generally contained to the TMF basin. Surficial material thicknesses ranged from less than 1 m to approx. 6 m, with the deepest deposits encountered in the centre of the TMF North Embankment footprint. Volcanic and sedimentary rocks were the prominent bedrock types encountered in the study area with some porphyry intrusive units. Intact bedrock strength data classifies the Volcanic rocks, Sedimentary rocks and Porphyry Intrusive rocks as strong to very strong rock with an overall FAIR Rock Mass Rating (RMR₈₉). The Mudstone unit, part of the Sedimentary units, is the weakest bedrock unit and was encountered towards the south abutment of the TMF South Embankment. Bedrock generally has low to moderate permeability.

The site investigation and subsequent geotechnical assessment provides specific information on the foundation characteristics for the following proposed mine infrastructure components:

TMF North Embankment – Six drillholes were completed in the vicinity of the TMF North Embankment during the 2016 site investigation, including 2 drillholes developed as monitoring wells. Information was also sourced from 6 drillholes from the 1996 site investigation program conducted by Golder. Overburden at the TMF North Embankment varies in thickness from 0.5 to 6 m and is classified as a thin veneer of colluvium (approximately 0.5 to 2 m thick) underlain in some cases by glacial till, or occasionally thicker colluvium deposits. Intact strength testing on samples from the

TMF North Embankment area indicates generally strong to very strong rock with UCS test results ranging from 85 to 225 MPa and an average value of 150 MPa. The bedrock has a FAIR rock quality designation. Bedrock generally consists of low to moderate permeability Volcanic rocks with some Porphyry Intrusive units to the north of a fault zone that crosscuts the TMF North Embankment. An additional fault is interpreted to occur west and parallel to the TMF North Embankment.

TMF South Embankment – Six drillholes were completed in the vicinity of the TMF South Embankment during the 2016 site investigation, including 2 drillholes developed as monitoring wells. Information was also sourced from 5 drillholes from the 1996 site investigation program conducted by Golder. Overburden at the TMF South Embankment varies in thickness from 0.6 to 5 m and is classified as a thin veneer of colluvium (approximately 0.5 to 2 m thick) underlain in some cases by glacial till, or occasionally thicker colluvium deposits. Intact strength testing of samples from the TMF South Embankment area indicates generally strong to very strong rock with UCS test results ranging from 80 to 205 MPa and an average value of 120 MPa. The bedrock has a FAIR rock quality designation. Bedrock generally consists of low to moderate permeability Volcanic and Sedimentary rocks. Two faults were encountered that crosscut the TMF South Embankment.

Process Plant Site – Two drillholes were completed in the vicinity of the Process Plant Site during this 2016 site investigation. Bedrock was encountered at or near to surface in the drillholes, with only a thin layer of topsoil present. Bedrock conditions at the Process Plant Site area are primarily characterized by Greywacke (Sedimentary unit) underlain by some Volcanic units (mafic and felsic dykes, gabbro, etc.) with a FAIR rock quality designation and approx. 60 MPa strength.

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ABBREVIATIONS

ASTM	American Society for Testing Materials
CGS	Canadian Geotechnical Society
Golder	Golder Associates
GSC	Geological Survey of Canada
GSI	Geological Strength Index
IDM	IDM Mining Ltd.
KP	Knight Piésold Ltd.
m	metre
mbgs	metres below ground surface
MPa	megapascals
MW	monitoring well
NP	non-plastic
PEA	Preliminary Economic Assessment
PSA	particle size analysis
the Project	the Red Mountain Project
PVC	polyvinyl chloride
RMR ₈₉	Rock Mass Rating
Royal Oak	Royal Oak Mines Inc.
RST	RST Instruments Ltd.
RQD	Rock Quality Designation
SI	site investigation
SPT	standard penetration tests
SRK	SRK Consulting
TMF	tailings management facility
UCS	unconfined compressive strength
USCS	Unified Soil Classification System
USGS	United States Geological Survey
VWP	Vibrating Wire Piezometer

1 – INTRODUCTION

1.1 PROJECT DESCRIPTION AND BACKGROUND

IDM Mining Ltd. (IDM) is preparing a Feasibility Study for the Red Mountain Project (the Project) located in northwestern British Columbia. The deposit is situated approx. 18 km east-northeast of Stewart, BC at 55° 57' N latitude and 129° 42' W longitude. The site is located between the Cambria Ice Field and the Bromley Glacier at elevations between 1,500 and 2,000 m.

The proposed Tailings Management Facility (TMF) and Process Plant Site are situated in the Bromley Humps area of the property, on a plateau above Bitter Creek, approx. 7 km northwest of the mine adit and underground portal, at elevations between 400 and 500 m. This area is characterized by rugged steep terrain with sparse overburden cover, prevalent bedrock outcrops, and vegetation and weather conditions typical of the north coastal mountains.

Knight Piésold Ltd. (KP) was retained by IDM to conduct a geotechnical site investigation program to assess surface soil and bedrock conditions beneath the proposed TMF embankments and Process Plant Site foundations. The goal of this program was to establish foundation design parameters, to evaluate hydraulic conductivity and seepage potential for the facilities, and to provide information to support the Feasibility Study and Environmental Assessment Application (EAA) for the Project.

1.2 PREVIOUS SITE INVESTIGATIONS AND REPORTS

A previous geotechnical investigation was conducted in the Bromley Humps area by Golder Associates (Golder) in 1996. It consisted of 11 geotechnical drillholes, with hydraulic conductivity testing and piezometer installations in each drillhole. A Draft Technical Memorandum documented this investigation but did not include geological logs for the drillholes (Golder, 1996).

Structural mapping of bedrock outcrops was conducted by IDM, and a bedrock and surficial geology map was produced. This map is provided in Section 3, with details on Figure A2.1 of Appendix A2.

1.3 SCOPE OF REPORT

KP completed a geotechnical site investigation program from August 13 to September 17, 2016. This site investigation program included the completion of 14 drillholes (8 within the footprint or alignment of the TMF embankments, 4 downstream of the TMF and 2 at the Process Plant Site), in-situ hydraulic conductivity testing at each of the drillholes in the TMF area, installation of 4 standpipe piezometers, 4 groundwater monitoring wells, and vibrating wire piezometers (VWP) in 6 drillholes.

The program also included the logging of historical drill core from 4 drillholes from the 1996 site investigation previously conducted by Golder, in the absence of geotechnical drillhole logs from this program. The 4 drillholes were selected to further investigate inferred faults identified by IDM.

This report provides a summary of the 2016 site investigation and includes an interpretation of the geotechnical conditions in the vicinity of the TMF and Process Plant Site. The results of the soil and rock laboratory testing programs are appended. This report also incorporates the results of the 1996 site investigation by Golder, where applicable and available. Recommendations for future investigations are included for consideration by IDM.

2 – 2016 GEOTECHNICAL SITE INVESTIGATION PROGRAM

2.1 GENERAL

The drilling, logging, field testing and installations for the site investigation were supervised by KP field engineers as follows:

- Drilling and logging of 10 geotechnical drillholes (BH16-001 to BH16-010) and 4 drillholes for groundwater monitoring wells (MW16-001 to MW16-004), including:
 - Surficial material logging and sampling in 11 vertical drillholes and 3 inclined drillholes
 - Standard Penetration Tests (SPTs)
 - Bedrock logging and sampling
 - In-situ hydraulic conductivity (Lugeon) testing
 - Installation of 4 groundwater monitoring wells (MW16-001 to MW16-004) following specifications and direction provided by SRK Consulting (SRK), outlined in KP (2016b)
 - Installation of 4 standpipe piezometers (BH16-001, BH16-002, BH16-003 and BH16-009)
 - Installation of vibrating wire piezometers (VWPs) in 6 drillholes (a single sensor was installed in 5 drillholes and two sensors at one location (BH16-010))
- Laboratory index testing of selected SPT and surficial material samples
- Laboratory strength testing of selected rock core samples

This report also includes supplemental information from the site investigation by Golder (Golder, 1996), where applicable and available, including the following:

- Drilling of 11 geotechnical drillholes - 4 drillholes were re-logged by KP field engineers as they intersected the inferred faults identified by IDM (DT-273, DT-277, DT-280 and DT-282)
- Hydraulic conductivity testing in each of the drillholes
- Spot water level data from August 29, 1996 for 16 historical piezometers at 11 locations (4 locations have nested installations)

The locations of the drillholes and monitoring wells are shown on Figure 2.1 (details are provided on Figure A2.2 of Appendix A2).

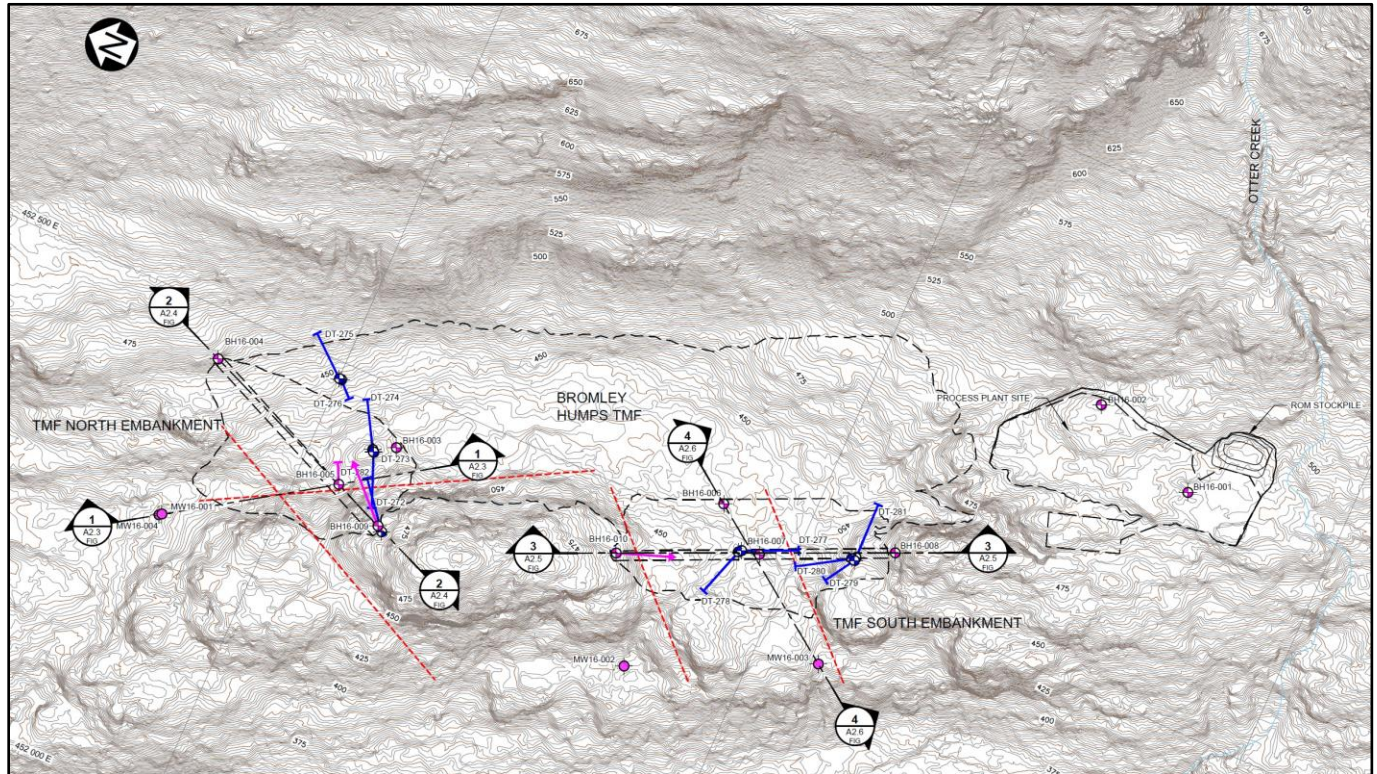


Figure 2.1 2016 Geotechnical Site Investigation Plan

2.2 DRILLING INVESTIGATIONS

2.2.1 Drilling

The 2016 drilling was completed by More Core Drilling Services Ltd. (MoreCore) using a diamond drill rig. The drillholes were advanced using only water, with the exception of BH16-010 where a biodegradable drill fluid was also used when conditions were difficult. All drillholes were logged and sampled by KP field engineers.

The drillholes completed in the study area (including the 4 drillholes from the previous Golder site investigation program that were re-logged as part of this program) are shown on Figure 2.1 and summarized in Table 2.1. A more detailed summary of the drillholes is provided as Table A1.1 of Appendix A1. Graphical representations of these drillhole logs are provided in Appendix B. Geotechnical drillhole logs are provided in Appendix D. Drillhole, SPT, core box and installation photographs are provided in Appendix F.

Table 2.1 Geotechnical Drillhole Summary

Drillhole ID	Coordinates			Azimuth (°)	Dip (°)	Total Depth (m)	Depth to Bedrock (m)	Date Started	Date Completed	Location
	Easting (m)	Northing (m)	Elev. (m)							
BH16-001	452,728	6,204,160	492	-	-90	30.8	0.58	13-08-16	14-08-16	Process Plant
BH16-002	452,774	6,204,277	508	-	-90	30.8	0.00	14-08-16	15-08-16	Process Plant
BH16-003	452,442	6,204,918	435	-	-90	31.0	1.00	16-08-16	18-08-16	TMF North Emb.
BH16-004	452,451	6,205,121	466	-	-90	30.5	0.50	24-08-16	25-08-16	TMF North Emb.
BH16-005	452,384	6,204,956	428	64	-60	45.0	6.84	26-08-16	29-08-16	TMF North Emb.
BH16-006	452,525	6,204,589	443	-	-90	34.9	4.83	29-08-16	31-08-16	TMF South Emb.
BH16-007	452,493	6,204,535	444	-	-90	34.8	2.57	02-09-16	03-09-16	TMF South Emb.
BH16-008	452,550	6,204,408	470	-	-90	31.5	1.20	04-09-16	06-09-16	TMF South Emb.
BH16-009 ³	452,362	6,204,903	464	45	-50	111.5	1.00	07-09-16	14-09-16	TMF North Emb.
BH16-010	452,435	6,204,669	463	160	-50	95.6	0.60	14-09-16	17-09-16	TMF South Emb.
MW16-001 ²	452,283	6,205,109	410	-	-90	30.8	0.80	18-08-16	20-08-16	TMF North Emb.
MW16-002	452,332	6,204,615	412	-	-90	32.8	2.80	20-08-16	22-08-16	TMF South Emb.
MW16-003	452,415	6,204,434	426	-	-90	31.2	1.22	22-08-16	23-08-16	TMF South Emb.
MW16-004 ²	452,281	6,205,112	410	-	-90	45.6	1.49	31-08-16	02-09-16	TMF North Emb.
DT-273	452,429	6,204,937	436	-	-90	82.3	0.29	30-07-96	30-08-96	TMF North Emb.
DT-277	452,489	6,204,553	445	156	-50	90.8	2.44	30-07-96	30-08-96	TMF South Emb.
DT-280	452,527	6,204,447	454	328	-47	85.0	8.64 ⁵	30-07-96	30-08-96	TMF South Emb.
DT-282	452,491	6,204,700	464	51	-60	114.0	2.83	30-07-96	30-08-96	TMF North Emb.

NOTES:

- COORDINATES AND ELEVATIONS ARE FINAL SURVEYED COORDINATES PROVIDED BY IDM.
- DRILLHOLE SLOUGHED IN DURING INSTALLATION OF GROUNDWATER MONITORING WELL AT MW16-004 DRILLED AT SAME DRILL PAD TO INSTALL SUITABLE AND STABLE MONITORING WELL.
- VIBRATING WIRE PIEZOMETER (VWP) INSTALLATION ABORTED DUE TO HIGH TAKE OF GROUT DURING INSTALLATION. STANDPIPE PIEZOMETER INSTALLED IN PLACE.
- DRILLHOLES WITH A "DT" PREFIX WERE COMPLETED AS PART OF THE 1996 GOLDER SI PROGRAM.
- COREBOX #1 FROM DT-280 MISSING FROM COREYARD WHEN RELOGGING CORE, THUS DEPTH TO BEDROCK ASSUMED AS START OF BOX #2.

2.2.2 Standard Penetration Tests

SPTs were conducted in each drillhole unless bedrock was encountered at or close to surface. SPTs were conducted at 1.5 m (5') intervals where conditions permitted and were completed to define the compactness and/or consistency of the soil, and to collect undisturbed samples for material classification and laboratory testing. The SPTs were performed by recording the number of blows delivered by a falling hammer on vertical drillholes and a hydraulic hammer on inclined drillholes to advance a split spoon sampler into the ground over four continuous 150 mm (6") increments. The sampler was driven to a total depth of 600 mm, or until refusal (R). The SPT 'N' value was calculated

the number of blows required to advance the sampler from 150 to 450 mm. The following information was routinely recorded for each SPT sample:

- Depth of test interval
- Blow counts for each 150 mm interval
- SPT 'N' value
- Recovery length
- Material description

2.2.3 Geotechnical Logging

Surficial materials recovered in drilling and SPT samples were characterized according to KP soil logging procedures. The KP procedures combine elements of the Canadian Foundation Engineering Manual (CGS, 2006) and the Unified Soil Classification System (USCS) American Standard for Testing and Materials (ASTM) D2488-93.

Soil and bedrock were cored with an HQ3 diamond drill bit using a standard wireline set-up and a 2.62 m core barrel (~ 8ft. 7in. including locking coupling, landing ring, and drill bit). HQ3 drilling uses thin, aluminium split tubes placed inside the core tube to allow the core to be recovered with reduced sample disturbance. The drilling was directed and supervised by KP field engineers and the recovered materials were logged, photographed, and selectively sampled for laboratory testing.

Detailed geotechnical logging of the bedrock drill core was carried out in all drillholes to characterize the rock mass. The following information was collected on a run-by-run basis:

- Run depth interval
- Core recovery
- Rock Quality Designation (RQD)
- Lithological description
- Field estimated Unconfined Compressive Strength (UCS)
- Number of discontinuities
- Discontinuity types
- Joint condition of discontinuities (i.e. roughness, aperture, infilling, weathering, etc.)

2.2.4 Rock Mass Classification

The Rock Mass Rating (RMR₈₉) classification system developed by Bieniawski (1989) was used to classify the rock mass. The RMR₈₉ logging system is based on field determination values of five key rock mass parameters:

- Intact rock hardness and UCS: The rock hardness and intact rock strength were estimated in the field using a geological hammer and correlated with laboratory UCS testing of selected core samples
- RQD: The RQD value was determined for each drilled run by summing the lengths of all intact core pieces greater than 10 cm in length and presenting the value as a percentage of the total run length (Deere & Deere, 1988)
- Discontinuity spacing: An estimate of discontinuity spacing was determined by counting the number of naturally occurring fractures encountered per length of drill run
- Discontinuity condition: The discontinuity condition rating was determined by evaluating fracture persistence, roughness, infilling, aperture, and weathering. The persistence was conservatively

assigned a rating of 0, which is consistent with high persistence. The other four condition parameters were determined by examination of the recovered core run

- Groundwater condition: A constant groundwater rating of 15, corresponding to dry conditions, was used to estimate RMR_{89} . This allows the RMR_{89} values to be consistent with the Geological Strength Index (GSI) classification scheme (Hoek et al, 2013)

Numerical ratings are applied to each of the five parameters of the RMR_{89} system. The sum of these five ratings is the RMR_{89} value and provides an estimation of rock mass quality. The value ranges from less than 20 to 100 with rock mass quality classifications are as follows:

- VERY GOOD rock – RMR_{89} of 81 to 100
- GOOD rock – RMR_{89} of 61 to 80
- FAIR rock – RMR_{89} of 41 to 60
- POOR rock – RMR_{89} of 21 to 40
- VERY POOR rock – RMR_{89} less than 20

2.3 GROUNDWATER DATA COLLECTION

2.3.1 Hydraulic Conductivity Testing

Packer (Lugeon) testing in bedrock was completed in all drillholes except BH16-001 and BH16-002. The packer tool was not yet available on site during completion of these drillholes. The tests were performed while the drillholes were being advanced over 6 m intervals with an RST Instruments Ltd. (RST) pneumatic single packer system. Nitrogen gas was used to inflate the packer tool.

Standard Lugeon testing with increasing and decreasing pressure stages was conducted to assess the hydraulic conductivity of the rock mass (data sheets are included in Appendix G).

The hydraulic conductivity tests results are summarized in Table A1.2 of Appendix A1 with zones of lost circulation summarized in Table A1.3.

2.3.2 Standpipe Piezometer Installations

Standpipe piezometers were installed in 4 geotechnical drillholes. One standpipe piezometer was installed at the upstream toe of the proposed TMF North Embankment (BH16-003), 1 at the northwest abutment of the TMF South Embankment (BH16-009) and 2 at the Process Plant Site (BH16-001 and BH16-002). The standpipe piezometers were installed by MoreCore under the direction and supervision of KP field engineers. The standpipe piezometer screen intervals were installed in zones of interest such as bedrock contacts and/or permeable zones identified during geotechnical logging.

Piezometer materials were installed in open drillholes, with the drill rods and casing removed before installation began. The depth of each zone was measured and recorded during the installation using a weighted tape.

All standpipe piezometers, except at BH16-009, were generally constructed as follows:

- A 3 m (10 ft) long, 2-inch diameter Schedule 40 Polyvinyl chloride (PVC) 0.020 inch machine slotted screen (washed and bagged) with a threaded bottom end cap was used (in the case of BH16-001 and BH16-002, no threaded end caps were available, so duct tape was used to seal

the base of the PVC pipe string). Blank 2-inch diameter Schedule 40 PVC riser pipes were installed to surface above the screen section in 3 m lengths

- Filter sand backfilled the annulus around the screened section of the piezometer to a minimum of 1 m above the well screen
- Coated (slow release) 3/8-inch bentonite pellets were placed above the filter sand to create a seal and isolate the completion zone of the piezometer
- A quick setting bentonite grout mix was used to backfill the annulus around the piezometer above the bentonite seal to ground surface
- Standard PVC well caps and locking protective steel well head covers were installed and cemented into place
- A concrete surface pad was installed to minimize surface water ponding and direct water away from the piezometer

A VWP installation was attempted at BH16-009, but was aborted because of high grout take during the installation. As a secondary option, a standpipe piezometer was installed in this drillhole. However, a less conventional standpipe piezometer installation was required because the high grout take experienced during the VWP installation attempt and relatively shallow angle of the drillhole. A slotted PVC pipe was installed at depth in the open hole and a plug was installed at surface to minimize surface runoff to the standpipe. This installation approach is sufficient to provide general information on groundwater levels at this location.

Standpipe piezometer installation details are provided in Appendix C1.

2.3.2.1 Transducer Installations

Transducers were installed in all standpipe piezometers except for BH16-009 (Table 2.2). Depending on site access conditions, a transducer is to be installed in BH16-009 in December 2016 during the groundwater sampling trip by Avison Management Services. Transducers were suspended on 1/8-inch stainless steel braided aircraft cable. The transducers are manufactured by Van Essen (Mini-Diver model with 50 m range) and were programmed to record water levels at one hour intervals.

Table 2.2 Transducer Installation Summary

Drillhole ID	PVC Stickup (mags)	Well Depth (mbPVC)	Water Level (mbPVC)	Transducer Type	Transducer Serial Number	Transducer Depth (mbPVC)
BH16-001	0.64	17.75	12.18	Mini-Diver	SNV1119	17.25
BH16-002	0.56	28.12	28.12	Mini-Diver	SNV1146	27.62
BH16-003	0.76	25.77	25.13	Mini-Diver	SNV1150	25.27
BH16-009	Installation planned for December 2016.					
MW16-001	Dry well. No installation. Only manual measurements collected.					
MW16-002	0.76	30.69	12.63	Mini-Diver	SNV1160	19
MW16-003	0.39	30.67	26.87	Mini-Diver	SNV1143	30.17
MW16-004	0.53	38.17	8.63	Mini-Diver	SNV1159	15
				Mini Baro-Diver	SNU8507	2.5

NOTES:

1. PVC STICKUP AND WATER LEVEL WAS MEASURED IMMEDIATELY BEFORE TRANSDUCER INSTALLATION.
2. TRANSDUCERS WERE INSTALLED USING 1/8" AIRCRAFT STAINLESS STEEL CABLE.

2.3.3 Groundwater Monitoring Well Installations

A total of 4 groundwater monitoring wells were installed by KP for SRK. The wells are located downstream of the TMF embankments; 2 downstream of the TMF North Embankment (MW16-001 and MW16-004), and 2 downstream of the TMF South Embankment (MW16-002 and MW16-003). The monitoring wells were installed by MoreCore and supervised by KP field engineers. The well specifications were provided by SRK (KP, 2016b). The screens were installed within zones of interest such as bedrock contacts and/or permeable zones identified during geotechnical logging that were below the expected static groundwater level.

The monitoring wells were installed in open drillholes, with the drill rods and casing removed before installation began, with the exception of MW16-004. The depth of each zone was measured and recorded during the installation using a weighted tape.

All monitoring wells were generally constructed as follows:

- Filter sand was used to backfill the drillhole to the desired screen zone installation depth.
- A 3 m (10 ft) long, 2-inch diameter Schedule 40 Polyvinyl Chloride (PVC) 0.020 inch machine slotted screen (washed and bagged) with a threaded bottom end cap attached was placed on the sand. Blank Schedule 40 PVC riser pipes were installed to surface above the screen section in 3 m lengths
- Filter sand backfilled the annulus around the screened section of the monitoring well to just below the bedrock/overburden contact
- Coated (slow release) 3/8-inch bentonite pellets were placed at the bedrock/overburden contact area, above the filter sand
- A quick setting bentonite grout mix was used to backfill the annulus around the standpipe piezometer above the bentonite seal to ground surface, as required

- Standard PVC well caps and locking protective steel well head covers were installed and cemented into place
- A concrete surface pad was installed to minimize surface water ponding and direct water away from the well

The drillhole sloughed at 12 mbgs while installing the well in MW16-001. As a result it was not possible to install filter sand to the bedrock contact and SRK subsequently recommended a replacement monitoring well. To minimize the likelihood of sloughing in the replacement well, MW16-004 was completed through the drill rods. MW16-004 was completed as far away as possible from MW16-001 on the same drill pad.

Groundwater monitoring well installation details are provided in Appendix C2.

2.3.3.1 Well Development and Transducer Installations

The monitoring wells were developed using an Inertial Pump System by Waterra (Waterra, 2016). This approach uses both surging and purging actions to remove fines and minimize drilling disturbances in the near well formation. The Waterra system included an Inertial Pump, 1-inch High Density Polyethylene (HDPE) tubing, surge block, foot valve and standard portable generator. Development was completed so that the stress (surging and purging) was concentrated in discrete intervals of the well screen. Development was continued at each interval until representative water was obtained, based on stabilized groundwater parameter measurements (i.e., pH, temperature, specific conductivity) or diminishing returns of sediment in the purged water was observed.

There was insufficient water at MW16-001 (dry) and MW16-003 (water level near the top of well screen) to complete well development. Approximately one day was spent developing each of the monitoring wells, MW16-002 and MW16-004. Well development was challenging at MW16-002 because the water level recovery was relatively slow.

Transducers were installed in all the monitoring wells in mid-September 2016, except at MW16-001 (Table 2.2). The transducers were installed in the monitoring wells using the same approach as the standpipe piezometers as described in Section 2.3.2.1.

2.3.4 Vibrating Wire Piezometer Installations

A total of 7 VWP's were installed by KP in 6 drillholes at the TMF embankments. The VWP's were installed by MoreCore under the direction and supervision of KP field engineers. The VWP transducers were installed within zones of interest identified during the drilling process.

The VWP's were generally installed as follows:

- The sensors were submerged in water and a "Field Zero" reading recorded and compared to calibration records
- A tremie pipe was prepared by cutting the bottom pipe of the PVC pipe string at a high angle and drilling several holes into the pipe to aid with grouting
- VWP's were taped to the outside of the tremie pipe, a minimum of 2 m above the bottom of the pipe, with the sensor tips upside down so that the water stayed in the filter
- The tremie pipe was lowered down hole, and the VWP cable was secured at regular intervals
- An open hole reading check was performed once the tremie pipe reached the bottom of drillhole

- The annulus was backfilled to surface by pumping cement-bentonite grout mix through the tremie pipe (grout mix 2.5: 1: 0.3 (water: cement: bentonite) by weight)
- Spot measurements were collected throughout the grouting procedure
- After grouting, a data logger within a protective casing was installed at each site

VWP installation details are provided in Appendix C3.

2.4 LABORATORY TESTING

Selected samples from the drillholes were collected for geotechnical laboratory testing to characterize material types encountered at the site. Specialized testing was conducted on samples to evaluate the performance of the materials and their suitability for specific end uses.

2.4.1 Soil Testing

Representative surficial material (soil) samples were selected from the materials encountered. Index testing on the surficial material and SPT samples was carried out at the KP Soils Laboratory in Denver, Colorado. A summary of the tests conducted on these samples is provided below:

- Particle Size Analysis (PSA): A total of 8 tests were completed to assess the gradation characteristics of the materials. Particle size analyses were carried out in accordance with ASTM D422 procedures
- Atterberg Limits were completed in accordance with the ASTM D854 test procedure

All laboratory test results are provided in Appendix E1 and summarized in Table 2.3.

Table 2.3 Soil Laboratory Test Summary

Drillhole ID	Sample No.	Depth From (mbgs)	Depth To (mbgs)	USCS	Grain Size (%)			Atterberg Limits ¹	Moisture Content (%)
					Gravel	Sand	Fines		
BH16-004 ²	TP16-001-GS-01	0.0	0.8	GW-GM	47.5	43.0	9.5	NP	8.3
	TP16-002-GS-01	0.0	0.8	GW	59.0	36.4	4.6	NP	5.7
	TP16-003-GS-01	0.0	0.8	GP	56.3	39.4	4.3	NP	6.4
	BH16-004-GS-01	0.0	0.5	GW-GM	50.9	42.4	6.7	NP	5.6
BH16-005	BH16-005-SPT-01	0.0	0.1	SP	41.8	53.3	4.9	NP	33.0
BH16-007	BH16-007-GS-01	0.1	0.4	GW	64.8	32.4	2.8	NP	5.3
MW16-003	MW16-003-SPT-01	0.0	0.1	GW-GM	54.3	29.0	16.7	NP	10.5
	MW16-003-SPT-02	0.6	1.2	ML-GW	34.8	29.4	35.8	NP	6.2

NOTES:

1. ALL SAMPLES TESTED AS BEING 'NP' OR NON PLASTIC DURING ATTERBERG LIMITS TESTS.
2. DUE TO THE POSSIBLE PRESENCE OF A MORaine AT BH16-004, A HAND-DUG TEST PIT WAS EXCAVATED TO PROCURE SAMPLES FOR MATERIAL CLASSIFICATION. THREE SAMPLES WERE TAKEN, LABELLED TP16-001, TP16-002, AND TP16-003.

2.4.2 Rock Testing

Drill core samples of representative rock types were selected and tested at the Robert M. Buchan Department of Mining Rock Mechanics Library at Queen’s University in Kingston, ON. A total of 11 core samples collected from the 2016 geotechnical drillholes and monitoring wells were tested using ASTM D7012-14 (UCS, Young’s Modulus and Poisson’s Ratio). International Society for Rock Mechanics (ISRM-1979) (2007) procedures were followed to perform the modulus determinations.

The results of laboratory rock testing are summarized in Table 2.4. Detailed test results are included in Appendix E2.

Table 2.4 Bedrock Laboratory Test Summary

Drillhole ID	Sample ID	Depth From (m)	Depth To (m)	Lithology	UCS (MPa)	Poisson’s Ratio (μ)	Young’s Modulus E (GPA)
BH16-001	UCS-01 ¹	2.27	2.52	Greywacke (Sedimentary)	64.9	0.18	22.1
BH16-001	UCS-02 ¹	16.75	16.99	Greywacke (Sedimentary)	59.7	0.18	26.2
BH16-002	UCS-02 ²	10.94	11.3	Mafic Dyke (Volcanics)	32.3	0.14	16.3
BH16-003	UCS-01	1.90	2.18	Goldslide Porphyry (Intrusives)	155.2	0.10	23.5
BH16-005	UCS-01	11.48	11.78	Diorite (Volcanics)	223.4	0.13	26.8
BH16-006	UCS-01	6.43	6.74	Mafic Dyke (Volcanics)	203.9	0.16	26.0
BH16-008	UCS-01 ¹	6.11	6.45	Siltstone (Sedimentary)	78.9	0.14	21.2
BH16-010	UCS-01	2.59	2.92	Gabbro (Volcanics)	86.6	0.13	20.9
MW16-001	UCS-01 ¹	3.19	3.43	Gabbro (Volcanics)	87.0	0.2	20.5
MW16-003	UCS-01	4.00	4.25	Dyke (Volcanics)	105.7	0.17	28.7
MW16-004	UCS-01 ¹	4.57	4.77	Goldslide Porphyry (Intrusives)	83.6	0.34	21.4

NOTES:

1. FAILURE OF SAMPLE PARTIALLY OCCURRED ALONG PRE-EXISTING FOLIATION PRESENT IN SAMPLE.
2. FAILURE OF SAMPLE COMPLETELY OCCURRED ALONG PRE-EXISTING FOLIATION PRESENT IN SAMPLE.

3 – GEOTECHNICAL CONDITIONS

3.1 SURFICIAL MATERIAL CONDITIONS

3.1.1 Surficial Material Thickness

Bedrock outcrops are prevalent in the Bromley Humps area, particularly at the proposed Process Plant Site. The TMF is located on a plateau that overhangs Bitter Creek in the glaciated valley formed by the retreat of the Bromley Glacier up Bitter Creek valley. Surficial material is approx. 1 to 2 m thick as encountered in the majority of the drillholes. The thickest overburden was encountered around the centre of the TMF North Embankment, approx. 6 m in drillhole (BH16-005).

3.1.2 Surficial Material Characterization

The surficial materials have been assessed using the geological and geotechnical information collected from drillhole data and laboratory testing. The goal of the subsurface investigations is to develop a geologic understanding of the major subsurface layers and assign distinct engineering characteristics to these units. The USCS system has been used for describing and categorizing soil. This classification allows for quick correlation for permeability, shear strength, compaction characteristics, workability, and volume change potential of a soil and gives indications of how it will be affected by water, frost, and other physical conditions.

3.1.3 Surficial Material Geotechnical Properties

The stratigraphic units identified in the 2016 investigations have been grouped using the USCS material classification system. The surficial materials have been grouped using the following material types (generally described from the surface down):

- Topsoil (OL, Pt)
- Colluvium deposits (GW-SP)
- Glacial till deposits (ML, GW)

Descriptions of the material properties are provided below and summarized in Table 3.1.

Table 3.1 Surficial Material Geotechnical Properties

USCS Classification		ML, GW	GW-SP
Geologic Model		Glacial Till Deposits	Colluvium Deposits
Particle Size Analysis	Gravel %	35 – 48 (41)	42 – 65 (55)
	Sand %	29 – 43 (36)	29 – 53 (39)
	Fines %	10 – 36 (23)	3 – 17 (7)
Moisture Content %		6 – 8 (7)	5 – 33 (11)
Atterberg Limits for <200# Sieve	Liquid Limit	NP	NP
	Plastic Limit	NP	NP
	Plasticity Index	NP	NP
SPT ³	'N' Values	64 - R	R

NOTES:

1. RESULTS IN BRACKETS ARE THE WEIGHTED AVERAGE I.E. (12).
2. NP: NON-PLASTIC.
3. A 'N' VALUE OF 'R' INDICATES THAT A BLOW COUNT IN EXCESS OF 50 BLOWS WAS RECORDED OVER A 6" INTERVAL, THUS TERMINATING THE SPT TEST AS TOO DENSE TO CONTINUE.

3.1.3.1 Topsoil Layer (OL, Pt)

A thin layer of topsoil is present over the majority of the TMF footprint (with the exception of areas of bedrock outcrops) and consists of moist, brown, silty sand with heavy organics content (mainly Forest Duff). The topsoil layer is approx. 0.1 m thick.

3.1.3.2 Colluvium (GW-SP)

Visual inspection and SPT testing confirmed the presence of steep colluvial slopes intermingled with areas of bedrock outcropping, particularly to the east of the proposed TMF. A total of 6 particle size distribution tests were completed for the colluvium deposits. PSA results indicate the material is primarily a well graded gravel to sandy gravel unit with a low fines content. The USCS designation for this material is GW-SP. The PSA distributions are shown on Figure 3.1 and the material properties are summarized in Table 3.1. SPT tests indicate that the material is a very dense material, with 'N' values of 64 and higher being recorded.

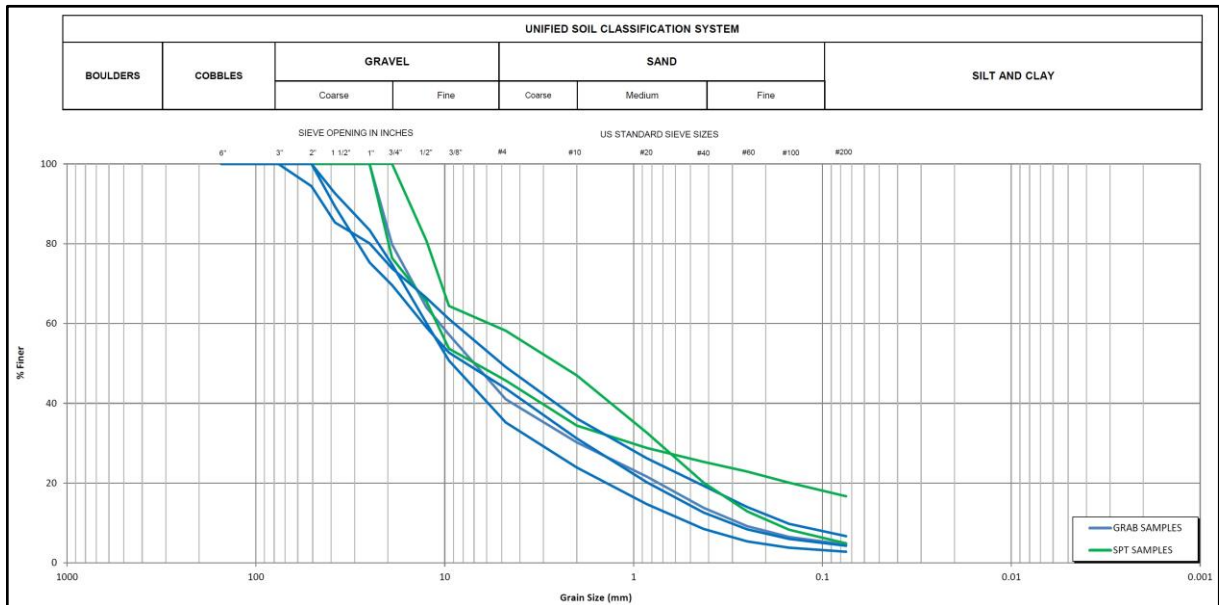


Figure 3.1 Colluvium Particle Size Distribution

3.1.3.3 Glacial Till (ML, GW)

Glacial till can be subdivided into loose to compact ablation till and compact to very dense lodgement till. The sparse presence of moraines suggests that lodgement till is more common in the area than ablation till, confirmed by the SPT 'N' values of R (refusal) for the glacial till, indicating a very dense material. PSA results indicate the material is primarily an inorganic sandy silt to well graded sandy gravel with a moderate fines content. The USCS designation for this material is ML to GW. The PSA distributions are shown on Figure 3.2 and the material properties are summarized in Table 3.1.

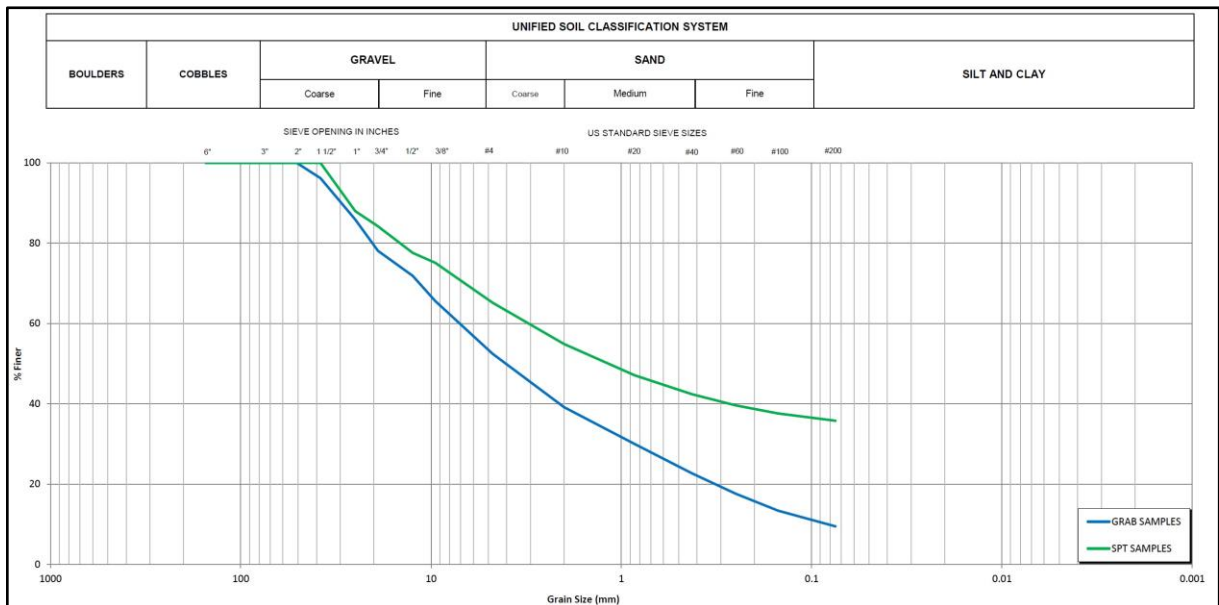


Figure 3.2 Glacial Till Particle Size Distribution

3.2 BEDROCK CONDITIONS

The following rock types were encountered at the site:

- Volcanic units: Gabbro, Diorite, Welded Tuff & Intrusive Dykes (Mafic Dykes and Felsic Dykes)
- Sedimentary units: Greywacke, Siltstone, Mudstone and Conglomerate
- Goldslide Suite of Porphyritic Intrusives

A bedrock and surficial geology map is shown on Figure 3.3.

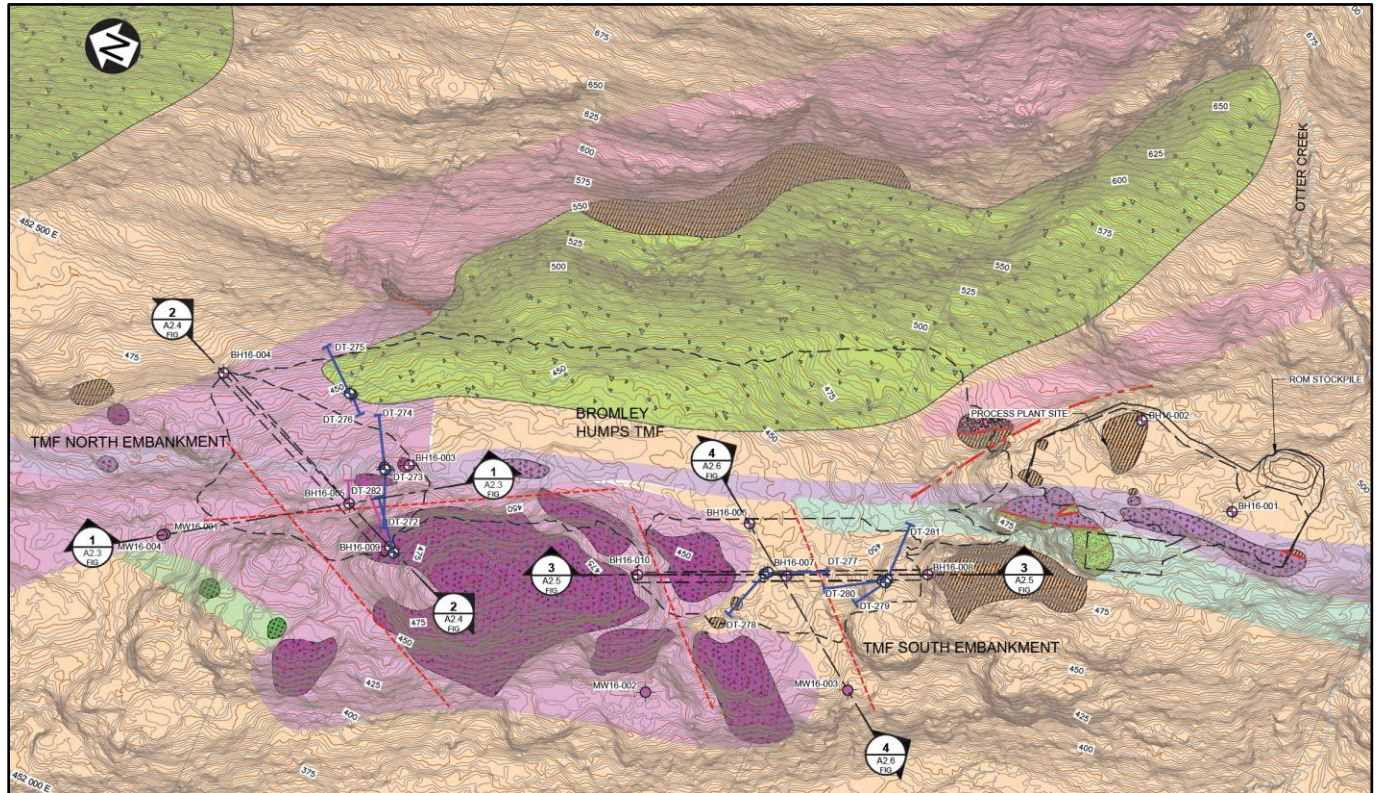


Figure 3.3 Bedrock and Surficial Geology

3.2.1 Rock Mass Properties

The RMR_{89} classification and RQD for the Volcanic units is FAIR, with intact rock strength ranging from strong to very strong (85 to 225 MPa). One mafic dyke sample failed along an existing foliation within the sample for an intact rock strength of 32 MPa.

The RMR_{89} classification and RQD for the Sedimentary units is FAIR, with intact rock strength considered strong (60 to 80 MPa).

The Goldslide Porphyry Suite of intrusive units are typically strong to very strong rocks (85 to 155 MPa) with RMR_{89} classifications of FAIR. This suite includes a minor feldspar-hornblende porphyry intrusive unit.

The bedrock properties are summarized in

Table 3.2.

Table 3.2 Bedrock Geotechnical Properties

Bedrock		Rock Strength (MPa)	Strength Description	Young's Modulus (GPa)	Poisson Ratio	Bulk Density	RQD %	RMR ₈₉	RMR ₈₉ Rating
Volcanic Units	Median	123	STRONG to VERY STRONG	23	0.16	2.82	55	52	FAIR
	Range	32 - 223		16 - 27	0.13 - 0.20	2.62 - 3.04		27 - 77	
Sedimentary Units	Median	68	STRONG	23	0.17	2.72	43	48	FAIR
	Range	60 - 79		21 - 26	0.14 - 0.18	2.71 - 2.73		27 - 67	
Goldslide Porphyry Intrusions	Median	119	STRONG to VERY STRONG	23	0.22	2.69	55	51	FAIR
	Range	84 - 155		21 - 24	0.10 - 0.34	2.61 - 2.76		39 - 71	

3.2.2 Rock Mass Permeability

Based on the Lugeon tests completed during this site investigation, the rock mass in the area of the TMF was observed to generally have a low to moderate hydraulic conductivity (2×10^{-9} to 1×10^{-5} m/s with a number of tests reporting no take). The hydraulic conductivity values calculated from the 5 tests completed within the identified fault structures were within the range of the host rock surrounding the structures. Circulation losses during drilling and high take during grouting at BH16-009 suggest the presence of permeable feature(s).

3.3 FOUNDATION CONDITIONS

3.3.1 TMF North Embankment Geotechnical Conditions

Six drillholes were completed in the vicinity of the proposed North Embankment, supplemented by 6 historical drillholes from the 1996 site investigation program, as summarized in Table 2.1.

3.3.1.1 Overburden Conditions

The TMF North Embankment foundation conditions are characterized by a thin veneer of colluvium and glacial till deposits, ranging in thickness from 0.5 m to 6 m (with an average thickness of 1 m encountered in the drillholes), overlying competent bedrock. These deposits are thickest (6 m) in drillhole BH16-005, located in a natural depression in the centre of the TMF North Embankment alignment. Bedrock is close to, or at, surface across the remainder of the footprint.

The dominant surficial material type in the TMF North Embankment area is colluvium, with thicker deposits underlain by glacial till.

3.3.1.2 Bedrock Conditions

The bedrock geology consists of Volcanic rocks with Goldslide Porphyry Intrusive units. Three drillholes with the 1996 and 2016 SI programs targeted inferred fault zones to assess the hydraulic conductivity and the orientation of the faults. The fault was encountered in drillholes BH16-009 (2016 SI), DT-272 and DT-282 (1996 SI) identified by zones of low RQD (44%) and RMR₈₉ of FAIR (52). The bedrock conditions at the TMF North Embankment area outside of the identified fault zones are

summarized by an average RQD of 46% and an average RMR_{89} of 53 which corresponds to FAIR quality rock. Intact strength testing of samples from the TMF North Embankment area indicates generally strong to very strong rock with UCS test results ranging from 85 MPa to 225 MPa and an average value of 150 MPa. The inferred fault zones/structures were found to intersect the embankment alignment. A plan view of the TMF North Embankment is shown on Figure 3.4 with a legend of bedrock rock types shown on Figure 3.5. Sections along the TMF North Embankment are shown on Figure 3.6 and Figure 3.7.

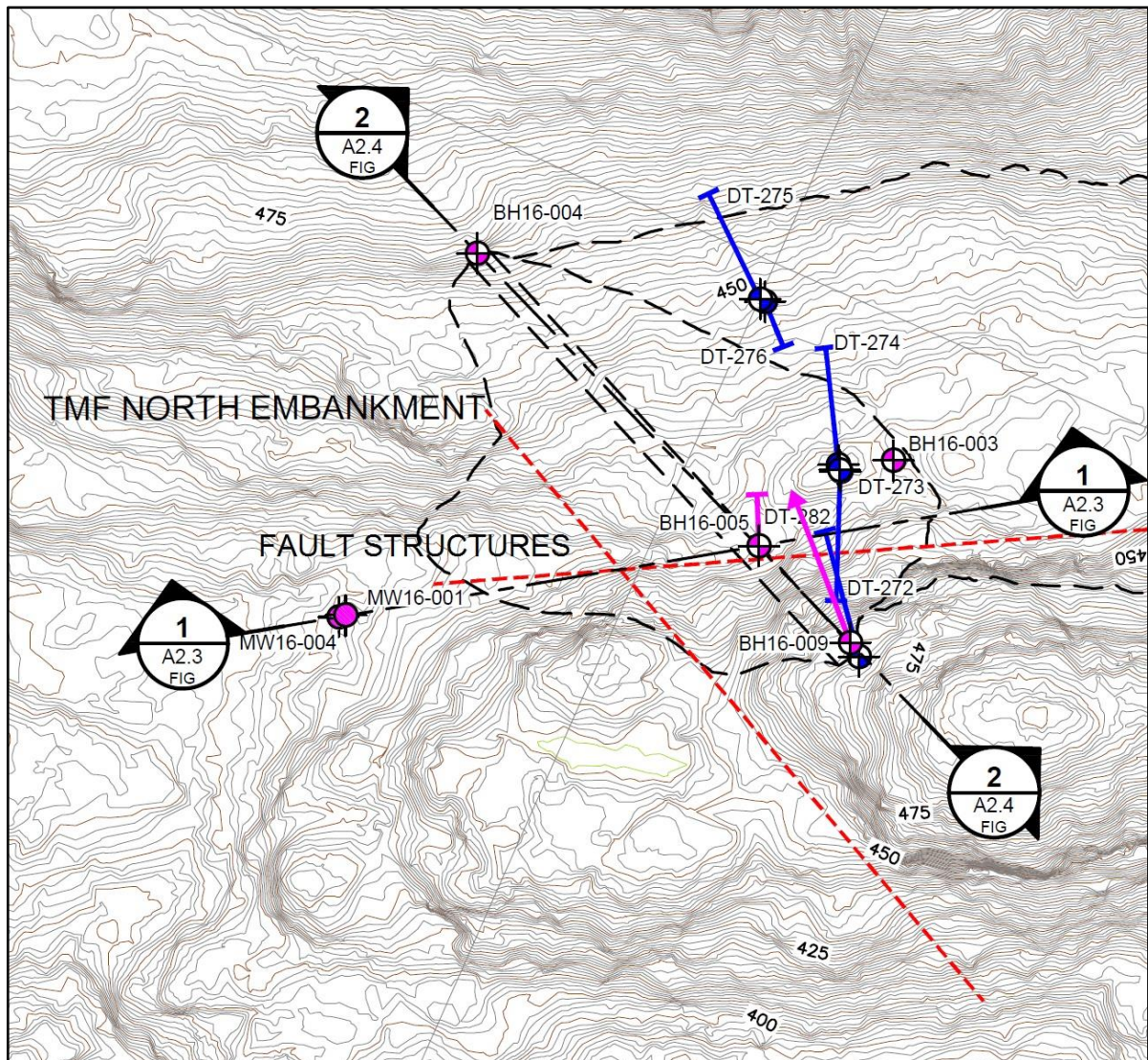


Figure 3.4 TMF North Embankment Plan



Figure 3.5 Bedrock Lithology Legend

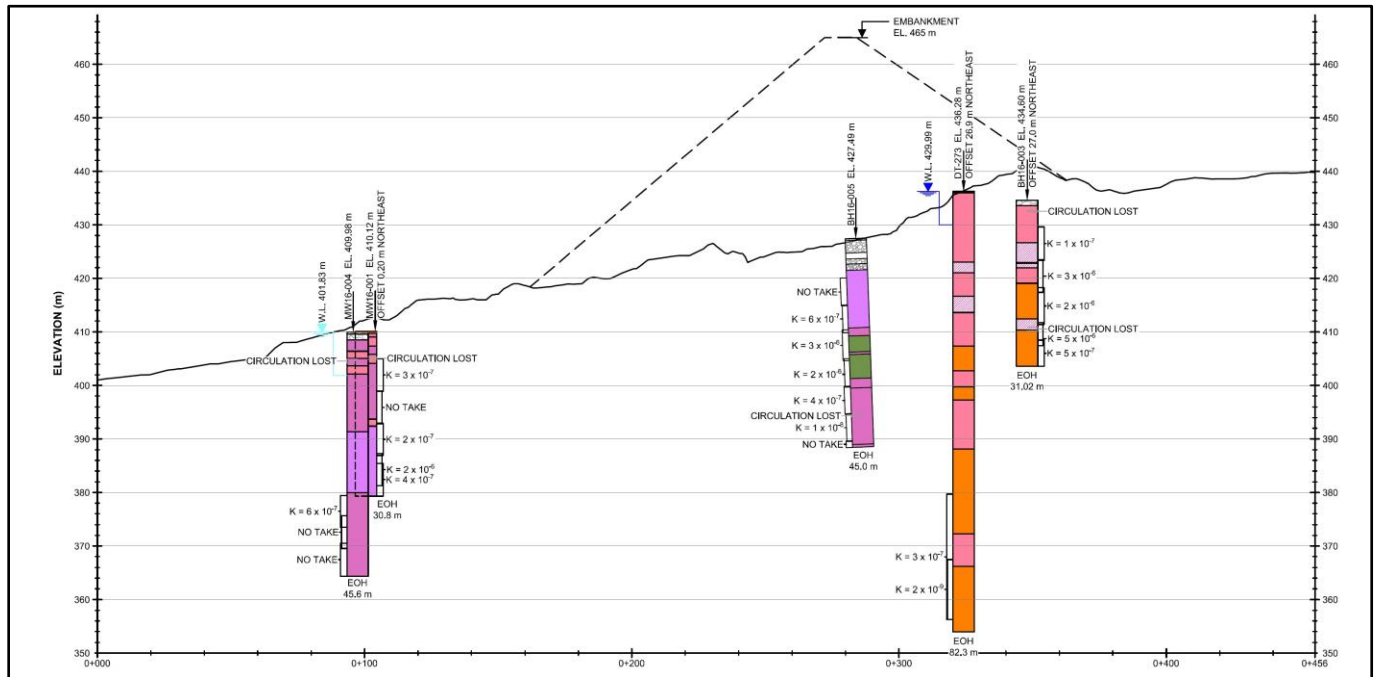


Figure 3.6 TMF North Embankment – Section 1

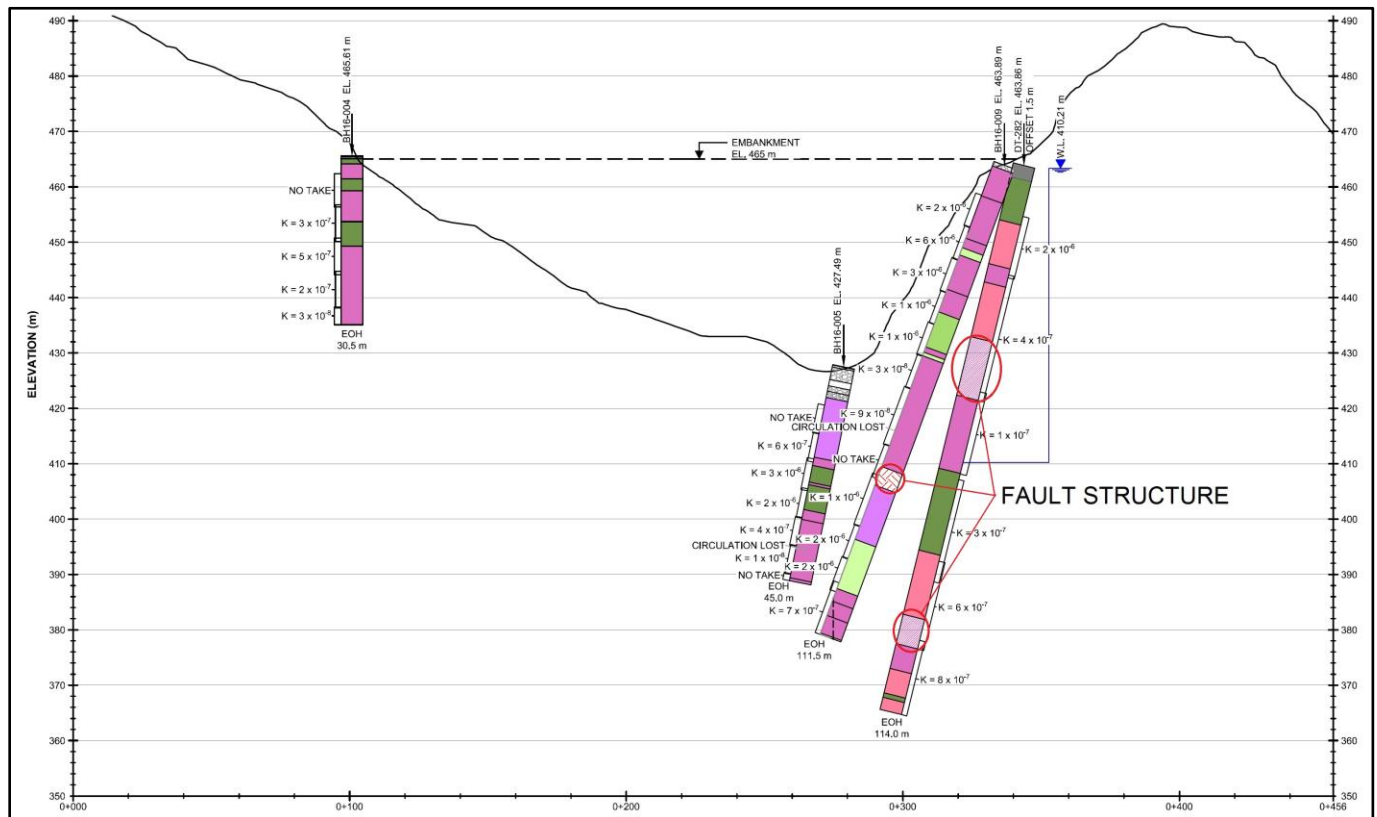


Figure 3.7 TMF North Embankment – Section 2

3.3.1.3 Groundwater Levels

Groundwater levels range from 8 to 25 m below ground surface (mbgs) based on measurements at MW16-004 and BH16-003 taken in mid-September 2016 (Table 2.2). MW16-001 (well depth of 23 mbgs) was dry in mid-September. Groundwater levels taken on August 29, 1996 and reported by Golder ranged from about 2 mbgs (DT-272) to approximately 65 mbgs (DT-282).

3.3.1.4 Hydraulic Conductivity

In-situ hydraulic conductivity testing at the TMF North Embankment indicates the rock mass has low to moderate permeability, with calculated hydraulic conductivity values ranging from 2×10^{-9} (DT-273 Test 2) to 6×10^{-6} m/s (BH16-009 Test 2) with 4 tests reporting no take (BH16-003 Test 5, BH16-004 Test 5, BH16-007 Test 7, BH16-009 Test 8).

3.3.2 TMF South Embankment

Six drillholes were completed in the vicinity of the proposed TMF South Embankment, supplemented by 5 historical drillholes from the 1996 site investigation program, as summarized in Table 2.1.

3.3.2.1 Overburden Conditions

The TMF South Embankment foundation conditions are characterized by a thin veneer of colluvium and glacial till deposits, varying in thickness from 0.6 to 5 m (with an average thickness of approx. 2 m encountered in the drillholes), overlying competent bedrock. These deposits are thickest (5 m) in

drillhole BH16-006, located in a natural depression in the centre of the embankment alignment. Bedrock is close to, or at surface in the remainder of the drillholes.

The dominant surficial material type in the TMF South Embankment area is colluvium with thicker deposits underlain by glacial till.

3.3.2.2 Bedrock Conditions

Bedrock conditions in the TMF South Embankment area are more complex than at the TMF North Embankment Area and are characterized by two faults that intersect the embankment alignment. The northern side of these fault zones is characterized by Volcanic units (predominantly gabbro) with Intrusive dykes (mafic and felsic in nature). The southern side of the fault zones is characterized by a collection of Sedimentary rock units, including siltstone, mudstone, greywacke and conglomerates. Three drillholes from the 1996 and 2016 SI programs targeted inferred fault zones to assess the hydraulic conductivity characteristics and the orientation of the faults. One fault was encountered in BH16-010 (2016 SI) and a second fault encountered in DT-277 and DT-280 (1996 SI) identified by zones of low RQD (14%) and RMR_{89} of 38 which correspond to POOR quality rock.

The bedrock conditions at the TMF South Embankment area outside of the identified fault zones are summarized by an average RQD of 62% and an average RMR_{89} of 57 which corresponds to FAIR quality rock. Intact strength testing of samples from the TMF South Embankment area indicates generally strong to very strong rock with UCS test results ranging from 80 MPa to 205 MPa and an average of 120 MPa. A plan view of the TMF South Embankment is shown on Figure 3.8 with sections along and through the TMF South Embankment are shown on Figure 3.9 and Figure 3.10.

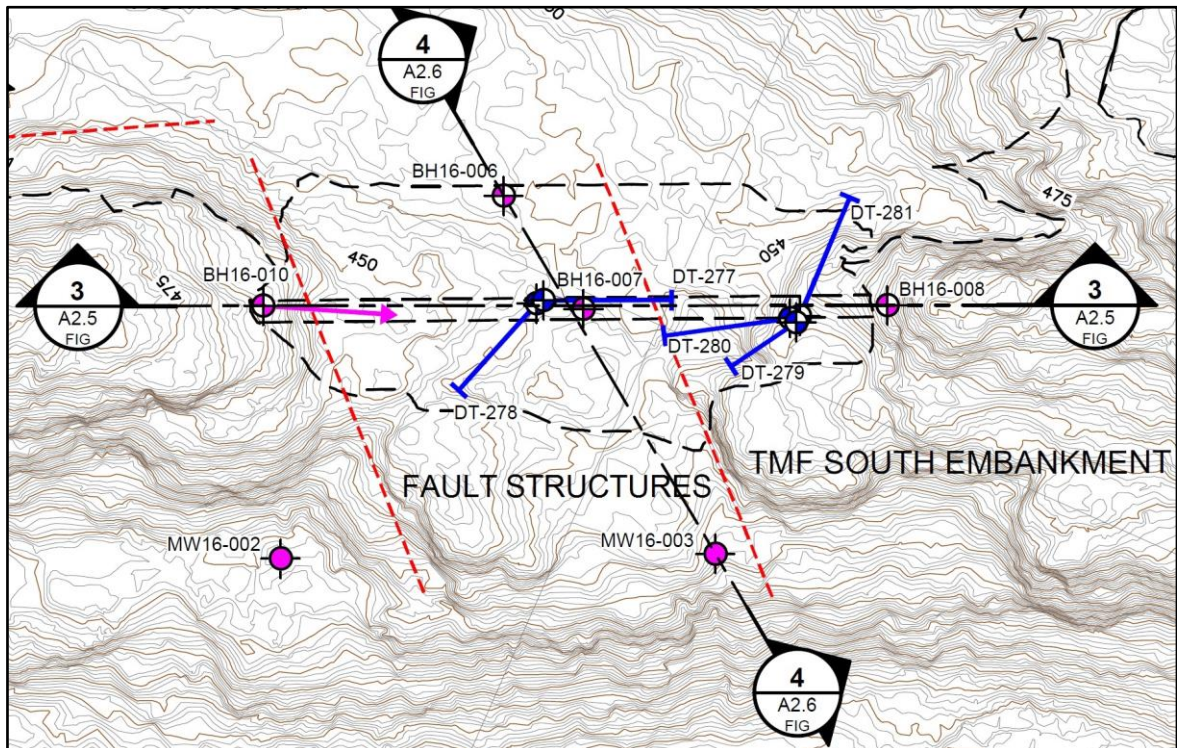


Figure 3.8 TMF South Embankment Plan

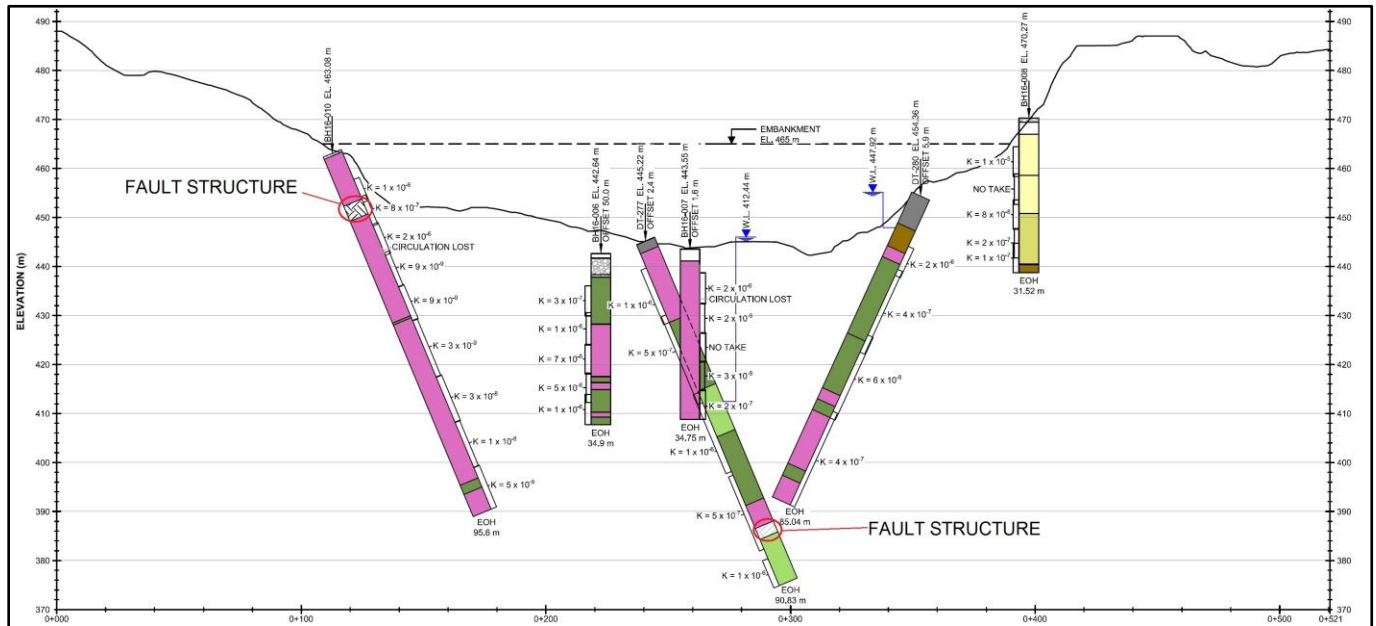


Figure 3.9 TMF South Embankment – Section 3

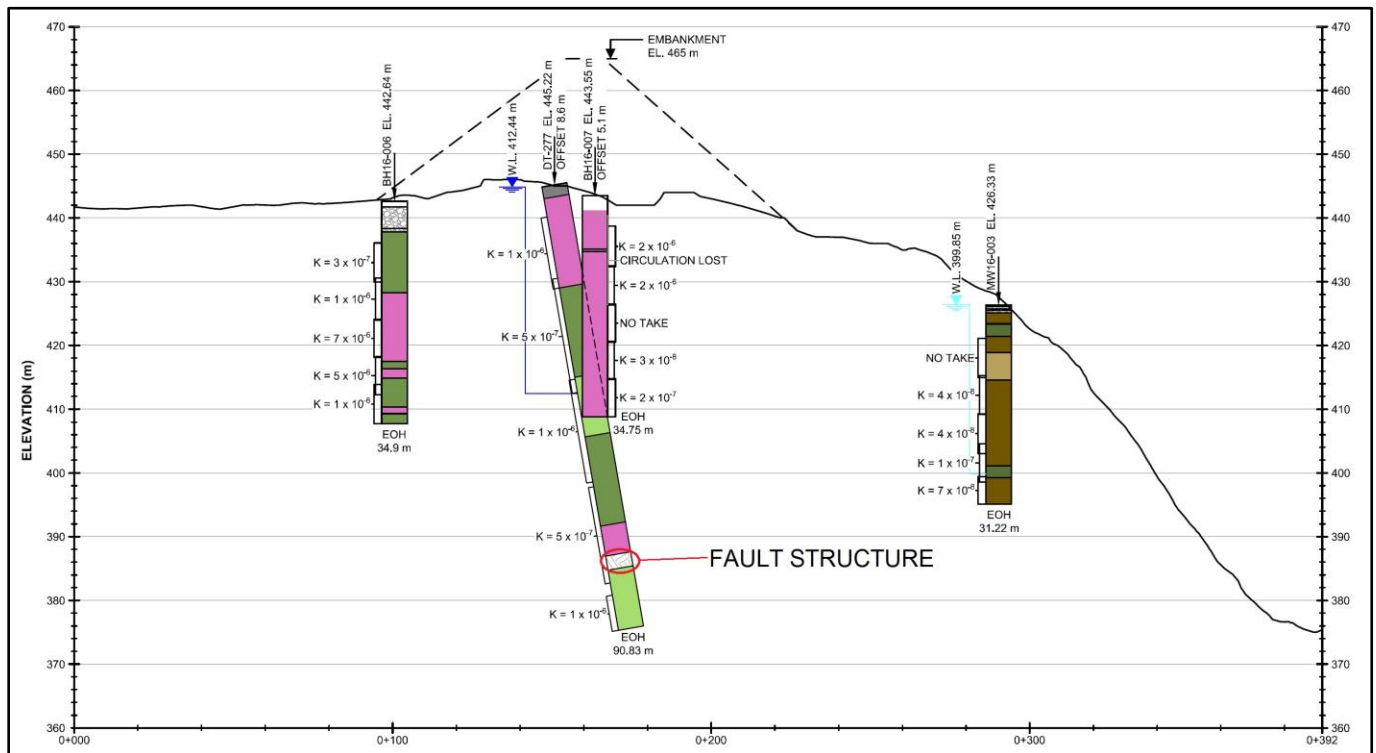


Figure 3.10 TMF South Embankment – Section 4

3.3.2.3 Groundwater Levels

Groundwater levels ranged from 1 to 16 mbgs based on open hole measurements taken prior to the installation of the VVPs at BH16-006, BH16-007, BH16-008 and BH16-010. Groundwater levels

measured by Golder on August 29, 1996 ranged from about 4 mbgs (DT-281) to approximately 43 mbgs (DT-277).

3.3.2.4 Hydraulic Conductivity

In-situ hydraulic conductivity testing during this investigation indicates the rock mass has low to moderate permeability, ranging from 3×10^{-9} m/s (DT-278 Test 3) to 1×10^{-5} m/s (BH16-008 Test 1) with two tests reporting no take (BH16-007 Test 3 and BH16-009 Test 8).

3.3.3 Process Plant Site

The proposed Process Plant Site location is on a bedrock outcrop that sits above and southeast of the Bromley Humps area, near the confluence of Otter Creek and Bitter Creek.

3.3.3.1 Overburden Conditions

Bedrock was encountered at or very close to surface at the Process Plant Site area, with only a thin veneer of topsoil being encountered in one of the drillholes.

3.3.3.2 Bedrock Conditions

Bedrock conditions at the Process Plant Site area are primarily characterized by a Sedimentary unit (greywacke) underlain by some Volcanic units (mafic and felsic dykes, gabbro, etc). The bedrock conditions are summarized by an average RQD of 50% and an average RMR₈₉ of 51 which corresponds to FAIR quality rock. Intact strength testing of samples from the Process Plant Site area indicate generally strong rock with UCS test results ranging from 60 to 65 MPa with an average of 62 MPa. Both UCS Samples failed partially along pre-existing foliations within the core samples. Therefore, UCS testing results are to be considered as conservative with respect to the rock mass as a whole at the Process Plant Site.

3.3.3.3 Groundwater Levels and Hydraulic Conductivity

Groundwater levels range from 12 to 28 mbgs based on spot water levels taken at BH16-001 and BH16-002 in mid-September 2016. No in-situ hydraulic conductivity testing was conducted in the Process Plant Site drillholes.

4 – SUMMARY AND RECOMMENDATIONS

4.1 SITE INVESTIGATION PROGRAM SUMMARY

The 2016 geotechnical site investigation program was carried out between August and September 2016. The program included the drilling of 14 geotechnical drillholes (including 4 drillholes for groundwater monitoring wells) and the logging of 4 geotechnical drillholes from the previous 1996 geotechnical site investigation at the locations of the proposed Tailings Management Facility (TMF) and Process Plant Site. In-situ hydraulic testing (Lugeon tests) was completed in the drillholes to obtain estimates of hydraulic conductivity in the bedrock. A total of 4 standpipes and 4 monitoring wells were installed, 3 of which can be used for groundwater quality monitoring (MW16-002, MW16-003, and MW16-004). Results of the drillhole logging, in combination with the results of laboratory testing, allowed for the identification and characterization of geological units within the site area. The results of the in-situ and laboratory testing were used to assess geotechnical parameters for the design of the TMF and Process Plant Site foundations.

4.1.1 TMF North Embankment

Six drillholes were completed in the vicinity of the TMF North Embankment including 4 drillholes, 2 monitoring wells from the 2016 Site Investigation Program, supplemented by 6 drillholes from the 1996 SI program. A thin veneer of colluvium is the dominant surficial material type and averages approx. 1 m thick as encountered in the drillholes with a maximum thickness of 6 m being encountered. Some thicker deposits are underlain by glacial till.

The bedrock conditions at the TMF North Embankment area are classified by FAIR quality rock with intact strength testing of samples from the TMF North Embankment area indicating generally strong to very strong rock (UCS test results ranging from 85 MPa to 225 MPa and average value of 150 MPa). Bedrock generally consists of low to moderate permeability Volcanic rocks with some Goldslide Porphyry Intrusive units. A fault structure intersects the TMF North Embankment with another structure running parallel and downstream of the TMF North Embankment.

4.1.2 TMF South Embankment

Eleven drillholes were completed in the vicinity of the TMF South Embankment including 4 drillholes, 2 monitoring wells from the 2016 Site Investigation Program, and a further 5 drillholes from the 1996 SI program. A thin veneer of colluvium is the dominant surficial material type and averages approx. 2 m thick encountered in the drillholes with a maximum thickness of 5 m being encountered. Some thicker deposits are underlain by a layer of glacial till.

The bedrock conditions at the TMF South Embankment are classified by FAIR quality rock with intact strength testing of samples from the TMF South Embankment area indicating generally strong to very strong rock with UCS test results ranging from 80 MPa to 205 MPa and an average of 120 MPa. Bedrock generally consists of low to moderate permeability Volcanic rocks with some Goldslide Porphyry Intrusive units to the north of the intersected fault zones with low permeability Sedimentary rocks to the south of the fault zone. Two fault structures were encountered that crosscut the TMF South Embankment.

4.1.3 Process Plant Site

Two drillholes were completed in the vicinity of the Process Plant Site. Bedrock was encountered at or near to surface in the drillholes, with only a thin layer of topsoil being encountered. Bedrock conditions at the Process Plant Site area are primarily characterized by a Sedimentary unit (greywacke) underlain by some Volcanic units (mafic and felsic dykes, gabbro, etc). Bedrock conditions are characterized by a FAIR quality greywacke with ~60 MPa rock strength.

4.2 RECOMMENDATIONS FOR FUTURE WORK

The 2016 geotechnical site investigation program was developed from the preliminary layouts from the 2016 Preliminary Economic Assessment (PEA) submission (KP, 2016a) to support a Feasibility Level design of these facilities. The preliminary mine layouts developed during this study are subject to change during future phases of engineering design. Therefore, the size, geometry and location of the TMF, Process Plant Site and other associated mine infrastructure may be adjusted or refined and future geotechnical/hydrogeological investigation programs will need to be developed as appropriate.

Additional studies will be also required to advance the current design to Detailed Design. These include:

- Seismic refraction surveying along TMF embankment alignments
- Additional drilling at the TMF embankments and the plant site to supplement the existing data base on overburden and bedrock conditions, including more angled drillholes to improve the characterization of bedrock structures
- Downhole seismic survey analysis on drillholes conducted at the Process Plant Site to calculate s-wave and p-wave properties for vibrating foundation design
- Drilling and investigations in the TMF basin to assess basin shaping and borrow potential
- Test pitting along proposed haul road alignment to assess borrow material potential (currently being conducted and analysed by Onsite Engineering)
- Additional instrumentation (including clustered sites) as well as ongoing water level monitoring of standpipe piezometers and vibrating wire piezometers to improve the characterization of the groundwater flow regime and potential for seepage from the TMF
- Additional UCS and point load tests to confirm initial UCS values

It is anticipated that this work will be completed during the Detailed Design process, after completion of the Feasibility Study in 2017.

5 – REFERENCES

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6 – CERTIFICATION

This report was prepared and reviewed by the undersigned.



Prepared:

30-2-2017
Jim Fogarty, B.Eng (Civil), P.Eng.
Project Engineer

<Original signed
by>

<Original signed by>

Reviewed:

Ken Embree, P.Eng.
Managing Principal, Vancouver

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<Original signed

Approval that this document adheres to Knight Piésold Quality Systems: by>

APPENDIX A

TABLES AND FIGURES

Appendix A1	Tables
Appendix A2	Figures

APPENDIX A1

TABLES

(Pages A1-1 to A1-5)

TABLE A1.1

IDM MINING LTD.
RED MOUNTAIN PROJECT

2016 GEOTECHNICAL SITE INVESTIGATION FACTUAL DATA REPORT
DRILLHOLE SUMMARY TABLE

Print Jun-29-17 14:03:00

Drillhole Designation	Predrill Designation	Coordinates			Azimuth (°)	Dip (°)	Drilling Technique	Total Depth (m-along hole)	Depth to Bedrock (m-along hole)	Date Started	Date Completed	Vibrating Wire Piezometer Information		Standpipe Piezometer/Monitoring Well Information			Area	
		Easting (m)	Northing (m)	Elevation (m)								Vibrating Wire Installation Depth (m-along hole)	Vibrating Wire Piezometer Target Feature	Screened Interval		Water Level Immediately after Installation ⁴ (mbgs)		Screen Zone Target
														From (mbgs)	To (mbgs)			
BH16-001	DH16-J	452,727.8	6,204,159.9	492.2	-	-90	HQ3: 0.00 - 30.80 m	30.80	0.58	13-08-16	14-08-16	Not Applicable		14.0	17.1	16.3	Contact between Dyke & Greywacke	Process Plant
BH16-002	DH16-I	452,773.7	6,204,276.9	507.9	-	-90	HQ3: 0.00 - 30.80 m	30.80	0.00	14-08-16	15-08-16	Not Applicable		24.5	27.6	27.6	Fractured Bedrock (Greywacke) Zone	Process Plant
BH16-003	DH16-C	452,442.0	6,204,917.7	434.6	-	-90	HQ3: 0.00 - 31.00 m	31.00	1.00	16-08-16	18-08-16	Not Applicable		22.0	25.0	24.6	Contact between Tuff and Sheared Gabbro Unit	TMF North Embankment
BH16-004	DH16-A	452,451.3	6,205,120.8	465.6	-	-90	HQ3: 0.00 - 30.50 m	30.50	0.50	24-08-16	25-08-16	28.5	Water Level Monitoring	Not Applicable			TMF North Embankment	
BH16-005	DH16-B	452,384.1	6,204,956.3	427.5	64	-60	HQ3: 0.00 - 45.00 m	45.00	6.84	26-08-16	29-08-16	38.0	Highly Broken and Chlorite Altered Zone	Not Applicable			TMF North Embankment	
BH16-006	DH16-F	452,525.0	6,204,588.7	442.6	-	-90	HQ3: 0.00 - 34.90 m	34.90	4.83	29-08-16	31-08-16	27.7	Highly Broken and Rubbleized Zone	Not Applicable			TMF South Embankment	
BH16-007	DH16-G	452,492.6	6,204,534.5	443.6	-	-90	HQ3: 0.00 - 34.80 m	34.75	2.57	02-09-16	03-09-16	31.5	Water Level Monitoring	Not Applicable			TMF South Embankment	
BH16-008	DH16-H	452,550.2	6,204,408.4	470.2	-	-90	HQ3: 0.00 - 31.50 m	31.50	1.20	04-09-16	06-09-16	27.1	Weak and Highly Fractured Bedrock Unit	Not Applicable			TMF South Embankment	
BH16-009	DH16-D	452,361.6	6,204,902.7	463.6	45	-50	HQ3: 0.00 - 111.50 m	111.50	1.00	07-09-16	14-09-16	Not Applicable ³		49.3	52.3	28.8	Highly Broken and Rubbleized Zone	TMF North Embankment
BH16-010	DH16-E	452,434.7	6,204,668.8	463.1	160	-50	HQ3: 0.00 - 95.60 m	95.60	0.60	14-09-16	17-09-16	28.9	Water Levels	Not Applicable			TMF South Embankment	
												7.5	Broken Zone					
MW16-001	MW16-A	452,283.1	6,205,109.2	410.1	-	-90	HQ3: 0.00 - 30.80 m	30.80	0.80	18-08-16	20-08-16	Not Applicable		20.0	23.0	18.1	Groundwater Quality Monitoring Well ²	Downstream of North TMF Embankment
MW16-002	MW16-B	452,332.4	6,204,614.9	412.3	-	-90	HQ3: 0.00 - 32.80 m	32.80	2.80	20-08-16	22-08-16	Not Applicable		26.8	29.8	5.8	Groundwater Quality Monitoring Well	Downstream of South TMF Embankment
MW16-003	MW16-C	452,414.9	6,204,434.3	426.3	-	-90	HQ3: 0.00 - 31.22 m	31.22	1.22	22-08-16	23-08-16	Not Applicable		27.1	30.2	6.2	Groundwater Quality Monitoring Well	Downstream of South TMF Embankment
MW16-004	MW16-004	452,281.2	6,205,111.7	410.0	-	-90	HQ3: 0.00 - 45.60 m	45.60	1.49	31-08-16	02-09-16	Not Applicable		34.5	37.6	6.6	Groundwater Quality Monitoring Well ²	Downstream of North TMF Embankment

M:\1101\00594\02\A\Report\1-Geotech SI Report\Rev A\Appendices\Appendix A - Tables & Figures\Appendix A1 - Tables\Excel Files\Table A1.1 - Drillhole Summary Table_rA.xlsx\ReadMe_First

NOTES:

- COORDINATES AND ELEVATIONS ARE FINAL SURVEYED COORDINATES PROVIDED BY IDM.
- DRILLHOLE SLOUGHED IN AT APPROXIMATELY 12 mbgs DURING INSTALLATION OF WELL AT MW16-001. MW16-004 DRILLED AT SAME DRILL PAD TO INSTALL REPLACEMENT WELL FOR SAMPLING PURPOSES. MW16-001 STILL SUITABLE FOR WATER LEVEL MONITORING
- VIBRATING WIRE PIEZOMETER INSTALLATION ABORTED DUE TO HIGH GROUT TAKE. STANDPIPE PIEZOMETER INSTALLED IN PLACE.
- WATER LEVELS IN STANDPIPE PIEZOMETERS WERE MEASURED IMMEDIATELY FOLLOWING STANDPIPE INSTALLATION, WITH THE EXCEPTION OF BH16-009 WHICH WAS MEASURED FIVE DAYS AFTER INSTALLATION.
- MONITORING WELL CONSTRUCTION SPECIFICATIONS PROVIDED BY SRK CONSULTING.

0	29JUN'17	ISSUED WITH REPORT VA101-594/02-1	JEF	KDE
REV	DATE	DESCRIPTION	PREP'D	REV'D

TABLE A1.2

**IDM MINING LTD.
RED MOUNTAIN PROJECT**

**2016 GEOTECHNICAL SITE INVESTIGATION FACTUAL DATA
REPORT
HYDRAULIC CONDUCTIVITY SUMMARY**

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Drillhole ID	Hydraulic Conductivity Testing				
	Test #	Test Interval		Hydraulic Conductivity	Notes
		From (m downhole)	To (m downhole)	(m/s)	
BH16-001	No Tests Conducted				
BH16-002	No Tests Conducted				
BH16-003	1	4.98	11.24	1E-07	
	2	11.12	17.2	3E-06	
	3	16.3	23.2	2E-06	
	4	22.83	27.17	5E-06	
	5	26.13	31.02	5E-07	
BH16-004	1	3.28	9.28	No Take	1
	2	8.86	15.5	3E-07	1
	3	14.86	21.5	5E-07	
	4	20.86	27.5	2E-07	
	5	27.35	30.5	3E-08	
BH16-005	1	8.43	14.43	No Take	
	2	14.28	20.28	6E-07	1
	3	19.64	26.28	3E-06	1
	4	25.86	32	2E-06	
	5	31.85	37.85	4E-07	
	6	37.7	43.7	1E-08	
	7	43.55	45	No Take	
BH16-006	1	6.56	12.7	3E-07	
	2	12.06	18.7	1E-06	
	3	18.55	24.55	7E-06	3
	4	24.4	30.4	5E-06	2
	5	28.76	34.9	1E-06	
BH16-007	1	4.86	11.2	2E-06	1
	2	11.06	17.2	2E-06	1
	3	17.05	23.05	No Take	
	4	22.9	28.9	3E-08	
	5	28.75	34.75	2E-07	
BH16-008	1	5.81	11.95	1E-05	1,2
	2	11.38	17.62	No Take	
	3	16.67	22.67	8E-08	
	4	22.52	28.52	2E-07	
	5	25.52	31.52	1E-07	
BH16-009	1	7.96	15.6	2E-06	1
	2	15.45	23.28	6E-06	1,2
	3	23.13	30.96	3E-06	1
	4	30.82	38.46	1E-06	1
	5	38.32	45.96	1E-06	
	6	45.81	53.64	3E-08	
	7	53.5	67.14	9E-08	
	8	66.99	74.82	No Take	
	9	73.96	86.1	1E-06	1
	10	85.95	93.78	2E-06	1,2
	11	93.63	101.46	2E-06	1,2
	12	99.36	111.5	7E-07	1,2
BH16-010	1	7.96	14.1	1E-06	
	2	12.5	20.33	8E-07	1,4
	3	19.96	28.13	2E-06	1,4
	4	27.46	36.6	9E-09	
	5	36.46	45.6	9E-09	
	6	45.45	60.6	3E-09	
	7	60.45	72.6	3E-08	
	8	72.46	84.6	1E-08	
	9	84.46	95.6	5E-09	
MW16-001	1	5.14	11.2	3E-07	
	2	11.12	17.3	No Take	
	3	17.2	23.2	2E-07	
	4	22.84	28.84	2E-06	
	5	24.66	30.8	4E-07	
MW16-002	1	5.4	11.2	4E-06	
	2	11.16	17.2	7E-07	
	3	17.05	23.05	No Take	
	4	22.9	28.9	No Take	
	5	28.75	32.8	No Take	
MW16-003	1	5.23	11.37	No Take	
	2	11.06	17.18	4E-08	
	3	17.06	23.29	4E-08	
	4	21.79	27.79	1E-07	
	5	26.95	31.22	7E-08	
MW16-004	1	30.52	36.52	6E-07	
	2	34.31	40.45	No Take	
	3	39.46	45.6	No Take	

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NOTES:

1. WATER LEVEL BELOW TOP PACKER AFTER PACKER INFLATION. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS. HYDRAULIC CONDUCTIVITY VALUE FOR QUALITATIVE PURPOSES ONLY AS TEST METHODOLOGY BASED ON SATURATED CONDITIONS.
2. HIGH TAKE DURING TESTING EMPTIED THE WATER TANK. NEEDED TO WAIT TO REFILL WATER TANK BETWEEN ONE OR MULTIPLE PRESSURE STAGES DURING TESTING.
3. LEAKAGE OBSERVED BETWEEN DRILL CASING AND DRILL RODS DURING TESTING.
4. APPLIED G STOP AFTER PACKER TEST TO TESTED INTERVAL TO MINIMIZE CIRCULATION LOSS IN THE DRILL HOLE.

0	29JUN'17	ISSUED WITH REPORT VA101-594/02-1	CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVW'D

TABLE A1.3

IDM MINING LTD.
RED MOUNTAIN PROJECT

2016 GEOTECHNICAL SITE INVESTIGATION FACTUAL DATA REPORT
DRILLING CIRCULATION LOSS SUMMARY

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Site ID	Downhole Depth Lost Circulation (m)	Downhole Depth Re-gained Circulation (m)	Comments
BH16-001	-	-	No zones of circulation loss
BH16-002	-	-	No zones of circulation loss
BH16-003	1.9	2.24	Fractured zone
	23.66	24.37	Fractured zone
BH16-004	-	-	No zones of circulation loss
BH16-005	37.85	38.38	Rubble and altered zone
BH16-006	-	-	No zones of circulation loss
BH16-007	3.2	17.2	
BH16-008	-	-	No zones of circulation loss
BH16-009	16.9	Not regained	
BH16-010	26.1	27.6	
MW16-001	4.8	5.3	Fractured zone
MW16-002	-	-	No zones of circulation loss
MW16-003	-	-	No zones of circulation loss
MW16-004	5.05	5.78	Broken zone and lithology contact

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0	29JUN'17	ISSUED WITH REPORT VA101-594/02-1	CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVWD

TABLE A1.4

**IDM MINING LTD.
RED MOUNTAIN PROJECT**

**2016 GEOTECHNICAL SITE INVESTIGATION FACTUAL DATA REPORT
SOILS LABORATORY TEST RESULTS SUMMARY**

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Drillhole ID	Sample No.	Target Infrastructure	Depth From (mbgs)	Depth To (mbgs)	Soil Type	Soil Description	USCS	Grain Size %			Atterberg Limits ^{1,2}			Moisture Content
								Gravel	Sand	Fines (Silt & Clay)	%			%
											PL	LL	PI	
TP16-001	GS-01	North TMF Embankment - East Abutment	0.0	0.8	Glacial Till	Well-graded GRAVEL and SAND with trace silt	GW-GM	47.5	43	9.5	0	0	0	8.3
TP16-002	GS-01	North TMF Embankment - East Abutment	0.0	0.8	Colluvium	Well-graded sandy GRAVEL	GW	59.0	36.4	4.6	0	0	0	5.7
TP16-003	GS-01	North TMF Embankment - East Abutment	0.0	0.8	Colluvium	Poorly graded sandy GRAVEL	GP	56.3	39.4	4.3	0	0	0	6.4
MW16-003	SPT-01	Downstream of South TMF Embankment	0.0	0.1	Colluvium	Well-graded GRAVEL with sand and some silt	GW-GM	54.3	29	16.7	0	0	0	10.5
MW16-003	SPT-02	Downstream of South TMF Embankment	0.6	1.2	Glacial Till	Well graded GLACIAL TILL	ML-GW	34.8	29.4	35.8	0	0	0	6.2
BH16-004	GS-01	North TMF Embankment - East Abutment	0.0	0.5	Colluvium	Well-graded sandy GRAVEL with trace silt	GW-GM	50.9	42.4	6.7	0	0	0	5.6
BH16-005	SPT-01	Centrepoint of North TMF Embankment	0.0	0.1	Colluvium	Poorly graded gravelly SAND	SP	41.8	53.3	4.9	0	0	0	33.0
BH16-007	GS-01	Centrepoint of South TMF Embankment	0.1	0.4	Colluvium	Well-graded GRAVEL with sand	GW	64.8	32.4	2.8	0	0	0	5.3

M:\1\01\00594\02\A\Report\1-Geotech SI Report\Rev A\Appendices\Appendix A - Tables & Figures\Appendix A1 - Tables\Table A1.4 - Soil Laboratory Testing Summary Table_r0.xlsx]Table A1.4 - Soil Test Summary

NOTES:

1. PL - PLASTIC LIMIT; LL - LIQUID LIMIT; PI - PLASTICITY INDEX; LI - LIQUIDITY INDEX.
2. "NP" INDICATES THE SAMPLE WAS NON PLASTIC.

0	29JUN'17	ISSUED WITH REPORT VA101-594/02-1	JEF	KDE
REV	DATE	DESCRIPTION	PREPD	REVD

TABLE A1.5

**IDM MINING LTD.
RED MOUNTAIN PROJECT**

**2016 GEOTECHNICAL SITE INVESTIGATION FACTUAL DATA REPORT
SUMMARY OF ROCK LABORATORY TEST RESULTS**

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Drillhole ID	Sample ID	Depth From (m)	Depth To (m)	Sample Length (m)	Sample Lithology	Laboratory Test					
						Density (g/cm ³)	Young's Modulus E (GPa)	Poisson's Ratio (μ)	UCS (MPa)	Moisture Content (%)	Specific Gravity
BH16-001	UCS-01 ¹	2.27	2.52	0.25	Greywacke	2.72	22.1	0.18	64.9	0.02	3.38
BH16-001	UCS-02 ¹	16.75	16.99	0.24	Greywacke	2.71	26.2	0.18	59.7	0.03	2.84
BH16-002	UCS-02 ²	10.94	11.30	0.36	Mafic Dyke	2.74	16.3	0.14	32.3	0.02	2.76
BH16-003	UCS-01	1.90	2.18	0.28	Goldslide Porphyry	2.61	23.5	0.10	155.2	0.01	2.64
BH16-005	UCS-01	11.48	11.78	0.30	Diorite	2.62	26.8	0.13	223.4	0.00	2.65
BH16-006	UCS-01	6.43	6.74	0.31	Mafic Dyke	2.73	26.0	0.16	203.9	0.02	3.22
BH16-008	UCS-01 ¹	6.11	6.45	0.34	Siltstone	2.73	21.2	0.14	78.9	0.02	2.94
BH16-010	UCS-01	2.59	2.92	0.33	Gabbro	3.04	20.9	0.13	86.6	0.03	3.08
MW16-001	UCS-01 ¹	3.19	3.43	0.24	Gabbro	3.04	20.5	0.20	87.0	0.04	3.10
MW16-003	UCS-01	4.00	4.25	0.25	Dyke	2.76	28.7	0.17	105.7	0.10	2.79
MW16-004	UCS-01 ¹	4.57	4.77	0.20	Goldslide Porphyry	2.76	21.4	0.34	83.6	0.00	2.79

M:\1\01\00594\02\A\Report\1-Geotech SI Report\Rev A\Appendices\Appendix A - Tables & Figures\Appendix A1 - Tables\Excel Files\[Table A1.5 - Rock Testing Results_rA.xlsx]Table A1.5 - Rock Test Summary

NOTES:

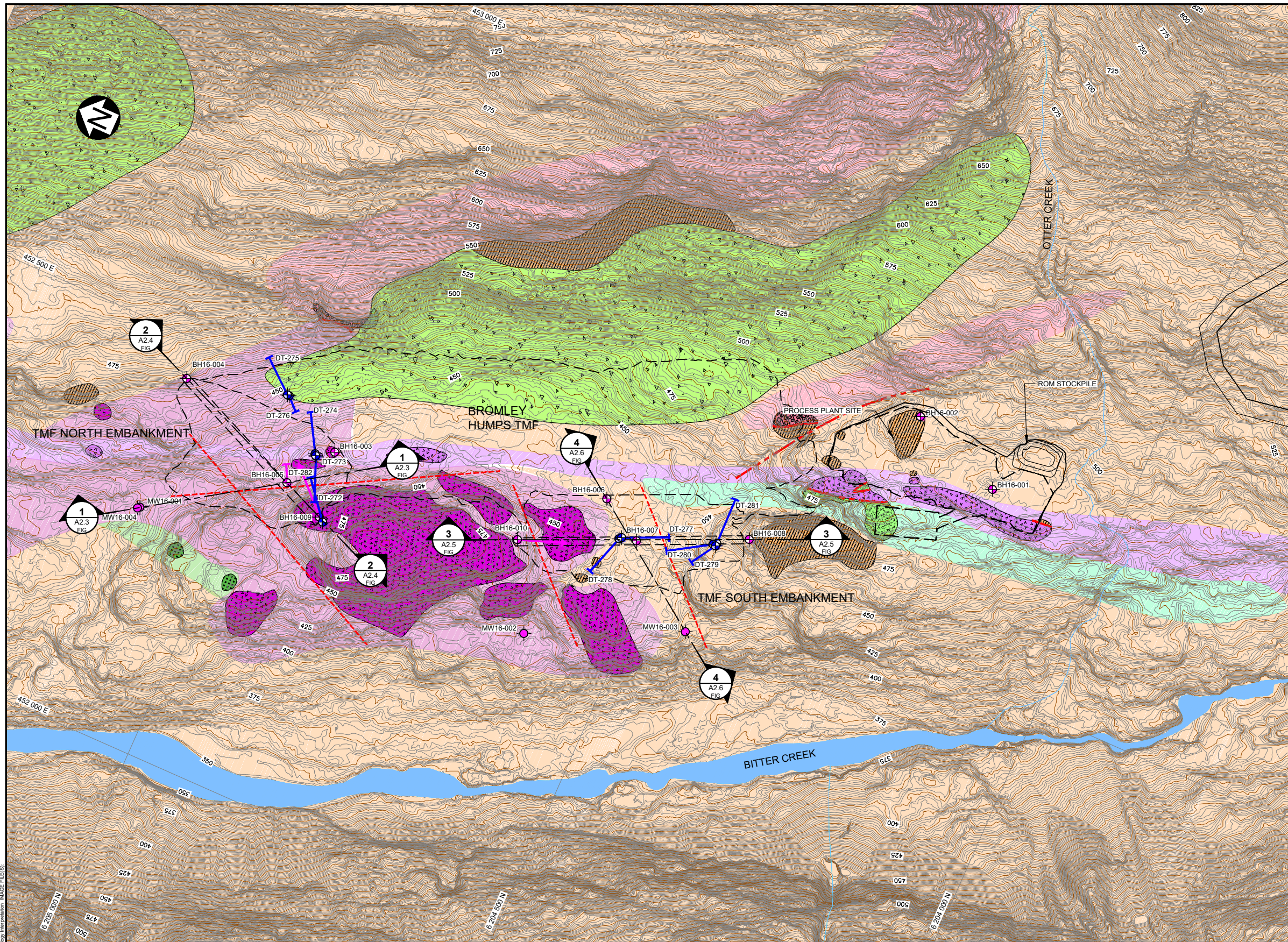
1. FAILURE OCCURS PARTIALLY ALONG PRE-EXISTING FOLIATION.
2. FAILURE OCCURS COMPLETELY ALONG PRE-EXISTING FOLIATION.

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	JEF	KDE
REV	DATE	DESCRIPTION	PREP'D	RVW'D

APPENDIX A2

FIGURES

(Pages A2-1 to A2-6)



LEGEND:

- BH16-001 2016 GEOTECHNICAL DRILLHOLES
- MW16-001 2016 MONITORING WELLS
- DT-272 1996 HISTORIC DRILLHOLE (GOLDER ASSOCIATES)
- INFERRED FAULT
- FAULT LINE
- GABBRO
- MORAINES
- QUARTZ MONZONITE
- SILTSTONE
- GOLDSLIDE PORPHYRY
- ANDESITE
- ARGILLITE
- GABBRO OUTCROP
- QUARTZ MONZONITE OUTCROP
- SILTSTONE OUTCROP
- GOLDSLIDE PORPHYRY OUTCROP
- ANDESITE OUTCROP
- ARGILLITE OUTCROP

DRILLHOLES				
LABEL	EASTING (m)	NORTHING (m)	AZIMUTH °	DIP °
BH16-001	452.728	6,204.160	0°	-90°
BH16-002	452.774	6,204.277	0°	-90°
BH16-003	452.442	6,204.918	0°	-90°
BH16-004	452.451	6,205.121	0°	-90°
BH16-005	452.384	6,204.956	64°	-60°
BH16-006	452.525	6,204.589	0°	-90°
BH16-007	452.493	6,204.535	0°	-90°
BH16-008	452.550	6,204.409	0°	-90°
BH16-009	452.362	6,204.903	45°	-50°
BH16-010	452.435	6,204.669	160°	-50°

MONITORING WELLS				
LABEL	EASTING (m)	NORTHING (m)	AZIMUTH °	DIP °
MW16-001	452.283	6,205.109	0°	-90°
MW16-002	452.332	6,204.615	0°	-90°
MW16-003	452.415	6,204.434	0°	-90°
MW16-004	452.281	6,205.112	0°	-90°

- NOTES:**
- COORDINATE GRID IS UTM NAD 83 ZONE 9.
 - TOPO PROVIDED BY JDS MINING (JANUARY 2016).
 - CONTOUR INTERVAL IS 1 METRE.
 - ALL ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
 - PLANT SITE LOCATION PROVIDED BY JDS MINING (NOVEMBER 2016).
 - NEGATIVE DIP IMPLIES DOWNHOLE.
 - INFERRED FAULTS PROVIDED BY IDM MINING LTD. (AUGUST 2016).
 - DRILLHOLE COORDINATES ARE FINAL SURVEYED COORDINATES PROVIDED BY IDM MINING LTD. (OCTOBER 2016).



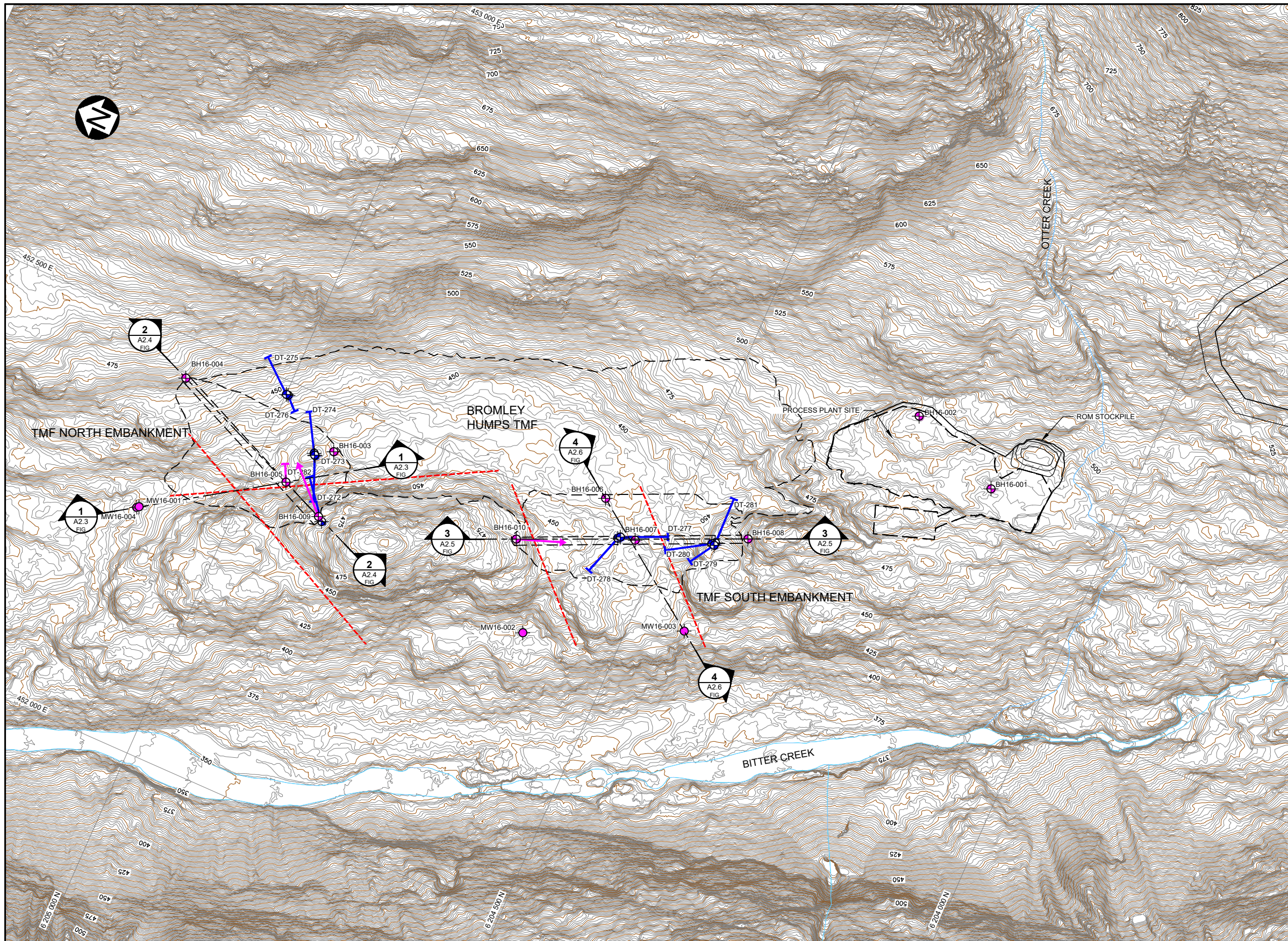
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 XREF FILE(S): HYDR PLANT SITE, CONTOURS - 1.m, LIBRARY, INFORMATION, IMAGE FILE(S)

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	29JUN17	ISSUED WITH REPORT	JEF	ELG/MJC	KDE

PLAN
SCALE A

IDM MINING LTD.
RED MOUNTAIN GOLD PROJECT
2016 GEOTECHNICAL SITE INVESTIGATION
SITE INVESTIGATION PLAN WITH BEDROCK & SURFICIAL GEOLOGY MAP

Knight Piésold CONSULTING	PIA NO. VA101-594/4	REF NO. 1
FIGURE A2.1		REV 0



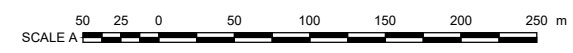
PLAN
SCALE A

- LEGEND:**
- BH16-001 2016 GEOTECHNICAL DRILLHOLES
 - MW16-001 2016 MONITORING WELLS
 - DT-272 1996 HISTORIC DRILLHOLE (GOLDER ASSOCIATES)
 - INFERRED FAULTS

DRILLHOLES				
LABEL	EASTING (m)	NORTHING (m)	AZIMUTH °	DIP °
BH16-001	452,728	6,204,160	0°	-90°
BH16-002	452,774	6,204,277	0°	-90°
BH16-003	452,442	6,204,918	0°	-90°
BH16-004	452,451	6,205,121	0°	-90°
BH16-005	452,384	6,204,956	64°	-60°
BH16-006	452,525	6,204,589	0°	-90°
BH16-007	452,493	6,204,535	0°	-90°
BH16-008	452,550	6,204,409	0°	-90°
BH16-009	452,362	6,204,903	45°	-50°
BH16-010	452,435	6,204,669	160°	-50°

MONITORING WELLS				
LABEL	EASTING (m)	NORTHING (m)	AZIMUTH °	DIP °
MW16-001	452,283	6,205,109	0°	-90°
MW16-002	452,332	6,204,615	0°	-90°
MW16-003	452,415	6,204,434	0°	-90°
MW16-004	452,281	6,205,112	0°	-90°

- NOTES:**
- COORDINATE GRID IS UTM NAD 83 ZONE 9.
 - TOPO PROVIDED BY JDS MINING (JANUARY 2016).
 - CONTOUR INTERVAL IS 1 METRE.
 - ALL ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
 - PLANT SITE LOCATION PROVIDED BY JDS MINING (NOVEMBER 2016).
 - NEGATIVE DIP IMPLIES DOWNHOLE.
 - INFERRED FAULTS PROVIDED BY IDM MINING (AUGUST 2016).
 - DRILLHOLE COORDINATES ARE FINAL SURVEYED COORDINATES PROVIDED BY IDM MINING (OCTOBER 2016).

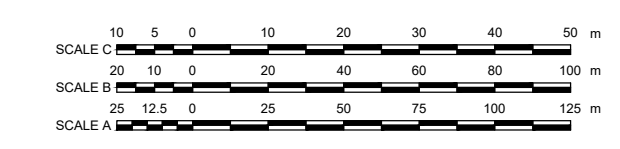
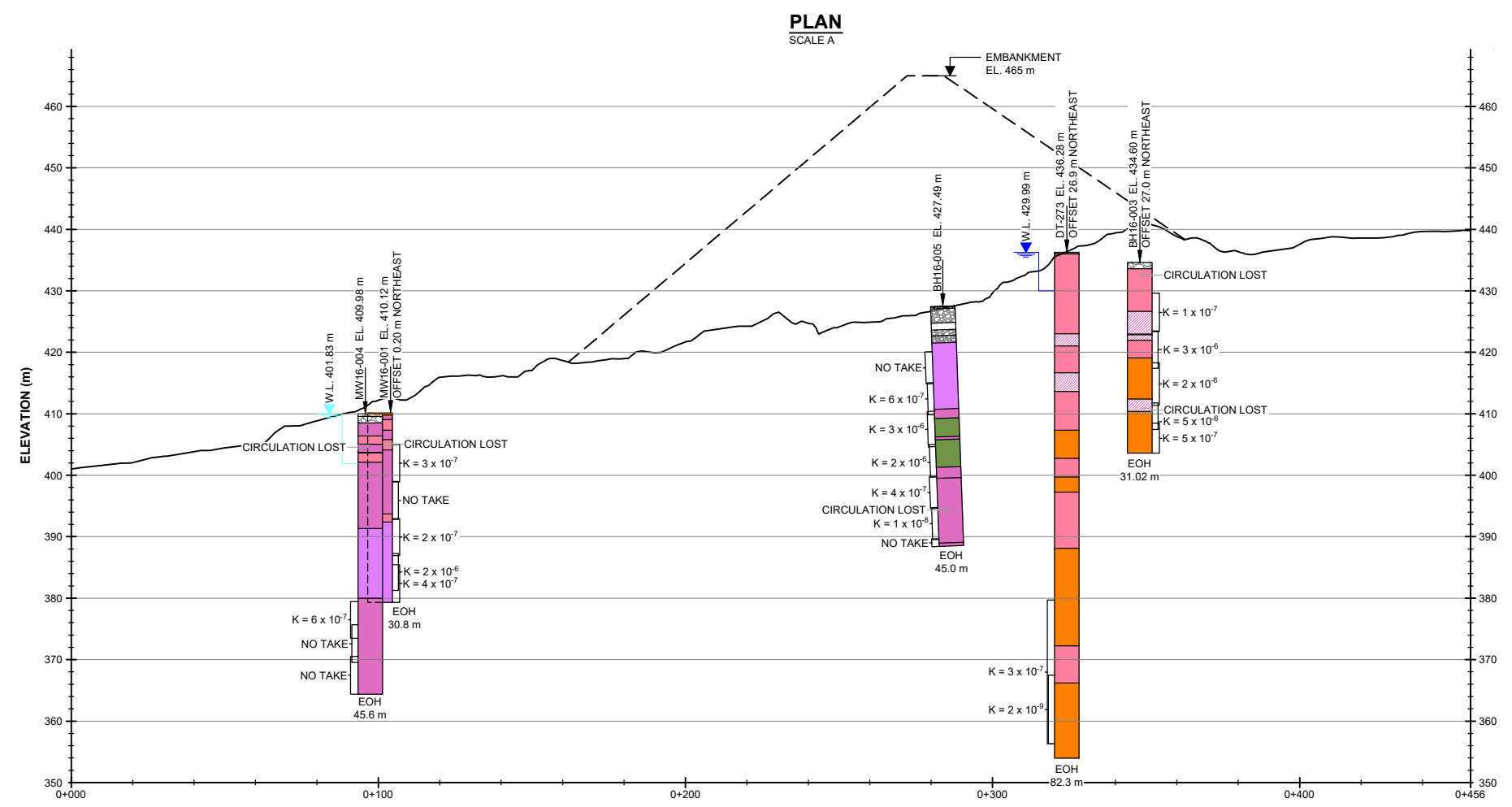
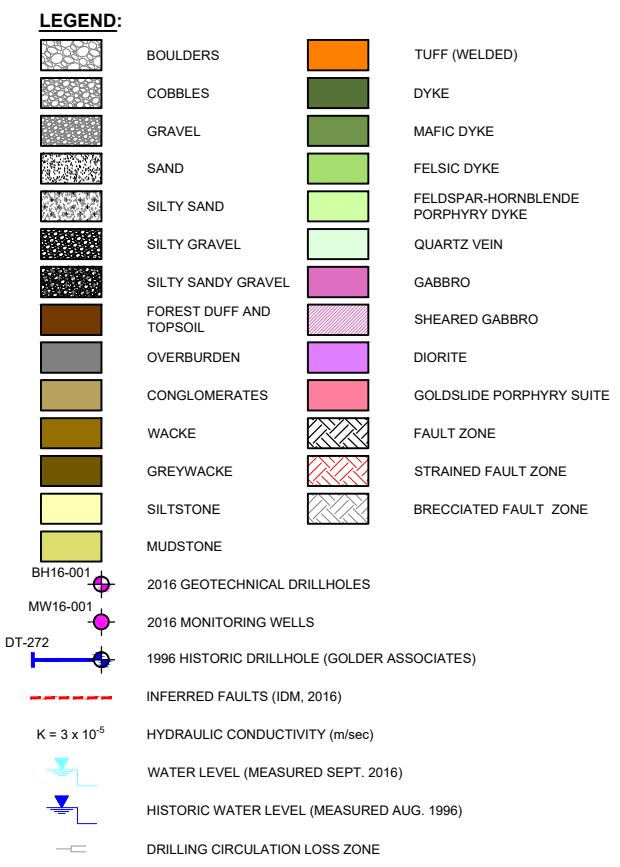
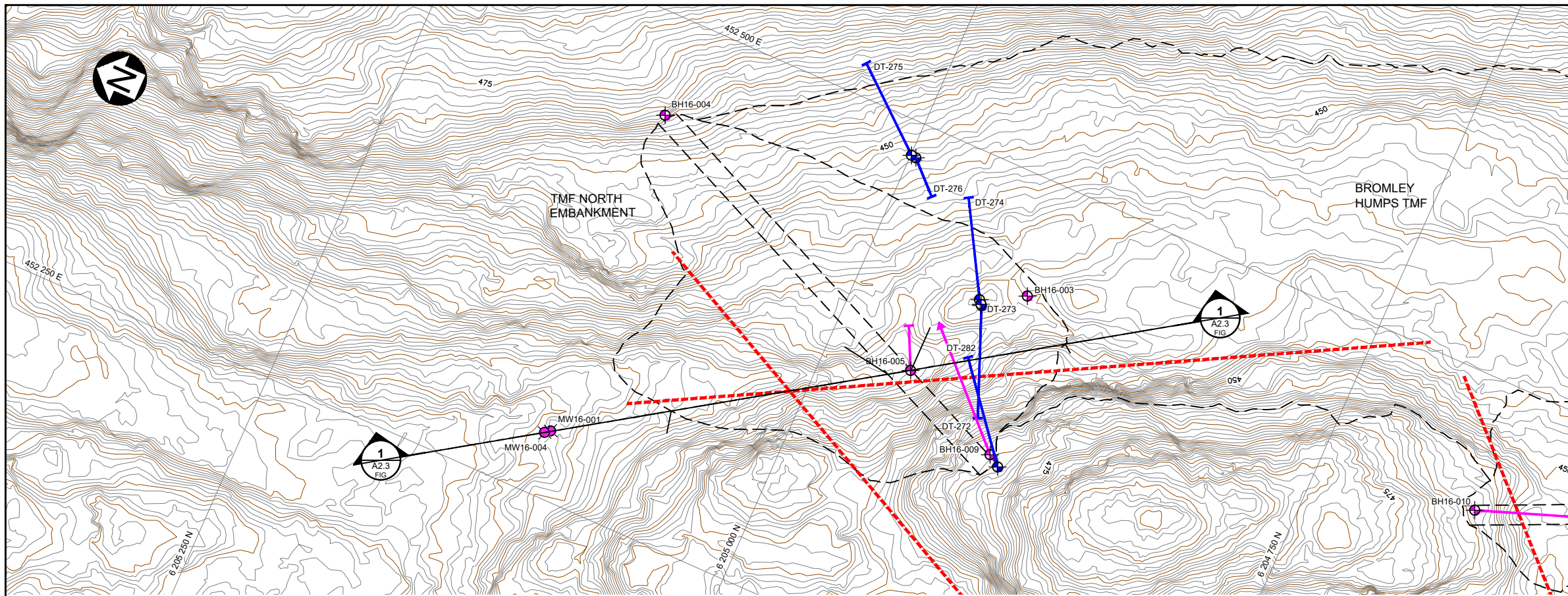


IDM MINING LTD.
RED MOUNTAIN GOLD PROJECT

**2016 GEOTECHNICAL SITE INVESTIGATION
SITE INVESTIGATION PLAN**

Knight Piesold CONSULTING	P/A NO. VA101-594/2	REF NO. 1
	FIGURE A2.2	

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 REV DATE DESCRIPTION DESIGNED DRAWN REVIEWED



IDM MINING LTD.
 RED MOUNTAIN GOLD PROJECT
 2016 GEOTECHNICAL SITE INVESTIGATION
 BROMLEY HUMPS TMF
 TMF NORTH EMBANKMENT - SECTION 1

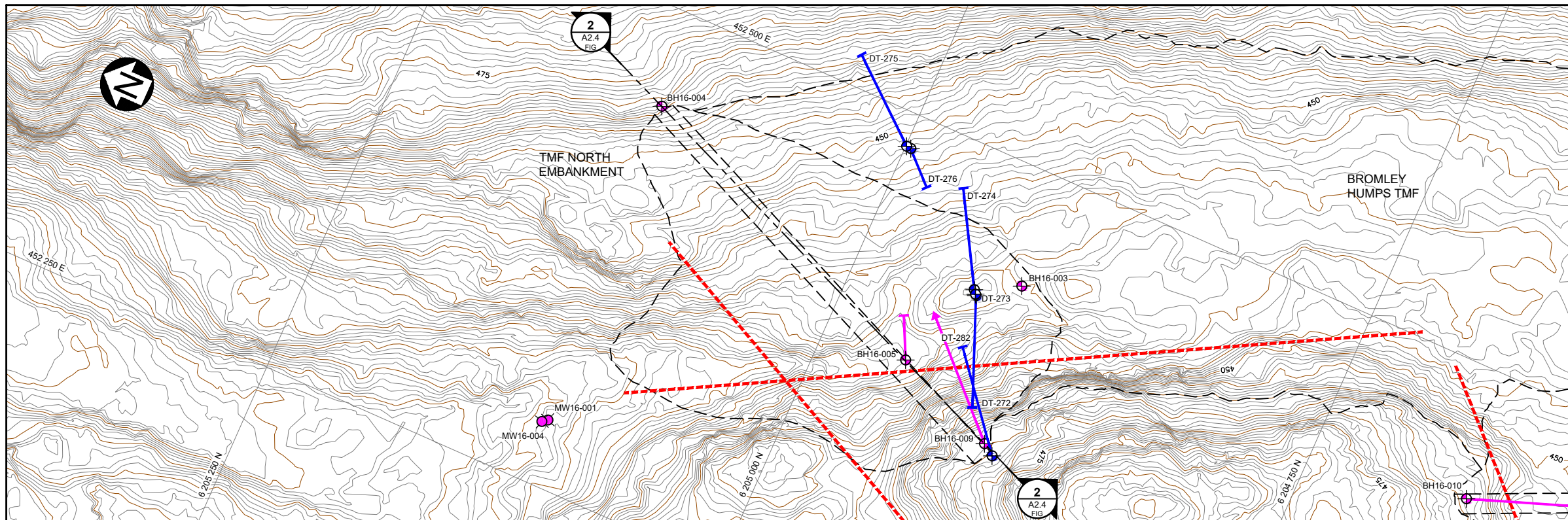
Knight Piésold CONSULTING

P/A NO. VA101-594/2 REF. NO. 1
 FIGURE A2.3 REV 0

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	29JUN'17	ISSUED WITH REPORT	JEF	ELG/MJC	KDE

1 SECTION
 HORIZONTAL: SCALE B
 VERTICAL: SCALE C



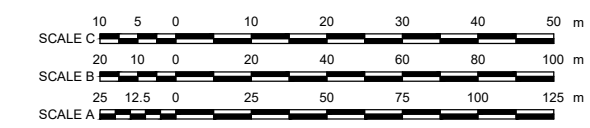
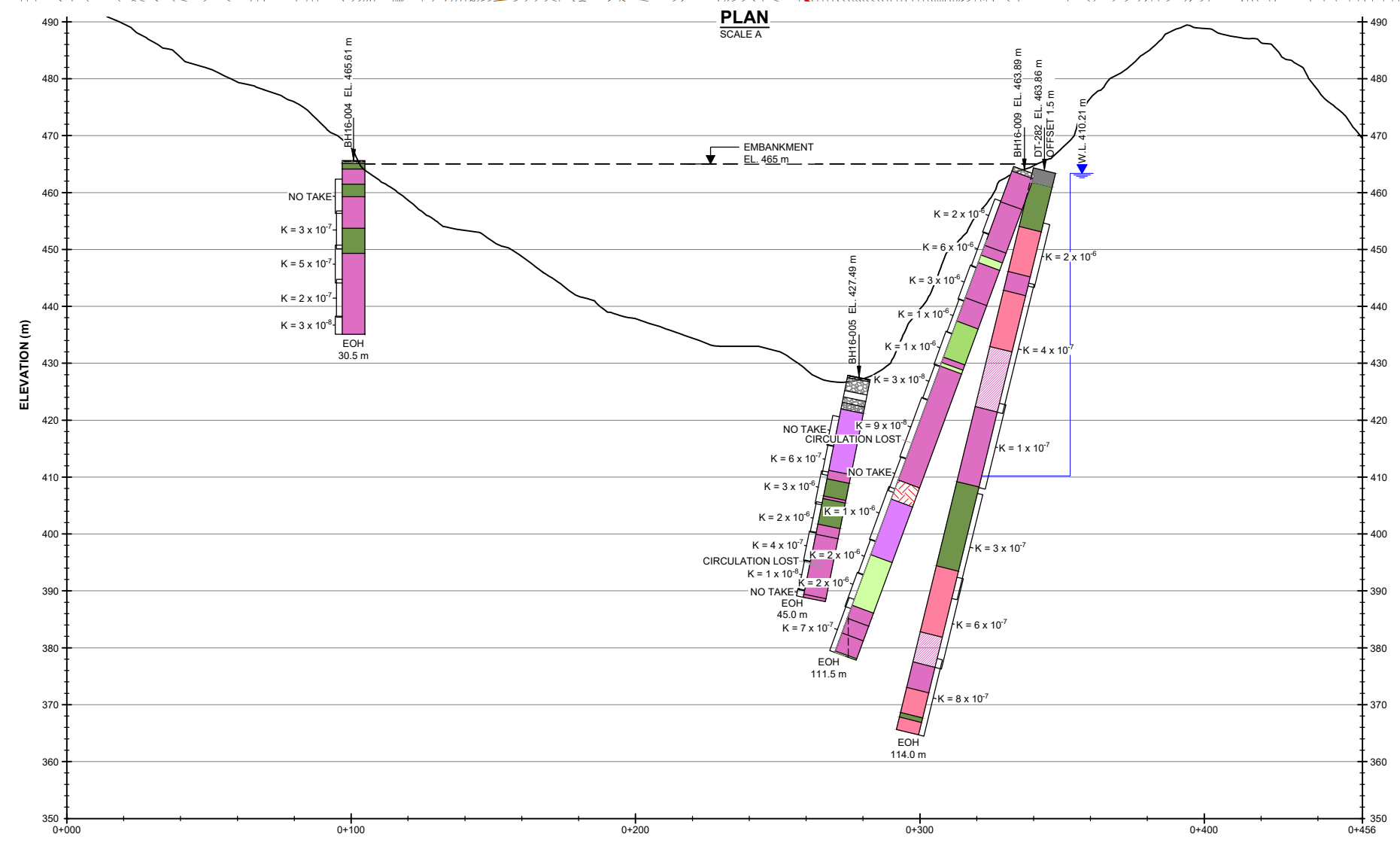
NOTES:

1. IN FIVE INSTANCES, HYDRAULIC CONDUCTIVITY TEST INTERVALS IN HISTORIC DRILLHOLES WERE TESTED TWICE, ONCE USING A FALLING HEAD TEST METHOD AND ONCE USING A CONSTANT HEAD TEST METHOD. THE MAJORITY OF REPORTED HISTORIC HYDRAULIC CONDUCTIVITY TESTS USED THE FALLING HEAD TEST METHOD. WHERE AN INTERVAL WAS TESTED USING TWO METHODS, THE FALLING HEAD TEST RESULT IS SHOWN. THE REPORTED FALLING HEAD TEST AND CONSTANT HEAD TEST RESULTS WERE WITHIN A MULTIPLE OF TWO, WITH THE EXCEPTION OF THE FIRST TEST INTERVAL IN DT-277 AND THE SECOND TEST INTERVAL IN DT-275 THAT WERE HALF AN ORDER OF MAGNITUDE AND OVER ONE ORDER OF MAGNITUDE DIFFERENT RESPECTIVELY.

LEGEND:

	BOULDERS		TUFF (WELDED)
	COBBLES		DYKE
	GRAVEL		MAFIC DYKE
	SAND		FELSIC DYKE
	SILTY SAND		FELDSPAR-HORNBLLENDE PORPHYRY DYKE
	SILTY GRAVEL		QUARTZ VEIN
	SILTY SANDY GRAVEL		GABBRO
	FOREST DUFF AND TOPSOIL		SHEARED GABBRO
	OVERBURDEN		DIORITE
	CONGLOMERATES		GOLDSLIDE PORPHYRY SUITE
	WACKE		FAULT ZONE
	GREYWACKE		STRAINED FAULT ZONE
	SILTSTONE		BRECCIATED FAULT ZONE
	MUDSTONE		

BH16-001 2016 GEOTECHNICAL DRILLHOLES
 MW16-001 2016 MONITORING WELLS
 DT-272 1996 HISTORIC DRILLHOLE (GOLDER ASSOCIATES)
 - - - - - INFERRED FAULTS (IDM, 2016)
 K = 3 x 10⁻⁵ HYDRAULIC CONDUCTIVITY (m/sec)
 WATER LEVEL (MEASURED SEPT. 2016)
 HISTORIC WATER LEVEL (MEASURED AUG. 1996)
 DRILLING CIRCULATION LOSS ZONE

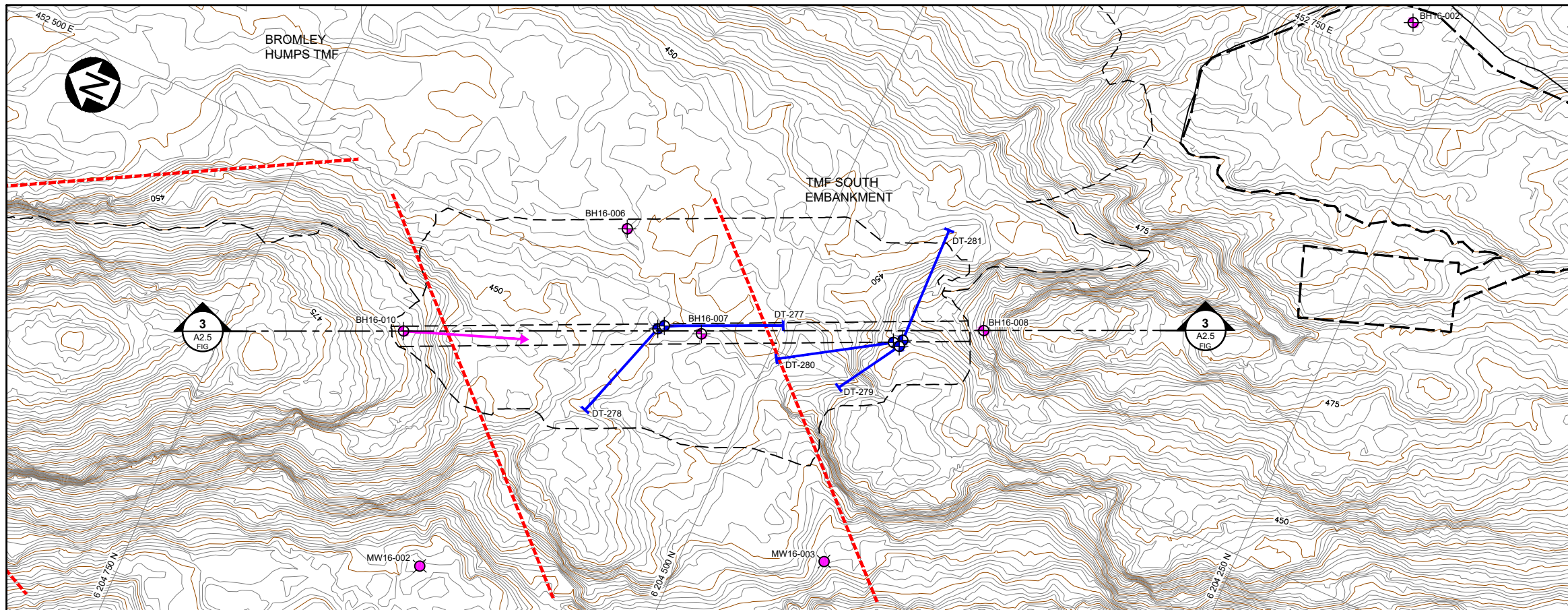


IDM MINING LTD.
 RED MOUNTAIN GOLD PROJECT
 2016 GEOTECHNICAL SITE INVESTIGATION
 BROMLEY HUMPS TMF
 TMF NORTH EMBANKMENT - SECTION 2

Knight Piésold CONSULTING

P/A NO. VA101-594/2 REF. NO. 1
 FIGURE A2.4 REV 0

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 REV DATE DESCRIPTION DESIGNED DRAWN REVIEWED



PLAN
SCALE A

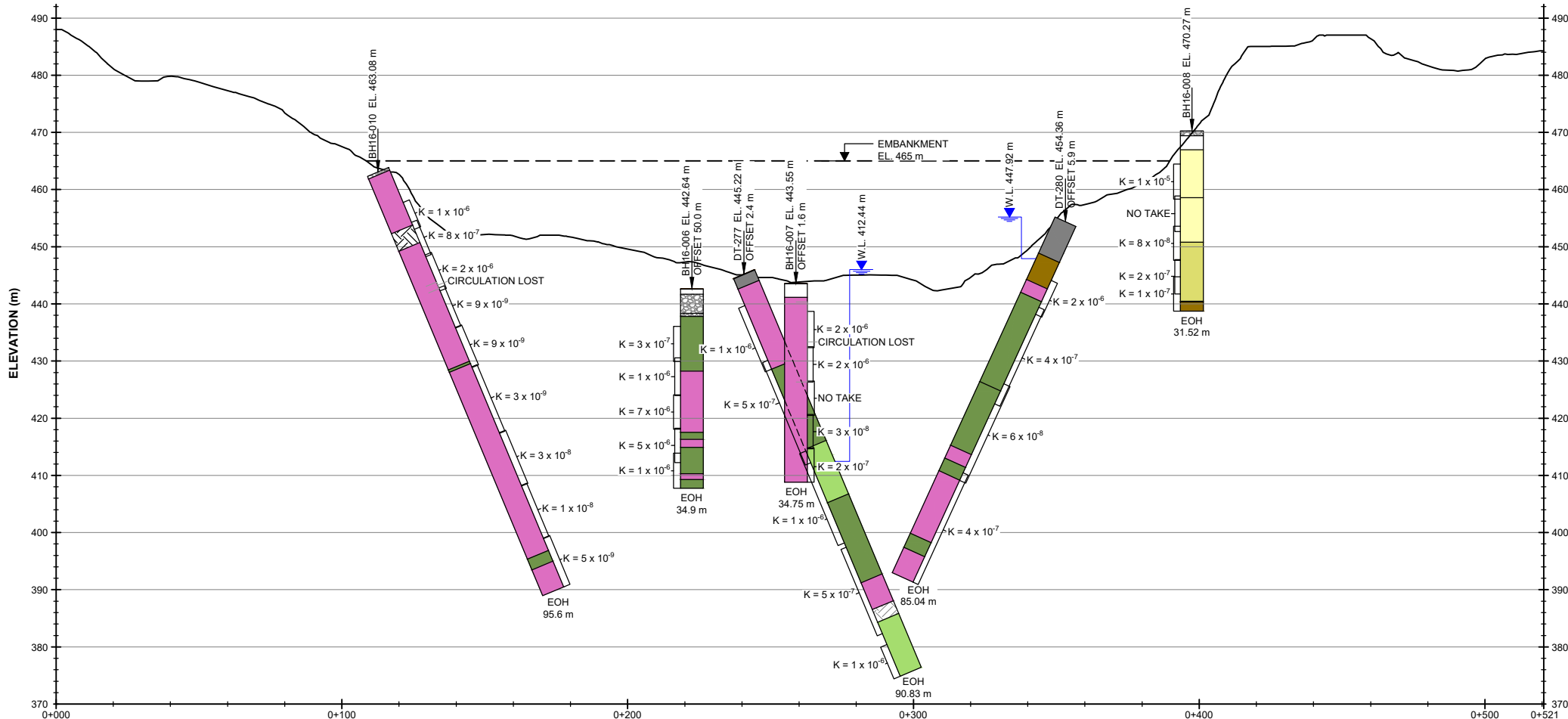
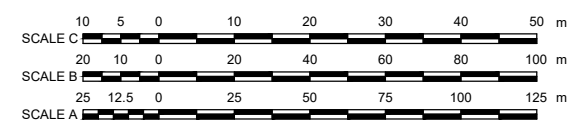
NOTES:

1. IN FIVE INSTANCES, HYDRAULIC CONDUCTIVITY TEST INTERVALS IN HISTORIC DRILLHOLES WERE TESTED TWICE, ONCE USING A FALLING HEAD TEST METHOD AND ONCE USING A CONSTANT HEAD TEST METHOD. THE MAJORITY OF REPORTED HISTORIC HYDRAULIC CONDUCTIVITY TESTS USED THE FALLING HEAD TEST METHOD. WHERE AN INTERVAL WAS TESTED USING TWO METHODS, THE FALLING HEAD TEST RESULT IS SHOWN. THE REPORTED FALLING HEAD TEST AND CONSTANT HEAD TEST RESULTS WERE WITHIN A MULTIPLE OF TWO, WITH THE EXCEPTION OF THE FIRST TEST INTERVAL IN DT-277 AND THE SECOND TEST INTERVAL IN DT-275 THAT WERE HALF AN ORDER OF MAGNITUDE AND OVER ONE ORDER OF MAGNITUDE DIFFERENT RESPECTIVELY.

LEGEND:

- | | | | |
|--|-------------------------|--|------------------------------------|
| | BOULDERS | | TUFF (WELDED) |
| | COBBLES | | DYKE |
| | GRAVEL | | MAFIC DYKE |
| | SAND | | FELSIC DYKE |
| | SILTY SAND | | FELDSPAR-HORNBLLENDE PORPHYRY DYKE |
| | SILTY GRAVEL | | QUARTZ VEIN |
| | SILTY SANDY GRAVEL | | GABBRO |
| | FOREST DUFF AND TOPSOIL | | SHEARED GABBRO |
| | OVERBURDEN | | DIORITE |
| | CONGLOMERATES | | GOLDSLIDE PORPHYRY SUITE |
| | WACKE | | FAULT ZONE |
| | GREYWACKE | | STRAINED FAULT ZONE |
| | SILTSTONE | | BRECCIATED FAULT ZONE |
| | MUDSTONE | | |

- 2016 GEOTECHNICAL DRILLHOLES
- 2016 MONITORING WELLS
- 1996 HISTORIC DRILLHOLE (GOLDER ASSOCIATES)
- INFERRED FAULTS (IDM, 2016)
- $K = 3 \times 10^{-5}$ HYDRAULIC CONDUCTIVITY (m/sec)
- WATER LEVEL (MEASURED SEPT. 2016)
- HISTORIC WATER LEVEL (MEASURED AUG. 1996)
- DRILLING CIRCULATION LOSS ZONE

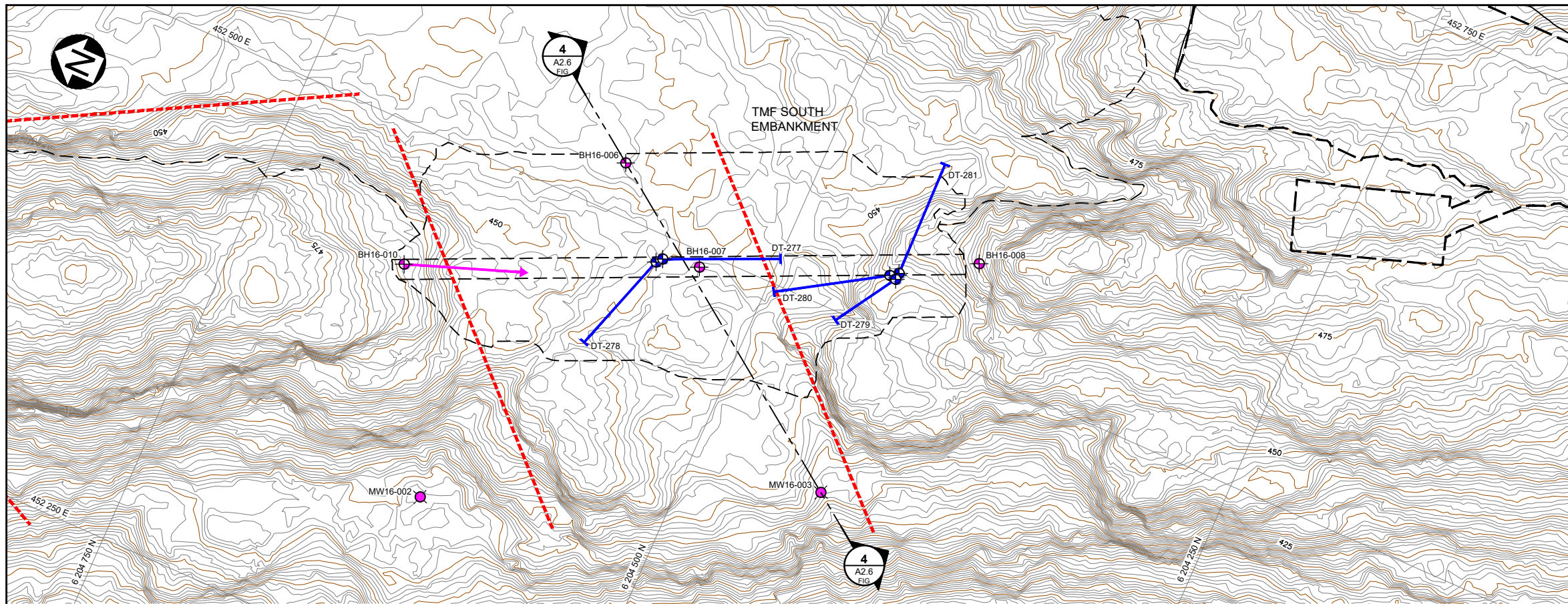


3 SECTION
HORIZONTAL: SCALE B
VERTICAL: SCALE C

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REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	29JUN'17	ISSUED WITH REPORT	JEF	ELG/MJC	KDE

IDM MINING LTD.		
RED MOUNTAIN GOLD PROJECT		
2016 GEOTECHNICAL SITE INVESTIGATION BROMLEY HUMPS TMF TMF SOUTH EMBANKMENT - SECTION 3		
Knight Piésold CONSULTING	P/A NO. VA101-594/2	REF NO. 1
FIGURE A2.5		REV 0



PLAN
SCALE A

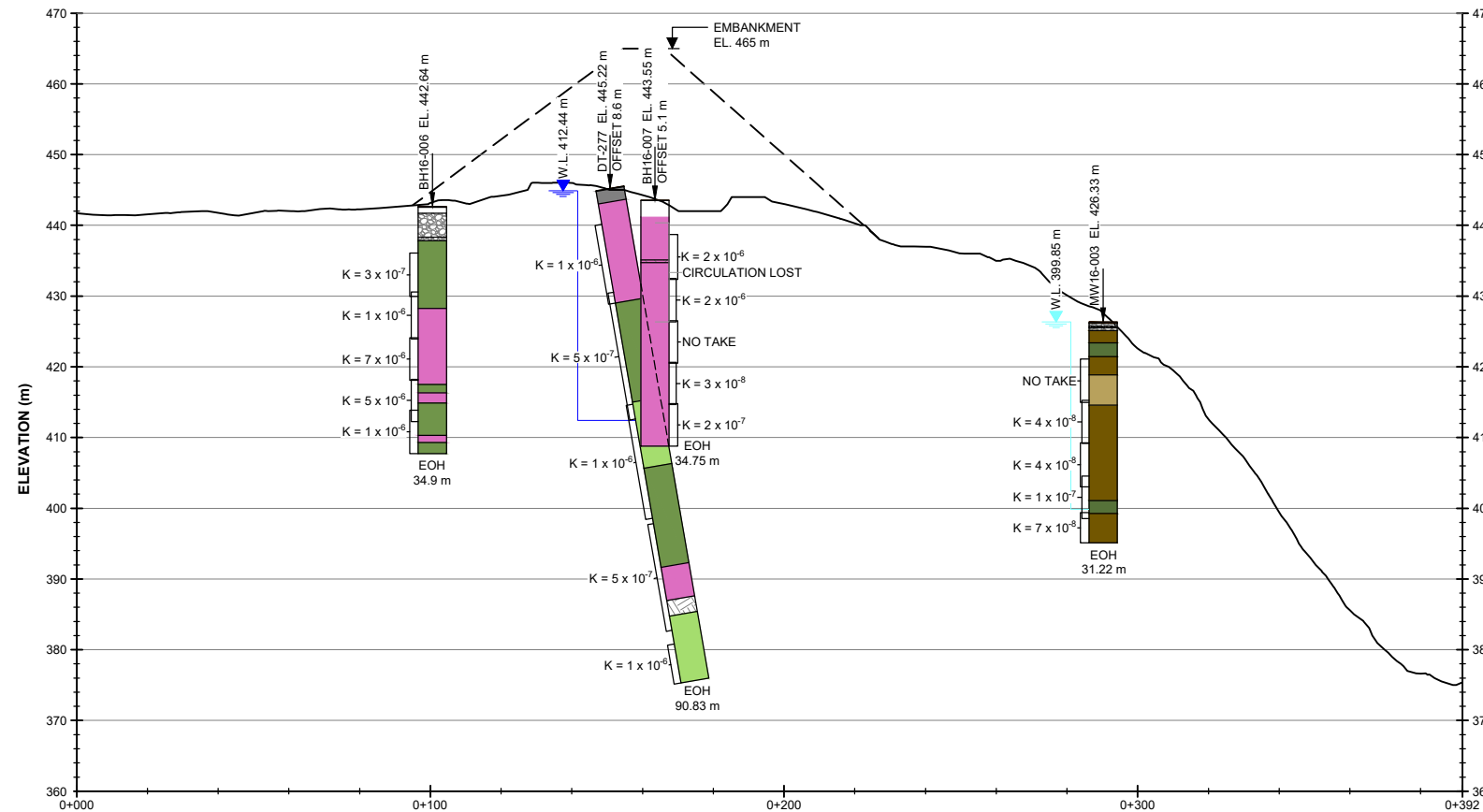
NOTES:

1. IN FIVE INSTANCES, HYDRAULIC CONDUCTIVITY TEST INTERVALS IN HISTORIC DRILLHOLES WERE TESTED TWICE, ONCE USING A FALLING HEAD TEST METHOD AND ONCE USING A CONSTANT HEAD TEST METHOD. THE MAJORITY OF REPORTED HISTORIC HYDRAULIC CONDUCTIVITY TESTS USED THE FALLING HEAD TEST METHOD. WHERE AN INTERVAL WAS TESTED USING TWO METHODS, THE FALLING HEAD TEST RESULT IS SHOWN. THE REPORTED FALLING HEAD TEST AND CONSTANT HEAD TEST RESULTS WERE WITHIN A MULTIPLE OF TWO, WITH THE EXCEPTION OF THE FIRST TEST INTERVAL IN DT-277 AND THE SECOND TEST INTERVAL IN DT-275 THAT WERE HALF AN ORDER OF MAGNITUDE AND OVER ONE ORDER OF MAGNITUDE DIFFERENT RESPECTIVELY.

LEGEND:

	BOULDERS		TUFF (WELDED)
	COBBLES		DYKE
	GRAVEL		MAFIC DYKE
	SAND		FELSIC DYKE
	SILTY SAND		FELDSPAR-HORNBLLENDE PORPHYRY DYKE
	SILTY GRAVEL		QUARTZ VEIN
	SILTY SANDY GRAVEL		GABBRO
	FOREST DUFF AND TOPSOIL		SHEARED GABBRO
	OVERBURDEN		DIORITE
	CONGLOMERATES		GOLDSLIDE PORPHYRY SUITE
	WACKE		FAULT ZONE
	GREYWACKE		STRAINED FAULT ZONE
	SILTSTONE		BRECCIATED FAULT ZONE
	MUDSTONE		

- BH16-001 2016 GEOTECHNICAL DRILLHOLES
- MW16-001 2016 MONITORING WELLS
- DT-272 1996 HISTORIC DRILLHOLE (GOLDER ASSOCIATES)
- INFERRED FAULTS (IDM, 2016)
- $K = 3 \times 10^{-5}$ HYDRAULIC CONDUCTIVITY (m/sec)
- WATER LEVEL (MEASURED SEPT. 2016)
- HISTORIC WATER LEVEL (MEASURED AUG. 1996)
- DRILLING CIRCULATION LOSS ZONE



4 SECTION
HORIZONTAL: SCALE B
VERTICAL: SCALE C



IDM MINING LTD.		
RED MOUNTAIN GOLD PROJECT		
2016 GEOTECHNICAL SITE INVESTIGATION BROMLEY HUMPS TMF TMF SOUTH EMBANKMENT - SECTION 4		
	P/A NO. VA101-594/2	REF NO. 1
FIGURE A2.6		REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	29JUN'17	ISSUED WITH REPORT	JEF	ELG/MJC	KDE

APPENDIX B

GRAPHICAL DRILLHOLE LOGS

Appendix B1	Geotechnical Drillhole Graphical Drillhole Logs
Appendix B2	Groundwater Monitoring Well Graphical Drillhole Logs
Appendix B3	1996 Site Investigation Graphical Drillhole Logs

APPENDIX B1

GEOTECHNICAL DRILLHOLE GRAPHICAL DRILLHOLE LOGS

(Pages B1-1 to B1-55)

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,728 E, 6,204,160 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 30.80 m

Drillhole No.: BH16-001
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 492.2 m
 Azimuth, Inclination: 0, -90

Page: 1 of 4
 Date Started: Aug 13, 16
 Date Completed: Aug 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
0	492		BOULDERS & COBBLES (0 to 0.58 m) Subrounded; poorly graded; grey; loose; moist; finer materials washed away during drilling process. Inferred from core samples retrieved from casing.	0													No hydraulic conductivity testing completed.
1	491		GREYWACKE (0.58 to 8.05 m) Grey to dark grey; fine grained; some convoluted textures, weakly bedded; medium strong; slightly to moderately fractured, some low angle fractures; slightly weathered; some chloritic and iron oxide staining on joint surfaces; few 1-3 mm thick calcite veinlets; some convoluted textures; few zones of lighter coloured beds.	68				50									
2	490			94				50									
					UCS-01												
3	489			100				50									
4	488			100				50									
5	487			100				25									
6	486			100				25									
7	485		BROKEN ZONE (6.84 to 8.01 m) Broken Zone within Greywacke unit	99				20									
8	484		DYKE (8.05 to 9.59 m) Light grey purple; fine grained; weakly foliated; medium strong; moderately to highly fractured and rubbleized; slightly weathered; dyke present in shear zone; calcareous matrix.	100				15									
9	483			100				20									

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,728 E, 6,204,160 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 30.80 m

Drillhole No.: BH16-001
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 492.2 m
 Azimuth, Inclination: 0, -90

Page: 2 of 4
 Date Started: Aug 13, 16
 Date Completed: Aug 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
11	482		GREYWACKE (9.59 to 10.22 m) Dark grey; fine grained; some convoluted textures, weakly bedded; medium strong; slightly to moderately fractured, some low angle fractures; slightly weathered; some chloritic and iron oxide staining on joint surfaces; few 1-3 mm thick calcite veinlets; some convoluted textures; few zones of lighter coloured beds.	100				50								
12	481		GABBRO OR MAFIC DYKE (10.22 to 12.89 m) Dark grey with light brown blebs; fine grained; weakly bedded; weak; moderately to highly fractured and rubbleized; slightly weathered; fine pyrite veinlets (1-2 mm thick) along the edges of the intrusion; dyke intruding subparallel to core axis; too fine grained to identify mineralization.	100				50								GWL measured during Pressure Transducer Installation.
13	480		GREYWACKE (12.89 to 30.8 m) Dark grey; fine grained; weakly bedded, some beds look convoluted, small offsets by microfaults; strong to very strong; moderately fractured, joints generally dipping approx. 50° relative to core axis; fresh to slightly weathered; trace iron oxide staining on most joint surfaces; few calcite veins cross-cutting bedding.	100				50								
15	479			96				40								
16	478		BROKEN ZONE (15.8 to 17.3 m) Broken Zone within Greywacke unit	100				40								
17	477				UCS-02			40								Mini-Diver Pressure Transducer - S/N: SNV1119 - Installation Depth: 16.61 mbgs
18	476			68				75								
19	475			100				75								
19	474			100				75								
19	473			100				35								

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B1-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,728 E, 6,204,160 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 30.80 m

Drillhole No.: BH16-001
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 492.2 m
 Azimuth, Inclination: 0, -90

Page: 3 of 4
 Date Started: Aug 13, 16
 Date Completed: Aug 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
472			GREYWACKE (12.89 to 30.8 m) Dark grey; fine grained; weakly bedded, some beds look convoluted, small offsets by microfaults; strong to very strong; moderately fractured, joints generally dipping approx. 50° relative to core axis; fresh to slightly weathered; trace iron oxide staining on most joint surfaces; few calcite veins cross-cutting bedding.													
21	471		BROKEN ZONE (18.8 to 20.3 m) Broken Zone within Greywacke unit	99				60								
22	470			100				100								
23	469															
24	468			100				60								
25	467			99				60								
26	466															
27	465			100				50								
28	464				UCS-03											
29	463			94				50								

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B1-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,728 E, 6,204,160 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 30.80 m

Drillhole No.: BH16-001
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 492.2 m
 Azimuth, Inclination: 0, -90

Page: 4 of 4
 Date Started: Aug 13, 16
 Date Completed: Aug 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
462				100				50								
31	461		End of Drillhole: 30.8 m Target Depth Reached													
32	460															
33	459															
34	458															
35	457															
36	456															
37	455															
38	454															
39	453															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,774 E, 6,204,277 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.30 m; HQ3 to 30.80 m

Drillhole No.: BH16-002
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 507.9 m
 Azimuth, Inclination: 0, -90

Page: 1 of 4
 Date Started: Aug 14, 16
 Date Completed: Aug 15, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

File M:\10\00564\02\ADATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\11\0100564\02\ADATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											20	40	60	80			
1	507		GREYWACKE (0 to 10.65 m) Black; fine grained; weakly bedded; medium to very strong; highly fractured, joints dipping at 30°-60° relative to core axis; fresh to slightly weathered; iron oxide staining on some joint surfaces; 1-2mm quartz-calcite veinlets following bedding, some local sections with <5 mm quartz-calcite veinlets convoluting.	59				40									No hydraulic conductivity testing completed.
2	506			100				60									
3	505			100				100									
4	504			98				100									
5	503			100				70									
6	502			100	UCS-01			35									
7	501			100				35									
8	500																
9	499			87				50									
	498																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

IDM Mining Ltd.
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FIGURE B1-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,774 E, 6,204,277 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.30 m; HQ3 to 30.80 m

Drillhole No.: BH16-002

Page: 2 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 14, 16

Total Length: 30.8 m

Date Completed: Aug 15, 16

Elevation: 507.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
11	497		MAFIC DYKE (10.65 to 11.46 m) Light beige; medium grained; massive with black and white phenocrysts; strong to very strong; moderately fractured; fresh to slightly weathered; sericite alteration in the groundmass and mafics altered to chlorite with patchy carbonate alteration.	100				50								
				94	UCS-02			75								
12	496		GREYWACKE (11.46 to 13.57 m) Black; fine grained; weakly bedded; strong to very strong; highly fractured, joints dipping at 30°-60° relative to core axis; fresh to slightly weathered; iron oxide staining on some joint surfaces; 1-2mm quartz-calcite veinlets following bedding, some local sections with <5 mm quartz-calcite veinlets convoluting.	100				120								
13	495		RUBBLE ZONE (11.5 to 11.65 m) Rubble Zone within Greywacke unit	100				75								
14	494		RUBBLE ZONE (12.8 to 12.95 m) Rubble Zone within Greywacke unit	100				50								
15	493		MAFIC DYKE (13.57 to 15.13 m) Light beige; medium grained; weakly foliated with black and white phenocrysts; strong; slightly to moderately fractured; fresh; sericite alteration (less pervasive) in the groundmass and mafics altered to chlorite with patchy carbonate alteration.	100				75								
16	492		GREYWACKE (15.13 to 30.8 m) Black; fine grained; weakly bedded; medium to very strong; highly fractured, joints dipping at 30°-60° relative to core axis; fresh to slightly weathered; iron oxide staining on some joint surfaces; 1-2mm quartz-calcite veinlets following bedding, some local sections with <5 mm quartz-calcite veinlets convoluting; microfaulting with meteoritic water alteration in the fracture plane.	100				35								
17	491															
18	490															
19	489															
	488															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Red Mountain Project**

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FIGURE B1-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,774 E, 6,204,277 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.30 m; HQ3 to 30.80 m

Drillhole No.: BH16-002

Drill Type: B15 Diamond Drill

Total Length: 30.8 m

Elevation: 507.9 m

Azimuth, Inclination: 0, -90

Page: 3 of 4

Date Started: Aug 14, 16

Date Completed: Aug 15, 16

Logged by: CAG/MEA

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
21	487		GREYWACKE (15.13 to 30.8 m) Black; fine grained; weakly bedded; medium to very strong; highly fractured, joints dipping at 30°-60° relative to core axis; fresh to slightly weathered; iron oxide staining on some joint surfaces; 1-2mm quartz-calcite veinlets following bedding, some local sections with <5 mm quartz-calcite veinlets convoluting; microfaulting with meteoritic water alteration in the fracture plane.	98				150								
22	486			87				150								
23	485			100				75								
24	484		BROKEN ZONE (23.3 to 23.6 m) Broken Zone within Greywacke unit	100				50								
25	483		BROKEN ZONE (24.8 to 26.1 m) Broken Zone within Greywacke unit	75				50								
26	482			89				35								
27	481			92				20								
28	480			100				50								
29	479		RUBBLE ZONE (28.7 to 29.3 m) Rubble Zone within Greywacke unit	100				25								
	478							25								

Mini-Diver Pressure Transducer - S/N: SNV1146 - Installation Depth: 27.06 mbgs
 GWL measured after standpipe piezometer installation. Confirmed during Pressure Transducer Installation.

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Ref. No.
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FIGURE B1-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,774 E, 6,204,277 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.30 m; HQ3 to 30.80 m

Drillhole No.: BH16-002
 Drill Type: B15 Diamond Drill
 Total Length: 30.8 m
 Elevation: 507.9 m
 Azimuth, Inclination: 0, -90

Page: 4 of 4
 Date Started: Aug 14, 16
 Date Completed: Aug 15, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
31	477		End of Drillhole: 30.8 m Target Depth Reached	100				25								
32	476															
33	475															
34	474															
35	473															
36	472															
37	471															
38	470															
39	469															
40	468															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,442 E , 6,204,918 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.27 m; HQ3 to 31.02 m

Drillhole No.: BH16-003

Page: 1 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 16, 16

Total Length: 31.0 m

Date Completed: Aug 18, 16

Elevation: 434.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											RQD	RMR	SPT TEST 'N' VALUES - X			
											20	40	60	80		
0 to 1	434		BOULDER (0 to 1 m) Subrounded; uniformly graded; mottled grey to dark grey; loose; iron oxide staining, visible quartz veinlets; finer materials washed away during drilling process.	10												
1 to 7.93	433		GOLDSLIDE PORPHYRY SUITE (1 to 7.93 m) Light pink; medium to coarse grained; aphanitic, massive; strong; moderately to highly fractured; fresh to slightly weathered; clay infill on one joint at 4.39 m; chlorite, calcite and iron oxide staining on joint surfaces; 2-3 mm diameter phenocrysts (approx. 70% of groundmass) with 1 mm diameter hornblende laths; chlorite altering mafics; grades into sheared zone below.	97	UCS-01			50								
1.4 to 1.8	432		BROKEN ZONE (1.4 to 1.8 m) Broken Zone within Goldslide Porphyry unit	100				50								
7.93 to 11.64	429		SHEARED GABBRO (7.93 to 11.64 m) Grey to dark grey; fine to medium grained; massive; medium strong; moderately to highly fractured, occasional small broken zones; slightly weathered; abundant calcite; coarse brown biotite (non-magnetic); shear fabric at a low angle to core axis; large quartz vein at lower contact.	100	UCS-02			25								
4.98 to 11.24	425			98				25								Packer Test #1 - 4.98-11.24 m - 1E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

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FIGURE B1-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,442 E, 6,204,918 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.27 m; HQ3 to 31.02 m

Drillhole No.: BH16-003
 Drill Type: B15 Diamond Drill
 Total Length: 31.0 m
 Elevation: 434.6 m
 Azimuth, Inclination: 0, -90

Page: 2 of 4
 Date Started: Aug 16, 16
 Date Completed: Aug 18, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
424	11		SHEARED GABBRO (7.93 to 11.64 m) Grey to dark grey; fine to medium grained; massive; medium strong; moderately to highly fractured, occasional small broken zones; slightly weathered; abundant calcite; coarse brown biotite (non-magnetic); shear fabric at a low angle to core axis; large quartz vein at lower contact.	100				25								
423	12		QUARTZ VEIN (11.64 to 11.75 m)													
422	13		SHEARED GABBRO (11.75 to 12.63 m) Grey to dark grey; fine to medium grained; massive; medium strong; moderately to highly fractured, occasional small broken zones; slightly weathered; abundant calcite; coarse brown biotite (non-magnetic); shear fabric at a low angle to core axis; large quartz vein at upper contact.	98				35								
421	14		GOLDSLIDE PORPHYRY SUITE (12.63 to 15.5 m) Light green grey; fine grained; aphanitic, massive; strong to very strong; moderately to highly fractured; fresh; iron oxide staining on some joint surfaces; calcite veining throughout; quartz veinlets with halos (sometimes with pyrite or chlorite); 2-3 mm diameter phenocrysts mostly masked by silica.	100				150								
420	15		TUFF (WELDED) (15.5 to 22.22 m) Grey; fine to medium grained; weakly bedded (barely visible); strong; moderately to highly fractured; fresh; iron oxide infill on some joints; trace quartz veinlets; 1-2 mm diameter feldspar phenocrysts scattered throughout; 2-4 mm dark mafics/lithic fragments, angular to rounded throughout with a couple of dark, rounded fragments up to 2 mm in diameter around 19.6 m.	100				50								
419	16															
418	17															
417	18															
416	19															
415	19															

Packer Test #2 - 11.12-17.20 m - 3E-06 m/s

Packer Test #3 - 16.30-23.20

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

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FIGURE B1-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,442 E, 6,204,918 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.27 m; HQ3 to 31.02 m

Drillhole No.: BH16-003
 Drill Type: B15 Diamond Drill
 Total Length: 31.0 m
 Elevation: 434.6 m
 Azimuth, Inclination: 0, -90

Page: 3 of 4
 Date Started: Aug 16, 16
 Date Completed: Aug 18, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
21	414		TUFF (WELDED) (15.5 to 22.22 m) Grey; fine to medium grained; weakly bedded (barely visible); strong; moderately to highly fractured; fresh; iron oxide infill on some joints; trace quartz veinlets; 1-2 mm diameter feldspar phenocrysts scattered throughout; 2-4 mm dark mafics/lithic fragments, angular to rounded throughout with a couple of dark, rounded fragments up to 2 mm in diameter around 19.6 m.	100	UCS-03			60									m - 2E-06 m/s
22	413		SHEARED GABBRO (22.22 to 24.22 m) Grey to dark grey; fine grained; massive; medium strong; intensely fractured; slightly to moderately weathered; clay, chlorite and iron oxide infill; abundant quartz-calcite; fracture spacing increasing with depth; quartz-calcite sometimes fractured and surrounded by a chlorite matrix.	86				50									
24	411		BROKEN ZONE (23.35 to 23.5 m) Broken Zone within Sheared Gabbro unit; heavy calcite infill.	100				50									
24	410		RUBBLE ZONE (23.66 to 24 m) Rubble Zone within Sheared Gabbro unit; light green oxidized gouge infill between rubble fragments.	99				25									Zone of Lost Circulation - 23.66-24.37 m
25	410		TUFF (WELDED) (24.22 to 31.02 m) Grey; fine to medium grained; weakly bedded (barely visible); strong; slightly to moderately fractured, becoming more competent with depth; slightly weathered; chlorite staining on joint surfaces; minor iron oxide staining; 1-2 mm diameter quartz and feldspar phenocrysts scattered throughout; some 2-4 mm dark mafics/lithic fragments, angular to rounded; dark light purple vein halos, approx. 1-3 mm wide; circulation loss up to 24.37 m.	100				25									Groundwater Level measured during Pressure Transducer Installation. Mini-Diver Pressure Transducer - S/N: SNV1150 - Installation Depth: 24.51 mbgs Packer Test #4 - 22.83-27.17 m - 5E-06 m/s
27	409		BROKEN ZONE (24.37 to 25 m) Broken Zone within Welded Tuff unit	100				50									
28	407																
29	406			97				50									Packer Test #5 - 26.13-31.02 m - 5E-07 m/s
30	405																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,442 E , 6,204,918 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.27 m; HQ3 to 31.02 m

Drillhole No.: BH16-003
 Drill Type: B15 Diamond Drill
 Total Length: 31.0 m
 Elevation: 434.6 m
 Azimuth, Inclination: 0 , -90

Page: 4 of 4
 Date Started: Aug 16, 16
 Date Completed: Aug 18, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
404		X Y X Y X Y X Y X Y		100				50								
31			End of Drillhole: 31.02 m Target Depth Reached	100				50								
403																
32																
402																
33																
401																
34																
400																
35																
399																
36																
398																
37																
397																
38																
396																
39																
395																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - East Abutment
 Coordinates: 452,451 E, 6,205,121 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.24 m; HQ3 to 30.50 m

Drillhole No.: BH16-004
 Drill Type: B15 Diamond Drill
 Total Length: 30.5 m
 Elevation: 465.6 m
 Azimuth, Inclination: 0, -90

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 Date Started: Aug 23, 16
 Date Completed: Aug 25, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										BLOW COUNTS (PER 6")	SPT TEST 'N' VALUES - X				
										---	---	---	---		
0	465		FOREST DUFF & TOPSOIL (0 to 0.1 m) Some gravel, angular; some silt; well graded; dark brown; very dense; moist; visible rootmat. From SPT recovery.	42	SPT-01	42	X	7.5/50+	R						
1	464		SILTY SAND (0.1 to 0.18 m) Fine to coarse grained; some gravel, fine to coarse grained, subangular to subrounded; some clay; well graded; non plastic; very dense; grey; moist. From SPT recovery.	100	UCS-01			25							
2	463		COBBLES & BOULDERS (0.18 to 0.5 m) Subrounded; some gravel, coarse grained, subangular to subrounded; poorly graded; grey; loose; moist; finer materials washed away during drilling process.	42	UCS-02			25							
3	462		MAFIC DYKE (0.5 to 1.5 m) Grey green; fine grained; massive; medium strong; slightly to moderately fractured; moderately weathered; iron oxide, calcite and chlorite infill; carbonate veinlets <1mm wide, increasing in frequency closer to contact; serpentinite-talc veinlets <3mm thick, light green coloured; sericite-chlorite alteration; minor pyroxene <1-2mm thick, biotite altered; contact with gabbro possibly faulted.	100				25							
4	461		RUBBLE ZONE (0.91 to 1.5 m) Rubble Zone within Mafic Dyke unit												
5	460		GABBRO (1.5 to 4.15 m) Light grey-green; medium grained; foliated; medium strong; slightly to moderately fractured; slightly weathered; chlorite, serpentinite and calcite infill; iron oxide staining on joint surfaces; undulating black chlorite veinlets <5mm thick; magnetic with coarse brown biotite and pyroxene <2mm thick; sharp undulating lower contact ~80° to core axis.	100				50							
6	459		MAFIC DYKE (4.15 to 6.35 m) Grey green; fine grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; chlorite, calcite and graphite infill; iron oxide staining on joint surfaces close to top contact; carbonate veinlets <1mm wide; sericite-chlorite alteration; minor pyroxene <1-2mm thick, biotite altered; sharp, low-angle lower contact, ~12° to core axis with black chlorite veinlet. Possibly fresher gabbro unit.	100				25							
7	458		GABBRO (6.35 to 11.9 m) Light grey-green; medium grained; foliated; medium strong; slightly to moderately fractured with one highly fractured section in middle of zone; slightly weathered; chlorite, calcite, graphite and serpentinite-talc infill in fractures; magnetic with coarse brown biotite and pyroxene <2mm thick.	100				25							
8	457		GABBRO (6.35 to 11.9 m) Light grey-green; medium grained; foliated; medium strong; slightly to moderately fractured with one highly fractured section in middle of zone; slightly weathered; chlorite, calcite, graphite and serpentinite-talc infill in fractures; magnetic with coarse brown biotite and pyroxene <2mm thick.	100				25							
9	456		GABBRO (6.35 to 11.9 m) Light grey-green; medium grained; foliated; medium strong; slightly to moderately fractured with one highly fractured section in middle of zone; slightly weathered; chlorite, calcite, graphite and serpentinite-talc infill in fractures; magnetic with coarse brown biotite and pyroxene <2mm thick.	100				25							

Packer Test #1 - 3.28-9.28 m
- No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - East Abutment
 Coordinates: 452,451 E , 6,205,121 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.24 m; HQ3 to 30.50 m

Drillhole No.: BH16-004
 Drill Type: B15 Diamond Drill
 Total Length: 30.5 m
 Elevation: 465.6 m
 Azimuth, Inclination: 0 , -90

Page: 2 of 4
 Date Started: Aug 23, 16
 Date Completed: Aug 25, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
455	11	+	GABBRO (6.35 to 11.9 m) Light grey-green; medium grained; foliated; medium strong; slightly to moderately fractured with one highly fractured section in middle of zone; slightly weathered; chlorite, calcite, graphite and serpentinite-talc infill in fractures; magnetic with coarse brown biotite and pyroxene <2mm thick.	100				50								
454	12	+	MAFIC DYKE (11.9 to 16.3 m) Grey green; coarse grained; porphyritic; strong; slightly to moderately fractured; trace quartz phenocrysts; iron oxide staining on joint surfaces; accicular hornblende laths <2-3mm thick with accicular diamond shape pyroxene <5mm thick; minor fps with vuggy hedge, possibly bleached xenolith, <5 mm, subrounded; trace pyrrhotite in veinlet selvage; silicified-sericitic at the contact margin; sharp lower contact.	100				60								
452	13	+	BROKEN ZONE (13.78 to 14.03 m) Broken Zone in Gabbro Unit. Broken fragments have iron oxide staining.	88				5								
451	14	+		97	UCS-03			75								
450	15	+		100				40								
449	16	+	GABBRO (16.3 to 30.5 m) Light grey-green; medium grained; foliated; medium strong to strong; slightly to moderately fractured; slightly weathered; serpentinite and black chlorite infill in fractures; black chlorite veinlets <5mm thick; magnetic with coarse brown biotite and pyroxene <2mm thick.	100				45								
448	17	+		94	UCS-04			70								
447	18	+		93				70								
446	19	+														

Groundwater level measured prior to grouting during VWP installation.
 Packer Test #2 - 8.86-15.50 m - 3E-07 m/s

Packer Test #3 - 14.86-21.50 m - 5E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

IDM Mining Ltd.
 Red Mountain Project



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - East Abutment
 Coordinates: 452,451 E , 6,205,121 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.24 m; HQ3 to 30.50 m

Drillhole No.: BH16-004
 Drill Type: B15 Diamond Drill
 Total Length: 30.5 m
 Elevation: 465.6 m
 Azimuth, Inclination: 0 , -90

Page: 3 of 4
 Date Started: Aug 23, 16
 Date Completed: Aug 25, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
21	445		GABBRO (16.3 to 30.5 m) Light grey-green; medium grained; foliated; medium strong to strong; slightly to moderately fractured; slightly weathered; serpentinite and black chlorite infill in fractures; black chlorite veinlets <5mm thick; magnetic with coarse brown biotite and pyroxene <2mm thick.	99				70										
				100				70										
22	444			101				60										
23	443																	
24	442			99				60										
25	441			100				60										
26	440																	
27	439			100				45										
28	438			100				30										
29	437			95				25										
30	436	100				25												

Packer Test #4 - 20.86-27.50 m - 2E-07 m/s

Vibrating Wire Piezometer
 Serial Number: VW38233
 Data Logger Serial Number: DT11289
 Packer Test #5 - 27.35-30.50 m - 3E-08 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

IDM Mining Ltd.
Red Mountain Project

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - East Abutment
 Coordinates: 452,451 E , 6,205,121 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.24 m; HQ3 to 30.50 m

Drillhole No.: BH16-004
 Drill Type: B15 Diamond Drill
 Total Length: 30.5 m
 Elevation: 465.6 m
 Azimuth, Inclination: 0 , -90

Page: 4 of 4
 Date Started: Aug 23, 16
 Date Completed: Aug 25, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
	435	+	End of Drillhole: 30.5 m Target Depth Reached													
	31															
	434															
	32															
	433															
	33															
	432															
	34															
	431															
	35															
	430															
	36															
	429															
	37															
	428															
	38															
	427															
	39															
	426															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E, 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HQ3 to 45.00 m

Drillhole No.: BH16-005

Page: 1 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 26, 16

Total Length: 45.0 m

Date Completed: Aug 29, 16

Elevation: 427.5 m

Logged by: CAG/MEA

Azimuth, Inclination: 64, -60

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
0	427		FOREST DUFF & TOPSOIL (0 to 0.1 m) Some sand; trace gravel, coarse, angular; poorly graded; dark brown; dense; moist; visible rootmat. From SPT recovery.	0	SPT-01 GS-01	59 23	G B	8/21/43	64	64						
1	426		SAND (0.1 to 0.36 m) Medium to coarse grained; some gravel, fine to coarse, subangular to subrounded; poorly graded; brown to grey; dense. From SPT recovery.	68	GS-02	64	G B	50+	R							
2	425		COBBLES (0.36 to 3.1 m) Rounded; some gravel, fine to coarse, rounded, varying lithologies; poorly graded; grey to dark grey; very dense; finer material washed away during drilling process.	31												
3	424		NO RECOVERY (3.1 to 4.4 m) No Recovery - Drill recovery washed away through drilling process	0												
4	423		COBBLES (4.4 to 5.5 m) Purplish grey (possibly highly weathered gabbro); fine to medium grained; massive; slightly weathered; pyrite infill on fracture surfaces; some gravel, subangular to subrounded; grey to dark grey; finer material washed away during drilling process.	72												
5	422		GRAVEL (5.5 to 6.84 m) Subrounded; uniformly graded; grey to dark grey; loose; finer material washed away during drilling process..	20												
6	421		DIORITE (6.84 to 19.27 m) Light grey-green; coarse grained; massive; medium strong to strong; moderately to highly fractured; fresh to slightly weathered; clay and calcite infill; calcite veins; felsic with minimal quartz; well developed plagioclase phenocrysts, <3mm in diameter, with local plagioclase blebs; fine accicular hornblende, <1mm thick; local mafic xenolith with chlorite alteration; lower gradational contact is more mafic and dark-grey coloured.	86				50								
7	420			100				50								
8	419			99				70								

Groundwater level measured prior to grouting during VWP installation.

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E , 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HQ3 to 45.00 m

Drillhole No.: BH16-005

Page: 2 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 26, 16

Total Length: 45.0 m

Date Completed: Aug 29, 16

Elevation: 427.5 m

Logged by: CAG/MEA

Azimuth, Inclination: 64 , -60

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
11	418		DIORITE (6.84 to 19.27 m) Light grey-green; coarse grained; massive; medium strong to strong; moderately to highly fractured; fresh to slightly weathered; clay and calcite infill; calcite veins; felsic with minimal quartz; well developed plagioclase phenocrysts, <3mm in diameter, with local plagioclase blebs; fine accicular hornblende, <1mm thick; local mafic xenolith with chlorite alteration; lower gradational contact is more mafic and dark-grey coloured.	100				60								
12	417		BROKEN ZONE (11.3 to 11.44 m) Broken Zone within Diorite unit	100	UCS-01			50								Packer Test #1 - 8.43-14.43 m - No Take
13	416		BROKEN ZONE (13.37 to 13.75 m) Broken Zone within Diorite unit	100				35								
14	415			100				50								
15	414		BROKEN ZONE (15.56 to 15.78 m) Broken Zone within Diorite unit	100				25								
16	413			93				25								
17	412			97				35								
18	411			97				25								
19																Packer Test #2 - 14.28-20.28 m - 6E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B1-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E , 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HQ3 to 45.00 m

Drillhole No.: BH16-005

Drill Type: B15 Diamond Drill

Total Length: 45.0 m

Elevation: 427.5 m

Azimuth, Inclination: 64 , -60

Page: 3 of 5

Date Started: Aug 26, 16

Date Completed: Aug 29, 16

Logged by: CAG/MEA

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
410	21		GABBRO (19.27 to 21 m) Dark grey; fine grained; strongly foliated; strong; highly fractured; slightly to moderately fractured; graphite, chlorite and quartz-calcite infill, trace pyrite blebs in selvage; sheared with pyroxenite altered to biotite (phlogopite); obscured upper contact is broken up; cross-cut by fine-grained, dark green-grey, silica-chlorite sills.	99				50									
409	22		RUBBLE ZONE (20.28 to 20.98 m) Rubble Zone within Gabbro unit.		UCS-02												
408	23		MAFIC DYKE (21 to 24.46 m) Light grey-green; medium grained; porphyritic; strong; moderately to highly fractured; fresh; intermediate intrusive unit with minimal quartz; well developed plagioclase phenocrysts, <1-2mm in diameter; fine grained mafic with chloritized hornblended in groundmass, and 1-2% pyroxenite veinlets, <2mm thick; strongly silicified; plagioclase is rimmed by alteration; more mafic, dark grey-black coloured at contact.	96				50									
407	24		BROKEN ZONE (23.69 to 24.46 m) Broken Zone at contact between Gabbro and Mafic Dyke units. Iron oxide staining on most fracture surfaces.	96				60									
406	25		GABBRO (24.46 to 25 m) Dark grey-black; fine grained; porphyritic, strongly foliated with brown biotite grain stretch; medium strong; highly fractured; fresh to slightly weathered; serpentine-chlorite with local talc in joint surfaces; completely sheared with quartz-calcite veins; crenulation and boudinage of gabbro and veins.	92				60									
405	26		RUBBLE ZONE (24.78 to 25 m) Rubble Zone within Gabbro unit.	100				45									
404	27		MAFIC DYKE (25 to 30.18 m) Dark grey-green; medium grained; medium strong to strong; slightly fractured; fresh to slightly weathered; intermediate intrusive unit with more mafic and minimal quartz; obscured plagioclase phenocryst rims; well developed pyroxenite, <4mm thick; local chlorite altered hornblende; strong silica alteration; more mafic, dark-grey coloured at contact.	97				45									
403	28		BROKEN ZONE (27.99 to 30.58 m) Broken Zone surrounding contact between Gabbro and Mafic Dyke units. Iron oxide staining on most fracture surfaces, gouge infill. 6 cm thick quartz vein at 30.23 m.	94				60									
402	29			100				45									
					UCS-03												
								5									
								45									

Packer Test #3 - 19.64-26.28 m - 3E-06 m/s

Packer Test #4 - 25.86-32.00 m - 2E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E , 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HQ3 to 45.00 m

Drillhole No.: BH16-005

Page: 4 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 26, 16

Total Length: 45.0 m

Date Completed: Aug 29, 16

Elevation: 427.5 m

Logged by: CAG/MEA

Azimuth, Inclination: 64 , -60

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
401	31		GABBRO (30.18 to 32.24 m) Dark grey-black; fine grained; massive; weak to medium strong; highly fractured, multiple healed fractures with quartz infill; slightly to moderately weathered; some chlorite, calcite and graphite infill; iron oxide staining on joint surfaces; sheared with quartz-calcite veins; crenulation and boudinage of gabbro and veins; sheared zone obliterated by silica altered gabbro unit with quartz-calcite veins, <5mm thick; local boudinage around veins; serpentinite-chlorite with local talc in vein selvage; fault gouge marking lower contact.	100				5									
400	32			100				35									
399	33		GABBRO (32.24 to 44.4 m) Dark grey-purple; medium grained; local strong foliation; massive; weak; highly fractured; moderately weathered; serpentinite-talc in joint infill; local fault gouge within unit; pyroxenite altered to brown biotite (phlogopite) from 37.91 m to 38.38 m, circulation loss throughout altered section.	100				15									
398	34			100				15									
397	35			100				15									
396	36			100				15									
395	37		BROKEN ZONE (37.41 to 38.38 m) Broken Zone within major Gabbro unit. Heavy chlorite alteration.	100				20									
394	38			100				10									
393	39			100													

Packer Test #5 - 31.85-37.85 m - 4E-07 m/s

Vibrating Wire Piezometer
 Serial Number: VW38231
 Data Logger Serial Number: DT11288
 Zone of Lost Circulation - 37.85-38.38 m

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
 Red Mountain Project**

**Knight Piésold
 CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E , 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HQ3 to 45.00 m

Drillhole No.: BH16-005

Page: 5 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 26, 16

Total Length: 45.0 m

Date Completed: Aug 29, 16

Elevation: 427.5 m

Logged by: CAG/MEA

Azimuth, Inclination: 64 , -60

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
											20	40	60	80				
41	392		GABBRO (32.24 to 44.4 m) Dark grey-purple; medium grained; local strong foliation; massive; weak; highly fractured; moderately weathered; serpentinite-talc in joint infill; local fault gouge within unit; pyroxenite altered to brown biotite (phlogopite) from 37.91 m to 38.38 m, circulation loss throughout altered section.	100				15								Packer Test #6 - 37.70-43.70 m - 1E-08 m/s		
			RUBBLE ZONE (40.12 to 40.28 m) Rubble Zone within Gabbro unit.	100				20										
42	391																	
43	390				100				25									
44					UCS-04													
45	389		GABBRO (44.4 to 45 m) Dark greenish grey; fine to medium grained, inequigranular; massive; slightly fractured; slightly weathered; graphite infill; sheared gabbro unit with black overprint groundmass; black chlorite and gabbro boudinage to rounded clasts.	100				35								Packer Test #7 - 43.55-45.00 m - No Take		
46	388		End of Drillhole: 45 m Target Depth Reached															
47	387																	
48	386																	
49	385																	

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Red Mountain Project**



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FIGURE B1-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Upstream Toe
 Coordinates: 452,525 E, 6,204,589 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 5.00 m; HQ3 to 34.90 m

Drillhole No.: BH16-006
 Drill Type: B15 Diamond Drill
 Total Length: 34.9 m
 Elevation: 442.6 m
 Azimuth, Inclination: 0, -90

Page: 1 of 4
 Date Started: Aug 29, 16
 Date Completed: Aug 31, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
0	442.6		FOREST DUFF & TOPSOIL (0 to 0.07 m) Some sand; trace gravel, coarse, angular; gap graded; dark brown; very dense; moist; visible rootmat. From SPT recovery.	36	SPT-01	29		13/50+		R						
1	441.5		NO RECOVERY (0.07 to 0.93 m) No recovery from advancing HWT casing.													
2	441.0		COBBLES (0.93 to 4.31 m) Subangular to subrounded, fine grained, massive, slightly weathered; uniformly graded; dark grey to light greenish grey; loose; wet; finer material washed away during drilling process.	65												
3	440.0			57												
4	439.0			100												
5	438.0		GRAVEL (4.31 to 4.83 m) Subangular to subrounded; uniformly graded; dark grey & purple; loose; wet; finer material washed away during drilling process.	69												
6	437.0		MAFIC DYKE (4.83 to 14.39 m) Light grey; medium grained; massive; strong; moderately to highly fractured; fresh to slightly weathered; biotization with epidote-carbonate alteration on joint surfaces; trace quartz veinlets; intrusive unit with fine grained brown biotite (phlogopite) and chlorite altered mafic; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands.	82												
7	436.0		BROKEN ZONE (5.52 to 5.63 m) Broken Zone within Mafic Dyke unit.	100	UCS-01											
8	435.0			100												
9	434.0			100												
10	433.0			100												

Groundwater level measured prior to grouting during VWP installation.

Packer Test #1 - 6.56-12.70 m - 3E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

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FIGURE B1-6

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Upstream Toe
 Coordinates: 452,525 E , 6,204,589 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 5.00 m; HQ3 to 34.90 m

Drillhole No.: BH16-006
 Drill Type: B15 Diamond Drill
 Total Length: 34.9 m
 Elevation: 442.6 m
 Azimuth, Inclination: 0 , -90

Page: 2 of 4
 Date Started: Aug 29, 16
 Date Completed: Aug 31, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
432	11	+	MAFIC DYKE (4.83 to 14.39 m) Light grey; medium grained; massive; strong; moderately to highly fractured; fresh to slightly weathered; biotization with epidote-carbonate alteration on joint surfaces; trace quartz veinlets; intrusive unit with fine grained brown biotite (phlogopite) and chlorite altered mafic; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands.	100				75										
431	12	+		100				80										
430	13	+		100				60										
429	14	+		100				80										
428	15	+	GABBRO (14.39 to 25.12 m) Dark grey-green; coarse grained; massive; medium strong; slightly to moderately fractured; slightly weathered; clay and chlorite infill in joints; iron oxide and manganese oxide staining on joint surfaces; some quartz-calcite veinlets; black biotite presence; pyroxenite, <3mm thick; 1% quartz; strong light green-beige serpentinite stockwork; high grade metamorphism.	100				40										
427	16	+		98	UCS-02			50										
426	17	+		98				50										
425	18	+		98				50										
424	19	+																
423	19	+		100				35										

Packer Test #2 - 12.06-18.70 m - 1E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-6

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Upstream Toe
 Coordinates: 452,525 E , 6,204,589 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 5.00 m; HQ3 to 34.90 m

Drillhole No.: BH16-006
 Drill Type: B15 Diamond Drill
 Total Length: 34.9 m
 Elevation: 442.6 m
 Azimuth, Inclination: 0 , -90

Page: 3 of 4
 Date Started: Aug 29, 16
 Date Completed: Aug 31, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
21	422		GABBRO (14.39 to 25.12 m) Dark grey-green; coarse grained; massive; medium strong; slightly to moderately fractured; slightly weathered; clay and chlorite infill in joints; iron oxide and manganese oxide staining on joint surfaces; some quartz-calcite veinlets; black biotite presence; pyroxenite, <3mm thick; 1% quartz; strong light green-beige serpentinite stockwork; high grade metamorphism.	99				35								
22	421		RUBBLE ZONE (22.37 to 22.87 m) Broken/Rubble Zone within major Gabbro unit. Clay infill and iron oxide staining on rubble fragments.	100				15								
24	419			100				25								
25	418		MAFIC DYKE (25.12 to 26.33 m) Dark grey-purple; medium grained; massive; medium strong; highly fractured; slightly weathered; chlorite & calcite infill on joint surfaces; iron oxide and manganese oxide staining on joint surfaces; calcite veins; mafic intrusive with fine grained biotite and chlorite alteration; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands; biotization with epidote-carbonate replacement alteration.	98				30								
27	416		BROKEN ZONE (26.05 to 26.3 m) Broken Zone within Mafic Dyke unit.	100				20								
28	415		GABBRO (26.33 to 27.75 m) Dark grey-green; coarse grained; massive; weak to medium strong; highly fractured; moderately weathered; chlorite and calcite infill on joint surfaces; iron oxide and manganese oxide staining on joint surfaces; black biotite presence; pyroxenite, <3mm thick; 1% quartz; strong light green-beige serpentinite stockwork; high grade metamorphism.	100				5								
29	414		RUBBLE ZONE (27.35 to 28.6 m) Broken/Rubble zone at contact between Mafic Dyke and Gabbro units.	100				5								
29	414			100				25								
29	413			100				15								

Packer Test #3 - 18.55-24.55 m - 7E-06 m/s

Packer Test #4 - 24.40-30.40 m - 5E-06 m/s
 Vibrating Wire Piezometer
 Serial Number: VW38232
 Data Logger Serial Number: DT11286

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE B1-6

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Upstream Toe
 Coordinates: 452,525 E, 6,204,589 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 5.00 m; HQ3 to 34.90 m

Drillhole No.: BH16-006

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 29, 16

Total Length: 34.9 m

Date Completed: Aug 31, 16

Elevation: 442.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
31	412		MAFIC DYKE (27.75 to 32.34 m) Light grey; medium grained; weak to strong; moderately to highly fractured; slightly to moderately weathered; iron oxide staining on joint surfaces; some calcite veining; intrusive unit with fine grained brown biotite (phlogopite) and chlorite altered mafic; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands; biotization with epidote-carbonate alteration on joint surfaces.	100	UCS-03			75									
32	411		BROKEN ZONE (29 to 30.4 m) Broken Zone within Mafic Dyke unit.														
33	410		GABBRO (32.34 to 33.36 m) Dark grey-green; coarse grained; massive; strong; moderately to highly fractured; slightly weathered; trace quartz veinlets; weak iron oxide staining on joint surfaces; black biotite presence; pyroxenite, <3mm thick; 1% quartz; strong light green-beige serpentinite stockwork; high grade metamorphism.	100				55									
34	409		MAFIC DYKE (33.36 to 34.9 m) Light grey; medium grained; massive; medium strong; heavily fractured; slightly weathered; iron oxide staining on joint surfaces; intrusive unit with fine grained brown biotite and chlorite altered mafic; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands; biotization with epidote-carbonate alteration on joint surfaces.	97				70									
35	408		MAFIC DYKE (33.36 to 34.9 m) Light grey; medium grained; massive; medium strong; heavily fractured; slightly weathered; iron oxide staining on joint surfaces; intrusive unit with fine grained brown biotite and chlorite altered mafic; 1-2% pyroxenite and trace quartz; specs of pyrite blebs; light purple bands; biotization with epidote-carbonate alteration on joint surfaces.	99				35									
35	408		End of Drillhole: 34.9 m Target Depth Reached														
36	407																
37	406																
38	405																
39	404																
40	403																

Packer Test #5 - 28.76-34.90 m - 1E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE B1-6

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Centrepont of Dam Crest
 Coordinates: 452,493 E , 6,204,535 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.40 m; HQ3 to 34.75 m

Drillhole No.: BH16-007

Page: 1 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 2, 16

Total Length: 34.8 m

Date Completed: Sep 4, 16

Elevation: 443.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											RQD	RMR	SPT TEST 'N' VALUES - X			
											20	40	60	80		
443			FOREST DUFF & TOPSOIL (0 to 0.04 m) Spongy; some sand, medium to coarse; trace gravel, fine, subrounded to platy; brown and dark grey; loose, moist. From SPT recovery.	0	SPT-01	7	X	3/2/4	6	X						
442			NO RECOVERY (0.04 to 2.4 m) No Recovery - Drill recovery washed away through drilling process.	0												
441			GABBRO (2.4 to 34.75 m) Dark green; coarse grained; phaneritic with some foliation; strong to medium strong; slightly to moderately fractured; graphite, chlorite and calcite infill; few quartz-calcite veins; biotite and hornblende phenocrysts, ~3-4mm in diameter; brecciated section from 8.46-8.82 m.	100				55								
440																
439								55								
438								45								
437								65								
436								55								
435			BRECCIATED SECTION (8.46 to 8.82 m) Brecciated Section	100				50								
434																

Groundwater level measured prior to grouting during VWP installation.

Packer Test #1 - 4.86-11.20 m - 2E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE B1-7

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Centrepont of Dam Crest
 Coordinates: 452,493 E , 6,204,535 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.40 m; HQ3 to 34.75 m

Drillhole No.: BH16-007

Page: 2 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 2, 16

Total Length: 34.8 m

Date Completed: Sep 4, 16

Elevation: 443.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
433	11		GABBRO (2.4 to 34.75 m) Dark green; coarse grained; phaneritic with some foliation; strong to medium strong; slightly to moderately fractured; graphite, chlorite and calcite infill; few quartz-calcite veins; biotite and hornblende phenocrysts, ~3-4mm in diameter; brecciated section from 8.46-8.82 m.	100				60								Zone of Lost Circulation - 3.20-17.20 m
432	12			101				50								
431	13			101				50								
430	14			101				50								
429	15			101				50								Packer Test #2 - 11.06-17.20 m - 2E-06 m/s
428	16			101				60								
427	17			101				35								
426	18			101				35								
425	19			101				35								
424	19			101				35								

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

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FIGURE B1-7

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Centrepont of Dam Crest
 Coordinates: 452,493 E , 6,204,535 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.40 m; HQ3 to 34.75 m

Drillhole No.: BH16-007

Page: 3 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 2, 16

Total Length: 34.8 m

Date Completed: Sep 4, 16

Elevation: 443.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
											20	40	60	80		
21	423		GABBRO (2.4 to 34.75 m) Dark green; coarse grained; phaneritic with some foliation; strong to medium strong; slightly to moderately fractured; graphite, chlorite and calcite infill; few quartz-calcite veins; biotite and hornblende phenocrysts, ~3-4mm in diameter; brecciated section from 8.46-8.82 m.	101				35							Packer Test #3 - 17.05-23.05 m - No Take	
22	422			100				35								
23	421			101				35								
24	420			101				35								
25	419			101				35								
26	418			101				35								
27	417			100		UCS-02			35							
28	416			100					35							
29	415			100					35							
30	414			100					20							

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE B1-7

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Centrepont of Dam Crest
 Coordinates: 452,493 E , 6,204,535 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.40 m; HQ3 to 34.75 m

Drillhole No.: BH16-007

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 2, 16

Total Length: 34.8 m

Date Completed: Sep 4, 16

Elevation: 443.6 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											20	40	60	80				
413	31		GABBRO (2.4 to 34.75 m) Dark green; coarse grained; phaneritic with some foliation; strong to medium strong; slightly to moderately fractured; graphite, chlorite and calcite infill; few quartz-calcite veins; biotite and hornblende phenocrysts, ~3-4mm in diameter; brecciated section from 8.46-8.82 m. BROKEN ZONE (29.87 to 30.05 m) Broken Zone within Gabbro unit.	100					35							Vibrating Wire Piezometer Serial Number: VW38236 Data Logger Serial Number: DT11296 Packer Test #5 - 28.75-34.75 m - 2E-07 m/s		
412	32					100	UCS-03				35							
411	33					100					35							
410	34					100					35							
409	35		End of Drillhole: 34.75 m Target Depth Reached															
408	36																	
407	37																	
406	38																	
405	39																	
404																		

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
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FIGURE B1-7

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,550 E, 6,204,409 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 0.85 m; HQ3 to 31.52 m

Drillhole No.: BH16-008
 Drill Type: B15 Diamond Drill
 Total Length: 31.5 m
 Elevation: 470.3 m
 Azimuth, Inclination: 0, -90

Page: 1 of 4
 Date Started: Sep 4, 16
 Date Completed: Sep 6, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
0	470		COBBLES (0 to 0.85 m) Subangular; uniformly graded; grey to dark grey, fine grained, massive, highly weathered; loose; wet; recovered from HWT Casing; finer material washed away during drilling process.	0														
1	469		BROKEN ZONE (0.85 to 3.3 m) Light grey-green; fine grained; brecciated in places with argillite in the matrix (may be soft sediment breccia); slightly weathered; strong iron oxide staining on joint surfaces; 60% Argillite; black; and 40% Siltstone.															
2	468		SILTSTONE (3.3 to 11.7 m) Light grey-green; fine grained; laminated; weakly banded & foliated, occasional darker silty argillite bands, mottled texture; strong to medium strong; heavily fractured; fresh to slightly weathered; gouge infill on some joints; weak iron oxide staining on some joint surfaces.	56				5										
3	467			96				25										
4	466			92				25										
5	465			96				55										
6	464			92		UCS-01		65										
7	463		95				35											
8	462		100				55											
9	461		100				45											

During VWP Installation, a structure at 4.80 m was taking high quantities of grout mix. Hole was backfilled from 4.80 m to surface using bentonite pellets as a seal.

Packer Test #1 - 5.81-11.95 m - 1E-05 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-8

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,550 E , 6,204,409 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 0.85 m; HQ3 to 31.52 m

Drillhole No.: BH16-008

Page: 2 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 4, 16

Total Length: 31.5 m

Date Completed: Sep 6, 16

Elevation: 470.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
460	460	[Graphic Log]	SILTSTONE (3.3 to 11.7 m) Light grey-green; fine grained; laminated; weakly banded & foliated, occasional darker silty argillite bands, mottled texture; strong to medium strong; heavily fractured; fresh to slightly weathered; gouge infill on some joints; weak iron oxide staining on some joint surfaces.	100				45			---	---	---	---		
459	459	[Graphic Log]									---	---	---	---		
458	458	[Graphic Log]	SILTSTONE (11.7 to 19.5 m) Light grey-green; fine grained; foliated and weakly laminated, massive; medium strong; slightly to moderately fractured; fresh to slightly weathered; quartz-calcite infill on joint surfaces; moderate iron oxide staining on some joints; many healed fractures on quartz-calcite veinlets.	100				40			---	---	---	---		
457	457	[Graphic Log]									---	---	---	---		
456	456	[Graphic Log]									---	---	---	---		
455	455	[Graphic Log]									---	---	---	---		
454	454	[Graphic Log]									---	---	---	---		
453	453	[Graphic Log]									---	---	---	---		
452	452	[Graphic Log]									---	---	---	---		
451	451	[Graphic Log]	BROKEN ZONE (19.25 to 19.75 m) Broken Zone at contact between Siltstone and Mudstone units	100				35			---	---	---	---		
				100				15			---	---	---	---		

Groundwater level measured prior to grouting during VWP installation.
 Packer Test #2 - 11.38-17.62 m - No Take

Packer Test #3 - 16.67-22.67 m - 8E-08 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-8

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,550 E , 6,204,409 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 0.85 m; HQ3 to 31.52 m

Drillhole No.: BH16-008

Page: 3 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 4, 16

Total Length: 31.5 m

Date Completed: Sep 6, 16

Elevation: 470.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
450	450		MUDSTONE (19.5 to 29.82 m) Grey to dark grey; foliated; slightly mottled; weak to medium strong; moderately to highly fractured with frequent broken zones; predominantly slightly weathered with occasional fresher and more moderately weathered zones; iron oxide staining and clay infill on joint surfaces; interbedded silty argillite and siltstone.	100				15								
449	449		BROKEN ZONE (20.6 to 21.27 m) Broken Zone within Mudstone unit													
448	448		BROKEN ZONE (22.77 to 22.88 m) Broken Zone within Mudstone unit	100				35								
447	447		BROKEN ZONE (23.12 to 23.82 m) Broken Zone within Mudstone unit	100				15								
446	446		BROKEN ZONE (25.49 to 25.7 m) Broken Zone within Mudstone unit	100				15								
445	445		BROKEN ZONE (26.18 to 27.04 m) Broken Zone within Mudstone unit	100				15								
444	444		BROKEN ZONE (28.6 to 28.75 m) Broken Zone within Mudstone unit	100				25								
443	443		QUARTZ VEIN													

Packer Test #4 - 22.52-28.52 m - 2E-07 m/s

Vibrating Wire Piezometer
 Serial Number: VW38234
 Data Logger Serial Number: DT11295

Packer Test #5 - 25.52-31.52 m - 1E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
 Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-8

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,550 E , 6,204,409 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 0.85 m; HQ3 to 31.52 m

Drillhole No.: BH16-008

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Sep 4, 16

Total Length: 31.5 m

Date Completed: Sep 6, 16

Elevation: 470.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
440			(29.82 to 29.95 m) Grey-white to white quartz and albite anhedral vein marking contact between Mudstone and Wacke units; minor carbonate.	100				15							
31			WACKE (29.95 to 31.52 m) Grey to light grey; fine grained; massive; medium strong; highly fractured; slightly to moderately weathered; clay infill on joint surfaces; iron oxide, chlorite and manganese oxide staining on joint surfaces; quartz-calcite micro-veining; biotite phenocrysts.	100				25							
439			BROKEN ZONE (30.02 to 30.22 m) Broken Zone within Wacke unit												
32			(31.42 to 31.52 m) Gradational contact into more porcelain and siliceous wacke.												
438			Broken Zone within Wacke unit												
33			End of Drillhole: 31.52 m Target Depth Reached												
437															
34															
436															
35															
435															
36															
434															
37															
433															
38															
432															
39															
431															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-8

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45, -50

Page: 1 of 12
 Date Started: Sep 7, 16
 Date Completed: Sep 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											RQD	RMR	SPT TEST 'N' VALUES - X			
											20	40	60	80		
0			BOULDERS & COBBLES (0 to 1.04 m) Subrounded; uniformly graded; light greenish grey; loose; wet; finer material washed away during drilling process.	0												
1	463		GABBRO (1.04 to 8.09 m) Grey to light greenish-grey; coarse grained; massive; weak to medium strong; highly broken, most fractures parallel to core axis; moderately weathered; iron oxide, clay, calcite and chlorite infill in joints; manganese oxide staining on joint surfaces; large quartz-carbonate veins; slightly altered hornblende-pyroxenite altering to chlorite; biotite phenocrysts approx. 2-3 mm in diameter.	98				15								
2			RUBBLE ZONE (1.09 to 1.21 m) Rubble Zone within Gabbro unit	100				20								
3	462		BROKEN ZONE (1.42 to 2.1 m) Broken Zone within Gabbro unit	100				5								
4	461		BROKEN/RUBBLE ZONE (2.48 to 3.9 m) Broken Zone within Gabbro unit	100				35								
5	460		RUBBLE ZONE (5.34 to 5.54 m) Rubble Zone within Gabbro unit	100				35								
6	459			100				45								
7	458			100				45								
8	457		LATE STAGE GABBRO DYKE (8.09 to 18.1 m) Tan coloured; fine grained; occasional fabric; medium strong to strong; moderately to highly fractured; slightly to moderately weathered; some chlorite infill; some iron oxide staining on joint surfaces; heavy black veinlets giving spiderweb like texture; trace calcite veining; fibrous look (serpentine or mica alteration) with some brown biotite alteration also; hornblende/pyroxenite phenocrysts approx. 1-4 mm in diameter throughout.	100				45								
9					UCS-01											

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45, -50

Page: 2 of 12
 Date Started: Sep 7, 16
 Date Completed: Sep 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES				
											SPT TEST 'N' VALUES - X									
											---	---	---	---						
456	+	+	LATE STAGE GABBRO DYKE (8.09 to 18.1 m) Tan coloured; fine grained; occasional fabric; medium strong to strong; moderately to highly fractured; slightly to moderately weathered; some chlorite infill; some iron oxide staining on joint surfaces; heavy black veinlets giving spiderweb like texture; trace calcite veining; fibrous look (serpentine or mica alteration) with some brown biotite alteration also; hornblende/pyroxenite phenocrysts approx. 1-4 mm in diameter throughout.	100				50												
455	+	+			100			60										Packer Test #1 - 7.96-15.60 m - 2E-06 m/s		
454	+	+		BROKEN ZONE (12.6 to 13 m) Broken Zone within Gabbro Dyke	100			50												
453	+	+			100			50												
452	+	+			100			35												
451	+	+		BROKEN ZONE (16 to 16.9 m) Broken Zone within Gabbro Dyke	100			5											Lost Circulation at 16.90 m and did not recover for remainder of drillhole.	
450	+	+		GABBRO (18.1 to 20.35 m) Grey; coarse grained; massive; medium strong to strong; slightly fractured; slightly weathered; weak iron oxide staining on joint surfaces; trace quartz veinlets; large quartz-carbonate veins; slightly altered hornblende-pyroxenite altering to chlorite; biotite phenocrysts approx. 2-3 mm in diameter.	100			40												
449	+	+			BROKEN ZONE (18.2 to 18.6 m) Broken Zone within Gabbro unit	100			40											Packer Test #2 - 15.45-23.28 m - 6E-06 m/s
						100			40											

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 3 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45, -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
21	448		FELDSPAR-HORNBLLENDE PORPHYRY DYKE (20.35 to 22.05 m) Grey; fine to medium grained; massive; weak to medium strong; intensely fractured; moderately weathered; clay and chlorite infill; iron oxide and manganese oxide staining on joint surfaces; 1 mm diameter hornblende phenocrysts with 1-2 mm diameter, subrounded feldspar phenocrysts; minor fine grained biotite alteration.	100				55								
22	447		BROKEN/RUBBLE ZONE (20.45 to 21.05 m) Broken Zone within Feldspar-Hornblende Porphyry Dyke	100				10								
23	446		BROKEN ZONE (21.6 to 22.05 m) Broken Zone at contact between Feldspar-Hornblende Porphyry Dyke and major Gabbro unit	96				15								
24	445		GABBRO (22.05 to 30.12 m) Greenish grey; fine grained; massive; weak to medium strong; highly fractured; moderately weathered; clay, chlorite, manganese oxide, hematite and iron oxide infill on joint surfaces; pyrite and calcite veins; biotite phenocrysts; weakly altered.	100				25								
25	444		BROKEN/RUBBLE ZONE (23.81 to 24.38 m) Broken Zone within Gabbro unit	100				25								
26	443		RUBBLE ZONE (26.4 to 26.98 m) Rubble Zone within Gabbro unit	100				15								
27	442		RUBBLE ZONE (27.68 to 27.78 m) Rubble Zone within Gabbro unit	100	UCS-03			10								
28	441		RUBBLE ZONE (27.68 to 27.78 m) Rubble Zone within Gabbro unit	100				5								
29				100				25								
				100				25								

Packer Test #3 - 23.13-30.96 m - 3E-06 m/s

Groundwater level measured after standpipe piezometer installation.

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 4 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45, -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
			BROKEN ZONE (29.72 to 30.72 m) Broken Zone within Gabbro unit	100				15							
			GABBRO (30.12 to 35.47 m) Grey; fine grained but becomes coarser near lower contact; massive; strong; slightly fractured; fresh to slightly weathered; chlorite infill on some joints; chlorite altered with some hornblende-pyroxenite alteration; hornblende, pyroxenite, biotite and plagioclase phenocrysts; minor disseminated pyrite.	87				60							
			BROKEN ZONE (30.13 to 30.72 m) Broken Zone within Gabbro unit												
				100				60							
				97				75							
			FELSIC DYKE (35.47 to 43.74 m) Light grey; fine to medium grained; massive & porphyritic; strong to very strong; moderately fractured; moderately to slightly weathered; moderate iron oxide staining on joint surfaces; few quartz-calcite veinlets; 2-3 mm diameter feldspar phenocrysts; silica rich; gradational upper contact.	100				100							
				100				100							
				100				50							

Packer Test #4 - 30.82-38.46 m - 1E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45, -50

Page: 5 of 12
 Date Started: Sep 7, 16
 Date Completed: Sep 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
 Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
433	433		FELSIC DYKE (35.47 to 43.74 m) Light grey; fine to medium grained; massive & porphyritic; strong to very strong; moderately fractured; moderately to slightly weathered; moderate iron oxide staining on joint surfaces; few quartz-calcite veinlets; 2-3 mm diameter feldspar phenocrysts; silica rich; gradational upper contact.	100	UCS-04			50								
41	41		BROKEN ZONE (40.47 to 40.6 m) Broken Zone within Gabbro unit	100				50								
42	42		BROKEN ZONE (42.4 to 43.36 m) Broken Zone within Felsic Dyke	100				50								
43	43			100				45								
44	44		GABBRO (43.74 to 44.95 m) Grey; coarse grained; massive; medium strong; highly fractured; fresh; clay and chlorite infill; strong iron oxide staining on joint surfaces; some quartz veining; few serpentine veins.	100				45								
45	45		FELDSPAR-HORNBLLENDE PORPHYRY DYKE (44.95 to 45.8 m) Green; fine grained; massive; medium strong; slightly to moderately fractured; slightly weathered; quartz veining; 1 mm diameter hornblende phenocrysts with 1-2 mm diameter, subrounded feldspar phenocrysts; minor fine grained biotite alteration.	100				45								
46	46		GABBRO (45.8 to 71.95 m) Grey; coarse grained; massive; weak to medium strong; moderately to highly fractured, multiple broken zones; chlorite, calcite and graphite infill; iron oxide and manganese oxide staining on joint surfaces; few serpentine veins.	100				15								
47	47		RUBBLE ZONE (47.21 to 47.78 m) Rubble Zone within Gabbro unit	100				15								
48	48		BROKEN ZONE (48.51 to 48.61 m) Broken Zone within Gabbro unit	100				15								
49	49			100				15								
426	426			100				35								

Packer Test #5 - 38.32-45.96 m - 1E-06 m/s

Packer Test #6 - 45.81-53.64 m - 3E-08 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E , 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 6 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45 , -50

Reviewed by: JEF

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 Library: M:\10\0654\02\ADATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											20	40	60	80			
425	51		GABBRO (45.8 to 71.95 m) Grey; coarse grained; massive; weak to medium strong; moderately to highly fractured, multiple broken zones; chlorite, calcite and graphite infill; iron oxide and manganese oxide staining on joint surfaces; few serpentine veins.	100				35									
				100				35									
424	52			100				35									
				100				35									
423	53			100				35									
				100				35									
422	54			100				35									
				97				35									
421	56			99				45									
				98				45									
420	57																
419	58																
418	59																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

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1

Rev.
0

FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 7 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45, -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
											20	40	60	80		
61	417		GABBRO (45.8 to 71.95 m) Grey; coarse grained; massive; weak to medium strong; moderately to highly fractured, multiple broken zones; chlorite, calcite and graphite infill; iron oxide and manganese oxide staining on joint surfaces; few serpentine veins.	97				45								Packer Test #7 - 53.50-67.14 m - 9E-08 m/s
62	416			100				55								
63	416			100				55								
64	415			100				55								
65	414			99				60								
66	414			100				60								
67	413			100				60								
68	412			94				60								
69	411			102				60								
						92				35						

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45, -50

Page: 8 of 12
 Date Started: Sep 7, 16
 Date Completed: Sep 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\MOUNTAIN 2016 GEOTECHNICAL SI.GPJ
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
410	410		GABBRO (45.8 to 71.95 m) Grey; coarse grained; massive; weak to medium strong; moderately to highly fractured, multiple broken zones; chlorite, calcite and graphite infill; iron oxide and manganese oxide staining on joint surfaces; few serpentine veins.	101				35									
71			BROKEN ZONE (59.64 to 60.04 m) Broken Zone within Gabbro unit														
409	409		BROKEN ZONE (71.85 to 72.02 m) Broken Zone at contact between major Gabbro unit and Strained Fault Zone	99				50									
72			STRAINED FAULT ZONE (71.95 to 76.33 m) Grey, dark grey, black, dark greenish grey; fine to coarse grained; massive with occasional flow banded sections; weak to strong; moderately to highly fractured; slightly weathered; chlorite and clay infill; heavy quartz and calcite veining; fairly competent with strong fabric perpendicular to core axis; mixing zone of gabbro, argillite and felsic dykes.					40									
408	408			96				40									
74			RUBBLE ZONE (74.64 to 74.82 m) Rubble Zone within Strained Fault Zone	89				5									
407	407			100				35									
75																	
406	406		DIORITE (76.33 to 89.1 m) Grey; medium grained; massive; medium strong to strong; moderately fractured; fresh; epidote staining on joint surfaces; some rubble infill on some joints; no veining; 2-4 mm diameter feldspar phenocrysts, 1 mm diameter mafic phenocrysts.	100				50									
76																	
405	405		BROKEN ZONE (78.18 to 79.4 m) Broken Zone within Diorite unit	100	UCS-05			25									
77																	
404	404			100				25									
78																	
403	403			64				45									
79																	

Packer Test #8 - 66.99-74.82 m - No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E , 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 9 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
81	402		DIORITE (76.33 to 89.1 m) Grey; medium grained; massive; medium strong to strong; moderately fractured; fresh; epidote staining on joint surfaces; some rubble infill on some joints; no veining; 2-4 mm diameter feldspar phenocrysts, 1 mm diameter mafic phenocrysts. RUBBLE ZONE (80.1 to 80.27 m) Rubble Zone within Diorite unit	81				75								Packer Test #9 - 73.96-86.10 m - 1E-06 m/s
82	401			100				75								
83	400			100				75								
84	399			100				75								
85	398			90				75								
86	397			97				80								
87	396			100				80								
88	396			99				80								
89	396			90	UCS-06			65								

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Page: 10 of 12

Drill Type: B15 Diamond Drill

Date Started: Sep 7, 16

Total Length: 111.5 m

Date Completed: Sep 14, 16

Elevation: 463.9 m

Logged by: CAG/MEA

Azimuth, Inclination: 45, -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											--- RQD					
91	394	[Hatched]	FELDSPAR-HORNBLENDE PORPHYRY DYKE (89.1 to 100.68 m) Light green-grey; fine grained; massive; weak to strong; moderately to highly fractured, frequently broken; fresh to slightly weathered; chlorite and calcite infill; iron oxide staining on joint surfaces; very few calcite and quartz veining; intruding gabbro; 1-2 mm hornblende and plagioclase phenocrysts.	100				45								Packer Test #10 - 85.95-93.78 m - 2E-06 m/s
92		[Hatched]	BROKEN ZONE (91.53 to 91.72 m) Broken Zone within Feldspar-Hornblende Porphyry Dyke	100				25								
93	393	[Hatched]		100				50								
94		[Hatched]	BROKEN/RUBBLE ZONE (94.28 to 94.98 m) Broken Zone within Feldspar-Hornblende Porphyry Dyke	100				50								
95	391	[Hatched]	RUBBLE ZONE (95.28 to 95.46 m) Broken Zone within Feldspar-Hornblende Porphyry Dyke	100				20								
96		[Hatched]		100				15								
97	390	[Hatched]	BROKEN/RUBBLE ZONE (96.92 to 97.32 m) Broken Zone within Feldspar-Hornblende Porphyry Dyke	100				20								
98	389	[Hatched]		100												
99		[Hatched]		100				50								
	388	[Hatched]		100												

Packer Test #11 -
93.63-101.46 m - 2E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02

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Rev. 0

FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45, -50

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 Date Completed: Sep 14, 16
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 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
387			BROKEN ZONE (100.38 to 100.68 m) Broken Zone at contact between Feldspar-Hornblende Porphyry Dyke and major Gabbro unit	100				25								
101			GABBRO (100.68 to 103.68 m) Grey; coarse grained; massive; medium strong; slightly fractured; slightly weathered; trace iron oxide infill, calcite infill; moderate to strong calcite veining; biotite alteration; fabric roughly perpendicular to core axis.	100				35								
386				100				45								
102				100				50								
103				100				50								
104			GABBRO (103.68 to 107.06 m) Grey; coarse grained; flow banded; strong; moderately to highly fractured; slightly weathered; chlorite infill; abundant calcite veining; sheared gabbro and mudstone; high strain appearance perpendicular to core axis; potentially contact zone.	97				50								
384				100				50								
105				100				50								
383				100				50								
106				100				50								
382			GABBRO (107.06 to 111.16 m) Grey; coarse grained; massive; strong; moderately to highly fractured; slightly weathered; chlorite and calcite infill; heavy quartz veining; moderate calcite veining; disseminated sulphides; biotite alteration; fabric roughly perpendicular to core axis.	100				50								
107				100				50								
108				100				50								
381				100				50								
109				97				50								
380				97				50								

Packer Test #12 - 99.36-111.50 m - 7E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E , 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.43 m; HQ3 to 111.50 m

Drillhole No.: BH16-009
 Drill Type: B15 Diamond Drill
 Total Length: 111.5 m
 Elevation: 463.9 m
 Azimuth, Inclination: 45 , -50

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 Date Started: Sep 7, 16
 Date Completed: Sep 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
111	379		GABBRO (107.06 to 111.16 m) Grey; coarse grained; massive; strong; moderately to highly fractured; slightly weathered; chlorite and calcite infill; heavy quartz veining; moderate calcite veining; disseminated sulphides; biotite alteration; fabric roughly perpendicular to core axis. FELDSPAR-HORNBLLENDE PORPHYRY DYKE (111.16 to 111.5 m) Green-grey; fine grained; massive; strong; moderately fractured; slightly weathered; very few veins; trace disseminated sulphides; intruding gabbro; 1-2 mm hornblende and plagioclase phenocrysts. End of Drillhole: 111.5 m Target Depth Reached	100				50								
112	378															
113	377															
114	376															
115	375															
116	374															
117	373															
118																
119																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

IDM Mining Ltd.
Red Mountain Project



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-9

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Drill Type: B15 Diamond Drill
 Total Length: 95.6 m
 Elevation: 463.1 m
 Azimuth, Inclination: 160 , -50

Page: 1 of 10
 Date Started: Sep 14, 16
 Date Completed: Sep 17, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
0	463		COBBLES (0 to 0.6 m) Angular; uniformly graded; light grey to tan; loose; wet; potentially weathered bedrock; finer material washed away during drilling process.	43												
0.6	462		GABBRO (0.6 to 13.08 m) Dark grey-green; coarse grained; massive; medium strong to strong; highly fractured; moderately to slightly weathered; chlorite, rubble & gouge infill in some joints; epidote and chlorite staining on joint surfaces; trace calcite veinlets; 5 cm thick quartz-calcite veins at 3.35 m and 4.84 m; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				60								
3.35	461			100	UCS-01			60								
4.84	460			99				35								
5.5	459			100				45								
6.5	458			100				45								
7.5	457			100				45								
8.5	457			86				45								
8.6			BROKEN ZONE (8.6 to 9.89 m) Broken Zone within major Gabbro unit	100				5								
9.89	456			100				45								

Vibrating Wire Piezometer
 Serial Number: VW38230
 Data Logger Serial Number: DT11285

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E, 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Drill Type: B15 Diamond Drill
 Total Length: 95.6 m
 Elevation: 463.1 m
 Azimuth, Inclination: 160, -50

Page: 2 of 10
 Date Started: Sep 14, 16
 Date Completed: Sep 17, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
11	455		GABBRO (0.6 to 13.08 m) Dark grey-green; coarse grained; massive; medium strong to strong; highly fractured; moderately to slightly weathered; chlorite, rubble & gouge infill in some joints; epidote and chlorite staining on joint surfaces; trace calcite veinlets; 5 cm thick quartz-calcite veins at 3.35 m and 4.84 m; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	97				45									
12	454			100				45									
13	453		FAULT ZONE (13.08 to 17.1 m) Grey-green; fine to coarse grained; massive; medium strong; rubbleized and broken; moderately to highly weathered; quartz and gouge infill between rubble fragments; iron oxide staining on rubble fragments; rubble fragments are angular, 2-5 cm in diameter; strong sericite alteration on hedges of the fault zone.	92				45									
14	452			90				45									
15	451			90				5									
16	451			75				5									
17	450		GABBRO (17.1 to 44.14 m) Dark grey-green; coarse grained; massive; strong; slightly to moderately fractured; slightly weathered; graphite and calcite infill; manganese oxide and iron oxide staining on joint surfaces; calcite and graphite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				15									
18	449		BROKEN ZONE (18 to 18.15 m) Broken Zone within major Gabbro unit	100				35									
19	449		BROKEN ZONE (18.6 to 19.05 m) Broken Zone within major Gabbro unit	100				5									
19	448		BROKEN ZONE (19.4 to 19.55 m)	100				35									

Packer Test #1 - 7.96-14.10 m - 1E-06 m/s

Groundwater level measured prior to grouting during VWP installation.

Packer Test #2 - 12.50-20.33 m - 8E-07 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

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VA101-594/02

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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 3 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
21	447		Broken Zone within major Gabbro unit GABBRO (17.1 to 44.14 m) Dark grey-green; coarse grained; massive; strong; slightly to moderately fractured; slightly weathered; graphite and calcite infill; manganese oxide and iron oxide staining on joint surfaces; calcite and graphite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				35								
22	446		100				35									
23	445		99				35									
24	444		100				35									
25	443		100				35									
26	442		100				35									
27	441		100				35									
28	440		100				35									
29	439		100				35									
									35							

Packer Test #3 - 19.96-28.13 m - 2E-06 m/s

Zone of Lost Circulation - 26.10-27.60 m

Vibrating Wire Piezometer
 Serial Number: VW38235
 Data Logger Serial Number: DT11287

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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 Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 4 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											20	40	60	80			
440			GABBRO (17.1 to 44.14 m) Dark grey-green; coarse grained; massive; strong; slightly to moderately fractured; slightly weathered; graphite and calcite infill; manganese oxide and iron oxide staining on joint surfaces; calcite and graphite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork. BROKEN ZONE (32.1 to 32.5 m) Broken Zone within major Gabbro unit; heavily veined; clay altered.	100				55							Packer Test #4 - 27.46-36.60 m - 9E-09 m/s		
31	439			93				5									
32	438			98				55									
34	437			100				55									
35	436			100				55									
36	435			UCS-02													
37	435			100				50									
38	434			98				50									
39	433																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Project No.
VA101-594/02

Ref. No.
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0

FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 5 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
41	432	+	GABBRO (17.1 to 44.14 m) Dark grey-green; coarse grained; massive; strong; slightly to moderately fractured; slightly weathered; graphite and calcite infill; manganese oxide and iron oxide staining on joint surfaces; calcite and graphite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				50			[SPT Test Values: 20, 40, 60, 80]				Packer Test #5 - 36.46-45.60 m - 9E-09 m/s	
42	431			99				50			[SPT Test Values: 20, 40, 60, 80]					
43	430			100				50			[SPT Test Values: 20, 40, 60, 80]					
45	429	+	MAFIC DYKE (44.14 to 44.68 m) Black; fine grained; brecciated with 10 cm diameter, subrounded breccia fragments with diffused hedges; medium strong; slightly fractured; slightly weathered.	99				40			[SPT Test Values: 20, 40, 60, 80]					
46	428	+	GABBRO (44.68 to 87.28 m) Dark grey-green; coarse grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; graphite, chlorite and calcite infill; graphite and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	97				40			[SPT Test Values: 20, 40, 60, 80]					
47	427			100				40			[SPT Test Values: 20, 40, 60, 80]					
48	426	+		100				40			[SPT Test Values: 20, 40, 60, 80]					
49	425			100				35			[SPT Test Values: 20, 40, 60, 80]					

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Red Mountain Project**

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 6 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
51	424	+	GABBRO (44.68 to 87.28 m) Dark grey-green; coarse grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; graphite, chlorite and calcite infill; graphite and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				35								
52	423	+		100				35								
53	422	+		100				35								
54	421	+		100				35								
55	420	+		100				35								
56	419	+		100				35								
57	418	+		100				35								
58																
59																
				98				35								

Packer Test #6 - 45.45-60.60 m - 3E-09 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 7 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
417		+	GABBRO (44.68 to 87.28 m) Dark grey-green; coarse grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; graphite, chlorite and calcite infill; graphite and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.												
61		+		100				35							
416		+													
62		+													
415		+			100			35							
63		+													
414		+			100			35							
64		+													
413		+			98			35							
65		+													
412		+		100			35								
66		+													
411		+		98			35								
67		+													
68		+													
69		+													
410		+													

Packer Test #7 - 60.45-72.60 m - 3E-08 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Red Mountain Project

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 8 of 10

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Length: 95.6 m

Date Completed: Sep 17, 16

Elevation: 463.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 160 , -50

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
409	71		GABBRO (44.68 to 87.28 m) Dark grey-green; coarse grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; graphite, chlorite and calcite infill; graphite and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork. BROKEN ZONE (70.58 to 70.97 m) Broken Zone within major Gabbro unit	100				15								
408	72			99				35								
407	73			100				40								
406	74			98				40								
405	75			100				30								
404	76			100				60								
403	77			100				60								
402	78			100				60								
	79															
	80															
	81															
	82															
	83															
	84															
	85															
	86															
	87															
	88															
	89															
	90															
	91															
	92															
	93															
	94															
	95															
	96															
	97															
	98															
	99															
	100															

Packer Test #8 - 72.46-84.60 m - 1E-08 m/s

GENERAL REMARKS:
 Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B1-10

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E, 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Drill Type: B15 Diamond Drill
 Total Length: 95.6 m
 Elevation: 463.1 m
 Azimuth, Inclination: 160, -50

Page: 9 of 10
 Date Started: Sep 14, 16
 Date Completed: Sep 17, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											--- RQD	--- RMR				
81	401	+ +	GABBRO (44.68 to 87.28 m) Dark grey-green; coarse grained; massive; medium strong to strong; slightly to moderately fractured; slightly weathered; graphite, chlorite and calcite infill; graphite and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				30								
82	400			100				35								
83	399			100				25								
84	398			100				40								
85	397			97				50								
86	396	+ +	MAFIC DYKE (87.28 to 89.72 m) Black; fine grained; brecciated with 10 cm diameter, subrounded breccia fragments with diffused hedges; medium strong; slightly fractured; slightly weathered.	100				40								
87	395			UCS-03												
88				100				40								
89				100				40								

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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Project No. VA101-594/02

Ref. No. 1

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FIGURE B1-10

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 95.60 m

Drillhole No.: BH16-010

Page: 10 of 10

Drill Type: B15 Diamond Drill
 Total Length: 95.6 m
 Elevation: 463.1 m
 Azimuth, Inclination: 160 , -50

Date Started: Sep 14, 16
 Date Completed: Sep 17, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
											20	40	60	80				
394		+ + + + + + + + + + + + + + + + + + + +	GABBRO (89.72 to 95.6 m) Dark grey-green; coarse grained; massive; medium strong; slightly to moderately fractured; slightly weathered; chlorite, sericite and quartz infill; heavy quartz and calcite veining; black biotite presence; unaltered pyroxenite, <3 mm thick; approximately 1% quartz content; light green-beige talc-serpentinite stockwork.	100				40			[SPT Test Values: 20, 40, 60, 80]				Packer Test #9 - 84.46-95.60 m - 5E-09 m/s			
91				393				40										
92				392		99			40									
93				391		100			45									
94			BROKEN ZONE (95.1 to 95.24 m) Broken Zone within major Gabbro unit	100				35			[SPT Test Values: 20, 40, 60, 80]							
95		390																
96			End of Drillhole: 95.6 m Target Depth Reached															
97																		
98																		
99																		
387																		

GENERAL REMARKS:
 Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE B1-10		

APPENDIX B2

GROUNDWATER MONITORING WELL GRAPHICAL DRILLHOLE LOGS

(Pages B2-1 to B2-17)

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,283 E, 6,205,109 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 30.80 m

Drillhole No.: MW16-001

Drill Type: B15 Diamond Drill

Total Length: 30.8 m

Elevation: 410.1 m

Azimuth, Inclination: 0, -90

Page: 1 of 4

Date Started: Aug 18, 16

Date Completed: Aug 20, 16

Logged by: CAG/MEA

Reviewed by: JEF

File: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
 Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 28, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
											20	40	60	80			
0	410		FOREST DUFF/TOPSOIL (0 to 0.36 m) Spongy, organic material present; some cobbles, subrounded to rounded; grey & dark brown; loose. From SPT recovery.	42													Monitoring well recorded as dry on September 7, 2016.
1	409		GABBRO (0.36 to 1.06 m) Light grey-green; medium grained; foliated; strong to medium strong; intensely fractured; moderately weathered to fresh; light green to beige serpentinite infill on some fractures; multiple spun joints; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100				50									
2	408		BROKEN ZONE (0.37 to 0.8 m) Broken Zone within Gabbro unit.	91				45									
3	407		GOLDSLIDE PORPHYRY SUITE (1.06 to 2.78 m) Light grey; fine grained; porphyritic; medium strong; moderately fractured; fresh; intermixed gabbro and goldslide porphyry intrusive; strongly overprinted by carbonate-sericite alteration; fragments subangular and <5cm in diameter; locally magnetic.	100	UCS-01			35									
4	406		GABBRO (2.78 to 4.34 m) Light grey-green; medium grained; foliated; medium strong to strong; highly fractured; light green to beige serpentinite infill on some fractures; iron oxide staining on some joints; some quartz veinlets; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	96				75									
5	405		BROKEN ZONE (3.8 to 5.3 m) Broken Zone at contact between Gabbro and Goldslide Porphyry units.	100				100									Zone of Lost Circulation - 4.80-5.30 m
6	404		GOLDSLIDE PORPHYRY SUITE (4.34 to 6.02 m) Light green; fine grained; porphyritic; strong to very strong; moderately to highly fractured; moderately to slightly weathered; clay and chlorite infill on joint surfaces; trace quartz veinlets; 35% phenocrysts; hornblende laths <2-5 mm in diameter, locally twinned; plagioclase phenocrysts <2 mm in diameter; strong chlorite alteration throughout with local carbonate alteration and epidote representation; chill margin contact with lower gabbro unit; mineral alignment, mostly pyroxenite with strong light beige-green serpentinite alteration.	96				35									
7	403		GABBRO (6.02 to 16.41 m) Light grey-green; medium grained; foliated; strong to very strong; moderately to highly fractured; slightly weathered; chlorite and trace gouge infill on most joint surfaces; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	97				45									
8	402		GABBRO (6.02 to 16.41 m) Light grey-green; medium grained; foliated; strong to very strong; moderately to highly fractured; slightly weathered; chlorite and trace gouge infill on most joint surfaces; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	94				70									Packer Test #1 - 5.14-11.20 m - 3E-07 m/s
9	401		GABBRO (6.02 to 16.41 m) Light grey-green; medium grained; foliated; strong to very strong; moderately to highly fractured; slightly weathered; chlorite and trace gouge infill on most joint surfaces; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).														

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B2-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,283 E, 6,205,109 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 30.80 m

Drillhole No.: MW16-001

Page: 2 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 18, 16

Total Length: 30.8 m

Date Completed: Aug 20, 16

Elevation: 410.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECT\RESERVED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
 Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 28, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES			
											SPT TEST 'N' VALUES - X								
											20	40	60	80					
400			GABBRO (6.02 to 16.41 m) Light grey-green; medium grained; foliated; strong to very strong; moderately to highly fractured; slightly weathered; chlorite and trace gouge infill on most joint surfaces; slickenside observed on multiple joint surfaces; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100				75											
11	399			92				125											
12	398			100				125											
				100				85											
13	397			100				75											
14	396			100				50											
15	395			93				175											
16	394			97				175											
17	393				GOLDSLIDE PORPHYRY SUITE (16.41 to 17.72 m) Grey; fine grained; porphyritic; very strong; moderately to highly fractured; fresh; some quartz & calcite-serpentinite veinlets; 25% phenocrysts, mainly hornblende laths (<7 mm diameter) and non-altered plagioclase phenocrysts (<3 mm); low angle undulating contact; crosscut by gabbro sections (approx. 10 cm wide) with strong calcite-serpentinite veins.	94				150									
18	392					100				40									
19	391					97				25									

Packer Test #2 - 11.12-17.30 m - No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

IDM Mining Ltd.
Red Mountain Project

Knight Piésold
 CONSULTING

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,283 E, 6,205,109 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 30.80 m

Drillhole No.: MW16-001

Page: 3 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 18, 16

Total Length: 30.8 m

Date Completed: Aug 20, 16

Elevation: 410.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 (KP CANADA GINT DATA TEMPLATE (RMR INPUT)) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	UCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
390			DIORITE (17.72 to 30.8 m) Grey to dark grey; coarse grained with grain size increasing with depth; grenue texture; medium strong; moderately to highly fractured; fresh to slightly weathered; chlorite infill and epidote staining on joint surfaces; calcite-epidote veinlets (<1 mm thick) throughout; minor undulating upper contact with melanocrate presence at contact; mildly magnetic with well developed plagioclase phenocrysts (approx. 70% of total phenos) <2-5 mm in diameter; quartz eyes (approx. 2% of total phenos) <5 mm in diameter; fine grained chloritized mafic intrusions with hornblende laths (<0.5-1 mm in diameter).	100				25								Packer Test #3 - 17.20-23.20 m - 2E-07 m/s
21	389		BROKEN ZONE (20.3 to 21 m) Broken Zone within Diorite unit.	100				30								GWL measured after groundwater quality monitoring well installation.
23	387		BROKEN ZONE (21.78 to 21.95 m) Broken Zone within Diorite unit.	100				25								
24	386		BROKEN ZONE (22.51 to 22.61 m) Broken Zone within Diorite unit.	97				50								
25	385		BROKEN ZONE (27.62 to 27.72 m) Broken Zone within Diorite unit.	94				50								
26	384		BROKEN ZONE (28.74 to 28.84 m) Broken Zone within Diorite unit.	97				50								Packer Test #4 - 22.84-28.84 m - 2E-06 m/s
27	383		BROKEN ZONE (27.62 to 27.72 m) Broken Zone within Diorite unit.	100				50								
28	382		BROKEN ZONE (28.74 to 28.84 m) Broken Zone within Diorite unit.	100				40								Packer Test #5 - 24.66-30.80 m - 4E-07 m/s
29	381		BROKEN ZONE (28.74 to 28.84 m) Broken Zone within Diorite unit.	100				175								
					UCS-02											

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,283 E, 6,205,109 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.20 m; HQ3 to 30.80 m

Drillhole No.: MW16-001

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 18, 16

Total Length: 30.8 m

Date Completed: Aug 20, 16

Elevation: 410.1 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\100654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
380	380			100				5								
31	379		End of Drillhole: 30.8 m Target Depth Reached													
32	378															
33	377															
34	376															
35	375															
36	374															
37	373															
38	372															
39	371															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,332 E, 6,204,615 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.90 m; HQ3 to 32.80 m

Drillhole No.: MW16-002

Drill Type: B15 Diamond Drill

Total Length: 32.8 m

Elevation: 412.3 m

Azimuth, Inclination: 0, -90

Page: 1 of 4

Date Started: Aug 20, 16

Date Completed: Aug 22, 16

Logged by: CAG/MEA

Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\MOUNTAIN 2016 GEOTECHNICAL SI\GPI Library - M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	KEY ROCK MASS PARAMETERS				SPT TEST 'N' VALUES - X	INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
										SPT TEST 'N' VALUES - X							
										--- RQD	--- RMR	20	40	60	80		
0	412		COBBLES (0 to 2.8 m) Rounded to subrounded; uniformly graded; grey; loose; wet; finer material washed away during drilling process.														
1	411			4													
2	410																
3	409		GABBRO (2.8 to 13.46 m) Light grey-green; coarse grained; foliated with medium grained foliations; medium strong to strong; moderately fractured; fresh to slightly weathered; chlorite and calcite infill on most; serpentinite infill on some fractures, light green to beige in colour; slickenside observed on multiple joint surfaces; calcite veining and veinlets throughout with intense quartz-calcite veining on the hedges of the fault zone; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100				35									
4	408			88				50									
5	407		BROKEN ZONE (2.81 to 3.1 m) Broken Zone within Gabbro unit														
6	406		RUBBLE ZONE (3.1 to 3.7 m) Rubble Zone within Gabbro unit														
7	405		BROKEN ZONE (4.3 to 4.53 m) Broken Zone within Gabbro unit	98				60									
8	404			99				50									
9	403			93				60									
				100				60									

Packer Test #1 - 5.40-11.20 m - 4E-06 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

IDM Mining Ltd.
Red Mountain Project

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,332 E, 6,204,615 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.90 m; HQ3 to 32.80 m

Drillhole No.: MW16-002

Drill Type: B15 Diamond Drill

Total Length: 32.8 m

Elevation: 412.3 m

Azimuth, Inclination: 0, -90

Page: 2 of 4

Date Started: Aug 20, 16

Date Completed: Aug 22, 16

Logged by: CAG/MEA

Reviewed by: JEF

File M:\10\0056402\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECT\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES			
											SPT TEST 'N' VALUES - X								
											--- RQD	--- RMR	20	40	60	80			
402		[Graphic Log: Gabbro]	GABBRO (2.8 to 13.46 m) Light grey-green; coarse grained; foliated with medium grained foliations; medium strong to strong; moderately fractured; fresh to slightly weathered; chlorite and calcite infill on most; serpentinite infill on some fractures, light green to beige in colour; slickenside observed on multiple joint surfaces; calcite veining and veinlets throughout with intense quartz-calcite veining on the hedges of the fault zone; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100	UCS-01			60											
401	90						60												
400	12					79				35									
399	13					87				70									
		[Graphic Log: Fault Zone]	FAULT ZONE (13.46 to 15.83 m) Fault Zone within Gabbro unit	97				5											
398	14					90			5										
397	15					90				5									
		[Graphic Log: Gabbro]	GABBRO (15.83 to 32.8 m) Light grey-green; coarse grained; medium grained foliations; medium strong; slightly to moderately fractured; fresh to slightly weathered; chlorite and calcite infill on most joints; serpentinite infill on some fractures, light green to beige in colour; trace iron oxide staining on some joint surfaces; slickenside observed on multiple joint surfaces; calcite veining and veinlets throughout with intense quartz-calcite veining on the hedges of the fault zone; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	98				35											
396	16					97				35									
395	17																		
394	18					100				35									
393	19			100				35											

Groundwater Level measured during Pressure Transducer Installation.

Packer Test #2 - 11.16-17.20 m - 7E-07 m/s

Mini-Diver Pressure Transducer - S/N: SNV1160 - Installation Depth: 18.24 mbgs

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

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Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B2-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,332 E, 6,204,615 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.90 m; HQ3 to 32.80 m

Drillhole No.: MW16-002

Page: 3 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 20, 16

Total Length: 32.8 m

Date Completed: Aug 22, 16

Elevation: 412.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
392	21		GABBRO (15.83 to 32.8 m) Light grey-green; coarse grained; medium grained foliations; medium strong; slightly to moderately fractured; fresh to slightly weathered; chlorite and calcite infill on most joints; serpentine infill on some fractures, light green to beige in colour; trace iron oxide staining on some joint surfaces; slickenside observed on multiple joint surfaces; calcite veining and veinlets throughout with intense quartz-calcite veining on the hedges of the fault zone; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100				35								Packer Test #3 - 17.05-23.05 m - No Take
391	22			100				35								
390	23			100				35								
389	24			95				35								
388	25			100				35								
387	26			99				35								
386	27			100				35								
385	28			100				35								
384	29			97				35								
383																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B2-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,332 E, 6,204,615 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 2.90 m; HQ3 to 32.80 m

Drillhole No.: MW16-002

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 20, 16

Total Length: 32.8 m

Date Completed: Aug 22, 16

Elevation: 412.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\100654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
31	382		GABBRO (15.83 to 32.8 m) Light grey-green; coarse grained; medium grained foliations; medium strong; slightly to moderately fractured; fresh to slightly weathered; chlorite and calcite infill on most joints; serpentinite infill on some fractures, light green to beige in colour; trace iron oxide staining on some joint surfaces; slickenside observed on multiple joint surfaces; calcite veining and veinlets throughout with intense quartz-calcite veining on the hedges of the fault zone; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter).	100	UCS-02			35							Packer Test #5 - 28.75-32.80 m - No Take		
32	381																
33	380					100				35							
33	379		End of Drillhole: 32.8 m Target Depth Reached														
34	378																
35	377																
36	376																
37	375																
38	374																
39	373																

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,415 E, 6,204,434 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.34 m; HQ3 to 31.22 m

Drillhole No.: MW16-003

Drill Type: B15 Diamond Drill

Total Length: 31.2 m

Elevation: 426.3 m

Azimuth, Inclination: 0, -90

Page: 1 of 4

Date Started: Aug 22, 16

Date Completed: Aug 23, 16

Logged by: CAG/MEA

Reviewed by: JEF

File: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\MOUNTAIN 2016 GEOTECHNICAL SI.GPJ
 Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 (KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											RQD	RMR	SPT TEST 'N' VALUES - X				
											20	40	60	80			
0	426		FOREST DUFF/TOPSOIL (0 to 0.1 m) Spongy; organics; some gravel, fine to coarse grained, subangular to subrounded; some sand, fine to coarse grained; some silt; visible rootlets; dark brown; moist. From SPT recovery.	0	SPT-01	33		25/50/36	86								
1	425		SILTY GRAVEL (0.1 to 0.2 m) Coarse, subangular to subrounded; some sand, fine to coarse grained; grey; dense; wet. From SPT recovery.	67	SPT-02	83		39/50+	R								
2	424		COBBLES (0.2 to 0.61 m) Subangular to subrounded; uniformly graded; mottled grey and brown; loose; wet; finer material washed away through drilling process.	97	GS-01	18	GB	5									
3	423		SILTY SANDY GRAVEL (0.61 to 0.81 m) Medium to coarse, getting coarser with depth, subangular to subrounded; fine to medium grained sand; trace clay; well graded; grey; very dense; wet. From SPT recovery.	95				5									
4	422		COBBLES (0.81 to 1.22 m) Subangular to subrounded; uniformly graded; mottled grey and brown; loose; wet; finer material washed away through drilling process.	100	UCS-01			15									
5	421		GREYWACKE (1.22 to 2.96 m) Grey; coarse grained and fine grained; bedded; weak; completely rubbleized; highly weathered; chlorite and iron oxide staining on rubble fragments; chlorite matrix; calcite veins and alteration; possible intrusions of dyke.	100	UCS-02			5									
6	420		DYKE (2.96 to 4.9 m) Light tan; fine grained; massive; medium strong; moderately fractured; fresh to slightly weathered; chlorite and calcite infill; calcite micro-veining; 1-2 mm diameter phenocrysts; shreddy looking brown biotite; sericite alteration.	100				15									
7	419		GREYWACKE (4.9 to 7.47 m) Grey; fine grained, equigranular; finely bedded; weak; intensely fractured; fresh to slightly weathered; 1-2mm thick quartz-calcite veinlets cross-cutting the bedding; bedded at low angle to core axis.	98				5									
8	418		RUBBLE ZONE (5.48 to 5.57 m) Rubble Zone within Greywacke unit					15									
9	417		CONGLOMERATES (7.47 to 11.75 m) Grey to dark grey; fine to medium grained; foliated; strong; highly fractured; fresh; pyrite infill on some joints; white and black clasts up to 4cm in diameter; mostly clast supported; stretched look to clasts and are all oriented in same direction; becoming more sand rich with depth; patchy pyrite (possibly clast related); chert and argillite clasts present.	99				60									Packer Test #1 - 5.23-11.37 m - No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,415 E, 6,204,434 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.34 m; HQ3 to 31.22 m

Drillhole No.: MW16-003

Drill Type: B15 Diamond Drill

Total Length: 31.2 m

Elevation: 426.3 m

Azimuth, Inclination: 0, -90

Page: 2 of 4

Date Started: Aug 22, 16

Date Completed: Aug 23, 16

Logged by: CAG/MEA

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
11	416		CONGLOMERATES (7.47 to 11.75 m) Grey to dark grey; fine to medium grained; foliated; strong; highly fractured; fresh; pyrite infill on some joints; white and black clasts up to 4cm in diameter; mostly clast supported; stretched look to clasts and are all oriented in same direction; becoming more sand rich with depth; patchy pyrite (possibly clast related); chert and argillite clasts present.	100				60			40	40	40	40		
12	415		GREYWACKE (11.75 to 25.25 m) Grey; fine grained; finely bedded; strong to medium strong; highly fractured; fresh; trace iron oxide staining on joint surfaces; trace calcite and pyrite infill; trace 1-2 mm thick quartz-calcite veinlets cross-cutting the bedding; microfaults offsetting bedding by a few mm.	98				60			40	40	40	40		
13	414			85				50			40	40	40	40		
14	413		BROKEN ZONE (14.87 to 14.97 m) Broken Zone within Greywacke unit.	100				35			40	40	40	40		
15	412		BROKEN ZONE (15.47 to 15.87 m) Broken Zone within Greywacke unit.	100				75			40	40	40	40		
16	411			93				25			40	40	40	40		
17	410			100				75			40	40	40	40		
18	409			94				75			40	40	40	40		
19	408			100				50			40	40	40	40		
19	407			100				25			40	40	40	40		
	407			94				50			40	40	40	40		

Packer Test #2 - 11.06-17.18 m - 4E-08 m/s

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B2-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,415 E , 6,204,434 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.34 m; HQ3 to 31.22 m

Drillhole No.: MW16-003

Page: 3 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 22, 16

Total Length: 31.2 m

Date Completed: Aug 23, 16

Elevation: 426.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
 Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 28, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)		SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
								BLOW COUNTS (PER 6")	SPT 'N' VALUE		SPT TEST 'N' VALUES - X						
												20	40	60	80		
406			GREYWACKE (11.75 to 25.25 m) Grey; fine grained; finely bedded; strong to medium strong; highly fractured; fresh; trace iron oxide staining on joint surfaces; trace calcite and pyrite infill; trace 1-2 mm thick quartz-calcite veinlets cross-cutting the bedding; microfaults offsetting bedding by a few mm.	100				35									Packer Test #3 - 17.06-23.29 m - 4E-08 m/s
21				100				45									
405				96				60									
22				91				60									
404				97				45									
23				90				35									
403			BROKEN ZONE (23.29 to 23.39 m) Broken Zone within Greywacke unit.														
24				99				25									
402			BROKEN ZONE (24.09 to 24.19 m) Broken Zone within Greywacke unit.														
25				100				70									
401			DYKE (25.25 to 27.07 m) Light tan; fine grained; porphyritic; strong; highly fractured; fresh to slightly weathered; mainly fresh joint surfaces with iron oxide staining on some joint surfaces; trace quartz veinlets; some grey veinlets cross-cutting core axis; 1-2 mm phenocrysts; shreddy looking brown biotite; sericite alteration.	100													
26				100				70									
400				100				70									
27				93				15									
399			GREYWACKE (27.07 to 31.22 m) Grey; fine grained, equigranular; finely bedded; weak to medium strong; highly to intensely fractured; moderately to slightly weathered; chlorite and calcite infill; iron oxide staining on joint surfaces; calcite veining (~5 mm thick); becoming lighter grey towards bottom of hole.	97				15									
28				100				15									
398			BROKEN/RUBBLE ZONE (27.79 to 29.97 m) Broken & Rubble Zone within Greywacke unit.	100				5									
29				100				15									
397				100				10									
																	Packer Test #4 - 21.79-27.79 m - 1E-07 m/s
																	Groundwater Level measured during Pressure Transducer installation.
																	Packer Test #5 - 26.95-31.22 m - 7E-08 m/s
																	Mini-Diver Pressure

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,415 E , 6,204,434 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.34 m; HQ3 to 31.22 m

Drillhole No.: MW16-003

Page: 4 of 4

Drill Type: B15 Diamond Drill

Date Started: Aug 22, 16

Total Length: 31.2 m

Date Completed: Aug 23, 16

Elevation: 426.3 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
	396			100				25							<input type="checkbox"/>	Transducer - S/N: SNV1143 - Installation Depth: 29.78 mbgs
31			End of Drillhole: 31.22 m Target Depth Reached	100				25								
	395															
	394															
	393															
	392															
	391															
	390															
	389															
	388															
	387															

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E, 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 45.60 m

Drillhole No.: MW16-004

Drill Type: B15 Diamond Drill

Total Length: 45.6 m

Elevation: 410.0 m

Azimuth, Inclination: 0, -90

Page: 1 of 5

Date Started: Aug 31, 16

Date Completed: Sep 2, 16

Logged by: CAG/MEA

Reviewed by: JEF

File M:\11010059\02\DATA\300 - SITE INVESTIGATION PROGRAM\INT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											RQD	RMR	SPT TEST 'N' VALUES - X					
												20	40	60	80			
1	409		BOULDER (0 to 0.41 m) Rounded; uniformly graded; hard; moist; boulder is greenish grey; fine to medium grained; highly weathered; calcite and biotite phenocrysts; calcite and chlorite infill on fracture surfaces. BOULDERS & COBBLES (0.41 to 1.49 m) Rounded; some gravel, coarse, angular to subangular; poorly graded; mottled greenish grey; loose; moist; iron oxide staining on fracture surfaces in boulder; finer materials washed out during drilling process.	100 61 100	GS-01 GS-02 GS-03	100 100 100	G B G B G B											
2	408		GABBRO (1.49 to 3.59 m) Light grey-green; medium grained; massive; weak to medium strong; highly fractured; moderately weathered; calcite, chlorite and graphite infill; manganese oxide and iron oxide staining on joint surfaces; calcite veins; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter); biotite, hornblende and plagioclase phenocrysts.	100				25										
3	407		BROKEN ZONE (3.11 to 3.36 m) Broken Zone within Gabbro unit	100				15										
4	406		GOLDSLIDE PORPHYRY SUITE (3.59 to 4.95 m) Light green; medium grained; massive; weak; highly to intensely fractured; slightly weathered; chlorite and biotite infill; some calcite veins; biotite and hornblende phenocrysts, 1-3 mm in diameter; some plagioclase phenocrysts, 1-2 mm in diameter.	100				20										
5	405		GABBRO (4.95 to 6.29 m) Light grey-green; medium grained; massive; weak; moderately to highly fractured; slightly weathered; calcite and chlorite infill; iron oxide staining on joint surfaces; calcite veins; chlorite matrix; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter); biotite, hornblende and plagioclase phenocrysts.	100	UCS-01			15										
6	404		GOLDSLIDE PORPHYRY SUITE (6.29 to 7.88 m) Light green; medium grained; massive; weak to medium strong; moderately to highly fractured; slightly weathered; chlorite, calcite and pyrite infill; iron oxide & manganese oxide staining on joint surfaces; calcite veining; trace quartz-calcite veins cross-cutting core axis; hornblende phenocrysts, 1-3 mm in diameter; some plagioclase phenocrysts, 1-2 mm in diameter.	100				20										
7	403		BROKEN ZONE (8.18 to 8.73 m) Broken Zone within Gabbro unit	100	UCS-02			15										
8	402		BROKEN ZONE (8.18 to 8.73 m) Broken Zone within Gabbro unit	100	UCS-03			35										
9	401		BROKEN ZONE (9.18 to 9.53 m) Broken Zone within Gabbro unit	100				15										

Mini Baro-Diver Pressure Transducer - S/N: SNU8507 - Installation Depth: 1.97 mbgs

Zone of Lost Circulation - 5.05-5.78 m

Groundwater Level measured during Pressure Transducer installation.

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E, 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 45.60 m

Drillhole No.: MW16-004

Page: 2 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 31, 16

Total Length: 45.6 m

Date Completed: Sep 2, 16

Elevation: 410.0 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT TEST 'N' VALUES	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											20	40	60	80			
11	399		GABBRO (7.88 to 18.65 m) Light grey-green; medium grained; massive; weak to strong; moderately to highly fractured; slightly to moderately weathered; chlorite and biotite infill; quartz veinlets; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter); biotite, hornblende and plagioclase phenocrysts; lower contact marked by fibrous serpentine vein, approx. 5 cm thick.	100				15									
				BROKEN ZONE (10.48 to 10.69 m) Broken Zone within Gabbro unit	100				60								
					100				50								
13	397				100				25								
14	396				100				15								
15	395				100				25								
16	394				100				25								
17	393				100				15								
18	392				100				50								
19	391				100				35								
				100	UCS-04			35									

Mini-Diver Pressure Transducer - S/N: SNV1159 - Installation Depth: 14.47 mbgs

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E, 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 45.60 m

Drillhole No.: MW16-004

Page: 3 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 31, 16

Total Length: 45.6 m

Date Completed: Sep 2, 16

Elevation: 410.0 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
21	389		DIORITE (18.65 to 30 m) Green-grey; medium grained; massive and phaneritic; medium strong to strong; moderately to highly fractured; fresh; sericite infill; trace weak iron oxide staining on joint surfaces; trace quartz-epidote veinlets; bladed hornblende phenocrysts, ~1 mm in diameter; feldspar phenocrysts, 1-3 mm in diameter. BROKEN ZONE (20.1 to 20.75 m) Broken Zone within Diorite unit	100				5										
				100				45										
22	388			100				50										
				100				50										
23	387			100				75										
24	386			100				75										
25	385			100				75										
26	384			100				100										
27	383			100				100										
28	382			100				100										
29	381	100				50												

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E, 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 45.60 m

Drillhole No.: MW16-004

Drill Type: B15 Diamond Drill

Total Length: 45.6 m

Elevation: 410.0 m

Azimuth, Inclination: 0, -90

Page: 4 of 5

Date Started: Aug 31, 16

Date Completed: Sep 2, 16

Logged by: CAG/MEA

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File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library: M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 28, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	UCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											20	40	60	80				
31	379		GABBRO (30 to 45.6 m) Light grey-green; medium grained; massive; medium strong to strong; highly fractured; slightly weathered; some chlorite & calcite infill; trace iron oxide and manganese oxide staining on some joint surfaces; several serpentine veins, 10-20 mm thick; chlorite matrix; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter); biotite, hornblende and plagioclase phenocrysts; intrusive dykes at 40 m and 42 m depth.	100				60										
32	378			100				35										
33	377				BROKEN ZONE (32.78 to 33.09 m) Broken Zone within Gabbro unit	100				35								
34	376				BROKEN ZONE (33.92 to 37.02 m) Broken Zone within Gabbro unit	100				35								
35	375					100				15								
36	374					100				5								
37	373					100				5								
38	372					100				3								
39	371					100				5								
						100	UCS-05			45								

Packer Test #1 - 30.52-36.52 m - 6E-07 m/s

Packer Test #2 - 34.31-40.45 m - No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

IDM Mining Ltd.
Red Mountain Project

Knight Piésold
 CONSULTING

Project No.	Ref. No.	Rev.
VA101-594/02	1	0

FIGURE B2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E , 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size HWT to 1.41 m; HQ3 to 45.60 m

Drillhole No.: MW16-004

Page: 5 of 5

Drill Type: B15 Diamond Drill

Date Started: Aug 31, 16

Total Length: 45.6 m

Date Completed: Sep 2, 16

Elevation: 410.0 m

Logged by: CAG/MEA

Azimuth, Inclination: 0 , -90

Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											20	40	60	80				
41	369		GABBRO (30 to 45.6 m) Light grey-green; medium grained; massive; medium strong to strong; highly fractured; slightly weathered; some chlorite & calcite infill; trace iron oxide and manganese oxide staining on some joint surfaces; several serpentine veins, 10-20 mm thick; chlorite matrix; magnetic response with coarse brown biotite and pyroxene plebs (<2 mm in diameter); biotite, hornblende and plagioclase phenocrysts; intrusive dykes at 40 m and 42 m depth.	100				45										
42	368			100			60											
43	367			100			50											
44	366			100			50											
45	365			100			50											
46	364		End of Drillhole: 45.6 m Target Depth Reached															
47	363																	
48	362																	
49	361																	

Packer Test #3 - 39.46-45.60 m - No Take

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE B2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

APPENDIX B3

1996 SITE INVESTIGATION GRAPHICAL DRILLHOLE LOGS

(Pages B3-1 to B3-40)

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E, 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0, -90

Page: 1 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
0	436		OVERBURDEN (0 to 0.29 m) Inferred overburden from adjacent drillholes.								[Hatched area]							
0.29	435		GOLDSLIDE PORPHYRY SUITE (0.29 to 13.26 m) Light grey to pale white; medium to coarse grained; porphyritic, massive; strong; moderately fractured; fresh to slightly weathered; chlorite and calcite infill; iron oxide staining on joint surfaces; 2-3 mm diameter phenocrysts with 1 mm hornblende laths; chlorite altering mafics.	97				50			[Hatched area]							
2	434										[Hatched area]							
3	433										[Hatched area]							
4	432			92				50			[Hatched area]							
5	431										[Hatched area]							
6	430										[Hatched area]							
7	429			100				60			[Hatched area]							
8	428										[Hatched area]							
9	427										[Hatched area]							

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E , 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0 , -90

Page: 2 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
11	426		GOLDSLIDE PORPHYRY SUITE (0.29 to 13.26 m) Light grey to pale white; medium to coarse grained; porphyritic, massive; strong; moderately fractured; fresh to slightly weathered; chlorite and calcite infill; iron oxide staining on joint surfaces; 2-3 mm diameter phenocrysts with 1 mm hornblende laths; chlorite altering mafics.	92				60								
12	425															
	424			97				50								
13	423		SHEARED GABBRO (13.26 to 15.24 m) Grey to dark grey; fine grained; aphanitic, massive; strong; moderately to highly fractured; fresh to slightly weathered; quartz veining at top of zone.													
14	422			93				80								
15	421		GOLDSLIDE PORPHYRY SUITE (15.24 to 19.6 m) Light grey to pale white; medium to coarse grained; porphyritic, massive; strong; moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; 2-3 mm diameter phenocrysts with 1 mm hornblende laths; chlorite altering mafics; some calcite inclusions.													
16	420		BROKEN ZONE (15.89 to 15.99 m) Broken Zone within Goldslide Porphyry Suite unit													
17	419			96				75								
18	418															
19	417															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E , 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0 , -90

Page: 3 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
416	21		SHEARED GABBRO (19.6 to 22.65 m) Grey to dark grey; fine grained; aphanitic, massive; strong; moderately to highly fractured; fresh to slightly weathered; calcite banding; chlorite alteration.	99				50								
415	22		GOLDSLIDE PORPHYRY SUITE (22.65 to 28.96 m) Light grey; medium to coarse grained; massive; strong; highly fractured with multiple broken zones; fresh to slightly weathered; iron oxide staining on joint surfaces and broken zone fragments.													
414	23		BROKEN ZONE (22.97 to 23.07 m) Broken Zone within Goldslide Porphyry Suite unit	93				75								
413	24		BROKEN ZONE (25.45 to 26.15 m) Broken Zone within Goldslide Porphyry Suite unit													
412	25		BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit	100				65								
411	26		BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit													
410	27		BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit	97				70								
409	28		BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit													
408	29		BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit													
407			BROKEN ZONE (28.63 to 28.88 m) Broken Zone within Goldslide Porphyry Suite unit													

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM.
 Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
 Red Mountain Project**

**Knight Piésold
 CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E , 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0 , -90

Page: 4 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
406		X Y	TUFF (WELDED) (28.96 to 33.53 m) Grey to dark grey; fine to medium grained; massive; strong; slightly to moderately fractured; fresh to slightly weathered; calcite veins and veinlets throughout; chlorite alteration.	100				50								
31		X Y														
405		X Y														
32		X Y														
404		X Y														
33		X Y														
403		X Y														
			GOLDSLIDE PORPHYRY SUITE (33.53 to 36.58 m) Grey to light green grey; fine grained; porphyritic, massive; strong; slightly fractured; fresh to slightly weathered; calcite banding and phenocrysts.	100				60								
34		X Y														
402		X Y														
35		X Y														
401		X Y														
36		X Y														
400		X Y														
37		X Y	TUFF (WELDED) (36.58 to 39.01 m) Grey to dark grey; fine to medium grained; massive; medium strong; slightly to moderately fractured; fresh to slightly weathered; calcite inclusions and bands; chlorite alteration.	94				40								
399		X Y														
38		X Y														
398		X Y														
39		X Y														
397		X Y														

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E, 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0, -90

Page: 5 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
											---	---	---	---				
396			GOLDSLIDE PORPHYRY SUITE (39.01 to 48.16 m) Light greenish grey; fine grained; silicified, massive; strong to medium strong; highly fractured with multiple broken zones; slightly to moderately weathered; calcite veinlets and veins throughout; iron oxide staining on joint surfaces and broken zone fragments.	90				55										
41			BROKEN ZONE (39.91 to 40.81 m) Broken Zone within Goldslide Porphyry Suite unit															
395																		
42																		
394																		
43																		
393																		
44			BROKEN ZONE (43.87 to 44.17 m) Broken Zone within Goldslide Porphyry Suite unit	94				25										
392																		
45			BROKEN ZONE (44.57 to 45.52 m) Broken Zone within Goldslide Porphyry Suite unit															
391																		
46																		
390																		
47																		
389																		
48																		
388			TUFF (WELDED) (48.16 to 64.01 m) Grey to dark grey; fine to medium grained; massive; weak to strong; slightly fractured with few broken and rubble zones; fresh to moderately weathered; clay infill in rubbleized sections.	100				30										
49			RUBBLE ZONE (48.17 to 48.26 m) Rubble Zone within Welded Tuff unit															
387			BROKEN ZONE (48.41 to 49.37 m)															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E , 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0 , -90

Page: 6 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
386		Y Y	Broken Zone within Welded Tuff unit TUFF (WELDED) (48.16 to 64.01 m) Grey to dark grey; fine to medium grained; massive; weak to strong; slightly fractured with few broken and rubble zones; fresh to moderately weathered; clay infill in rubbleized sections.	96				40								
51		Y Y														
385		Y Y														
52		Y Y														
384		Y Y														
53		Y Y														
383		Y Y		97				50								
54		Y Y														
382		Y Y	RUBBLE ZONE (54.25 to 54.37 m) Rubble Zone within Welded Tuff unit	100				20								
55		Y Y	BROKEN ZONE (54.45 to 54.65 m) Broken Zone within Welded Tuff unit													
381		Y Y														
56		Y Y														
380		Y Y		95				60								
57		Y Y														
379		Y Y														
58		Y Y														
378		Y Y														
59		Y Y														
377		Y Y		99				60								

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E, 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0, -90

Page: 7 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
376			TUFF (WELDED) (48.16 to 64.01 m) Grey to dark grey; fine to medium grained; massive; weak to strong; slightly fractured with few broken and rubble zones; fresh to moderately weathered; clay infill in rubbleized sections.													
61			BROKEN ZONE (60.96 to 61.31 m) Broken Zone within Welded Tuff unit													
375																
62																
374				100				60								
63			BROKEN ZONE (63.06 to 63.16 m) Broken Zone within Welded Tuff unit													
373																
64			GOLDSLIDE PORPHYRY SUITE (64.01 to 70.1 m) Light greenish grey; fine to medium grained; porphyritic, massive; highly fractured with multiple broken zones; slightly weathered; clay altered in broken areas.													
372																
65				98				35								
371																
66																
370																
67																
369																
68			BROKEN ZONE (68.06 to 68.76 m) Broken Zone within Goldslide Porphyry Suite unit													
368				100				45								
69																
367																

Constant Head Test #1 - 56.60-80.00 m - 3E-07 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd.
Red Mountain Project

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E, 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0, -90

Page: 8 of 9
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
366		X Y	TUFF (WELDED) (70.1 to 82.3 m) Dark grey to grey; fine to coarse grained; foliated to massive; medium strong to strong; moderately fractured with broken sections near the top; slightly weathered; banded quartz-calcite near top of zone; calcite inclusions throughout; chlorite altered with occasional clay altered sections; black xenoliths and calcite veinlets near bottom of hole.	89				50							
71		X Y													
365		X Y													
72		X Y													
364		X Y													
73		X Y													
363		X Y		100				75							
74		X Y													
362		X Y													
75		X Y													
361		X Y													
76		X Y													
360		X Y													
77		X Y													
359		X Y		100				75							
78		X Y													
358		X Y													
79		X Y		93				25							
357		X Y													

Falling Head Test #1 - 68.80-80.00 m - 2E-09 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd.
Red Mountain Project

Knight Piésold
CONSULTING

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E , 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 1.50 m; BQ to 82.30 m

Drillhole No.: DT-273
 Drill Type: N/A
 Total Length: 82.3 m
 Elevation: 436.3 m
 Azimuth, Inclination: 0 , -90

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
356		X Y X Y X Y X Y X Y X Y X Y X Y X Y X Y	TUFF (WELDED) (70.1 to 82.3 m) Dark grey to grey; fine to coarse grained; foliated to massive; medium strong to strong; moderately fractured with broken sections near the top; slightly weathered; banded quartz-calcite near top of zone; calcite inclusions throughout; chlorite altered with occasional clay altered sections; black xenoliths and calcite veinlets near bottom of hole.	100				50								
81																
355																
82																
354			End of Drillhole: 82.3 m Target Depth Reached													
83																
353																
84																
352																
85																
351																
86																
350																
87																
349																
88																
348																
89																
347																

GENERAL REMARKS:
 Elevations and coordinates are surveyed coordinates provided by IDM.
 Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

Knight Piésold
CONSULTING

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FIGURE B3-1

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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 Date Started: Jul 30, 96
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
0	445		TOPSOIL (0 to 0.1 m) Inferred topsoil thickness from adjacent drillholes OVERBURDEN (0.1 to 2.44 m) Inferred overburden from adjacent drillholes.														
2.44	443		GABBRO (2.44 to 20.73 m) Greenish grey; fine to coarse grained; porphyritic, massive; very strong; slightly to moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; biotite phenocrysts towards lower half of zone; chlorite altered. BROKEN ZONE (2.87 to 3.12 m) Broken Zone within Gabbro unit	52				100									
3.12	442																
5.79	441																
6.79	440			97				100									
8.29	439																
9.29	438																

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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 Date Started: Jul 30, 96
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											---	---	---	---			
11	437		GABBRO (2.44 to 20.73 m) Greenish grey; fine to coarse grained; porphyritic, massive; very strong; slightly to moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; biotite phenocrysts towards lower half of zone; chlorite altered.	100				100								Falling Head Test #1 - 6.20-20.70 m - 1E-07m/s	
12	436																
13	435					100				100							
14	434																
15	433																
16	433	BROKEN ZONE (16.45 to 16.65 m) Broken Zone within Gabbro unit		92				100								Constant Head Test #1 - 6.20-20.70 m - 5E-07 m/s	
17	432																
18	431																
19	430			100				100									

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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 Date Started: Jul 30, 96
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
21	429	+	MAFIC DYKE (20.73 to 39.01 m) Light greenish grey to light grey; fine to coarse grained; porphyritic, massive; very strong; moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; quartz and calcite veinlets throughout; biotite phenocrysts throughout.	98				100								
22	428							100								
23	427															
24	426				100			100								
25	425															
26	424															
27	423				97			100								
28																
29																

Falling Head Test #2 - 18.70-42.10 m - 5E-07 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES							
											SPT TEST 'N' VALUES - X												
											20	40	60	80									
422	+	+	MAFIC DYKE (20.73 to 39.01 m) Light greenish grey to light grey; fine to coarse grained; porphyritic, massive; very strong; moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; quartz and calcite veinlets throughout; biotite phenocrysts throughout.	97				100								Constant Head Test #2 - 18.70-42.10 m - 3E-07 m/s							
31	+	+																					
421	+	+																					
32	+	+																					
420	+	+																					
33	+	+																					
34	+	+																					
419	+	+															FELSIC DYKE (39.01 to 51.21 m) Light grey to grey; fine to coarse grained; porphyritic, massive; strong; slightly fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; some clay infill in places.	95			100		
35	+	+																					
418	+	+																					
36	+	+																					
417	+	+																					
37	+	+																					
38	+	+																					
416	+	+																					
39	+	+																					
415	+	+																					

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**



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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E, 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156, -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
41	414	+	FELSIC DYKE (39.01 to 51.21 m) Light grey to grey; fine to coarse grained; porphyritic, massive; strong; slightly fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; some clay infill in places.	98				85			[Hatched area with blue diagonal lines]					
42	413	+									[Hatched area with blue diagonal lines]					
43	412	+			90			75			[Hatched area with blue diagonal lines]					
44	411	+		BROKEN ZONE (43.77 to 43.97 m) Broken Zone within Felsic Dyke unit							[Hatched area with blue diagonal lines]					
46	410	+		98			125			[Hatched area with blue diagonal lines]						
48	409	+								[Hatched area with blue diagonal lines]						
49	408	+								[Hatched area with blue diagonal lines]						
49	408	+		98			125			[Hatched area with blue diagonal lines]						

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E, 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156, -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
51	406	+	FELSIC DYKE (39.01 to 51.21 m) Light grey to grey; fine to coarse grained; porphyritic, massive; strong; slightly fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; some clay infill in places.								---	---	---	---		Falling Head Test #3 - 39.40-60.40 m - 1E-06 m/s
52	405	+	MAFIC DYKE (51.21 to 69.49 m) Light grey to pale grey; coarse grained; porphyritic to equigranular, massive; very strong; moderately fractured; fresh; calcite infill and inclusions.	94				125			---	---	---	---		
53	404	+									---	---	---	---		
54	403	+		89				125			---	---	---	---		
55	402	+									---	---	---	---		
56	401	+		97				100			---	---	---	---		
57	400	+									---	---	---	---		
58		+									---	---	---	---		
59		+									---	---	---	---		

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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Red Mountain Project**

**Knight Piésold
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
399	399	+	MAFIC DYKE (51.21 to 69.49 m) Light grey to pale grey; coarse grained; porphyritic to equigranular, massive; very strong; moderately fractured; fresh; calcite infill and inclusions.	100				100			[SPT Test 'N' Values Graph]					
61		+														
398	398	+														
62		+														
397	397	+														
63		+														
64		+														
396	396	+														
65		+														
395	395	+														
66		+														
394	394	+	BROKEN ZONE (66.45 to 67.06 m) Broken Zone within Mafic Dyke unit	95				100								
67		+														
68		+														
393	393	+														
69		+														
392	392	+														

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
											20	40	60	80		
71	391		GABBRO (69.49 to 75.59 m) Green grey; fine to coarse grained; massive; strong; slightly fractured; fresh to slightly weathered; calcite veinlets; black biotite phenocrysts; chlorite altered.	100				85								Falling Head Test #4 - 61.40-81.10 m - 5E-07 m/s
72	390							85								
73	389															
74	388			99				85								
75	388															
76	387		BRECCIATED FAULT ZONE (75.59 to 78.49 m) Dark grey to light greenish grey; fine to coarse grained; porphyritic, brecciated; weak to very weak; intensely fractured and broken; moderately weathered; clay infill in broken sections; highly altered and sheared; chlorite rich.													
77	386		BROKEN ZONE (76.09 to 76.56 m) Broken Zone within Brecciated unit					5								
78	386		BROKEN ZONE (76.99 to 77.19 m) Broken Zone within Brecciated unit	99												
78	386		BROKEN ZONE (77.54 to 78.7 m) Broken Zone within Brecciated unit													
79	385		FELSIC DYKE (78.49 to 90.83 m) Grey to light grey; fine to coarse grained; porphyritic, massive; strong to very strong; slightly fractured; fresh; calcite veinlets throughout; chlorite altered; calcite and biotite phenocrysts throughout.													
384																

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
81	383	+	FELSIC DYKE (78.49 to 90.83 m) Grey to light grey; fine to coarse grained; porphyritic, massive; strong to very strong; slightly fractured; fresh; calcite veinlets throughout; chlorite altered; calcite and biotite phenocrysts throughout.	98				50								
82		+	BROKEN ZONE (81.64 to 82.24 m) Broken Zone within Felsic Dyke unit													
83	382	+		100				75								
84	381	+														
85	380	+		100				100								
86	379	+		100				100								
87		+														
88	378	+														
89	377	+		97				100								

Falling Head Test #5 - 83.60-90.80 m - 1E-06 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
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**Knight Piésold
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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size BW to 0.95 m; BQ to 90.83 m

Drillhole No.: DT-277
 Drill Type: N/A
 Total Length: 90.8 m
 Elevation: 445.2 m
 Azimuth, Inclination: 156 , -50

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
	376	+ + +														
	91		End of Drillhole: 90.83 m Target Depth Reached													
	375															
	92															
	374															
	93															
	373															
	94															
	372															
	95															
	371															
	96															
	370															
	97															
	369															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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Red Mountain Project**



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FIGURE B3-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E, 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328, -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
0 to 8.64	454 to 449		OVERBURDEN (0 to 8.64 m) Inferred overburden from adjacent drillholes. Depth to Bedrock unknown, Core Box 1 missing from Core Yard when logging core.													
8.64 to 14.94	450 to 448		WACKE (8.64 to 14.94 m) Grey to light grey; fine to medium grained; porphyritic, massive; strong; slightly to moderately fractured; fresh to slightly weathered; minor iron oxide staining on joint surfaces; calcite veinlets throughout; minor chlorite alteration. BROKEN ZONE													

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd.
Red Mountain Project

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E, 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328, -47

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 Date Started: Jul 30, 96
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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
447			(9.04 to 9.34 m) Broken Zone within Wacke unit WACKE (8.64 to 14.94 m) Grey to light grey; fine to medium grained; porphyritic, massive; strong; slightly to moderately fractured; fresh to slightly weathered; minor iron oxide staining on joint surfaces; calcite veinlets throughout; minor chlorite alteration.	89				70							
446															
445				97			75								
444															
443			GABBRO (14.94 to 17.98 m) Light grey to green grey; medium to coarse grained; equigranular, massive; strong; moderately fractured; fresh; chlorite altered with some intensely altered sections.	94				50						Falling Head Test #1 - 12.90-21.00 m - 2E-06 m/s	
442															
441															
440				77			85								

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM.
 Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd. Red Mountain Project		
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FIGURE B3-3		

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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 Library: M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
21	439	+	MAFIC DYKE (17.98 to 39.32 m) Greyish white to white; fine to coarse grained; porphyritic to equigranular and massive; strong to very strong; fresh to slightly weathered; calcite phenocrysts; trace iron oxide staining.													
22	438	+									79	90				
24	437	+									96	100				
28	434	+									100	100				
25	436	+														
26	435	+														
27	435	+														
29	433	+														

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES	
											SPT TEST 'N' VALUES - X						
											20	40	60	80			
31	432	+	MAFIC DYKE (17.98 to 39.32 m) Greyish white to white; fine to coarse grained; porphyritic to equigranular and massive; strong to very strong; fresh to slightly weathered; calcite phenocrysts; trace iron oxide staining.	100												Falling Head Test #2 - 19.30-42.40 m - 4E-07 m/s	
32	431	+															
33	430	+															
34	429	+															
35	428	+															
36	427	+															
37	426	+															
38		+															
39		+															
		+															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											20	40	60	80				
425	+	+	MAFIC DYKE (39.32 to 54.56 m) Grey to light grey; medium to coarse grained; equigranular, massive, porphyritic; strong to very strong; moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; calcite veinlets throughout; chlorite altered; calcite phenocrysts throughout.	95				100										
41	+	+																
424	+	+																
42	+	+																
423	+	+																
44	+	+				98					85							
422	+	+																
45	+	+																
421	+	+																
46	+	+																
47	+	+		100				85										
48	+	+																
419	+	+																
49	+	+																
418	+	+																

Falling Head Test #3 - 37.60-60.70 m - 6E-08 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
											20	40	60	80				
51	417	+	MAFIC DYKE (39.32 to 54.56 m) Grey to light grey; medium to coarse grained; equigranular, massive, porphyritic; strong to very strong; moderately fractured; fresh to slightly weathered; iron oxide staining on joint surfaces; calcite veinlets throughout; chlorite altered; calcite phenocrysts throughout.	100				100			[Hatched pattern]							
52	416	+									[Hatched pattern]							
53	415	+		84				100			[Hatched pattern]							
54	415	+									[Hatched pattern]							
55	414	+	GABBRO (54.56 to 57.61 m) Light grey to greenish grey; fine to coarse grained; porphyritic, massive; very strong; slightly to moderately fractured; fresh; calcite veinlets throughout.	100				100			[Hatched pattern]							
56	413	+		100				100			[Hatched pattern]							
57	413	+									[Hatched pattern]							
58	412	+	MAFIC DYKE (57.61 to 60.66 m) Grey; fine to medium grained; equigranular, massive; very strong; slightly to moderately fractured fresh; calcite and quartz veinlets throughout.	100				150			[Hatched pattern]							
59	411	+		100				150			[Hatched pattern]							

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E, 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328, -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
410	410	+	GABBRO (60.66 to 75.59 m) Dark green to greenish grey; fine to coarse grained; porphyritic, massive; very strong; slightly to moderately fractured; fresh; calcite veinlets throughout; heavily chloritized.	100				150								
61	409	+									100	150				
62	408	+									100	150				
63	407	+		100	150											
64	406	+		100	175											
65	405	+		100												
66	404	+		100												
67																
68																
69																

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
403	402	+	GABBRO (60.66 to 75.59 m) Dark green to greenish grey; fine to coarse grained; porphyritic, massive; very strong; slightly to moderately fractured; fresh; calcite veinlets throughout; heavily chloritized.	99				175			[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	Falling Head Test #4 - 58.90-85.00 m - 4E-07 m/s
71	72															
402	401	+	FELSIC DYKE (75.59 to 78.94 m) Grey; fine grained; porphyritic, massive; very strong; moderately fractured; fresh; calcite phenocrysts throughout.	100				175			[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	
73	74															
401	400	+	GABBRO (78.94 to 85.04 m) Dark green to greenish grey; fine to coarse grained; equigranular, massive; very strong; slightly to moderately fractured; fresh; calcite veinlets throughout; heavily chloritized.	92				100			[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	
75	76															
399	398	+									[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	
77	78															
398	397	+									[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	
79	80															
397	396	+									[SPT Test 'N' Values: 20, 40, 60, 80]				[Instrumentation / Well Details]	
81	82															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E , 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 1.50 m; NQ to 85.04 m

Drillhole No.: DT-280
 Drill Type: N/A
 Total Length: 85.0 m
 Elevation: 454.4 m
 Azimuth, Inclination: 328 , -47

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											---	---	---	---				
											20	40	60	80				
81	395	[Graphic Log: Pattern of small crosses]	GABBRO (78.94 to 85.04 m) Dark green to greenish grey; fine to coarse grained; equigranular, massive; very strong; slightly to moderately fractured; fresh; calcite veinlets throughout; heavily chloritized.	100				150			[SPT Test 'N' Values: Blue hatched area, red line]				[Instrumentation / Well Details: Hatched pattern]			
82	394			95				150										
83	393																	
84	393																	
85	392		End of Drillhole: 85.04 m Target Depth Reached															
86																		
87	391																	
88	390																	
89																		
	389																	

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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Red Mountain Project**

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FIGURE B3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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 Reviewed by: JEF

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
0 to 2.83	463		OVERBURDEN (0 to 2.83 m) Inferred overburden from adjacent drillholes.													
2.83 to 5.89	461		MAFIC DYKE (2.83 to 11.89 m) Dark grey to black; fine to medium grained; massive; strong; moderately to highly fractured with highly broken section in middle of zone; fresh to slightly weathered.	100				60								
5.89 to 6.69	459		BROKEN ZONE (5.89 to 6.69 m) Broken Zone within Mafic Dyke unit													
6.69 to 9.00	457			89				60								

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
455	455	+	MAFIC DYKE (2.83 to 11.89 m) Dark grey to black; fine to medium grained; massive; strong; moderately to highly fractured with highly broken section in middle of zone; fresh to slightly weathered.	92				60								
11	454	+														
12	453	+	GOLDSLIDE PORPHYRY SUITE (11.89 to 21.03 m) Grey to light grey; fine to medium grained; massive; strong; moderately fractured; fresh to slightly weathered; calcite veinlets; black (biotite) phenocrysts.													
13	452	+	BROKEN ZONE (11.9 to 12 m) Broken Zone withing Goldslide Porphyry unit	86				75								
14	451	+														
15	450	+														
16	449	+														
17	448	+														
18	447	+														
19																

Falling Head Test #1 -
10.10-22.90 m - 2E-06 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E , 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51 , -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
21	446		GOLDSLIDE PORPHYRY SUITE (11.89 to 21.03 m) Grey to light grey; fine to medium grained; massive; strong; moderately fractured; fresh to slightly weathered; calcite veinlets; black (biotite) phenocrysts.												
22	445		GABBRO (21.03 to 24.84 m) Dark grey to greenish grey; fine to coarse grained; massive; strong; intensely fractured and broken; moderately to slightly weathered; chlorite infill in fractured sections; iron oxide staining on broken zone fragments; calcite and quartz veining throughout.												
23	444		BROKEN ZONE (21.65 to 21.85 m) Broken Zone within Gabbro unit	100				75							
24	443		BROKEN ZONE (24.08 to 24.86 m) Broken Zone within Gabbro unit	100				75							
25	442		GOLDSLIDE PORPHYRY SUITE (24.84 to 36.27 m) Greyish white to light grey; fine to medium grained; porphyritic with some aphanitic and silicified sections, massive; strong; highly fractured; fresh; some calcite and chlorite alteration.												
26	441		BROKEN ZONE (27.83 to 28.73 m) Broken Zone withing Goldslide Porphyry unit	95				75							
27	440		BROKEN ZONE (27.83 to 28.73 m) Broken Zone withing Goldslide Porphyry unit												
28	439		BROKEN ZONE (27.83 to 28.73 m) Broken Zone withing Goldslide Porphyry unit	99				75							
29	438		BROKEN ZONE (27.83 to 28.73 m) Broken Zone withing Goldslide Porphyry unit												

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
31	437		GOLDSLIDE PORPHYRY SUITE (24.84 to 36.27 m) Greyish white to light grey; fine to medium grained; porphyritic with some aphanitic and silicified sections, massive; strong; highly fractured; fresh; some calcite and chlorite alteration.	54				60								
32	436															
33	435															
34	434		BROKEN ZONE (33.82 to 34.72 m) Broken Zone withing Goldslide Porphyry unit	59				60								
35	433															
36	432		SHEARED GABBRO (36.27 to 48.46 m) Grey to green grey; fine to medium grained; massive; strong; highly fractured with multiple broken sections; chlorite alteration; black (biotite) phenocrysts.	95				75								
37	431															
38	430															
39	430															

Falling Head Test #2 - 22.30-48.50 m - 4E-07 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
429	429		SHEARED GABBRO (36.27 to 48.46 m) Grey to green grey; fine to medium grained; massive; strong; highly fractured with multiple broken sections; chlorite alteration; black (biotite) phenocrysts.	97				60								
433	433		BROKEN ZONE (42.97 to 43.07 m) Broken Zone within Gabbro unit													
444	444		BROKEN ZONE (43.77 to 43.97 m) Broken Zone within Gabbro unit	99				65								
455	455		BROKEN ZONE (45.07 to 45.17 m) Broken Zone within Gabbro unit													
477	477		GABBRO (48.46 to 63.7 m) Dark grey to greenish grey; fine to coarse grained; massive; strong; moderately fractured with occasional broken sections; moderately to slightly weathered; chlorite infill in fractured sections; iron oxide staining on broken zone fragments; calcite and quartz veining throughout; chlorite altered.	100				75								

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES		
											SPT TEST 'N' VALUES - X							
											20	40	60	80				
420	51		GABBRO (48.46 to 63.7 m) Dark grey to greenish grey; fine to coarse grained; massive; strong; moderately fractured with occasional broken sections; moderately to slightly weathered; chlorite infill in fractured sections; iron oxide staining on broken zone fragments; calcite and quartz veining throughout; chlorite altered.	92				80										
419	52			BROKEN ZONE (52.05 to 52.2 m) Broken Zone within Gabbro unit														
418	53					94				75								
417	54																	
416	55																	
415	56			90														
414	57																	
413	58																	
412	59			100														
																	Falling Head Test #3 - 46.70-63.80 m - 1E-07 m/s	

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd.
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E , 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51 , -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
61	411		GABBRO (48.46 to 63.7 m) Dark grey to greenish grey; fine to coarse grained; massive; strong; moderately fractured with occasional broken sections; moderately to slightly weathered; chlorite infill in fractured sections; iron oxide staining on broken zone fragments; calcite and quartz veining throughout; chlorite altered.	100				75			RQD					
62	410										RMR					
63	409										SPT					
64	408		MAFIC DYKE (63.7 to 80.77 m) Grey to dark grey; fine to coarse grained; massive; strong; moderately fractured; fresh to slightly weathered; calcite veins; black (biotite) phenocrysts; calcite and quartz inclusions; chlorite alteration.	100				75			RQD					
65	407										RMR					
66	406										SPT					
67	405										SPT					
68	404										SPT					
69	404										RQD					

GENERAL REMARKS:
 Elevations and coordinates are surveyed coordinates provided by IDM.
 Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-4

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E , 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51 , -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES									
											SPT TEST 'N' VALUES - X														
											20	40	60	80											
403	+	+	MAFIC DYKE (63.7 to 80.77 m) Grey to dark grey; fine to coarse grained; massive; strong; moderately fractured; fresh to slightly weathered; calcite veins; black (biotite) phenocrysts; calcite and quartz inclusions; chlorite alteration.	94				80																	
71	+	+																							
402	+	+																							
72	+	+																							
401	+	+																							
73	+	+																							
400	+	+									85						75								Constant Head Test #1 - 65.00-82.00 m - 3E-07 m/s
74	+	+																							
75	+	+																							
399	+	+																							
76	+	+																							
398	+	+																							
77	+	+																							
397	+	+	93				75																		
78	+	+																							
396	+	+																							
79	+	+																							
395	+	+																							
98	+	+																							

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

IDM Mining Ltd.
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
81	394		BROKEN ZONE (80.34 to 80.44 m) Broken Zone within Mafic Dyke unit GOLDSLIDE PORPHYRY SUITE (80.77 to 94.18 m) Greyish white to pale grey; medium to coarse grained; porphyritic, equigranular, and massive; very strong; slightly fractured with highly fractured section near top of zone; fresh.	98				100								
82	393															
83	392															
84	391															
85	390															
86	389			98				125								
87	388															
88	387															
89	387			99				125								

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	JCS (MPa)	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											---	---	---	---		
91	385		GOLDSLIDE PORPHYRY SUITE (80.77 to 94.18 m) Greyish white to pale grey; medium to coarse grained; porphyritic, equigranular, and massive; very strong; slightly fractured with highly fractured section near top of zone; fresh.								---	---	---	---		
92	384			96				125			---	---	---	---		
93	383										---	---	---	---		
94	382		SHEARED GABBRO (94.18 to 100.28 m) Grey to light grey; fine grained; massive, porphyritic and silicified; very strong; intensely fractured; fresh to slightly weathered; iron oxide staining on fracture surfaces; calcite phenocrysts. BROKEN ZONE (95.18 to 96.18 m) Broken Zone within Gabbro unit								---	---	---	---		
95	381			94				100			---	---	---	---		
96	380										---	---	---	---		
97	379										---	---	---	---		
98	378			100				100			---	---	---	---		
99	378										---	---	---	---		

Constant Head Test #2 - 86.30-100.30 m - 6E-07 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

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 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

File M:\10\0604\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\0604\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 (KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
										SPT TEST 'N' VALUES - X					
										20	40	60	80		
377			GABBRO (100.28 to 105.46 m) Dark grey to greenish grey; fine to medium grained; massive; strong; moderately fractured; fresh to slightly weathered; calcite veinlets; chlorite alteration.												
101			BROKEN ZONE (101.88 to 102.18 m) Broken Zone within Gabbro unit	100				70							
376															
102															
375															
103															
374															
104				100				75							Falling Head Test #4 - 98.50-114.00 m - 8E-07 m/s
373															
105															
372			GOLDSLIDE PORPHYRY SUITE (105.46 to 110.55 m) Greyish white to pale grey; fine to coarse grained; equigranular, and massive; very strong; slightly fractured; fresh; some black (biotite) phenocrysts.												
106															
107															
108				100				125							
370															
109															
369															Constant Head Test #3 - 98.50-114.00 m - 5E-07 m/s

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E , 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N
 Hole Size NW to 3.00 m; NQ to 114.00 m

Drillhole No.: DT-282
 Drill Type: N/A
 Total Length: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51 , -60

Page: 12 of 12
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT LIBRARY - REV A.GLB, GEOTECHNICAL DRILLHOLE LOG, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

DEPTH - (m)	ELEVATION - (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	RUN RECOVERY (%)	SAMPLE NO.	SAMPLE REC. (%)	SAMPLE TYPE	BLOW COUNTS (PER 6")	JCS (MPa)	SPT 'N' VALUE	KEY ROCK MASS PARAMETERS				INSTRUMENTATION / WELL DETAILS	DRILLING NOTES
											SPT TEST 'N' VALUES - X					
											20	40	60	80		
111	368		MAFIC DYKE (110.55 to 111.47 m) Dark grey; fine grained; massive; strong; slightly fractured; fresh to slightly weathered; calcite veins and banding; chlorite alteration.	100				70								
112	367		GOLDSLIDE PORPHYRY SUITE (111.47 to 114 m) Greyish white to light greenish grey; fine grained; aphanitic, silicified and massive; very strong; slightly fractured; fresh to slightly weathered; some calcite veinlets.	100				125								
114	365		End of Drillhole: 114 m Target Depth Reached													
115	364															
116	363															
117	362															
118	361															

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**



Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE B3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

APPENDIX C

WELL COMPLETION LOGS

- Appendix C1 Standpipe Piezometers
- Appendix C2 Groundwater Monitoring Wells
- Appendix C3 Vibrating Wire Piezometers
- Appendix C4 1996 Site Investigation Standpipe Piezometers

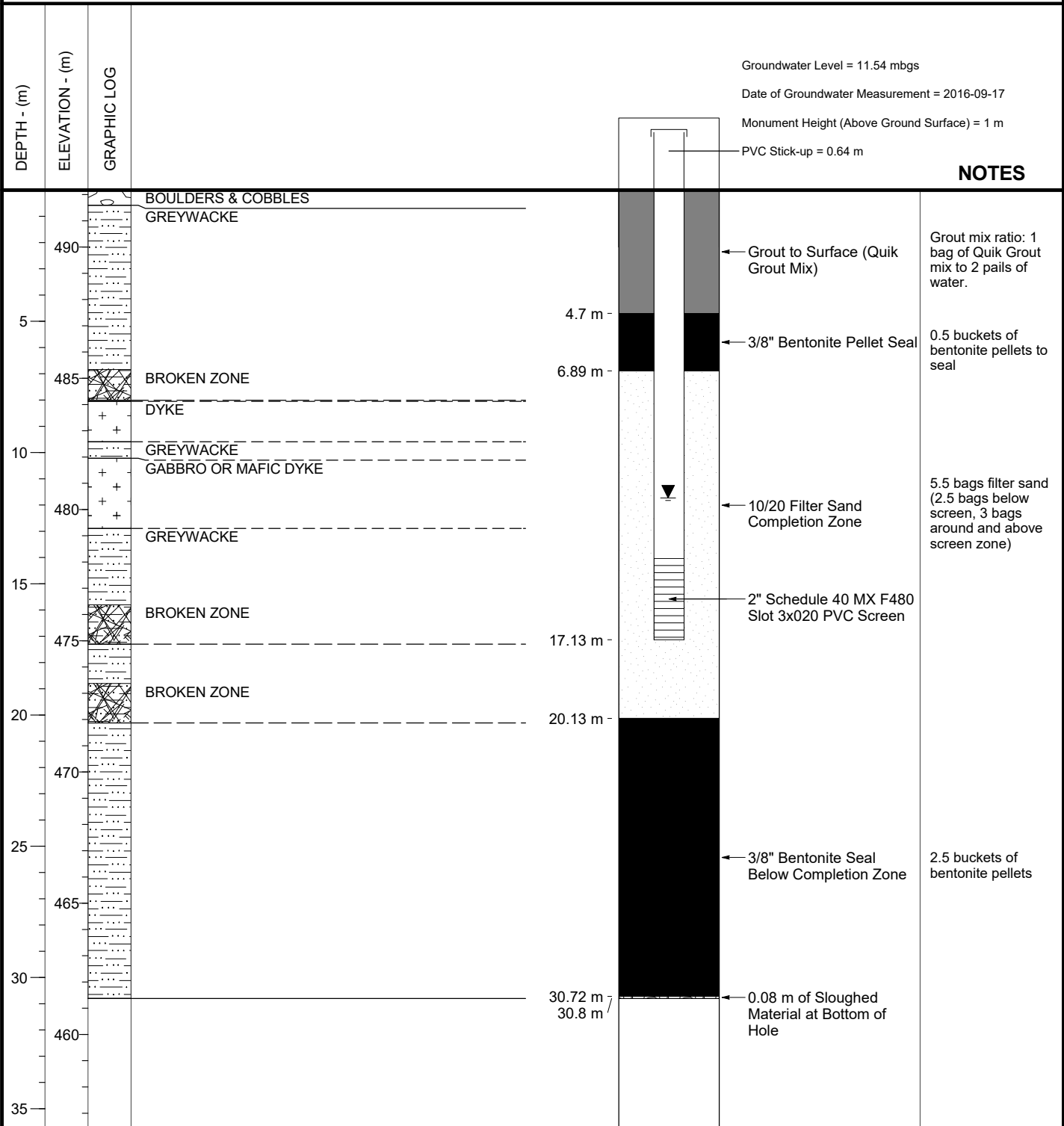
APPENDIX C1
STANDPIPE PIEZOMETER COMPLETION LOGS
(Pages C1-1 to C1-4)

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,728 E , 6,204,160 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-001
 Drill Type: B15 Diamond Drill
 Total Depth: 30.8 m
 Elevation: 492.171 m
 Azimuth , Inclination: 0 , -90

Page: 1 of 1
 Date Started: Aug 13, 16
 Date Completed: Aug 14, 16
 Logged by: CAG/MEA
 Reviewed by: JEF

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NOTES

Grout mix ratio: 1 bag of Quik Grout mix to 2 pails of water.

0.5 buckets of bentonite pellets to seal

5.5 bags filter sand (2.5 bags below screen, 3 bags around and above screen zone)

2.5 buckets of bentonite pellets

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE C1-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Process Plant Site
 Coordinates: 452,774 E , 6,204,277 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-002

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 14, 16

Total Depth: 30.8 m

Date Completed: Aug 15, 16

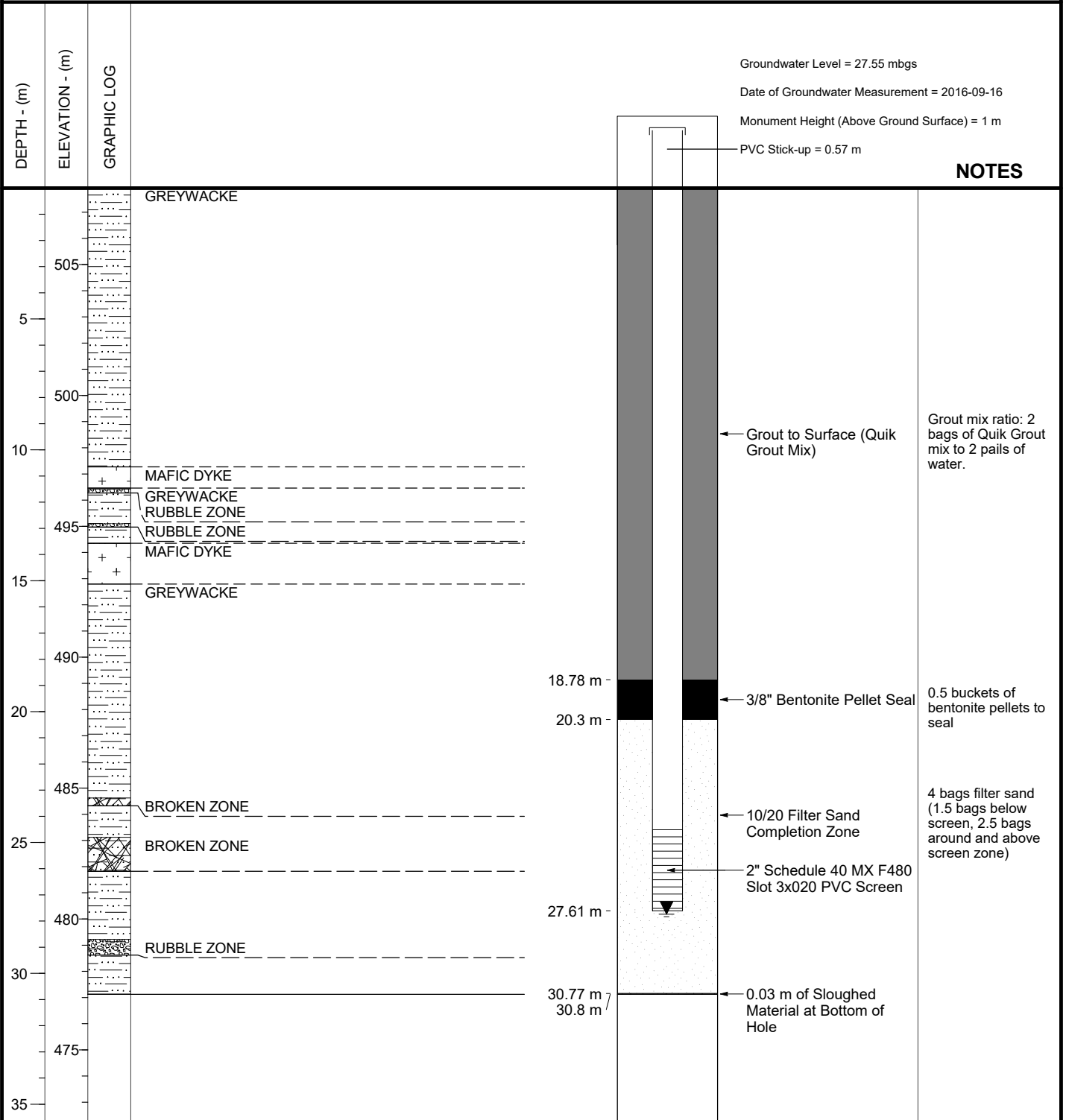
Elevation: 507.922 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE C1-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,442 E , 6,204,918 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-003

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 16, 16

Total Depth: 31.0 m

Date Completed: Aug 18, 16

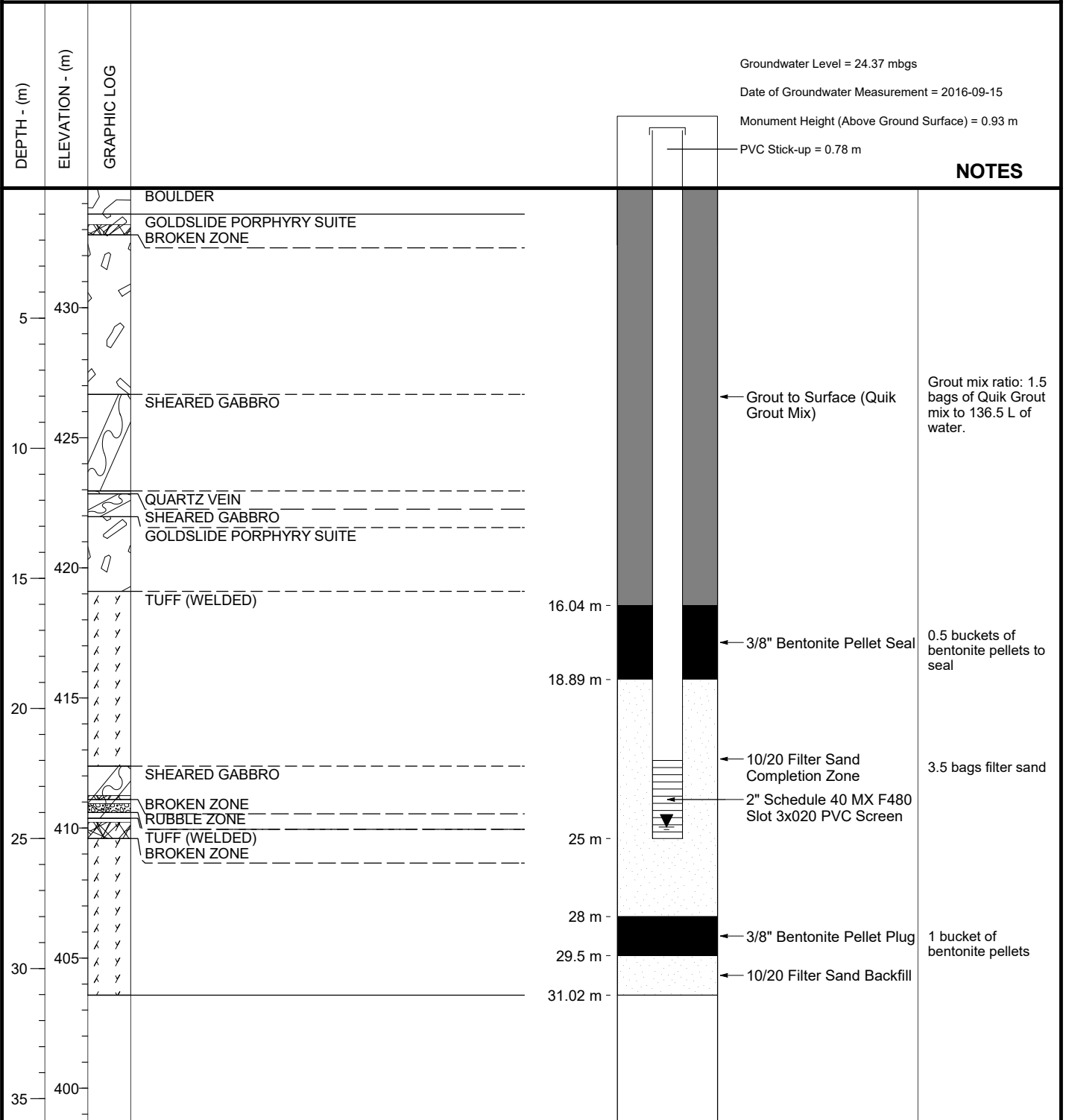
Elevation: 434.596 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE C1-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,362 E, 6,204,903 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-009

Drill Type: B15 Diamond Drill

Total Depth: 111.5 m

Elevation: 463.893 m

Azimuth , Inclination: 45 , -50

Page: 1 of 1

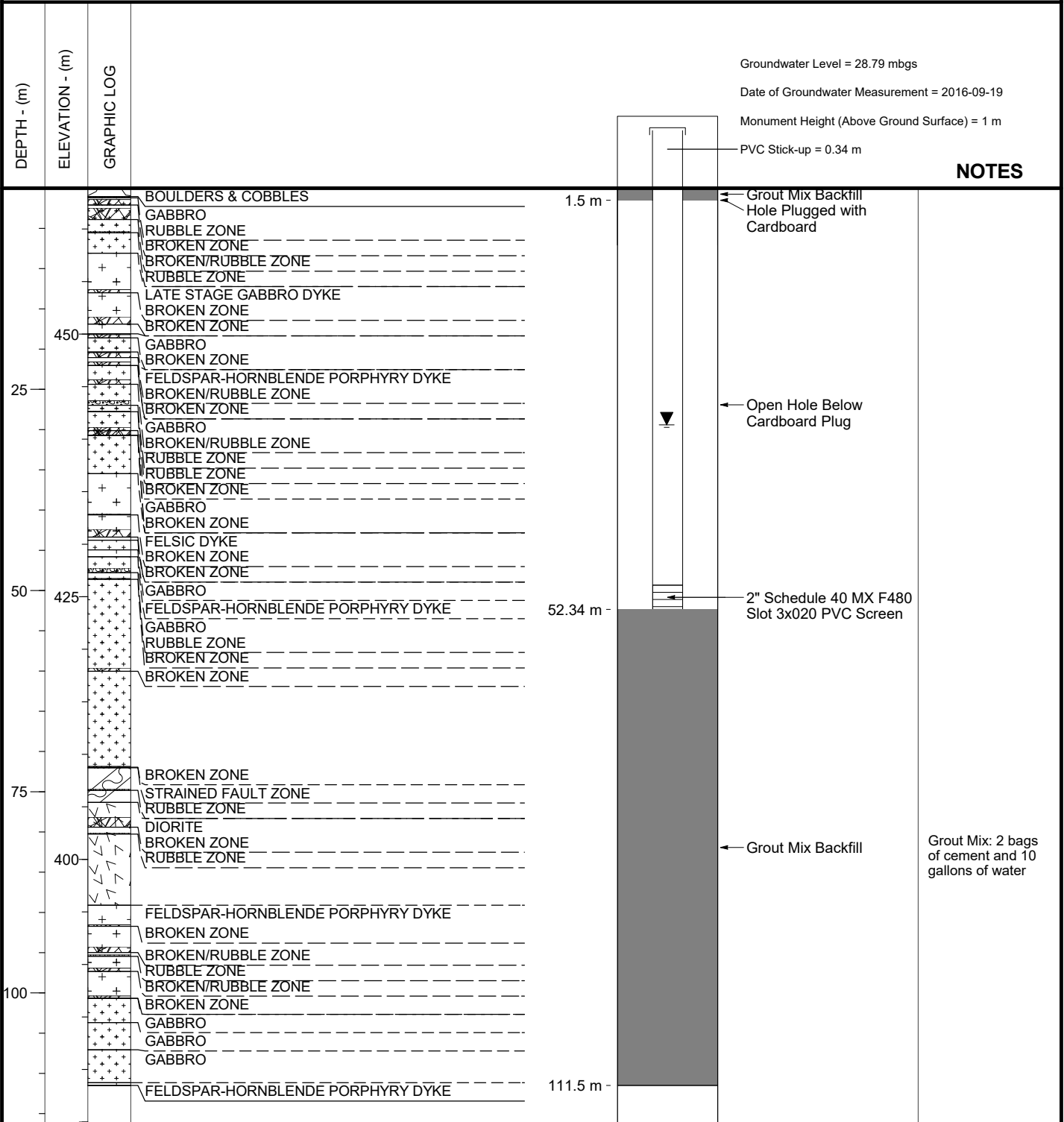
Date Started: Sep 7, 16

Date Completed: Sep 14, 16

Logged by: CAG/MEA

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. VWP installation failed due to structure at 55 m taking high grout quantities. Standpipe piezometer installed in place.

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FIGURE C1-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

APPENDIX C2

GROUNDWATER MONITORING WELL COMPLETION LOGS

(Pages C2-1 to C2-4)

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,283 E, 6,205,109 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: MW16-001

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 18, 16

Total Depth: 30.8 m

Date Completed: Aug 20, 16

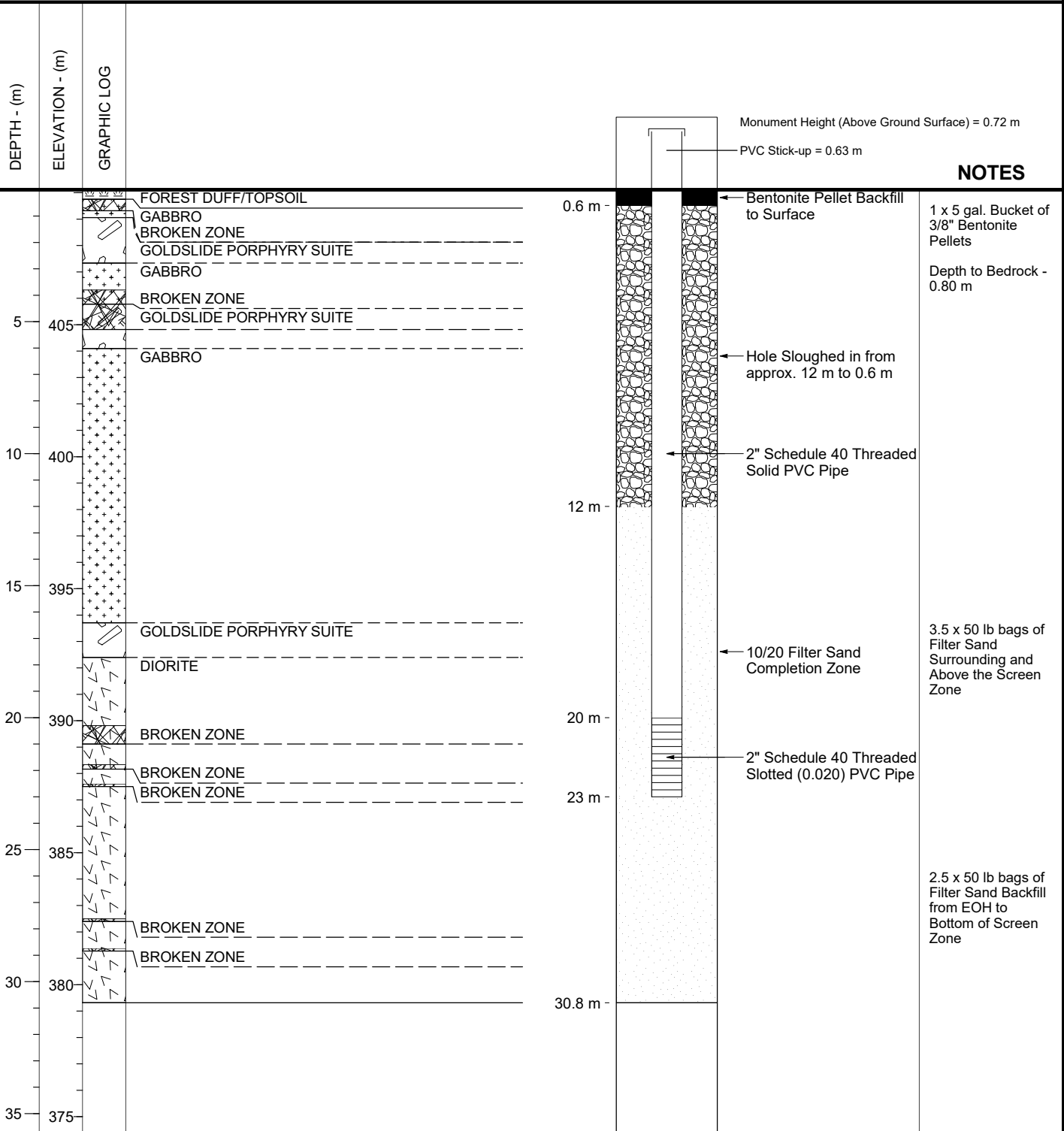
Elevation: 410.116 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

**IDM Mining Ltd.
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE C2-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,332 E , 6,204,615 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: MW16-002

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 20, 16

Total Depth: 32.8 m

Date Completed: Aug 22, 16

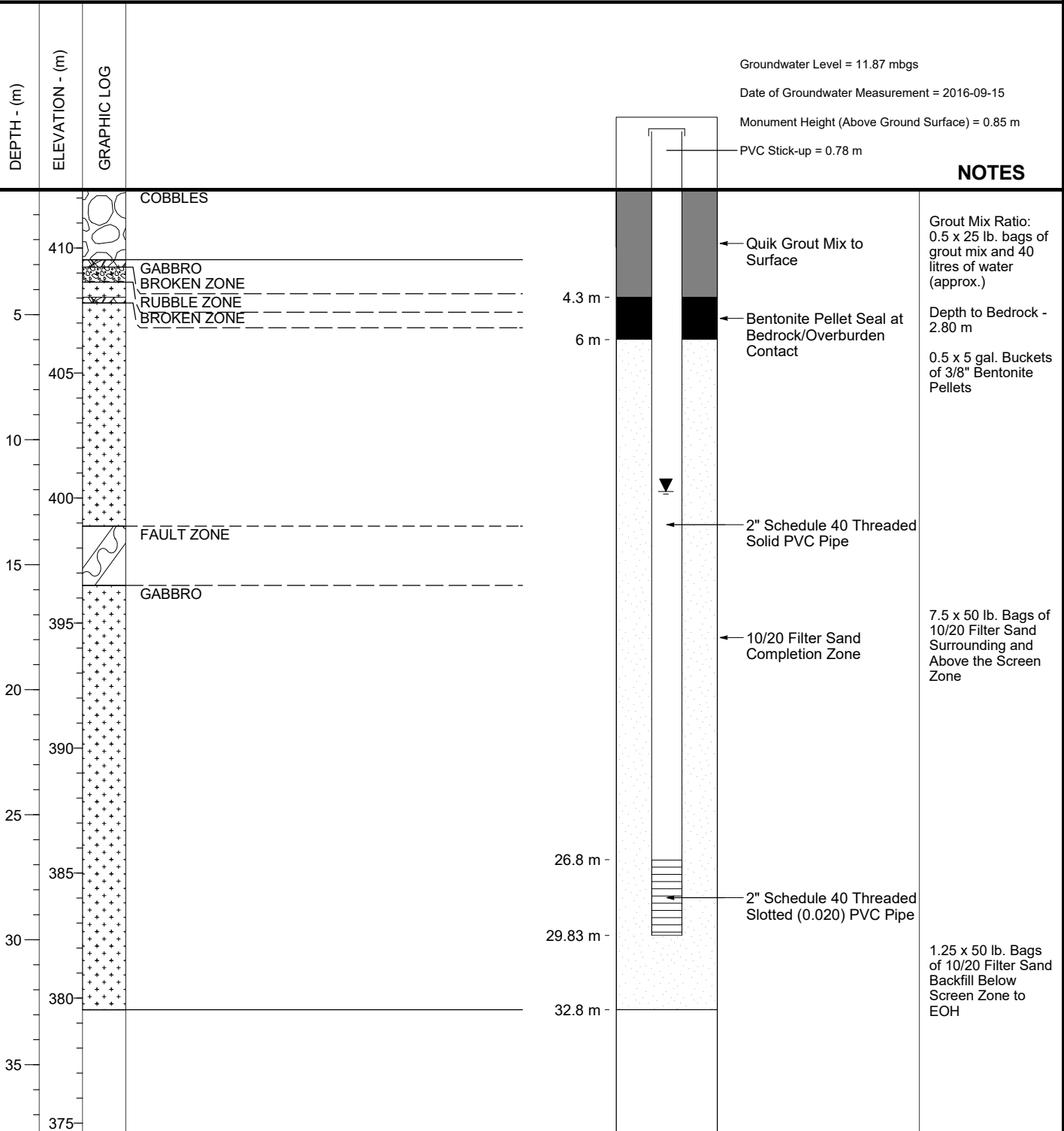
Elevation: 412.334 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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NOTES

Groundwater Level = 11.87 mbgs
 Date of Groundwater Measurement = 2016-09-15
 Monument Height (Above Ground Surface) = 0.85 m
 PVC Stick-up = 0.78 m

Grout Mix Ratio:
 0.5 x 25 lb. bags of
 grout mix and 40
 litres of water
 (approx.)

Depth to Bedrock -
 2.80 m

0.5 x 5 gal. Buckets
 of 3/8" Bentonite
 Pellets

7.5 x 50 lb. Bags of
 10/20 Filter Sand
 Surrounding and
 Above the Screen
 Zone

1.25 x 50 lb. Bags
 of 10/20 Filter Sand
 Backfill Below
 Screen Zone to
 EOH

GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

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FIGURE C2-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed South TMF Embankment
 Coordinates: 452,415 E , 6,204,434 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: MW16-003

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 22, 16

Total Depth: 31.2 m

Date Completed: Aug 23, 16

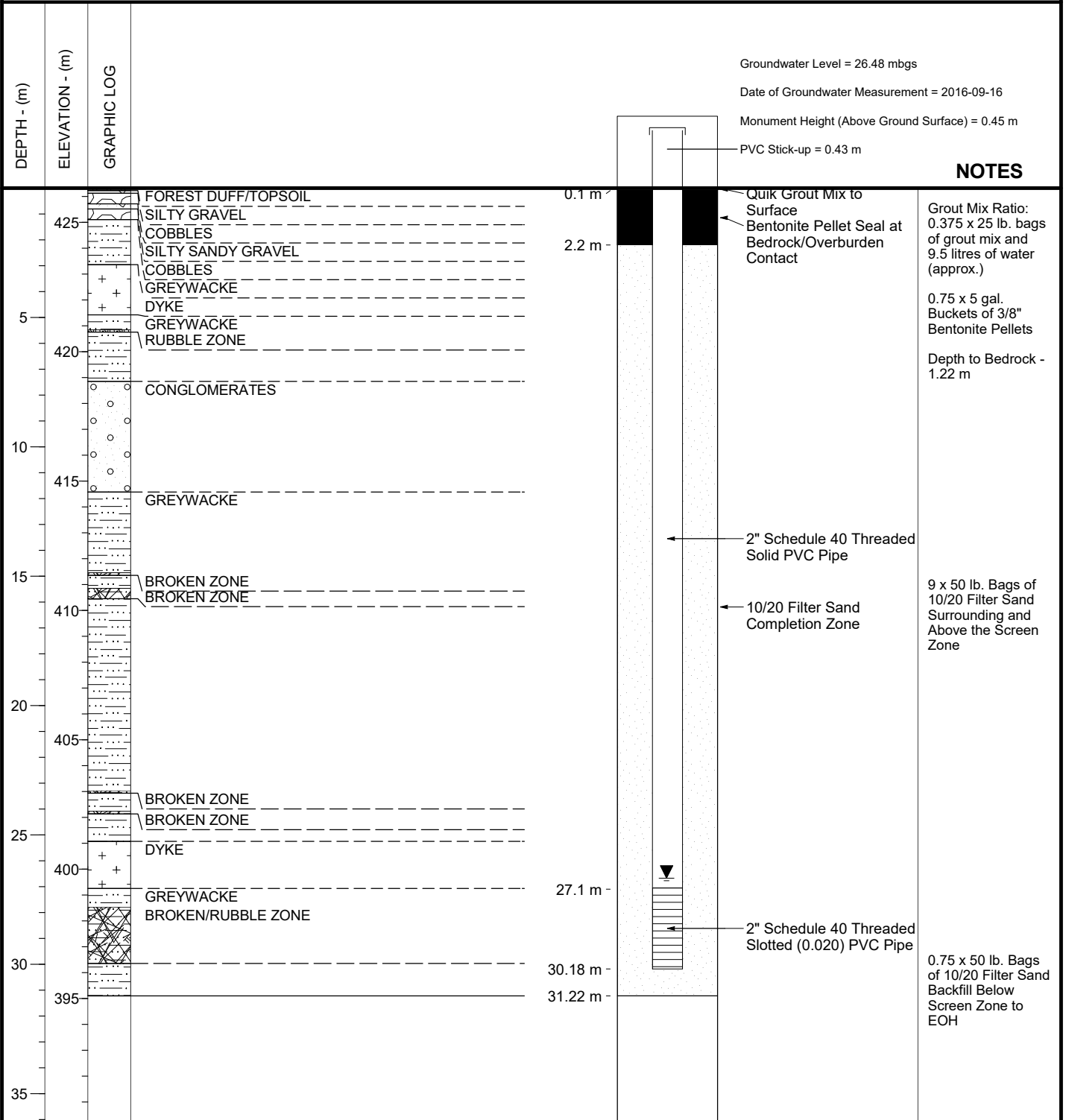
Elevation: 426.325 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

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FIGURE C2-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: Downgradient of proposed North TMF Embankment
 Coordinates: 452,281 E, 6,205,112 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: MW16-004

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 31, 16

Total Depth: 45.6 m

Date Completed: Sep 2, 16

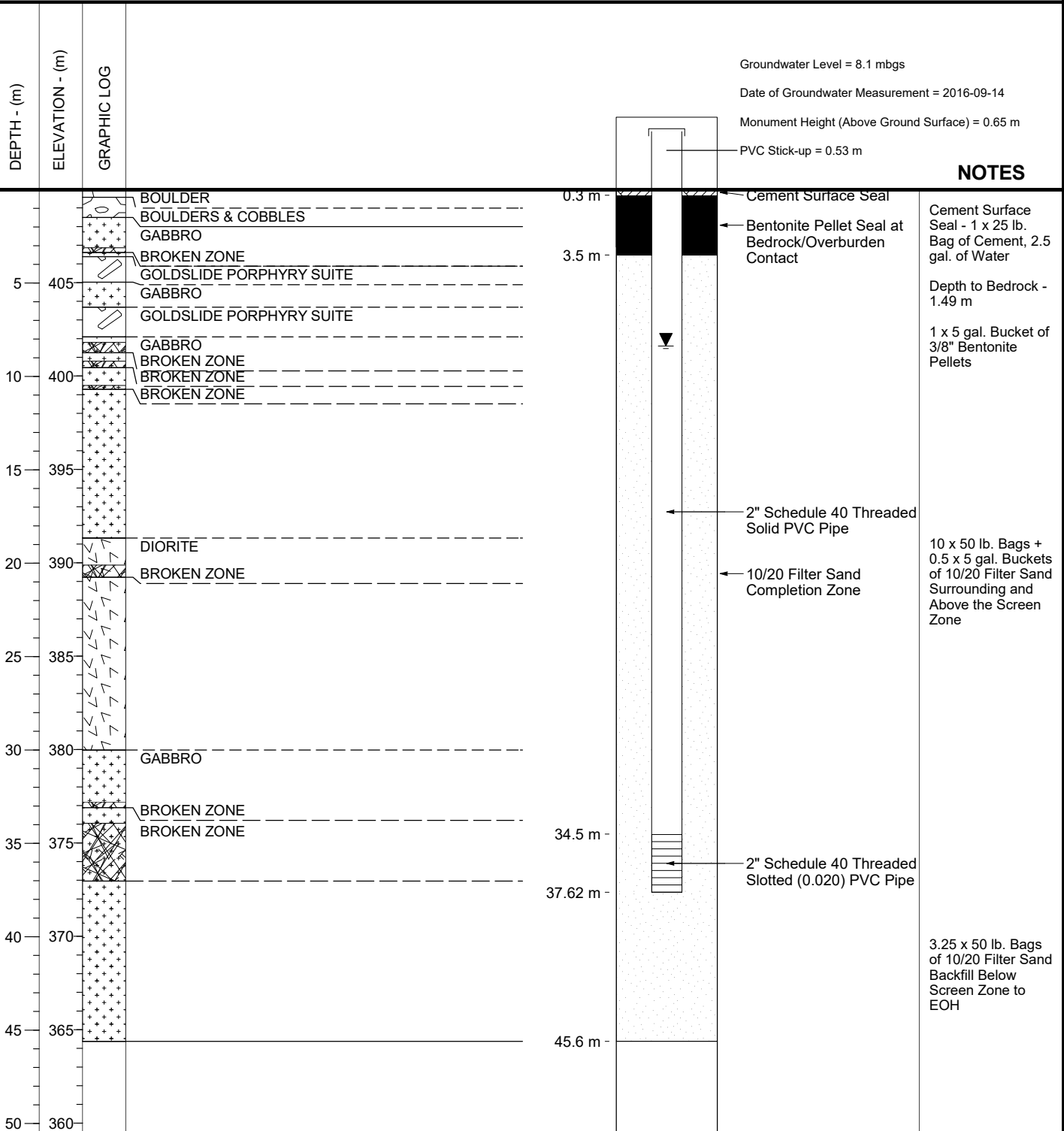
Elevation: 409.976 m

Logged by: CAG/MEA

Azimuth, Inclination: 0, -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM. Monitoring Well specifications provided by SRK Consulting (VA16-01091).

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FIGURE C2-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

APPENDIX C3

VIBRATING WIRE PIEZOMETER COMPLETION LOGS

(Pages C3-1 to C3-6)

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - East Abutment
 Coordinates: 452,451 E, 6,205,121 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-004

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 23, 16

Total Depth: 30.5 m

Date Completed: Aug 25, 16

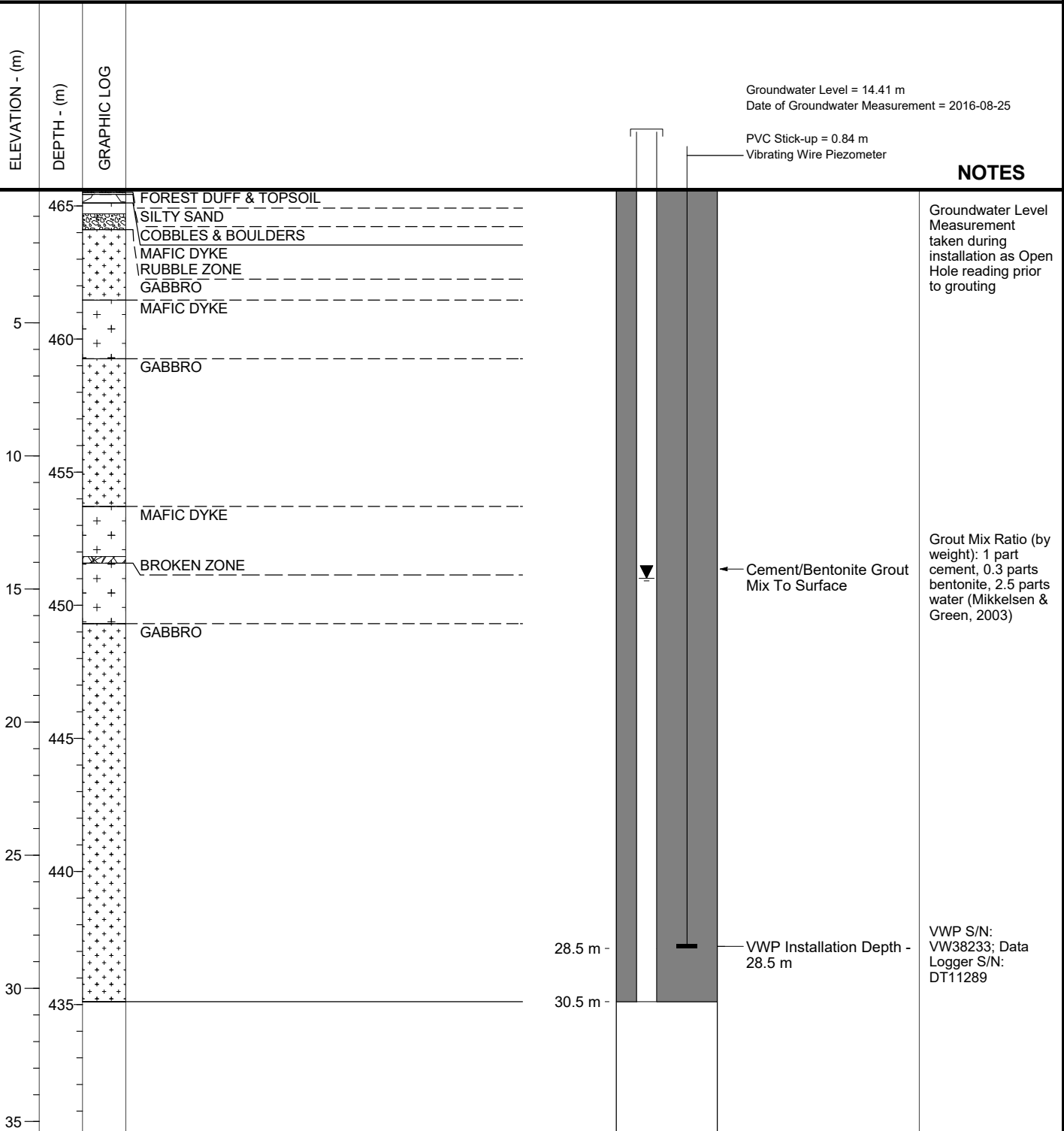
Elevation: 465.612 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE C3-1

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: North TMF Embankment - Centrepoint of Dam Crest
 Coordinates: 452,384 E , 6,204,956 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-005

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 26, 16

Total Depth: 45.0 m

Date Completed: Aug 29, 16

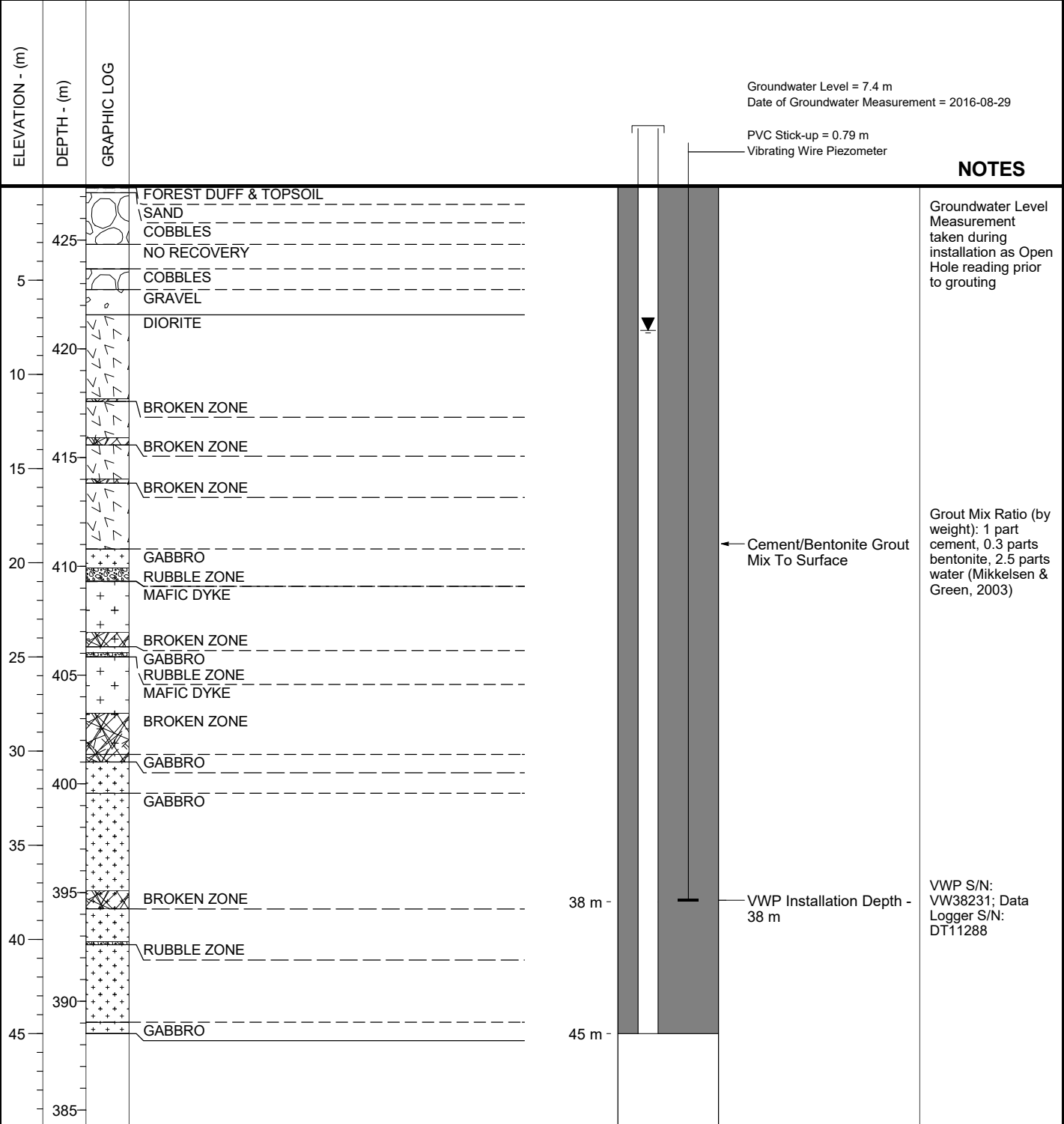
Elevation: 427.488 m

Logged by: CAG/MEA

Azimuth , Inclination: 64 , -60

Reviewed by: JEF

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GENERAL REMARKS:
 Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

<i>Knight Piésold</i> CONSULTING	Project No. VA101-594/02	Ref. No. 1	Rev. 0
	FIGURE C3-2		

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Upstream Toe
 Coordinates: 452,525 E , 6,204,589 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-006

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Aug 29, 16

Total Depth: 34.9 m

Date Completed: Aug 31, 16

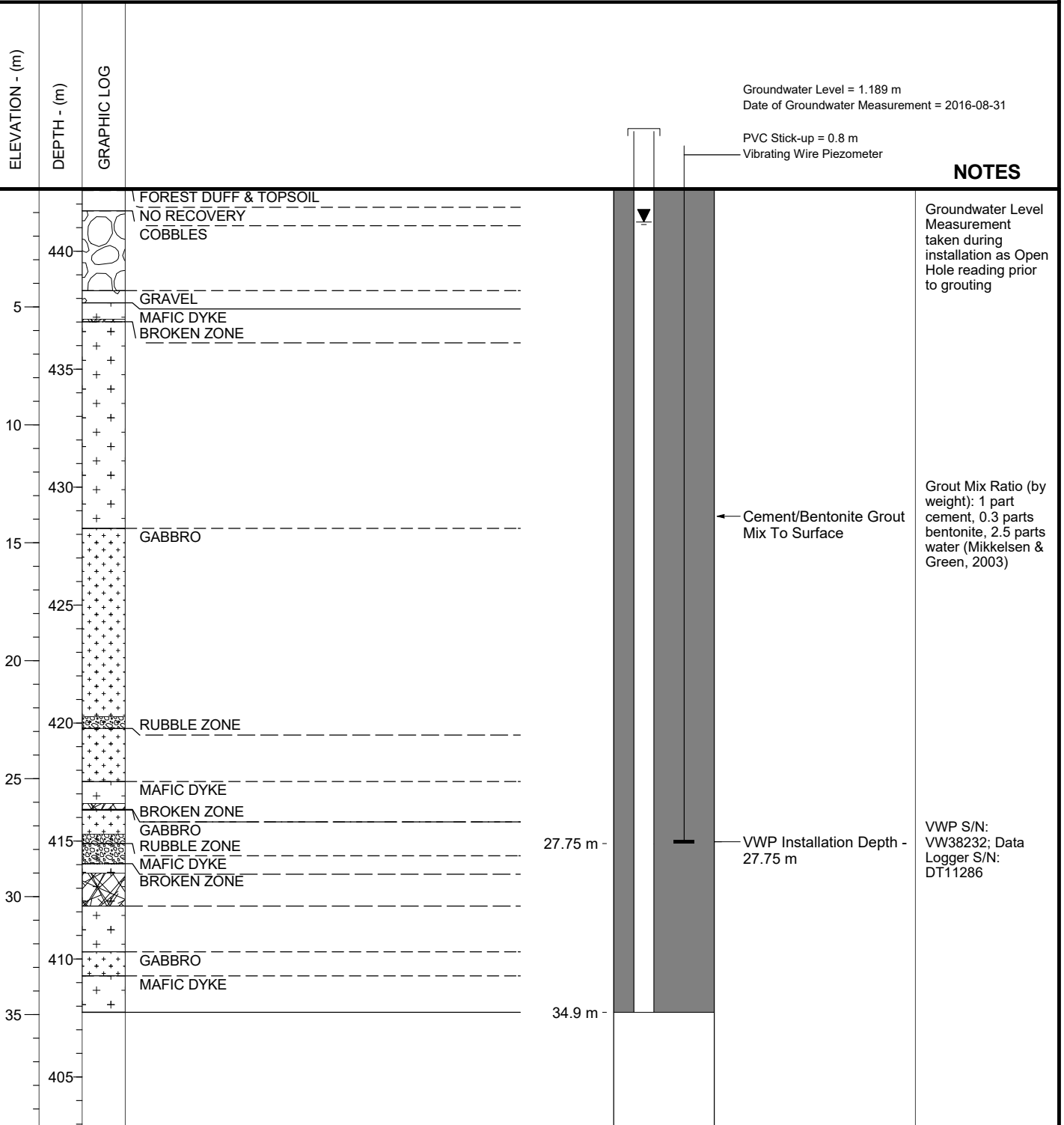
Elevation: 442.641 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE C3-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - Centrepont of Dam Crest
 Coordinates: 452,493 E , 6,204,535 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-007

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Sep 2, 16

Total Depth: 34.8 m

Date Completed: Sep 4, 16

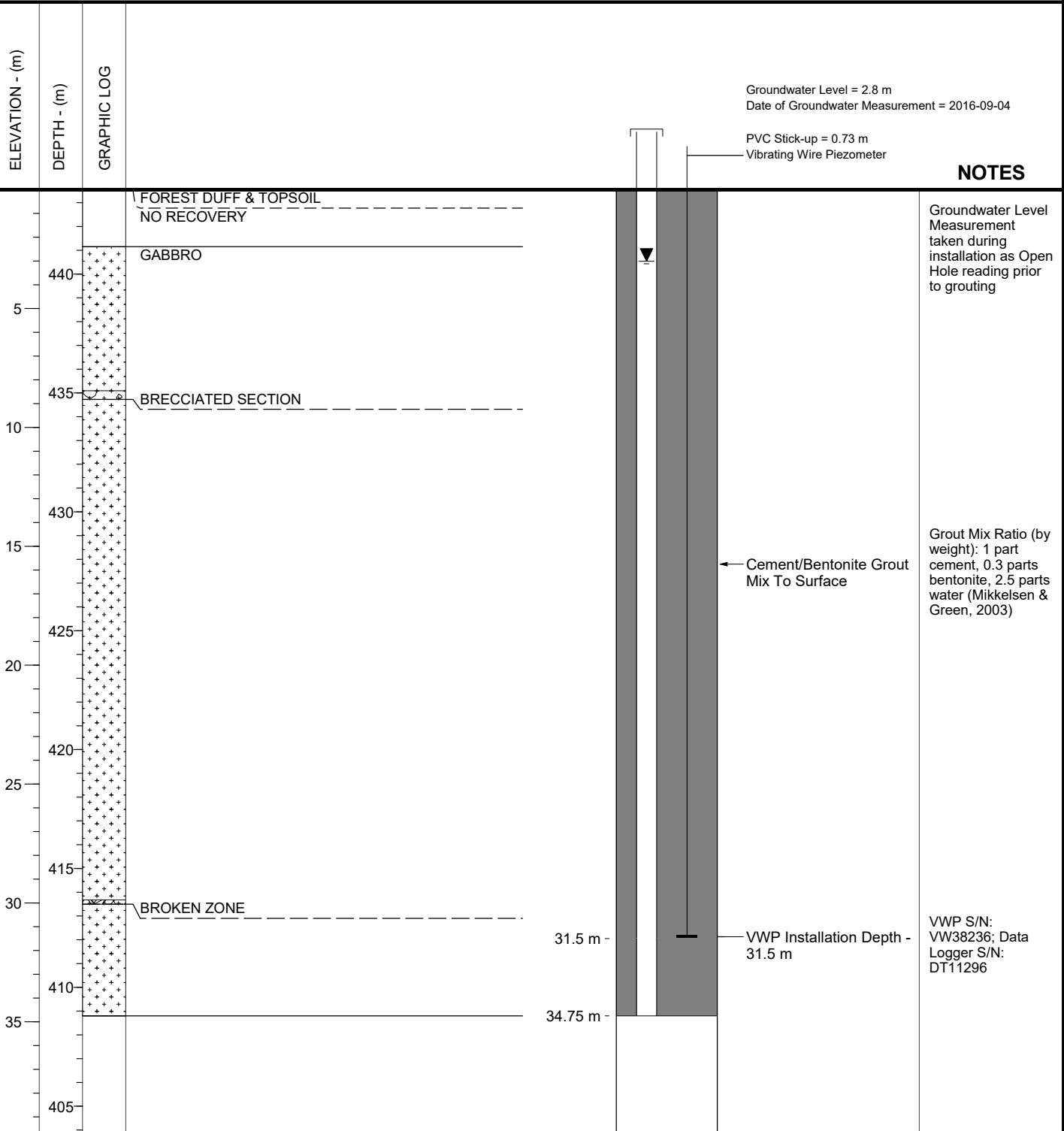
Elevation: 443.55 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

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GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

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FIGURE C3-4

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,550 E , 6,204,409 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-008

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Sep 4, 16

Total Depth: 31.5 m

Date Completed: Sep 6, 16

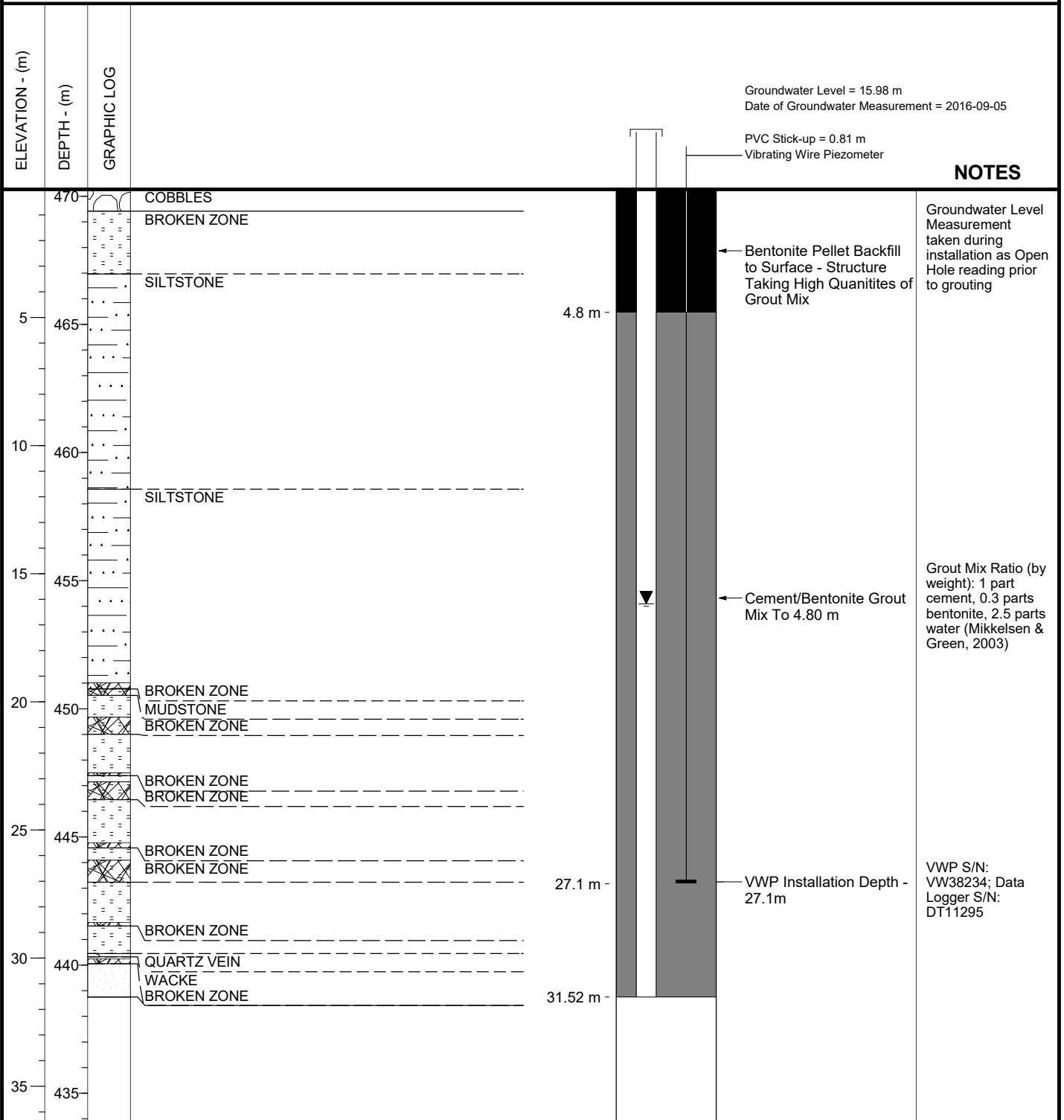
Elevation: 470.272 m

Logged by: CAG/MEA

Azimuth , Inclination: 0 , -90

Reviewed by: JEF

File M:\10\0654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECT\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\10\100654\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, WELL COMPLETION DETAILS - 1 PIPE & VW, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17



GENERAL REMARKS:

Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No.
VA101-594/02

Ref. No.
1

Rev.
0

FIGURE C3-5

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: More Core Diamond Drilling Service Ltd.
 Location: South TMF Embankment - North Abutment
 Coordinates: 452,435 E , 6,204,669 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: BH16-010

Page: 1 of 1

Drill Type: B15 Diamond Drill

Date Started: Sep 14, 16

Total Depth: 95.6 m

Date Completed: Sep 17, 16

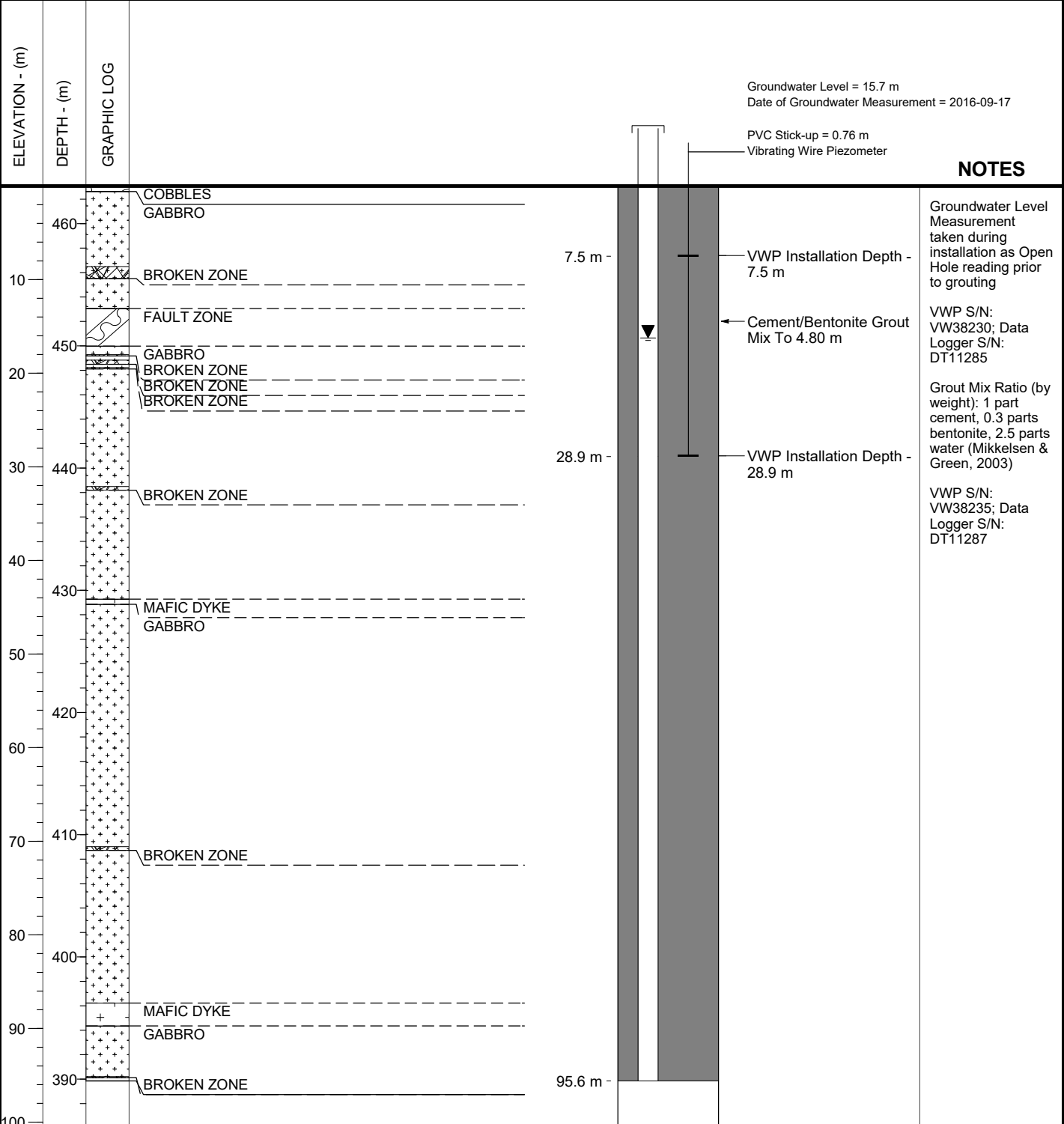
Elevation: 463.084 m

Logged by: CAG/MEA

Azimuth , Inclination: 160 , -50

Reviewed by: JEF

File M:\10\06594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECT\RED MOUNTAIN\2016 GEOTECHNICAL SI.GPJ
 Library: M:\10\06594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, WELL COMPLETION DETAILS - 1 PIPE & VW, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17



GENERAL REMARKS:
 Bedrock lithology and detailed geology logs provided by IDM. Elevations and coordinates are surveyed coordinates provided by IDM.

IDM Mining Ltd.
Red Mountain Project

<i>Knight Piésold</i> CONSULTING	Project No. VA101-594/02	Ref. No. 1	Rev. 0
	FIGURE C3-6		

APPENDIX C4

1996 SITE INVESTIGATION STANDPIPE PIEZOMETER COMPLETION LOGS

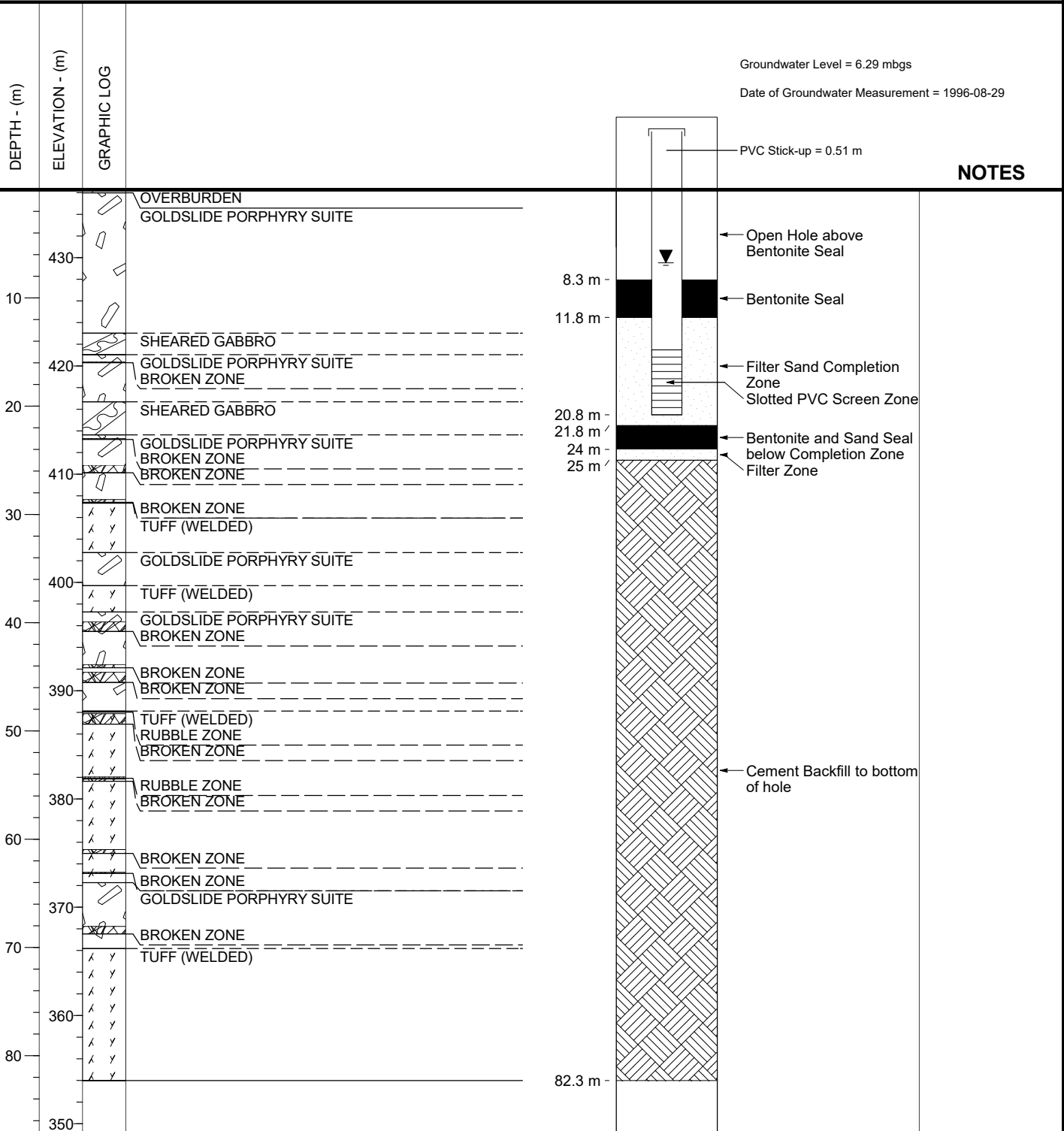
(Pages C4-1 to C4-6)

Contractor: N/A
 Location: North TMF Embankment - Upstream Toe
 Coordinates: 452,429 E, 6,204,937 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: DT-273
 Drill Type: N/A
 Total Depth: 82.3 m
 Elevation: 436.282 m
 Azimuth, Inclination: 0, -90

Page: 1 of 1
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT LIBRARY - REV A.GLB, WELL COMPLETION DETAILS - 1 PIPE, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17



NOTES

GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

**Knight Piésold
CONSULTING**

Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE C4-1

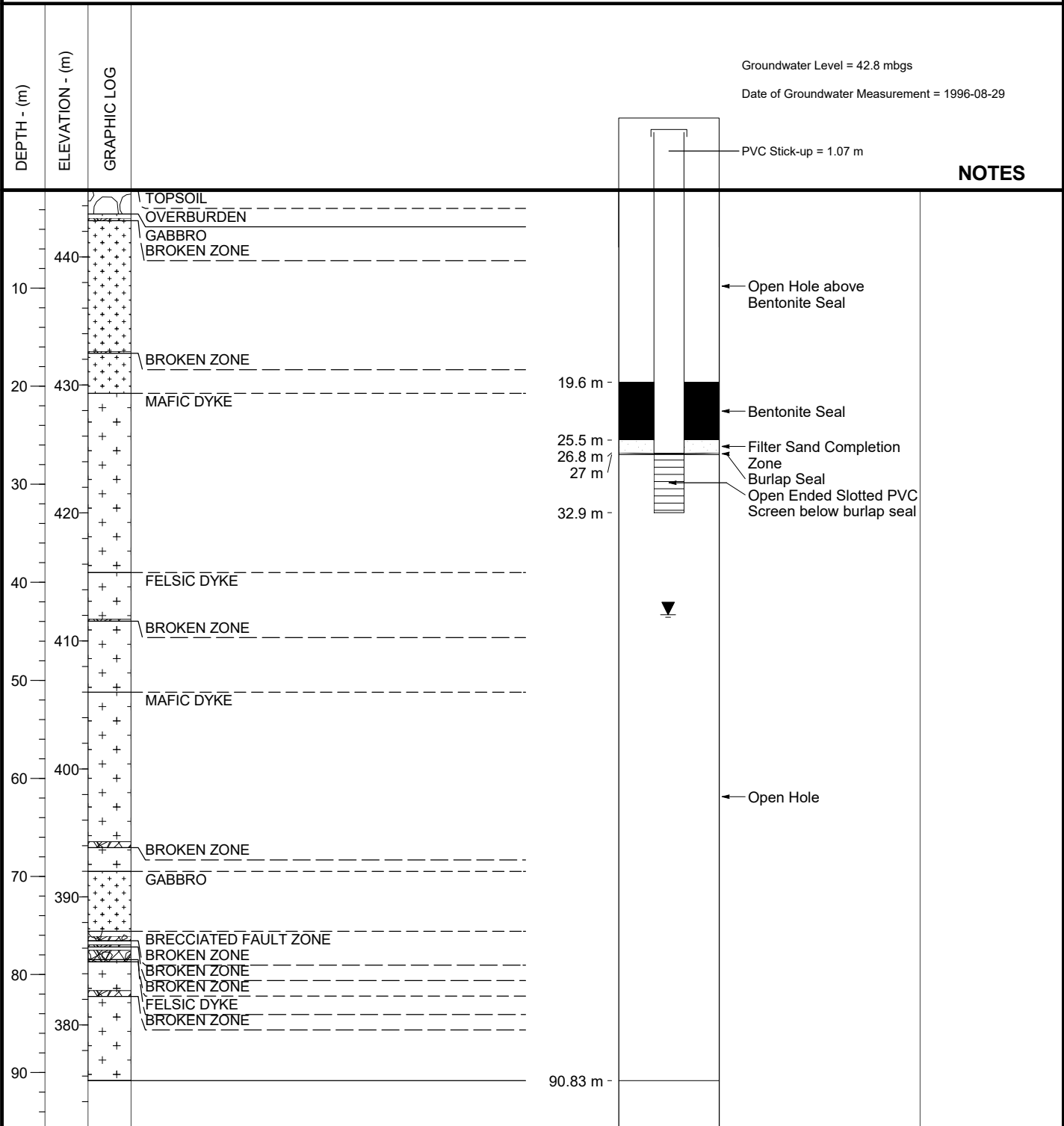
Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

Contractor: N/A
 Location: South TMF Embankment - Upstream Embankment Face
 Coordinates: 452,489 E , 6,204,553 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: DT-277
 Drill Type: N/A
 Total Depth: 90.8 m
 Elevation: 445.223 m
 Azimuth , Inclination: 156 , -50

Page: 1 of 1
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

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GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE C4-2

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

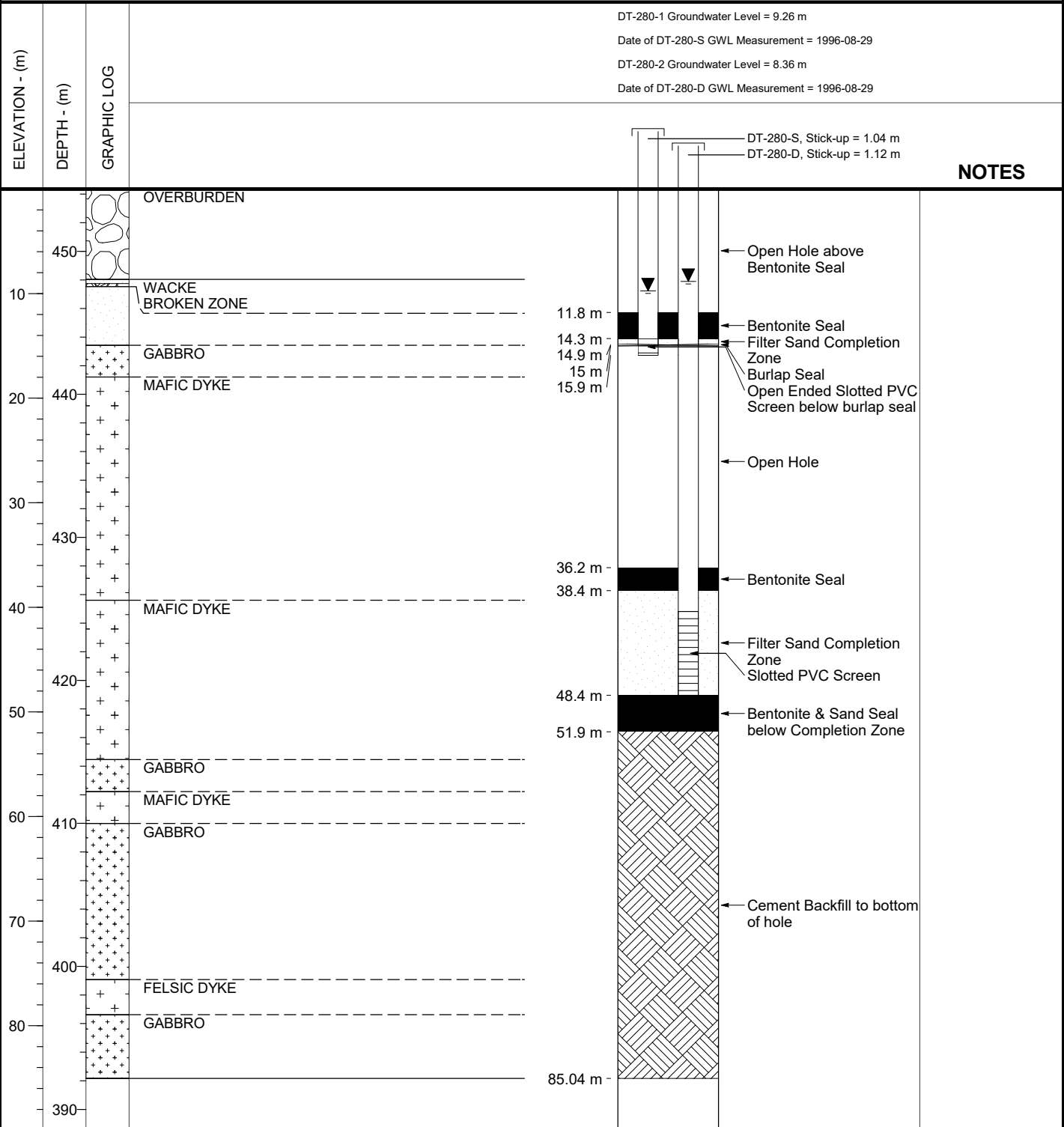
Contractor: N/A
 Location: South TMF Embankment - South Abutment
 Coordinates: 452,527 E, 6,204,447 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: DT-280
 Drill Type: N/A
 Total Depth: 85.0 m
 Elevation: 454.359 m
 Azimuth , Inclination: 328 , -47

Page: 1 of 1
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

DT-280-1 Groundwater Level = 9.26 m
 Date of DT-280-S GWL Measurement = 1996-08-29
 DT-280-2 Groundwater Level = 8.36 m
 Date of DT-280-D GWL Measurement = 1996-08-29

File M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library\M\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY\2016 KP CANADA GINT LIBRARY - REV A.GLB, WELL COMPLETION DETAILS - 2 PIPES, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17



GENERAL REMARKS:

Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
 Red Mountain Project**

**Knight Piésold
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Project No. VA101-594/02	Ref. No. 1	Rev. 0
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FIGURE C4-3

Logging conducted according to the ASTM 2488 standard and the Canadian Foundation Engineering Manual, 4th Edition, 2006.

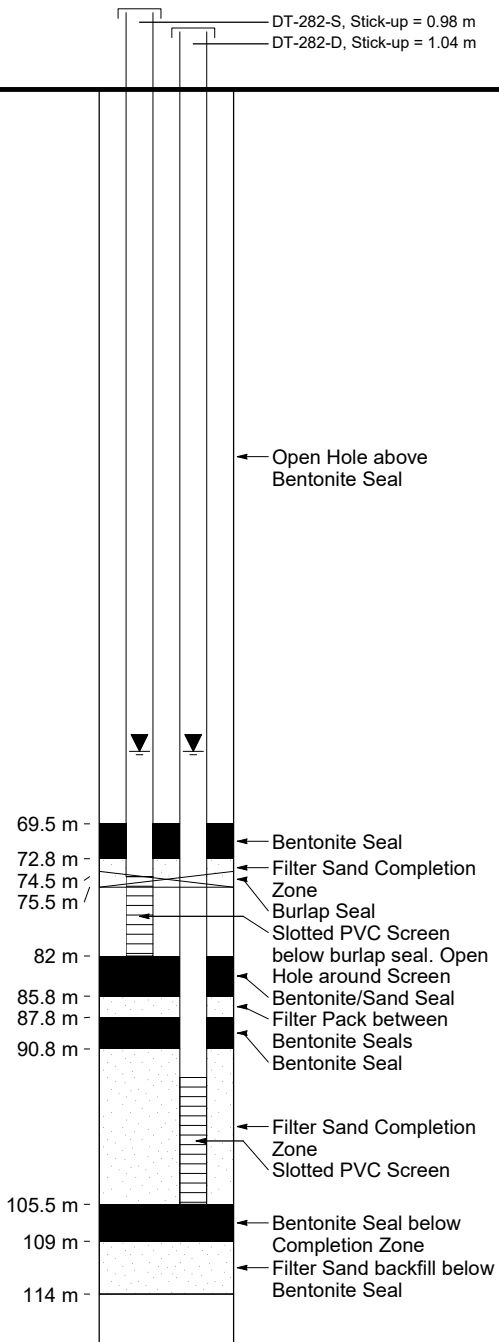
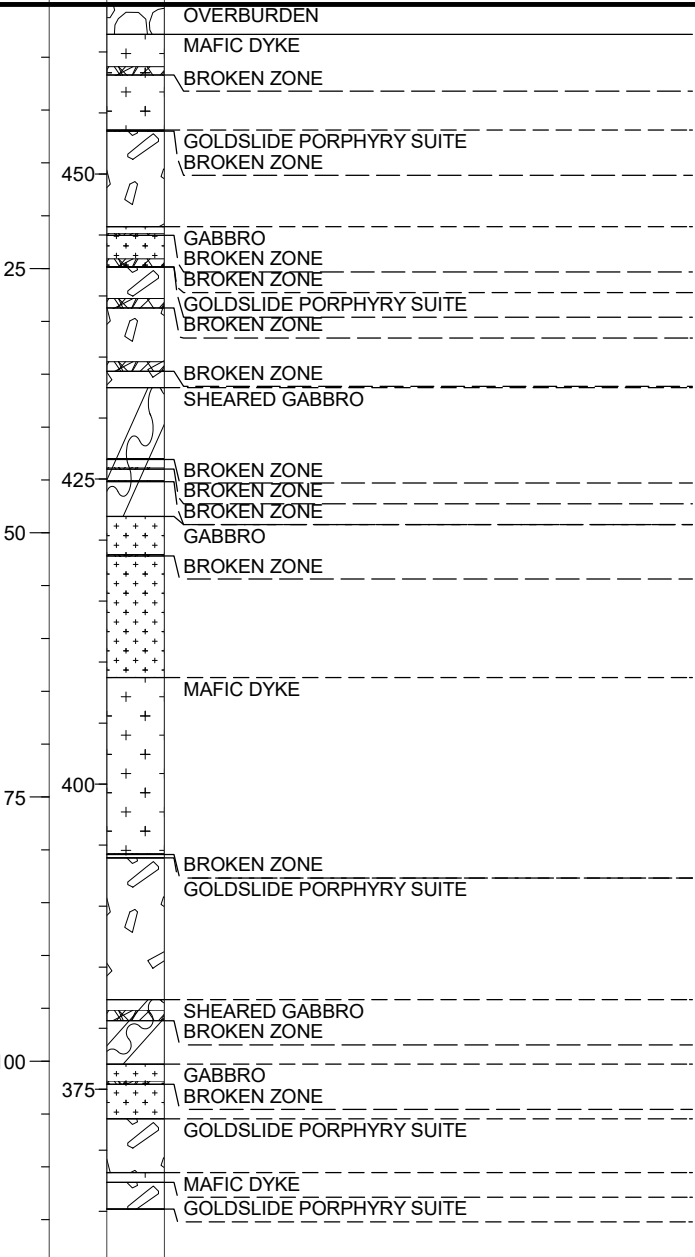
Contractor: N/A
 Location: North TMF Embankment - West Abutment
 Coordinates: 452,491 E, 6,204,700 N
 Coordinate System: UTM NAD83 Zone 9N

Drillhole No.: DT-282
 Drill Type: N/A
 Total Depth: 114.0 m
 Elevation: 463.9 m
 Azimuth, Inclination: 51, -60

Page: 1 of 1
 Date Started: Jul 30, 96
 Date Completed: Aug 30, 96
 Logged by: JBC
 Reviewed by: JEF

DT-282-1 Groundwater Level = 62 m
 Date of DT-282-S GWL Measurement = 1996-08-29
 DT-282-2 Groundwater Level = 62 m
 Date of DT-282-D GWL Measurement = 1996-08-29

ELEVATION - (m)
 DEPTH - (m)
 GRAPHIC LOG



NOTES

GENERAL REMARKS:
 Elevations and coordinates are surveyed coordinates provided by IDM. Relog of historic drillhole from 1996 geotechnical site investigation program. Lithological units inferred from adjacent drillholes and similar descriptions.

**IDM Mining Ltd.
Red Mountain Project**

Knight Piésold CONSULTING	Project No. VA101-594/02	Ref. No. 1	Rev. 0
	FIGURE C4-4		

File: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\PROJECTS\RED MOUNTAIN\2016 GEOTECHNICAL SI\GPI Library: M:\110100594\02\DATA\300 - SITE INVESTIGATION PROGRAM\GINT\LIBRARY - REV A.GLB, WELL COMPLETION DETAILS - 2 PIPES, 2016 KP CANADA GINT DATA TEMPLATE (RMR INPUT) - REV A.GDT, Jun 29, 17

APPENDIX D

DRILLHOLE RMR89/RQD LOGS

- Appendix D1 Geotechnical Drillhole Logs
- Appendix D2 Groundwater Monitoring Well Logs
- Appendix D3 1996 Site Investigation Drillhole Logs

APPENDIX D1
GEOTECHNICAL DRILLHOLE LOGS
(Pages D1-1 to D1-21)

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-001

DRILL RUN DATA									GEOLOGY - COMMENTS									DISCONTINUITY DATA - RATING SYSTEMS												
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
0.58	491.59	1.17	491.00	0.59	0.40	68	0.22	37	4	80	50	R4	Greywacke	Grey to dark grey	Fine-grained	Massive	Moderately fractured, slightly weathered, calcite veining	0.78	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J	cc				50
1.17	491.00	2.62	489.55	1.45	1.36	94	0.58	40	8	151	50	R4	Greywacke	Grey to dark grey	Fine-grained	Massive	Slightly to moderately fractured, slightly weathered, calcite veining, iron oxide infill	0.83	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	SW	16	J	FeO	cc			52
2.62	489.55	3.84	488.33	1.22	1.22	100	1.07	88	9	122	50	R4	Greywacke	Grey to dark grey	Fine-grained	Massive	Slightly to moderately fractured, slightly weathered, calcite veining, chlorite infill	0.38	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl				57
3.84	488.33	5.34	486.83	1.50	1.50	100	1.30	87	6	214	50	R4	Greywacke	Grey to dark grey	Fine-grained	Massive	Slightly to moderately fractured, slightly weathered, calcite veining	0.86	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J					60
5.34	486.83	6.84	485.33	1.50	1.50	100	0.71	47	14	100	25	R3	Greywacke	Grey to dark grey	Fine-grained	Massive	Medium strong, slightly to highly fractured, moderately weathered, calcite veining, iron oxide infill	0.82	> 20 m	1 - 5 mm	SL Rough	Soft > 5 mm	MW	7	J	FeO				41
6.84	485.33	8.01	484.16	1.17	1.16	99	0.12	10	max	5	20	R2	Greywacke	Grey to dark grey	Fine-grained	Massive	Weak, predominantly small broken zones, moderately weathered, calcite veining, trace clay infill	0.50	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	cly				34
8.01	484.16	9.03	483.14	1.02	1.02	100	0.00	0	max	5	15	R2	Dyke	Mottled grey	Fine to medium-grained	Massive	Weak, moderately to highly fractured, moderately weathered, iron oxide infill, calcite veining	0.00	> 20 m	1 - 5 mm	SL Rough	Soft > 5 mm	MW	7	J	FeO	cc			32
9.03	483.14	9.89	482.28	0.86	0.86	100	0.00	0	max	5	20	R2	Dyke	Mottled grey	Fine to medium-grained	Massive	Weak, moderately to highly fractured, moderately weathered, iron oxide infill, calcite veining. Transitions to dark grey at 9.58 m	0.20	> 20 m	1 - 5 mm	SL Rough	Soft > 5 mm	MW	7	J	FeO	cc			33
9.89	482.28	11.39	480.78	1.50	1.50	100	0.82	55	11	125	50	R4	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, chlorite infill, calcite micro veining	0.28	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl				52
11.39	480.78	12.89	479.28	1.50	1.50	100	1.21	81	5	250	50	R4	Gabbro/Marfic Dyke	Dark grey	Fine-grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, chlorite infill, calcite veining	0.73	> 20 m	0.1 - 1.0	Rough	None	FRESH	21	J	chl				66
12.89	479.28	14.39	477.78	1.50	1.50	100	0.53	35	15	94	50	R4	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, iron oxide infill, calcite veining	1.04	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO	cc			49
14.39	477.78	15.80	476.37	1.41	1.35	96	0.42	30	27	48	40	R3	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, slightly weathered, trace calcite veinlets, some rubellized joint surfaces, joints dipping at approx. 50° to core axis	0.00	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J	Rub				45
15.80	476.37	17.30	474.87	1.50	1.50	100	1.38	92	19	75	40	R3	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, fresh to slightly weathered, trace calcite veinlets, one broken zone approx. 7 cm in length at 16.39 m, joints dipping at approx. 50° to core axis	0.59	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	cc			51
17.30	474.87	17.90	474.27	0.60	0.41	68	0.11	18	7	51	75	R4	Greywacke	Dark grey	Fine-grained	Thinly bedded	Strong, trace calcite veinlets, weak iron oxide infill on some joint surfaces, joints dipping at approx. 50° to core axis	0.00	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J	FeO				48
17.90	474.27	18.80	473.37	0.90	0.90	100	0.51	57	13	64	75	R4	Greywacke	Dark grey	Fine-grained	Thinly bedded	Strong, trace calcite veinlets, weak iron oxide infill on some joint surfaces, joints dipping at approx. 50° to core axis	0.00	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	FeO				56
18.80	473.37	20.30	471.87	1.50	1.50	100	1.00	67	21	68	35	R3	Greywacke	Dark grey	Fine-grained	Thinly bedded	Medium strong, fresh to slightly weathered, trace calcite veinlets, calcite vein approximately 10 mm thick at 19.42 m, iron oxide staining on some joint surfaces	0.93	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	FeO	Rub			45
20.30	471.87	21.80	470.37	1.50	1.49	99	1.34	89	10	135	60	R4	Greywacke	Dark grey	Fine-grained	Thinly bedded	Strong, fresh, trace calcite veinlets, calcite vein approximately 10 mm thick at 19.42 m, iron oxide staining on some joint surfaces	0.42	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc				60
21.80	470.37	23.30	468.87	1.50	1.50	100	1.37	91	8	167	100	R5	Greywacke	Dark grey	Fine-grained	Massive	Very strong, fresh, trace calcite veinlets, joints dipping at approx. 50° to core axis, one spun joint at 23.12 m	0.56	> 20 m	< 0.1 mm	Smooth	None	SW	17	J					67
23.30	468.87	24.80	467.37	1.50	1.50	100	1.09	73	17	83	60	R4	Greywacke	Dark grey	Fine-grained	Massive	Strong, fresh, trace calcite veinlets, joints dipping at 50° relative to core axis, trace iron oxide staining on joint surfaces	1.44	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J	FeO				58
24.80	467.37	26.30	465.87	1.50	1.49	99	0.99	66	16	88	60	R4	Greywacke	Dark grey	Fine-grained	Massive	Strong, fresh, calcite veinlets, trace iron oxide staining on joint surfaces, representative joint dipping at approx. 75° to core axis	0.42	> 20 m	1 - 5 mm	Smooth	None	FRESH	14	J	FeO				55
26.30	465.87	27.80	464.37	1.50	1.50	100	1.19	79	12	115	50	R4	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, fresh, some calcite veinlets, trace calcite infilling, representative joint dipping at approx. 46° to core axis	0.64	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J	cc				60
27.80	464.37	29.30	462.87	1.50	1.41	94	1.14	76	6	201	50	R4	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, fresh, trace calcite veinlets, trace pyrite infill on joint surfaces, representative joint dipping at approx. 57° to core axis	0.37	> 20 m	< 0.1 mm	Smooth	None	FRESH	18	J	py				61
29.30	462.87	30.80	461.37	1.50	1.50	100	0.96	64	13	107	50	R4	Greywacke	Dark grey	Fine-grained	Massive	Medium strong, fresh trace calcite veinlets, trace iron oxide staining on joint surface, representative joint dipping at approx. 41° to core axis	0.74	> 20 m	< 0.1 mm	Smooth	None	FRESH	18	J	FeO				58

EOH

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-002

DRILL RUN DATA									GEOLOGY - COMMENTS								DISCONTINUITY DATA - RATING SYSTEMS												
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	ROD Length	ROD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
m	m	m	m	m	m	%	m	%		mm								ft											
0.10	507.82	1.60	506.32	1.50	0.91	61	0.46	31	17	51	40	R3	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Medium strong, fresh, sporadic calcite veinlets	0.27	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				49
1.60	506.32	2.30	505.62	0.70	0.70	100	0.52	74	7	88	60	R4	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Medium strong, fresh, sporadic calcite veinlets	0.26	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				59
2.30	505.62	3.30	504.62	1.00	1.00	100	0.38	38	16	59	100	R5	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Very strong, fresh, trace calcite veinlets, moderately fractured, weak FeO staining on some joint surfaces, some conchoidal fracture surfaces.	0.33	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	SW	11	J		FeO		49
3.30	504.62	3.80	504.12	0.50	0.50	100	0.18	36	11	42	100	R5	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Very strong, fresh, trace calcite veinlets, moderately fractured, weak FeO staining on some joint surfaces, some conchoidal fracture surfaces.	0.17	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	VNL	cc	FeO		50
3.80	504.12	5.30	502.62	1.50	1.50	100	1.01	67	13	107	70	R4	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Strong, fresh, many calcite veinlets,	1.27	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	SW	11	J		FeO		53
5.30	502.62	6.80	501.12	1.50	1.46	97	0.65	43	27	52	35	R3	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Medium strong, fresh, trace calcite veinlets.	0.72	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J		FeO		50
6.80	501.12	8.30	499.62	1.50	1.50	100	0.85	57	13	107	35	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, fresh, trace calcite veinlets, FeO staining on some joint surfaces.	1.44	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		51
8.30	499.62	9.80	498.12	1.50	1.36	91	0.44	29	35	38	50	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, moderately to heavily fractured, rubble infill on some joints.	0.85	> 20 m	1 - 5 mm	Smooth	Hard > 5 mm	SW	9	J	Rub			42
9.80	498.12	10.69	497.23	0.89	0.89	100	0.40	45	12	68	50	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, some calcite infill, trace calcite veinlets.	0.10	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				55
10.69	497.23	11.50	496.42	0.81	0.76	94	0.52	64	3	190	75	R4	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Strong, fresh, <1mm black and white phenocrysts in unidentifiable groundmass.	0.07	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				62
11.50	496.42	12.80	495.12	1.30	1.30	100	1.10	85	40	32	120	R5	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Very strong, fresh, trace calcite veinlets, 15cm-thick rubble zone at top of run, weak FeO staining on some joints	0.45	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	VNL	cc	FeO		60
12.80	495.12	13.61	494.31	0.81	0.81	100	0.73	90	4	162	75	R4	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Strong, fresh, trace calcite veinlets, 15cm-thick rubble zone at top of run, weak FeO staining on some joints	0.48	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				64
13.61	494.31	14.30	493.62	0.69	0.69	100	0.63	91	4	138	50	R4	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Medium strong, fresh, some quartz and biotite veining.	0.27	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				64
14.30	493.62	15.18	492.74	0.88	0.88	100	0.61	69	3	220	75	R4	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Strong, fresh, slightly weathered joint surfaces, some quartz and biotite veining.	0.70	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				62
15.18	492.74	15.80	492.12	0.62	0.57	92	0.00	0	20	27	35	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, fresh, trace calcite veinlets, trace weathering on joint surfaces	0.44	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				45
15.80	492.12	17.30	490.62	1.50	1.50	100	1.24	83	11	125	35	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, fresh, trace calcite veinlets, trace weathering on joint surfaces	0.78	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	FRESH	13	J	cc			55
17.30	490.62	18.80	489.12	1.50	1.50	100	1.13	75	10	136	35	R3	Greywacke	Dark grey	Fine grained	Massive	As previous, trace yellow staining on joint surfaces.	0.41	> 20 m	1 - 5 mm	Smooth	None	SW	13	J				54
18.80	489.12	20.30	487.62	1.50	1.43	95	0.81	54	18	75	50	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fine grained, some quartz-calcite veinlets, FeO staining on some joint surfaces	0.95	> 20 m	1 - 5 mm	Smooth	Hard > 5 mm	SW	9	J	Rub	FeO		46
20.30	487.62	20.70	487.22	0.40	0.39	98	0.12	30	5	65	150	R5	Greywacke	Dark grey	Fine grained	Massive	Very strong, fresh, moderately fractured.	0.20	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				59
20.70	487.22	21.80	486.12	1.10	0.94	85	0.42	38	12	72	150	R5	Greywacke	Dark grey	Fine grained	Massive	As previous, very strong, trace calcite veinlets, FeO staining on some joint surfaces.	0.50	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J				57
21.80	486.12	23.30	484.62	1.50	1.50	100	0.86	57	10	136	75	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, fresh joint surfaces	1.05	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				58
23.30	484.62	23.60	484.32	0.30	0.30	100	0.13	43	MAX	5	50	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, fresh joint surfaces, highly fractured.	0.10	> 20 m	1 - 5 mm	Smooth	Soft > 5 mm	MW	5	Brok	Rub		40	
23.60	484.32	24.80	483.12	1.20	0.92	77	0.40	33	14	61	50	R4	Greywacke	Dark grey	Fine grained	Massive, weakly bedded	Strong, fresh, FeO staining on some joint surfaces.	0.18	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				52
24.80	483.12	25.70	482.22	0.90	0.80	89	0.00	0	MAX	5	35	R3	Greywacke	Dark grey	Fine grained	Massive	Broken zone; rubble infill and FeO staining on joint surfaces.	0.00	> 20 m	1 - 5 mm	Smooth	Soft > 5 mm	MW	5	Brok	Rub		32	
25.70	482.22	26.10	481.82	0.40	0.37	92	0.00	0	MAX	5	20	R2	Greywacke	Dark grey	Fine grained	Massive	Broken zone; rubble infill and FeO staining on joint surfaces.	0.00	> 20 m	1 - 5 mm	Smooth	Soft > 5 mm	MW	5	Brok	Rub		31	
26.10	481.82	26.30	481.62	0.20	0.20	100	0.00	0	7	25	50	R4	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, FeO staining on some joint surfaces.	0.02	> 20 m	< 0.1 mm	Smooth	None	SW	17	J				46
26.30	481.62	27.80	480.12	1.50	1.50	100	1.07	71	12	115	35	R3	Greywacke	Dark grey	Fine grained	Massive	Strong, fresh, some medium-grey bands, strong FeO weathering on some joint surfaces.	0.50	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc			54
27.80	480.12	28.90	479.02	1.10	0.97	88	0.00	0	MAX	5	25	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, fresh, trace calcite veinlets, FeO staining on few joint surfaces, 20cm-thick rubble zone at bottom of run.	0.51	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO		39
28.90	479.02	29.30	478.62	0.40	0.40	100	0.00	0	9	40	25	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, fresh, trace calcite veinlets, FeO staining on few joint surfaces, 20cm-thick rubble zone at bottom of run.	0.60	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				45
29.30	478.62	30.80	477.12	1.50	1.50	100	0.79	53	19	75	25	R3	Greywacke	Dark grey	Fine grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, iron oxide infill in few joints, calcite veining, 15 mm thick calcite infill at 30.72 m.	0.47	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J		FeO		53

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-003

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average		
m	m	m	m	m	m		ft			mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
1.00	433.60	2.24	432.36	1.24	1.20	97	0.60	15	MAX	5	50	R4	Goldslide Porphyry Suite	Grey	Medium to coarse grained	Massive, porphyritic	Strong, intensely fractured, fresh, rubble and broken zone at middle of the run, rubble at the bottom of run is drill induced (drillers's observation).	0.87	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	FRESH	14	Brok	Rub				44
2.24	432.36	3.69	430.91	1.45	1.45	100	1.00	21	9	145	50	R4	Goldslide Porphyry Suite	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, fresh, no rubble or broken zones.	0.85	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				52	
3.69	430.91	5.19	429.41	1.50	1.50	100	0.94	19	11	125	50	R4	Goldslide Porphyry Suite	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, slightly weathered, clay infill at 4.39 m.	0.70	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	cly			45	
5.19	429.41	6.69	427.91	1.50	1.50	100	0.25	5	16	88	50	R4	Goldslide Porphyry Suite	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately to highly fractured, slightly weathered, chlorite, calcite, and iron oxide infill.	0.86	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc	FeO	44	
6.69	427.91	8.19	426.41	1.50	1.50	100	0.49	10	20	71	50	R4	Goldslide Porphyry Suite / Sheared Gabbro	Grey	Medium to coarse grained	Massive, porphyritic	Strong, slightly weathered GOLDSLIDE PORPHYRY to 7.93 m then becomes SHEARED GABBRO, grey, fine to medium grained, massive, medium strong, slightly fractured, slightly weathered, clay infill at 7.93 m, calcite veining.	1.24	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cly	cc		45	
8.19	426.41	9.56	425.04	1.37	1.37	100	0.55	12	MAX	5	25	R3	Sheared Gabbro	Grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly weathered, chlorite, iron oxide infill, rubble and broken zones at the top of run, heavy calcite veining.	0.90	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO		39	
9.56	425.04	10.17	424.43	0.61	0.60	98	0.00	0	10	55	25	R3	Sheared Gabbro	Grey to dark grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly weathered, broken zones at the bottom of the run, calcite veining and infill.	0.11	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc			38	
10.17	424.43	11.24	423.36	1.07	1.07	100	0.17	5	8	119	25	R3	Sheared Gabbro	Grey to dark grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly weathered, trace iron oxide and chlorite infill, heavy calcite veining and infill.	0.85	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc			43	
11.24	423.36	12.80	421.80	1.56	1.53	98	1.48	29	8	170	35	R3	Sheared Gabbro	Medium grey	Fine grained	Porphyritic	Medium strong, moderately fractured, fresh, quartz-phyric in indistinguishable groundmass, one 15cm-thick quartz vein at 11.64 m, fresh joint surfaces.	0.16	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				52	
12.80	421.80	14.30	420.30	1.50	1.50	100	1.33	27	15	94	150	R5	Goldslide Porphyry Suite	Medium grey	Fine grained	Massive	Very strong, moderately to highly fractured, fresh, sugary texture, FeO staining on some joint surfaces.	0.46	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	FRESH	14	VNL	qtz			54	
14.30	420.30	15.80	418.80	1.50	1.50	100	0.99	20	22	65	50	R4	Goldslide Porphyry Suite	Medium grey	Fine grained	Massive	Strong, highly fractured, fresh, some quartz veinlets, multiple broken joints.	1.15	> 20 m	1 - 5 mm	SL Rough	Hard > 5 mm	SW	11	J	Rub			43	
15.80	418.80	17.20	417.40	1.40	1.40	100	0.99	22	25	54	35	R3	Tuffaceous Rock (Welded)	Medium grey	Fine grained	Porphyritic	Medium strong, highly fractured, fresh, quartz-phyric in indistinguishable groundmass, fresh joint surfaces.	0.17	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				48	
17.20	417.40	18.70	415.90	1.50	1.50	100	0.53	11	29	50	60	R4	Tuffaceous Rock (Welded)	Medium grey	Fine grained	Porphyritic	Strong, highly fractured, fresh, feldspar phenocrysts approximately 1-2 mm in diameter, 2-4 mm dark mafic/lithic fragments.	0.65	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				50	
18.70	415.90	20.20	414.40	1.50	1.50	100	1.21	25	11	125	60	R4	Tuffaceous Rock (Welded)	Medium grey	Fine grained	Porphyritic	Strong, fresh, feldspar phenocrysts approximately 1-2 mm in diameter, 2-4 mm dark mafic/lithic fragments.	0.44	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				53	
20.20	414.40	21.70	412.90	1.50	1.50	100	0.80	16	30	48	60	R4	Tuffaceous Rock (Welded)	Medium grey	Fine grained	Porphyritic	Strong, fresh, quartz-biotite-phyric in indistinguishable groundmass, trace quartz veinlets, fresh joint surfaces.	0.36	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				51	
21.70	412.90	23.20	411.40	1.50	1.29	86	0.35	7	20	61	50	R4	Tuffaceous Rock (Welded) / Sheared Gabbro	Medium grey	Fine grained	Porphyritic	Strong, highly fractured, fresh, 1-2 mm diameter feldspar phenocrysts, contact with quartz vein at 0.55m, medium strong, fresh, FeO infill on some joints.	0.33	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		44	
23.20	411.40	23.66	410.94	0.46	0.46	100	0.00	0	MAX	5	50	R4	Sheared Gabbro	Grey	Fine grained	Massive	Medium strong, intensely fractured, slightly to moderately weathered, clay, chlorite, calcite, and iron oxide infill, broken zone at the middle of the run, heavy calcite infill, 0.15 m of slough at the top of the run due to flushing the hole before packer testing.	0.31	> 20 m	1 - 5 mm	SL Rough	Soft > 5 mm	MW	7	J	Rub			36	
23.66	410.94	24.37	410.23	0.71	0.70	99	0.00	0	MAX	5	25	R3	Sheared Gabbro	Grey to dark grey	Fine grained	Massive	Medium strong, intensely fractured, slightly to moderately weathered, clay, chlorite, calcite, and iron oxide infill, broken zone at the middle of the run, heavy calcite infill, 0.15 m of slough at the top of the run due to flushing the hole before packer testing.	0.60	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO	cc	37	

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-003

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m	(%)	ft	(%)		mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
24.37	410.23	25.39	409.21	1.02	1.02	100	0.21	6	MAX	5	25	R3	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Medium strong, intensely fractured, slightly to moderately weathered, clay, chlorite, calcite, and iron oxide infill, broken zone at the middle of the run, heavy calcite infill, 0.15 m of slough at the top of the run due to flushing the hole before packer testing.	0.65	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	FeO				38
25.39	409.21	26.86	407.74	1.47	1.47	100	0.95	20	10	134	50	R4	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, slightly weathered, no broken zones, slightly to moderately fractured, minor iron oxide staining.	0.67	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO			47	
26.86	407.74	27.77	406.83	0.91	0.91	100	0.32	11	6	130	50	R4	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, slightly weathered, chlorite infill.	0.04	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	chl			48	
27.77	406.83	29.27	405.33	1.50	1.45	97	1.13	23	8	161	50	R4	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, slightly weathered, minor iron oxide staining, chlorite infill, quartz phenocrysts and biotite specs within the groundmass matrix.	0.71	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl			48	
29.27	405.33	30.77	403.83	1.50	1.50	100	1.18	24	6	214	50	R4	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Strong, fresh, slightly to moderately fractured, no iron oxide infill, minor chlorite infill.	0.43	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				53	
30.77	403.83	31.02	403.58	0.25	0.25	100	0.23	28	2	83	50	R4	Tuffaceous Rock (Welded)	Grey	Medium to coarse grained	Massive, porphyritic	Strong, moderately fractured, slightly weathered, no chlorite infill, calcite infill.	0.00	> 20 m	1 - 5 mm	V Rough	Soft < 5 mm	SW	14	J	cc			47	

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-004

DRILL RUN DATA									GEOLOGY - COMMENTS							DISCONTINUITY DATA - RATING SYSTEMS													
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		ft											ft	Persis-P	Apert-A	Rough-R	Infill-I	Weath-W	TOTAL (RMR)					
0.50	465.11	1.50	464.11	1.00	1.00	100	0.87	27	4	200	25	R3	Mafic Dyke	Light greenish grey	Fineto medium grained, inequigranular	Massive	Medium strong, slightly to moderately fractured, moderately weathered, biotite specks, calcite veining, iron oxide, calcite, chlorite infill, rubble zone from 0.91m to end of the run.	0.64	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	FeO	cc	chl	41
1.50	464.11	3.00	462.61	1.50	0.63	42	0.51	10	2	210	25	R3	Gabbro	Greenish grey	Fineto medium grained, inequigranular	Massive, porphyritic	Medium strong, slightly to moderately fractured, slightly weathered, chlorite and calcite infill, biotite specks, chlorite matrix, quartz phenocrysts, 2 spun joints.	0.00	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J				41
3.00	462.61	4.50	461.11	1.50	1.50	100	0.90	18	9	150	25	R3	Gabbro / Mafic Dyke	Greenish grey up to 4.14m then becomes light greenish grey	Fineto medium grained, inequigranular	Massive, porphyritic up to 4.14m then becomes massive	From 3.00-4.14 m, as previous then becomes MAFIC DYKE, medium strong, moderately fractured, moderately to slightly weathered, calcite, chlorite, and iron oxide infill, biotite specks.	0.13	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl	FeO	45
4.50	461.11	6.00	459.61	1.50	1.50	100	1.27	26	3	375	50	R4	Mafic Dyke	Light greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, slightly fractured, slightly weathered, quartz and calcite veining	1.31	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl	FeO	50
6.00	459.61	6.55	459.06	0.55	0.55	100	0.29	16	4	110	35	R3	Mafic Dyke / Gabbro	Light greenish grey up to 6.15m then becomes greenish grey	Fine to medium grained, inequigranular	Massive up to 6.15m then becomes porphyritic	From 6-6.15 m, MAFIC DYKE, as previous. From 6.15-6.55 m, GABBRO, medium strong, moderately to highly fractured, slightly weathered, chlorite, calcite, and graphite infill, long quartz veinlet 5mm thick at 6.10m, core from 6.15m to 6.35m is half gabbro and half mafic dyke.	0.33	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc	graph	45
6.55	459.06	8.05	457.56	1.50	1.50	100	1.02	21	6	214	25	R3	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive, porphyritic	Medium strong, slightly to moderately fractured, slightly weathered, chlorite, calcite, and graphite infill.	0.23	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc	graph	46
8.05	457.56	9.28	456.33	1.23	1.23	100	1.14	28	MAX	5	25	R3	Gabbro	Greenish grey except from 8.90m to 9.12m, light greenish grey	Fine to medium grained, inequigranular except from 8.90m to 9.12m, fine grained	Massive, porphyritic except from 8.90m to 9.12m, massive	Medium strong, intensely fractured, slightly weathered, chlorite, graphite, and calcite infill, 1 spun joint at 8.54m.	0.30	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc	graph	44
9.28	456.33	10.78	454.83	1.50	1.50	100	0.88	18	10	136	50	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, trace quartz veinlets, weak yellow staining on some joint surfaces, quartz infill, spun joint at 9.94 m.	0.22	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	qtz			49
10.78	454.83	12.28	453.33	1.50	1.50	100	1.12	23	1	691	60	R4	Gabbro / Mafic Dyke	Greenish grey	Medium grained	Porphyritic	From 6-6.15 m, GABBRO, as previous. From 6.15-6.55 m, MAFIC DYKE, strong, single fracture, slightly weathered, trace quartz phenocrysts toward end of run, weak yellow staining on some joint surfaces.	0.44	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J	qtz			53
12.28	453.33	13.78	451.83	1.50	1.50	100	1.29	26	12	115	60	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, slightly weathered, quartz biotite-phyric in indistinguishable matrix, trace quartz veinlets, one 10mm-thick quartz vein at 12.31 m, iron oxide staining on most joint surfaces.	0.29	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				52
13.78	451.83	14.03	451.58	0.25	0.22	88	0.00	0	MAX	5	5	R2	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Broken Zone, iron oxide staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub		32	
14.03	451.58	15.50	450.11	1.47	1.42	97	1.41	29	7	178	75	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, iron oxide staining on joint surfaces, trace quartz veinlets.	0.27	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J				53
15.50	450.11	16.33	449.28	0.83	0.83	100	0.29	11	15	52	40	R3	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, highly fractured, slightly weathered, some quartz veinlets, iron oxide staining on joint surfaces.	0.50	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		41
16.33	449.28	17.00	448.61	0.67	0.67	100	0.40	18	5	112	45	R3	Gabbro	Greenish grey	Medium grained	Porphyritic	Medium strong, moderately to highly fractured, slightly weathered, some quartz veinlets.	0.46	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		43
17.00	448.61	18.50	447.11	1.50	1.41	94	1.35	27	3	353	70	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, slightly fractured, slightly weathered, trace quartz veinlets, chlorite alteration on some joint surfaces.	1.12	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	SW	9	VNL	qtz	chl		47
18.50	447.11	20.00	445.61	1.50	1.39	93	0.70	14	8	154	70	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, trace quartz and biotite veinlets.	0.12	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	SW	9	J	cc			43
20.00	445.61	21.05	444.56	1.05	1.04	99	0.37	11	15	65	70	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, highly fractured, slightly weathered, some clay-altered joint surfaces, generally fresh joint surfaces with clay infill.	0.47	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	SW	9	J		chl		41
21.05	444.56	21.50	444.11	0.45	0.45	100	0.13	9	1	225	70	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, slightly fractured, slightly weathered, some clay-altered joint surfaces, generally fresh joint surfaces with clay infill.	0.13	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	SW	9	J		chl		43
21.50	444.11	23.00	442.61	1.50	1.50	100	1.42	29	5	250	60	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, slightly fractured, slightly weathered, quartz and chlorite infill on most joint surfaces.	1.40	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl		48

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-004

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m	(%)	ft	(%)										ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
23.00	442.61	24.50	441.11	1.50	1.50	100	0.92	19	9	150	60	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, quartz and chlorite infill on most joint surfaces.	1.12	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	qtz	chl		46
24.50	441.11	25.70	439.91	1.20	1.20	100	0.89	23	7	150	60	R4	Gabbro	Greenish grey	Medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, quartz and chlorite infill on most joint surfaces.	0.65	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	qtz	chl		46
25.70	439.91	27.20	438.41	1.50	1.50	100	1.21	25	10	136	45	R3	Gabbro	Greenish grey	Medium grained	Porphyritic	Medium strong, moderately fractured, slightly weathered, chlorite infill on joint surfaces.	0.46	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		44
27.20	438.41	27.50	438.11	0.30	0.30	100	0.32	33	1	150	30	R3	Gabbro	Greenish grey	Medium grained	Porphyritic	Medium strong, single fracture, slightly weathered, chlorite infill on joint surfaces.	0.32	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		44
27.50	438.11	29.00	436.61	1.50	1.43	95	1.43	29	5	238	25	R3	Gabbro	Greenish grey	Fine to medium grained	Massive, porphyritic	Medium strong, slightly fractured, slightly weathered, calcite, chlorite, and graphite infill, biotite specks, calcite and graphite veins	0.84	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc	chl	graph	44
29.00	436.61	30.50	435.11	1.50	1.50	100	1.36	28	7	188	25	R3	Gabbro	Greenish grey	Fine to medium grained	Massive, porphyritic	Medium strong, slightly to moderately fractured, slightly weathered, calcite, chlorite, and graphite infill, biotite specks, calcite and graphite veins, 20mm thick calcite vein at 20.49mm, END OF HOLE.	0.40	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc	chl	graph	43

EOH

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-005

DRILL RUN DATA									GEOLOGY - COMMENTS							DISCONTINUITY DATA - RATING SYSTEMS																
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	ROD Length	ROD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average			
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)								
m	m	m	m	m	m	(%)	ft	(%)			(MPa)							m														
6.84	421.56	7.60	420.91	0.76	0.65	86	0.17	7	7	81	50	R4	Diorite	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, fresh, quartz-biotite-phyric in indistinguishable groundmass, fresh joint surfaces with trace dark brown staining.	0.29	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						50	
7.60	420.91	8.00	420.56	0.40	0.40	100	0.10	8	4	80	50	R4	Diorite	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, fresh, some slough at top of run.	0.14	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						50	
8.00	420.56	9.50	419.26	1.50	1.49	99	0.29	6	11	124	70	R4	Diorite	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, fresh, trace quartz veinlets.	1.03	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	FRESH	15	J	qtz					48	
9.50	419.26	11.00	417.96	1.50	1.50	100	0.61	12	15	94	60	R4	Diorite	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, fresh.	0.13	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						51	
11.00	417.96	12.25	416.88	1.25	1.25	100	0.84	20	9	125	50	R4	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Strong, moderately fractured, fresh, no infill, quartz phenocrysts and biotite specks, minor broken zone from 11.3m to 11.44m.	0.06	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						52	
12.25	416.88	13.75	415.58	1.50	1.50	100	0.62	13	25	58	35	R3	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Medium strong, highly fractured, fresh to slightly weathered, clay and calcite infill, calcite veins, broken zones from 13.37m to 13.75m.	0.00	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cly	cc				41	
13.75	415.58	14.43	414.99	0.68	0.68	100	0.68	30	3	170	50	R4	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Strong, moderately fractured, fresh, no infill, calcite veins, no broken zones.	0.43	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						54	
14.43	414.99	15.78	413.82	1.35	1.35	100	0.66	15	MAX	5	25	R3	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Medium strong, intensely fractured, fresh to slightly weathered, calcite infill, broken zone from 15.56m to the end of the run.	1.10	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc					39	
15.78	413.82	17.28	412.52	1.50	1.39	93	0.73	15	MAX	5	25	R3	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Medium strong, intensely fractured, fresh, calcite veins, broken zone at top of the run.	1.18	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J						44	
17.28	412.52	18.78	411.22	1.50	1.46	97	1.15	23	8	162	35	R3	Diorite	Grey	Fine to medium grained, inequigranular	Massive, porphyritic	Medium strong, moderately fractured, fresh, no broken zones.	0.75	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						51	
18.78	411.22	20.28	409.93	1.50	1.45	97	0.67	14	23	60	25	R3	Diorite / Gabbro	Grey up to 19.30m then becomes greenish grey to dark grey	Fine to medium grained, inequigranular up to 19.30m then becomes fine grained, equigranular	Massive, porphyritic up to 19.30m then becomes massive	Medium strong, moderately fractured, moderately weathered, no calcite veins up to 19.30m, then becomes GABBRO, weak, highly fractured, slightly to moderately weathered, graphite, chlorite, and calcite infills, calcite veinlets, quartz infill at 19.70m, chlorite matrix.	1.16	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	graph	chl	cc				38
20.28	409.93	21.78	408.63	1.50	1.49	99	0.95	19	11	124	50	R4	Gabbro / Mafic Dyke	White and dark grey, or medium grey	Fine to medium grained	Massive, porphyritic	Up to 20.98 m: heavy quartz veining, rubble sections, then becomes MAFIC DYKE, strong, moderately fractured, fresh, lightly silicified, fresh joint surfaces.	1.17	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						52	
21.78	408.63	22.33	408.15	0.55	0.53	96	0.43	24	2	177	50	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, slightly to moderately fractured, fresh, quartz-biotite phyric in indistinguishable groundmass.	0.12	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						53	
22.33	408.15	23.28	407.33	0.95	0.91	96	0.71	23	6	130	60	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, fresh, dark grey blotchy staining on joint surfaces.	0.18	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						53	
23.28	407.33	24.03	406.68	0.75	0.69	92	0.41	17	MAX	5	60	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, intensely fractured, fresh, broken section from 23.69-23.93 m	0.22	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J						50	
24.03	406.68	24.78	406.03	0.75	0.75	100	0.00	0	MAX	5	45	R3	Mafic Dyke / Gabbro	White and dark grey, or medium grey	Fine to medium grained	Massive, porphyritic	Up to 24.46 m: strong, intensely fractured, fresh, then becomes GABBRO, medium strong, highly fractured, fresh, heavy quartz veining, disseminated sulphides.	0.14	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J						45	
24.78	406.03	25.93	405.03	1.15	1.11	97	0.54	14	12	85	45	R3	Gabbro / Mafic Dyke	White and dark grey, or medium grey	Fine to medium grained	Massive, porphyritic	Up to 25.00 m: medium strong, moderately to highly fractured, slightly weathered, heavy quartz veining, rubble sections; then becomes MAFIC DYKE, medium strong, moderately fractured, slightly weathered, quartz-biotite-phyric porphyry.	0.58	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO				44	
25.93	405.03	26.28	404.73	0.35	0.33	94	0.32	28	0	330	60	R4	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Strong, no joints, fresh, quartz-biotite phyric in indistinguishable groundmass, no joints.	0.00	< 1 m	None	V Rough	None	FRESH	30	NJ						67	
26.28	404.73	27.58	403.60	1.30	1.30	100	0.83	19	3	325	45	R3	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Medium strong, slightly fractured, slightly weathered, trace brown staining on fracture surfaces.	0.13	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J						50	
27.58	403.60	29.08	402.30	1.50	1.49	99	0.66	13	MAX	5	45	R3	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Medium strong, intensely fractured, slightly weathered, broken from 27.99-28.48 m, iron oxide staining on fracture surfaces.	0.41	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO				43	
29.08	402.30	29.43	402.00	0.35	0.35	100	0.00	0	MAX	5	5	R2	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Broken zone, iron oxide staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	FeO				32	

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-005

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m		ft											m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
29.43	402.00	30.03	401.48	0.60	0.59	98	0.21	11	25	23	45	R3	Mafic Dyke	Medium grey	Fine grained	Porphyritic	Medium strong, highly fractured, moderately weathered, broken at top and bottom of run, iron oxide staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	FeO			37
30.03	401.48	30.58	401.00	0.55	0.55	100	0.00	0	MAX	5	5	R2	Gabbro	White and dark grey	Fine to medium grained	Massive, porphyritic	Broken zone, 6cm-thick quartz vein at 30.23 m, FeO staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	FeO			32
30.58	401.00	32.00	399.78	1.42	1.42	100	0.47	10	26	53	35	R3	Gabbro	White and dark grey	Fine to medium grained	Massive, porphyritic	Medium strong, highly fractured, fresh, heavy quartz veining causing silicification of country rock, many healed fractures with quartz infilling, iron oxide staining on joint surfaces.	0.31	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				45	
32.00	399.78	33.50	398.48	1.50	1.50	100	0.64	13	MAX	5	15	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, intensely fractured, moderately weathered, chlorite, calcite, and graphite infill, rubble and broken zones at the top of the run, quartz rubble fragments from 30.14m to 30.20m, chlorite matrix, biotite specks.	0.86	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	36	
33.50	398.48	35.00	397.18	1.50	1.50	100	0.93	19	22	65	15	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, highly fractured, moderately weathered, no rubble zones, broken zone at the middle of the run, 1 spun joint.	0.37	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	38	
35.00	397.18	36.50	395.88	1.50	1.50	100	0.69	14	18	79	15	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, moderately to highly fractured, moderately weathered, no significant broken zones, no spun joints.	1.10	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	37	
36.50	395.88	37.85	394.71	1.35	1.35	100	1.15	26	15	84	20	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, moderately to highly fractured, moderately weathered, broken zone from 37.41 m to 37.63 m, 1 spun joint.	0.32	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	chl	cc	graph	42	
37.85	394.71	39.35	393.41	1.50	1.50	100	0.66	13	MAX	5	10	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, intensely fractured, moderately to highly weathered, chlorite alteration from 37.91m to 38.38m (possible fault zone?), lost circulation from 37.85m to 38.38m, no spun joint.	1.20	BROKEN	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Alt	chl	Rub	cc	29	
39.35	393.41	40.85	392.11	1.50	1.50	100	1.29	26	MAX	5	15	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, intensely fractured, slightly to moderately weathered, no chlorite alteration, mix of rubble and broken zone from 40.12m to 40.28m, 2 spun joints.	0.20	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	38	
40.85	392.11	42.35	390.81	1.50	1.50	100	0.90	18	15	94	20	R2	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Weak, moderately to highly fractured, moderately weathered, no spun joints, no rubble and broken zones.	0.39	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	38	
42.35	390.81	43.70	389.64	1.35	1.35	100	0.98	22	9	135	25	R3	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, moderately fractured, moderately weathered, quartz infill from 42.5m to 42.56m, 2cm thick quartz vein at 42.45m.	0.05	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	chl	cc	graph	43	
43.70	389.64	45.00	388.52	1.30	1.30	100	1.35	32	4	260	35	R3	Gabbro	Dark greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, slightly fractured, slightly weathered, more graphite than chlorite infill, heavy calcite veins from 44.89m onward with thickness of 1.5cm. EOH.	0.12	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	cc	chl	49	

EOH

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-006

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	ROD Length	ROD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
4.83	437.81	5.20	437.44	0.37	0.37	100	0.00	0	5	62	45	R3	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Medium strong, highly fractured, slightly weathered, weak green staining on joint surfaces; top 0.03m of run is gravel.	0.08	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				44
5.20	437.44	5.30	437.34	0.10	0.10	100	0.00	0	MAX	5	25	R3	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Medium strong, intensely fractured, slightly weathered, some slough at top of run.	0.33	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	bio			37
5.30	437.34	6.80	435.84	1.50	1.50	100	1.12	75	10	136	70	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, moderately fractured, fresh, trace quartz veinlets, 11cm-thick broken zone at 5.52 m	0.16	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J				60
6.80	435.84	7.90	434.74	1.10	1.10	100	1.05	95	5	183	75	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, slightly to moderately fractured, slightly weathered, trace quartz veinlets, dark brown staining on joint surfaces, spun joint at 6.91 m.	0.14	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				64
7.90	434.74	9.40	433.24	1.50	1.50	100	1.24	83	7	188	55	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, slightly to moderately fractured, slightly weathered, dark brown staining on joint surfaces, trace quartz veinlets.	1.00	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				60
9.40	433.24	10.50	432.14	1.10	1.10	100	0.88	80	6	157	55	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, moderately fractured, fresh, some quartz veinlets.	0.66	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	FRESH	14	VNL	qtz			58
10.50	432.14	11.20	431.44	0.70	0.70	100	0.50	71	3	175	75	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, slightly to moderately weathered, fresh, spun joints at 10.58 m and 10.99 m	0.48	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	FRESH	15	VNL	qtz			59
11.20	431.44	12.35	430.29	1.15	1.15	100	0.58	50	12	88	80	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, moderately to highly weathered, slightly weathered, clay alteration on few joint surfaces.	0.11	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	qtz			55
12.35	430.29	12.70	429.94	0.35	0.35	100	0.26	74	1	175	60	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, single fracture, slightly weathered, brownish yellow staining on the joint surface, quartz infill.	0.26	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J	qtz			57
12.70	429.94	13.55	429.09	0.85	0.85	100	0.46	54	10	77	80	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, moderately to highly fractured, slightly weathered, 8cm-thick heavily fractured zone at 13.13 m, iron oxide staining on joint surfaces.	0.24	> 20 m	1 - 5 mm	Smooth	None	SW	13	J				53
13.55	429.09	14.20	428.44	0.65	0.65	100	0.46	71	5	108	80	R4	Mafic Dyke	Medium grey	Fine to medium grained	Massive	Strong, highly to moderately fractured, moderately weathered, joint surfaces rubleized.	0.23	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	gg		50
14.20	428.44	15.70	426.94	1.50	1.50	100	1.30	87	10	136	40	R3	Gabbro	Medium grey	Medium to coarse grained	Massive	Medium strong, moderately fractured, slightly to moderately weathered, some calcite veinlets.	0.93	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	MW	11	J	FeO			55
15.70	426.94	17.20	425.44	1.50	1.47	98	1.18	79	13	105	50	R4	Gabbro	Medium grey	Medium to coarse grained	Massive	Strong, moderately to highly fractured, slightly weathered, trace quartz veinlets.	0.46	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				61
17.20	425.44	18.70	423.94	1.50	1.47	98	1.25	83	8	163	50	R4	Gabbro	Medium grey	Medium to coarse grained	Massive	Strong, moderately fractured, slightly weathered, quartz infill and black staining on joint surfaces.	0.75	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J	qtz	ox		57
18.70	423.94	20.20	422.44	1.50	1.50	100	1.38	92	6	214	35	R3	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, slightly to moderately fractured, slightly weathered, manganese oxide, calcite and chlorite infill, calcite veins, chlorite matrix, biotite specks.	1.23	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	MnO	cc	chl	56
20.20	422.44	21.70	420.94	1.50	1.49	99	1.43	95	5	248	35	R3	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, slightly fractured, slightly weathered, manganese oxide, calcite and chlorite infill, calcite veins, chlorite matrix, biotite specks.	0.55	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	MnO	chl	cc	61
21.70	420.94	23.20	419.44	1.50	1.50	100	0.65	43	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive	Weak, highly fractured, slightly to moderately weathered, broken and rubble zone from 22.37 m to 22.87 m, clay and iron oxide infill.	1.38	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	cly	MnO	FeO	33
23.20	419.44	24.55	418.09	1.35	1.35	100	1.17	87	8	150	25	R3	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive	Medium strong, moderately fractured, slightly weathered, trace clay and iron oxide infill, no broken and rubble zones.	1.08	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	MnO	chl	cc	57
24.55	418.09	26.05	416.59	1.50	1.47	98	0.78	52	30	47	30	R3	Mafic Dyke	Greenish grey	Fine to medium grained, inequigranular up to 25.19 then becomes fine grained with calcite specks	Massive	Same GABBRO as previous up 25.19 m, then becomes MAFIC DYKE, medium strong, highly fractured, slightly weathered, chlorite, calcite, iron oxide, and manganese oxide infill, calcite veins.	0.92	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	VN	cc	MnO	FeO	46
26.05	416.59	27.55	415.09	1.50	1.50	100	0.78	52	30	48	20	R2	Gabbro	Greenish grey	Fine grained with calcite specks up to 26.30m then becomes fine to medium grained	Massive	Weak MAFIC DYKE, moderately weathered broken zone up to 26.30 m then becomes GABBRO. From 26.13m to 26.30m is half MDK and GAB. Weak GABBRO, highly fractured, slightly to moderately weathered, chlorite, calcite, iron oxide, and manganese oxide infill, broken zones from 27.35 m to 27.55 m	1.15	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	MnO	43
27.55	415.09	27.75	414.89	0.20	0.20	100	0.00	0	MAX	5	5	R2	Gabbro	Greenish grey	Fine to medium grained, inequigranular	Massive	Weak, intensely fractured, moderately weathered, broken and rubble zones throughout.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	chl	cc	27

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-006

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m	(%)	m	(%)		mm	(MPa)							m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
27.75	414.89	28.60	414.04	0.85	0.85	100	0.00	0	MAX	5	5	R2	Mafic Dyke	Greenish grey	Fine grained, equigranular	Massive	Weak, intensely fractured, slightly to moderately weathered, chlorite, calcite, iron oxide, and manganese oxide infill, calcite veins, minor competent rock in the middle of the run	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc	chl	27
28.60	414.04	29.00	413.64	0.40	0.40	100	0.26	65	6	57	25	R3	Mafic Dyke	Greenish grey	Fine grained, equigranular	Massive	Medium strong, highly fractured, moderately weathered, 1 spun joint, calcite specks.	0.29	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	VN	cc	FeO	chl	46
29.00	413.64	30.40	412.24	1.40	1.40	100	0.35	25	45	30	15	R2	Mafic Dyke	Greenish grey	Fine grained, equigranular	Massive	Weak, highly fractured and broken throughout, moderately weathered.	1.26	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	VN	cc	FeO	MnO	38
30.40	412.24	31.90	410.74	1.50	1.50	100	0.98	65	14	100	75	R4	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, slightly weathered, trace quartz veinlets, weak FeO staining on joint surfaces, spun joint at 30.64 m.	0.79	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				58
31.90	410.74	33.40	409.24	1.50	1.50	100	1.26	84	8	167	55	R4	Gabbro	Medium greenish grey	Fine to coarse grained	Massive	Strong, moderately fractured, slightly weathered, MAFIC DYKE. Contact with GABBRO at 32.33 m, trace quartz veinlets, weak iron oxide staining on joint surfaces.	0.49	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J	qtz		58	
33.40	409.24	33.70	408.94	0.30	0.29	97	0.00	0	3	73	70	R4	Gabbro	Medium grey	Fine to medium grained	Porphyritic	Strong, highly fractured, slightly weathered, moderate iron oxide staining on joint surfaces.	0.05	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				46
33.70	408.94	34.90	407.74	1.20	1.19	99	0.12	10	35	33	35	R3	Mafic Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, highly fractured, slightly weathered, iron oxide staining on joint surfaces.	0.16	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				44

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-007

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																	
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average		
m	m	m	m	m	m		m											ft	Persis-P	Apert-A	Rough-R	Infill-I	Weath-W	TOTAL (RMR)							
2.57	440.98	3.70	439.85	1.13	1.13	100	1.13	100	6	161	55	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, slightly weathered, slightly to moderately fractured, trace calcite veinlets, quartz infill on most joint surfaces.	0.87	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl			59	
3.70	439.85	5.20	438.35	1.50	1.50	100	0.98	65	11	125	55	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, slightly weathered, moderately fractured, 10cm-thick shear zone at 4.95m, trace quartz veinlets.	0.69	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	VNL	qtz				54	
5.20	438.35	6.14	437.41	0.94	0.94	100	0.50	53	8	104	45	R3	Gabbro	Medium grey	Medium to coarse grained	Porphyritic	Medium strong, fresh, slightly to moderately fractured, quartz-biotite-phyric, some quartz veinlets, weak beige staining on joint surfaces.	0.28	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J					53	
6.14	437.41	6.70	436.85	0.56	0.56	100	0.46	82	2	187	65	R4	Gabbro	Medium grey	Medium to coarse grained	Porphyritic	Medium strong, fresh, slightly fractured, quartz-biotite-phyric, some quartz veinlets, weak beige staining on joint surfaces.	0.27	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					64	
6.70	436.85	8.20	435.35	1.50	1.50	100	1.50	100	3	375	55	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, fresh, slightly fractured, fresh joint surfaces.	0.93	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					70	
8.20	435.35	9.70	433.85	1.50	1.50	100	1.16	77	3	375	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive, brecciated	Strong, fresh to slightly weathered, slightly fractured, weak beige staining throughout, brecciated from 8.46-8.82 m, 6cm-thick rubble zone at 8.46m.	0.66	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	VNL	qtz	chl			61	
9.70	433.85	11.20	432.35	1.50	1.50	100	1.26	84	8	167	60	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive	Strong, fresh to slightly weathered, slightly to moderately fractured, moderate iron oxide staining on some joint surfaces.	0.84	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J		chl			61	
11.20	432.35	12.70	430.85	1.50	1.51	101	1.35	90	6	216	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive	Strong, fresh to slightly weathered, slightly to moderately fractured, weak iron oxide staining on joint surfaces, trace quartz veinlets.	0.45	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	qtz	chl			57	
12.70	430.85	14.20	429.35	1.50	1.51	101	1.39	93	7	189	50	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, fresh to slightly weathered, slightly to moderately fractured, chlorite alteration on joint surfaces.	0.43	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	qtz	chl			59	
14.20	429.35	15.70	427.85	1.50	1.51	101	1.06	71	8	168	50	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, slightly weathered, slightly to moderately fractured, trace calcite veinlets.	0.56	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl			56	
15.70	427.85	17.20	426.35	1.50	1.51	101	1.50	100	2	503	60	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, fresh to slightly weathered, slightly fractured.	0.26	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J					64	
17.20	426.35	18.70	424.85	1.50	1.51	101	1.18	79	8	168	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.89	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc		56	
18.70	424.85	20.20	423.35	1.50	1.51	101	1.35	90	7	189	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.39	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc		59	
20.20	423.35	21.70	421.85	1.50	1.51	101	1.41	94	6	216	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.56	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	cc			60	
21.70	421.85	23.05	420.50	1.35	1.35	100	1.33	99	5	225	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.25	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc		61	
23.05	420.50	24.55	419.00	1.50	1.51	101	1.45	97	7	189	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, iron oxide, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.31	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	FeO	graph		60	
24.55	419.00	26.05	417.50	1.50	1.51	101	1.37	91	6	216	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, three spun joints, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	0.65	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc			59	
26.05	417.50	27.55	416.00	1.50	1.50	100	1.37	91	7	188	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix.	1.33	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl	graph		59	
27.55	416.00	28.90	414.65	1.35	1.35	100	1.34	99	5	225	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, 1 spun joint, graphite, chlorite, and calcite infill, calcite veins, biotite specks, chlorite matrix, fibrous asbestos at 28.57m.	1.02	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl	graph		61	
28.90	414.65	30.30	413.25	1.40	1.40	100	0.88	63	18	74	20	R2	Gabbro	Greenish grey	Fine to coarse grained	Massive	Weak, slightly weathered, highly fractured, calcite rubble zone from 28.9 to 29.94 m, rubble zone from 29.49m to 29.52 m, broken zone from 29.87 m to 30.05 m.	0.36	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	VNL	cc	graph	chl			47

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-007

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m	(%)	m	(%)		mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
30.30	413.25	30.80	412.75	0.50	0.50	100	0.41	82	4	100	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly to moderately fractured, 2 spun joints.	0.42	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	SW	16	J	chl	cc	graph	58
30.80	412.75	32.30	411.25	1.50	1.50	100	1.50	100	5	250	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly weathered, slightly fractured, heavy iron oxide infill and staining from 31.50 m to 31.57 m.	0.92	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	SW	16	J	graph	chl	cc	64
32.30	411.25	33.80	409.75	1.50	1.50	100	1.11	74	9	150	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, fresh to slightly weathered, slightly to moderately fractured, iron oxide infill throughout, pyrite infill.	0.29	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO	chl	graph	55
33.80	409.75	34.75	408.80	0.95	0.95	100	0.63	66	6	136	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, fresh to slightly weathered, slightly to moderately fractured.	0.45	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO	chl	graph	53

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-008

DRILL RUN DATA									GEOLOGY - COMMENTS									DISCONTINUITY DATA - RATING SYSTEMS												
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
1.50	468.77	2.10	468.17	0.60	0.60	100	0.10	17	MAX	5	5	R2	Mudstone/Siltstone	Medium to dark grey	Fine grained	Brecciated	Broken zone, slightly weathered, strong FeO staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub				33
2.10	468.17	2.95	467.32	0.85	0.85	100	0.13	15	MAX	5	25	R3	Mudstone/Siltstone	Medium to dark grey	Fine grained	Weakly bedded	Medium strong, fresh to slightly weathered, some calcite veinlets, 0.14m-thick broken zone at 0.25m, moderate dull orange staining on joint surfaces.	0.14	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		42	
2.95	467.32	3.45	466.82	0.50	0.50	100	0.00	0	11	42	25	R3	Siltstone	Medium grey	Fine grained	Weakly bedded	Medium strong, fresh, heavily fractured, weak brown staining on joint surfaces.	0.27	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		41	
3.45	466.82	4.15	466.12	0.70	0.70	100	0.16	23	14	47	55	R4	Siltstone	Medium grey	Fine grained	Weakly bedded	Strong, fresh, trace calcite veinlets, fresh or slightly weathered joint surfaces.	0.16	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				49	
4.15	466.12	5.65	464.62	1.50	1.47	98	0.97	65	16	86	65	R4	Siltstone	Medium grey	Fine grained	Weakly bedded	Strong, fresh, trace calcite veinlets, fresh or slightly weathered joint surfaces.	0.26	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				58	
5.65	464.62	6.65	463.62	1.00	0.95	95	0.00	0	MAX	5	35	R3	Siltstone	Medium grey	Fine grained	Weakly bedded	Medium strong, slightly weathered, heavily fractured, gouge and rubble on few joint surfaces.	0.46	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		41	
6.65	463.62	8.15	462.12	1.50	1.50	100	0.30	20	32	45	55	R4	Siltstone	Medium grey	Fine grained	Weakly bedded	Strong, slightly weathered, heavily fractured	0.48	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		46	
8.15	462.12	9.65	460.62	1.50	1.50	100	0.94	63	13	107	45	R3	Siltstone	Medium grey	Fine grained	Weakly bedded	Medium strong, slightly weathered	0.40	> 20 m	< 0.1 mm	Smooth	Hard < 5 mm	SW	15	J		FeO		54	
9.65	460.62	11.15	459.12	1.50	1.50	100	0.11	7	14	100	45	R3	Siltstone	Medium grey	Fine grained	Weakly bedded	Medium strong, slightly weathered, weak dull orange staining on joint surfaces.	0.53	> 20 m	< 0.1 mm	Smooth	Hard < 5 mm	SW	15	J		FeO		45	
11.15	459.12	12.32	457.95	1.17	1.17	100	1.08	92	5	195	40	R3	Siltstone	Medium grey	Fine grained	Massive and weakly bedded	Medium strong, fresh, heavy quartz-filled healed fractures.	0.08	> 20 m	< 0.1 mm	Smooth	None	FRESH	18	J				64	
12.32	457.95	13.82	456.45	1.50	1.50	100	1.42	95	6	214	50	R4	Siltstone	Medium grey	Fine grained	Weakly bedded	Strong, slightly weathered, moderate FeO staining on few joints.	0.28	> 20 m	< 0.1 mm	Smooth	Hard < 5 mm	SW	15	J		FeO		62	
13.82	456.45	15.32	454.95	1.50	1.50	100	1.50	100	3	375	50	R4	Siltstone	Medium grey	Fine grained	Weakly bedded	Strong, fresh, quartz and calcite infill on joint surfaces.	1.31	> 20 m	< 0.1 mm	Smooth	Soft < 5 mm	FRESH	14	J	cc			64	
15.32	454.95	16.82	453.45	1.50	1.43	95	1.18	79	9	143	35	R3	Siltstone	Medium grey	Fine grained	Weakly bedded	Medium strong, slightly weathered, FeO staining on joint surfaces.	0.34	> 20 m	< 0.1 mm	Smooth	None	SW	17	J				59	
16.82	453.45	18.32	451.95	1.50	1.48	99	1.19	79	6	211	35	R3	Siltstone	Medium grey	Fine grained	Massive to weakly bedded	Medium strong, fresh, some faint relict bedding/structure, trace quartz veinlets.	0.44	> 20 m	< 0.1 mm	Smooth	Hard < 5 mm	FRESH	16	J	qtz			59	
18.32	451.95	18.75	451.52	0.43	0.43	100	0.32	74	2	143	35	R3	Siltstone	Medium grey	Fine grained	Massive to weakly bedded	Medium strong, fresh, some faint relict bedding/structure, trace quartz veinlets.	0.10	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		55	
18.75	451.52	20.25	450.02	1.50	1.50	100	1.08	72	MAX	5	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, slightly to highly fractured, slightly weathered, iron oxide, calcite, graphite and chlorite infill, chlorite and graphite matrix, minor calcite veins, broken zone from 19.25m to 19.75m.	1.24	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J	graph	cc	FeO	50	
20.25	450.02	21.60	448.67	1.35	1.35	100	0.49	36	MAX	5	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, moderately to highly fractured, slightly to moderately weathered, clay infill, broken zone from 20.60m to 21.27m.	0.14	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	cly	FeO	chl	39	
21.60	448.67	22.67	447.60	1.07	1.07	100	0.73	68	8	119	35	R3	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Medium strong, slightly to moderately fractured, slightly weathered, no clay infill and broken zones.	0.11	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO	chl		53	
22.67	447.60	24.17	446.10	1.50	1.50	100	0.72	48	MAX	5	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, highly fractured, broken zone from 22.77m to 22.88mm, from 23.12m to 23.62m, from 23.67m to 23.82m.	0.37	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	FeO	chl	graph	46	
24.17	446.10	25.70	444.57	1.53	1.53	100	1.02	67	25	59	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, moderately to highly fractured, fresh to slightly weathered, trace iron oxide infill, broken zone from 25.49m to 25.70m.	1.06	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J				52	
25.70	444.57	27.20	443.07	1.50	1.50	100	0.46	31	37	39	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, slightly to highly fractured, slightly weathered, iron oxide infill, broken zone from 26.18m to 27.04m.	0.79	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO	graph	41	
27.20	443.07	28.52	441.75	1.32	1.32	100	0.82	62	13	94	15	R2	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Weak, slightly to moderately weathered, heavy, iron oxide infill at 27.40m and 28.47m, rubble zone from 27.43m to 27.5m, presence of pyrite infill.	0.96	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	py	cc		52	
28.52	441.75	30.02	440.25	1.50	1.50	100	1.03	69	MAX	5	25	R3	Interbedded Mudstone and Siltstone	Greenish grey to dark grey	Fine grained	Massive to weakly bedded	Medium strong, iron oxide infill, broken and rubble zone from 28.60m to 28.75m, rubble zone from 29.73m to 29.77m, heavy iron oxide and calcite infill from 29.78m to 30.02m.	1.10	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	FeO	graph		49	
30.02	440.25	30.87	439.40	0.85	0.85	100	0.00	0	MAX	5	15	R2	Wacke	Greenish grey to dark grey up to 30.22m then becomes light greenish grey	Fine grained	Massive to weakly bedded up to 30.22m then becomes massive	Weak, highly fractured, minor calcite infill, broken and rubble zones up to 30.22m then becomes WACKE weak, highly fractured, slightly to moderately weathered, broken zone, iron oxide, clay, chlorite, and manganese oxide infill, biotite specks, and calcite micro veins.	0.83	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	FeO	cly	chl	34	
30.87	439.40	31.52	438.75	0.65	0.65	100	0.52	80	4	130	25	R3	Wacke	Light greenish grey	Fine grained	Massive	Medium strong, moderately fractured, slightly to moderately weathered.	0.55	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	cly	FeO	MnO	53	

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-009

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																	
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average		
m	m	m	m	m	m		m			mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)							
1.04	463.09	2.10	462.28	1.06	1.04	98	0.30	28	MAX	5	15	R2	Gabbro	Light greenish grey	Fine to medium grained	Massive	Washed out sample from 0 to 0.97m while casing with HWT. OVERBURDEN, cobbles and boulders and possibly sand, silt, and gravel that got washed out, GABBRO starts at 1.04m, weak, moderately to highly fractured, slightly to moderately weathered, iron oxide, clay, calcite, chlorite, and manganese oxide infill, chlorite matrix, biotite specks, calcite veins, rubble zone from 1.09m to 1.21m, broken zone from 1.42m to 2.10m.	0.44	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	VNL	cc	chl				38
2.10	462.28	3.60	461.13	1.50	1.50	100	0.52	35	MAX	5	20	R2	Gabbro	Light greenish grey up to 2.56m then becomes creamy grey	Fine to medium grained up to 2.56m then becomes fine grained	Massive	Medium strong, slightly weathered up to 2.56m then becomes weak, highly fractured, slightly to moderately weathered, iron oxide, manganese oxide, calcite, and chlorite infill, heavy calcite infill throughout, biotite specks, broken and rubble zone from 2.48m to 3.60m.	0.90	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	MnO	FeO	cc			39
3.60	461.13	3.90	460.90	0.30	0.30	100	0.00	0	MAX	5	5	R2	Gabbro	White and dark grey	Fine grained	Massive	Rubble zone.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub				27	
3.90	460.90	5.10	459.98	1.20	1.20	100	0.40	33	13	86	35	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, moderately fractured, fresh to slightly weathered, some quartz veinlets, 9cm-thick calcite vein at 4.18 m.	0.50	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				51		
5.10	459.98	6.60	458.83	1.50	1.50	100	0.29	19	MAX	5	35	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, heavily fractured, moderately weathered, 20cm-thick rubble zone at 5.34 m, iron oxide staining on joint surfaces.	0.73	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	MW	11	J		FeO		41		
6.60	458.83	8.10	457.69	1.50	1.50	100	1.22	81	3	375	45	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly fractured, slightly weathered, iron oxide staining on joint surfaces, trace calcite veinlets.	0.30	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				61		
8.10	457.69	9.60	456.54	1.50	1.50	100	0.35	23	24	60	45	R3	Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, highly fractured, moderately weathered, dark brown and black staining on joint surfaces, some chlorite infill.	0.41	> 20 m	1 - 5 mm	SL Rough	Hard > 5 mm	MW	9	J	Rub	gg		41		
9.60	456.54	11.10	455.39	1.50	1.50	100	1.06	71	8	167	50	R4	Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, slightly to moderately fractured, slightly weathered, heavy quartz-biotite veining.	0.35	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl		56		
11.10	455.39	12.60	454.24	1.50	1.50	100	0.82	55	20	71	60	R4	Dyke	Light to dark grey	Fine to coarse grained	Massive, porphyritic	Alternating sections of later stage gabbro and coarse grained gabbro; strong, highly fractured, moderately weathered, chlorite infill and iron oxide staining on joint surfaces, heavy calcite and quartz veining.	0.28	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl			47		
12.60	454.24	14.10	453.09	1.50	1.50	100	0.47	31	MAX	5	50	R4	Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, highly fractured, slightly weathered, broken top 0.40 m of run, 3.5cm-thick shear zone at 13.33 m.	1.03	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl			45		
14.10	453.09	14.95	452.44	0.85	0.85	100	0.29	34	10	77	50	R4	Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, highly fractured, slightly weathered, heavy quartz-chlorite veining, trace iron oxide staining.	0.53	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J		FeO		50		
14.95	452.44	15.60	451.94	0.65	0.65	100	0.00	0	15	41	35	R3	Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, highly fractured, moderately weathered.	0.22	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl			37		
15.60	451.94	16.00	451.63	0.40	0.40	100	0.00	0	9	40	35	R3	Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, highly fractured, moderately weathered, intensely veined.	0.20	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	FeO		37		
16.00	451.63	16.90	450.94	0.90	0.90	100	0.00	0	MAX	5	5	R2	Dyke	Medium grey	Fine to medium grained	Porphyritic	Broken Zone	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub			32		
16.90	450.94	17.10	450.79	0.20	0.20	100	0.00	0	4	40	25	R3	Dyke	Medium grey	Fine to medium grained	Porphyritic	Medium strong, moderately fractured, slightly weathered, iron oxide staining and clay infill.	0.18	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO		40		
17.10	450.79	18.60	449.64	1.50	1.50	100	0.35	23	35	42	40	R3	Dyke	Medium grey	Fine grained	Brecciated, massive	Medium strong, highly fractured, slightly weathered, iron oxide staining and infill on joint surfaces, broken zone from 18.20 to 18.60 m.	0.56	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	SW	11	J		FeO		42		
18.60	449.64	19.00	449.34	0.40	0.40	100	0.40	100	3	100	40	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly fractured, slightly weathered, trace quartz veinlets, weak iron oxide staining on joint surfaces, spun joint at 19.04 m.	0.15	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO		59		
19.00	449.34	20.10	448.49	1.10	1.10	100	0.99	90	3	275	40	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly fractured, slightly weathered, trace quartz veinlets, weak iron oxide staining on joint surfaces.	0.75	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				61		

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ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-009

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																	
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average			
m	m	m	m	m	m		m											ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)							
20.10	448.49	20.35	448.30	0.25	0.25	100	0.00	0	2	83	55	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly fractured, slightly weathered, trace quartz veinlets, weak iron oxide staining on joint surfaces, 2cm-thick clay zone at bottom of run.	0.13	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J					45	
20.35	448.30	20.85	447.92	0.50	0.41	82	0.00	0	MAX	5	10	R2	Feldspar-Hornblende Porphyry Dyke	Light greenish grey	Fine to medium grained	Massive	Weak, highly fractured, moderately to highly weathered, clay, iron oxide, manganese oxide, and chlorite infill, clay from 20.35m to 20.45m, rubble and broken zone from 20.45m to 20.85m.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Alt	clay	Rub	FeO		27	
20.85	447.92	21.05	447.76	0.20	0.20	100	0.00	0	MAX	5	15	R2	Feldspar-Hornblende Porphyry Dyke	Light greenish grey	Fine to medium grained	Massive	Weak, highly fractured, slightly weathered, no clay, presence of pyrite, rubble zone from 20.85m to 20.95m, broken zone from 20.95m to 21.05m.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	FeO	MnO		27	
21.05	447.76	22.15	446.92	1.10	1.10	100	1.10	100	22	48	25	R3	Feldspar-Hornblende Porphyry Dyke	Light greenish grey to dark grey	Fine to medium grained up to 21.60m then becomes fine grained up to 22.05m then back to fine to medium grained	Massive	Medium strong, slightly to highly fractured, slightly to moderately weathered, chlorite, calcite, iron oxide, and manganese oxide infill, calcite veins, biotite specks from 21.05m to 21.60m and 22.05m to 22.15m, heavy calcite veins at the bottom of the run, broken zone from 21.60m to 22.05m.	0.88	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	VNL	chl	FeO	cc		53	
22.15	446.92	23.28	446.06	1.13	1.09	96	0.77	68	8	121	25	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly to moderately weathered, clay, chlorite, calcite, manganese oxide, and iron oxide infill, calcite veins, biotite specks.	0.76	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	clay	FeO	MnO		47	
23.28	446.06	24.78	444.91	1.50	1.50	100	0.68	45	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, highly fractured, moderately weathered, broken and rubble zone from 23.81m to 24.38m, presence of graphite and pyrite infill.	0.15	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	graph	py		41	
24.78	444.91	26.28	443.76	1.50	1.50	100	1.18	79	16	88	25	R3	Gabbro	Greenish grey up to 25.71m then becomes light greenish grey	Fine to coarse grained	Massive, porphyritic	Medium strong, slightly to moderately fractured, slightly to moderately weathered, chlorite, calcite, iron oxide, and manganese oxide infill, 5mm clay infill at 25.91m, calcite veins, calcite and biotite specks.	0.15	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	MnO		49	
26.28	443.76	26.98	443.22	0.70	0.70	100	0.00	0	MAX	5	10	R2	Gabbro	Mottled greenish grey	Fine grained	Massive	Weak, highly fractured, slightly to moderately weathered, clay, chlorite, manganese oxide and iron oxide infill, trace pyrite veins, calcite veins, broken and rubble zone from 26.4m to 26.98m.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	clay	FeO		32	
26.98	443.22	27.68	442.69	0.70	0.44	63	0.00	0	MAX	5	5	R2	Gabbro	Mottled greenish grey	Fine grained	Massive	Weak, highly fractured, slightly to moderately weathered, clay, chlorite, manganese oxide and iron oxide infill, trace pyrite veins, calcite veins, broken and rubble zones.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	clay	FeO		32	
27.68	442.69	29.00	441.67	1.32	1.32	100	1.08	82	MAX	5	25	R3	Gabbro	Light greenish grey to dark grey	Fine grained up to 28.18m then becomes fine to coarse grained	Massive up to 28.18m then becomes schistose	Medium strong, highly fractured, slightly to moderately weathered, hematite, iron oxide, chlorite, and pyrite infill, pyrite and calcite veins, biotite specks, rubble zone from 27.68m to 27.78m.	0.20	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	hem	FeO	chl		52	
29.00	441.67	29.72	441.12	0.72	0.72	100	0.22	31	11	60	25	R3	Gabbro	Greenish grey to dark grey	Fine to coarse grained	Massive, schistose	Medium strong, moderately fractured, slightly to moderately weathered, hematite, iron oxide, chlorite, and pyrite infill, pyrite and calcite veins, biotite specks.	0.54	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	clay	FeO	MnO		43	
29.72	441.12	30.96	440.17	1.24	1.24	100	0.25	20	MAX	5	15	R2	Gabbro	Greenish grey to dark grey up to 30.15m then becomes greenish grey	Fine to coarse grained	Massive, schistose up to 30.15m then becomes porphyritic	Weak, highly fractured, slightly weathered, graphite, chlorite, calcite, clay, iron oxide, and manganese oxide infill, biotite specks, chlorite matrix, broken zone from 29.72m to 30.72m.	0.60	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	graph	chl	cc		35	
30.96	440.17	32.45	439.03	1.49	1.29	87	1.10	74	3	323	60	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, slightly weathered, some disseminate sulphides, light brown staining and chlorite infill on joint surfaces.	0.44	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl				56	
32.45	439.03	33.96	437.88	1.51	1.51	100	1.33	88	3	378	60	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, slightly weathered, some disseminate sulphides, light brown staining and chlorite infill on joint surfaces.	0.51	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J					64	
33.96	437.88	35.46	436.73	1.50	1.45	97	1.44	96	1	725	75	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, slightly weathered, some disseminate sulphides, light brown staining and chlorite infill on joint surfaces. "leopard spot" texture and black platy minerals at 35.03 m.	0.00	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	cc				66

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DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m		m			mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
35.46	436.73	36.96	435.58	1.50	1.50	100	1.41	94	4	300	100	R5	Felsic Dyke	White to medium grey	Fine to medium grained	Massive, porphyritic	Very strong, slightly fractured, slightly weathered, heavily quartz-veined and silicified, iron oxide staining on joint surfaces and veinlets with around 5mm of penetration.	0.48	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J				67
36.96	435.58	38.46	434.43	1.50	1.50	100	1.16	77	6	214	100	R5	Felsic Dyke	White to medium grey	Fine to medium grained	Massive, porphyritic	Very strong, slightly to moderately fractured, slightly weathered, heavy quartz veining, some iron oxide staining throughout and on joint surfaces with maximum 3mm penetration.	0.24	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO		60
38.46	434.43	39.96	433.28	1.50	1.50	100	0.86	57	15	94	50	R4	Felsic Dyke	White to medium grey	Fine to medium grained	Massive, porphyritic	Strong, moderately fractured, moderately weathered, iron oxide staining on joint surfaces with up to 1cm penetration.	0.45	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	MW	11	J		FeO		49
39.96	433.28	41.46	432.13	1.50	1.50	100	1.13	75	16	88	50	R4	Felsic Dyke	White to medium grey	Fine to medium grained	Massive, porphyritic	Strong, moderately to highly fractured, slightly weathered, 13cm-thick rubble zone at 40.47 m, strong iron oxide staining on joint with up to 2cm penetration.	0.45	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO		55
41.46	432.13	42.96	430.98	1.50	1.50	100	0.49	33	MAX	5	50	R4	Felsic Dyke	Light grey and orangey grey	Fine to coarse grained	Porphyritic	Strong, highly fractured towards bottom of run, slightly weathered, highly weathered broken zone from 42.40 m to end of run.	0.28	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok				40
42.96	430.98	44.46	429.83	1.50	1.50	100	0.64	43	37	39	45	R3	Gabbro	Light to medium grey and orange	Fine to coarse grained	Massive	Medium strong, highly fractured, fresh, some quartz veining, clay and chlorite infill, broken top 0.40m of run with strong iron oxide staining throughout.	0.84	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	FRESH	17	VNL	qtz		52	
44.46	429.83	45.96	428.68	1.50	1.50	100	1.26	84	6	214	45	R3	Feldspar-Hornblende Porphyry Dyke	Light to medium grey	Fine grained	Massive	Alternating gabbro and felsic dyke. Medium strong, slightly to moderately fractured, slightly weathered, some quartz veining in felsic dyke section.	0.49	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J	qtz		59	
45.96	428.68	47.11	427.80	1.15	1.15	100	0.16	14	13	82	15	R2	Gabbro	Dark greenish grey up to 45.56m then becomes light grey	Fine to medium grained up to 45.56m then becomes fine grained	Massive	Weak, highly fractured, slightly to moderately weathered, chlorite, calcite, and graphite infill up to 45.56m then becomes iron oxide, manganese oxide, chlorite, and serpentinite infill, calcite matrix.	0.84	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	FeO	MnO	chl	40
47.11	427.80	48.61	426.65	1.50	1.50	100	0.39	26	MAX	5	15	R2	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Weak, moderately to highly fractured, slightly to moderately weathered, calcite, clay, chlorite, and manganese oxide infill, biotite specks, calcite veins, rubble zone with clay infill from 47.21m to 47.31m, rubble zone with chlorite infill from 47.68m to 47.78m, broken zone from 48.51m to 48.61m.	0.50	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	chl	cc	graph	38
48.61	426.65	48.71	426.58	0.10	0.10	100	0.00	0	4	20	15	R2	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Weak, moderately fractured, slightly to moderately weathered.	0.00	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	cly	chl	graph	35
48.71	426.58	50.21	425.43	1.50	1.50	100	1.33	89	5	250	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly to moderately weathered, presence of graphite infill.	0.40	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	VNL	cc	chl	graph	57
50.21	425.43	50.61	425.12	0.40	0.40	100	0.40	100	2	133	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly to moderately weathered, presence of graphite infill.	0.12	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	chl	cc	graph	58
50.61	425.12	52.11	423.97	1.50	1.50	100	1.39	93	7	188	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, heavy calcite veining and infill at 51.81m.	1.23	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl		59
52.11	423.97	53.64	422.80	1.53	1.53	100	1.48	97	6	219	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, heavy calcite infill at 52.56m.	1.17	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	graph		61
53.64	422.80	55.14	421.65	1.50	1.50	100	1.50	100	8	167	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, no heavy calcite infill.	0.54	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc	61
55.14	421.65	56.64	420.50	1.50	1.45	97	1.36	91	5	242	35	R3	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, calcite veins up to 1.5 cm thick.	0.85	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc	59
56.64	420.50	58.14	419.35	1.50	1.48	99	0.12	8	22	64	45	R3	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Medium strong, moderately fractured, slightly to moderately weathered, chlorite and gouge/clay infill, trace calcite veinlets.	0.58	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	gg	chl		39
58.14	419.35	59.64	418.20	1.50	1.47	98	0.28	19	MAX	5	45	R3	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, slightly weathered.	1.14	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl		44
59.64	418.20	61.14	417.05	1.50	1.46	97	0.79	53	MAX	5	45	R3	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, slightly weathered, chlorite, gouge and calcite infills, broken top 0.4m of run, some calcite veinlets.	1.23	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl		50

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DRILL RUN DATA									GEOLOGY - COMMENTS						DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m		m			mm								ft	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
61.14	417.05	62.64	415.90	1.50	1.50	100	1.50	100	4	300	55	R4	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Strong, slightly fractured, slightly weathered.	0.43	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl	cc			62
62.64	415.90	64.14	414.76	1.50	1.50	100	1.44	96	13	107	55	R4	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Strong, moderately fractured, slightly weathered.	0.69	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc			61
64.14	414.76	65.64	413.61	1.50	1.48	99	1.29	86	6	211	60	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, slightly to moderately fractured, fresh, chlorite altered throughout, intermittent calcite and quartz veinlets.	1.21	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	cc	chl			58
65.64	413.61	67.14	412.46	1.50	1.50	100	1.50	100	9	150	60	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, slightly to moderately fractured, slightly weathered, light grey and clay-altered for top 0.25m of run.	0.46	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl				60
67.14	412.46	67.64	412.07	0.50	0.47	94	0.21	42	5	78	60	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, moderately fractured, slightly weathered, 5cm-thick quartz vein at 67.45 m.	0.21	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl				48
67.64	412.07	68.94	411.08	1.30	1.32	102	0.52	40	11	110	60	R4	Gabbro	Greenish grey	Fine to coarse grained	Massive	Strong, moderately fractured, slightly weathered, intermittent disseminated sulphides.	0.01	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	VNL	qtz				50
68.94	411.08	70.14	410.16	1.20	1.10	92	0.91	76	7	138	35	R3	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Medium strong, slightly to moderately fractured, slightly fractured, trace calcite veinlets.	0.42	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl	cc			53
70.14	410.16	71.64	409.01	1.50	1.52	101	1.48	99	7	190	35	R3	Gabbro	Medium to dark greenish grey	Fine to coarse grained	Massive	Medium strong, slightly to moderately fractured, slightly fractured, trace calcite veinlets.	0.68	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl				59
71.64	409.01	73.14	407.86	1.50	1.48	99	0.64	43	25	57	50	R4	Fault Zone	Medium to dark greenish grey	Fine to coarse grained	Massive	Strong, highly fractured, slightly weathered, 17cm-thick broken zone at 71.85 m, rubby joint infill.	0.25	> 20 m	1 - 5 mm	SL Rough	Hard > 5 mm	SW	11	J	Rub	chl			46
73.14	407.86	74.64	406.71	1.50	1.44	96	0.85	57	11	120	40	R3	Fault Zone	Medium to dark grey	Fine to coarse grained	Massive, flow banded	Medium strong, moderately fractured, slightly weathered, heavy quartz and calcite veining, joints with quartz calcite, and chlorite infill.	0.31	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl				50
74.64	406.71	74.82	406.57	0.18	0.16	89	0.00	0	MAX	5	5	R2	Fault Zone	Grey to dark grey	Fine grained	Massive	Weak, highly fractured, moderately weathered, graphite infill, heavy clay infill throughout, rubble and broken zone for the whole run.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	cly	graph		32
74.82	406.57	75.00	406.44	0.18	0.18	100	0.18	100	0	180	35	R3	Fault Zone	Creamy dark grey to black	Fine grained	Massive	Medium strong, no fractures, slightly weathered, clay and graphite infill, heavy calcite veins.	0.00	< 1 m	None	V Rough	None	FRESH	30	NJ					77
75.00	406.44	76.50	405.29	1.50	1.50	100	0.70	47	21	68	30	R3	Fault Zone	Light greenish grey up to 75.38m then becomes dark greenish grey up to 76.4m then becomes grey	Fine grained up to 75.38m then fine to medium grained up to 76.4m then becomes fine to coarse grained	Massive up to 76.4m then becomes porphyritic	Weak, highly fractured, slightly to moderately weathered, chlorite, graphite and calcite infill up to 76.4m then becomes DIORITE, medium strong, slightly fractured, fresh, quartz phenocrysts, chlorite matrix.	0.83	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	MW	10	J	chl	graph	cc		44
76.50	405.29	77.90	404.22	1.40	1.40	100	0.92	66	7	175	50	R4	Diorite	Light greenish grey	Fine to coarse grained	Massive, Porphyritic	Strong, slightly to moderately fractured, fresh, quartz phenocrysts, chlorite matrix	0.73	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					60
77.90	404.22	79.40	403.07	1.50	1.50	100	0.42	28	MAX	5	25	R3	Diorite	Light greenish grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, moderately to highly fractured, fresh to slightly weathered, chlorite infill, core split in half from 78.18m to 79.4m, broken zone from 78.18m to 79.4m.	0.84	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl				41
79.40	403.07	80.10	402.53	0.70	0.45	64	0.00	0	MAX	5	45	R3	Diorite	Light grey	Fine to coarse grained	Porphyritic	Medium strong, intensely fractured and shattered likely due to reaming, fresh.	0.00	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J					44
80.10	402.53	81.60	401.38	1.50	1.22	81	0.81	54	14	81	75	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, moderately fractured, fresh to slightly weathered, rubble at top 0.17m - likely slough - fresh joint surfaces.	0.86	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					58
81.60	401.38	83.10	400.23	1.50	1.50	100	1.23	82	8	167	75	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, slightly to moderately fractured, fresh to slightly weathered, some rubble and gouge joint infill.	0.75	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					65
83.10	400.23	84.30	399.31	1.20	1.20	100	0.57	47	8	133	75	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, moderately fractured, fresh to slightly weathered.	0.42	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					58
84.30	399.31	85.80	398.16	1.50	1.50	100	0.56	37	13	107	75	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, moderately fractured, fresh slightly weathered, trace weak beige staining on joint surfaces.	0.56	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J					53
85.80	398.16	86.10	397.93	0.30	0.27	90	0.00	0	0	270	75	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, no joints, fresh to slightly weathered.	0.00	< 1 m	None	V Rough	None	FRESH	30	NJ					64
86.10	397.93	87.20	397.09	1.10	1.07	97	0.60	55	15	67	80	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, moderately fractured, fresh, generally fresh joint surfaces with trace beige staining.	0.03	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					59
87.20	397.09	87.60	396.78	0.40	0.40	100	0.00	0	12	31	80	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, moderately to highly fractured, fresh.	0.33	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					50
87.60	396.78	89.10	395.64	1.50	1.48	99	0.42	28	20	70	80	R4	Diorite	Medium grey	Fine to medium grained	Massive, Porphyritic	Strong, highly fractured, fresh, some rubby joint surfaces.	0.65	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J					55
89.10	395.64	90.10	394.87	1.00	0.90	90	0.26	26	17	50	65	R4	Feldspar-Hornblende Porphyry Dyke	Medium to dark grey	Fine grained	Massive, Schistose	Strong, moderately to highly fractured, fresh to slightly weathered, rubble and gouge joint infill, trace calcite veinlets, low schistosity, spun joint at 89.25 m.	0.21	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	gg				45

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DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m		m											ft	Persis-P	Apert-A	Rough-R	Infill-I	Weath-W	TOTAL (RMR)						
90.10	394.87	90.60	394.49	0.50	0.50	100	0.26	52	5	83	45	R3	Feldspar-Hornblende Porphyry Dyke	Medium grey	Fine grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, moderately silicified, quartz veining at 90.10 m, iron oxide staining on fracture surfaces and along veinlets with inconsistent <5mm penetration.	0.41	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J					52
90.60	394.49	92.10	393.34	1.50	1.50	100	1.19	79	15	94	25	R3	Feldspar-Hornblende Porphyry Dyke	Light greenish grey	Fine to medium grained	Massive	Medium strong, moderately fractured, slightly weathered, iron oxide, manganese oxide, chlorite, and calcite infill, quartz specks, calcite veins, rubble zone from 90.6m to 90.66m, broken zone from 91.53m to 91.72m	0.92	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	FeO	MnO	chl		52
92.10	393.34	93.60	392.19	1.50	1.50	100	1.44	96	9	150	50	R4	Feldspar-Hornblende Porphyry Dyke	Light greenish grey	Fine to medium grained	Massive	Strong, slightly to moderately fractured, fresh to slightly weathered.	0.14	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl		61	
93.60	392.19	93.78	392.05	0.18	0.18	100	0.00	0	1	90	50	R4	Feldspar-Hornblende Porphyry Dyke	Light greenish grey	Fine to medium grained	Massive	Strong, 1 fracture, fresh, no infill	0.08	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J					47
93.78	392.05	95.28	390.90	1.50	1.40	93	0.33	22	MAX	5	20	R2	Feldspar-Hornblende Porphyry Dyke	Light greenish grey up to 94.7m then becomes creamy dark greenish grey	Fine to medium grained up to 94.7m then becomes fine grained	Massive	Weak, moderately to highly fractured, slightly weathered, iron oxide, manganese oxide, chlorite and calcite infill, broken zone from 94.28m to 94.56m, rubble zone from 94.78m to 94.98m.	0.37	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO			40
95.28	390.90	96.68	389.83	1.40	1.40	100	0.57	41	27	50	15	R2	Feldspar-Hornblende Porphyry Dyke	Creamy dark greenish grey up to 95.46m then becomes greenish grey	Fine grained up to 95.46m then becomes fine to medium grained	Massive	Weak, slightly to moderately fractured, slightly weathered, manganese oxide, iron oxide, chlorite, and calcite infill, similar joint angles, rubble and broken zone from 95.28m to 95.46m.	0.66	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	MnO	FeO	chl		46
96.68	389.83	98.18	388.68	1.50	1.50	100	1.07	71	MAX	5	20	R2	Feldspar-Hornblende Porphyry Dyke	Greenish grey	Fine to medium grained	Massive	Weak, highly fractured, slightly weathered, broken zone from 96.92m to 97.32m, trace calcite veins, not similar joint angles	1.16	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO	MnO		48
98.18	388.68	99.68	387.53	1.50	1.50	100	1.39	93	5	250	50	R4	Feldspar-Hornblende Porphyry Dyke	Greenish grey	Fine to medium grained	Massive	Strong, slightly fractured, fresh to slightly weathered, no iron oxide infill, no rubble zones.	0.95	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	MnO	chl			63
99.68	387.53	101.18	386.38	1.50	1.50	100	1.15	77	MAX	5	25	R3	Feldspar-Hornblende Porphyry Dyke	Greenish grey up to 100.68m then becomes dark greenish grey	Fine to medium grained up to 100.68m then becomes fine grained	Massive	Weak, slightly to highly fractured, slightly weathered, up to 100.68m then becomes GABBRO, medium strong, slightly to moderately fractured, slightly weathered, chlorite, calcite, iron oxide, and manganese oxide infill, heavy calcite veining and infill, biotite specks, broken zone from 100.38m to 100.68m.	1.27	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	cc			49
101.18	386.38	101.46	386.17	0.28	0.28	100	0.25	89	1	140	35	R3	Gabbro	Dark greenish grey	Fine grained	Massive	Medium strong, one joint, fresh to slightly weathered, trace iron oxide infill, less heavy calcite infill and veining	0.24	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J	MnO				60
101.46	386.17	102.56	385.32	1.10	1.10	100	1.04	95	2	367	45	R3	Gabbro	Medium to dark grey	Fine to coarse grained	Massive	Medium strong, only two joints, fresh, some calcite veinlets, chlorite infill, trace disseminated sulphides.	1.04	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl			61
102.56	385.32	104.06	384.18	1.50	1.50	100	1.05	70	9	150	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive, flow banded	Strong, moderately fractured, fresh to slightly weathered, some calcite and quartz veinlets, moderate disseminated sulphides, 3cm-thick shear zone at 103.76 m.	0.48	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl			53
104.06	384.18	105.56	383.03	1.50	1.45	97	0.68	45	12	112	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive, flow banded	Strong, moderately fractured, fresh to slightly weathered, some calcite and quartz veinlets, moderate disseminated sulphides.	0.52	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl			48
105.56	383.03	107.06	381.88	1.50	1.50	100	0.58	39	17	83	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Flow banded	Strong, moderately to highly fractured, fresh to slightly weathered, heavy quartz and calcite veining, disseminated sulphides, chlorite and calcite infill, multiple partially-spun joints.	0.19	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl			46
107.06	381.88	108.56	380.73	1.50	1.50	100	1.19	79	10	136	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive	Medium strong, moderately fractured, fresh to slightly weathered, some quartz and calcite veining, chlorite and calcite infill.	0.81	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl			57
108.56	380.73	110.06	379.58	1.50	1.45	97	0.71	47	17	81	50	R4	Gabbro	Medium to dark grey	Fine to coarse grained	Massive	Strong, moderately to highly fractured, slightly weathered.	0.41	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl			50
110.06	379.58	111.50	378.48	1.44	1.44	100	0.73	51	11	120	50	R4	Gabbro	Light to medium grey	Fine to medium grained	Massive	Strong, moderately fractured, slightly weathered, heavy quartz and calcite veining, contact with Feldspar-Hornblende Porphyry Dyke at 111.20 m, trace disseminated sulphides.	0.55	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl			48

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DRILLHOLE I.D. BH16-010

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																	
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average		
m	m	m	m	m	m		m			mm								m	P	A	R	I	W	TOTAL (RMR)							
0.60	462.62	2.10	461.47	1.50	1.50	100	0.90	60	11	125	60	R4	Gabbro	Light to medium grey	Fine to coarse grained	Massive	Strong, moderately to highly fractured, fresh to slightly weathered, slightly weathered joint surfaces with brown staining and chlorite infill, spun joint at 0.88 m.	0.73	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J					55	
2.10	461.47	3.60	460.32	1.50	1.50	100	1.50	100	6	214	60	R4	Gabbro	Light to medium grey	Fine to coarse grained	Massive	Strong, slightly to moderately fractured, fresh, trace calcite veinlets, 5cm-thick quartz vein at 3.35 m.	0.37	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	VNL	cc	chl			61	
3.60	460.32	5.10	459.17	1.50	1.49	99	0.13	9	35	41	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, fresh to slightly weathered, rugged and gouge infill with dark brownish orange staining, 4cm-thick calcite vein at 4.84 m.	0.00	> 20 m	1 - 5 mm	SL Rough	Hard > 5 mm	MW	9	J	Rub	chl			38	
5.10	459.17	6.40	458.18	1.30	1.30	100	0.71	55	18	68	45	R3	Gabbro	Light to medium greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, fresh to slightly weathered, joints with beige and dark green staining and chlorite infill, trace disseminated sulphides.	0.58	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J		chl			46	
6.40	458.18	6.60	458.02	0.20	0.20	100	0.00	0	12	15	45	R3	Gabbro	Light to medium greenish grey	Fine to coarse grained	Massive	Medium strong, intensely fractured, moderately weathered in sections.	0.09	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	MW	7	J		chl			35	
6.60	458.02	7.75	457.14	1.15	1.15	100	0.36	31	20	55	45	R3	Gabbro	Light to medium greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, moderately weathered, trace calcite veinlets.	0.63	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J		chl			42	
7.75	457.14	8.10	456.88	0.35	0.30	86	0.15	43	1	150	45	R3	Gabbro	Light to medium greenish grey	Fine to coarse grained	Massive	Medium strong, moderately fractured, fresh to slightly weathered.	0.16	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl			47	
8.10	456.88	8.60	456.49	0.50	0.50	100	0.00	0	MAX	5	5	R2	Gabbro	Light to medium grey	Fine to coarse grained	Massive	Broken zone, iron oxide staining on fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	FeO			32	
8.60	456.49	9.60	455.73	1.00	1.00	100	0.11	11	MAX	5	45	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, intensely fractured, fresh to slightly weathered, broken zone for top 0.29m of run, 10cm-thick quartz vein at 8.64 m.	0.36	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	FeO			41	
9.60	455.73	11.10	454.58	1.50	1.45	97	1.05	70	9	145	45	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, moderately fractured, fresh to slightly weathered, some calcite and chlorite veinlets, chlorite infilling.	1.13	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl			53	
11.10	454.58	12.60	453.43	1.50	1.50	100	1.34	89	7	188	45	R3	Gabbro	Light to medium grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, moderate quartz, calcite, and chlorite veinlets, chlorite infill on joint surfaces, trace moderate iron oxide staining on joint surfaces.	0.39	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	SW	11	J		FeO			56	
12.60	453.43	14.10	452.28	1.50	1.38	92	0.43	29	MAX	5	45	R3	Gabbro / Fault Zone	Light to dark grey	Fine to medium grained	Massive, flow banded	Medium strong, intensely fractured, fresh to slightly weathered, heavy quartz and calcite veining at top and bottom of run. To 13.10 m, then becomes structural fault zone, weak, highly broken.	0.54	> 20 m	1 - 5 mm	Smooth	Hard > 5 mm	SW	9	J	Rub	FeO			41	
14.10	452.28	15.10	451.51	1.00	0.90	90	0.26	26	MAX	5	45	R3	Fault Zone	Grey and pinkish orange	Fine to coarse grained	Massive	Medium strong, highly broken, moderately weathered, broken bottom 0.40m of run, fractures with iron oxide, rubble, quartz, or gouge infill, trace quartz and calcite veinlets.	0.40	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	gg	FeO			38
15.10	451.51	15.60	451.13	0.50	0.45	90	0.00	0	MAX	5	5	R2	Fault Zone	Grey and pinkish orange	Fine to coarse grained	Massive	Broken Zone	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	cly	FeO			32
15.60	451.13	17.10	449.98	1.50	1.13	75	0.00	0	MAX	5	5	R2	Fault Zone	Mottled light brown to dark grey	Fine to medium grained	Massive	Weak, highly broken and rubbleized, moderately weathered, chlorite, calcite, clay, manganese oxide, and iron oxide infill, calcite veins. Broken zone from 15.74 m to 16.05 m, rubble zone from 16.05 m to 16.34 m.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Rub	Rub	FeO	cly			32
17.10	449.98	18.15	449.18	1.05	1.05	100	0.00	0	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, intensely fractured, slightly to moderately weathered. Broken zone from 18.00 m to 18.15 m.	0.80	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	cly	chl	MnO			34
18.15	449.18	18.60	448.83	0.45	0.45	100	0.45	100	1	225	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly fractured, moderately weathered, no broken zones.	0.27	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	cly	FeO	MnO			59
18.60	448.83	19.55	448.10	0.95	0.95	100	0.00	0	MAX	5	5	R2	Gabbro	Dark grey to greenish grey	Fine to medium grained	Massive	Weak, highly fractured and broken, moderately weathered, weathering increases with depth, broken zones from 18.60m to 18.70m & 18.90m to 19.05m, rubble zone from 19.20m to 19.25m, clay alteration from 19.25m to 19.35m, broken zone from 19.40m to 19.55m.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Alt	cly	Rub	chl			32
19.55	448.10	20.33	447.51	0.78	0.78	100	0.27	35	9	78	35	R3	Gabbro	Dark grey to greenish grey	Fine to medium grained	Massive	Medium strong, highly fractured, slightly to moderately weathered, graphite veins.	0.36	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	graph	chl	cc			45
20.33	447.51	21.60	446.53	1.27	1.27	100	1.02	80	7	159	35	R3	Gabbro	Dark grey to greenish grey	Fine to medium grained	Massive	Medium strong, moderately fractured, moderately weathered, 1 spun joint.	0.10	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	graph	chl	cc			54

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-010

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
21.60	446.53	23.10	445.38	1.50	1.50	100	1.20	80	10	136	35	R3	Gabbro	Dark grey to greenish grey	Fine to medium grained	Massive	Medium strong, moderately fractured, moderately weathered.	0.64	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	cly	FeO	MnO	54
23.10	445.38	24.60	444.24	1.50	1.48	99	1.14	76	6	211	35	R3	Gabbro	Dark grey to greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, 1 spun joint at 24.00 m, dark grey from 24.24 m to 24.6 m (graphite matrix).	0.19	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl	graph	56
24.60	444.24	26.10	443.09	1.50	1.50	100	1.22	81	7	188	35	R3	Gabbro	Light greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, no graphite matrix, graphite veins.	1.35	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl	cc	graph	55
26.10	443.09	27.60	441.94	1.50	1.50	100	1.26	84	7	188	35	R3	Gabbro	Light greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, biotite specks.	1.19	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl		57
27.60	441.94	28.13	441.53	0.53	0.53	100	0.38	72	4	106	35	R3	Gabbro	Light greenish grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly weathered.	0.33	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc	54
28.13	441.53	29.10	440.79	0.97	0.97	100	0.89	92	4	194	35	R3	Gabbro	Light greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, presence of pyrite at 28.58 m, no clay, manganese oxide, and iron oxide infill, heavy calcite infill at top of the run.	0.45	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	py	chl	59
29.10	440.79	30.60	439.64	1.50	1.50	100	1.30	87	12	115	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly weathered, heavy calcite infill at top of the run, heavy calcite veins at middle of the run.	1.24	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl		57
30.60	439.64	32.10	438.49	1.50	1.50	100	1.49	99	8	167	55	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, moderately fractured, moderately weathered, heavy quartz and calcite veining, calcite and chlorite infill on joint surfaces.	0.45	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	MW	10	J	cc	chl		58
32.10	438.49	32.50	438.18	0.40	0.37	93	0.00	0	MAX	5	5	R2	Gabbro	White and medium grey	Fine grained	Massive	Broken zone, heavily veined and clay-altered.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	qtz	cc	32
32.50	438.18	33.60	437.34	1.10	1.08	98	1.06	96	2	360	55	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, intermittent quartz and calcite veining.	0.66	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl			62
33.60	437.34	35.10	436.19	1.50	1.50	100	1.50	100	3	375	55	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, heavily veined.	1.07	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	cc			63
35.10	436.19	36.60	435.04	1.50	1.50	100	1.50	100	4	300	55	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, intermittent veining.	0.57	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				68
36.60	435.04	38.10	433.89	1.50	1.50	100	1.50	100	3	375	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, fresh to slightly weathered, intermittent quartz veining.	0.82	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	ser			64
38.10	433.89	39.60	432.74	1.50	1.47	98	1.47	98	3	368	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, fresh, some disseminated sulphides.	0.88	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				69
39.60	432.74	41.10	431.60	1.50	1.50	100	1.50	100	5	250	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, moderately weathered, some disseminated sulphides.	0.28	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	MW	10	J	chl			59
41.10	431.60	42.60	430.45	1.50	1.48	99	1.48	99	2	493	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, moderately weathered, 2cm-thick quartz vein at 47.54 m.	0.33	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	MW	10	J	chl			61
42.60	430.45	44.10	429.30	1.50	1.50	100	1.50	100	5	250	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, slightly fractured, moderately weathered.	0.50	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	MW	10	J	ser	chl		59
44.10	429.30	45.60	428.15	1.50	1.48	99	1.46	97	5	247	40	R3	Mafic Dyke / Gabbro	Medium to dark grey	Fine to coarse grained	Massive, porphyritic	Dark grey porphyritic Mafic Dyke to 44.68 m. Medium strong GABBRO, slightly fractured from 44.68 m onwards, slightly weathered.	0.59	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc			61
45.60	428.15	47.10	427.00	1.50	1.45	97	1.38	92	7	181	40	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, trace quartz veinlets.	0.60	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl			56
47.10	427.00	48.60	425.85	1.50	1.50	100	1.47	98	6	214	40	R3	Gabbro	Medium grey	Fine to coarse grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, trace quartz veinlets.	0.91	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl	ser		59
48.60	425.85	50.10	424.70	1.50	1.50	100	1.38	92	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, graphite, chlorite, and calcite infill, calcite and graphite veins, biotite specks, chlorite matrix.	0.19	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	cc	59
50.10	424.70	51.60	423.55	1.50	1.50	100	1.35	90	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, graphite, chlorite, and calcite infill, calcite and graphite veins, biotite specks, chlorite matrix.	0.55	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl		59
51.60	423.55	53.10	422.40	1.50	1.50	100	1.40	93	6	214	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, graphite, chlorite, and calcite infill, calcite and graphite veins, biotite specks, chlorite matrix.	0.83	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl		60
53.10	422.40	54.60	421.25	1.50	1.50	100	1.29	86	8	167	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, moderately fractured, slightly weathered, graphite, chlorite, and calcite infill, calcite and graphite veins, biotite specks, chlorite matrix.	0.91	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl		58

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Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m		m			mm								m	Persis-P	Apert-A	Rough-R	Infill-I	Weath-W	TOTAL (RMR)						
54.60	421.25	56.10	420.10	1.50	1.50	100	1.43	95	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, heavy calcite infill from 55.40 m to 55.70 m.	0.67	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			60
56.10	420.10	57.60	418.96	1.50	1.50	100	1.44	96	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, calcite veins up to 8mm thick.	0.79	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			60
57.60	418.96	59.10	417.81	1.50	1.50	100	1.40	93	6	214	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, fresh to slightly weathered, graphite veins up to 10mm thick and calcite veins up to 3mm thick.	1.17	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			60
59.10	417.81	60.60	416.66	1.50	1.47	98	1.47	98	4	294	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly fractured, fresh to slightly weathered, graphite infill from 59.10 m to 59.27 m and from 60.12 m to 60.21 m.	0.33	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl			62
60.60	416.66	62.10	415.51	1.50	1.50	100	1.45	97	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, calcite veins up to 5mm thick, graphite infill from 61.62 m to 61.80 m.	0.79	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			60
62.10	415.51	63.60	414.36	1.50	1.50	100	1.43	95	7	188	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, calcite and graphite veins up to 4mm thick.	0.22	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			60
63.60	414.36	65.10	413.21	1.50	1.50	100	1.50	100	4	300	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly fractured, slightly weathered, calcite veins up to 5mm and graphite veins up to 10mm thick.	0.33	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			62
65.10	413.21	66.60	412.06	1.50	1.47	98	1.47	98	6	210	35	R3	Gabbro	Greenish grey throughout except from 65.7m to 65.98m becomes creamy grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, pure quartz core from 66.00 m to 66.04 m, span joint at 66.04 m, calcite veins up to 3mm and graphite veins up to 8mm thick, trace pyrite at 65.27 m.	0.17	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	py		61
66.60	412.06	68.10	410.91	1.50	1.50	100	1.44	96	5	250	35	R3	Gabbro	Greenish grey to dark grey	Fine to medium grained	Massive	Medium strong, slightly fractured, slightly weathered, graphite, chlorite, and calcite infill, graphite and calcite veins, heavy graphite infill from 67.25m to 67.37m.	0.79	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl			61
68.10	410.91	69.60	409.76	1.50	1.47	98	1.44	96	3	368	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly fractured, slightly weathered, manganese oxide dendrites from 68.10 m to 68.36 m, trace pyrite at 68.71 m.	0.61	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	graph	chl	py		62
69.60	409.76	71.10	408.61	1.50	1.50	100	1.09	73	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, intensely fractured, slightly to moderately weathered, broken and rubble zone from 70.58 m to 70.97 m with quartz, manganese oxide, iron oxide, and clay infill.	1.37	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	cly	FeO	MnO	46	
71.10	408.61	72.60	407.47	1.50	1.48	99	1.47	98	6	211	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, chlorite and calcite infill, chlorite matrix, biotite specks.	1.03	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc			61
72.60	407.47	74.10	406.32	1.50	1.50	100	1.50	100	3	375	40	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, slightly fractured, fresh to slightly weathered, <2mm quartz veinlets spaced approximately 1cm across entire length of run, chlorite and sericite infill on joint surfaces, some disseminated sulphides.	1.05	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	ser	chl			61
74.10	406.32	75.60	405.17	1.50	1.47	98	1.43	95	4	294	40	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, slightly fractured, fresh to slightly weathered, trace quartz veinlets, some disseminated sulphides.	0.97	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl			59
75.60	405.17	77.10	404.02	1.50	1.50	100	1.17	78	8	167	30	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, moderately weathered, trace quartz veinlets, disseminated sulphides.	0.72	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	J	Rub	chl			50
77.10	404.02	78.60	402.87	1.50	1.50	100	1.50	100	3	375	60	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, disseminated sulphides.	0.32	> 20 m	< 0.1 mm	Smooth	Soft < 5 mm	SW	13	J	ser	chl			64
78.60	402.87	80.10	401.72	1.50	1.50	100	1.50	100	4	300	60	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, heavy quartz veining between 79.17 m and 79.41 m.	0.56	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	SW	11	VNL	qtz			61	
80.10	401.72	81.60	400.57	1.50	1.50	100	1.40	93	5	250	30	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, slightly fractured, fresh to slightly weathered, some quartz veinlets, chlorite infill on joint surfaces, some disseminated sulphides.	0.39	> 20 m	< 0.1 mm	Smooth	Soft < 5 mm	SW	13	J	qtz	chl			59

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. BH16-010

DRILL RUN DATA									GEOLOGY - COMMENTS						DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average		
m	m	m	m	m	m		m			mm								m	P	A	R	I	W	TOTAL (RMR)						
81.60	400.57	83.10	399.42	1.50	1.50	100	1.32	88	9	150	35	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, moderately fractured, slightly weathered, trace quartz veinlets concentrated between 82.30 m and 82.50 m, weak iron oxide staining on some joint surfaces, chlorite infill, disseminated sulphides.	0.11	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	ser				58
83.10	399.42	84.60	398.27	1.50	1.50	100	1.10	73	10	136	25	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, moderately fractured, slightly weathered, moderate quartz and calcite veining, heavy veining around 84.20 m, sericite infill, some disseminated sulphides.	1.05	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	ser				51
84.60	398.27	86.10	397.12	1.50	1.50	100	1.36	91	6	214	40	R3	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, trace quartz veining, 0.05m-thick clay zone at top of run, may be cuttings.	0.60	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		57	
86.10	397.12	87.60	395.97	1.50	1.46	97	1.36	91	4	292	50	R4	Gabbro	Greenish grey	Fine to medium grained	Massive	Strong, slightly fractured, slightly weathered, trace quartz veinlets, chlorite and sericite infill on joint surfaces.	0.29	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl	FeO	58	
87.60	395.97	89.10	394.83	1.50	1.50	100	1.48	99	2	500	40	R3	Mafic Dyke	Greenish grey	Fine to coarse grained	Massive, brecciated	Medium strong, slightly fractured, slightly weathered, rounded grey clasts in dark grey to black porphyritic matrix.	1.16	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		61	
89.10	394.83	90.60	393.68	1.50	1.50	100	1.50	100	4	300	40	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive, brecciated	Mafic Dyke to 89.72 m, then GABBRO, medium strong, slightly fractured, slightly weathered.	0.76	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		60	
90.60	393.68	92.10	392.53	1.50	1.50	100	1.50	100	9	150	40	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, moderately fractured, fresh, chlorite and sericite infill on joint surfaces.	0.53	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl		59	
92.10	392.53	93.60	391.38	1.50	1.48	99	1.40	93	3	370	40	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive, brecciated	Medium strong, slightly fractured, slightly weathered, heavy quartz and chlorite veining causing brecciation in sections; chlorite, sericite, and quartz infill.	0.27	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	ser	chl		59	
93.60	391.38	95.10	390.23	1.50	1.50	100	1.44	96	7	188	45	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, slightly to moderately fractured, slightly weathered, some veining.	1.15	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	ser			59	
95.10	390.23	95.60	389.85	0.50	0.50	100	0.36	72	11	42	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Massive	Medium strong, highly fractured, slightly weathered, heavy quartz veining, broken top 0.14m of run.	0.30	> 20 m	< 0.1 mm	Smooth	None	SW	17	J				56	

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APPENDIX D2
GROUNDWATER MONITORING WELL LOGS
(Pages D2-1 to D2-7)

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-001

DRILL RUN DATA										GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From m	Elev. From m	Depth To m	Elev. to m	Run Length m	Recov. Length m	Recov. (%)	RQD Length m	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run m	Joint Condition						Disc. Type	Fill Type 1 (see Leg)	Fill Type 2 (see Leg)	Fill Type 3 (see Leg)	RMR-89 Total Run Average	
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
0.36	409.76	0.80	409.32	0.44	0.44	100	0.21	48	4	88	50	R4	Gabbro	Medium grey	Fine grained	Porphyritic	Strong, highly fractured, moderately weathered, multiple spun joints due to casing.	0.21	> 20 m	1 - 5 mm	Smooth	Soft > 5 mm	MW	5	Rub	Rub				41
0.80	409.32	2.30	407.82	1.50	1.36	91	1.02	68	6	194	45	R3	Gabbro / Goldside Porphyry Suite	Medium grey	Fine grained	Porphyritic	Medium strong, slightly to moderately fractured, fresh, fresh joint surfaces. GABBRO to 1.06 m then becomes Goldside Porphyry Suite (GOP).	0.13	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				60	
2.30	407.82	3.80	406.32	1.50	1.50	100	1.07	71	11	125	35	R3	Goldside Porphyry Suite / Gabbro	Medium grey	Fine grained	Porphyritic	Medium strong, moderately fractured, fresh. GOP to 2.78 m then becomes GAB.	0.20	> 20 m	< 0.1 mm	Smooth	None	FRESH	18	J				58	
3.80	406.32	5.30	404.82	1.50	1.44	96	0.45	30	23	60	75	R4	Gabbro / Goldside Porphyry Suite	Medium grey	Fine grained	Porphyritic	Strong, highly broken, moderately weathered, fractured sections, FeO staining on some joint surfaces, some quartz veinlets. GAB to 4.34 m then becomes GOP.	0.08	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub			42	
5.30	404.82	6.80	403.32	1.50	1.50	100	1.08	72	13	107	100	R5	Goldside Porphyry Suite / Gabbro	Medium grey	Fine grained	Porphyritic	Very strong, moderately fractured, slightly weathered, trace quartz veinlets, clay and chlorite infill on few joint surfaces, generally fresh joints. GOP to 6.02 m then becomes GAB.	0.16	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				63	
6.80	403.32	7.70	402.42	0.90	0.86	96	0.49	54	9	86	35	R3	Gabbro	Medium greenish-grey	Fine grained	Porphyritic	Medium strong, moderately to highly fractured, moderately weathered, clay and chlorite infill on most joint surfaces, trace quartz veinlets.	0.34	> 20 m	1 - 5 mm	Smooth	Hard > 5 mm	MW	7	J	Rub	chl		43	
7.70	402.42	8.30	401.82	0.60	0.58	97	0.00	0	12	45	45	R3	Gabbro	Medium grey	Fine grained	Porphyritic	Medium strong, highly fractured, slightly weathered, gouge and clay/chlorite infill on most joint surfaces.	0.06	> 20 m	1 - 5 mm	Smooth	Hard > 5 mm	SW	9	J	Rub	gg		38	
8.30	401.82	9.80	400.32	1.50	1.41	94	0.89	59	11	118	70	R4	Gabbro	Medium grey	Fine grained	Porphyritic	Strong, moderately fractured, moderately weathered.	0.21	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	MW	7	J		chl		47	
9.80	400.32	10.70	399.42	0.90	0.90	100	0.61	68	13	64	75	R4	Gabbro	Medium grey	Fine grained	Porphyritic	Strong, highly fractured, slightly weathered, gouge and chlorite infill on joint surfaces.	0.13	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl		56	
10.70	399.42	11.20	398.92	0.50	0.46	92	0.25	50	4	92	125	R5	Gabbro	Medium grey	Fine grained	Porphyritic	Very strong, moderately to highly fractured, slightly weathered.	0.21	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl		56	
11.20	398.92	12.50	397.62	1.30	1.30	100	0.95	73	12	100	125	R5	Gabbro	Medium grey	Fine to medium grained	Porphyritic	Very strong, moderately fractured, slightly weathered, some chlorite and sericite infilling.	0.38	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		ser		61	
12.50	397.62	12.70	397.42	0.20	0.20	100	0.20	100	1	100	85	R4	Gabbro	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, slightly weathered.	0.13	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		ser		62	
12.70	397.42	13.50	396.62	0.80	0.80	100	0.38	48	12	62	75	R4	Gabbro	Medium greenish-grey	Fine to medium grained	Porphyritic	Strong, highly fractured, slightly weathered, chlorite alteration on joint surfaces.	0.06	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J		chl		50	
13.50	396.62	14.20	395.92	0.70	0.70	100	0.00	0	4	140	50	R4	Gabbro	Medium greenish-grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, slightly weathered, quartz vein running subparallel to core axis, quartz and chlorite infill on joints.	0.14	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	VNL	qtz	chl		42	
14.20	395.92	15.50	394.62	1.30	1.21	93	0.87	67	3	303	175	R5	Gabbro	Medium grey	Fine grained	Porphyritic	Very strong, slightly fractured, slightly weathered, many quartz-infilled healed fractures.	0.39	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl		64	
15.50	394.62	16.10	394.02	0.60	0.58	97	0.20	33	12	45	175	R5	Gabbro	Medium grey	Fine grained	Porphyritic	Very strong, highly fractured, slightly weathered.	0.29	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J		chl		55	
16.10	394.02	17.30	392.82	1.20	1.13	94	0.48	40	11	94	150	R5	Goldside Porphyry Suite	Medium grey	Fine grained	Porphyritic	Very strong, moderately to highly fractured, fresh, some quartz veinlets, fresh joint surfaces. GAB to 16.41 m then becomes GOP.	0.10	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				61	
17.30	392.82	18.80	391.32	1.50	1.50	100	0.39	26	15	94	40	R3	Diorite	Medium to dark grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, moderately to highly fractured, slightly weathered, joint infill of chlorite, calcite veinlets, heavy calcite veining at top of run, quartz phenocrysts, biotite specks, calcite veins, inequigranular, more competent with depth. GOP to 17.72 m then becomes DIORITE.	0.90	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				46	
18.80	391.32	20.30	389.82	1.50	1.45	97	0.38	25	24	58	25	R3	Diorite	Light to medium grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, highly fractured, slightly weathered, chlorite infill in joints, quartz phenocrysts, biotite specks, calcite veins, inequigranular.	0.06	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J				41	
20.30	389.82	21.47	388.65	1.17	1.17	100	0.28	24	MAX	5	25	R3	Diorite	Light to medium grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, intensely fractured, slightly weathered, iron oxide staining, broken at top and middle of run.	1.03	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J				40	
21.47	388.65	22.51	387.61	1.04	1.04	100	0.65	62	MAX	5	30	R3	Diorite	Light to medium grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, intensely fractured, slightly weathered, minor iron oxide staining, broken zone from 21.78 to 21.95m.	0.16	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J				49	
22.51	387.61	23.20	386.92	0.69	0.69	100	0.00	0	MAX	5	25	R3	Diorite	Light to medium grey	Fine to coarse grained	Massive, Porphyritic	Medium strong, intensely fractured, fresh to slightly weathered, broken zones at top of run.	0.60	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J				39	
23.20	386.92	23.30	386.82	0.10	0.10	100	0.10	100	0	100	50	R4	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Strong, no fractures, fresh, quartz and feldspar phenocrysts, biotite specks, inequigranular, pad started lifting while drilling.	0.00	< 1 m	None	V Rough	None	FRESH	30	NJ				77	
23.30	386.82	24.09	386.03	0.79	0.77	97	0.75	95	2	257	50	R4	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Strong, slightly fractured, fresh to slightly weathered, chlorite infill.	0.27	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				62	
24.09	386.03	24.90	385.22	0.81	0.76	94	0.45	56	7	95	50	R4	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Strong, moderately to highly fractured, fresh to slightly weathered, chlorite infill.	0.08	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				52	

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-001

DRILL RUN DATA									GEOLOGY - COMMENTS						DISCONTINUITY DATA - RATING SYSTEMS														
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill Type 1 (see Leg)	Fill Type 2 (see Leg)	Fill Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	P	A	R	I	W	TOTAL (RMR)					
24.90	385.22	26.40	383.72	1.50	1.45	97	1.06	71	11	121	50	R4	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Strong, moderately to highly fractured, slightly weathered, minor iron oxide staining.	0.45	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				55
26.40	383.72	27.62	382.50	1.22	1.22	100	1.09	89	8	136	50	R4	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Strong, moderately fractured, fresh to slightly weathered, 3 spun joints.	0.23	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				59
27.62	382.50	28.84	381.28	1.22	1.22	100	0.83	68	MAX	5	40	R3	Diorite	Light to medium grey	Medium to coarse grained	Massive, Porphyritic	Medium strong, intensely fractured, slightly weathered, 3 spun joints, broken zone at top and bottom of run.	1.03	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J				49
28.84	381.28	29.30	380.82	0.46	0.46	100	0.40	87	4	92	175	R5	Diorite	Medium grey	Fine to medium grained	Porphyritic	Very strong, moderately to highly fractured, fresh, quartz-plagioclase biotite phytic in indistinguishable groundmass, generally fresh joint surfaces, quartz/epidote infill on one joint.	0.29	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				71
29.30	380.82	30.80	379.32	1.50	1.50	100	1.05	70	9	150	75	R4	Diorite	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, fresh, epidote infill on few joints.	0.09	0	0.1 - 1.0	SL Rough	None	FRESH	19	J				62

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-002

DRILL RUN DATA										GEOLOGY - COMMENTS							DISCONTINUITY DATA - RATING SYSTEMS													
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill Type 1 (see Leg)	Fill Type 2 (see Leg)	Fill Type 3 (see Leg)	RMR-89 Total Run Average	
m	m	m	m	m	m	(%)	m	(%)										m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)						
2.80	409.53	3.10	409.23	0.30	0.30	100	0.00	0	2	100	35	R3	Gabbro	Medium greenish grey	Fine to medium grained	Porphyritic	Medium strong, moderately to highly fractured and broken, moderately weathered, visible plagioclase and biotite, rubbly joints with chlorite alteration on joint surfaces, trace calcite and quartz veinlets.	0.12	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub				36
3.10	409.23	3.70	408.63	0.60	0.53	88	0.44	73	3	133	50	R4	Gabbro	Medium greenish grey	Fine to medium grained	Porphyritic	Strong, moderately fractured, moderately weathered, fractures heavily rubbleized, quartz vein at 3.42 m.	0.08	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub				44
3.70	408.63	5.20	407.13	1.50	1.50	100	0.79	53	18	79	60	R4	Gabbro	Medium greenish grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, slightly weathered, some quartz veinlets, quartz and chlorite infill, 0.23 m-thick broken zone at 4.30 m.	1.10	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	VNL	qtz				54
5.20	407.13	6.70	405.63	1.50	1.47	98	1.17	78	8	163	60	R4	Gabbro	Light to medium grey	Coarse grained	Porphyritic	Strong, moderately fractured, fresh, disseminated pyrite and galena, visible quartz and biotite, fresh joint surfaces	0.99	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				63	
6.70	405.63	7.50	404.83	0.80	0.79	99	0.12	15	33	23	50	R4	Gabbro	Light to medium grey	Coarse grained	Porphyritic	Medium strong, heavily fractured, fresh to slightly weathered, 3cm-thick shear zone at 7.15 m, FeO staining on few joint surfaces.	0.33	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc	FeO		42	
7.50	404.83	8.20	404.13	0.70	0.65	93	0.13	19	9	65	60	R4	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Strong, highly fractured, fresh, visible plagioclase, biotite, and epidote, quartz veining, fresh joint surfaces.	0.51	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				52	
8.20	404.13	9.70	402.63	1.50	1.50	100	0.54	36	20	71	60	R4	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Strong, highly fractured, fresh to slightly weathered, 5cm-thick quartz vein at 9.38 m	1.13	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J		chl		46	
9.70	402.63	11.20	401.13	1.50	1.50	100	1.18	79	10	136	60	R4	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Strong, moderately fractured, fresh, some quartz veinlets.	0.29	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	FRESH	17	J	qtz			61	
11.20	401.13	11.50	400.83	0.30	0.27	90	0.13	43	2	90	60	R4	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Strong, moderately to highly fractured, slightly weathered, trace pink staining on joint surfaces.	0.13	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J				55	
11.50	400.83	12.70	399.63	1.20	0.95	79	0.25	21	15	59	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, highly fractured, fresh to slightly weathered, some quartz veinlets, FeO staining on some joint surfaces, heavily weathered joint at 0.02m	0.41	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl		45	
12.70	399.63	13.60	398.73	0.90	0.78	87	0.26	29	MAX	5	70	R4	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Strong, highly fractured and rubbleized, fresh to slightly weathered, many rubbly joints, broken zone for bottom 0.16m.	0.17	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	gg		36	
13.60	398.73	13.90	398.43	0.30	0.29	97	0.00	0	MAX	5	5	R2	Gabbro	Medium grey	Fine to coarse grained	Massive, Porphyritic	Rubble zone.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub				27
13.90	398.43	14.20	398.13	0.30	0.27	90	0.00	0	MAX	5	5	R2	Gabbro	Medium grey	Fine to coarse grained	Massive, Porphyritic	Rubble zone.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub				27
14.20	398.13	14.50	397.83	0.30	0.27	90	0.00	0	MAX	5	5	R2	Gabbro	Medium grey	Fine to coarse grained	Massive, Porphyritic	Rubble zone.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub				27
14.50	397.83	15.70	396.63	1.20	1.17	98	0.74	62	5	195	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly to moderately fractured, fresh, dark green staining on joint surfaces, some quartz veinlets, 13cm-thick rubble zone at top of run.	0.78	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	FRESH	15	J	chl	ser		54	
15.70	396.63	17.20	395.13	1.50	1.46	97	1.02	68	13	104	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, moderately to highly fractured, fresh, frequent quartz veinlets.	0.31	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	FRESH	17	VNL	qtz				56
17.20	395.13	18.70	393.63	1.50	1.50	100	1.12	75	9	150	35	R3	Gabbro	Greenish grey	Fine to coarse grained	Porphyritic	Medium strong, moderately fractured, slightly weathered, quartz phenocrysts, biotite specks, chlorite and calcite in joints and veinlets.	0.83	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				55	
18.70	393.63	20.20	392.13	1.50	1.50	100	1.34	89	10	136	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, moderately fractured, slightly weathered, quartz phenocrysts, biotite specks, chlorite and calcite in joints and veinlets.	0.84	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				58	
20.20	392.13	21.70	390.63	1.50	1.50	100	1.40	93	8	167	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, moderately fractured, slightly weathered, quartz phenocrysts, biotite specks, chlorite and calcite in joints and veinlets.	0.42	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				59	
21.70	390.63	23.05	389.28	1.35	1.35	100	1.27	94	5	225	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly fractured, fresh to slightly weathered, minor iron oxide staining.	0.96	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				60	
23.05	389.28	24.55	387.78	1.50	1.42	95	1.42	95	5	237	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly fractured, fresh to slightly weathered, minor iron oxide staining.	0.75	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				60	
24.55	387.78	26.05	386.28	1.50	1.50	100	1.45	97	10	136	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, moderately fractured, fresh to slightly weathered, iron oxide infill in joints at 25.11m.	0.56	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				60	
26.05	386.28	27.55	384.78	1.50	1.49	99	1.46	97	6	213	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly to moderately fractured, fresh to slightly weathered, no iron oxide staining, calcite veins up to 10mm thick, 2 spun joints.	0.74	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				61	
27.55	384.78	28.90	383.43	1.35	1.35	100	1.33	99	6	193	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly to moderately fractured, fresh to slightly weathered, 1 spun joint, calcite veins up to 6mm thick.	0.37	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				61	
28.90	383.43	30.40	381.93	1.50	1.45	97	1.45	97	2	483	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly fractured, fresh to slightly weathered, 1 spun joint, calcite vein up to 10mm thick at 30.05m.	1.15	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				63	
30.40	381.93	31.90	380.43	1.50	1.50	100	1.50	100	6	214	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, slightly to moderately fractured, fresh to slightly weathered, 3 spun joints, calcite veins up to 8mm thick at 31.09m.	0.69	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				61	
31.90	380.43	32.80	379.53	0.90	0.90	100	0.90	100	1	450	35	R3	Gabbro	Medium grey	Fine to coarse grained	Porphyritic	Medium strong, only one fracture, fresh to slightly weathered, no spun joints, calcite veins up to 2mm thick.	0.17	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J				64	

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-003

DRILL RUN DATA											GEOLOGY - COMMENTS						DISCONTINUITY DATA - RATING SYSTEMS												
Depth From m	Elev. From m	Depth To m	Elev. to m	Run Length m	Recov. Length m	Recov. (%)	RQD Length m	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run m	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
																			Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
1.22	425.08	1.42	424.88	0.20	0.20	100	0.00	0	MAX	5	5	R2	Grewacke	Multicolour and greenish light grey	Coarse grained and fine grained	Massive	Weak, highly broken and rubbleized, highly to completely weathered, chlorite matrix, calcite veins, equigranular.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc	chl	27
1.42	424.88	2.12	424.18	0.70	0.68	97	0.00	0	MAX	5	5	R2	Grewacke	Light greenish grey up to 1.52m then becomes dark grey	Fine grained, equigranular	Massive	Weak, highly broken and rubbleized, highly to completely weathered, heavy calcite veins and alteration, crumbly, iron oxide and chlorite infill.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc	chl	27
2.12	424.18	2.52	423.78	0.40	0.36	90	0.00	0	MAX	5	5	R2	Grewacke	Dark grey	Fine grained, equigranular	Massive	Weak, highly broken and rubbleized, highly to completely weathered, calcite veins and alteration.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc		27
2.52	423.78	3.37	422.93	0.85	0.81	95	0.11	13	MAX	5	15	R2	Greywacke / Dyke	Grey to dark grey up to 2.92m then becomes light grey	Fine grained, equigranular up to 2.92m then becomes fine to medium grained, inequigranular	Massive	Weak, moderately to highly fractured, slightly to moderately weathered, iron oxide, chlorite, and calcite infill, calcite veinlets, chlorite alteration at 2.92m, to 2.92 m then becomes, tan coloured DYKE, medium strong, moderately fractured, slightly weathered, chlorite and calcite infill, biotite specks.	0.40	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	cc	FeO	38
3.37	422.93	3.87	422.43	0.50	0.50	100	0.50	100	2	167	25	R3	Dyke	Light grey	Fine to medium grained, inequigranular	Massive	Medium strong, moderately fractured, fresh, biotite specks and micas, calcite micro veinlets.	0.19	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				65
3.87	422.43	5.37	420.93	1.50	1.50	100	1.22	81	7	188	15	R2	Dyke / Greywacke	Light grey up to 4.87m then becomes dark grey	Fine to medium grained, inequigranular up to 4.87m then becomes fine grained, equigranular	Massive	Medium strong, slightly to moderately fractured, calcite and chlorite infill, calcite veins up to 15mm thick, from 4.87m to 5.37m. To 4.90 m then becomes GREYWACKE, weak, moderately fractured, slightly weathered, calcite and pyrite infill.	0.45	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc		55
5.37	420.93	6.72	419.58	1.35	1.35	100	0.55	41	MAX	5	5	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, intensely fractured, fresh, no pyrite infill, rubble zone from 5.48 m to 5.57 m.	0.46	> 20 m	1 - 5 mm	SL Rough	None	FRESH	16	J				46
6.72	419.58	8.22	418.08	1.50	1.47	98	0.72	48	MAX	5	15	R2	Greywacke / Conglomerates	Dark grey	Fine grained, equigranular up to 7.42m then becomes fine to coarse grained, inequigranular	Massive up to 7.42m then becomes schistose	Weak, highly broken and rubbleized, fresh to slightly weathered. To 7.47 m then becomes CONGOLMERATES, strong, fresh to slightly weathered, heavy calcite phenocrysts presence, calcite veining.	0.10	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc			43
8.22	418.08	9.82	416.48	1.60	1.58	99	0.95	59	20	75	60	R4	Conglomerates	Light to dark grey	Coarse grained	Schistose	Strong, moderately fractured, fresh, subangular flow-modified quartz-siltstone clasts, pyrite infill on some joints.	0.21	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	FRESH	17	J	py			56
9.82	416.48	11.37	414.93	1.55	1.55	100	0.54	35	MAX	5	60	R4	Conglomerates	Light to dark grey	Fine to coarse grained	Massive, brecciated	Medium strong, intensely fractured, fresh, sections of thinly-bedded siltstone or schistose breccia; 8cm-thick broken zone at 10.38 m, massive pyrite clasts at 10.52 m, fresh joint surfaces.	0.34	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	FRESH	17	J	qtz			51
11.37	414.93	12.02	414.28	0.65	0.64	98	0.00	0	20	30	60	R4	Conglomerates	Medium to dark grey	Fine to medium grained	Bedded, flow banded	Strong, highly fractured, fresh, heavy quartz and calcite veining, trace pyrite veinlets. To 11.75 m then becomes GREYWACKE, medium strong, fresh, intensely fractured.	0.21	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	FRESH	14	J	qtz			44
12.02	414.28	12.87	413.43	0.85	0.72	85	0.00	0	MAX	5	50	R4	Greywacke	Medium to dark grey	Fine to medium grained	Bedded, flow banded	Strong, intensely fractured, fresh, 6.5cm-thick shear zone at 12.45 m.	0.26	> 20 m	1 - 5 mm	Smooth	Hard < 5 mm	FRESH	12	J	py			41
12.87	413.43	14.37	411.93	1.50	1.50	100	1.33	89	7	188	35	R3	Greywacke	Medium to dark grey	Fine grained	Massive, bedded	Medium strong, slightly to moderately fractured, fresh, trace calcite veinlets, fresh joint surfaces, rubble for top 5cm of run.	1.28	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				61
14.37	411.93	15.47	410.83	1.10	1.10	100	0.59	54	30	35	75	R4	Greywacke	Medium to dark grey	Fine grained	Massive, bedded	Strong, highly fractured, fresh, 19cm-thick broken zone at 14.78 m, strong, fresh.	0.27	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				58
15.47	410.83	15.87	410.43	0.40	0.37	93	0.00	0	MAX	5	25	R3	Greywacke	Medium to dark grey	Fine grained	Massive, bedded	Broken zone, fresh fracture surfaces.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub			33
15.87	410.43	17.18	409.12	1.31	1.31	100	0.71	54	15	82	75	R4	Greywacke	Medium to dark grey	Fine grained	Massive, bedded	Strong, moderately to highly fractured, fresh to slightly weathered, trace calcite veinlets.	0.43	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	cc			51
17.18	409.12	17.90	408.40	0.72	0.68	94	0.00	0	10	62	75	R4	Greywacke	Medium to dark grey	Fine grained	Bedded	Strong, highly fractured, fresh.	0.07	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				48
17.90	408.40	18.70	407.60	0.80	0.80	100	0.00	0	20	38	50	R4	Greywacke	Medium to dark grey	Fine grained	Bedded	Strong, highly fractured, fresh to slightly weathered, trace calcite and quartz veinlets, trace FeO staining on joint surfaces.	0.56	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO		43
18.70	407.60	19.10	407.20	0.40	0.40	100	0.00	0	MAX	5	25	R3	Greywacke	Medium to dark grey	Fine grained	Bedded	Medium strong, intensely fractured, fresh, fresh fracture surfaces.	0.08	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				43
19.10	407.20	20.20	406.10	1.10	1.03	94	0.65	59	11	86	50	R4	Greywacke	Medium to dark grey	Fine grained	Bedded	Strong, moderately to highly fractured, fresh, trace calcite veinlets, trace calcite and pyrite infill.	0.12	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	FRESH	15	J	py			53
20.20	406.10	21.10	405.20	0.90	0.90	100	0.54	60	12	69	35	R3	Greywacke	Medium to dark grey	Fine grained	Bedded	Medium strong, highly fractured, fresh, trace calcite veinlets.	0.17	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J				54
21.10	405.20	21.70	404.60	0.60	0.60	100	0.37	62	7	75	45	R3	Greywacke	Medium to dark grey	Fine grained	Bedded	Medium strong, moderately to highly fractured, fresh, fresh joint surfaces.	0.02	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	FRESH	13	J	cc			51
21.70	404.60	22.20	404.10	0.50	0.48	96	0.00	0	12	37	60	R4	Greywacke	Dark grey	Fine grained	Bedded	Strong, highly fractured, fresh, one heavily weathered iron oxide-stained joint at 21.85 m, generally quartz- and calcite-infilled joint surfaces.	0.41	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	FRESH	13	J	cc			43

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-003

DRILL RUN DATA										GEOLOGY - COMMENTS							DISCONTINUITY DATA - RATING SYSTEMS												
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)					
22.20	404.10	23.29	403.01	1.09	0.99	91	0.57	52	15	62	60	R4	Greywacke	Dark grey	Fine grained	Bedded	Strong, highly fractured, fresh, some quartz veinlets, iron oxide staining on joint surfaces.	0.44	> 20 m	0.1 - 1.0	SL Rough	Hard < 5 mm	SW	16	J		FeO		54
23.29	403.01	24.19	402.11	0.90	0.87	97	0.23	26	25	33	45	R3	Greywacke	Dark grey	Fine grained	Massive, bedded	Medium strong, highly fractured, fresh, trace quartz veinlets, trace gouge infill, generally fresh joint surfaces, broken top and bottom of run.	0.28	> 20 m	< 0.1 mm	Smooth	Soft < 5 mm	FRESH	14	J	cc		46	
24.19	402.11	24.79	401.51	0.60	0.54	90	0.30	50	10	49	35	R3	Greywacke	Medium to dark grey	Fine grained	Masive, bedded	Strong, highly fractured, fresh to slightly weathered, some quartz veinlets, iron oxidestaining on some joint surfaces.	0.23	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	FeO	49	
24.79	401.51	25.59	400.71	0.80	0.79	99	0.00	0	MAX	5	25	R3	Greywacke	Medium to dark grey	Fine	Bedded, porphyritic	Medium strong, intensely fractured, fresh to slightly weathered, iron oxide staining on most joint surfaces. Contact with dyke at 25.25 m.	0.28	> 20 m	0.1 - 1.0	Smooth	Hard < 5 mm	SW	14	J		FeO	40	
25.59	400.71	26.29	400.01	0.70	0.70	100	0.14	20	15	44	70	R4	Dyke	Medium grey	Fine to medium grained	Porphyritic	Strong, highly fractured, fresh to slightly weathered, trace quartz veinlets, fresh joint surfaces.	0.31	> 20 m	1 - 5 mm	SL Rough	Hard < 5 mm	SW	13	J		FeO	46	
26.29	400.01	27.39	398.91	1.10	1.10	100	0.72	65	9	110	70	R4	Dyke / Greywacke	Medium grey	Fine to medium grained	Porphyritic	Strong, moderately to highly fractured, fresh, iron oxide staining on some joints. Contact at 27.07 m with greywacke.	0.34	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J			59	
27.39	398.91	27.79	398.51	0.40	0.37	93	0.00	0	MAX	5	15	R2	Greywacke	Dark grey	Fine grained	Massive, bedded	Weak, intensely fractured, slightly weathered, chlorite and iron oxide infill.	0.00	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J			36	
27.79	398.51	28.49	397.81	0.70	0.68	97	0.00	0	MAX	5	15	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, highly broken and rubbleized, slightly to moderately weathered, chlorite and iron oxide infill, rubble zone at top and broken zone at the bottom of the run, calcite veining.	0.18	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	chl	Feo	cc	32
28.49	397.81	28.81	397.49	0.32	0.32	100	0.00	0	MAX	5	15	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, intensely broken and rubbleized, highly weathered.	0.05	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc	chl	27
28.81	397.49	29.11	397.19	0.30	0.30	100	0.00	0	MAX	5	5	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, intensely broken and rubbleized, highly weathered.	0.00	RUBBLE	RUBBLE	RUBBLE	RUBBLE	RUBBLE	2	Rub	Rub	cc		27
29.11	397.19	29.51	396.79	0.40	0.40	100	0.00	0	MAX	5	15	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, intensely broken and rubbleized, highly weathered.	0.28	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	cc	chl	FeO	32
29.51	396.79	29.97	396.33	0.46	0.46	100	0.00	0	MAX	5	10	R2	Greywacke	Dark grey	Fine grained, equigranular	Massive	Weak, intensely broken and rubbleized, highly weathered.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	cc	chl	FeO	32
29.97	396.33	30.79	395.51	0.82	0.82	100	0.37	45	11	68	25	R3	Greywacke	Dark grey to grey	Fine grained, equigranular	Massive	Medium strong, highly fractured, slightly to moderately weathered, chlorite, calcite, and iron oxide infill, calcite veining up to 5mm thick.	0.44	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	chl	cc	FeO	46
30.79	395.51	31.22	395.08	0.43	0.43	100	0.24	56	20	20	25	R3	Greywacke	Dark grey to grey	Fine grained, equigranular	Massive	Medium strong, highly fractured, slightly weathered, no chlorite infill, graphite infill.	0.08	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc	FeO	graph	46

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-004

DRILL RUN DATA									GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS															
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill Type 1 (see Leg)	Fill Type 2 (see Leg)	Fill Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	P	A	R	I	W	TOTAL (RMR)					
1.49	408.49	2.08	407.90	0.59	0.59	100	0.31	53	7	74	25	R3	Gabbro	Greenish grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, slightly to moderately weathered, calcite, chlorite, graphite, manganese oxide, and iron oxide infill.	0.94	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	cc	chl	graph	47
2.08	407.90	3.58	406.40	1.50	1.50	100	0.96	64	25	58	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, highly fractured, slightly to moderately weathered, calcite and chlorite infill, trace iron oxide infill, calcite veins, broken zone from 3.11 m to 3.36 m.	1.45	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	MW	9	VNL	cc	chl	FeO	45
3.58	406.40	4.28	405.70	0.70	0.70	100	0.39	56	21	32	20	R2	Goldslide Porphyry Suite	Light greenish grey up to 4.17m then becomes fine to medium grained	Fine grained up to 4.17m then becomes fine to medium grained	Massive	Weak, highly fractured, slightly weathered, biotite specks, chlorite infill, biotite infill from 4.17 m to 4.28 m..	0.55	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	CT	chl	cc	graph	45
4.28	405.70	5.78	404.20	1.50	1.50	100	0.73	49	MAX	5	15	R2	Goldslide Porphyry Suite / Gabbro	Light greenish grey up to 4.95m then becomes greenish grey	Fine grained up to 4.95m then becomes fine to medium grained	Massive	Weak, intensely fractured, slightly weathered, chlorite matrix, biotite specks, calcite veins, becoming more competent with depth. To 4.95 m then becomes GABBRO, weak, moderately to highly fractured, slightly weathered, calcite, chlorite, and iron oxide infill, biotite specks, calcite veins, lost circulation from 5.05 m to 5.78 m.	0.67	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	CT	cc	chl	FeO	43
5.78	404.20	6.63	403.35	0.85	0.85	100	0.70	82	8	94	20	R2	Gabbro / Goldslide Porphyry Suite	Greenish grey up to 6.33m then becomes light greenish grey	Fine to medium grained	Massive up to 6.33m then becomes porphyritic	Medium strong, slightly fractured, slightly weathered, calcite, chlorite, and graphite infill, trace iron oxide infill, calcite veins, chlorite matrix. To 6.29 m then becomes GOP, moderately to highly fractured, slightly to moderately weathered, becoming less competent with depth, calcite, chlorite, iron oxide, and manganese oxide infill, heavy calcite veining up to 5mm thick.	0.38	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	chl	graph	54
6.63	403.35	7.88	402.10	1.25	1.25	100	0.63	50	10	114	35	R3	Goldslide Porphyry Suite	Greenish grey	Fine to medium grained	Massive, porphyritic	Medium strong, moderately to highly fractured, slightly weathered, chlorite, calcite, iron oxide, and pyrite infill, calcite veins up to 1cm thick, biotite specks and crystals.	0.96	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	py	FeO	50
7.88	402.10	8.73	401.25	0.85	0.85	100	0.22	26	22	37	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, highly fractured, slightly weathered, chlorite, calcite, and pyrite infill, trace iron oxide infill, 10 cm rubble zone slough of quartz and gabbro from the top of the run, broken zone from 8.18 m to 8.73 m.	0.43	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	cc		40
8.73	401.25	9.53	400.45	0.80	0.80	100	0.45	56	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, intensely fractured, slightly weathered, 12 cm of rubble zone slough of quartz and gabbro, broken zone from 9.18 m to 9.53 m.	0.15	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	graph	chl	py	45
9.53	400.45	11.03	398.95	1.50	1.50	100	1.00	67	13	107	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak, moderately to highly fractured, fresh to slightly weathered, broken zone from 10.48m to 10.69m.	0.80	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl	graph	py	48
11.03	398.95	11.98	398.00	0.95	0.95	100	0.45	47	10	86	60	R4	Gabbro	Medium greenish grey	Fine to coarse grained	Massive	Strong, moderately to highly fractured, fresh to slightly weathered, chlorite and biotite infill, trace quartz veinlets.	0.21	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl			51
11.98	398.00	12.63	397.35	0.65	0.65	100	0.46	71	3	163	50	R4	Gabbro	Medium greenish grey	Fine to coarse grained	Massive	Strong, moderately fractured, fresh to slightly weathered, spun joint at 12.05 m.	0.53	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl	bio		54
12.63	397.35	13.45	396.53	0.82	0.82	100	0.38	46	9	82	25	R3	Gabbro	Dark greenish grey	Medium to coarse grained	Massive	Medium strong, moderately to highly fractured, moderately weathered, chlorite- and clay-altered joints.	0.71	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	MW	7	J	chl			41
13.45	396.53	14.70	395.28	1.25	1.25	100	0.52	42	16	74	15	R2	Gabbro	Dark greenish grey	Medium to coarse grained	Massive	Weak, highly fractured, moderately weathered, clay- and gouge-infilled joints, weakly chlorite-altered throughout.	0.22	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	MW	7	J				39
14.70	395.28	15.60	394.38	0.90	0.90	100	0.29	32	9	90	25	R3	Gabbro	Dark greenish grey	Medium to coarse grained	Massive	Medium strong, moderately to highly fractured, fresh to slightly weathered, gouge infill on few joints.	0.10	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				48
15.60	394.38	17.10	392.88	1.50	1.50	100	0.70	47	19	75	25	R3	Gabbro	Medium greenish grey	Fine to medium grained	Massive	Medium strong, highly fractured, fresh to slightly weathered, some calcite veinlets, weak chlorite alteration or infill on joint surfaces.	0.96	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	SW	9	J	chl	cly		43
17.10	392.88	17.90	392.08	0.80	0.80	100	0.18	23	MAX	5	15	R2	Gabbro	Medium grey	Fine to medium grained	Massive	Weak, intensely fractured, moderately weathered, heavy quartz veining.	0.37	> 20 m	1 - 5 mm	Smooth	Soft < 5 mm	MW	7	VNL	cc	chl		35
17.90	392.08	18.60	391.38	0.70	0.70	100	0.49	70	5	117	50	R4	Gabbro	Medium grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, fresh to slightly weathered.	0.16	> 20 m	0.1 - 1.0	Smooth	Soft < 5 mm	SW	12	J	chl			53
18.60	391.38	19.00	390.98	0.40	0.40	100	0.00	0	6	57	35	R3	Diorite	Medium grey	Fine to medium grained	Massive	Medium strong, highly fractured, fresh to slightly weathered, quartz-biotite phyr, fresh joint surfaces, 5.5cm-thick quartz vein at top of run.	0.28	> 20 m	0.1 - 1.0	Smooth	None	SW	16	J				44
19.00	390.98	20.10	389.88	1.10	1.10	100	0.59	54	9	110	35	R3	Diorite	Medium grey	Fine to medium grained	Massive	Medium strong, moderately to highly fractured, fresh, fresh joint surfaces.	0.83	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				55
20.10	389.88	20.75	389.23	0.65	0.65	100	0.00	0	MAX	5	5	R2	Diorite	Medium grey	Fine to medium grained	Massive	Broken zone.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub			32
20.75	389.23	21.45	388.53	0.70	0.70	100	0.11	16	15	44	45	R3	Diorite	Medium grey	Fine to medium grained	Massive	Medium strong, highly fractured, fresh.	0.17	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J				50

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. MW16-004

DRILL RUN DATA										GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS														
Depth From	Elev. From	Depth To	Elev. to	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Lithology (Client)	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Depth From Top of Run	Joint Condition						Disc. Type	Fill Type 1 (see Leg)	Fill Type 2 (see Leg)	Fill Type 3 (see Leg)	RMR-89 Total Run Average
m	m	m	m	m	m		m											m	P	A	R	I	W	TOTAL (RMR)					
21.45	388.53	22.20	387.78	0.75	0.75	100	0.28	37	8	83	50	R4	Diorite	Medium grey	Finet to medium grained	Massive	Medium strong, moderately to highly fractured, fresh, sericite infill.	0.34	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	FRESH	15	J	ser			50
22.20	387.78	23.00	386.98	0.80	0.80	100	0.56	70	6	114	50	R4	Diorite	Medium grey	Finet to medium grained	Massive	Medium strong, moderately to highly fractured, fresh.	0.09	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			60	
23.00	386.98	24.50	385.48	1.50	1.50	100	1.08	72	9	150	75	R4	Diorite	Medium grey	Finet to medium grained	Massive	Strong, moderately to highly fractured, fresh.	1.17	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			63	
24.50	385.48	26.00	383.98	1.50	1.50	100	1.25	83	10	136	75	R4	Diorite	Medium grey	Finet to medium grained	Massive	Strong, moderately fractured, fresh.	0.63	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			65	
26.00	383.98	27.50	382.48	1.50	1.50	100	1.49	99	4	300	100	R5	Diorite	Medium grey	Finet to medium grained	Massive	Very strong, slightly fractured, fresh, fresh joint surfaces.	0.66	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			72	
27.50	382.48	29.00	380.98	1.50	1.50	100	1.15	77	11	125	100	R5	Diorite	Medium grey	Finet to medium grained	Massive	Very strong, moderately fractured, fresh.	0.72	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			65	
29.00	380.98	30.50	379.48	1.50	1.50	100	0.97	65	10	136	50	R4	Diorite	Medium grey	Finet to medium grained	Massive	Strong, moderately fractured, fresh, trace weak iron oxide staining on joint surfaces.	1.33	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	J			59	
30.50	379.48	32.00	377.98	1.50	1.50	100	0.69	46	14	100	60	R4	Gabbro	Medium grey	Finet to medium grained	Massive	Strong, moderately to highly fractured, fresh to slightly weathered, weak iron oxide and light green staining on joint surfaces.	0.12	> 20 m	0.1 - 1.0	SL Rough	None	SW	18	J			55	
32.00	377.98	33.09	376.89	1.09	1.09	100	0.40	37	MAX	5	35	R3	Gabbro	Grey	Fine to medium grained	Massive, porphyritic	Medium strong, intensely fractured, fresh to slightly weathered, calcite and iron oxide infill, quartz phenocrysts, biotite specks, broken zone from 32.00 m to 32.03 m and 32.78 m to 33.09 m.	0.56	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	cc	FeO	43	
33.09	376.89	33.57	376.41	0.48	0.48	100	0.27	56	11	40	35	R3	Gabbro	Grey	Fine to medium grained	Massive, porphyritic	Medium strong, highly fractured, fresh to slightly weathered, minor broken zones, 1 spun joint, presence of chlorite infill.	0.39	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc	FeO	50
33.57	376.41	33.92	376.06	0.35	0.35	100	0.26	74	11	29	35	R3	Gabbro	Grey	Fine to medium grained	Massive, porphyritic	Medium strong, highly fractured, fresh to slightly weathered, no chlorite infill, criss cross joints.	0.26	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc	FeO	53	
33.92	376.06	34.45	375.53	0.53	0.53	100	0.00	0	30	17	35	R3	Gabbro	Greenish grey	Fine to medium grained	Massive, porphyritic	Medium strong, intensely fractured, slightly weathered, chlorite infill and matrix, broken zone.	0.33	BROKEN	BROKEN	BROKEN	BROKEN	SW	9	J	chl	cc	FeO	37
34.45	375.53	35.03	374.95	0.58	0.58	100	0.00	0	MAX	5	15	R2	Gabbro	Greenish grey	Fine to medium grained	Massive, porphyritic	Weak, highly fractured and rubblelized, presence of manganese oxide infill from 34.95m to 35.03m.	0.07	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Rub	Rub	MnO	chl	32
35.03	374.95	35.73	374.25	0.70	0.70	100	0.00	0	MAX	5	5	R2	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Weak, intensely fractured, slightly to moderately weathered, chlorite, graphite, and calcite infill, trace iron oxide infill, chlorite matrix, calcite veins, biotite specks, rubble zone from 35.17 m to 35.27 m, chlorite and clay alteration from 35.67 m to 35.73 m.	0.43	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Rub	Rub	chl	graph	32
35.73	374.25	36.52	373.46	0.79	0.79	100	0.00	0	MAX	5	5	R2	Gabbro	Dark greenish grey	Fine to medium grained	Massive	Weak, highly broken and rubblelized, moderately weathered, rubble zone from 35.73 m to 35.83 m, no major alteration, broken zone from 35.83 m to 36.52 m.	0.48	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	cc	32
36.52	373.46	37.65	372.33	1.13	1.13	100	0.10	9	MAX	5	3	R1	Gabbro	Greenish grey	Fine to medium grained	Massive	Very weak, intensely fractured, moderately to highly weathered, broken zone from 36.72 m to 37.02 m, chlorite, calcite, manganese oxide, and iron oxide infill, chlorite matrix, biotite specks, heavy chlorite and calcite alteration from 37.02 m until the end of the run.	0.00	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	chl	Rub	cc	32
37.65	372.33	39.15	370.83	1.50	1.50	100	1.04	69	23	63	5	R2	Gabbro	Greenish grey	Fine to medium grained	Massive	Weak to very weak, highly fractured, fresh to slightly weathered, strength decreases with depth, slightly to moderately fractured, slightly to moderately weathered, graphite, calcite, and chlorite infill, no alteration, minor broken zone at bottom of the run.	0.84	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	graph	chl	cc	47
39.15	370.83	40.45	369.53	1.30	1.30	100	0.50	38	21	59	45	R3	Gabbro	Medium grey	Fine to coarse grained	Massive, porphyritic	Medium strong, highly fractured, fresh to slightly weathered, 48cm GOP intrusion at 39.65 m, chlorite or clay infill on most joints.	0.37	> 20 m	1 - 5 mm	SL Rough	Soft < 5 mm	SW	11	J	chl		45	
40.45	369.53	41.95	368.03	1.50	1.50	100	1.09	73	9	150	45	R3	Gabbro	Medium grey	Fine to medium grained	Porphyritic	Medium strong, moderately fractured, fresh, intrusive unit terminates and transitions back to GABBRO at 41.07 m, 4cm-thick quartz vein at 41.01 m, calcite infill on most joints.	1.21	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	cc		55	
41.95	368.03	43.45	366.53	1.50	1.50	100	1.06	71	10	136	60	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, moderately fractured, fresh to slightly weathered, weakly chlorite altered throughout, trace calcite and quartz veinlets.	0.54	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl		56	
43.45	366.53	44.95	365.03	1.50	1.50	100	1.37	91	8	167	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, moderately fractured, fresh to slightly weathered.	1.36	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	VNL	cc	chl	60	
44.95	365.03	45.60	364.38	0.65	0.65	100	0.53	82	3	163	50	R4	Gabbro	Medium grey	Fine to coarse grained	Massive	Strong, moderately fractured, fresh to slightly weathered, spun joint at 44.99 m.	0.51	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl		58	

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APPENDIX D3

1996 SITE INVESTIGATION DRILLHOLE LOGS

(Pages D3-1 to D3-8)

GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. DT-277

DRILL RUN DATA										GEOLOGY - COMMENTS									DISCONTINUITY DATA - RATING SYSTEMS																	
Depth From	Elev. From	Depth From	Depth To	Elev. to	Depth To	Run Length	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Field Rock Interp.	Depth From Top of Run	Depth Incremental from previous discontinuity	Elev. m	Discontinuity Number	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	RMR-89 Total By Joint		
ft	m	m	ft	m	m	m	m		m											m	m	m		Persis-P	Apert-A	Rough R	Infill I	Weath W	TOTAL (RMR)							
218.00	394.32	66.45	228.00	391.99	69.49	3.05	2.90	95	1.63	53	17	161	100	R5	Greyish white	Coarse	Equigranular, massive	Strong to very strong, moderately fractured, fresh to slightly weathered, calcite infill, broken zone at start of run	Mafic Dyke	0.00	0.00	394.32	1	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub		cc		56	49
																				0.81	0.81	393.70	2	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	SW	15	J	cc		FeO		57	
																				1.20	0.39	393.40	3	> 20 m	< 0.1 mm	SL Rough	None	SW	19	J				61		
																				2.50	1.30	392.41	4	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	J	chl	cc		58		
																				2.85	0.35	392.14	5	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cly		56		
228.00	391.99	69.49	238.00	389.65	72.54	3.05	3.04	100	2.85	94	8	338	85	R4	Greenish grey to grey	Fine to coarse	Massive	Strong, slightly fractured, fresh to slightly weathered, calcite veinlets, chlorite alteration, biotite phenocrysts, transition back to Gabbro	Gabbro	0.41	0.41	391.67	1	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	FRESH	15	J	FeO		chl		67	66
																				1.70	1.29	390.68	2	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	VNL	cc				67	
																				2.00	0.30	390.46	3	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl	cc		65		
238.00	389.65	72.54	248.00	387.32	75.59	3.05	3.02	99	2.82	93	3	755	85	R4	Greenish grey to grey	Fine to coarse	Massive	Strong, slightly fractured, fresh, 50 cm shear zone in middle of run, chlorite altered	Gabbro	0.35	0.35	389.38	1	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	J	chl				67	71
																				1.00	0.65	388.89	2	> 20 m	< 0.1 mm	Rough	Soft < 5 mm	FRESH	18	J	chl	cc		73		
																				1.00	0.00	388.89	3	> 20 m	> 5 mm	SL Rough	Soft > 5 mm	HW	4	SH	dly	Rub	chl		59	
248.00	387.32	75.59	259.00	384.75	78.94	3.35	3.32	99	0.56	17	max	5	5	R2	Dark grey to light greenish grey	Fine to coarse	Breccia	Weak to very weak, intensely fractured and broken, moderately to highly weathered, some clay infill, chlorite rich, highly altered and sheared	Brecciated Fault	0.50	0.50	386.93	1	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	cly	33	33	
																				1.40	0.90	386.24	2	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	cly		33	
																				1.95	0.55	385.82	3	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	chl		33	
																				3.01	1.06	385.01	4	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	chl		33	
259.00	384.75	78.94	270.00	382.18	82.30	3.35	3.30	98	1.61	48	max	5	50	R4	Grey	Fine to coarse	Porphyritic, massive	Medium strong to strong, intensely fractured and broken, fresh to slightly weathered, calcite veinlets, chlorite altered, biotite phenocrysts	Felsic Dyke	0.14	0.14	384.64	1	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	SW	14	J	chl				51	49
																				1.80	1.66	383.37	2	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	VNL	cc		chl		51	
																				2.30	0.50	382.99	3	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	FRESH	17	J	chl	cly		52		
																				2.70	0.40	382.68	4	BROKEN	BROKEN	BROKEN	BROKEN	BROKEN	7	Brok	Rub	chl	cly		42	
270.00	382.18	82.30	278.00	380.31	84.73	2.44	2.43	100	2.31	95	5	405	75	R4	Grey	Fine to coarse	Porphyritic, massive	Strong, slightly fractured, fresh to slightly weathered, chlorite altered	Felsic Dyke	0.10	0.10	382.10	1	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	FRESH	17	J	chl				68	68
																				2.00	1.90	380.65	2	> 20 m	1 - 5 mm	SL Rough	None	SW	15	J			chl		66	
278.00	380.31	84.73	288.00	377.98	87.78	3.05	3.05	100	2.70	89	7	381	100	R5	Grey	Fine to coarse	Porphyritic, massive	Strong to very strong, slightly fractured, fresh, calcite veinlets, chlorite alteration, calcite and biotite phenocrysts	Felsic Dyke	0.57	0.57	379.88	1	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	FRESH	15	VNL	chl	cc		67	67	
																				1.82	1.25	378.92	2	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	J	chl				68	
																				2.82	1.00	378.15	3	> 20 m	< 0.1 mm	SL Rough	Soft < 5 mm	FRESH	16	VNL	cc				68	
288.00	377.98	87.78	298.00	375.64	90.83	3.05	2.96	97	2.94	96	3	740	100	R5	Grey	Fine to coarse	Porphyritic, massive	Strong to very strong, slightly fractured, fresh to slightly weathered, calcite veinlets, chlorite alteration, calcite and biotite phenocrysts	Felsic Dyke	0.97	0.97	377.23	1	> 20 m	< 0.1 mm	SL Rough	None	SW	19	J			chl		76	76

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GEOTECHNICAL DRILLHOLE LOGGING DATA SHEET
ROCK MASS CLASSIFICATION - RMR 1989
DRILLHOLE I.D. DT-280

DRILL RUN DATA										GEOLOGY - COMMENTS					DISCONTINUITY DATA - RATING SYSTEMS																			
Depth From	Elev. From	Depth From	Depth To	Elev. to	Depth To	Recov. Length	Recov. (%)	RQD Length	RQD (%)	# of Fractures	Average Fracture Spac. mm	UCS (Est.) (MPa)	ROCK CLASS.	Rock Colour	Rock Grain Size / Texture	Structure	Other Notes	Field Rock Interp.	Depth From Top of Run	Depth From Collar	Elev. m	Discontinuity Number	Joint Condition					Disc. Type	Fill. Type 1 (see Leg)	Fill. Type 2 (see Leg)	Fill. Type 3 (see Leg)	RMR-89 Total Run Average	RMR-89 Total By Joint	
ft	m	m	ft	m	m	m		m			mm								m	m	m		P	A	R	I	W	TOTAL (RMR)						
249.00	398.85	75.90	259.00	396.62	78.94	2.80	92	2.22	73	15	175	100	R5	Grey	Fine	Porphyritic, massive	Strong to very strong, moderately fractured, fresh, calcite phenocrysts, possibly intermediate dyke	Felsic Dyke	0.38	76.28	398.57	1	> 20 m	< 0.1 mm	SL Rough	None	FRESH	20	J			cc	64	66
																			1.55	77.45	397.72	2	> 20 m	0.1 - 1.0	Smooth	None	FRESH	17	J			cc	63	63
																			2.70	78.60	396.88	3	> 20 m	< 0.1 mm	Smooth	None	FRESH	18	J				64	64
259.00	396.62	78.94	269.00	394.39	81.99	3.04	100	2.85	94	8	338	150	R5	Dark green to greenish grey	Coarse	Equigranular, massive	Very strong, slightly fractured, fresh to moderately weathered, returns to Gabbro	Gabbro	0.15	79.09	396.51	1	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	MW	12	J	chy	chl		69	67
																			0.41	79.35	396.32	2	> 20 m	0.1 - 1.0	SL Rough	Soft < 5 mm	FRESH	15	J	chl			70	70
269.00	394.39	81.99	279.00	392.17	85.04	2.90	95	2.90	95	6	414	150	R5	Dark green to greenish grey	Coarse	Equigranular, massive	Very strong, slightly fractured, fresh	Gabbro	0.47	82.46	394.05	1	> 20 m	< 0.1 mm	Rough	Soft < 5 mm	FRESH	18	J	cc			75	74
																			0.64	82.63	393.93	2	> 20 m	0.1 - 1.0	SL Rough	None	FRESH	19	VN	cc	qtz		75	75
																			2.60	84.59	392.49	3	> 20 m	0.1 - 1.0	Rough	Soft < 5 mm	FRESH	17	J	chl			73	73
EOH																																		

APPENDIX E

LABORATORY TEST RESULTS

Appendix E1	Soil Test Results
Appendix E2	Rock Test Results

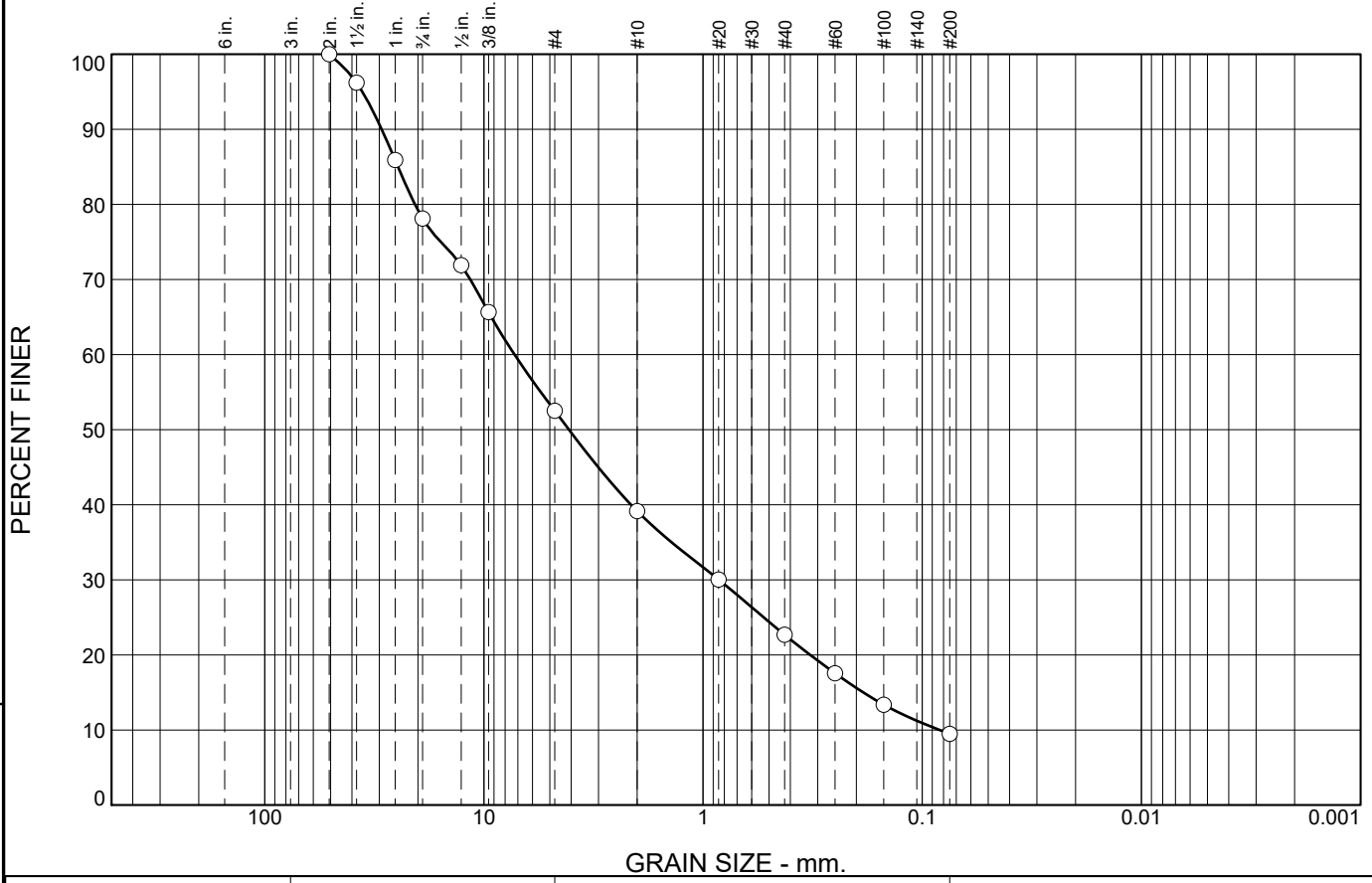
APPENDIX E1

SOIL TEST RESULTS

(Pages E1-1 to E1-17)

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.9	25.6	13.3	16.5	13.2	9.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	96.2		
1	85.9		
.75	78.1		
.5	71.9		
.375	65.6		
#4	52.5		
#10	39.2		
#20	30.0		
#40	22.7		
#60	17.6		
#100	13.4		
#200	9.5		

Soil Description

well-graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 29.2667 D₈₅= 24.6373 D₆₀= 7.2561
D₅₀= 4.0912 D₃₀= 0.8473 D₁₅= 0.1859
D₁₀= 0.0833 C_u= 87.09 C_c= 1.19

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: Grab 1 **Source of Sample:** _____ **Date:** 11/11/6
Location: TP16-001 **Elev./Depth:** _____

	Client: IDM Mining Inc. Project: Red Mountain Project Project No.: VA101-00594/02
Figure	

GRAIN SIZE DISTRIBUTION TEST DATA

11/21/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: TP16-001

Sample Number: Grab 1

Material Description: well-graded gravel with silt and sand

Date: 11/11/6

PL: NP

LL: NP

PI: NP

USCS Classification: GW-GM

AASHTO Classification: A-1-a

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
3687.52	0.00	0.00	2	0.00	100.0
			1.5	139.70	96.2
			1	519.70	85.9
			.75	806.70	78.1
			.5	1036.00	71.9
			.375	1266.80	65.6
			#4	1751.20	52.5
578.80	184.00	0.00	#10	100.40	39.2
			#20	169.00	30.0
			#40	224.23	22.7
			#60	262.73	17.6
			#100	294.30	13.4
			#200	323.50	9.5

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	21.9	25.6	47.5	13.3	16.5	13.2	43.0			9.5

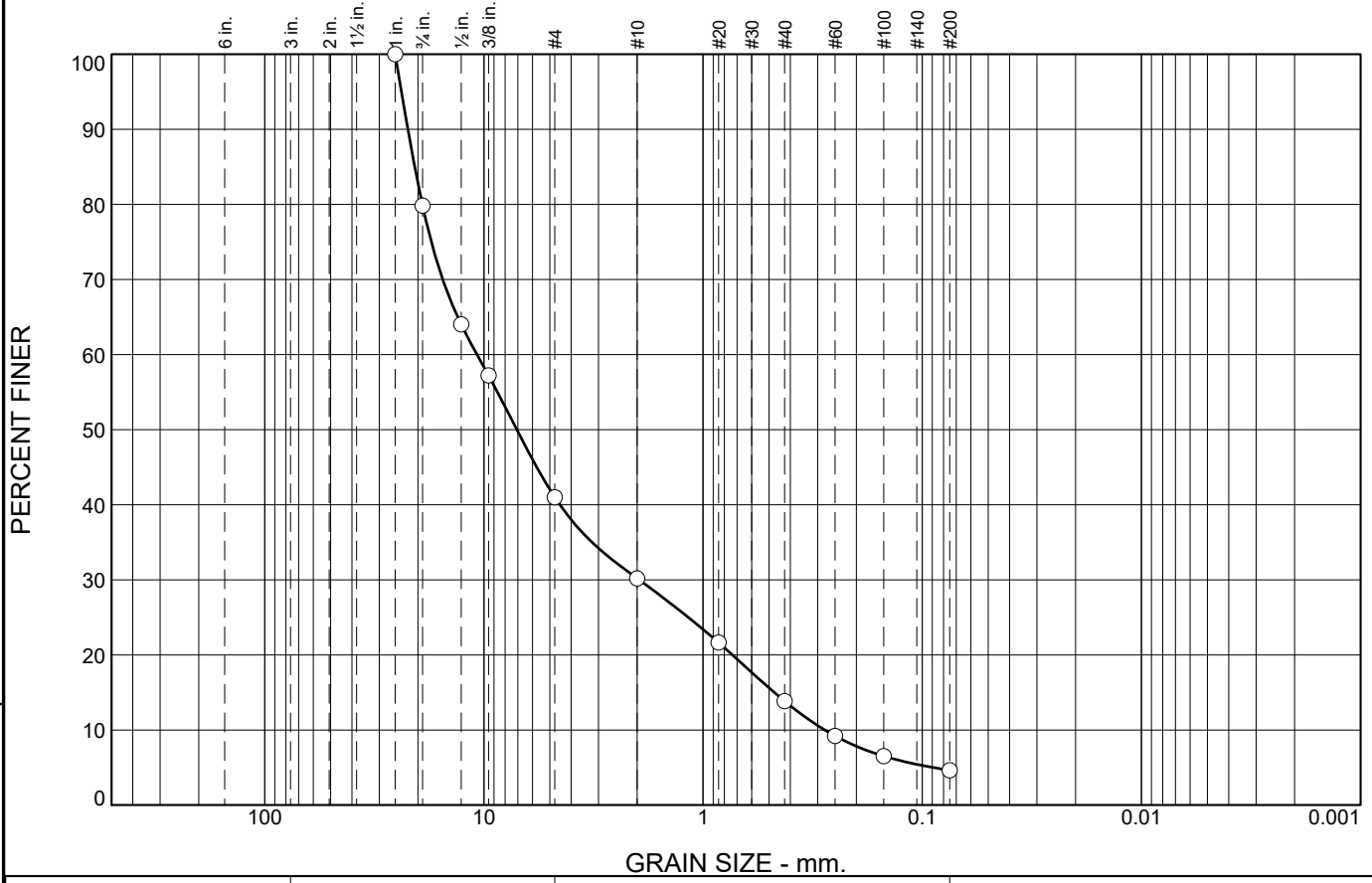
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
	0.0833	0.1859	0.3245	0.8473	2.1334	4.0912	7.2561	20.6442	24.6373	29.2667	35.8160

Fineness Modulus	C _u	C _c
4.74	87.09	1.19

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.2	38.8	10.8	16.4	9.2	4.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	79.8		
.5	64.0		
.375	57.2		
#4	41.0		
#10	30.2		
#20	21.6		
#40	13.8		
#60	9.2		
#100	6.5		
#200	4.6		

Soil Description

well-graded gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 22.2213 D₈₅= 20.6841 D₆₀= 10.7552
D₅₀= 7.0769 D₃₀= 1.9587 D₁₅= 0.4736
D₁₀= 0.2784 C_u= 38.63 C_c= 1.28

Classification

USCS= GW AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: Grab 1 Source of Sample: Date: 11/14/16
Location: TP16-002 Elev./Depth:

	<p>Client: IDM Mining Inc. Project: Red Mountain Project Project No: VA101-00594/02</p>
<p>Figure</p>	

Tested By: EAG Checked By: JDB

GRAIN SIZE DISTRIBUTION TEST DATA

11/21/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: TP16-002

Sample Number: Grab 1

Material Description: well-graded gravel with sand

Date: 11/14/16

PL: NP

LL: NP

PI: NP

USCS Classification: GW

AASHTO Classification: A-1-a

Tested by: EAG

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
702.40	186.70	0.00	1	0.00	100.0
			.75	103.99	79.8
			.5	185.55	64.0
			.375	220.62	57.2
			#4	304.30	41.0
			#10	359.99	30.2
			#20	404.08	21.6
			#40	444.29	13.8
			#60	468.20	9.2
			#100	482.06	6.5
			#200	491.87	4.6

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	20.2	38.8	59.0	10.8	16.4	9.2	36.4			4.6

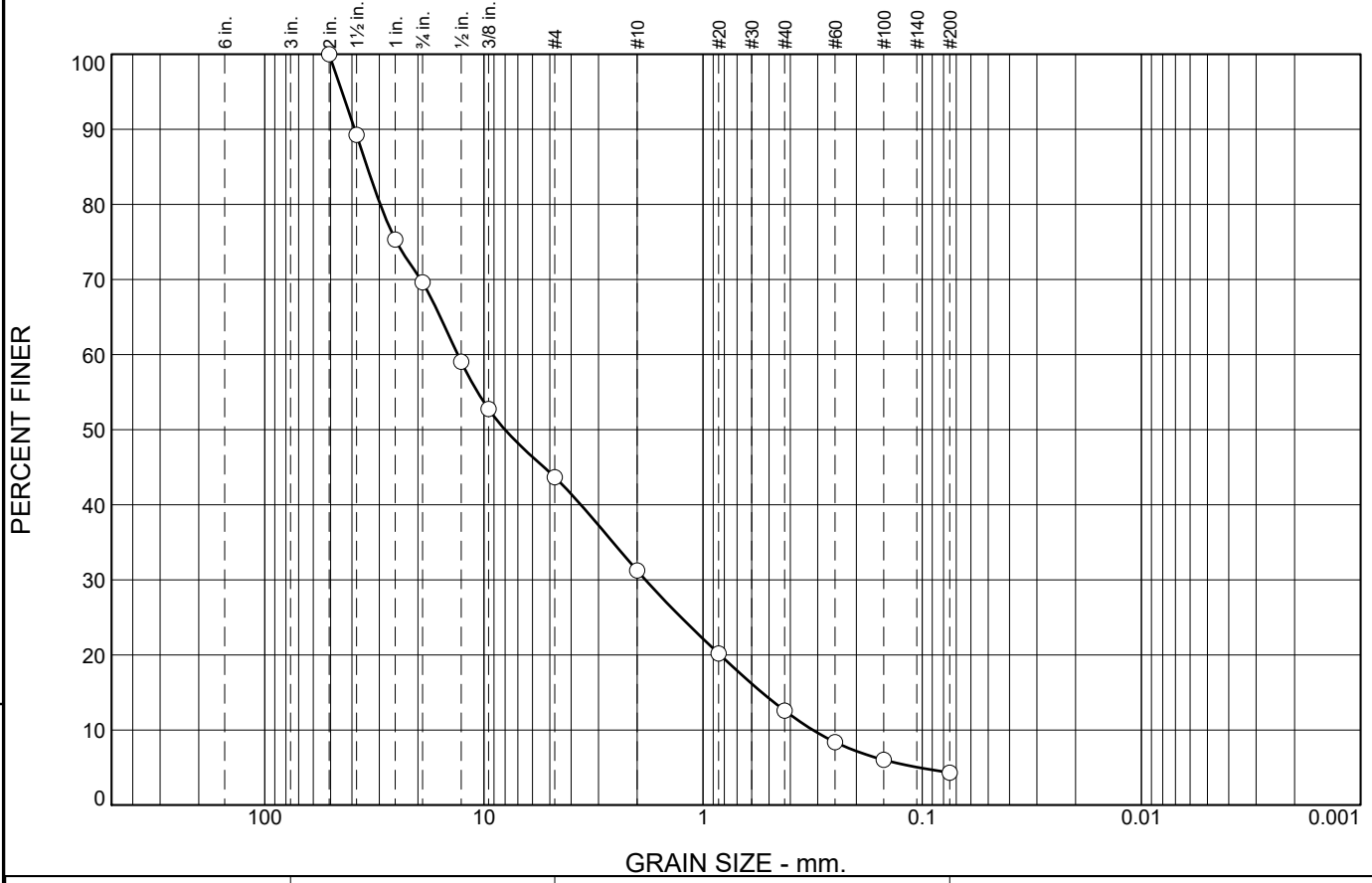
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.0889	0.2784	0.4736	0.7348	1.9587	4.5032	7.0769	10.7552	19.1040	20.6841	22.2213	23.7781

Fineness Modulus	C _u	C _c
5.30	38.63	1.28

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	30.4	25.9	12.5	18.6	8.3	4.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	89.3		
1	75.3		
.75	69.6		
.5	59.0		
.375	52.7		
#4	43.7		
#10	31.2		
#20	20.2		
#40	12.6		
#60	8.4		
#100	6.0		
#200	4.3		

Soil Description

poorly graded gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 38.8463 D₈₅= 34.0958 D₆₀= 13.1752
D₅₀= 8.0242 D₃₀= 1.8334 D₁₅= 0.5394
D₁₀= 0.3153 C_u= 41.78 C_c= 0.81

Classification

USCS= GP AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: Grab 1 Source of Sample: Date: 11/14/16
Location: TP16-003 Elev./Depth:



Client: IDM Mining Inc.
Project: Red Mountain Project
Project No: VA101-00594/02

Figure

Tested By: EAG Checked By: JDB

GRAIN SIZE DISTRIBUTION TEST DATA

11/21/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: TP16-003

Sample Number: Grab 1

Material Description: poorly graded gravel with sand

Date: 11/14/16

PL: NP

LL: NP

PI: NP

USCS Classification: GP

AASHTO Classification: A-1-a

Tested by: EAG

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
878.10	186.60	0.00	2	0.00	100.0
			1.5	74.27	89.3
			1	170.70	75.3
			.75	210.11	69.6
			.5	283.27	59.0
			.375	326.76	52.7
			#4	389.56	43.7
			#10	475.50	31.2
			#20	551.90	20.2
			#40	604.50	12.6
			#60	633.50	8.4
			#100	649.80	6.0
			#200	661.70	4.3

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	30.4	25.9	56.3	12.5	18.6	8.3	39.4			4.3

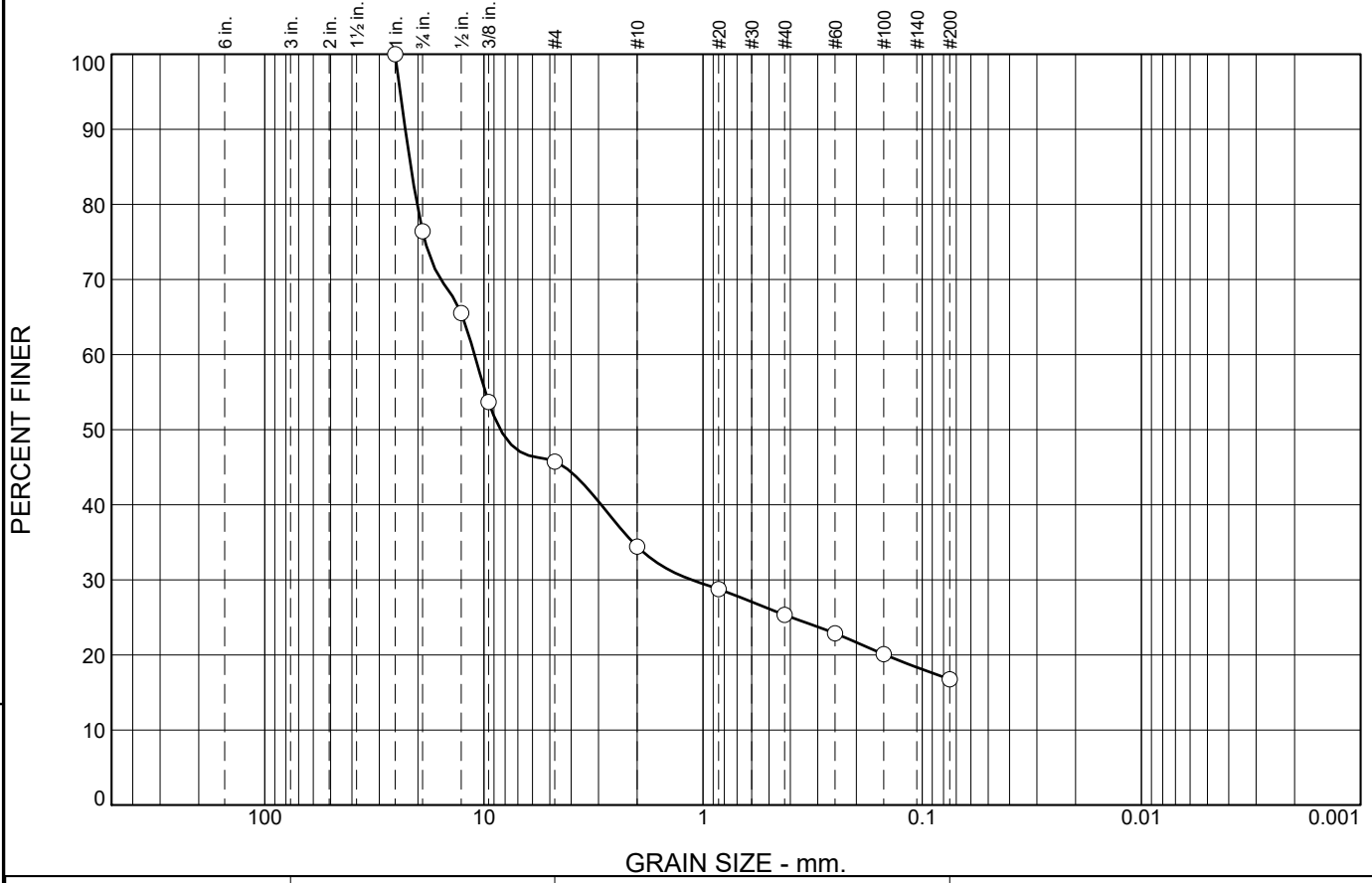
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.1036	0.3153	0.5394	0.8367	1.8334	3.6114	8.0242	13.1752	29.7192	34.0958	38.8463	44.3745

Fineness Modulus	C _u	C _c
5.55	41.78	0.81

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.6	30.7	11.3	9.1	8.6	16.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	76.4		
.5	65.5		
.375	53.7		
#4	45.7		
#10	34.4		
#20	28.8		
#40	25.3		
#60	22.9		
#100	20.1		
#200	16.7		

Soil Description

silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 22.8349 D₈₅= 21.5520 D₆₀= 11.0391
D₅₀= 8.4113 D₃₀= 1.1268 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

* (no specification provided)

Sample No.: SPT 1 Source of Sample: Date: 11/14/16
Location: MW16-003 Elev./Depth: 0-0.10m

	<p>Client: IDM Mining Inc. Project: Red Mountain Project Project No: VA101-00594/02</p>
<p>Figure</p>	

Tested By: JK Checked By: JDB

GRAIN SIZE DISTRIBUTION TEST DATA

11/22/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: MW16-003

Depth: 0-0.10m

Sample Number: SPT 1

Material Description: silty gravel with sand

Date: 11/14/16

PL: NP

LL: NP

PI: NP

USCS Classification: GM

AASHTO Classification: A-1-b

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
269.80	184.30	0.00	1	0.00	100.0
			.75	20.16	76.4
			.5	29.47	65.5
			.375	39.60	53.7
			#4	46.39	45.7
			#10	56.06	34.4
			#20	60.91	28.8
			#40	63.84	25.3
			#60	65.95	22.9
			#100	68.32	20.1
			#200	71.18	16.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	23.6	30.7	54.3	11.3	9.1	8.6	29.0			16.7

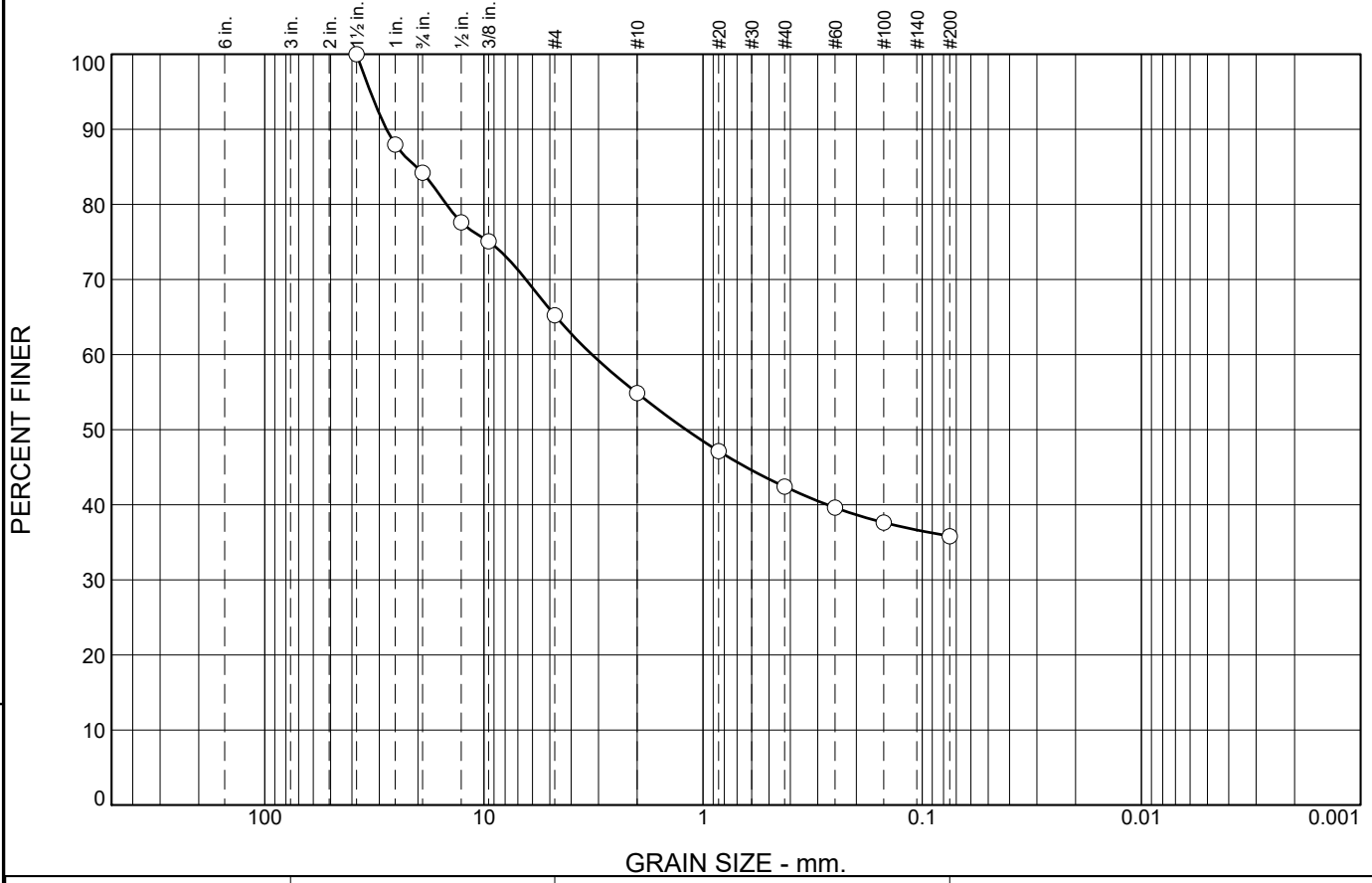
D5	D10	D15	D20	D30	D40	D50	D60	D80	D85	D90	D95
			0.1474	1.1268	2.9154	8.4113	11.0391	20.1818	21.5520	22.8349	24.1027

Fineness Modulus
4.86

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.8	19.0	10.3	12.5	6.6	35.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5	100.0		
1	88.0		
.75	84.2		
.5	77.6		
.375	75.1		
#4	65.2		
#10	54.9		
#20	47.1		
#40	42.4		
#60	39.6		
#100	37.6		
#200	35.8		

Soil Description

silty gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 27.8346 D₈₅= 20.2894 D₆₀= 3.2119
D₅₀= 1.1960 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-4(0)

Remarks

* (no specification provided)

Sample No.: SPT 2 **Source of Sample:** **Date:** 11/14/16
Location: MW16-003 **Elev./Depth:** 0.61-1.22m

	Client: IDM Mining Inc. Project: Red Mountain Project Project No.: VA101-00594/02
Figure	

GRAIN SIZE DISTRIBUTION TEST DATA

11/22/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: MW16-003

Depth: 0.61-1.22m

Sample Number: SPT 2

Material Description: silty gravel with sand

Date: 11/14/16

PL: NP

LL: NP

PI: NP

USCS Classification: GM

AASHTO Classification: A-4(0)

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
603.50	0.00	0.00	1.5	0.00	100.0
			1	72.56	88.0
			.75	95.25	84.2
			.5	135.14	77.6
			.375	150.42	75.1
			#4	209.83	65.2
			#10	272.30	54.9
			#20	319.00	47.1
			#40	347.50	42.4
			#60	364.40	39.6
			#100	376.40	37.6
			#200	387.40	35.8

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	15.8	19.0	34.8	10.3	12.5	6.6	29.4			35.8

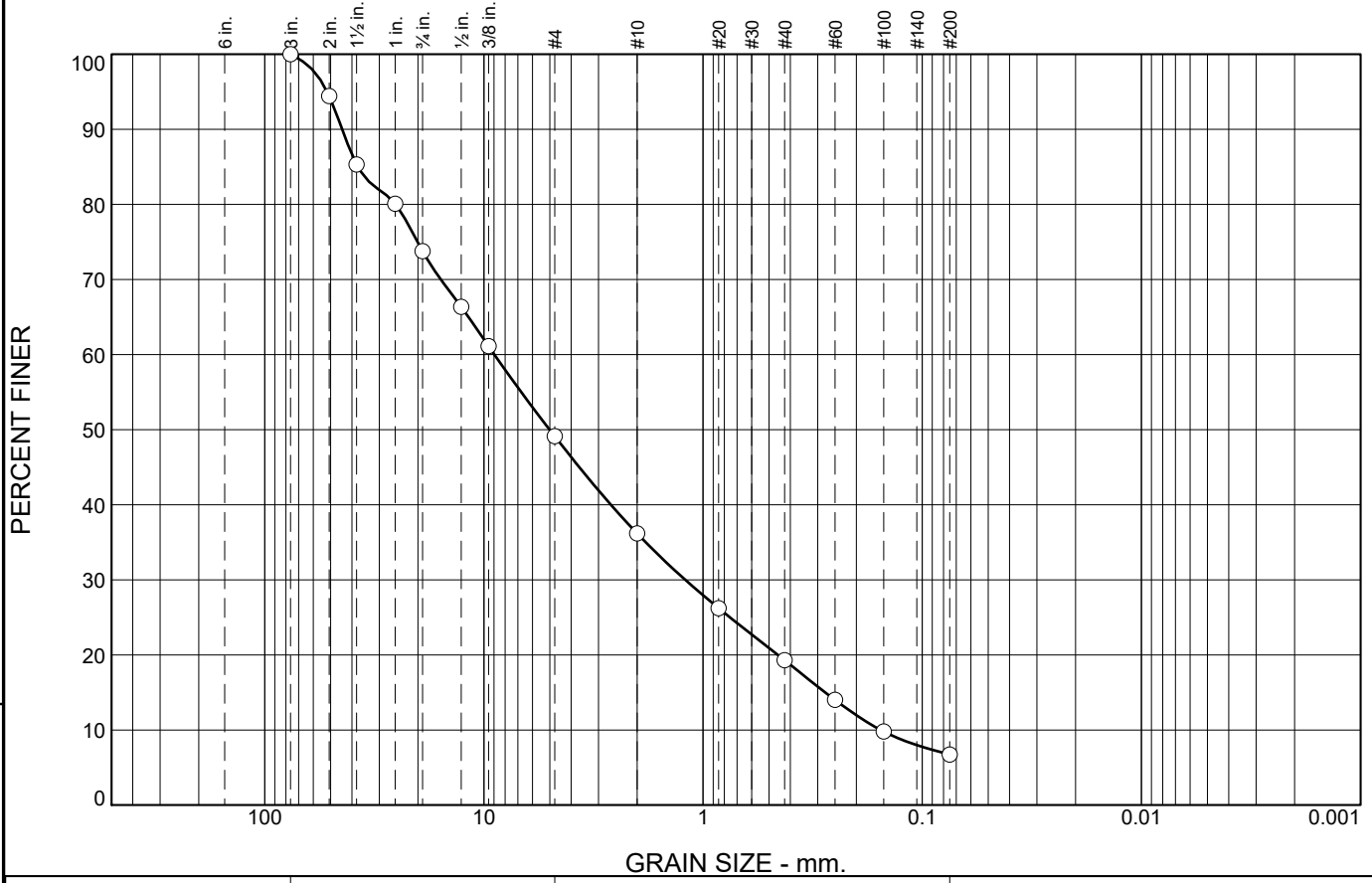
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
					0.2711	1.1960	3.2119	14.8249	20.2894	27.8346	32.9519

Fineness Modulus
3.46

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.2	24.7	12.9	16.9	12.6	6.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	94.4		
1.5	85.3		
1	80.1		
.75	73.8		
.5	66.4		
.375	61.1		
#4	49.1		
#10	36.2		
#20	26.2		
#40	19.3		
#60	14.0		
#100	9.8		
#200	6.7		

Soil Description

well-graded gravel with silt and sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 44.3022 D₈₅= 37.5884 D₆₀= 8.9638
D₅₀= 5.0131 D₃₀= 1.2055 D₁₅= 0.2770
D₁₀= 0.1548 C_u= 57.91 C_c= 1.05

Classification

USCS= GW-GM AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: Grab 1 **Source of Sample:** **Date:** 11/9/16
Location: BH16-004 **Elev./Depth:**

	Client: IDM Mining Inc. Project: Red Mountain Project Project No.: VA101-00594/02
Figure	

GRAIN SIZE DISTRIBUTION TEST DATA

11/21/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: BH16-004

Sample Number: Grab 1

Material Description: well-graded gravel with silt and sand

Date: 11/9/16

PL: NP

LL: NP

PI: NP

USCS Classification: GW-GM

AASHTO Classification: A-1-a

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
11341.35	0.00	0.00	3	0.00	100.0
			2	630.50	94.4
			1.5	1665.00	85.3
			1	2258.00	80.1
			.75	2975.50	73.8
			.5	3815.00	66.4
			.375	4410.50	61.1
			#4	5770.50	49.1
699.50	185.80	0.00	#10	135.37	36.2
			#20	239.36	26.2
			#40	312.00	19.3
			#60	367.20	14.0
			#100	411.30	9.8
			#200	443.30	6.7

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	26.2	24.7	50.9	12.9	16.9	12.6	42.4			6.7

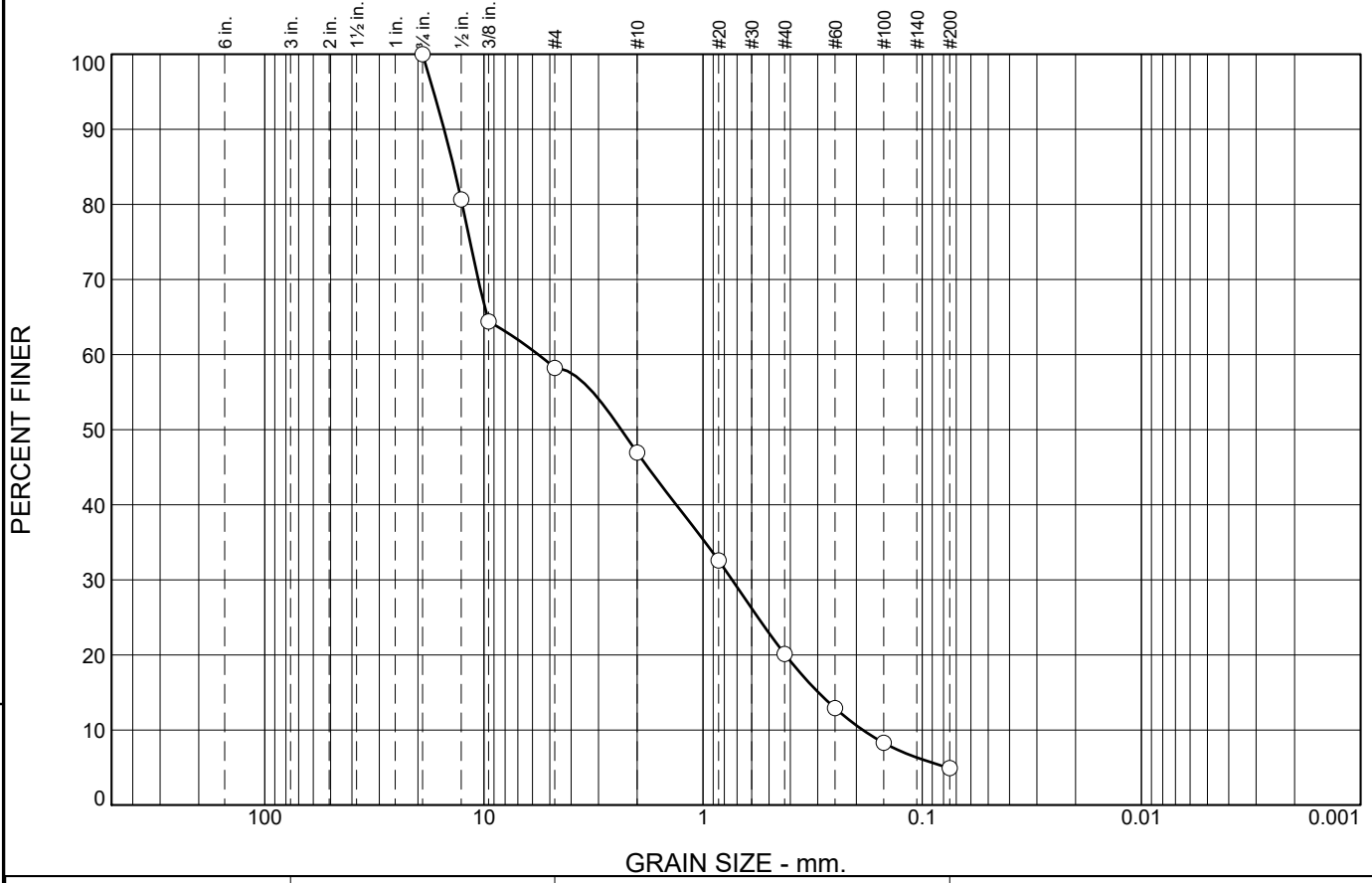
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
	0.1548	0.2770	0.4565	1.2055	2.6336	5.0131	8.9638	25.2558	37.5884	44.3022	51.8734

Fineness Modulus	C _u	C _c
5.14	57.91	1.05

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	41.8	11.2	26.9	15.2	4.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	80.7		
.375	64.4		
#4	58.2		
#10	47.0		
#20	32.6		
#40	20.1		
#60	12.9		
#100	8.3		
#200	4.9		

Soil Description

poorly graded sand with gravel

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 15.1952 D₈₅= 13.7417 D₆₀= 5.6466
D₅₀= 2.3637 D₃₀= 0.7372 D₁₅= 0.2976
D₁₀= 0.1867 C_u= 30.25 C_c= 0.52

Classification

USCS= SP AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: SPT 1 **Source of Sample:** **Date:** 11/14/16
Location: BH16-005 **Elev./Depth:** 0-0.10m



Client: IDM Mining Inc.
Project: Red Mountain Project
Project No.: VA101-00594/02

Figure

Tested By: JK **Checked By:** JDB

GRAIN SIZE DISTRIBUTION TEST DATA

11/22/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: BH16-005

Depth: 0-0.10m

Sample Number: SPT 1

Material Description: poorly graded sand with gravel

Date: 11/14/16

PL: NP

LL: NP

PI: NP

USCS Classification: SP

AASHTO Classification: A-1-a

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
216.50	185.00	0.00	.75	0.00	100.0
			.5	6.09	80.7
			.375	11.21	64.4
			#4	13.16	58.2
			#10	16.71	47.0
			#20	21.24	32.6
			#40	25.16	20.1
			#60	27.43	12.9
			#100	28.89	8.3
			#200	29.95	4.9

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	41.8	41.8	11.2	26.9	15.2	53.3			4.9

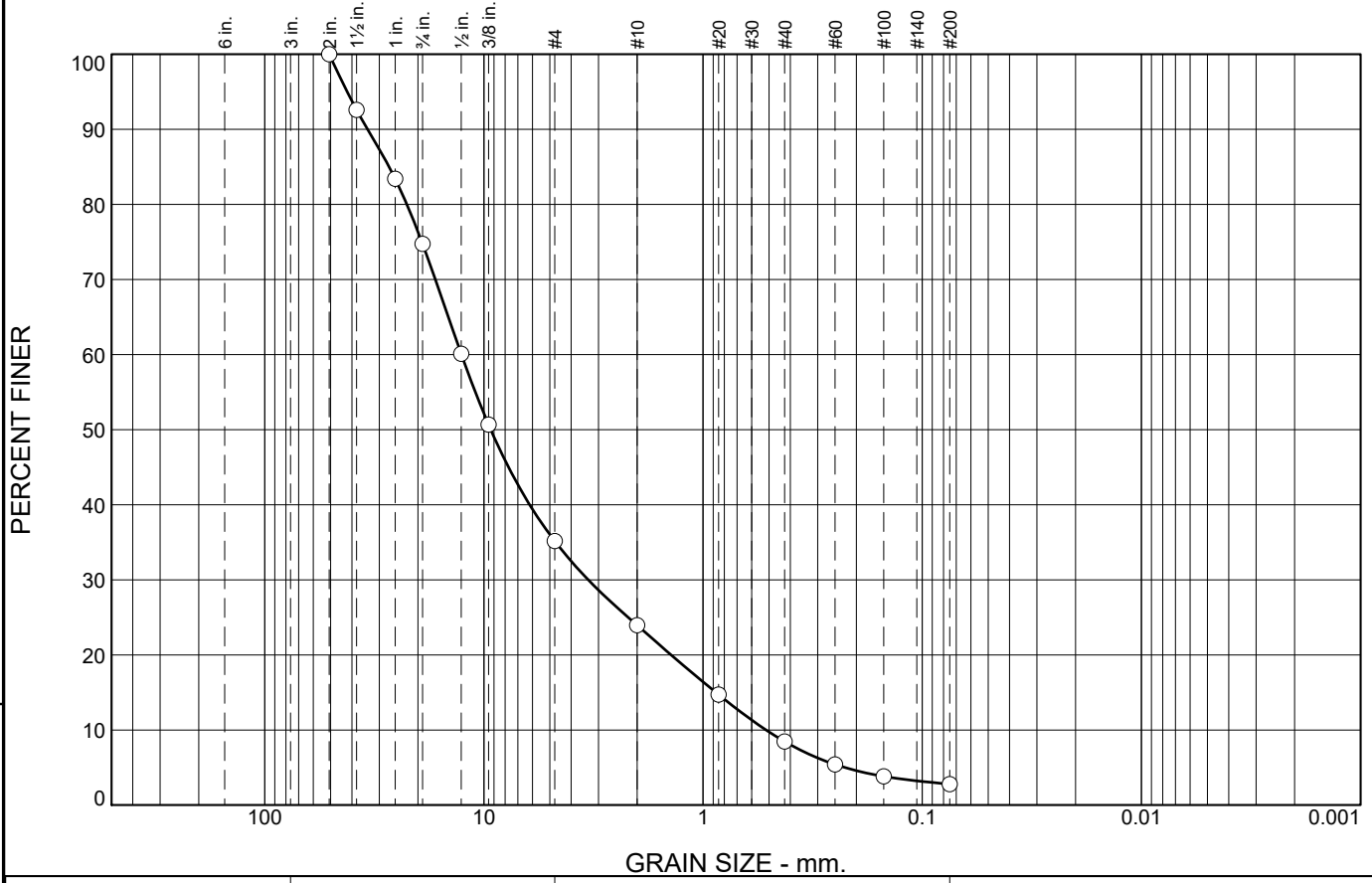
D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.0766	0.1867	0.2976	0.4217	0.7372	1.3253	2.3637	5.6466	12.5551	13.7417	15.1952	16.9627

Fineness Modulus	C _u	C _c
4.40	30.25	0.52

Knight Piesold Geotechnical Lab.

Particle Size Distribution Report ASTM D6913

The USCS classification pertains only to the portion of sample that passes the 3" sieve as per ASTM D2487.



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	25.2	39.6	11.3	15.4	5.7	2.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
1.5	92.6		
1	83.4		
.75	74.8		
.5	60.1		
.375	50.7		
#4	35.2		
#10	23.9		
#20	14.7		
#40	8.5		
#60	5.4		
#100	3.8		
#200	2.8		

Soil Description

well-graded gravel with sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 33.9372 D₈₅= 27.0757 D₆₀= 12.6650
D₅₀= 9.3104 D₃₀= 3.3409 D₁₅= 0.8737
D₁₀= 0.5163 C_u= 24.53 C_c= 1.71

Classification

USCS= GW AASHTO= A-1-a

Remarks

* (no specification provided)

Sample No.: Grab 1 **Source of Sample:** _____ **Date:** 11/11/16
Location: BH16-007 **Elev./Depth:** 0.1-0.35m

	Client: IDM Mining Inc. Project: Red Mountain Project Project No.: VA101-00594/02
Figure	

Tested By: JK **Checked By:** JDB

GRAIN SIZE DISTRIBUTION TEST DATA

11/21/2016

Client: IDM Mining Inc.

Project: Red Mountain Project

Project Number: VA101-00594/02

Location: BH16-007

Depth: 0.1-0.35m

Sample Number: Grab 1

Material Description: well-graded gravel with sand

Date: 11/11/16

PL: NP

LL: NP

PI: NP

USCS Classification: GW

AASHTO Classification: A-1-a

Tested by: JK

Checked by: JDB

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Cumulative Pan Tare Weight (grams)	Sieve Opening Size	Cumulative Weight Retained (grams)	Percent Finer
12242.47	0.00	0.00	2	0.00	100.0
			1.5	906.50	92.6
			1	2029.50	83.4
			.75	3091.00	74.8
			.5	4885.00	60.1
			.375	6039.50	50.7
			#4	7938.50	35.2
644.20	186.20	0.00	#10	146.00	23.9
			#20	266.25	14.7
			#40	347.80	8.5
			#60	387.50	5.4
			#100	408.10	3.8
			#200	421.60	2.8

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	25.2	39.6	64.8	11.3	15.4	5.7	32.4			2.8

D ₅	D ₁₀	D ₁₅	D ₂₀	D ₃₀	D ₄₀	D ₅₀	D ₆₀	D ₈₀	D ₈₅	D ₉₀	D ₉₅
0.2254	0.5163	0.8737	1.3987	3.3409	6.1846	9.3104	12.6650	22.4511	27.0757	33.9372	42.0285

Fineness Modulus	C _u	C _c
5.81	24.53	1.71

Knight Piesold Geotechnical Lab.

Project	<u>Red Mountain</u>	Project No.	<u>VA101-00594/02</u>
Lab No.	<u>L2016-107PPQ</u>	Date of Test	<u>10/10/2016</u>
Tested By	<u>JDH</u>	Checked By	<u>JDB</u>

Drying Conditions: 105 deg C Method: Oven

Sample No.		<i>BH16-004</i>	<i>BH16-005</i>	<i>MW16-003</i>	<i>MW16-003</i>	<i>BH16-007</i>
Sample ID		<i>GRAB 1</i>	<i>STP 1</i>	<i>SPT 1</i>	<i>SPT 2</i>	<i>GRAB 1</i>
Depth		<i>0.4-0.7m</i>	<i>0-0.10m</i>	<i>0-0.10m</i>	<i>0.61-1.22m</i>	<i>0.10-0.35m</i>
Tare No.		<i>Hog</i>	<i>Ryan</i>	<i>Ben</i>	<i>RG17</i>	<i>P111</i>
Tare + Wet Soil	<i>A</i>	<i>1086.3</i>	<i>226.9</i>	<i>269.8</i>	<i>629.3</i>	<i>1189.2</i>
Tare + Dry Soil	<i>B</i>	<i>1035.4</i>	<i>216.5</i>	<i>261.7</i>	<i>603.5</i>	<i>1137.3</i>
Tare	<i>C</i>	<i>131.7</i>	<i>185.0</i>	<i>184.3</i>	<i>186.6</i>	<i>149.0</i>
Wt. of Water	<i>D, A-B</i>	<i>50.9</i>	<i>10.4</i>	<i>8.1</i>	<i>25.8</i>	<i>51.9</i>
Dry Soil, Ws	<i>E, B-C</i>	<i>903.7</i>	<i>31.5</i>	<i>77.4</i>	<i>416.9</i>	<i>988.3</i>
Moisture Content, (%)	<i>(D / E) x100</i>	<i>5.6</i>	<i>33.0</i>	<i>10.5</i>	<i>6.2</i>	<i>5.3</i>

Sample No.		<i>TP16-001</i>	<i>TP16-002</i>	<i>TP16-003</i>		
Sample ID		<i>GRAB 1</i>	<i>GRAB 1</i>	<i>GRAB 1</i>		
Depth		<i>unk.</i>	<i>unk.</i>	<i>unk.</i>		
Tare No.		<i>P52</i>	<i>RG5</i>	<i>RG1</i>		
Tare + Wet Soil	<i>A</i>	<i>679.2</i>	<i>731.6</i>	<i>922.2</i>		
Tare + Dry Soil	<i>B</i>	<i>631.7</i>	<i>702.4</i>	<i>878.1</i>		
Tare	<i>C</i>	<i>57.9</i>	<i>186.7</i>	<i>186.6</i>		
Wt. of Water	<i>A-B, D</i>	<i>47.5</i>	<i>29.2</i>	<i>44.1</i>		
Dry Soil, Ws	<i>B-C, E</i>	<i>573.8</i>	<i>515.7</i>	<i>691.5</i>		
Moisture Content, (%)	<i>(D / E) x100</i>	<i>8.3</i>	<i>5.7</i>	<i>6.4</i>		

APPENDIX E2

ROCK TEST RESULTS

(Pages E2-1 to E2-21)



DEPARTMENT OF
MINING ENGINEERING

Goodwin Hall
Queen's University
Kingston, Ontario, Canada K7L 3N6
Tel 613 533-2230
Fax 613 533-6597

November 21, 2016

Mr. Jim Fogarty
Knight Piesold Ltd.
Suite 1400 - 750 West Pender St.
Vancouver, British Columbia V6C 2T8

Re: Rock core testing – IDM Mining Inc. Red Mountain Project

Dear Mr. Fogarty:

Rock core specimens (designated as being from the IDM Mining Red Mountain Project) have been received and tested to unconfined compression strength failure, along with determination of sample moisture content and specific gravity conditions. All tests were conducted according to the standards of the following organizations:

- The Complete ISRM (International Society of Rock Mechanics) Suggested Methods for Rock Characterization, Testing and Monitoring:1974-2006. April, 2007 Edition Prepared by the Commission on Testing Methods of the International Society for Rock Mechanics. Edited by R. Ulusay and J. A. Hudson. ISBN 978-975-93675-4-1.
- ASTM International Standards

The specific test protocols of each organization that were adhered to in conducting tests undertaken for this report included:

-ISRM Suggested Methods for Determining Water Content, Porosity, Density, Absorption and Related Properties, pp. 85-98 (*also in accordance with (Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass – ASTM D2216-05) and (Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer – ASTM D854-14)*), and

-ISRM Suggested Methods for Determining the Uniaxial Compressive Strength and Deformability of Rock Materials, pp. 151-15, (*also in accordance with Standard Test Method for Determining the Unconfined Compressive Strength of Intact Core Specimens – ASTM D2938-1) and (Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens Under Varying States of Stress and Temperatures – ASTM D7012-14)*)

Each received sample that was tested for unconfined strength was subjected to a process of preparation that included:

-diamond sawing to prepare cylindrical samples having nearly parallel end faces and length-to-diameter aspect ratios approximating 2.25-to-1

-diamond lathing, to prepare sample faces parallel to within ± 0.025 mm

-testing to failure within a servo-controlled compression frame

All tests were performed under axial strain control at rates approximating 10^{-5} s^{-1} . For these tests, simultaneous recording of axial force, axial deformation and circumferential deformation was performed from which determination of standard failure parameters (UCS, Young's Modulus and Poisson's ratio) was made.

Sixteen rock core specimens for this Project were delivered to Queen's University in two pails for unconfined (11) strength testing purposes and for determination of moisture content and specific gravity parameters for each sample that was tested. Five untested specimens were retained and will be returned to you upon submission of this report.

A summary of failure strength test results is tabled and included. Where strength parameters are indicated by the notations (f) or (pf), core sample failure was observed to have occurred either fully or partially along pre-existing foliation surfaces rather than through intact rock material. It was noted also that the apparent moisture contents of all specimens received was essentially zero, as marked and therefore no charge will be levied for moisture content determinations on these samples in our submitted invoice.

Separate plots of the stress/strain responses of each sample that was tested will also be forwarded to you electronically upon submission of this report. Additionally, photo images of specimens as-received and both prior to and following failure testing are appended to the written report for your information.

Should you also require any additional information concerning work that has been performed, please do not hesitate to contact me by telephone at (613)-533-2198 or by FAX at (613)-533-6597.

Yours sincerely,

J. F. Archibald, Ph.D., P. Eng., FCIM

**Results of Failure Tests (IDM Mining Red Mountain Project)
(November, 2106)**

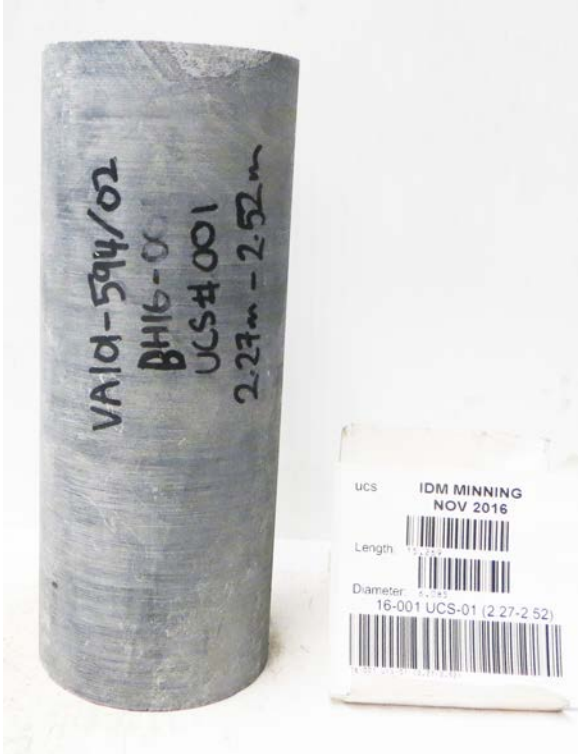
Drillhole/Sample (depth, m)	Density (g/cm ³)	Young's Modulus E (GPa)	Poisson's ratio (μ)	UCS S _c (MPa)	Moisture Content (%)	Specific Gravity
BH16-001/UCS-01 (2.27-2.52)	2.72	22.098	0.18	64.9 (pf)	0.02	3.38
BH16-001/UCS-02 (16.75-16.99)	2.71	26.157	0.18	59.7 (pf)	0.03	2.84
BH16-002/UCS-02 (10.94-11.30)	2.74	16.268	0.14	32.3 (f)	0.02	2.76
BH16-003/UCS-01 (1.90-2.18)	2.61	23.508	0.10	155.2	0.01	2.64
BH16-005/UCS-01 (11.48-11.78)	2.62	26.800	0.13	223.4	0	2.65
BH16-006/UCS-01 (6.43-6.74)	2.73	25.958	0.16	203.9	0.02	3.22
BH16-008/UCS-01(6.11-6.45)	2.73	21.234	0.14	78.9 (pf)	0.02	2.94
BH16-010/UCS-01(2.59-2.92)	3.04	20.924	0.13	86.6	0.03	3.08
MW16-001/UCS-01(3.19-3.43)	3.04	20.490	0.20	87.0 (pf)	0.04	3.10
MW16-003/UCS-01(4.00-4.25)	2.76	28.730	0.17	105.7	0.10	2.79
MW16-004/UCS-01(4.57-4.77)	2.76	21.419	0.34	83.6 (pf)	0	2.79

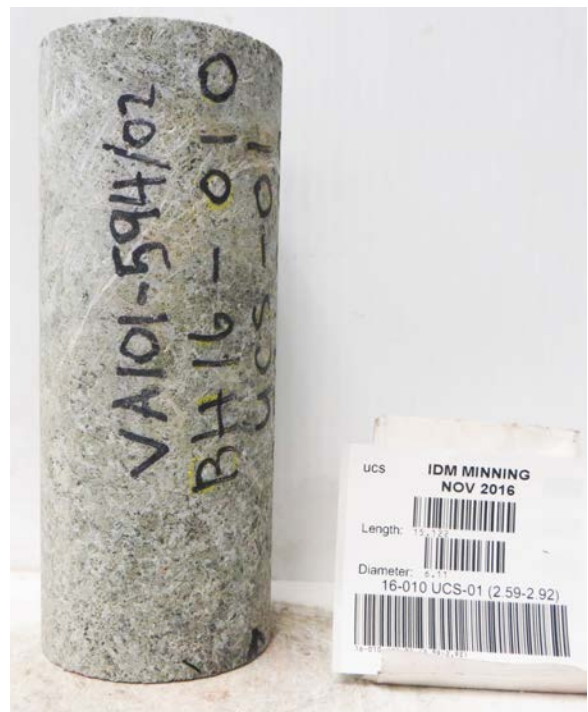
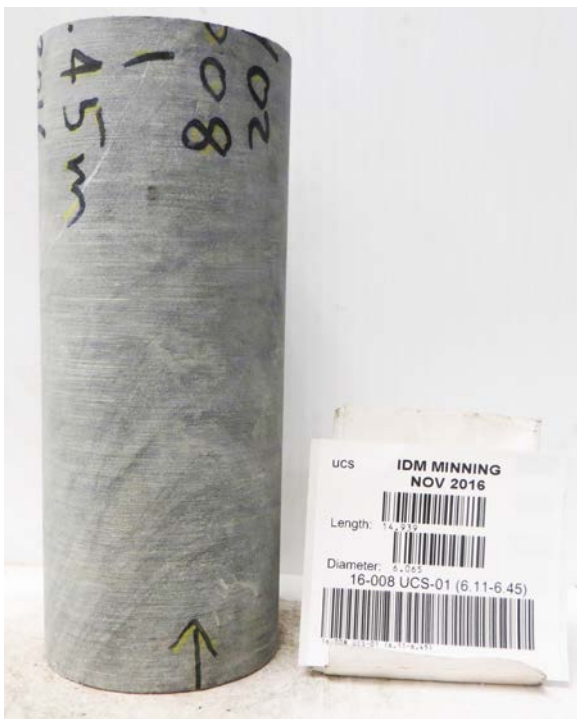
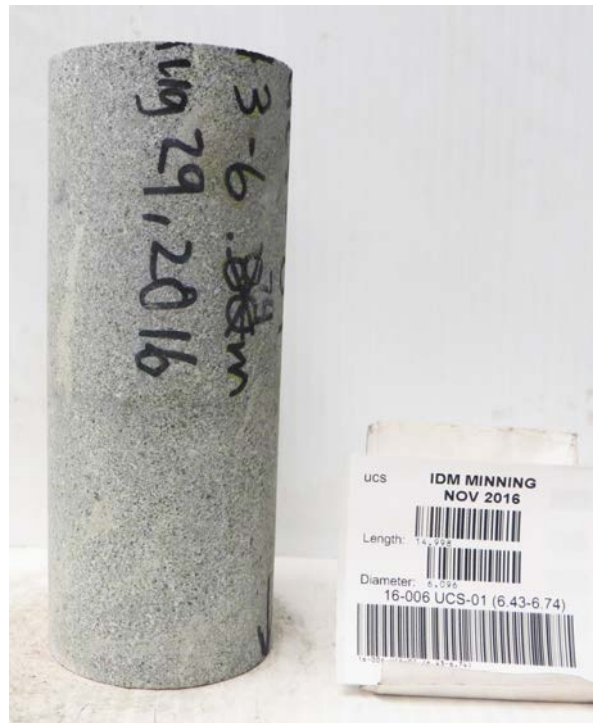
(pf) – indicates failure to occur partially along pre-existing foliation

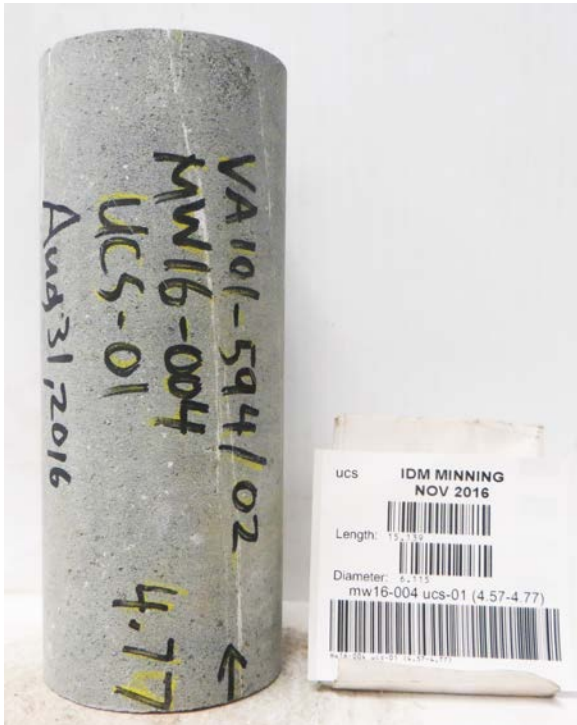
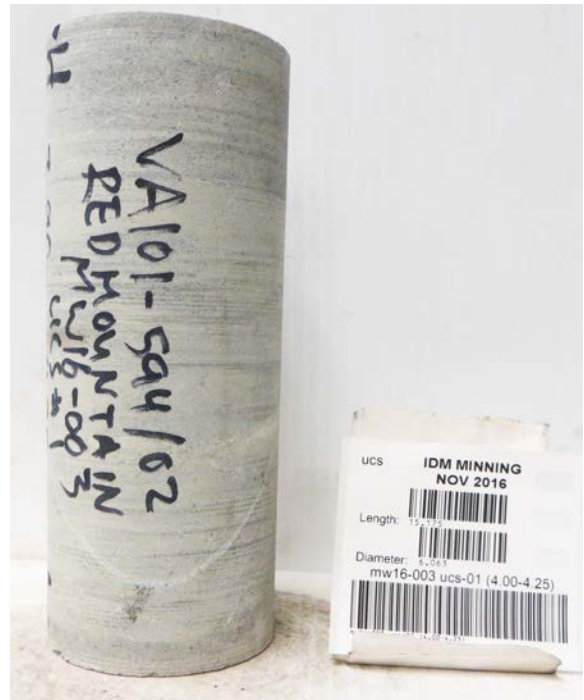
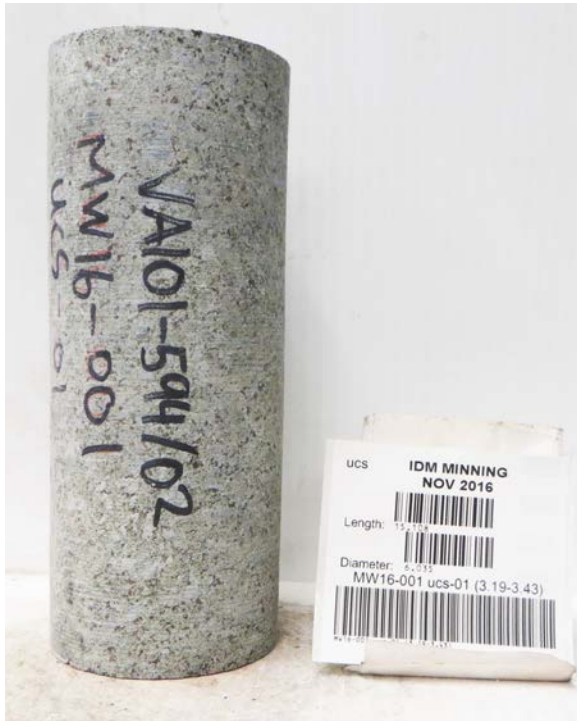
(f) – indicates failure to occur entirely along pre-existing foliation

SPECIMEN PHOTOGRAPHS

Pre-Test Unconfined Compression Specimens

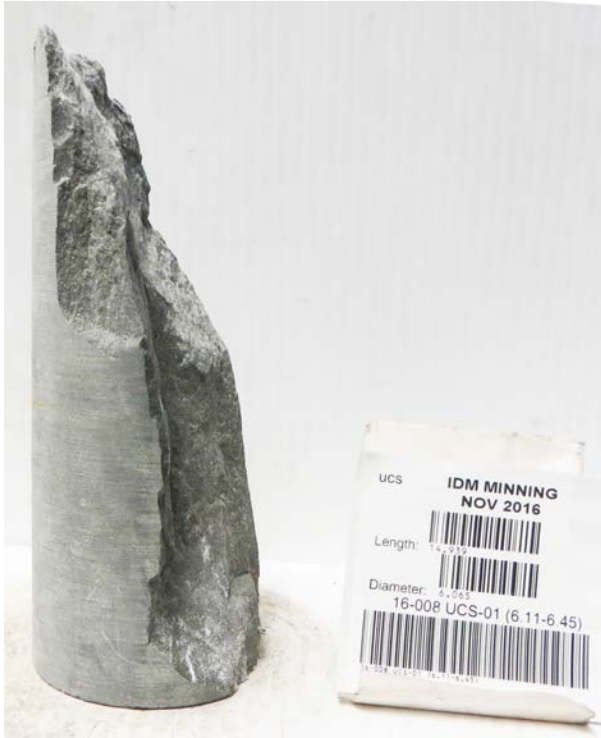


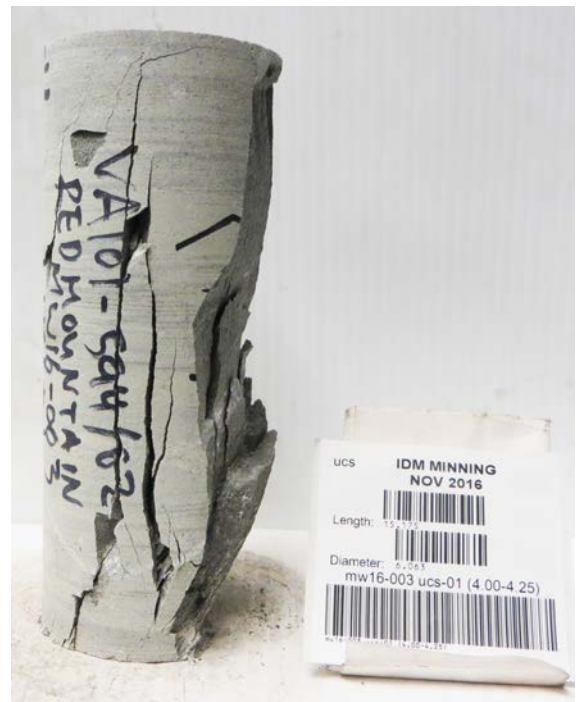
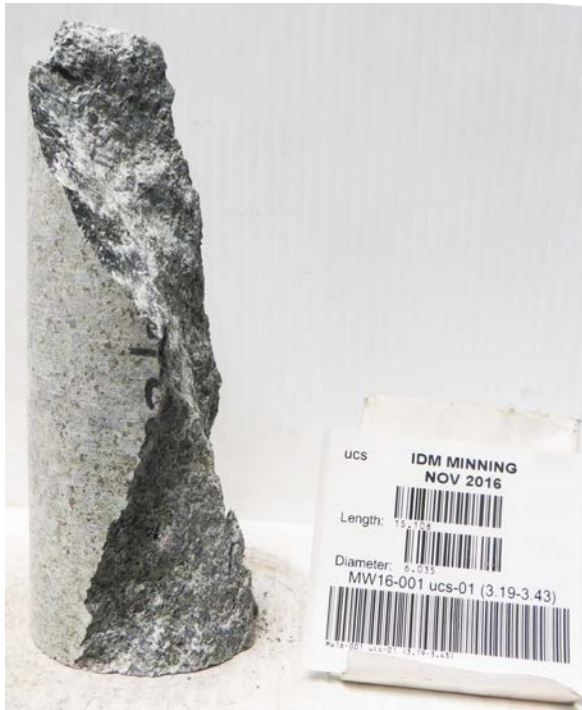




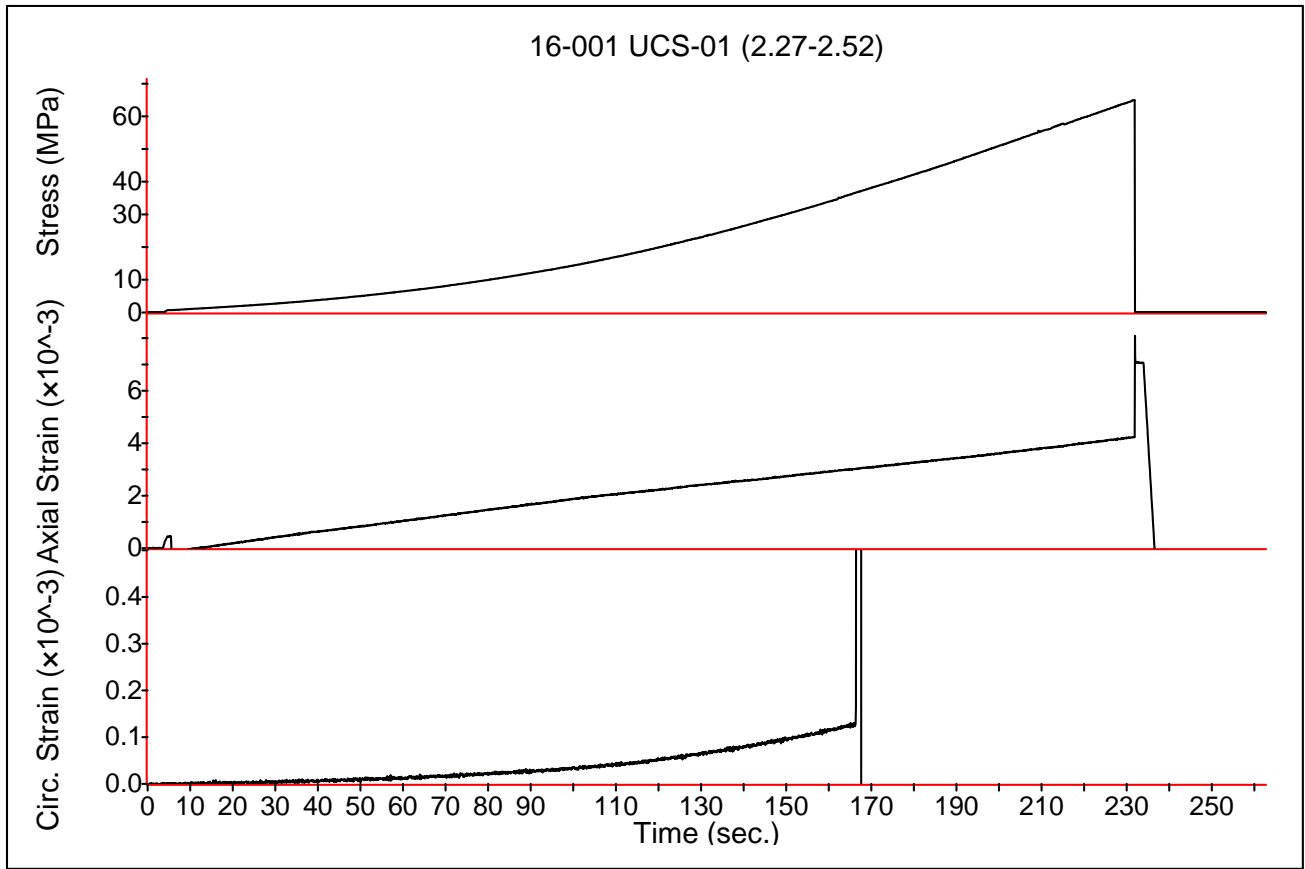
Post-Test Unconfined Compression Specimens







Data Set Properties



Description: 16-001 UCS-01 (2.27-2.52)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

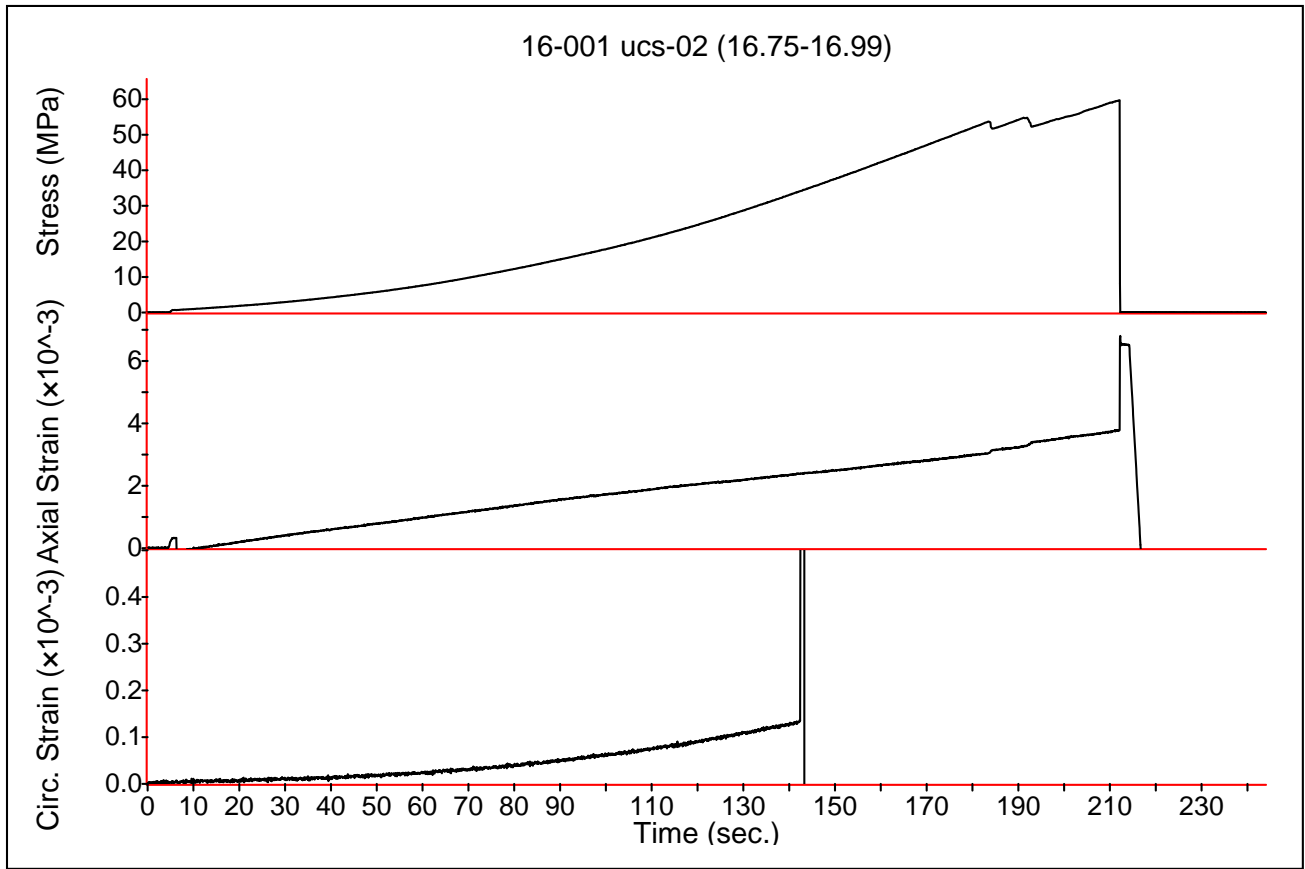
Sample Properties

Shape: Cylinder
 Length (cm): 15.269
 Diameter (cm): 6.085

Analysis Results

Peak Stress: 64.9497 MPa

Data Set Properties



Description: 16-001 ucs-02 (16.75-16.99)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

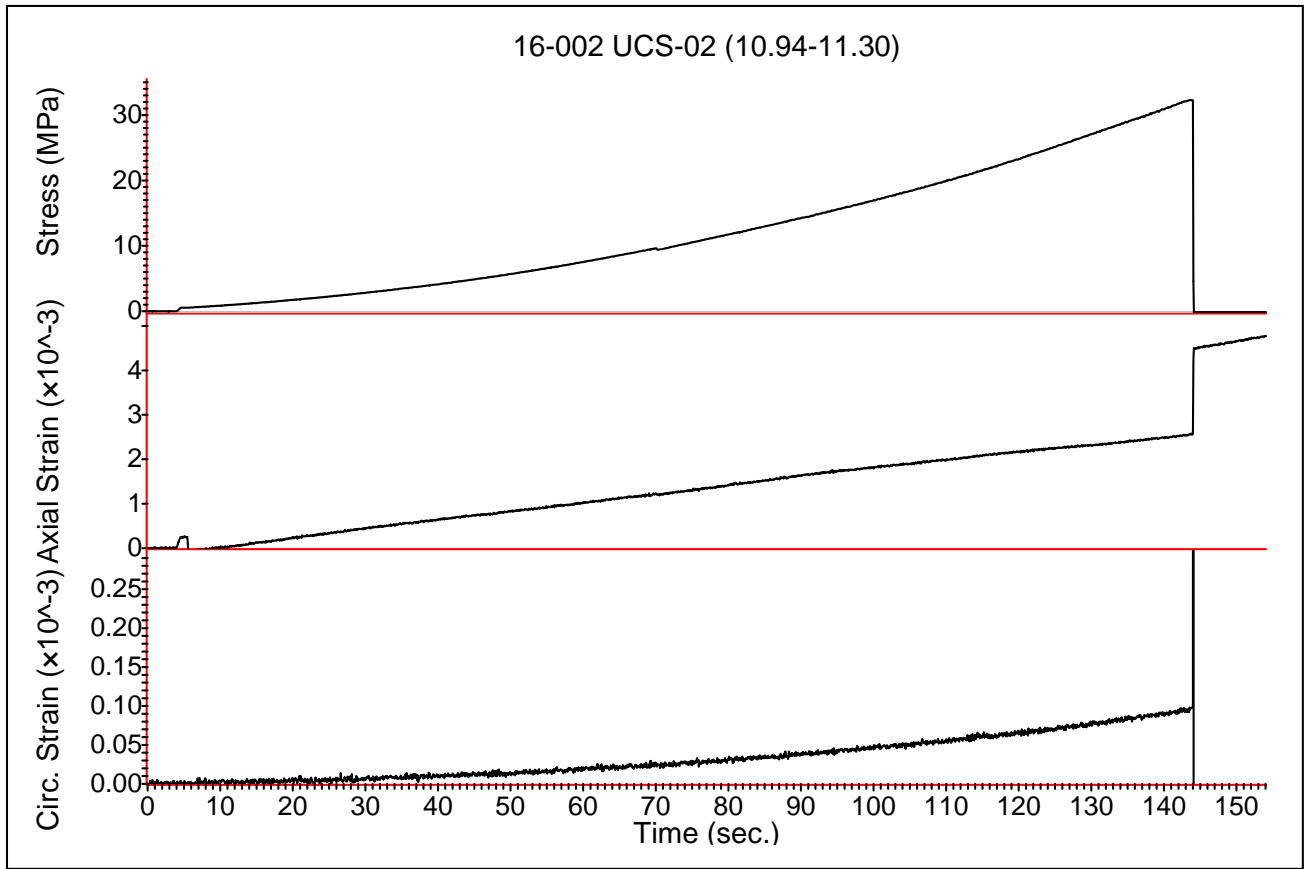
Sample Properties

Shape: Cylinder
 Length (cm): 15.223
 Diameter (cm): 6.086

Analysis Results

Peak Stress: 59.7219 MPa

Data Set Properties



Description: 16-002 UCS-02 (10.94-11.30)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

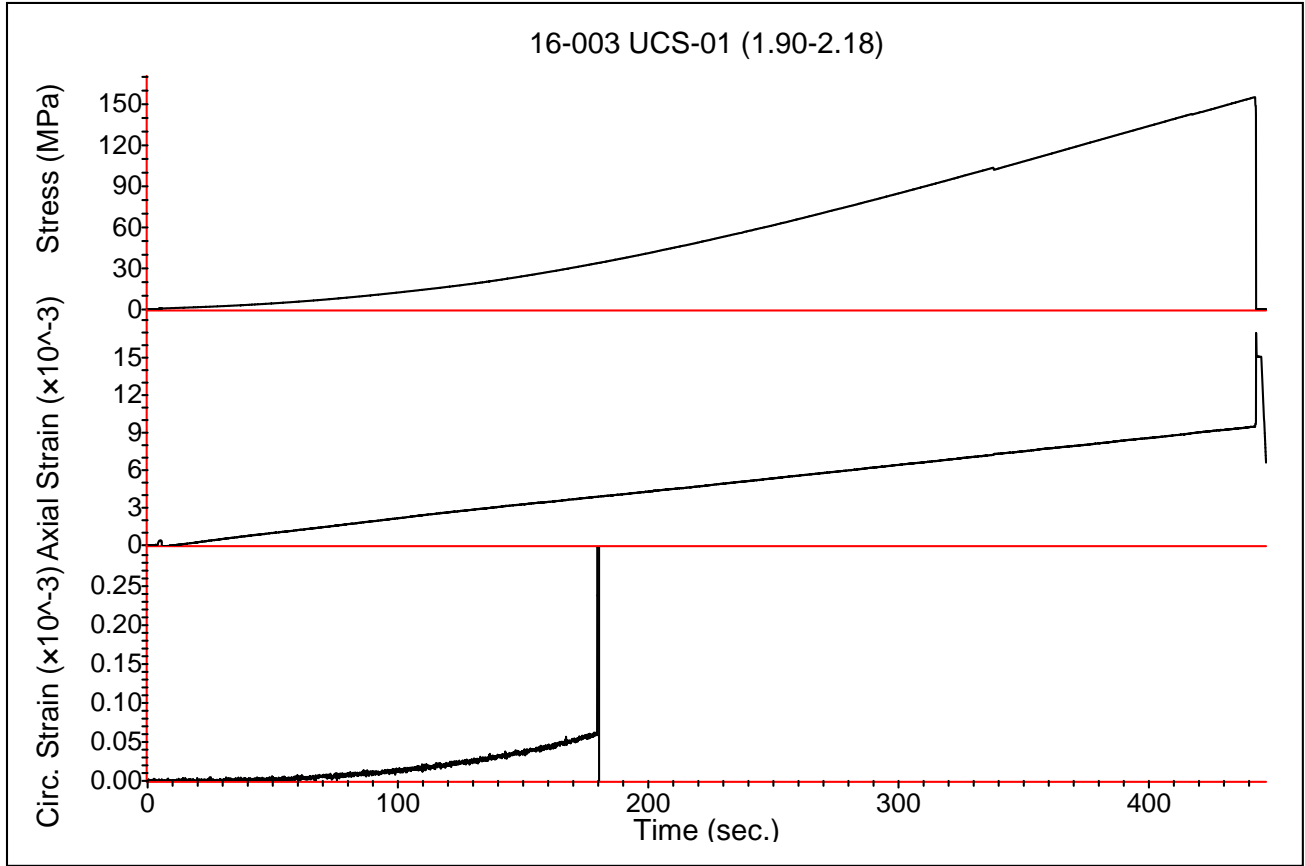
Sample Properties

Shape: Cylinder
 Length (cm): 14.879
 Diameter (cm): 6.087

Analysis Results

Peak Stress: 32.2923 MPa

Data Set Properties



Description: 16-003 UCS-01 (1.90-2.18)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

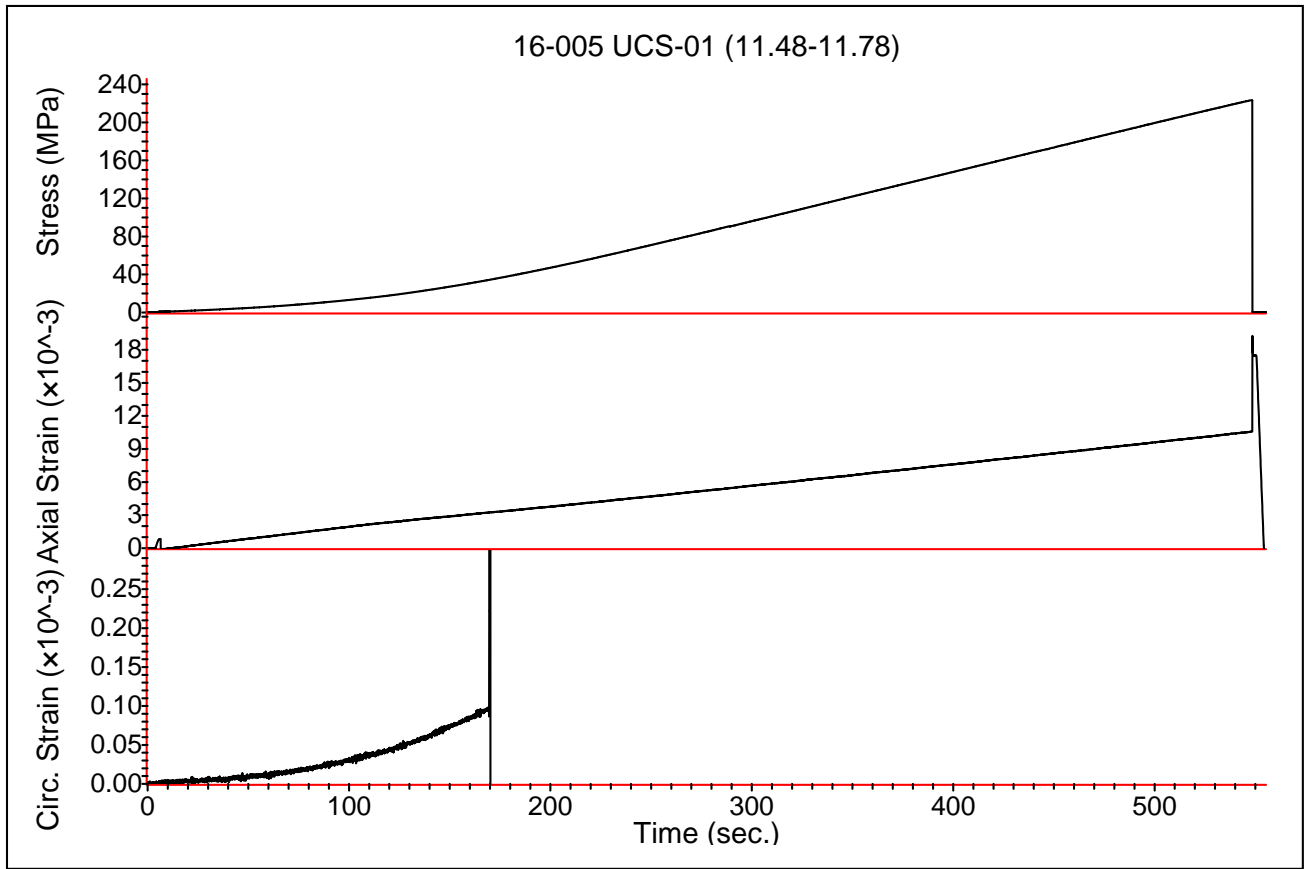
Sample Properties

Shape: Cylinder
 Length (cm): 13.99
 Diameter (cm): 6.075

Analysis Results

Peak Stress: 155.226 MPa

Data Set Properties



Description: 16-005 UCS-01 (11.48-11.78)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

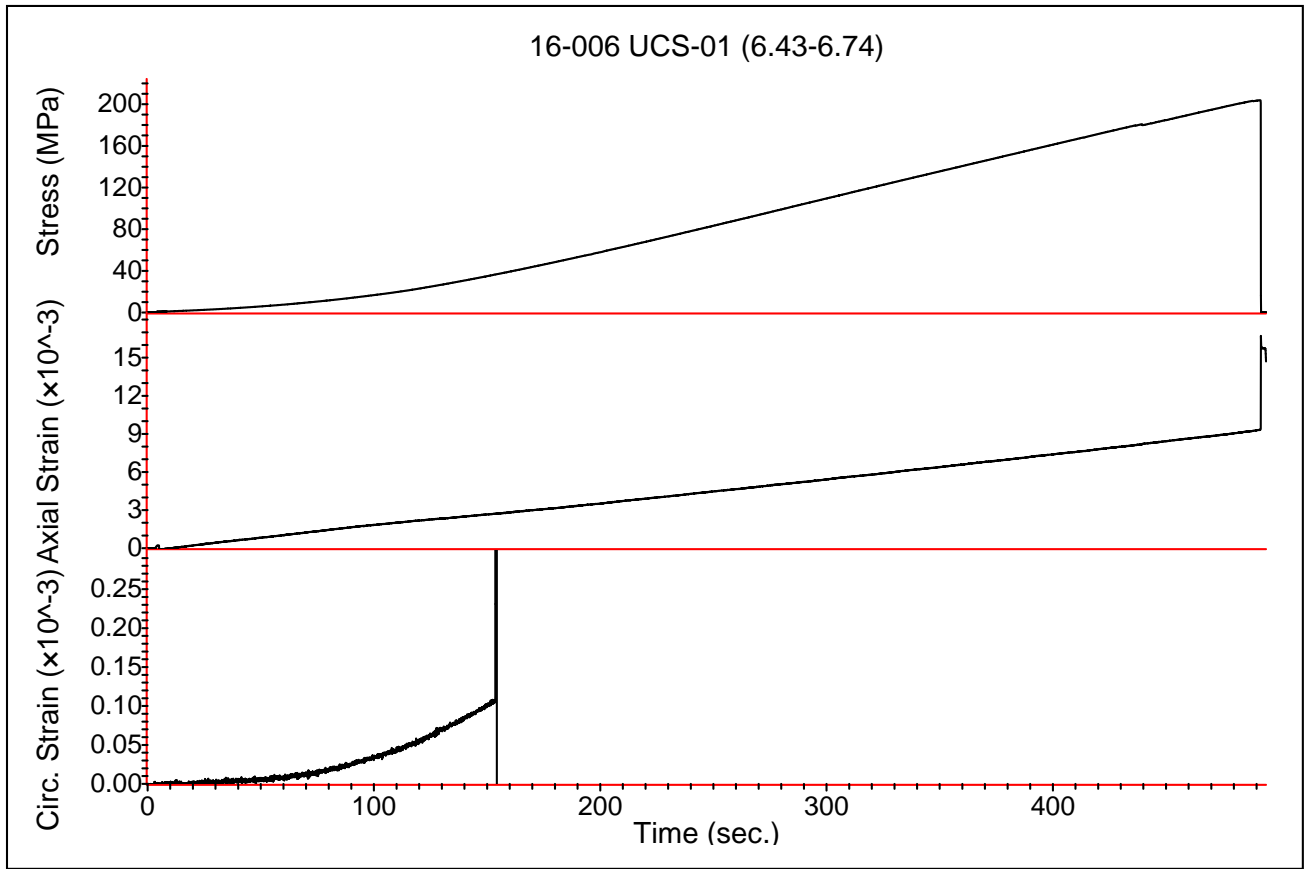
Sample Properties

Shape: Cylinder
 Length (cm): 15.019
 Diameter (cm): 6.107

Analysis Results

Peak Stress: 223.407 MPa

Data Set Properties



Description: 16-006 UCS-01 (6.43-6.74)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

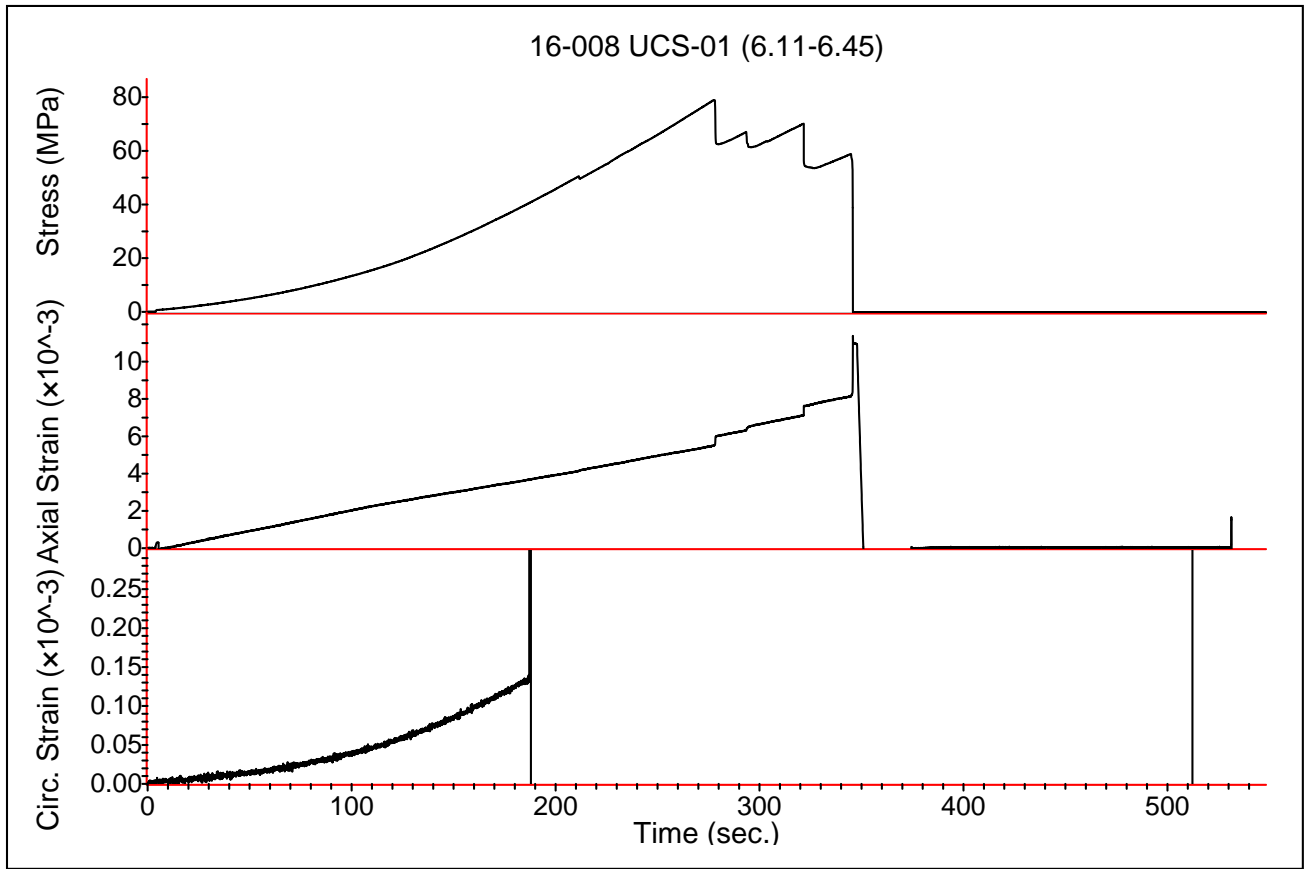
Sample Properties

Shape: Cylinder
 Length (cm): 14.998
 Diameter (cm): 6.096

Analysis Results

Peak Stress: 203.909 MPa

Data Set Properties



Description: 16-008 UCS-01 (6.11-6.45)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

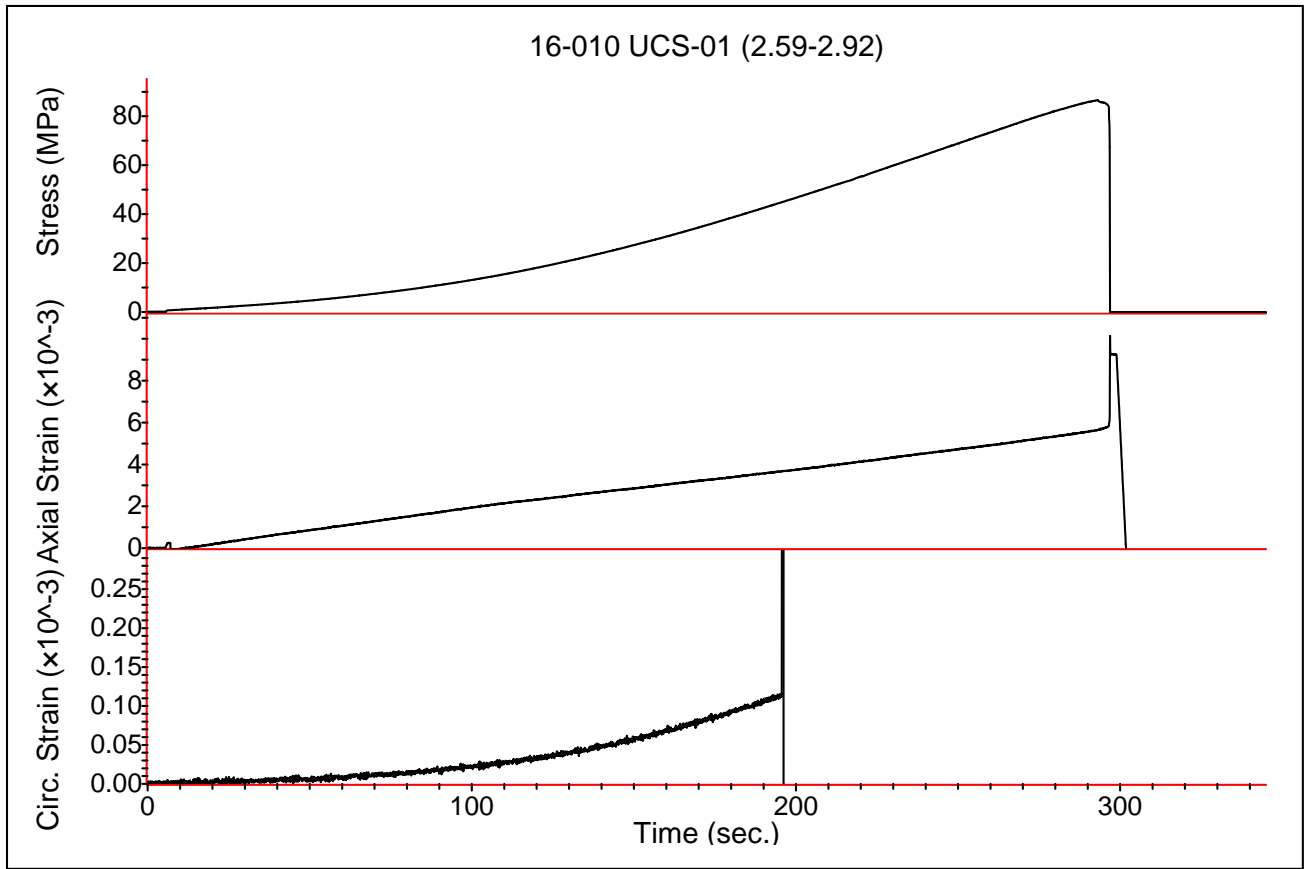
Sample Properties

Shape: Cylinder
 Length (cm): 14.939
 Diameter (cm): 6.065

Analysis Results

Peak Stress: 78.9335 MPa

Data Set Properties



Description: 16-010 UCS-01 (2.59-2.92)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

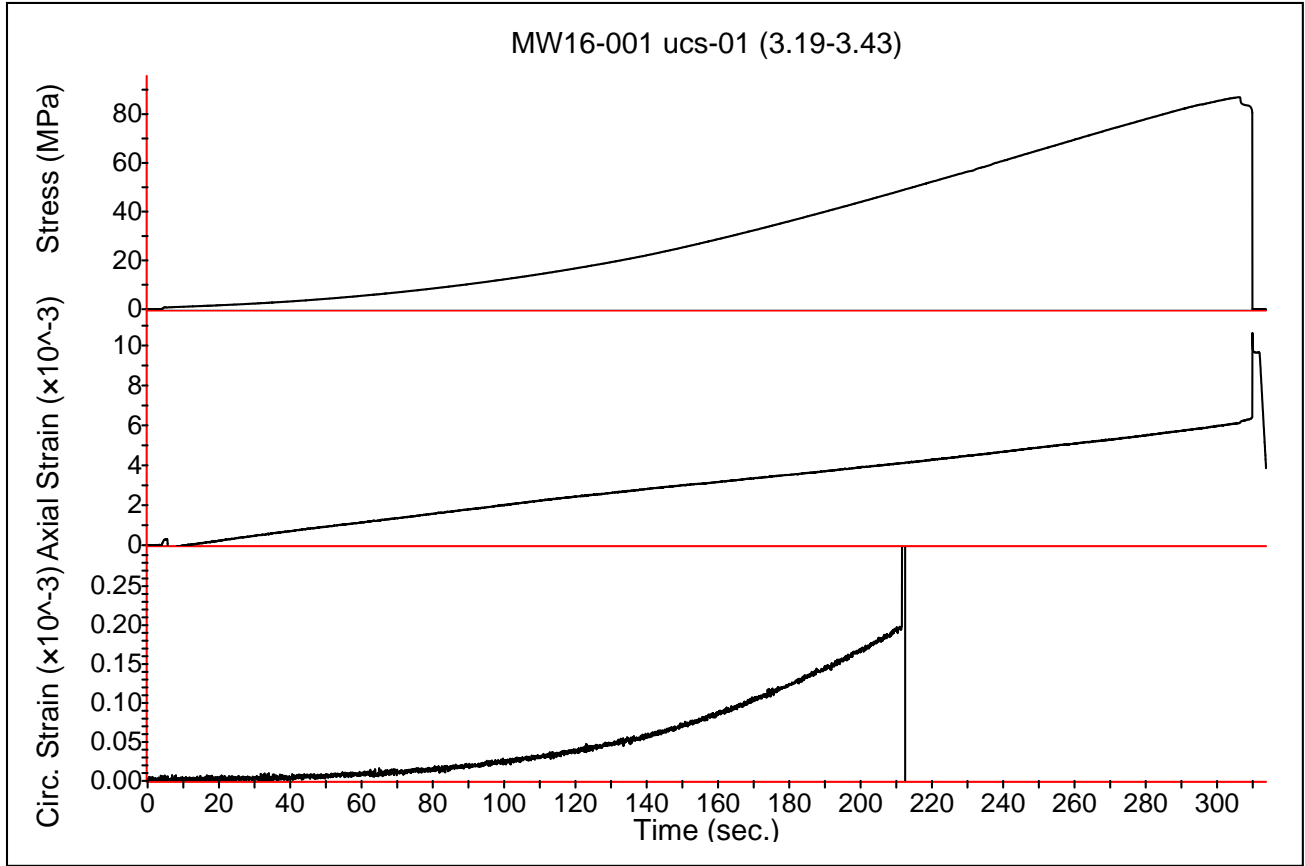
Sample Properties

Shape: Cylinder
 Length (cm): 15.122
 Diameter (cm): 6.11

Analysis Results

Peak Stress: 86.6086 MPa

Data Set Properties



Description: MW16-001 ucs-01 (3.19-3.43)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

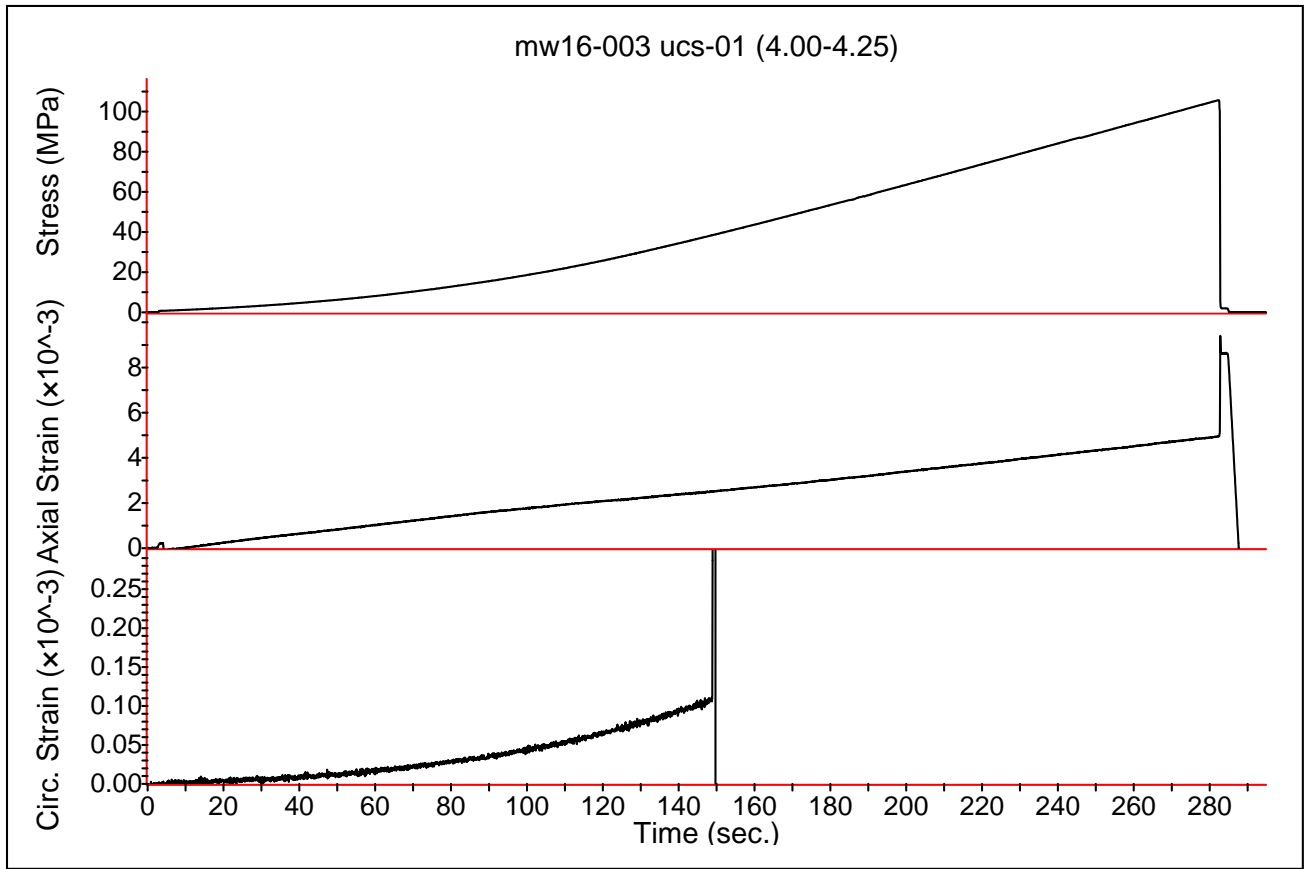
Sample Properties

Shape: Cylinder
 Length (cm): 15.108
 Diameter (cm): 6.035

Analysis Results

Peak Stress: 86.9775 MPa

Data Set Properties



Description: mw16-003 ucs-01 (4.00-4.25)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

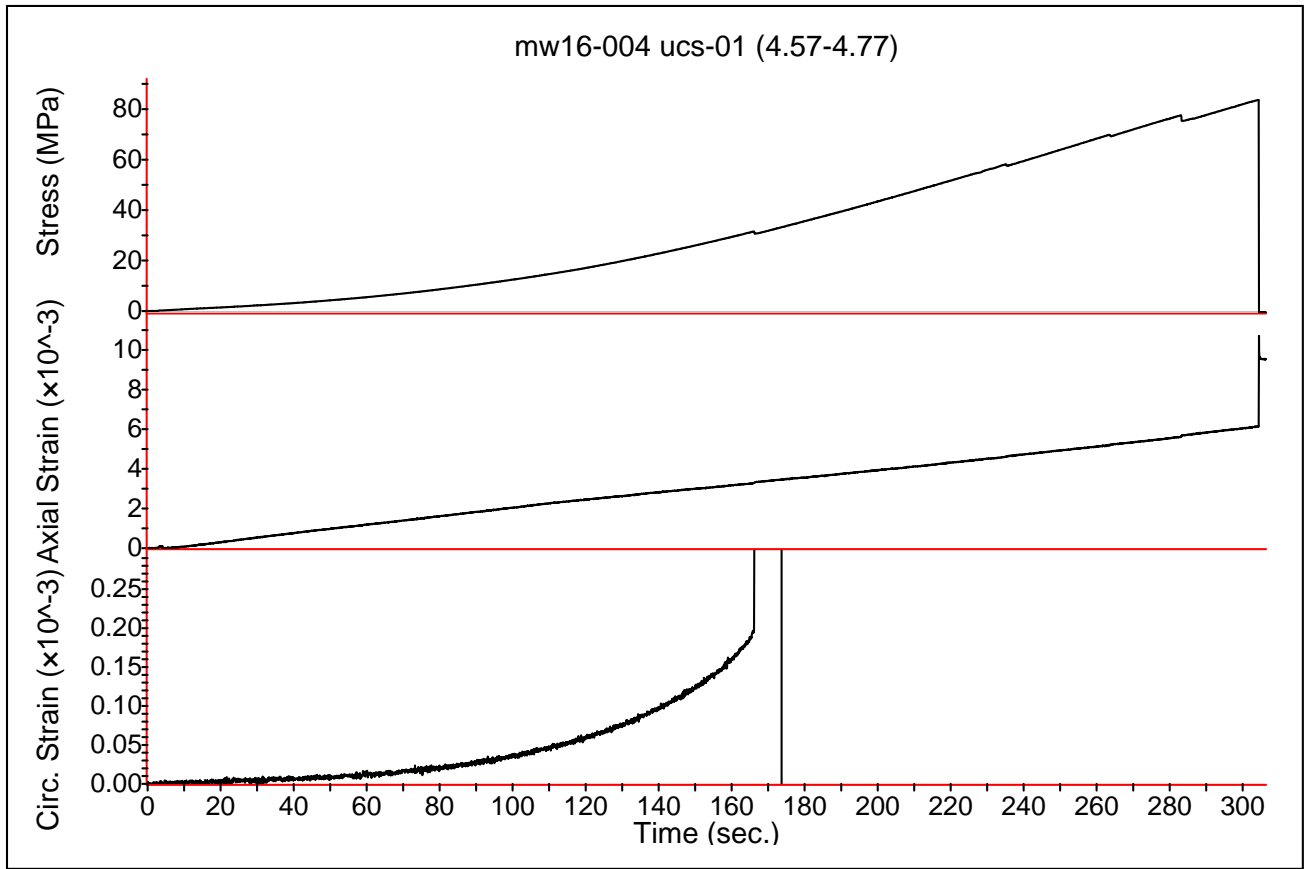
Sample Properties

Shape: Cylinder
 Length (cm): 15.175
 Diameter (cm): 6.063

Analysis Results

Peak Stress: 105.727 MPa

Data Set Properties



Description: mw16-004 ucs-01 (4.57-4.77)

Test Properties

Serial Number:
 Date Created: Thursday, November 10, 2016
 Temperature: 25 °C
 Pressure: 100 Pa
 Atmosphere:
 Sample Position: 0

Sample Properties

Shape: Cylinder
 Length (cm): 15.139
 Diameter (cm): 6.115

Analysis Results

Peak Stress: 83.6297 MPa

APPENDIX F

PHOTOGRAPHS

Appendix F1	Drill Site Photographs
Appendix F2	Core Box Photographs
Appendix F3	Sample Photographs

APPENDIX F1
DRILLHOLE SITE PHOTOGRAPHS
(Pages F1-1 to F1-19)



PHOTO 1 BH16-001 Looking North



PHOTO 2 BH16-001 Looking South



PHOTO 3 BH16-001 Looking East



PHOTO 4 BH16-001 Looking West

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PHOTO 5 BH16-002 Looking North



PHOTO 6 BH16-002 Looking South



PHOTO 7 BH16-002 Looking East



PHOTO 8 BH16-002 Looking West

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PHOTO 9 BH16-003 Looking North



PHOTO 10 BH16-003 Looking South



PHOTO 11 BH16-003 Looking East



PHOTO 12 BH16-003 Looking West

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PHOTO 13 BH16-004 Looking North



PHOTO 14 BH16-004 Looking South



PHOTO 15 BH16-004 Looking East



PHOTO 16 BH16-004 Looking West

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PHOTO 17 BH16-004 Nitrogen Packer Gas Tank Setup



PHOTO 18 BH16-004 Nitrogen Packer Assembly



PHOTO 19 BH16-004 Rock Outcrop - NNW of Drill

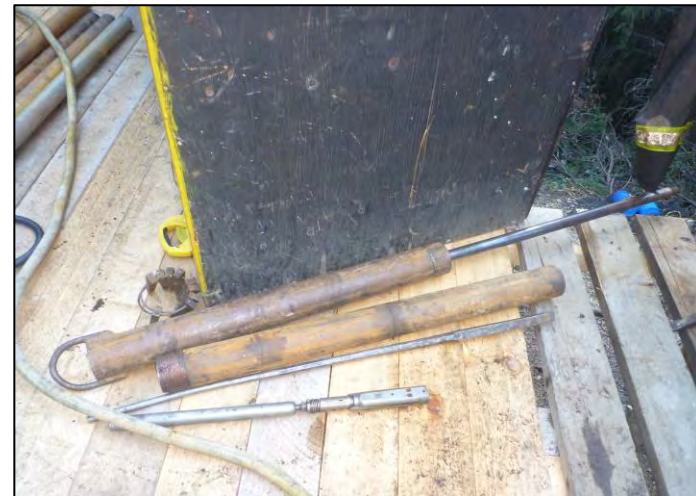


PHOTO 20 BH16-004 SPT Hammer

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PHOTO 21 BH16-004 SPT Split Spoon Sampler



PHOTO 22 BH16-004 Hand Dug Test Pit

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PHOTO 23 BH16-005 Looking North



PHOTO 24 BH16-005 Looking South



PHOTO 25 BH16-005 Looking East



PHOTO 26 BH16-005 Looking West

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PHOTO 27 BH16-006 Looking North



PHOTO 28 BH16-006 Looking South



PHOTO 29 BH16-006 Looking East



PHOTO 30 BH16-006 Looking West

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PHOTO 31 BH16-007 Looking North



PHOTO 32 BH16-007 Looking South



PHOTO 33 BH16-007 Looking East



PHOTO 34 BH16-007 Looking West

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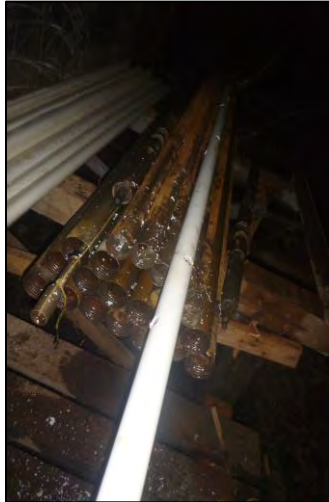


PHOTO 35 BH16-007 Drilled PVC as Tremie



PHOTO 36 BH16-007 VWP Datalogger

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PHOTO 37 BH16-008 Looking North



PHOTO 38 BH16-008 Looking South



PHOTO 39 BH16-008 Looking East

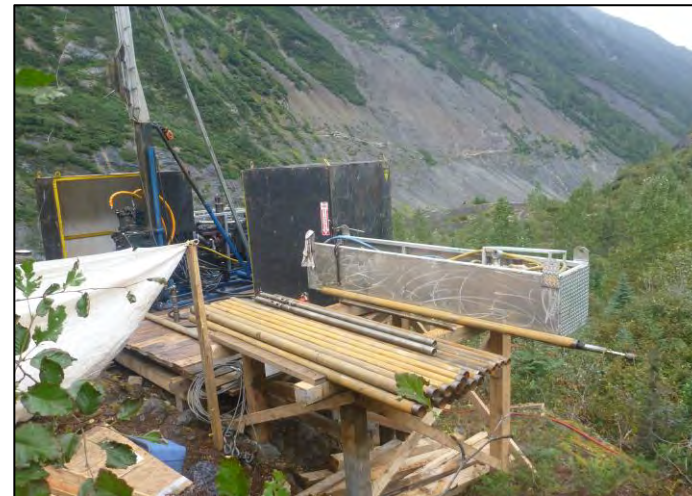


PHOTO 40 BH16-008 Looking West

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PHOTO 41 BH16-009 Looking North



PHOTO 42 BH16-009 Looking South



PHOTO 43 BH16-009 Looking East



PHOTO 44 BH16-009 Looking West

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PHOTO 45 BH16-10 Looking North



PHOTO 46 BH16-10 Looking South



PHOTO 47 BH16-10 Looking East



PHOTO 48 BH16-10 Looking West

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PHOTO 49 MW16-001 Looking North



PHOTO 50 MW16-001 Looking South



PHOTO 51 MW16-001 Looking East



PHOTO 52 MW16-001 Looking West

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PHOTO 53 MW16-002 Looking North



PHOTO 54 MW16-002 Looking South

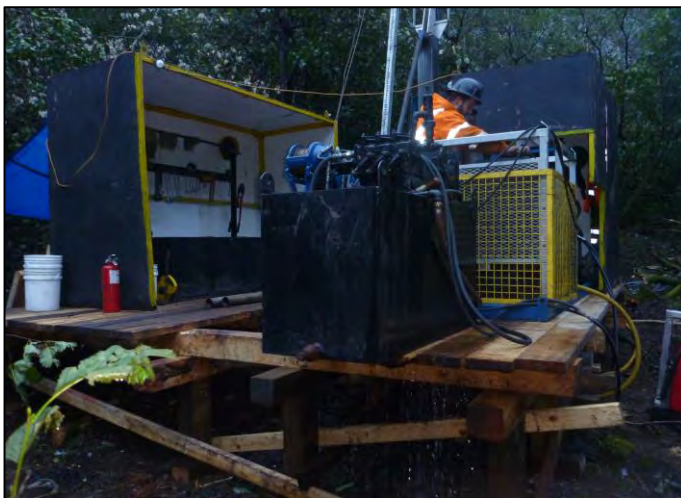


PHOTO 55 MW16-002 Looking East

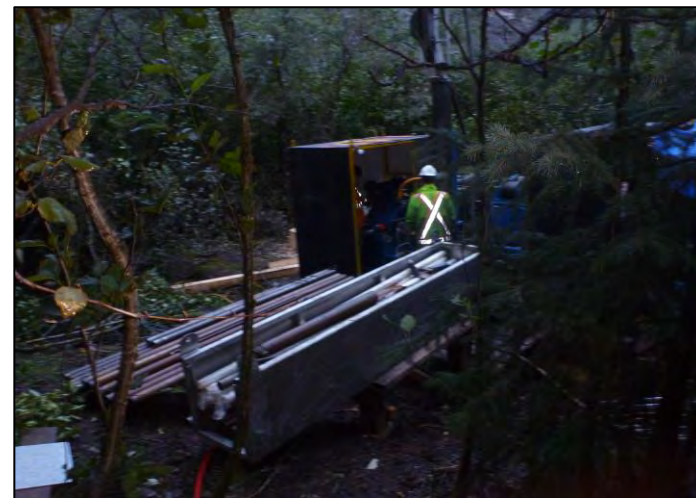


PHOTO 56 MW16-002 Looking West

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PHOTO 57 MW16-002 Completed Standpipe Installation



PHOTO 58 MW16-002 Flowmeter Assembly



PHOTO 59 MW16-002 Nitrogen gas setup

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PHOTO 60 MW16-003 Looking North



PHOTO 61 MW16-003 Looking South



PHOTO 62 MW16-003 Looking East



PHOTO 63 MW16-003 Looking West

IDM MINING LTD.
RED MOUNTAIN GOLD PROJECT

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PHOTO 64 MW16-003 Rock Outcrop NW of Drill



PHOTO 65 MW16-003 Completed Standpipe Installation



PHOTO 66 MW16-003 Nitrogen Packer Flowmeter Assembly

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PHOTO 67 MW16-004 Looking East



PHOTO 68 MW16-004 Looking North



PHOTO 69 MW16-004 Looking South



PHOTO 70 MW16-004 Looking West

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RED MOUNTAIN GOLD PROJECT

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APPENDIX F2

CORE BOX PHOTOGRAPHS

(Pages F2-1 to F2-39)



PHOTO 1 BH16-001 - Box 1-2 - 0.00-6.84 m



PHOTO 2 BH16-001 - Box 3-4 - 6.84-13.15 m



PHOTO 3 BH16-001 - Box 5-6 - 13.15-19.51 m



PHOTO 4 BH16-001 - Box 7-8 - 19.51-25.90 m

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PHOTO 5 BH16-001 - Box 9-10 - 25.90-30.80 m EOH

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RED MOUNTAIN PROJECT

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PHOTO 6 BH16-002 - Box 1-2 - 0.00-6.58 m



PHOTO 7 BH16-002 - Box 3-4 - 6.58-13.06 m



PHOTO 8 BH16-002 - Box 5-6 - 13.06-19.23 m



PHOTO 9 BH16-002 - Box 7-8 - 19.23-25.70 m

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PHOTO 10 BH16-002 - Box 9-10 - 25.70-30.80 m EOH

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PHOTO 11 BH16-003 - Box 1-2 - 0.00-7.47 m



PHOTO 12 BH16-003 - Box 3-4 - 7.47-13.72 m

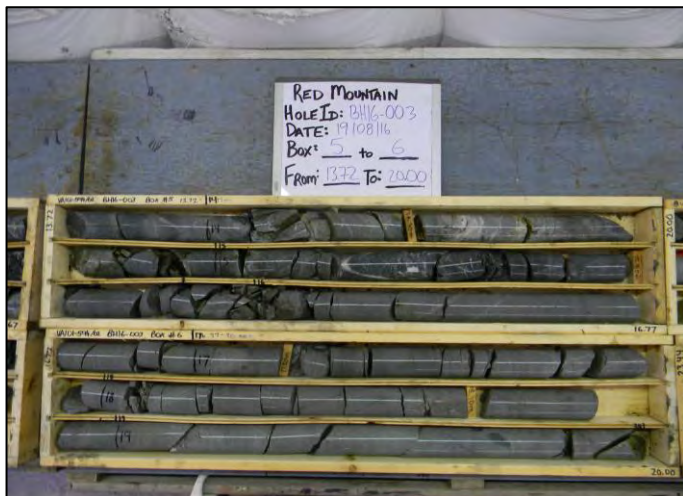


PHOTO 13 BH16-003 - Box 5-6 - 13.72-20.00 m



PHOTO 14 BH16-003 - Box 7-8 - 20.00-26.29 m

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RED MOUNTAIN PROJECT



PHOTO 15 BH16-003 - Box 9-10 - 26.29-31.02 m EOH

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RED MOUNTAIN PROJECT

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PHOTO 16 BH16-004 - Box 1-2 - 0.00-8.05 m



PHOTO 17 BH16-004 - Box 3-4 - 8.05-13.64 m



PHOTO 18 BH16-004 - Box 5-6 - 13.64-20.00 m



PHOTO 19 BH16-004 - Box 7-8 - 20.00-26.21 m

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PHOTO 20 BH16-004 - Box 9-10 - 26.21-30.50 m EOH

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PHOTO 21 BH16-005 - Box 1-2 - 0.00-10.47 m



PHOTO 22 BH16-005 - Box 3-4 - 10.47-17.06 m



PHOTO 23 BH16-005 - Box 5-6 - 17.06-23.45 m



PHOTO 24 BH16-005 - Box 7-8 - 23.45-29.26 m

IDM MINING LTD.
RED MOUNTAIN PROJECT



PHOTO 25 BH16-005 - Box 9-10 - 29.26-35.52 m



PHOTO 26 BH16-005 - Box 11-12 - 35.52-41.44 m



PHOTO 27 BH16-005 - Box 13-14 - 41.44-45.00 m EOH

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RED MOUNTAIN PROJECT

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PHOTO 28 BH16-006 - Box 1-2 - 0.00-7.49 m



PHOTO 29 BH16-006 - Box 3-4 - 7.49-13.50 m



PHOTO 30 BH16-006 - Box 5-6 - 13.50-19.74 m



PHOTO 31 BH16-006 - Box 7-8 - 19.74-26.05 m

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PHOTO 32 BH16-006 - Box 9-10 - 26.05-31.77 m



PHOTO 33 BH16-006 - Box 11 - 31.77-34.90 m EOH

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RED MOUNTAIN PROJECT

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PHOTO 34 BH16-007 - Box 1-2 - 2.40-8.46 m



PHOTO 35 BH16-007 - Box 3-4 - 8.46-14.99 m



PHOTO 36 BH16-007 - Box 5-6 - 14.99-21.07 m



PHOTO 37 BH16-007 - Box 7-8 - 21.07-27.20 m

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PHOTO 38 BH16-007 - Box 9-10 - 27.20-33.63 m



PHOTO 39 BH16-007 - Box 11 - 33.63-34.75 m EOH

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PHOTO 40 BH16-008 - Box 1-2 - 0.00-7.90 m



PHOTO 41 BH16-008 - Box 3-4 - 7.90-14.00 m



PHOTO 42 BH16-008 - Box 5-6 - 14.00-20.50 m



PHOTO 43 BH16-008 - Box 7-8 - 19.20-25.70 m

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RED MOUNTAIN PROJECT



PHOTO 44 BH16-008 - Box 9-10 - 25.70-31.52 m EOH

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PHOTO 45 BH16-009 - Box 1-2 - 0.00-7.00 m



PHOTO 46 BH16-009 - Box 3-4 - 7.00-13.18 m



PHOTO 47 BH16-009 - Box 5-6 - 13.18-18.82 m



PHOTO 48 BH16-009 - Box 7-8 - 18.82-24.86 m

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RED MOUNTAIN PROJECT



PHOTO 49 BH16-009 - Box 9-10 - 24.86-31.55 m



PHOTO 50 BH16-009 - Box 11-12 - 31.55-38.01 m



PHOTO 51 BH16-009 - Box 13-14 - 38.01-44.36 m



PHOTO 52 BH16-009 - Box 15-16 - 44.36-50.91 m

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RED MOUNTAIN PROJECT

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PHOTO 53 BH16-009 - Box 17-18 - 50.91-57.41 m



PHOTO 54 BH16-009 - Box 19-20 - 57.41-64.04 m



PHOTO 55 BH16-009 - Box 21-22 - 64.04-70.31 m



PHOTO 56 BH16-009 - Box 23-24 - 70.31-76.78 m

IDM MINING LTD.
RED MOUNTAIN PROJECT



PHOTO 57 BH16-009 - Box 25-26 - 76.78-83.28 m



PHOTO 58 BH16-009 - Box 27-28 - 83.28-89.31 m

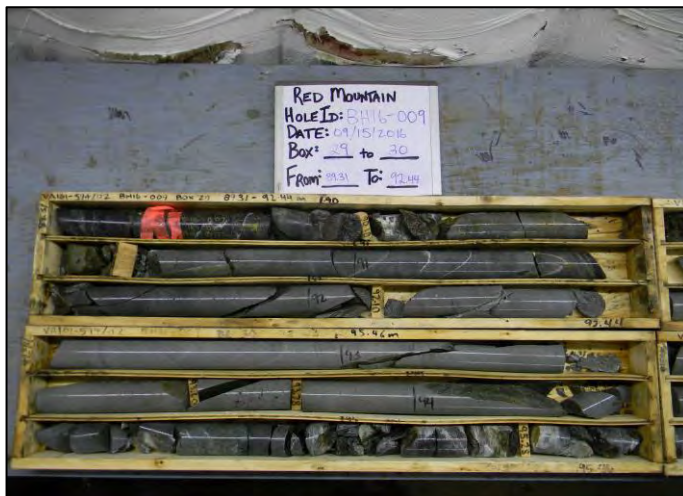


PHOTO 59 BH16-009 - Box 29-30 - 89.31-92.44 m



PHOTO 60 BH16-009 - Box 31-32 - 95.46-101.50 m

IDM MINING LTD.
RED MOUNTAIN PROJECT



PHOTO 61 BH16-009 - Box 33-34 - 101.56-108.04 m



PHOTO 62 BH16-009 - Box 35-36 - 108.04-111.50 m EOH

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RED MOUNTAIN PROJECT

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PHOTO 63 BH16-010 - Box 1-2 - 0.00-6.40 m



PHOTO 64 BH16-010 - Box 3-4 - 6.40-12.39 m



PHOTO 65 BH16-010 - Box 5-6 - 12.39-19.27 m



PHOTO 66 BH16-010 - Box 7-8 - 14.27-25.82 m

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RED MOUNTAIN PROJECT



PHOTO 67 BH16-010 - Box 9-10 - 25.82-32.21 m



PHOTO 68 BH16-010 - Box 11-12 - 32.21-38.98 m



PHOTO 69 BH16-010 - Box 13-14 - 38.78-45.07 m



PHOTO 70 BH16-010 - Box 15-16 - 45.07-51.60 m

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RED MOUNTAIN PROJECT



PHOTO 71 BH16-010 - Box 17-18 - 51.60-58.10 m



PHOTO 72 BH16-010 - Box 19-20 - 58.10-64.44 m



PHOTO 73 BH16-010 - Box 20-21 - 61.30-67.73 m

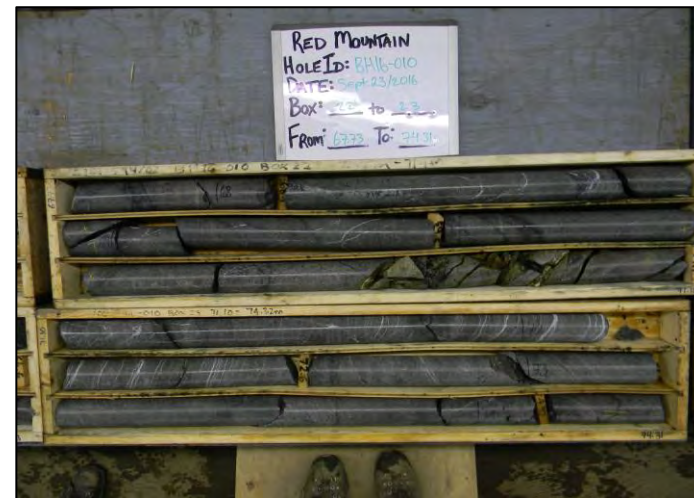


PHOTO 74 BH16-010 - Box 22-23 - 67.73-74.31 m

IDM MINING LTD.
RED MOUNTAIN PROJECT



PHOTO 75 BH16-010 - Box 24-25 - 74.31-80.65 m



PHOTO 76 BH16-010 - Box 26-27 - 80.65-86.35 m



PHOTO 77 BH16-010 - Box 28-29 - 86.33-92.88 m



PHOTO 78 BH16-010 - Box 30 - 92.88-95.60 m EOH

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PHOTO 79 MW16-001 - Box 1-2 - 0.00-6.80 m



PHOTO 80 MW16-001 - Box 3-4 - 6.80-12.77 m



PHOTO 81 MW16-001 - Box 5-6 - 12.77-15.60 m



PHOTO 82 MW16-001 - Box 7-8 - 18.98-25.25 m

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PHOTO 83 MW16-001 - Box 9-10 - 25.25-30.80 m EOH

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PHOTO 84 MW16-002 - Box 1-2 - 0.00-8.92 m



PHOTO 85 MW16-002 - Box 3-4 - 8.92-15.70 m



PHOTO 86 MW16-002 - Box 5-6 - 15.70-22.08 m



PHOTO 87 MW16-002 - Box 7-8 - 22.08-28.50 m

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PHOTO 88 MW16-002 - Box 9-10 - 28.50-32.80 m EOH

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PHOTO 89 MW16-003 - Box 1-2 - 0.00-7.84 m



PHOTO 90 MW16-003 - Box 3-4 - 7.84-13.75 m



PHOTO 91 MW16-003 - Box 5-6 - 13.75-19.70 m



PHOTO 92 MW16-003 - Box 7-8 - 19.70-25.59 m

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PHOTO 93 MW16-003 - Box 9-10 - 25.50-31.27 m EOH

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PHOTO 94 MW16-004 - Box 1 - 0.00-4.24 m



PHOTO 95 MW16-004 - Box 2-3 - 4.24-9.75 m



PHOTO 96 MW16-004 - Box 4-5 - 9.75-16.00 m



PHOTO 97 MW16-004 - Box 6-7 - 16.00-21.99 m

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PHOTO 98 MW16-004 - Box 8-9 - 21.99-28.20 m



PHOTO 99 MW16-004 - Box 10-11 - 28.20-34.14 m



PHOTO 100 MW16-004 - Box 12-13 - 34.14-40.45 m



PHOTO 101 MW16-004 - Box 14-15 - 40.45-45.60 m EOH

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PHOTO 102 DT-273 - Box 1-2 - 0.29-11.86m



PHOTO 103 DT-273 - Box 3-4 - 11.86-23.24m



PHOTO 104 DT-273 - Box 5-6 - 23.24-34.12m



PHOTO 105 DT-273 - Box 7-8 - 34.12-45.50m

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PHOTO 106 DT-273 - Box 9-10 - 45.50-56.82m



PHOTO 107 DT-273 - Box 11-12 - 56.82-67.95m



PHOTO 108 DT-273 - Box 13-15 - 67.95-82.30m EOH

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PHOTO 109 DT-277 - Box 1-4 - 2.44-26.48m



PHOTO 110 DT-277 - Box 5-8 - 26.48-50.08m



PHOTO 111 DT-277 - Box 9-12 - 50.08-73.30m



PHOTO 112 DT-277 - Box 13-16 - 73.30-92.26m EOH

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PHOTO 113 DT-280 - Box 2-5 - 8.64-32.34m



PHOTO 114 DT-280 - Box 6-9 - 32.34-55.78m



PHOTO 115 DT-280 - Box 10-12 - 55.78-72.85m



PHOTO 116 DT-280 - Box 13-15 - 72.85-85.03m EOH

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PHOTO 117 DT-282 - Box 1-2 - 2.84-14.94m



PHOTO 118 DT-282 - Box 3-4 - 14.94-26.11m



PHOTO 119 DT-282 - Box 5-7 - 26.11-45.42m



PHOTO 120 DT-282 - Box 8-10 - 45.42-62.17m

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PHOTO 121 DT-282 - Box 11-13 - 62.17-79.62m



PHOTO 122 DT-282 - Box 14-16 - 79.62-96.48m



PHOTO 123 DT-282 - Box 17-20 - 96.48-113.99m EOH

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APPENDIX F3
SAMPLE PHOTOGRAPHS
(Pages F3-1 to F3-21)

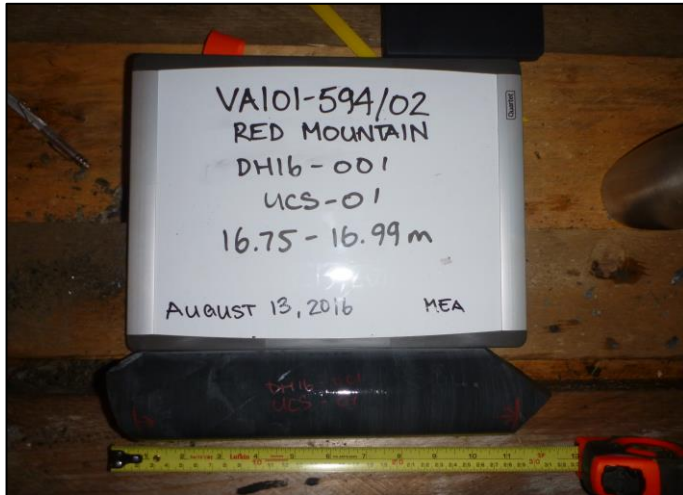


PHOTO 1 BH16-001 UCS-01 16.75-16.99m



PHOTO 2 BH16-001 UCS-02 27.80-28.14m

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PHOTO 3 BH16-002 UCS-01 5.30-5.59m



PHOTO 4 BH16-002 UCS-02 10.99-11.30m



PHOTO 5 BH16-002 UCS-03 29.80-30.03m

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PHOTO 6 BH16-003 UCS-01 1.90-2.19m

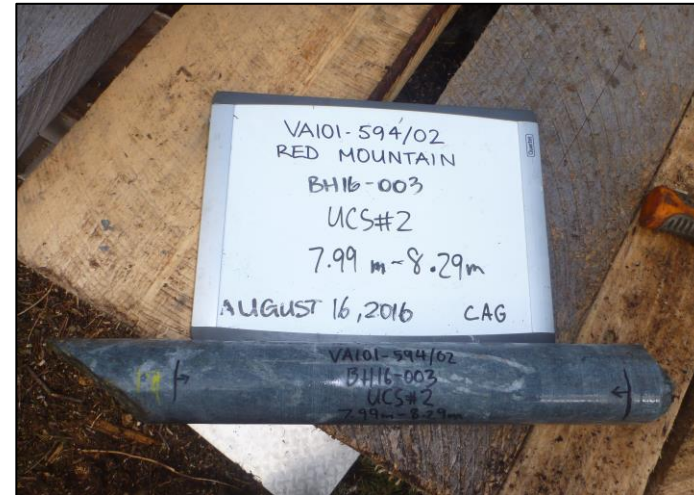


PHOTO 7 BH16-003 UCS-02 7.99-8.29m



PHOTO 8 BH16-003 UCS-03 21.01-21.29m

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PHOTO 9 BH16-004 SPT-01 0.00-0.43m



PHOTO 10 BH16-004 UCS-01 0.71-1.00m



PHOTO 11 BH16-004 UCS-02 1.69-1.99m



PHOTO 12 BH16-004 UCS-03 14.83-15.13m

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PHOTO 13 BH16-004 UCS-04 17.69-18.00m

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PHOTO 14 BH16-005 GS-01 0.00-0.61m



PHOTO 15 BH16-005 GS-02 0.61-1.35m



PHOTO 16 BH16-005 SPT-01 0.00-0.61m

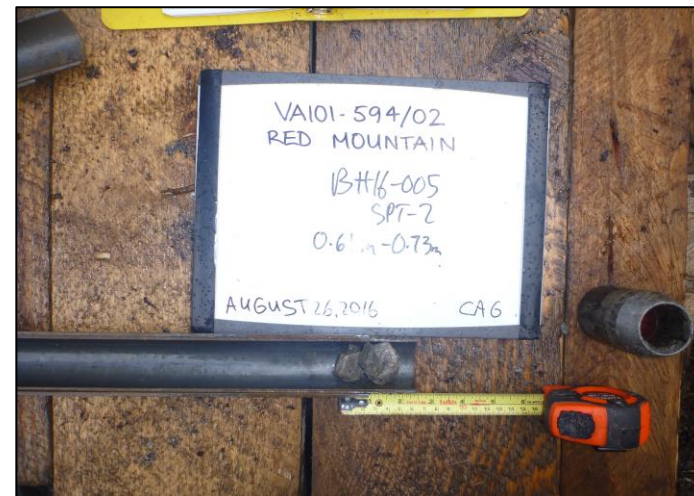


PHOTO 17 BH16-005 SPT-02 0.61-0.73m

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PHOTO 18 BH16-005 UCS-01 11.48-11.78m

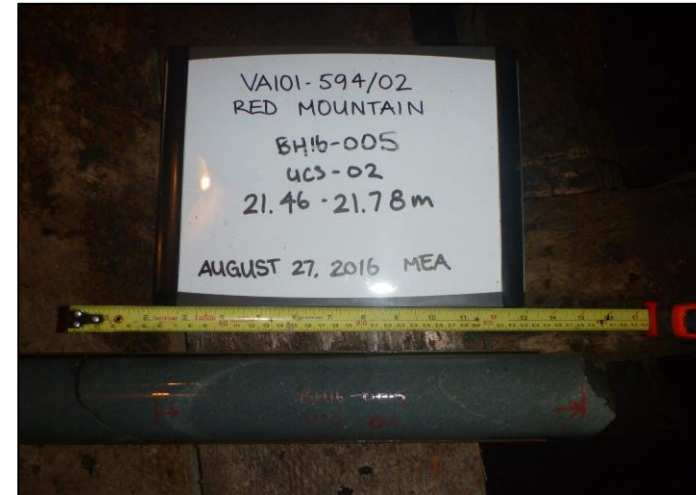


PHOTO 19 BH16-005 UCS-02 21.46-21.78m



PHOTO 20 BH16-005 UCS-03 28.66-28.88m



PHOTO 21 BH16-005 UCS-04 43.84-44.40m

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29JUN'17



PHOTO 22 BH16-006 SPT-01 0.00-0.24m

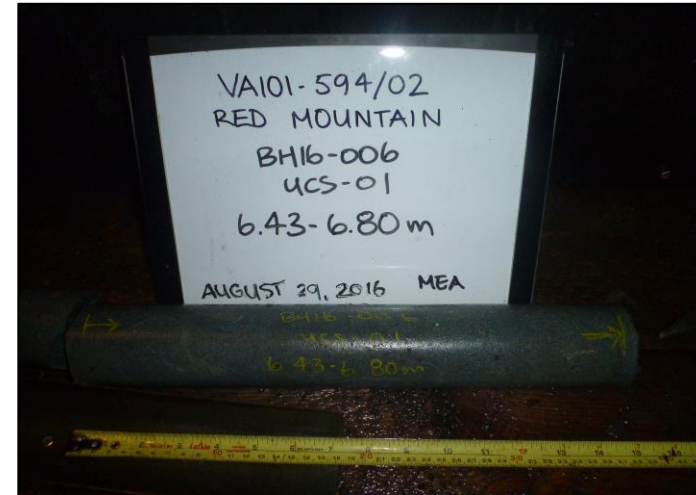


PHOTO 23 BH16-006 UCS-01 6.43-6.80m

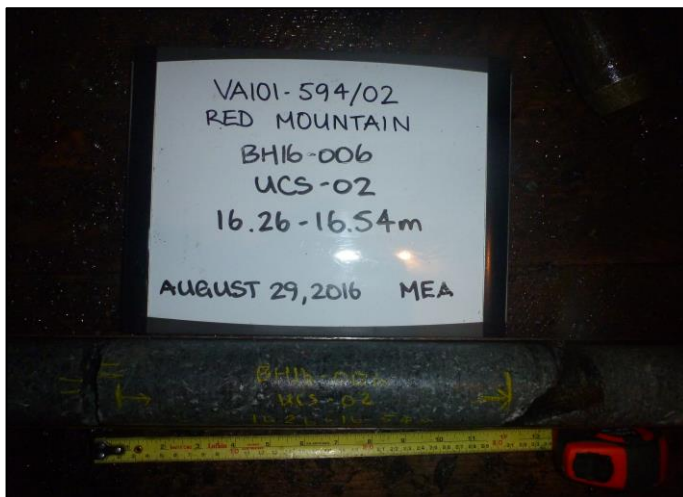


PHOTO 24 BH16-006 UCS-02 16.26-16.54m



PHOTO 25 BH16-006 UCS-03 30.84-31.10m

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29JUN'17



PHOTO 26 BH16-007 SPT-01 0.00-0.61m

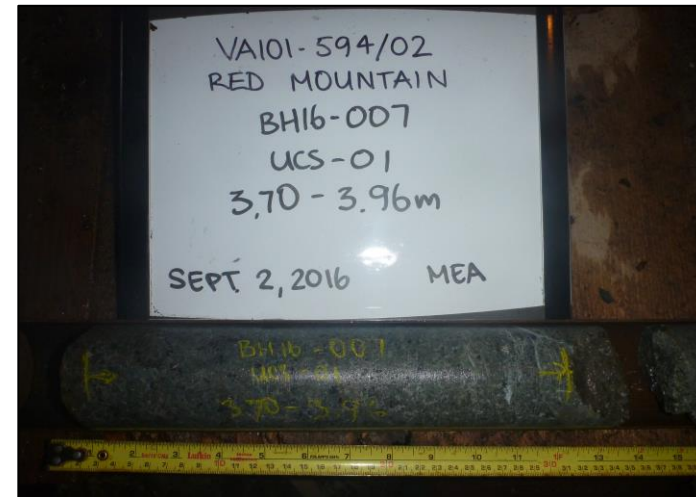


PHOTO 27 BH16-007 UCS-01 3.70-3.96m



PHOTO 28 BH16-007 UCS-02 26.06-26.38m

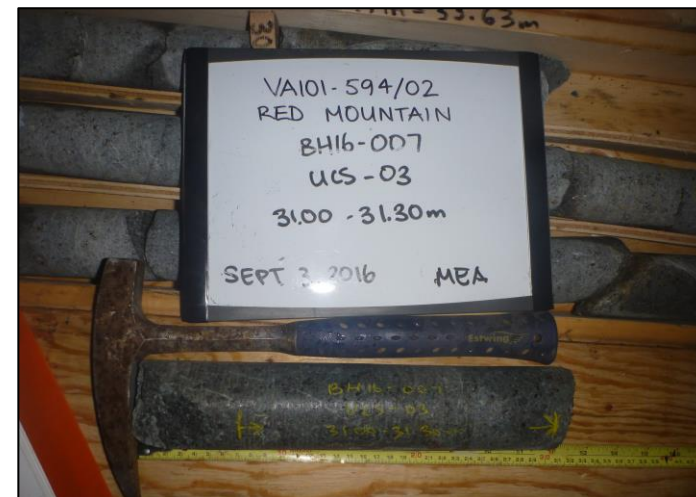


PHOTO 29 BH16-007 UCS-03 31.00-31.30m

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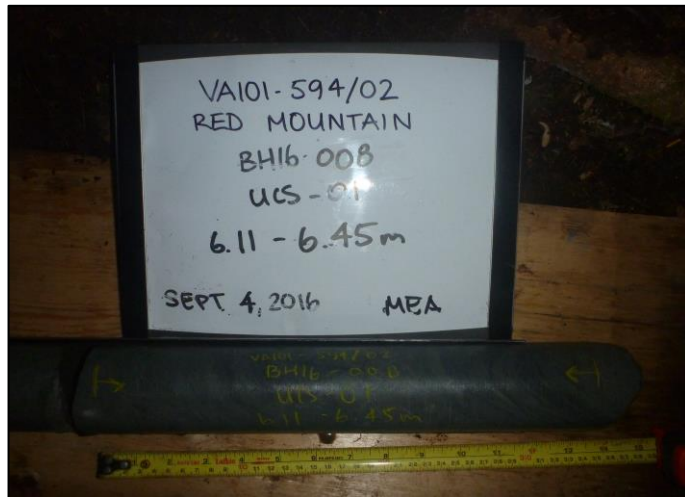


PHOTO 30 BH16-008 UCS-01 6.11-6.45m



PHOTO 31 BH16-008 UCS-02 28.95-29.52m

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Rev 0
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PHOTO 32 BH16-009 UCS-01 9.60-9.95m



PHOTO 33 BH16-009 UCS-02 19.80-20.10m

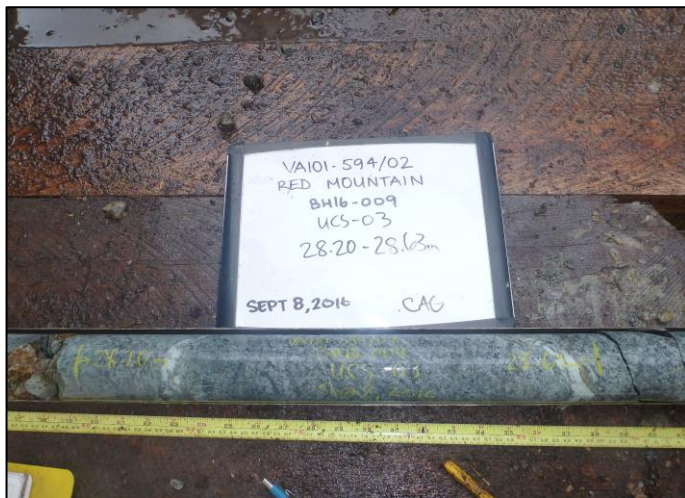


PHOTO 34 BH16-009 UCS-03 28.20 - 28.63m

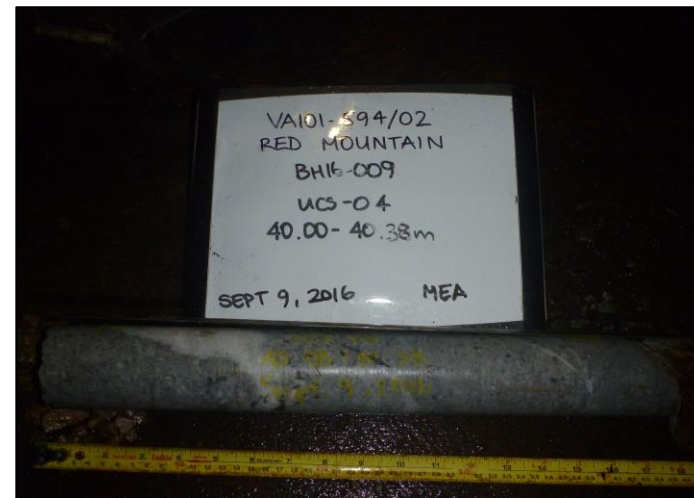


PHOTO 35 BH16-009 UCS-04 40.00-40.38m

**IDM MINING LTD.
RED MOUNTAIN PROJECT**

VA101-594/2
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PHOTO 36 BH16-009 UCS-05 77.35-77.89m

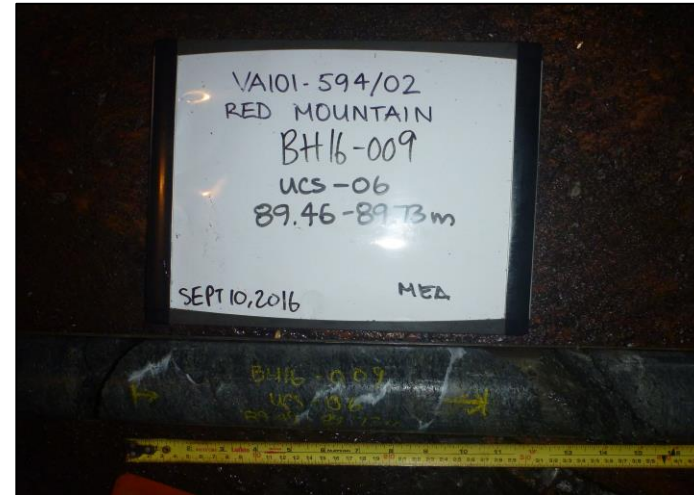


PHOTO 37 BH16-009 UCS-06 89.46-89.73m

IDM MINING LTD.
RED MOUNTAIN PROJECT

VA101-594/2
Rev 0
29JUN'17



PHOTO 38 BH16-010 UCS-01 2.48-2.92m

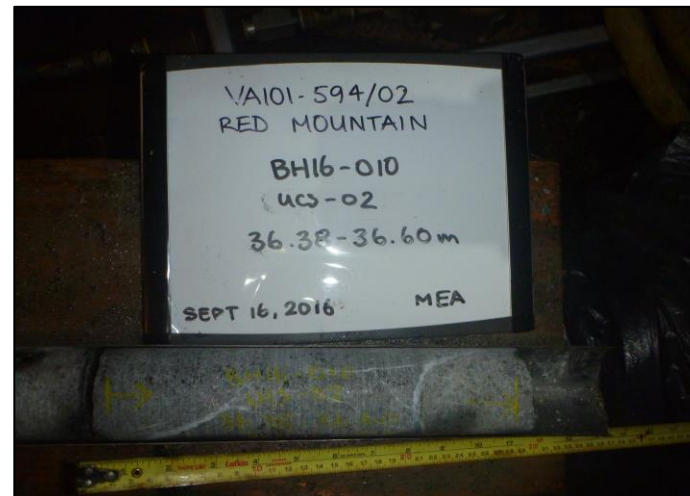


PHOTO 39 BH16-010 UCS-02 36.38-36.60m

**IDM MINING LTD.
RED MOUNTAIN PROJECT**

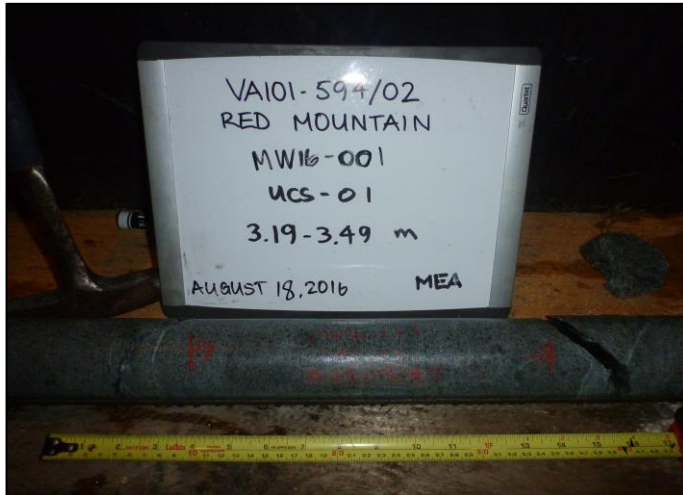


PHOTO 40 MW16-001 UCS-01 3.19-3.49m

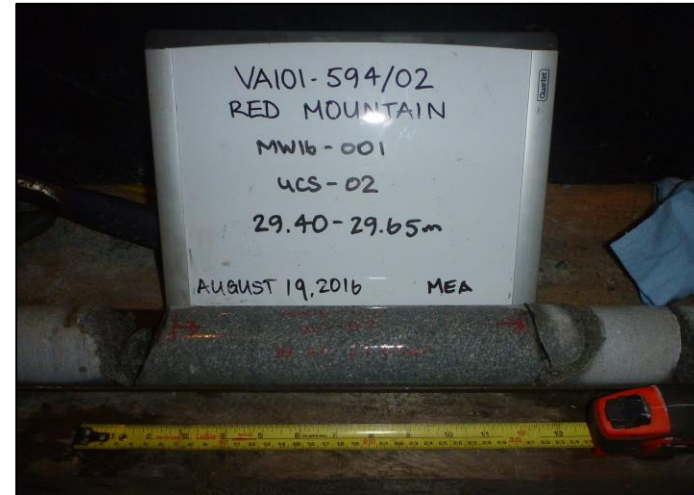


PHOTO 41 MW16-001 UCS-02 29.40-29.65m

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PHOTO 42 MW16-002 UCS-01 10.54-10.77m



PHOTO 43 MW16-002 UCS-02 31.20-31.57m

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PHOTO 44 MW16-003 GS-01 0.00-1.14m



PHOTO 45 MW16-003 SPT-01 0.00-0.61m



PHOTO 46 MW16-003 SPT-02 0.61-1.22m



PHOTO 47 MW16-003 UCS-01 3.90-4.25m

IDM MINING LTD.
RED MOUNTAIN PROJECT

VA101-594/2
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PHOTO 48 MW16-003 UCS-02 5.06-5.29m

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RED MOUNTAIN PROJECT**

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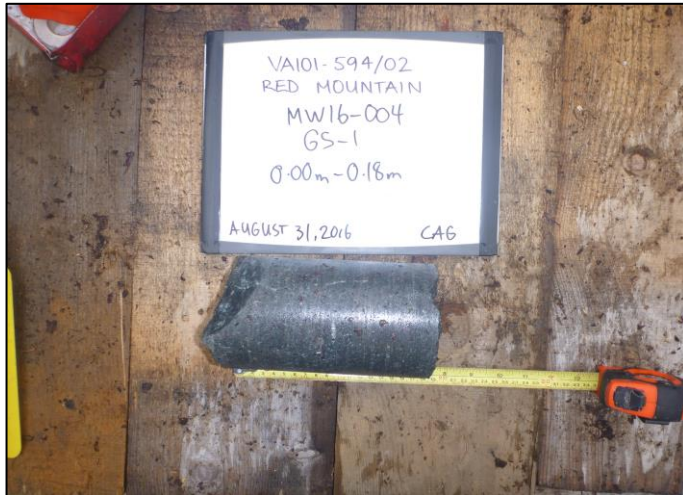


PHOTO 49 MW16-004 GS-01 0.00-0.18m

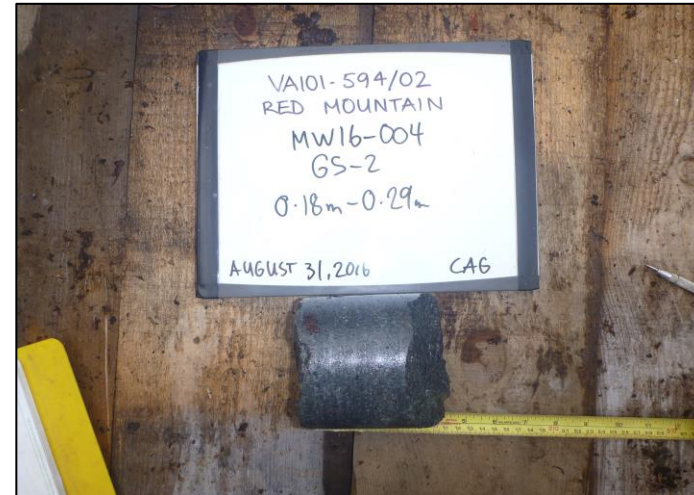


PHOTO 50 MW16-004 GS-02 0.18-0.29m



PHOTO 51 MW16-004 GS-03 0.29-0.41m



PHOTO 52 MW16-004 GS-04 0.41-1.41m

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RED MOUNTAIN PROJECT**

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PHOTO 53 MW16-004 UCS-01 4.57-4.77m

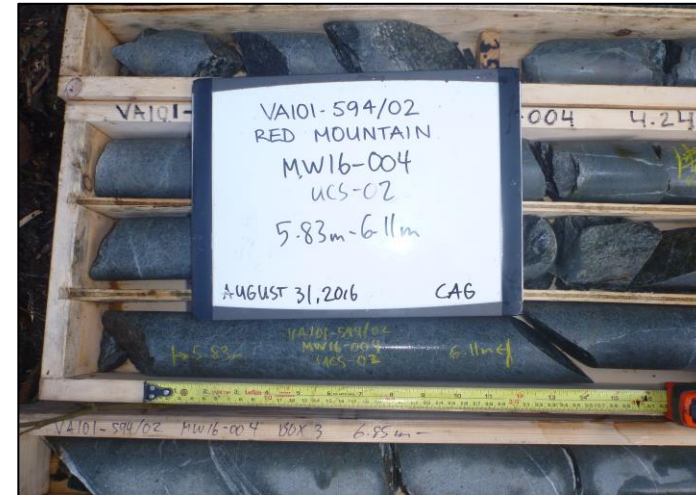


PHOTO 54 MW16-004 UCS-02 5.83-6.11m



PHOTO 55 MW16-004 UCS-03 6.83-7.07m



PHOTO 56 MW16-004 UCS-04 19.38-19.83m

IDM MINING LTD.
RED MOUNTAIN PROJECT

VAI01-594/2
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PHOTO 57 MW16-004 UCS-05 39.65-39.93m

IDM MINING LTD.
RED MOUNTAIN PROJECT

VA101-594/2
Rev 0
29JUN'17



PHOTO 58 DT-273 UCS-01 27.60m-27.93m



PHOTO 59 DT-280 UCS-01 20.30m-20.51m



PHOTO 60 DT-282 UCS-01 14.59m-14.80m

IDM MINING LTD.
RED MOUNTAIN PROJECT

VA101-594/2
Rev 0
29JUN'17

APPENDIX G

HYDRAULIC CONDUCTIVITY TESTING DATA SHEETS

(Pages G-1 to G-71)

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-003

AREA: Bromley Humps TMF North Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 16.34 4.98 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

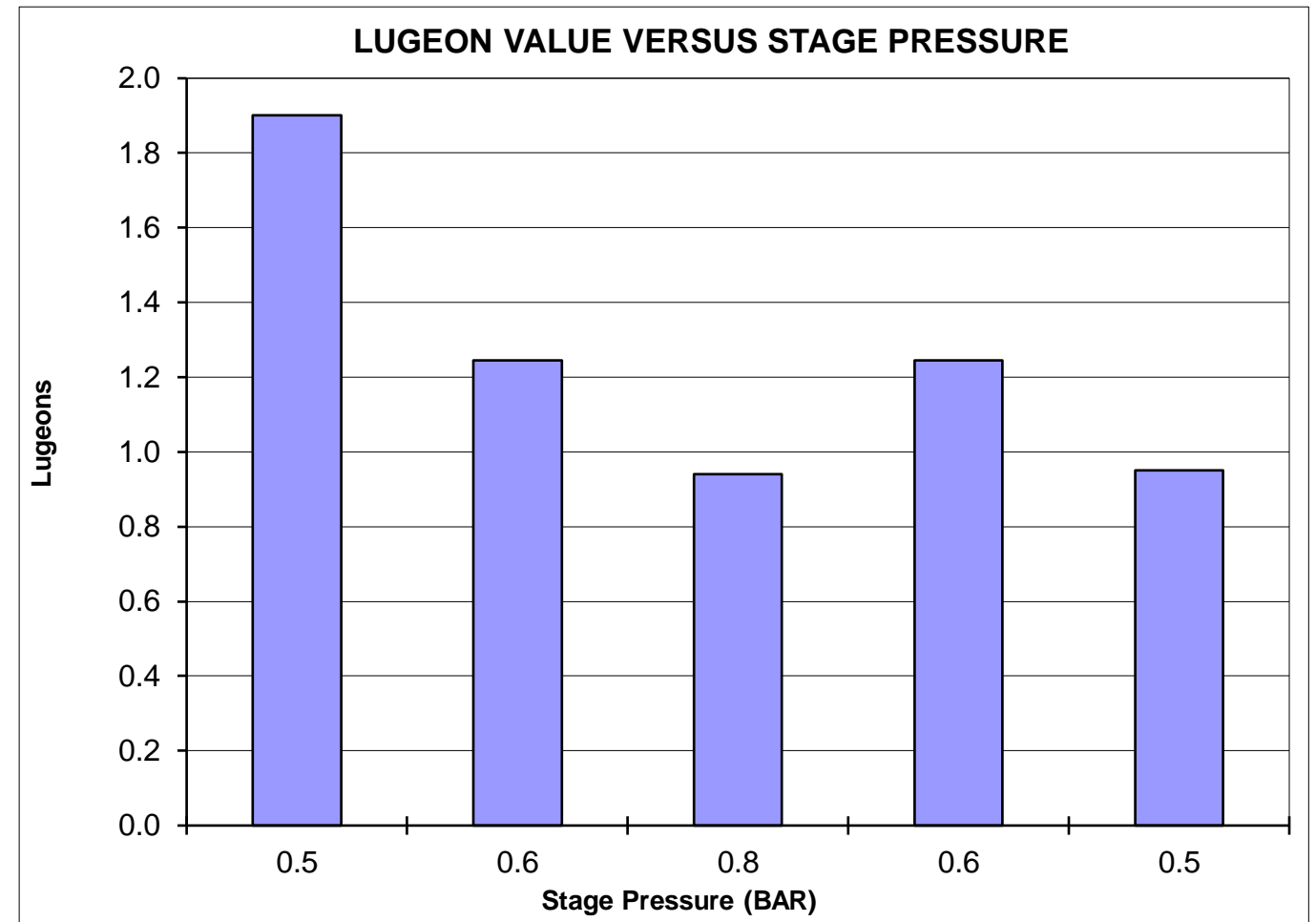
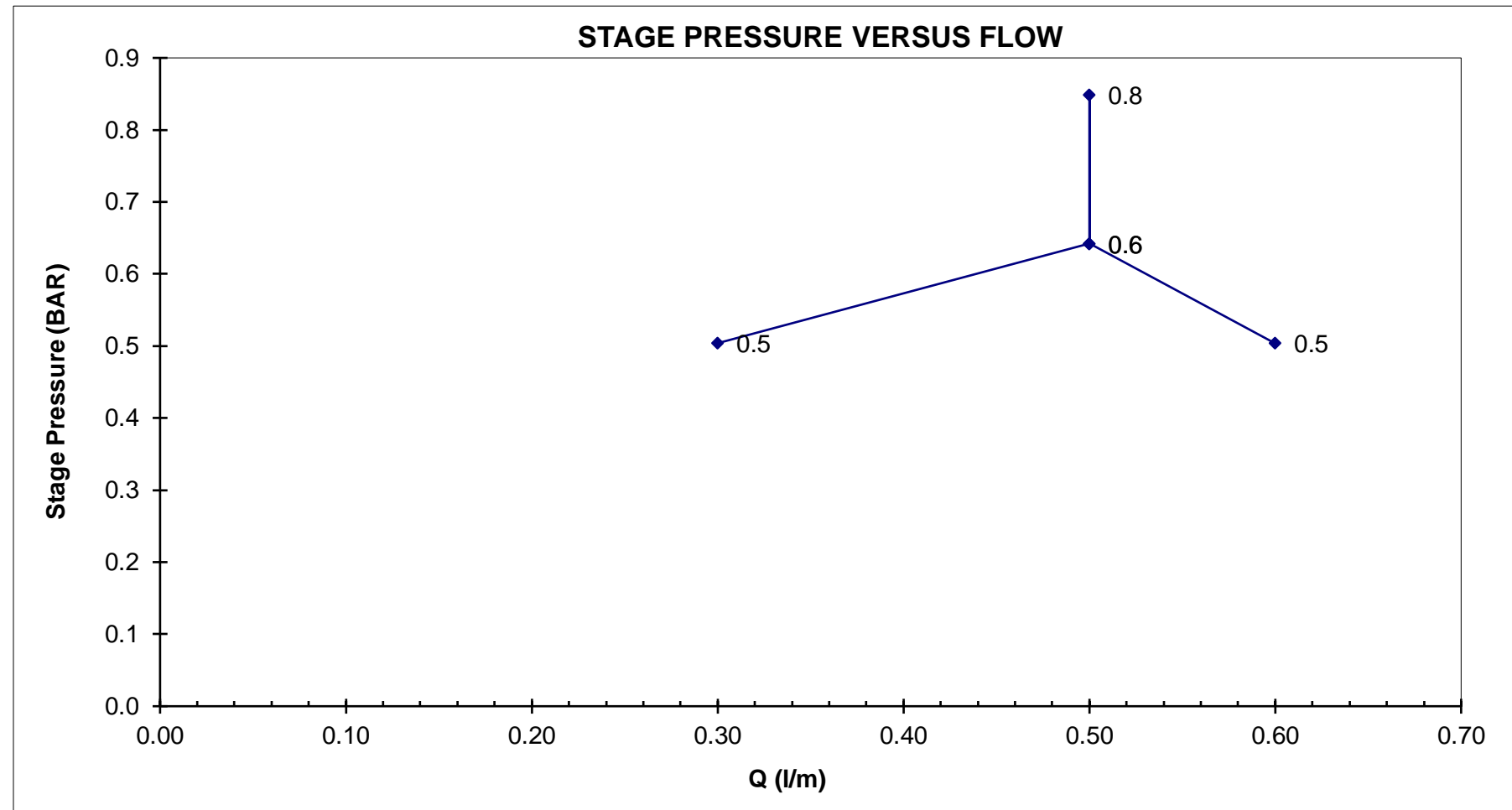
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 17-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 36.88 11.24 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3							FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
0.21	0.00	0.50	0	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.6	1.9
			1	0.00	1.00	0.50	0.50	1.00				
			2									
			Average Take l/m		0.00	1.00	0.50	0.50	1.00			
0.34	0.00	0.64	0	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.5	1.2
			1	0.50	0.50	0.50	0.00	0.50				
			2									
			Average Take l/m		0.50	0.50	0.50	0.00	0.50			
0.55	0.00	0.85	0	0.78	0.78	0.78	0.78	0.79	0.79	0.79	0.5	0.9
			1	0.50	1.00	0.50	0.50	0.50				
			2									
			Average Take l/m		0.50	1.00	0.50	0.50	0.50			
0.34	0.00	0.64	0	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.5	1.2
			1	0.00	0.50	0.50	0.50	0.50				
			2									
			Average Take l/m		0.00	0.50	0.50	0.50	0.50			
0.21	0.00	0.50	0	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.3	1.0
			1	0.00	0.50	0.50	0.00	0.50				
			2									
			Average Take l/m		0.00	0.50	0.50	0.00	0.50			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 1

K = 1.E-05 cm/s

INTERPRETATION TYPE OF FLOW: VOID FILLING

K = 1.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. MINOR LEAK OBSERVED FROM THE STUFFING BOX AT 8 PSI
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREP'D	R/W'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-003

AREA: Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.4 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 36.48 11.12 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

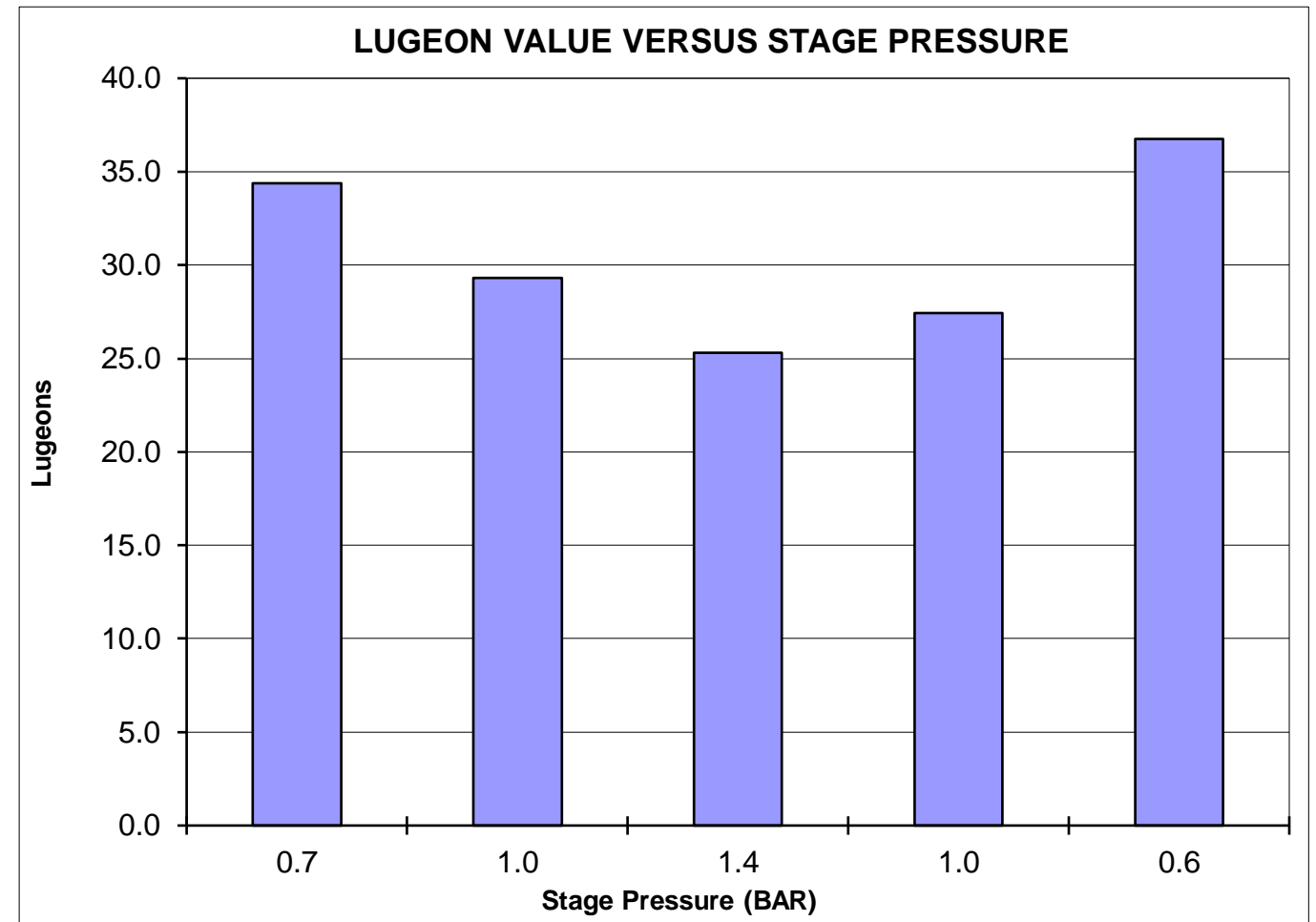
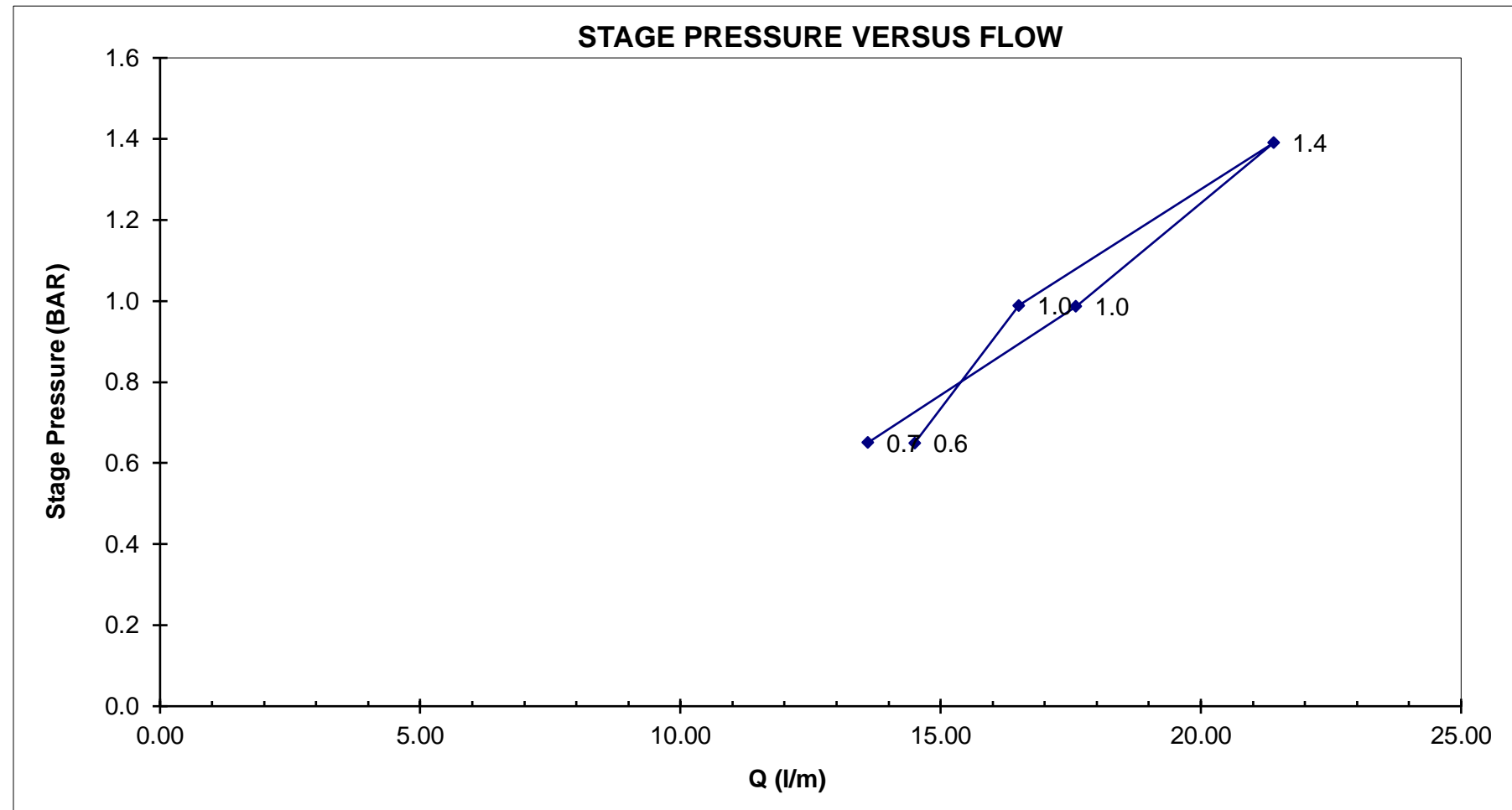
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 17-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 56.43 17.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.34	0.01	0.65	Flowmeter m3	2.33	2.34	2.36	2.37	2.38	2.40				
			Take litres		11.50	14.00	11.50	16.50	14.50				
			Average Take l/m		11.50	14.00	11.50	16.50	14.50			13.6	34.4
0.69	0.02	0.99	Flowmeter m3	2.41	2.43	2.45	2.46	2.48	2.50				
			Take litres		17.50	23.50	13.00	17.00	17.00				
			Average Take l/m		17.50	23.50	13.00	17.00	17.00			17.6	29.3
1.10	0.03	1.39	Flowmeter m3	2.51	2.53	2.55	2.57	2.59	2.61				
			Take litres		21.50	22.50	20.50	21.00	21.50				
			Average Take l/m		21.50	22.50	20.50	21.00	21.50			21.4	25.3
0.69	0.02	0.99	Flowmeter m3	2.62	2.64	2.66	2.67	2.69	2.71				
			Take litres		17.00	16.50	16.50	16.50	16.00				
			Average Take l/m		17.00	16.50	16.50	16.50	16.00			16.5	27.4
0.34	0.01	0.65	Flowmeter m3	2.72	2.73	2.74	2.76	2.77	2.79				
			Take litres		14.50	14.50	14.50	15.50	13.50				
			Average Take l/m		14.50	14.50	14.50	15.50	13.50			14.5	36.7



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 25

K = 3.E-04 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 3.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. LEAK OBSERVED FROM THE STUFFING BOX AT 16 PSI WITH AN APPROXIMATE FLOW RATE OF 15 mL/s
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P3 +/- 1 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-003

AREA: Bromley Humps TMF North Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 13.6 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 53.48 16.30 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

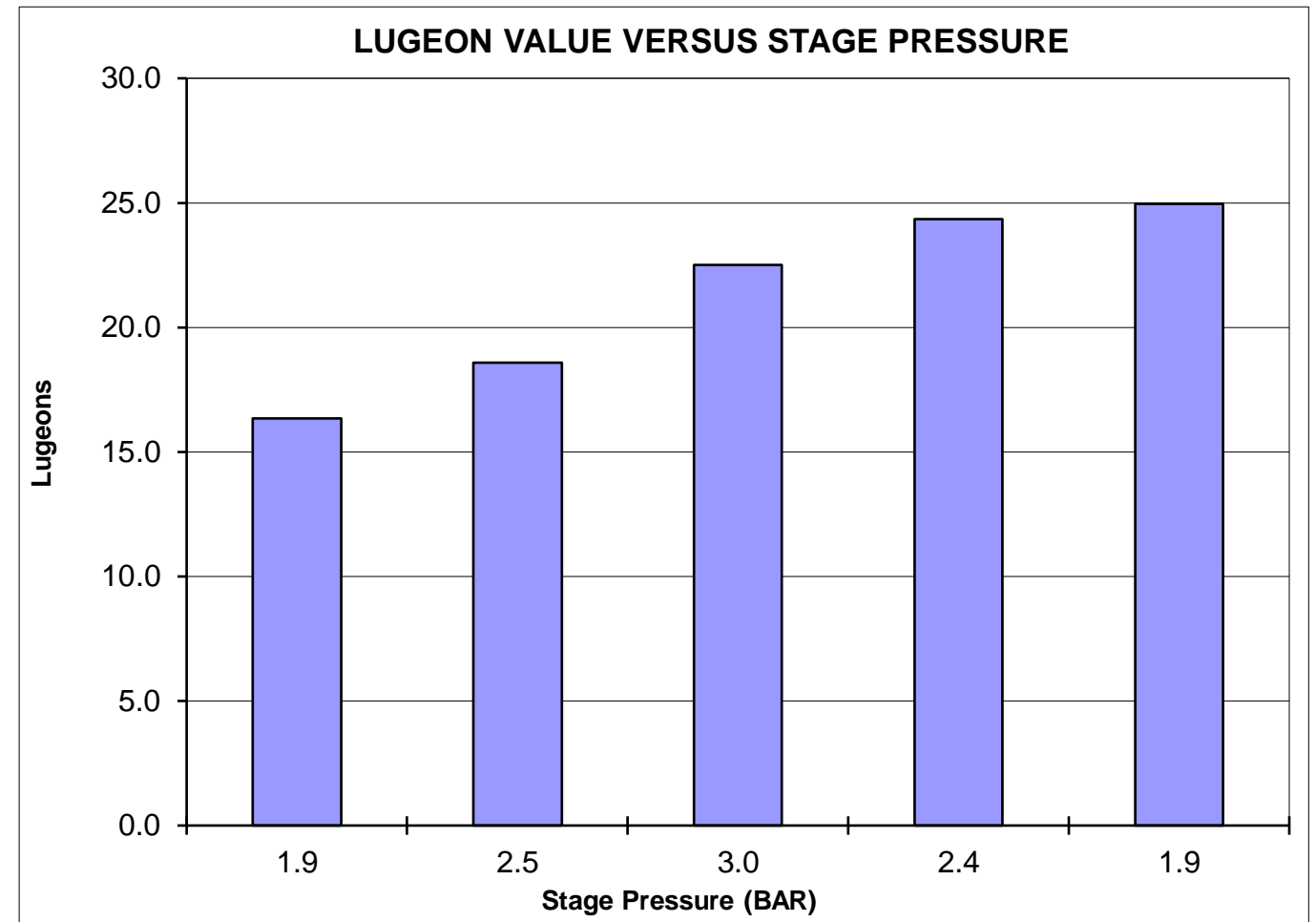
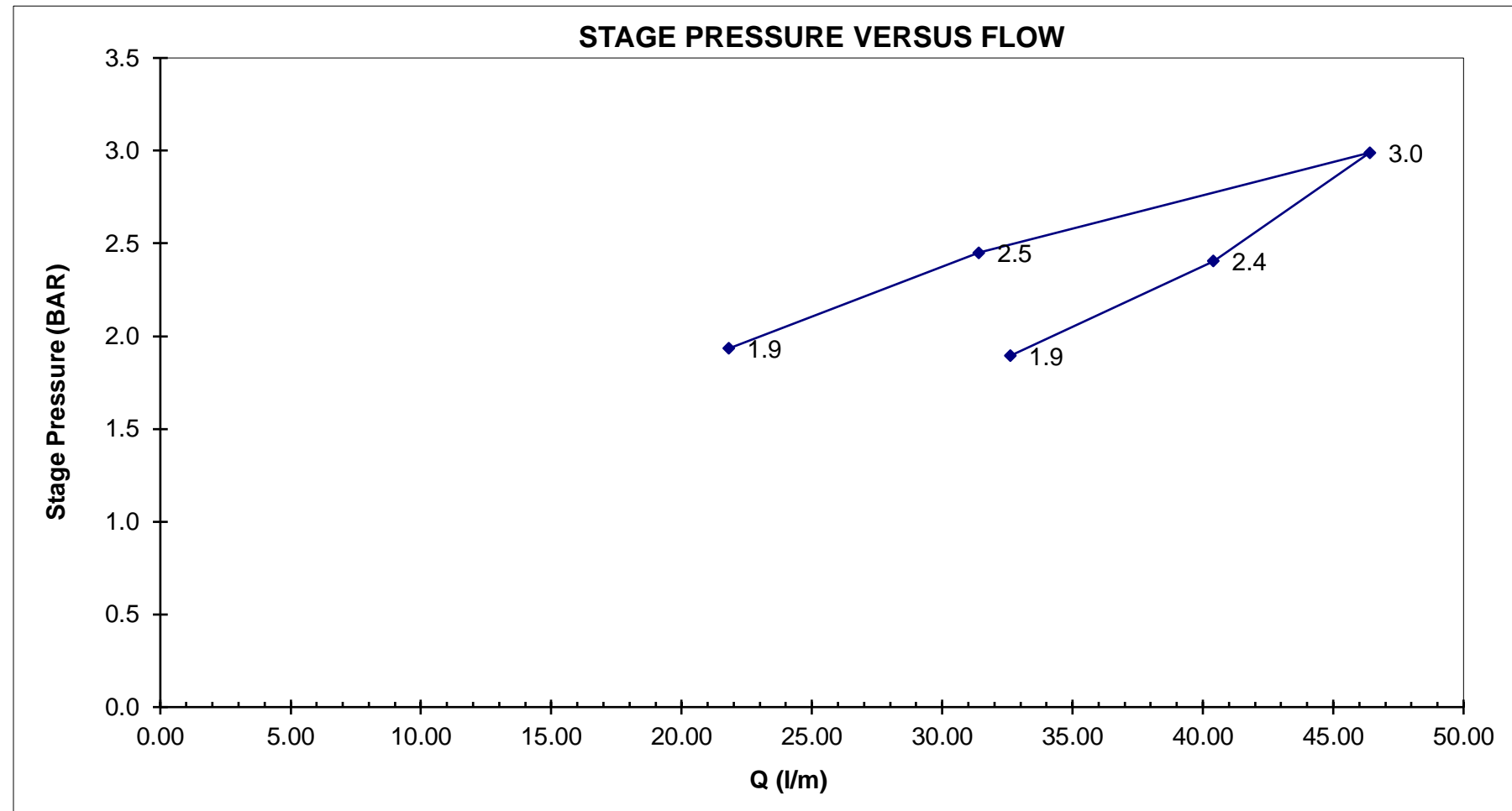
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 17-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 76.12 23.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.55	0.03	1.93	Flowmeter m3	3.30	3.32	3.34	3.37	3.39	3.41				
			Take litres		23.00	21.00	23.00	21.00	21.00				
			Average Take l/m		23.00	21.00	23.00	21.00	21.00			21.8	16.3
1.10	0.07	2.45	Flowmeter m3	3.50	3.53	3.56	3.59	3.63	3.66				
			Take litres		31.00	31.00	32.00	32.00	31.00				
			Average Take l/m		31.00	31.00	32.00	32.00	31.00			31.4	18.6
1.72	0.15	2.99	Flowmeter m3	3.80	3.85	3.89	3.94	3.99	4.03				
			Take litres		45.00	48.00	45.00	48.00	46.00				
			Average Take l/m		45.00	48.00	45.00	48.00	46.00			46.4	22.5
1.10	0.11	2.41	Flowmeter m3	4.17	4.21	4.25	4.29	4.33	4.37				
			Take litres		40.00	40.00	42.00	39.00	41.00				
			Average Take l/m		40.00	40.00	42.00	39.00	41.00			40.4	24.3
0.55	0.07	1.89	Flowmeter m3	4.48	4.51	4.55	4.58	4.61	4.64				
			Take litres		33.00	32.00	33.00	32.00	33.00				
			Average Take l/m		33.00	32.00	33.00	32.00	33.00			32.6	24.9



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 25

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	PREP'D	RW'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-003

AREA: Bromley Humps TMF North Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 17.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 74.90 22.83 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

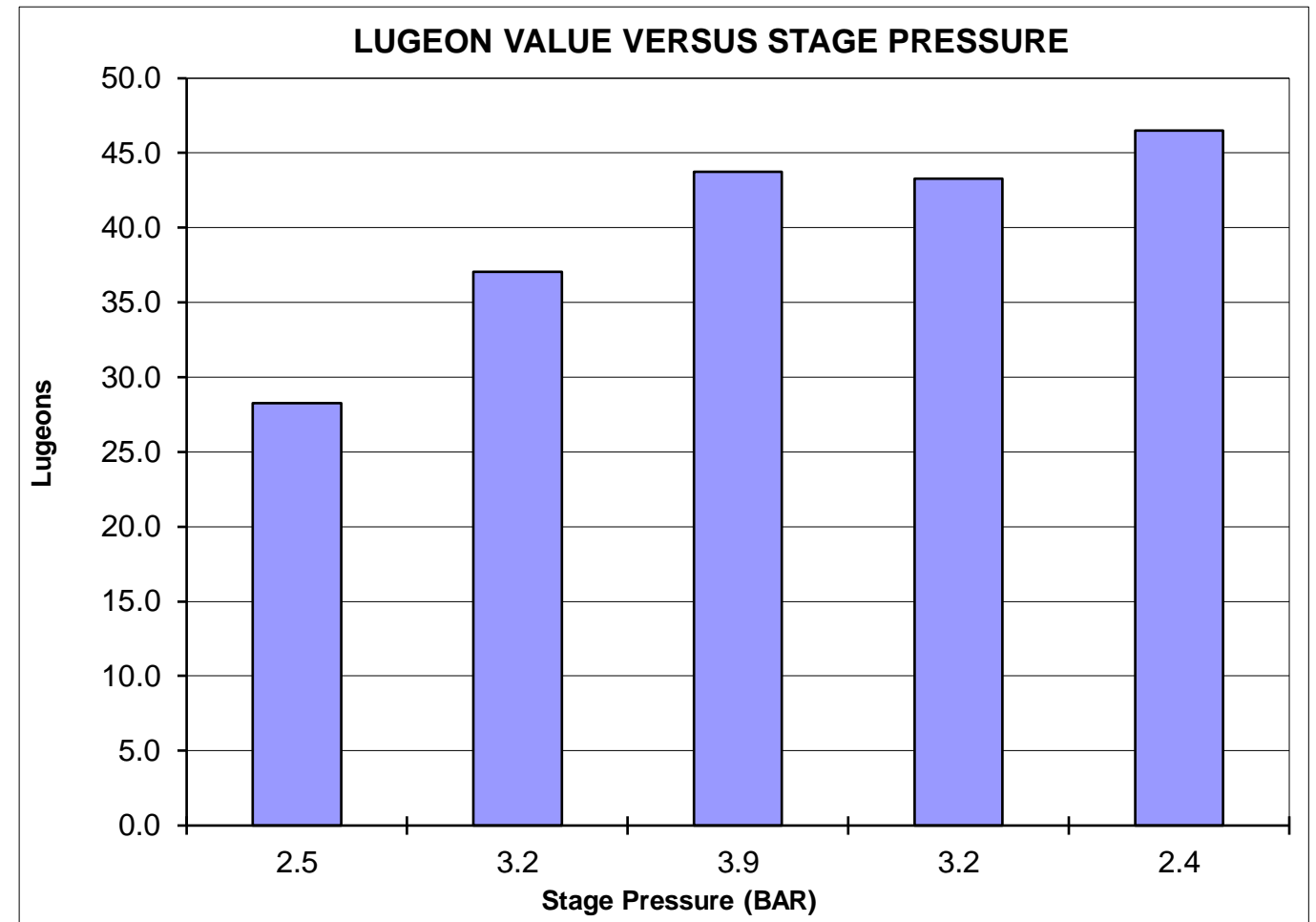
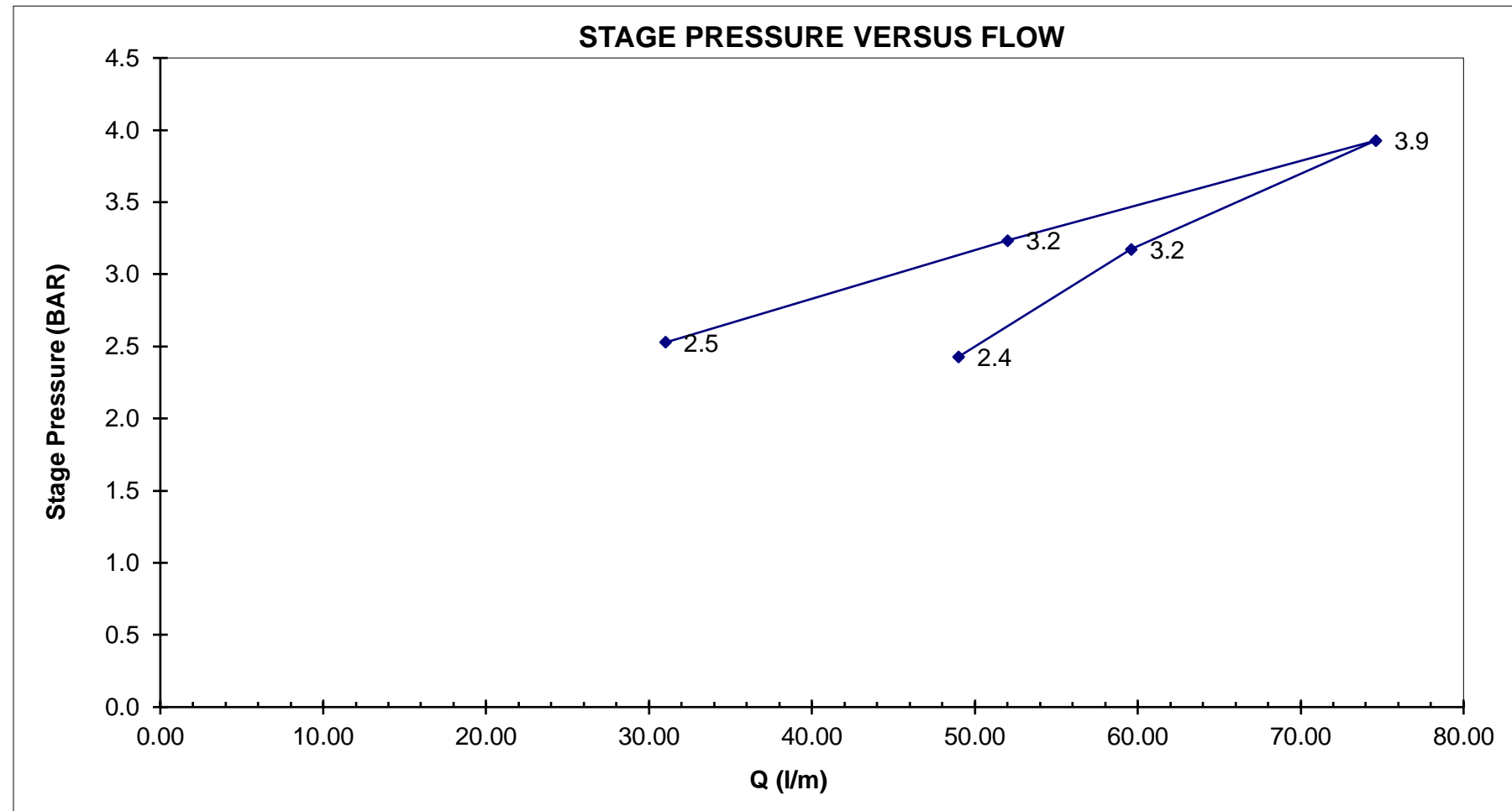
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 17-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 89.14 27.17 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.07	2.53	Flowmeter m3	5.13	5.16	5.19	5.22	5.25	5.29				
			Take litres		32.00	32.00	29.00	31.00	31.00				
			Average Take l/m		32.00	32.00	29.00	31.00	31.00			31.0	28.2
1.66	0.19	3.23	Flowmeter m3	5.42	5.47	5.52	5.58	5.63	5.68				
			Take litres		51.00	52.00	52.00	52.00	53.00				
			Average Take l/m		51.00	52.00	52.00	52.00	53.00			52.0	37.1
2.55	0.39	3.93	Flowmeter m3	5.89	5.96	6.03	6.11	6.18	6.26				
			Take litres		74.00	74.00	75.00	76.00	74.00				
			Average Take l/m		74.00	74.00	75.00	76.00	74.00			74.6	43.8
1.66	0.25	3.17	Flowmeter m3	6.49	6.55	6.61	6.67	6.73	6.79				
			Take litres		59.00	61.00	60.00	58.00	60.00				
			Average Take l/m		59.00	61.00	60.00	58.00	60.00			59.6	43.3
0.83	0.17	2.43	Flowmeter m3	6.87	6.92	6.97	7.02	7.07	7.12				
			Take litres		50.00	49.00	49.00	49.00	48.00				
			Average Take l/m		50.00	49.00	49.00	49.00	48.00			49.0	46.5



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 47

K = 5.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 5.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. LEAK OBSERVED FROM THE STUFFING BOX STARTING FROM PRESSURE STAGE P3 TO P5 WITH AN APPROXIMATE FLOW RATE OF 5mL/min
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\VA\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 4

REV	DATE	DESCRIPTION	PREP'D	R/W'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-003

AREA: Bromley Humps TMF North Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 14.8 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 85.73 26.13 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

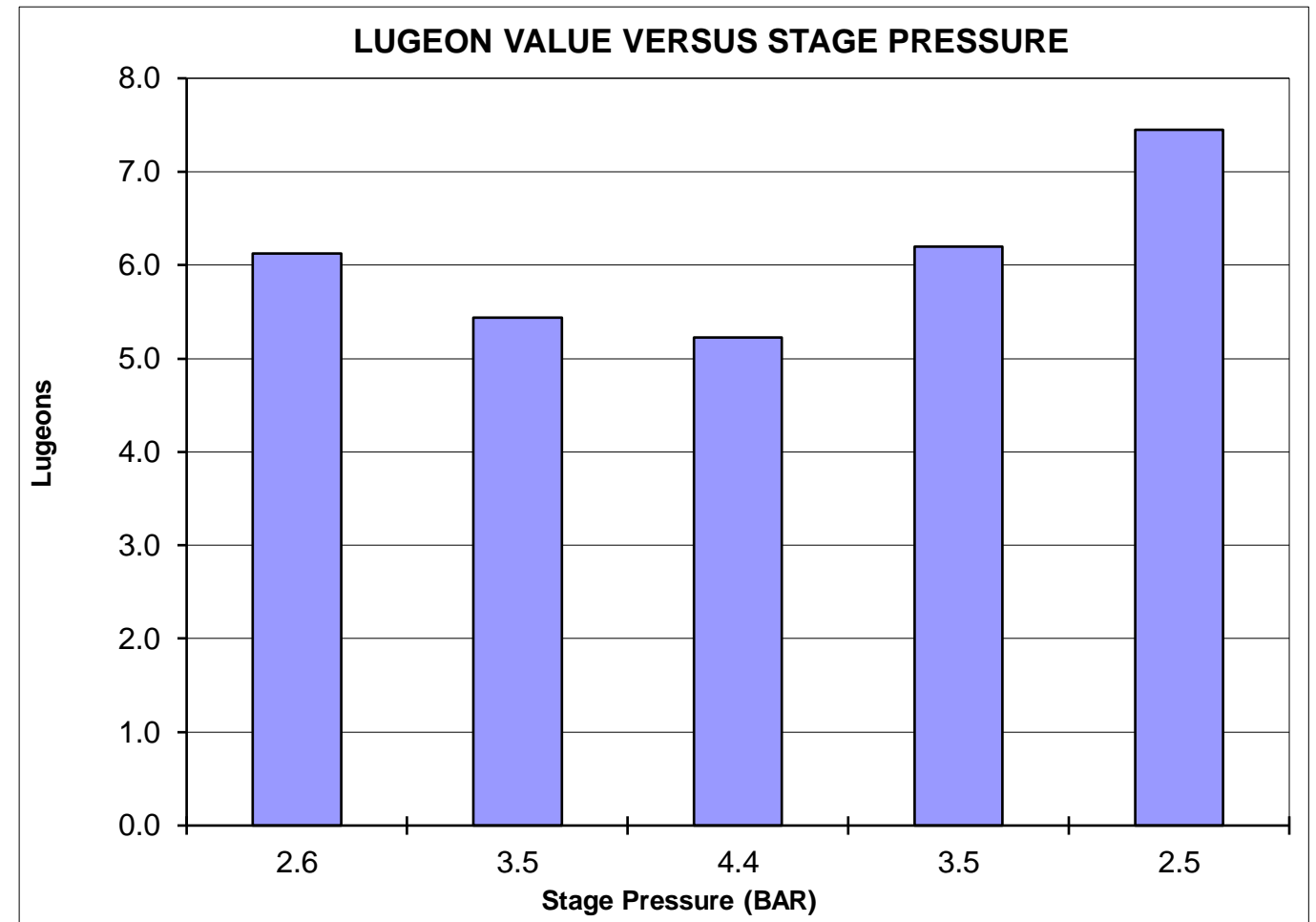
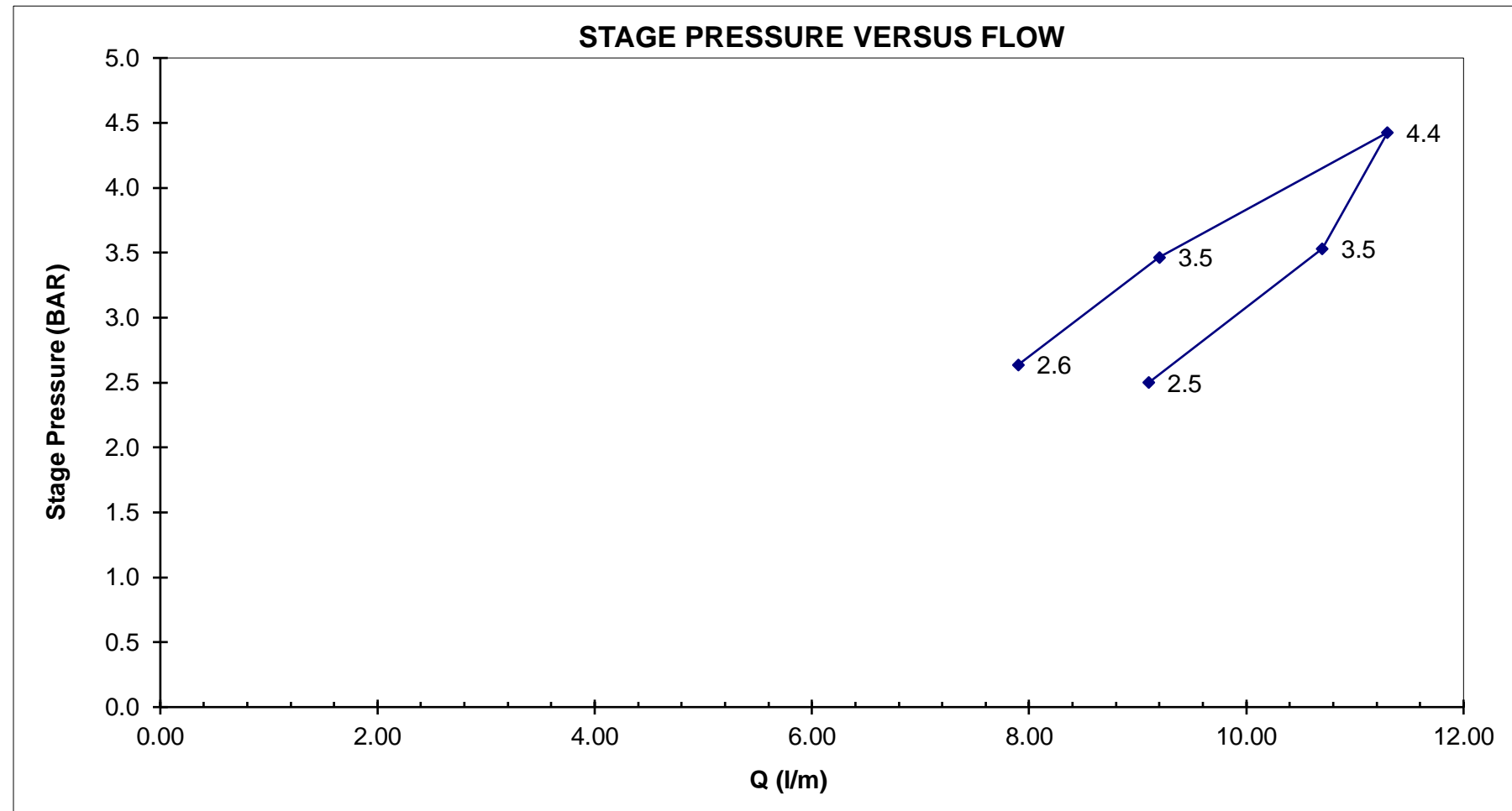
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 17-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 101.77 31.02 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.10	0.00	2.64	Flowmeter m3	7.43	7.44	7.45	7.46	7.46	7.47				
			Take litres		8.50	8.00	8.00	7.50	7.50				
			Average Take l/m		8.50	8.00	8.00	7.50	7.50			7.9	6.1
1.93	0.01	3.46	Flowmeter m3	7.49	7.50	7.51	7.52	7.53	7.54				
			Take litres		9.00	9.00	9.50	9.00	9.50				
			Average Take l/m		9.00	9.00	9.50	9.00	9.50			9.2	5.4
2.90	0.01	4.43	Flowmeter m3	7.54	7.55	7.57	7.58	7.59	7.60				
			Take litres		11.50	11.50	11.00	11.00	11.50				
			Average Take l/m		11.50	11.50	11.00	11.00	11.50			11.3	5.2
2.00	0.01	3.53	Flowmeter m3	7.61	7.62	7.63	7.64	7.65	7.66				
			Take litres		10.50	10.50	11.00	11.00	10.50				
			Average Take l/m		10.50	10.50	11.00	11.00	10.50			10.7	6.2
0.97	0.01	2.50	Flowmeter m3	7.67	7.68	7.69	7.70	7.70	7.71				
			Take litres		9.00	9.00	9.00	9.00	9.50				
			Average Take l/m		9.00	9.00	9.00	9.00	9.50			9.1	7.5



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 5

K = 5.E-05 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 5.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. LEAK OBSERVED FROM THE STUFFING BOX AT PRESSURE STAGE P2 WITH AN APPROXIMATE FLOW RATE OF 15mL/min AND AT PRESSURE STAGE P3 WITH AN APPROXIMATE FLOW RATE OF 50mL/min
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 5

REV	DATE	DESCRIPTION	PREP'D	R/W'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-004

AREA: Bromley Humps TMF North Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 6.3 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 10.76 3.28 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

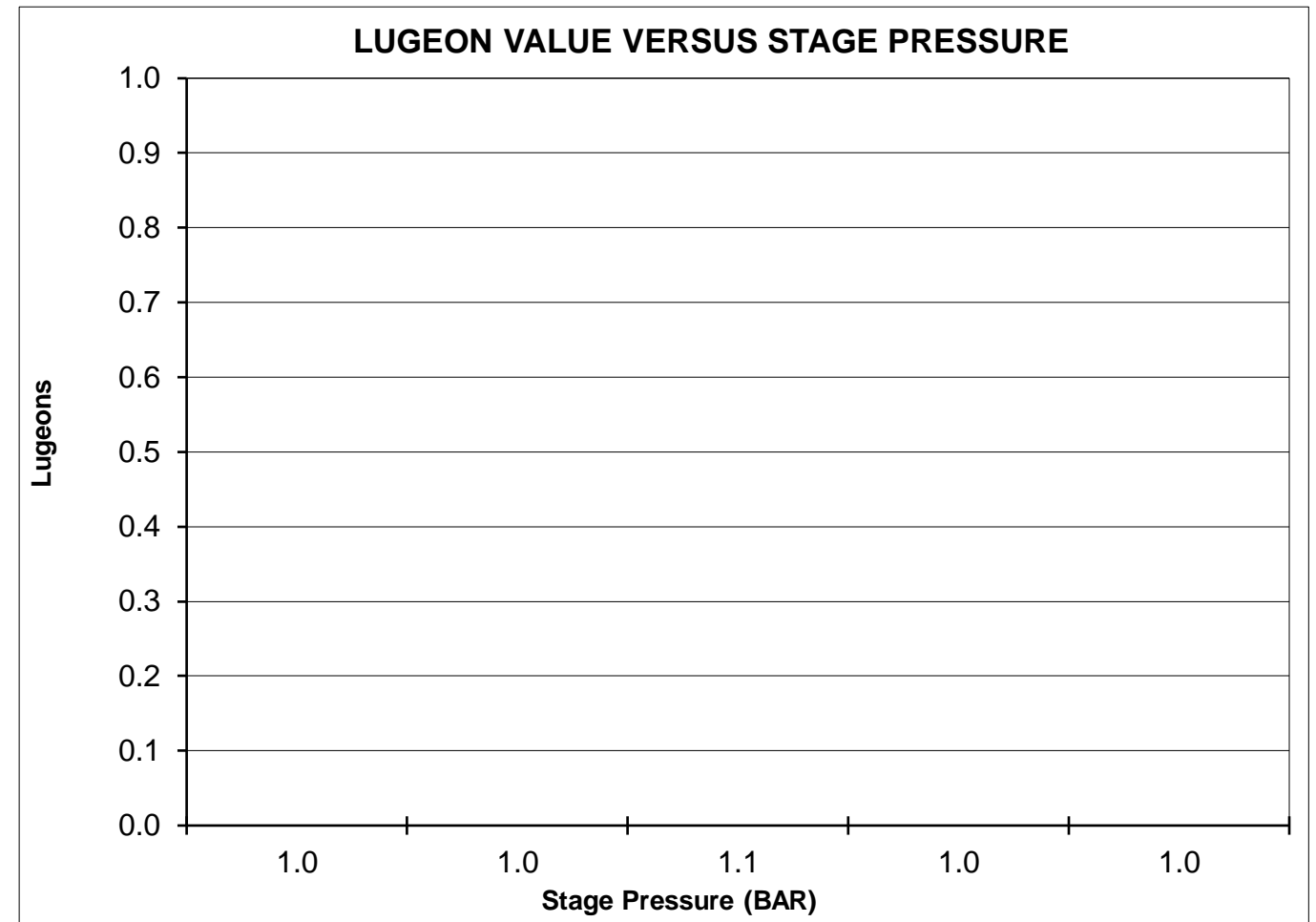
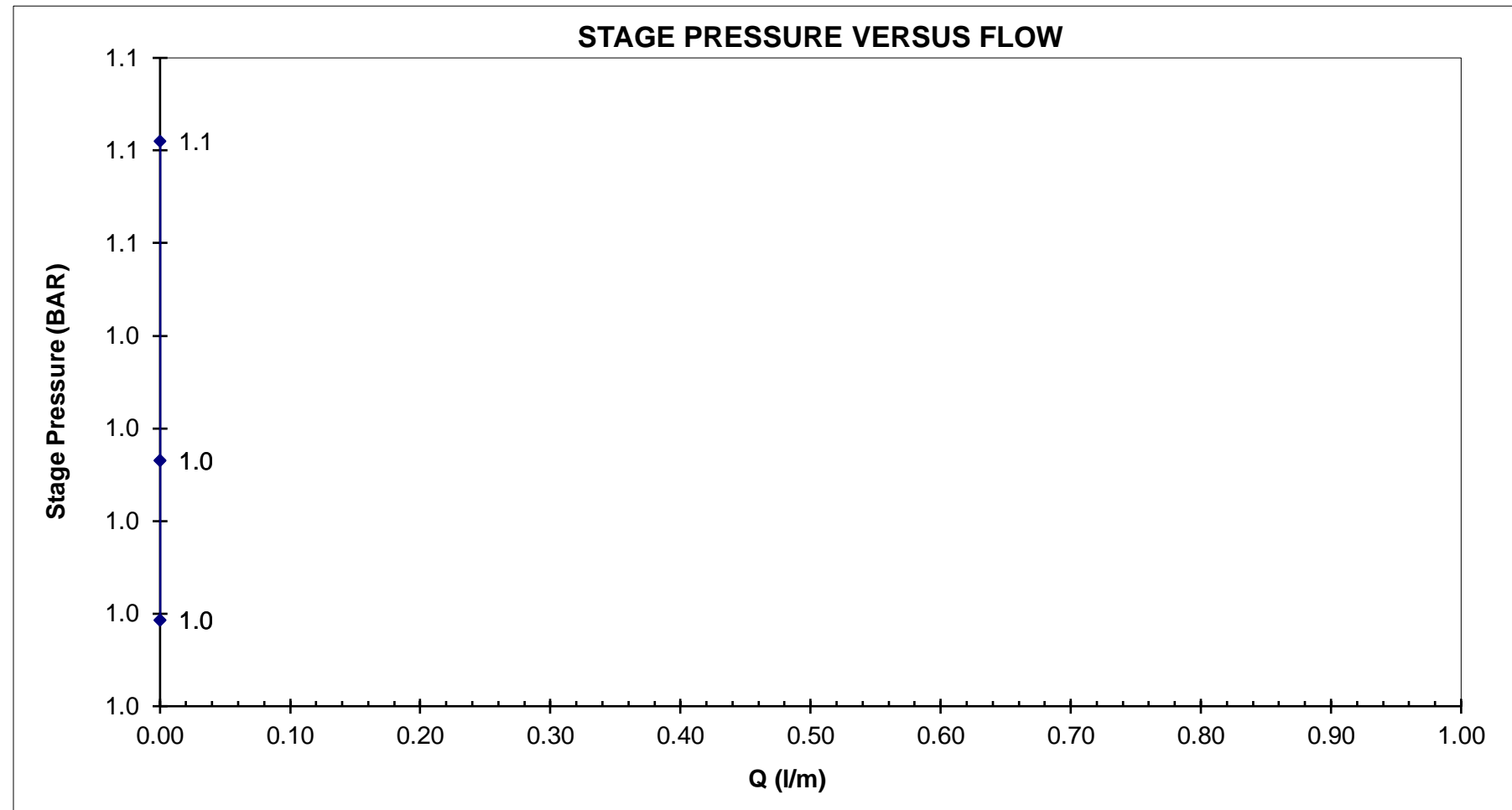
GAUGE HEIGHT ABOVE GROUND: 1.2 m

DATE: 24-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 30.45 9.28 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3							FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
0.24	0.00	0.98	0	10.69	10.69	10.69	10.69	10.69	10.69	10.69	0.0	0.0
			1	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Take litres									
			Average Take l/m									
0.28	0.00	1.01	0	10.69	10.69	10.69	10.69	10.69	10.69	0.0	0.0	
			1	0.00	0.00	0.00	0.00	0.00	0.00			0.00
			Take litres									
			Average Take l/m									
0.34	0.00	1.08	0	10.69	10.69	10.69	10.69	10.69	10.69	0.0	0.0	
			1	0.00	0.00	0.00	0.00	0.00	0.00			0.00
			Take litres									
			Average Take l/m									
0.28	0.00	1.01	0	10.69	10.69	10.69	10.69	10.69	10.69	0.0	0.0	
			1	0.00	0.00	0.00	0.00	0.00	0.00			0.00
			Take litres									
			Average Take l/m									
0.24	0.00	0.98	0	10.69	10.69	10.69	10.69	10.69	10.69	0.0	0.0	
			1	0.00	0.00	0.00	0.00	0.00	0.00			0.00
			Take litres									
			Average Take l/m									



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.25 PSI; P3 +/- 0.25 PSI; P4 +/- 0.25 PSI; P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. NO WATER ABOVE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 3.07 mbgs. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1		
			PREPD	RWW'D

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-004

AREA: Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 12.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 29.07 8.86 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

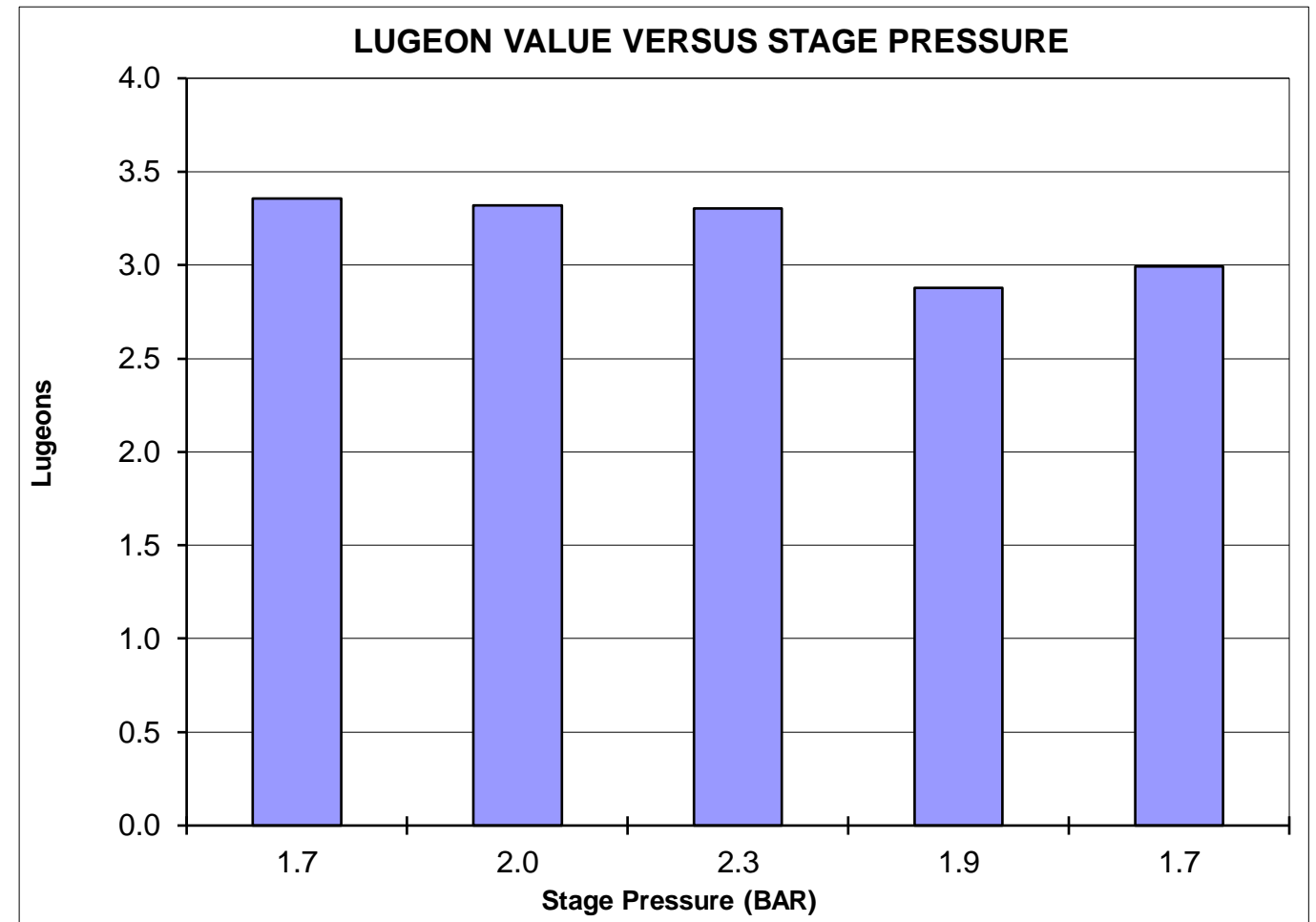
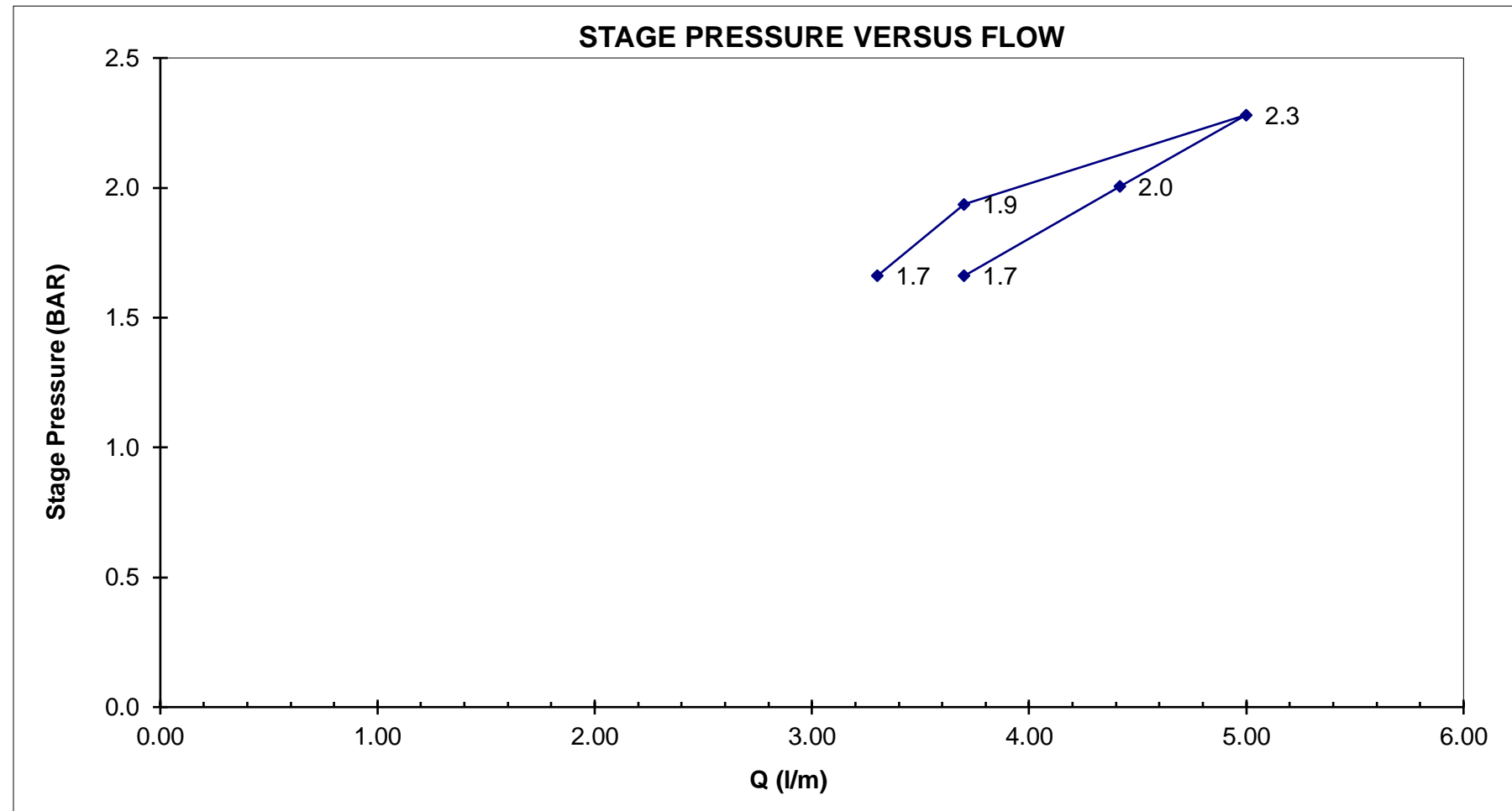
GAUGE HEIGHT ABOVE GROUND: 1.3 m

DATE: 24-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 50.85 15.50 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.34	0.00	1.66	Flowmeter m3	10.81	10.82	10.82	10.82	10.83	10.83				
			Take litres		3.00	4.00	4.00	4.00	3.50				
			Average Take l/m		3.00	4.00	4.00	4.00	3.50			3.7	3.4
0.69	0.00	2.01	Flowmeter m3	10.90	10.90	10.90	10.91	10.91	10.92	10.92	0.00		
			Take litres		4.50	3.50	5.50	4.00	4.50	4.50			
			Average Take l/m		4.50	3.50	5.50	4.00	4.50	4.50		4.4	3.3
0.97	0.00	2.28	Flowmeter m3	10.94	10.94	10.95	10.95	10.96	10.96				
			Take litres		5.00	5.00	5.00	5.00	5.00				
			Average Take l/m		5.00	5.00	5.00	5.00	5.00			5.0	3.3
0.62	0.00	1.94	Flowmeter m3	10.98	10.98	10.99	10.99	11.00	11.00				
			Take litres		3.50	3.50	4.00	4.00	3.50				
			Average Take l/m		3.50	3.50	4.00	4.00	3.50			3.7	2.9
0.34	0.00	1.66	Flowmeter m3	11.00	11.00	11.01	11.01	11.01	11.02				
			Take litres		3.00	3.50	3.00	3.50	3.50				
			Average Take l/m		3.00	3.50	3.00	3.50	3.50			3.3	3.0



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 3

K = 3.E-05 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 3.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 1 PSI; P2 +/- 2 PSI; P3 +/- 3 PSI; P4 +/- 2 PSI; P5 +/- 1 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. DURING THE STAGE PRESSURE P2 TEST, THE PRESSURE WAS NOT STABLE AND GRADUALLY INCREASED THAT RESULTED TO A RE-TEST OF THE STAGE PRESSURE P2
 5. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 6. NO WATER ABOVE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 7.64 mbgs. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	ME/CAG	CHS
			PREPD	RW/D

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-004

AREA: Bromley Humps TMF North Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 8.9 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 48.75 14.86 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

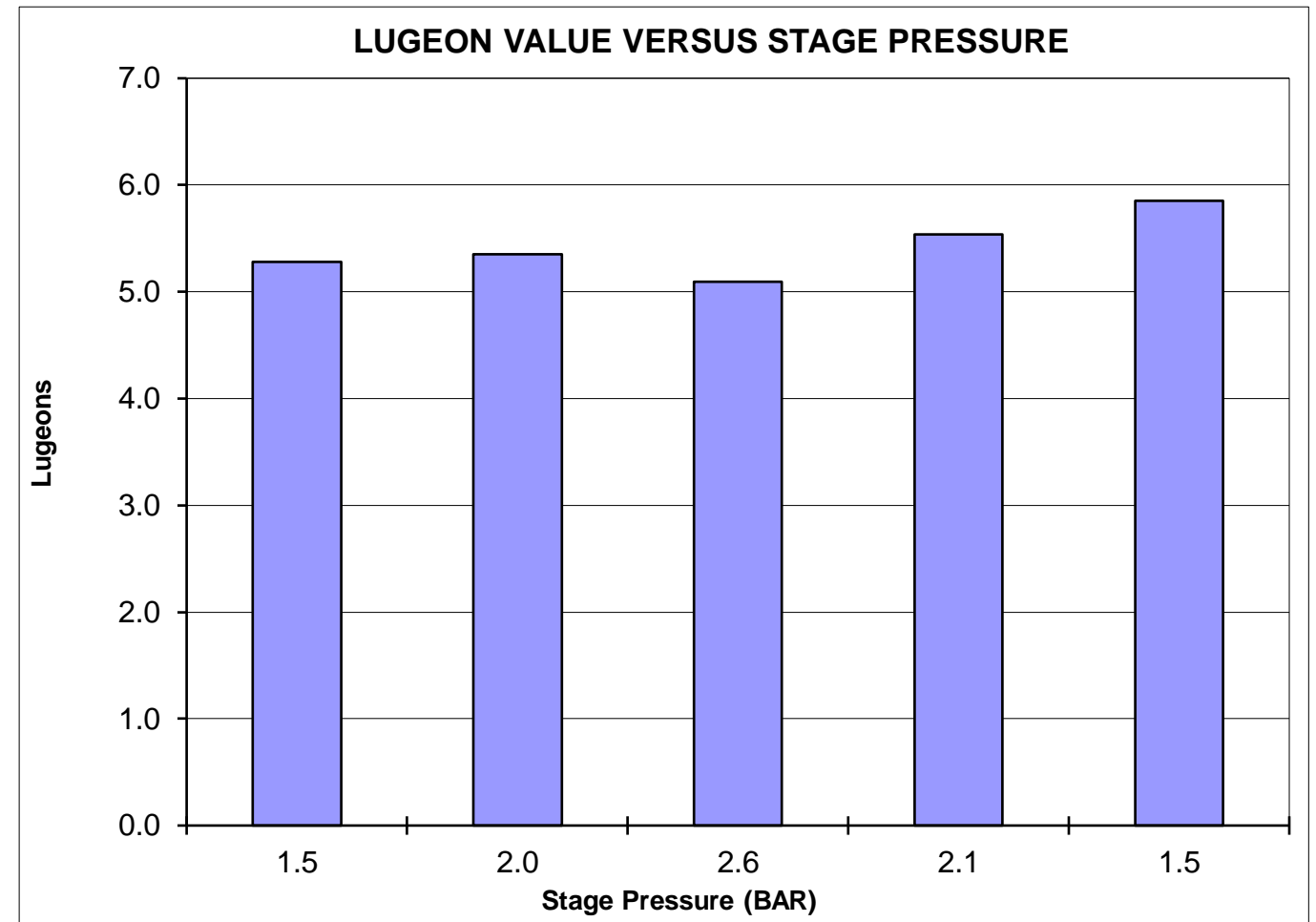
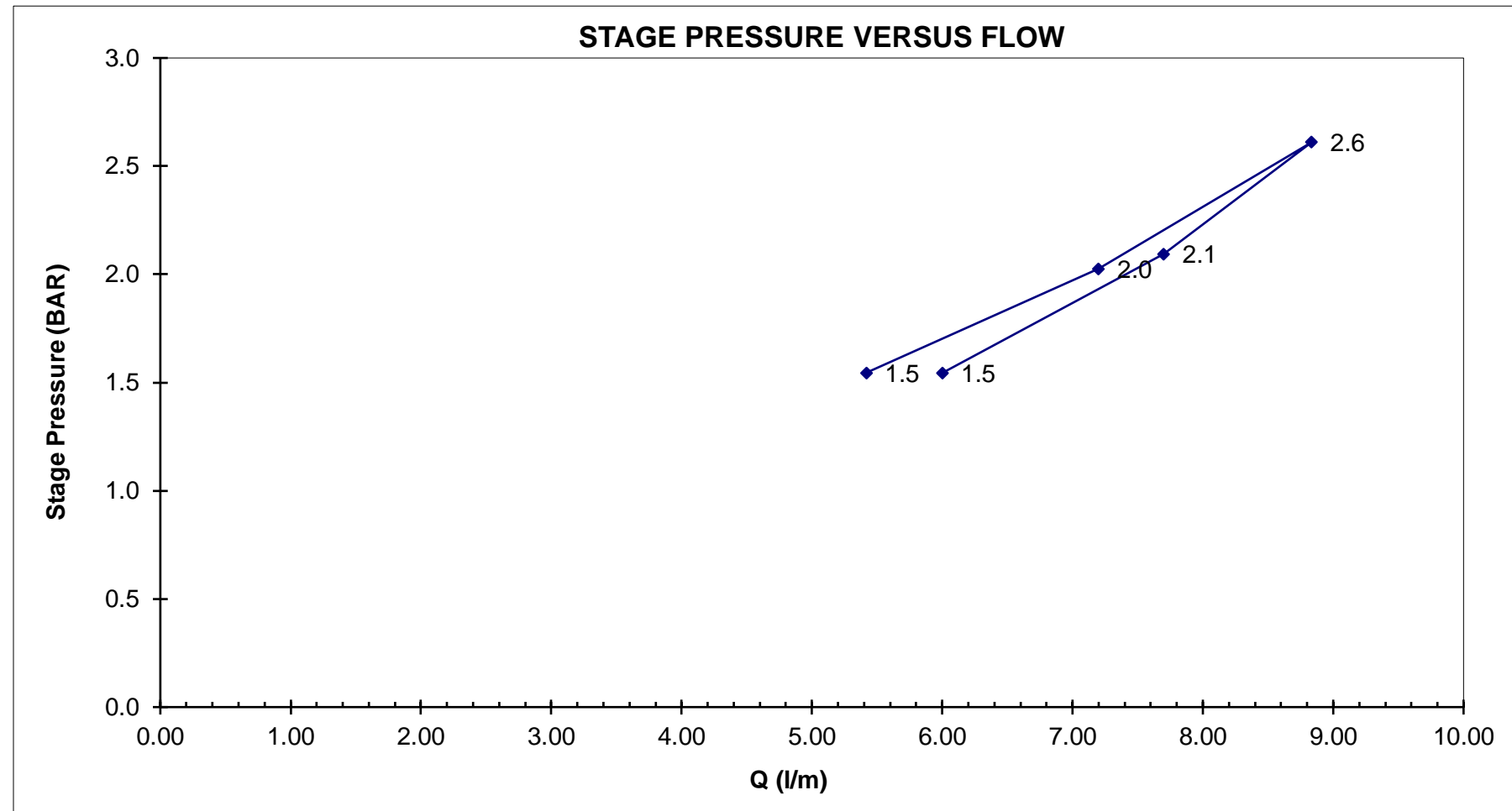
GAUGE HEIGHT ABOVE GROUND: 1.3 m

DATE: 24-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 70.54 21.50 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.55	0.00	1.54	Flowmeter m3	11.18	11.18	11.19	11.19	11.20	11.20	11.21	0.00	5.4	5.3
			Take litres		5.50	5.00	6.00	5.00	5.50	5.50			
			Average Take l/m		5.50	5.00	6.00	5.00	5.50	5.5			
1.03	0.00	2.03	Flowmeter m3	11.24	11.24	11.25	11.26	11.27	11.27			7.2	5.4
			Take litres		7.50	7.00	7.50	7.00	7.00				
			Average Take l/m		7.50	7.00	7.50	7.00	7.00				
1.62	0.00	2.61	Flowmeter m3	11.30	11.31	11.32	11.33	11.34	11.35	11.36		8.8	5.1
			Take litres		8.50	9.00	8.00	9.50	9.00	9.00			
			Average Take l/m		8.50	9.00	8.00	9.50	9.00	9			
1.10	0.00	2.09	Flowmeter m3	11.39	11.39	11.40	11.41	11.42	11.42			7.7	5.5
			Take litres		8.00	7.50	7.50	8.00	7.50				
			Average Take l/m		8.00	7.50	7.50	8.00	7.50				
0.55	0.00	1.54	Flowmeter m3	11.44	11.44	11.45	11.46	11.46	11.47			6.0	5.9
			Take litres		6.00	5.50	6.50	6.00	6.00				
			Average Take l/m		6.00	5.50	6.50	6.00	6.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 5

K = 5.E-05 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 5.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK REMOVED FOR TEST TO CHECK IF REDUCING PRESSURE GAUGE NOISE.
 3. PRESSURE GAUGE NOISE: P1 +/- 1 PSI; P2 +/- 1 PSI; P3 +/- 1.5 PSI; P4 +/- 1 PSI; P5 +/- 2 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. DURING THE STAGE P1, THE PRESSURE WAS NOT STABLE AND GRADUALLY INCREASED AND SO STAGE P1 REPEATED.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	MEP/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEP/CAG	CHS
			PREPD	RWW'D

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-004

AREA: Bromley Humps TMF North Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 10.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 68.44 20.86 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

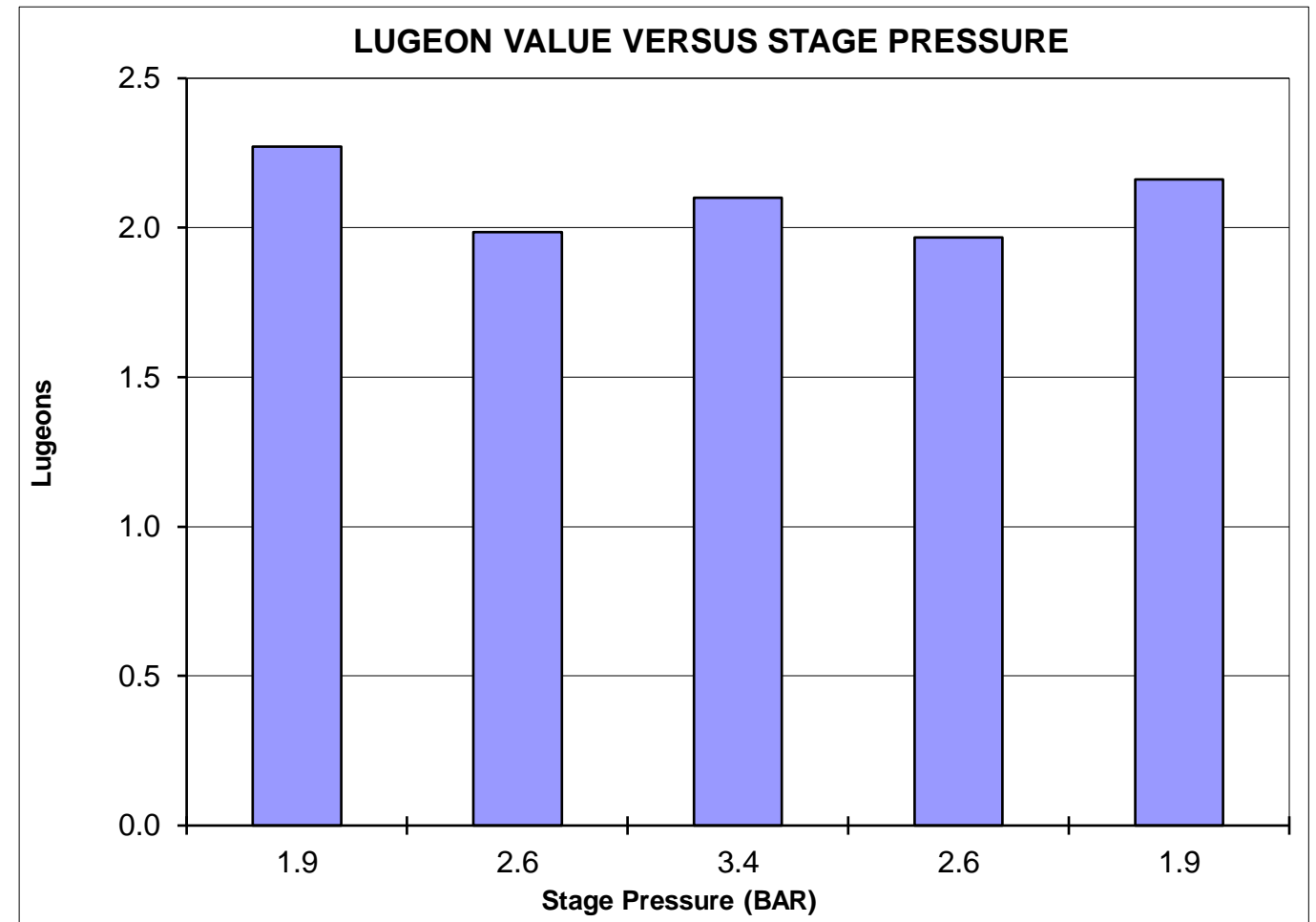
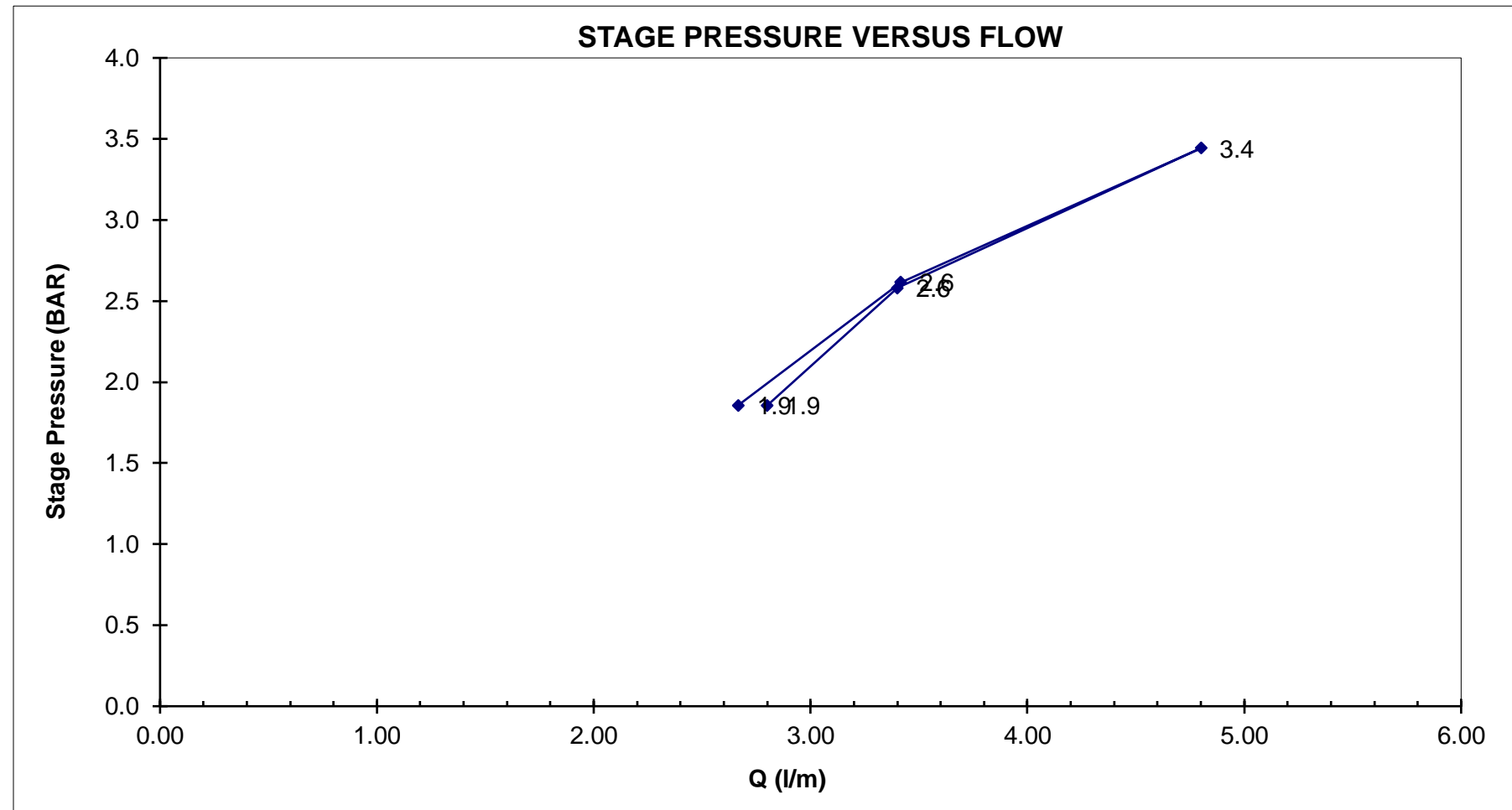
GAUGE HEIGHT ABOVE GROUND: 1.3 m

DATE: 24-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 90.22 27.50 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.76	0.00	1.86	Flowmeter m3	11.65	11.65	11.66	11.66	11.66	11.67			2.8	2.3
			Take litres		3.00	3.00	2.50	3.00	2.50				
			Average Take l/m		3.00	3.00	2.50	3.00	2.50				
1.48	0.00	2.58	Flowmeter m3	11.68	11.68	11.68	11.69	11.69	11.70			3.4	2.0
			Take litres		3.50	3.00	3.50	3.50	3.50				
			Average Take l/m		3.50	3.00	3.50	3.50	3.50				
2.34	0.00	3.44	Flowmeter m3	11.71	11.72	11.72	11.73	11.73	11.74			4.8	2.1
			Take litres		5.50	5.00	4.50	4.50	4.50				
			Average Take l/m		5.50	5.00	4.50	4.50	4.50				
1.52	0.00	2.62	Flowmeter m3	11.74	11.75	11.75	11.75	11.76	11.76	11.76		3.4	2.0
			Take litres		3.50	3.50	3.50	3.00	3.50	3.50			
			Average Take l/m		3.50	3.50	3.50	3.00	3.50	3.5			
0.76	0.00	1.86	Flowmeter m3	11.77	11.77	11.77	11.78	11.78	11.78	11.78		2.7	2.2
			Take litres		2.50	2.50	3.00	2.50	3.00	2.50			
			Average Take l/m		2.50	2.50	3.00	2.50	3.00	2.5			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 2

K = 2.E-05 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 2.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 1 PSI; P2 +/- 1 PSI; P3 +/- 2 PSI; P4 +/- 1.5 PSI; P5 +/- 1 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. NO SURGE TANK USED SINCE IT DID NOT IMPROVE THE PRESSURE GAUGE NOISE
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 4

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-004

AREA: Bromley Humps TMF North Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 9.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 89.74 27.35 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

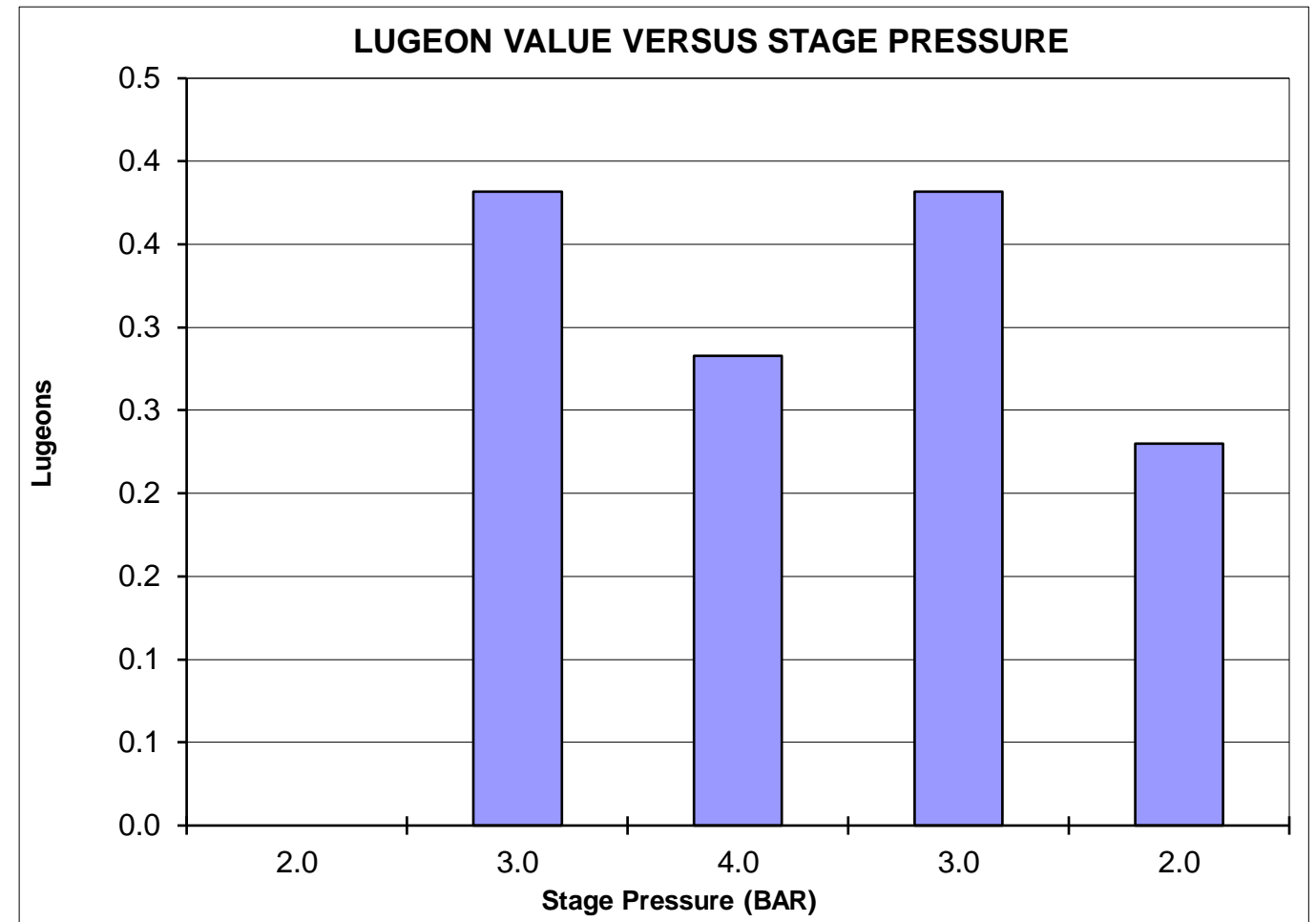
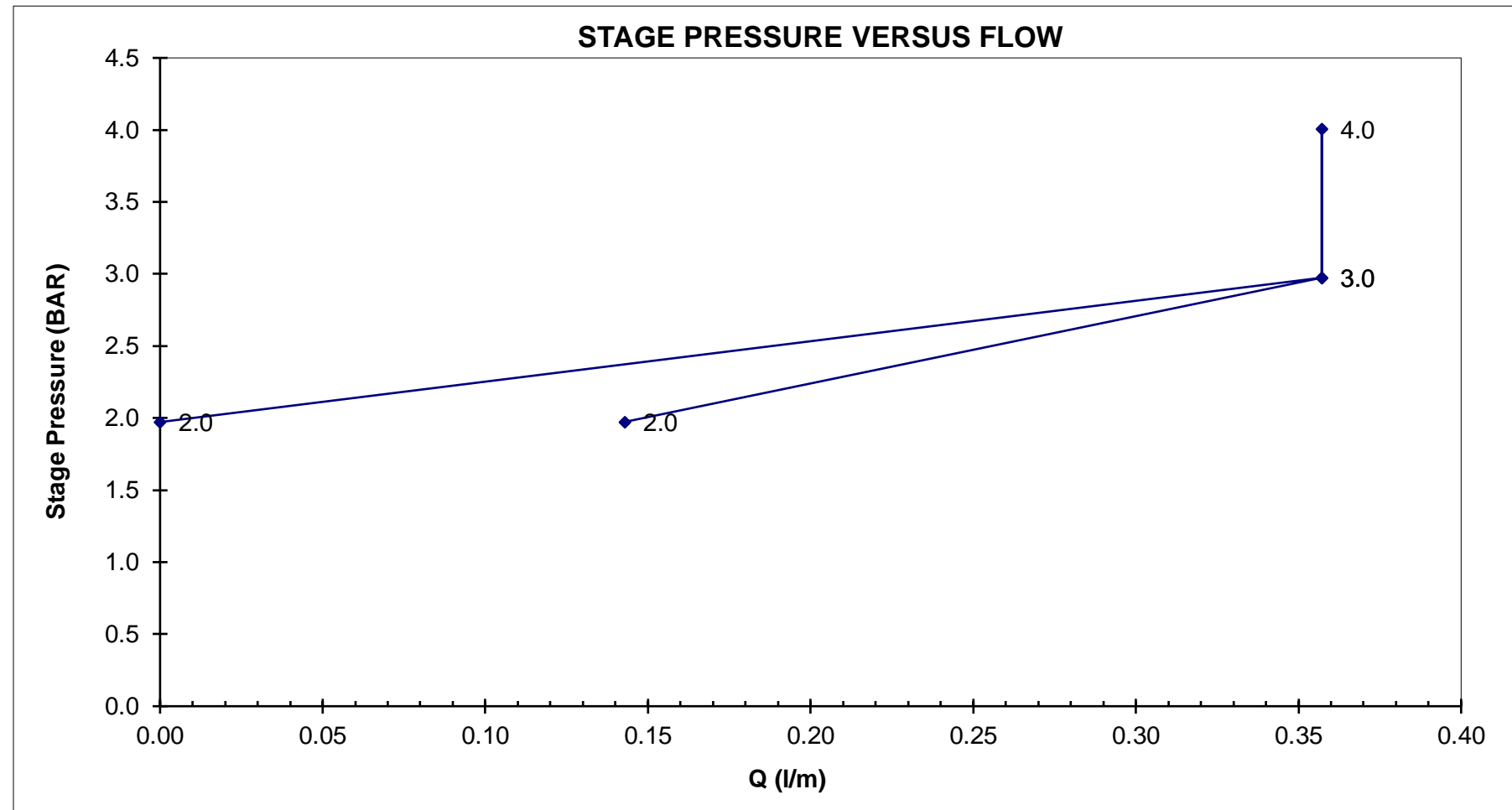
GAUGE HEIGHT ABOVE GROUND: 1.2 m

DATE: 25-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 100.07 30.50 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.97	0.00	1.97	Flowmeter m3	11.83	11.83	11.83	11.83	11.83	11.83	11.83	11.83	0.0	0.0
			Take litres		1.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		1.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.97	0.00	2.97	Flowmeter m3	11.84	11.84	11.84	11.84	11.84	11.84	11.84	11.84	0.4	0.4
			Take litres		0.50	0.00	0.50	0.50	0.00	0.50	0.50		
			Average Take l/m		0.50	0.00	0.50	0.50	0.00	0.50	0.50		
3.00	0.00	4.01	Flowmeter m3	11.85	11.85	11.85	11.85	11.85	11.85	11.85	11.85	0.4	0.3
			Take litres		0.00	0.50	0.50	0.50	0.50	0.00	0.50		
			Average Take l/m		0.00	0.50	0.50	0.50	0.50	0.00	0.50		
1.97	0.00	2.97	Flowmeter m3	11.85	11.85	11.85	11.85	11.85	11.85	11.85	11.85	0.4	0.4
			Take litres		0.00	0.50	0.00	0.50	0.50	0.50	0.50		
			Average Take l/m		0.00	0.50	0.00	0.50	0.50	0.50	0.50		
0.97	0.00	1.97	Flowmeter m3	11.85	11.85	11.85	11.85	11.85	11.85	11.85	11.85	0.1	0.2
			Take litres		0.50	0.00	0.00	0.50	0.00	0.00	0.00		
			Average Take l/m		0.50	0.00	0.00	0.50	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.3

K = 3.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 3.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0.5 PSI; P5 +/- 0.125 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. SURGE TANK USED
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 5

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 1 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.5 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 27.66 8.43 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

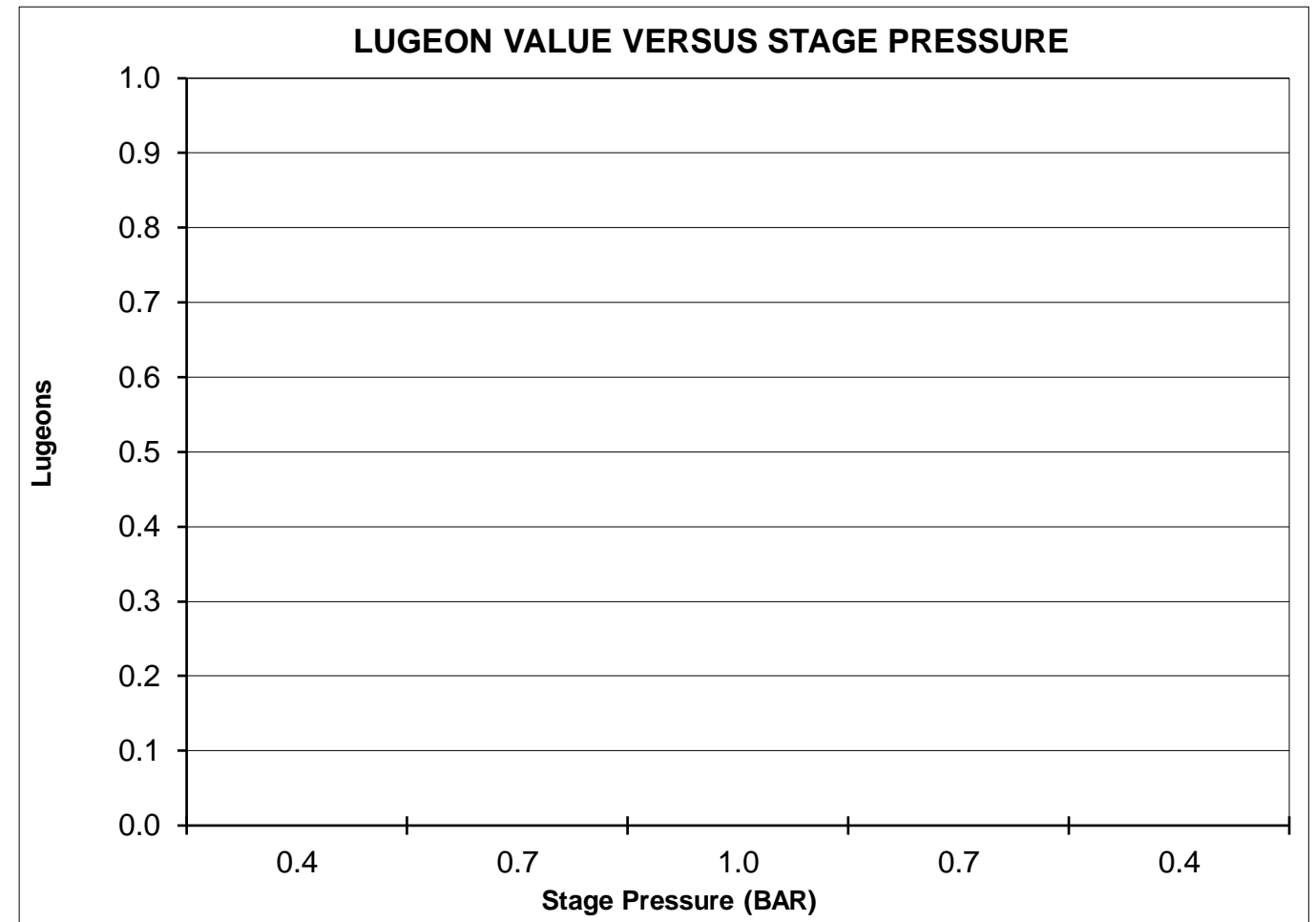
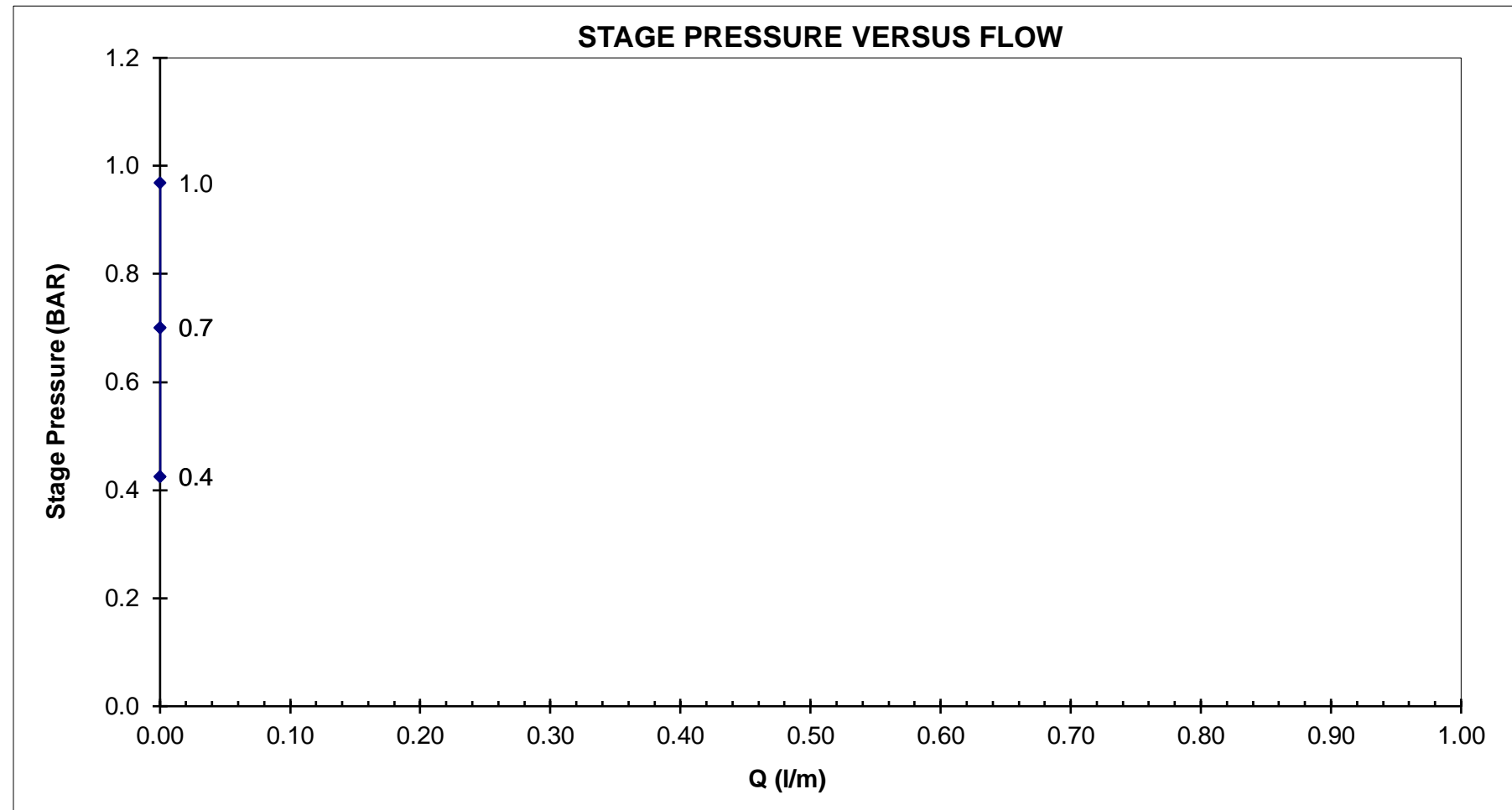
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 27-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 47.34 14.43 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.00	0.43	Flowmeter m3	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.48	0.00	0.70	Flowmeter m3	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	0.0	0.0
			Take litres		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
0.75	0.00	0.97	Flowmeter m3	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	0.0	0.0
			Take litres		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
0.48	0.00	0.70	Flowmeter m3	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.21	0.00	0.43	Flowmeter m3	11.86	11.86	11.86	11.86	11.86	11.86	11.86	11.86	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI; P2 +/- 0.125 PSI; P3 +/- 0.125 PSI; P4 +/- 0.125 PSI; P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. SURGE TANK USED

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-005 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 17.3 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 46.85 14.28 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

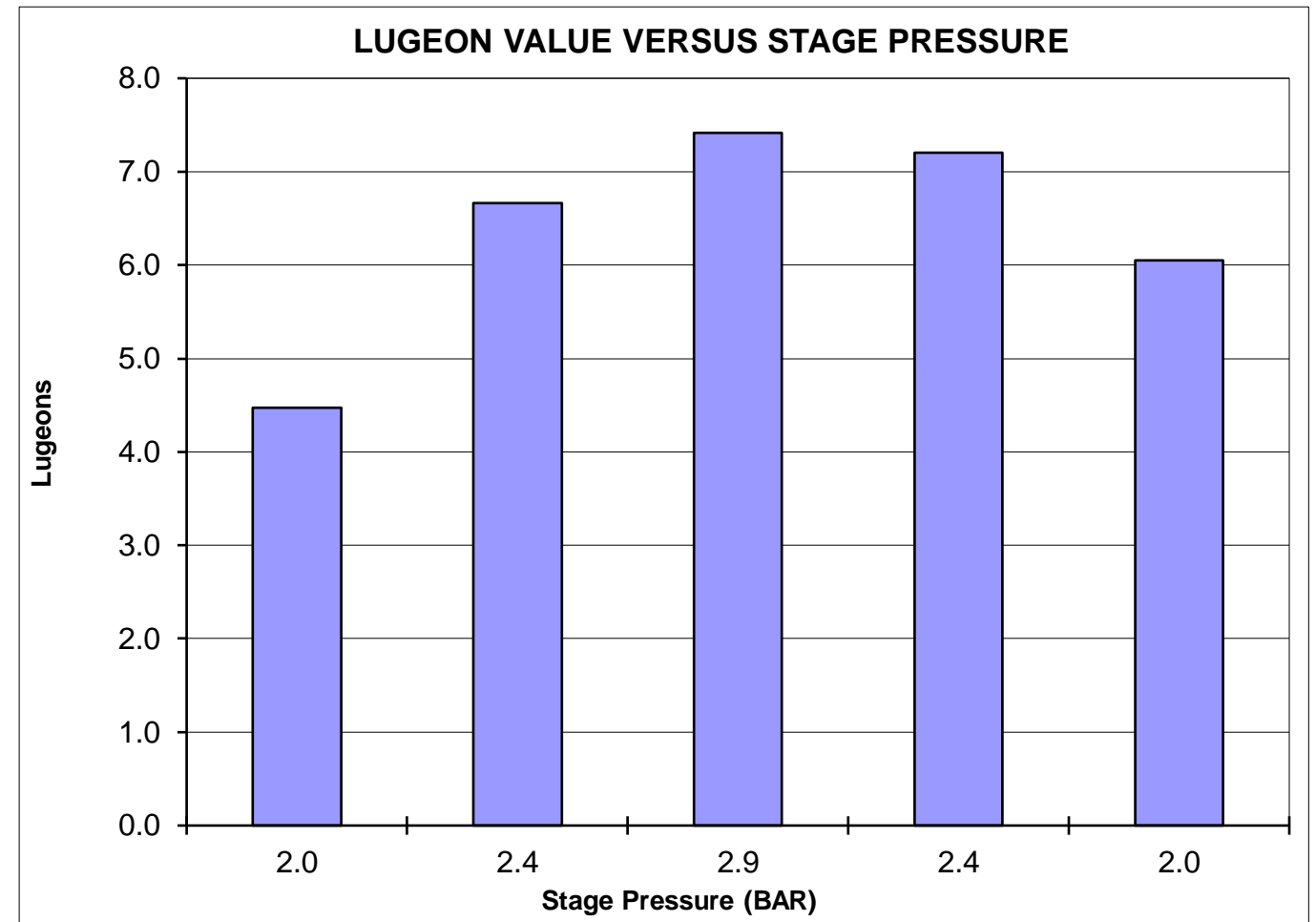
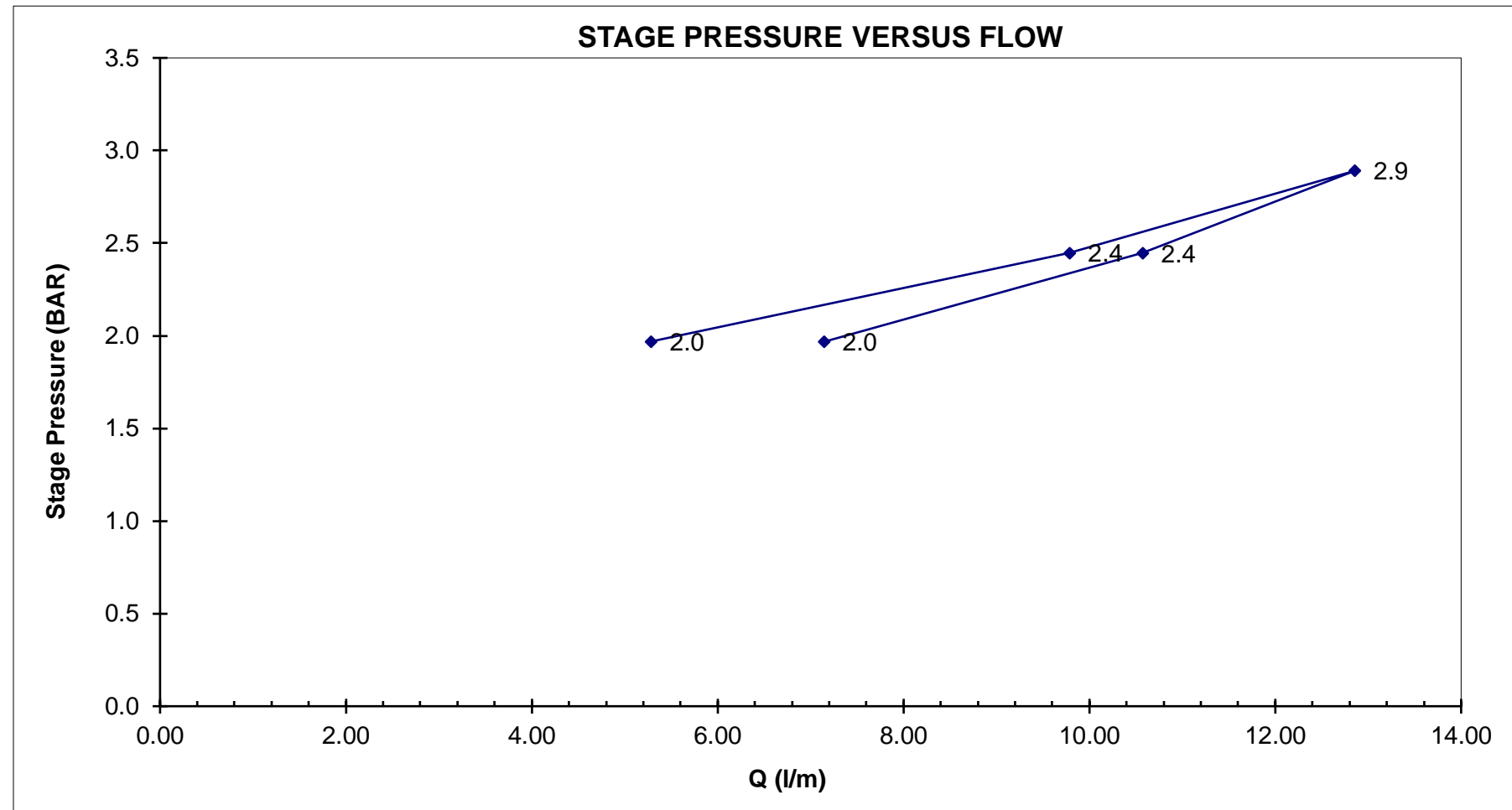
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 27-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 66.53 20.28 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.00	1.97	Flowmeter m3	11.91	11.91	11.92	11.92	11.93	11.93	11.94	11.94	5.3	4.5
			Take litres		5.50	5.50	5.00	5.00	5.50	5.50	5.00		
			Average Take l/m		5.50	5.50	5.00	5.00	5.50	5.5	5		
0.90	0.01	2.45	Flowmeter m3	11.99	12.00	12.01	12.02	12.03	12.04	12.05	12.06	9.8	6.7
			Take litres		9.00	8.50	8.50	9.50	10.50	11.00	11.50		
			Average Take l/m		9.00	8.50	8.50	9.50	10.50	11	11.5		
1.34	0.01	2.89	Flowmeter m3	12.17	12.18	12.20	12.21	12.22	12.24	12.25	12.26	12.9	7.4
			Take litres		13.50	12.00	13.00	13.00	13.00	12.50	13.00		
			Average Take l/m		13.50	12.00	13.00	13.00	13.00	12.5	13		
0.90	0.01	2.45	Flowmeter m3	12.28	12.29	12.30	12.31	12.32	12.34	12.35	12.36	10.6	7.2
			Take litres		10.50	10.50	10.50	10.50	11.00	10.50	10.50		
			Average Take l/m		10.50	10.50	10.50	10.50	11.00	10.5	10.5		
0.41	0.00	1.97	Flowmeter m3	12.41	12.42	12.43	12.44	12.45	12.45	12.46	12.46	7.1	6.1
			Take litres		8.00	8.00	9.00	8.00	8.50	8.50	0.00		
			Average Take l/m		8.00	8.00	9.00	8.00	8.50	8.5	0		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 6

K = 6.E-05 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 6.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0.5 PSI; P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. NO WATER ABOVE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 2.91 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-005 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	MEP/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	PREPD	RWW'D

SHEET 3 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 23.0 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 64.44 19.64 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

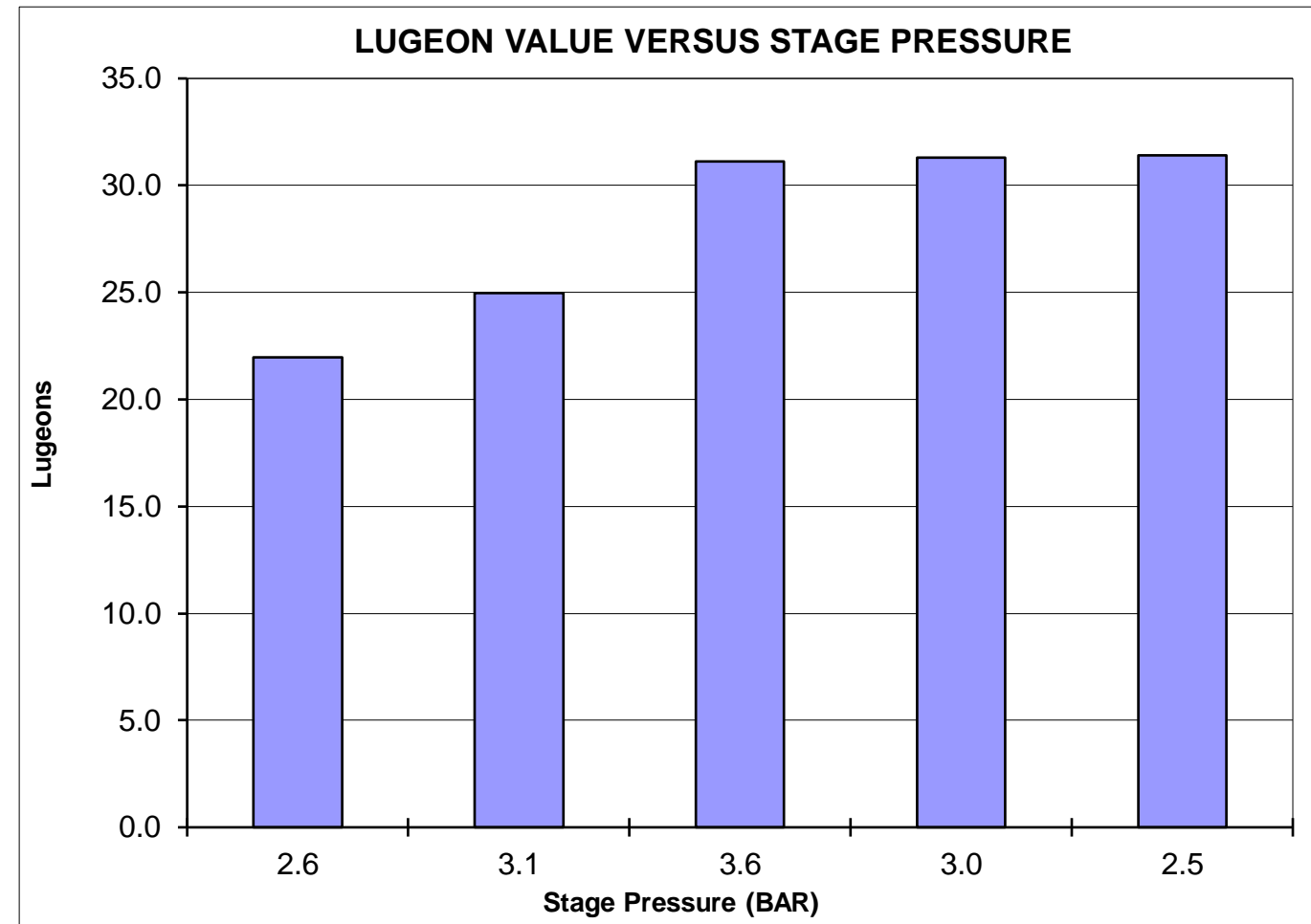
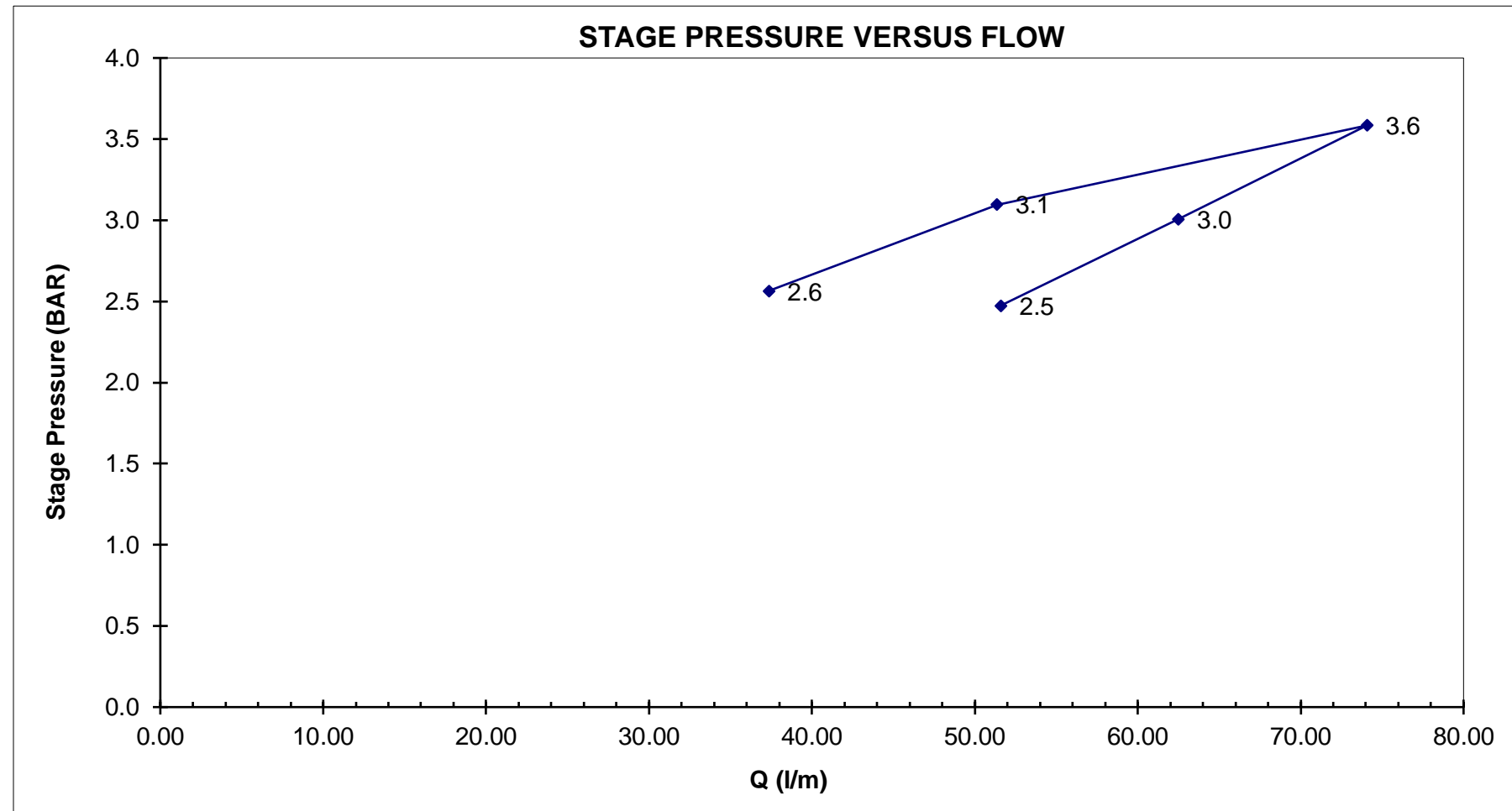
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 28-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 86.22 26.28 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.62	0.10	2.56	Flowmeter m3	13.30	13.33	13.37	13.41	13.44	13.48	13.52	13.56		
			Take litres		37.00	37.50	36.00	37.50	38.50	37.50	37.50		
			Average Take l/m		37.00	37.50	36.00	37.50	38.50	37.5	37.5	37.4	22.0
1.24	0.18	3.10	Flowmeter m3	13.70	13.75	13.81	13.86	13.91	13.96	14.01	14.06		
			Take litres		52.00	51.50	51.00	50.50	51.50	52.00	51.00		
			Average Take l/m		52.00	51.50	51.00	50.50	51.50	52	51	51.4	25.0
1.93	0.39	3.58	Flowmeter m3	14.33	14.40	14.47	14.55	14.62	14.70	14.77	14.84		
			Take litres		74.50	74.00	74.50	73.50	73.50	74.50	74.00		
			Average Take l/m		74.50	74.00	74.50	73.50	73.50	74.5	74	74.1	31.1
1.24	0.27	3.01	Flowmeter m3	15.10	15.16	15.22	15.28	15.35	15.41				
			Take litres		61.50	62.50	62.50	63.00	63.00				
			Average Take l/m		61.50	62.50	62.50	63.00	63.00			62.5	31.3
0.62	0.19	2.47	Flowmeter m3	15.55	15.60	15.65	15.70	15.75	15.80				
			Take litres		51.50	52.00	51.50	51.50	51.50				
			Average Take l/m		51.50	52.00	51.50	51.50	51.50			51.6	31.4



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 31

K = 3.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 3.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 1 PSI; P2 +/- 0 PSI; P3 +/- 0.25 PSI; P4 +/- 0 PSI; P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. DRY HOLE PRIOR TO PACKER TEST. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-005 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	PREP	RWD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 4 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 4.0 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 84.84 25.86 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

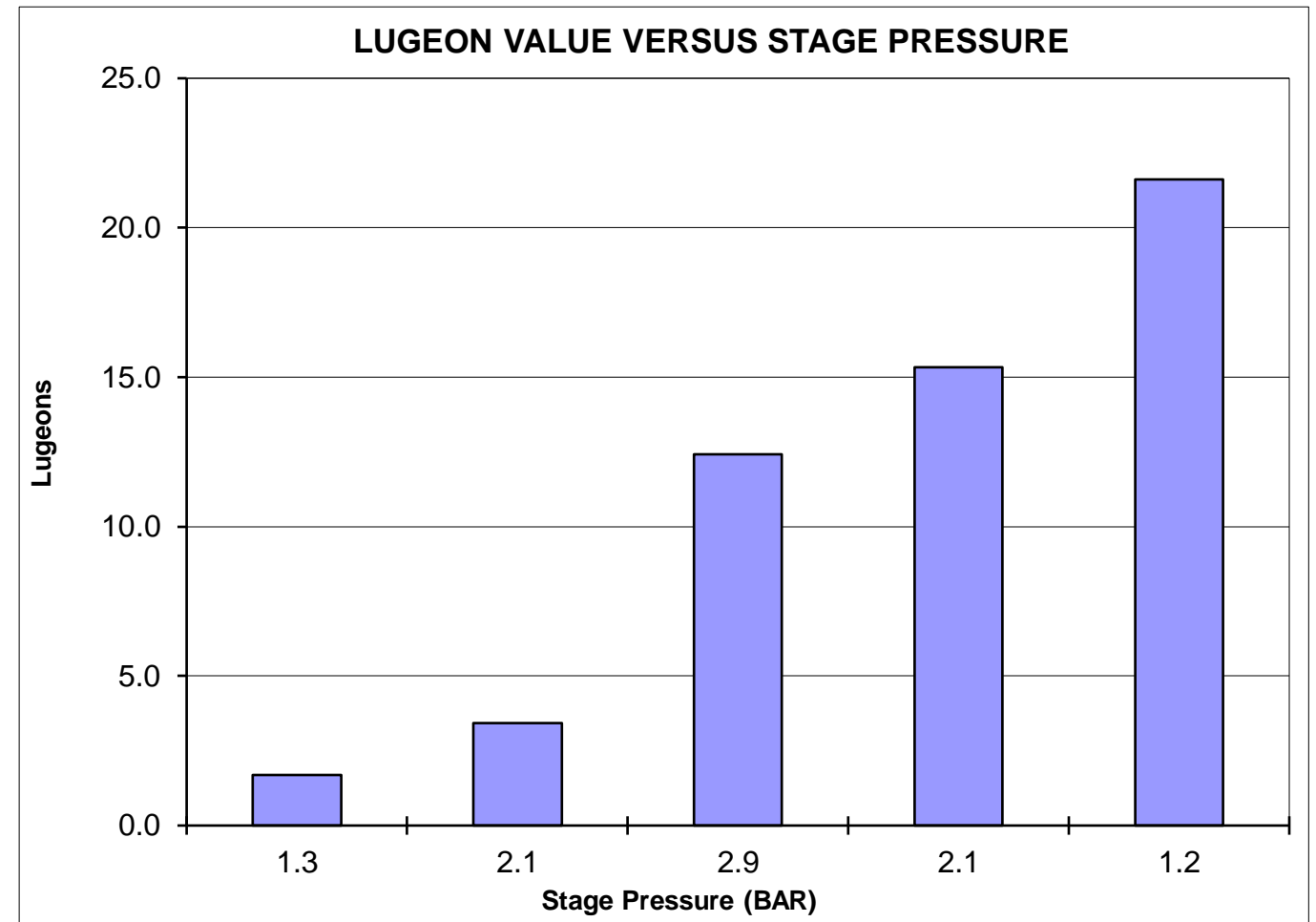
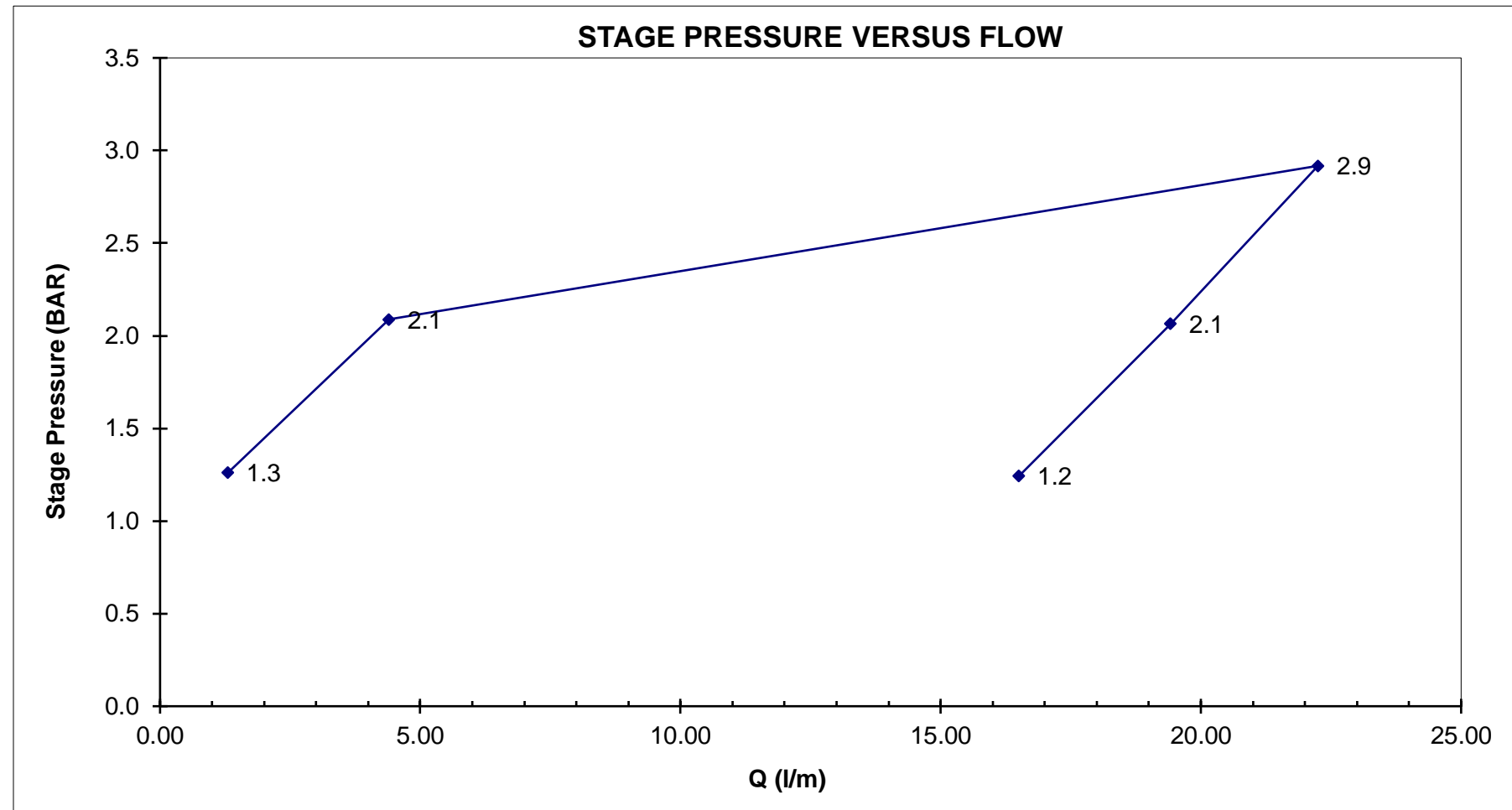
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 28-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 104.99 32.00 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.00	1.26	Flowmeter m3	15.88	15.88	15.88	15.88	15.88	15.89				
			Take litres		0.50	1.50	1.50	2.00	1.00				
			Average Take l/m		0.50	1.50	1.50	2.00	1.00			1.3	1.7
1.66	0.00	2.09	Flowmeter m3	15.90	15.90	15.91	15.91	15.91	15.92				
			Take litres		4.50	4.50	4.50	4.00	4.50				
			Average Take l/m		4.50	4.50	4.50	4.00	4.50			4.4	3.4
2.52	0.03	2.92	Flowmeter m3	16.09	16.11	16.14	16.16	16.18	16.20	16.22			
			Take litres		22.00	23.00	22.00	22.50	22.00	22.00			
			Average Take l/m		22.00	23.00	22.00	22.50	22.00	22		22.3	12.4
1.66	0.03	2.06	Flowmeter m3	16.27	16.28	16.30	16.32	16.34	16.36	16.38			
			Take litres		19.50	19.00	19.50	20.00	19.50	19.00			
			Average Take l/m		19.50	19.00	19.50	20.00	19.50	19		19.4	15.3
0.83	0.02	1.24	Flowmeter m3	16.42	16.44	16.46	16.47	16.49	16.51	16.52			
			Take litres		17.00	17.00	16.50	16.50	16.50	15.50			
			Average Take l/m		17.00	17.00	16.50	16.50	16.50	15.5		16.5	21.6



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 22

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0 PSI; P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	ME/CAG	CHS
			PREPD	RWW'D

SHEET 5 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 26.4 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 104.50 31.85 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

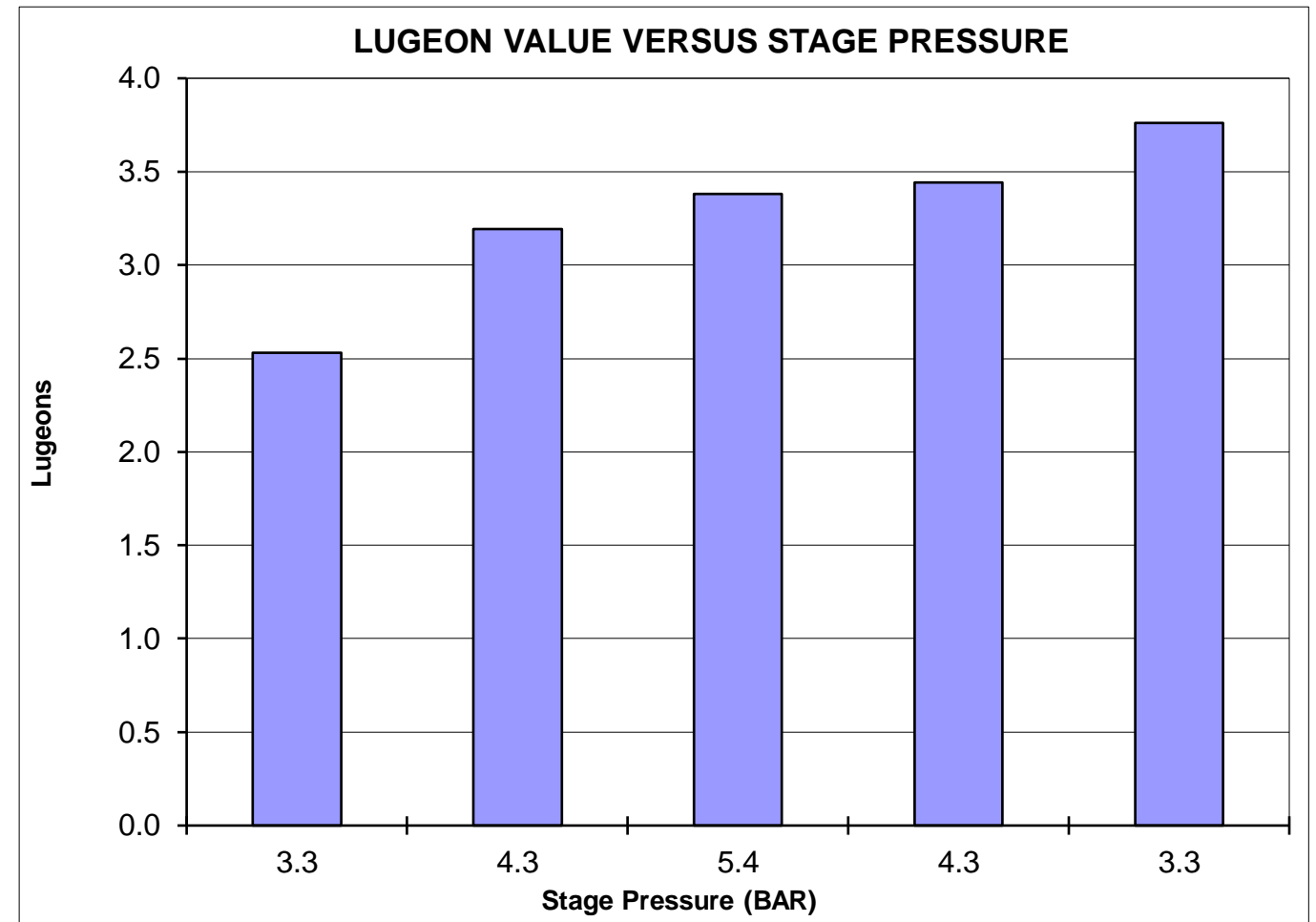
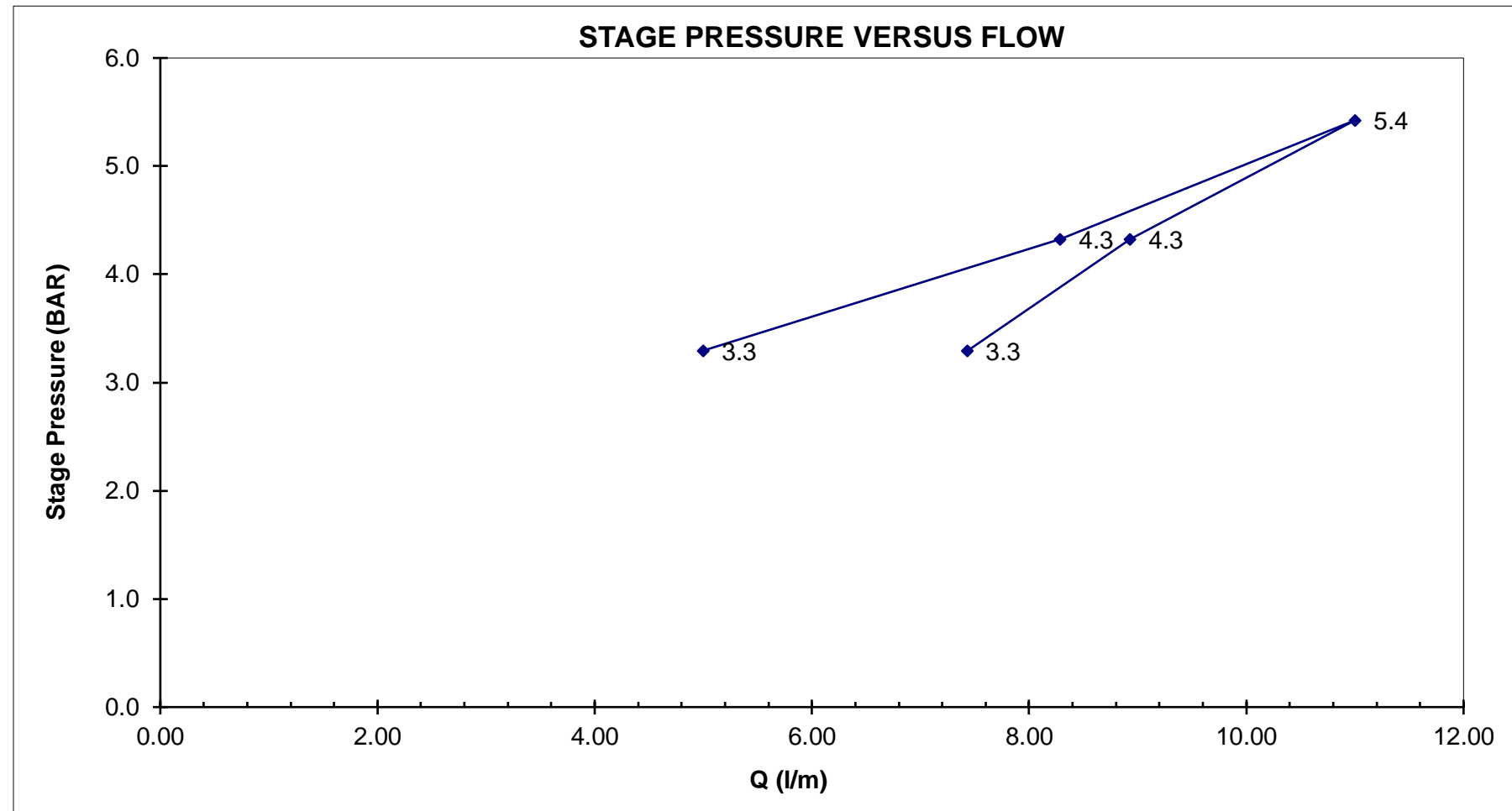
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 28-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 124.19 37.85 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
0.97	0.00	3.29	Flowmeter m3	16.69	16.70	16.70	16.71	16.71	16.72	16.72	16.73	5.0	2.5
			Take litres		5.00	5.00	5.00	5.00	5.00	5.00	5.00		
			Average Take l/m		5.00	5.00	5.00	5.00	5.00	5.00	5.00		
2.00	0.00	4.32	Flowmeter m3	16.84	16.85	16.86	16.87	16.88	16.89	16.89	16.90	8.3	3.2
			Take litres		8.50	8.50	8.00	8.50	8.50	7.50	8.50		
			Average Take l/m		8.50	8.50	8.00	8.50	8.50	7.50	8.50		
3.10	0.01	5.42	Flowmeter m3	16.95	16.97	16.98	16.99	17.00	17.01	17.02	17.03	11.0	3.4
			Take litres		11.50	11.50	11.00	11.00	11.00	10.00	11.00		
			Average Take l/m		11.50	11.50	11.00	11.00	11.00	10.00	11.00		
2.00	0.00	4.32	Flowmeter m3	17.09	17.09	17.10	17.11	17.12	17.13	17.14	17.15	8.9	3.4
			Take litres		9.00	8.50	9.00	8.50	9.00	9.50	9.00		
			Average Take l/m		9.00	8.50	9.00	8.50	9.00	9.50	9.00		
0.97	0.00	3.29	Flowmeter m3	17.17	17.17	17.18	17.19	17.20	17.20	17.21	17.22	7.4	3.8
			Take litres		7.50	7.00	7.50	7.50	7.50	7.50	7.50		
			Average Take l/m		7.50	7.00	7.50	7.50	7.50	7.50	7.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 4

K = 4.E-05 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 4.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.125 PSI; P3 +/- 0.125 PSI; P4 +/- 0.25 PSI; P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

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0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 6 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 6

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 22.9 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 123.69 37.70 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

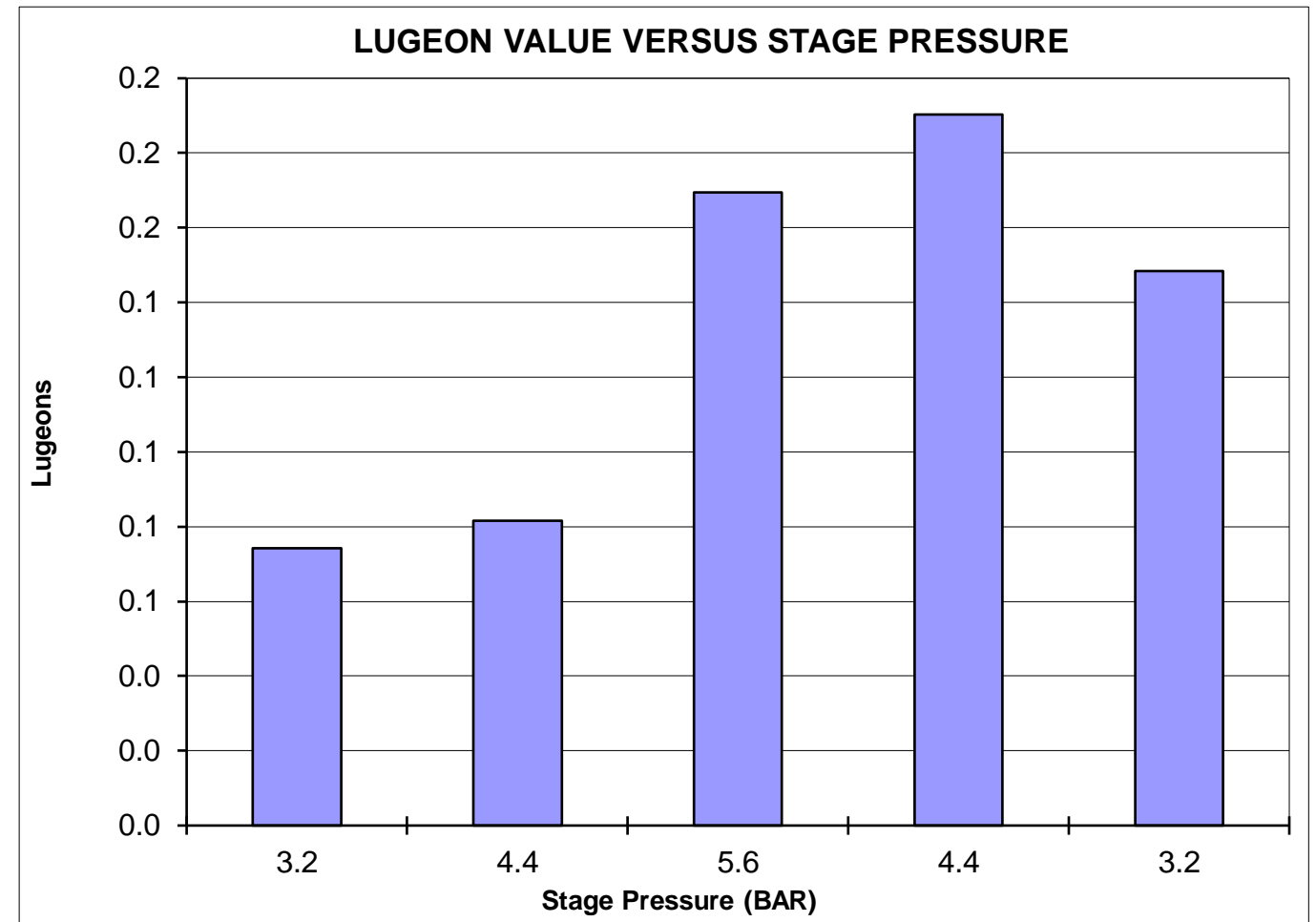
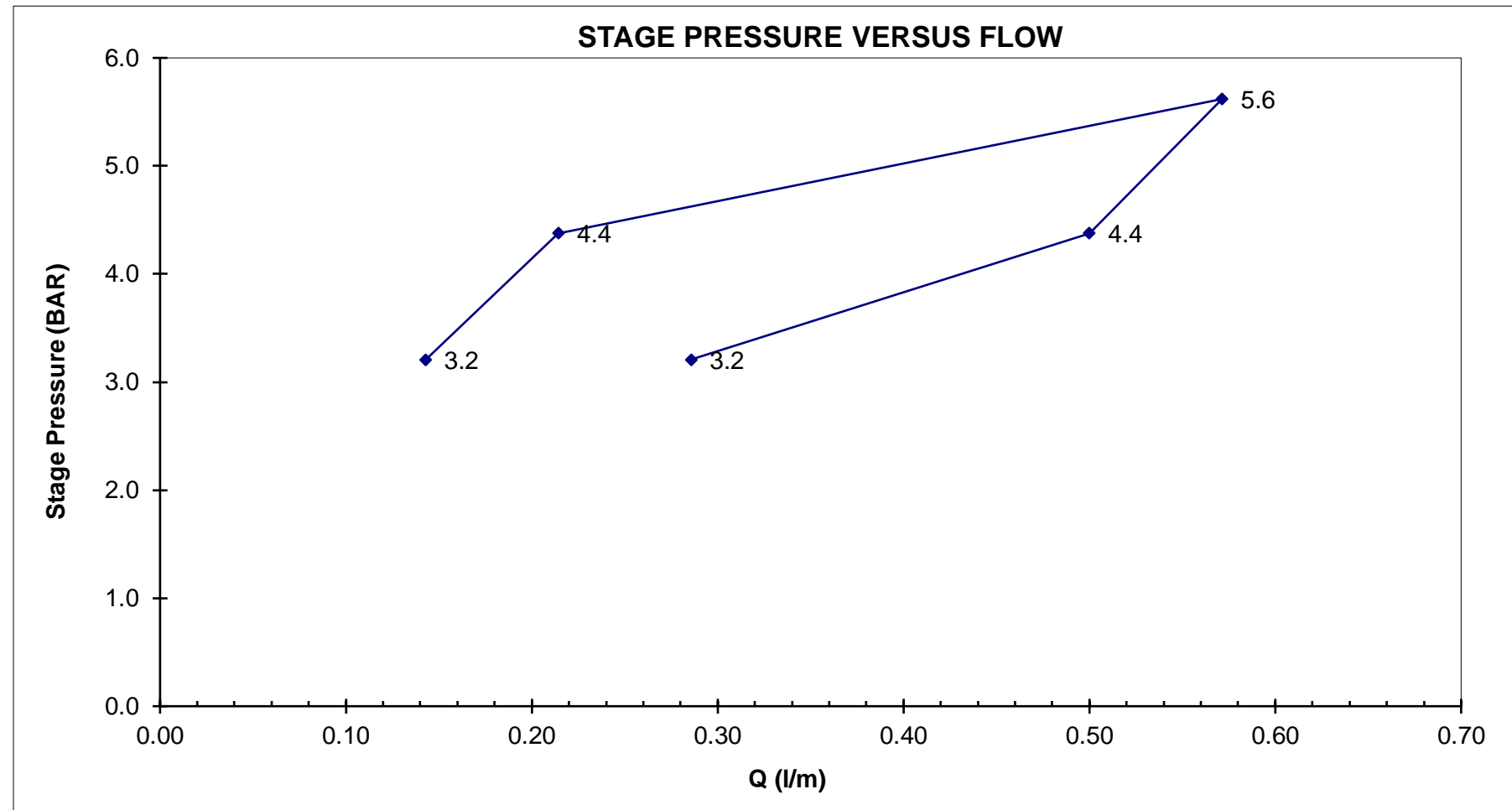
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 28-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 143.38 43.70 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.17	0.00	3.21	Flowmeter m3	17.28	17.28	17.28	17.28	17.28	17.28	17.28	17.28	0.1	0.1
			Take litres		0.50	0.00	0.00	0.00	0.50	0.00	0.00		
			Average Take l/m		0.50	0.00	0.00	0.00	0.50	0.00	0.00		
2.34	0.00	4.38	Flowmeter m3	17.30	17.30	17.30	17.30	17.30	17.30	17.30	17.30	0.2	0.1
			Take litres		0.00	0.50	0.00	0.00	0.50	0.00	0.50		
			Average Take l/m		0.00	0.50	0.00	0.00	0.50	0.00	0.50		
3.59	0.00	5.62	Flowmeter m3	17.34	17.34	17.34	17.34	17.34	17.34	17.34	17.34	0.6	0.2
			Take litres		0.50	1.50	0.00	0.50	1.00	0.50	0.00		
			Average Take l/m		0.50	1.50	0.00	0.50	1.00	0.50	0.00		
2.34	0.00	4.38	Flowmeter m3	17.34	17.34	17.34	17.34	17.34	17.34	17.35	17.35	0.5	0.2
			Take litres		0.50	0.50	0.50	0.50	0.50	0.50	0.50		
			Average Take l/m		0.50	0.50	0.50	0.50	0.50	0.50	0.50		
1.17	0.00	3.21	Flowmeter m3	17.35	17.35	17.35	17.35	17.35	17.35	17.35	17.35	0.3	0.1
			Take litres		0.50	0.00	0.50	0.50	0.00	0.50	0.00		
			Average Take l/m		0.50	0.00	0.50	0.50	0.00	0.50	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.1

K = 1.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 1.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI; P2 +/- 0.5 PSI; P3 +/- 1 PSI; P4 +/- 0.5 PSI; P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-005 - Lugeon Spreadsheet_r0.xlsx\TEST 6

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 7 OF 7

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-005

AREA: Bromley Humps TMF North Embankment

TEST NO: 7

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 24.2 m

DIP: 60 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 142.88 43.55 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

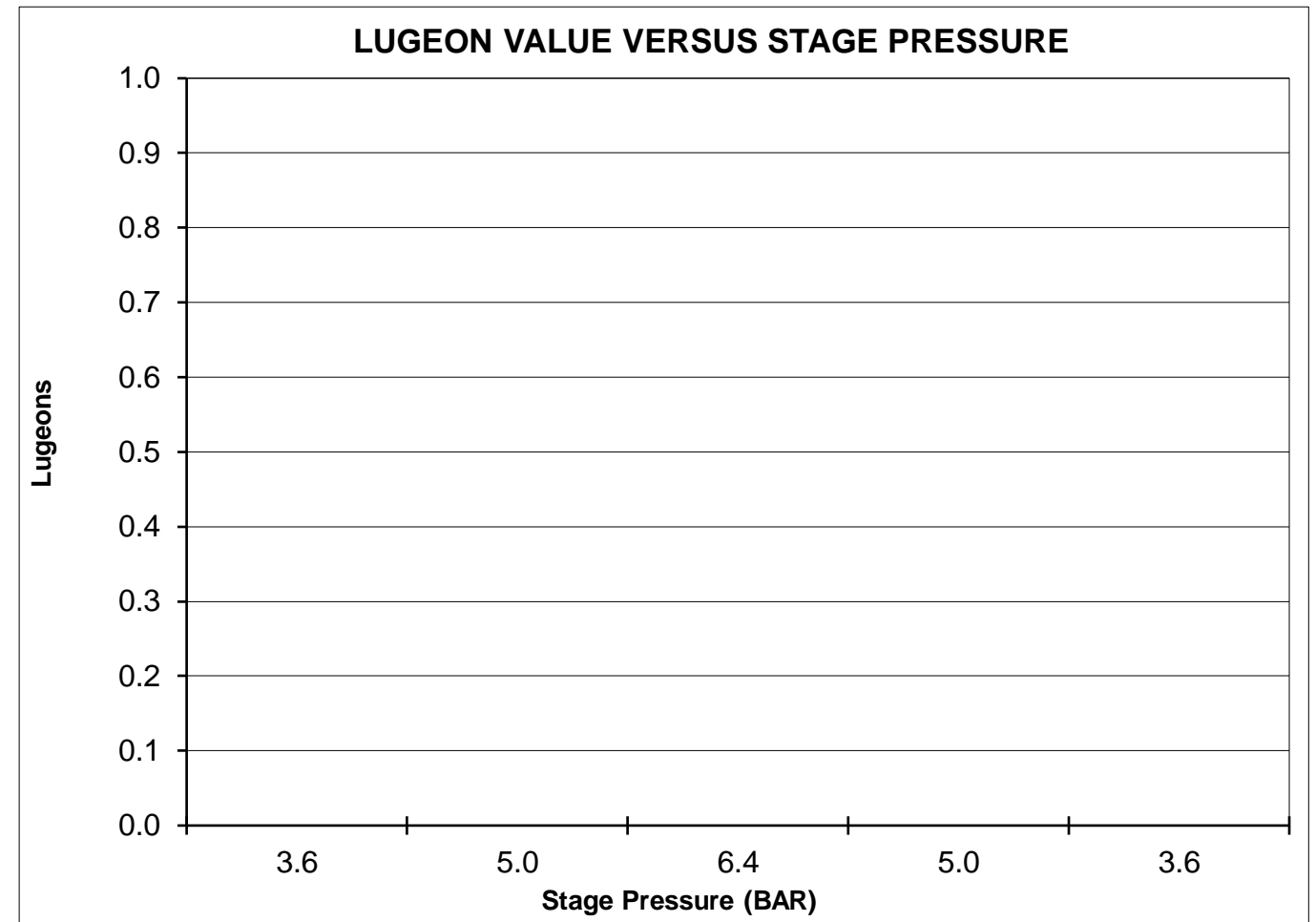
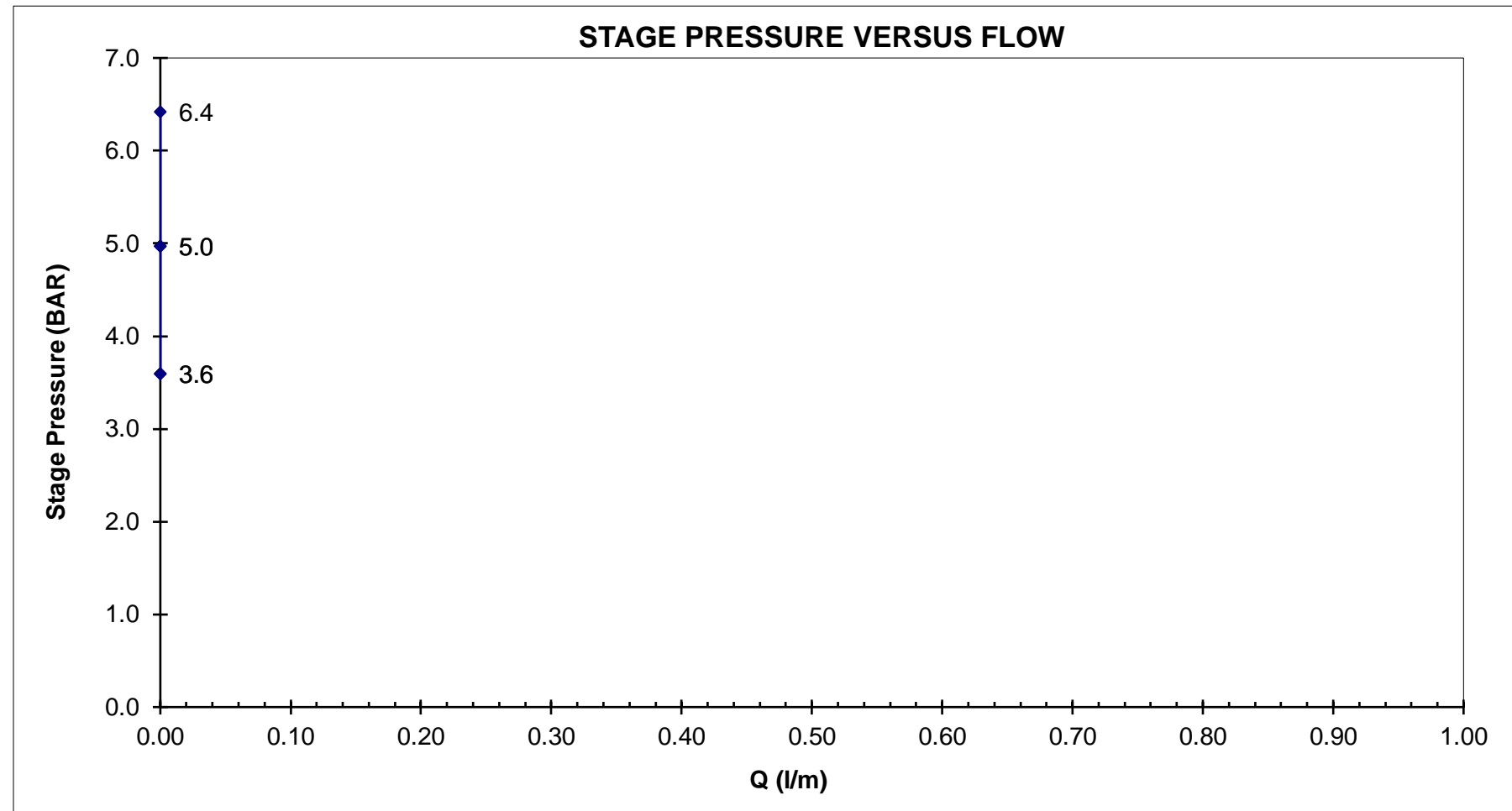
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 28-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 147.64 45.00 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.45	0.00	3.59	Flowmeter m3	17.54	17.54	17.54	17.54	17.54	17.54			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
2.83	0.00	4.97	Flowmeter m3	17.54	17.54	17.54	17.54	17.54	17.54			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
4.28	0.00	6.42	Flowmeter m3	17.54	17.54	17.54	17.54	17.54	17.54			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
2.83	0.00	4.97	Flowmeter m3	17.54	17.54	17.54	17.54	17.54	17.54			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
1.45	0.00	3.59	Flowmeter m3	17.54	17.54	17.54	17.54	17.54	17.54			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 0 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0.5 PSI; P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. REPLACED PRESSURE GAUGE PRIOR TO TEST WITH A GAUGE THAT MEASURES UP TO 100 PSI

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-005 - Lugeon Spreadsheet_r0.xlsx\TEST 7

REV	DATE	DESCRIPTION	MEP/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEP/CAG	CHS
			PREP	RWD

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-006

AREA: Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.3 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 21.52 6.56 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

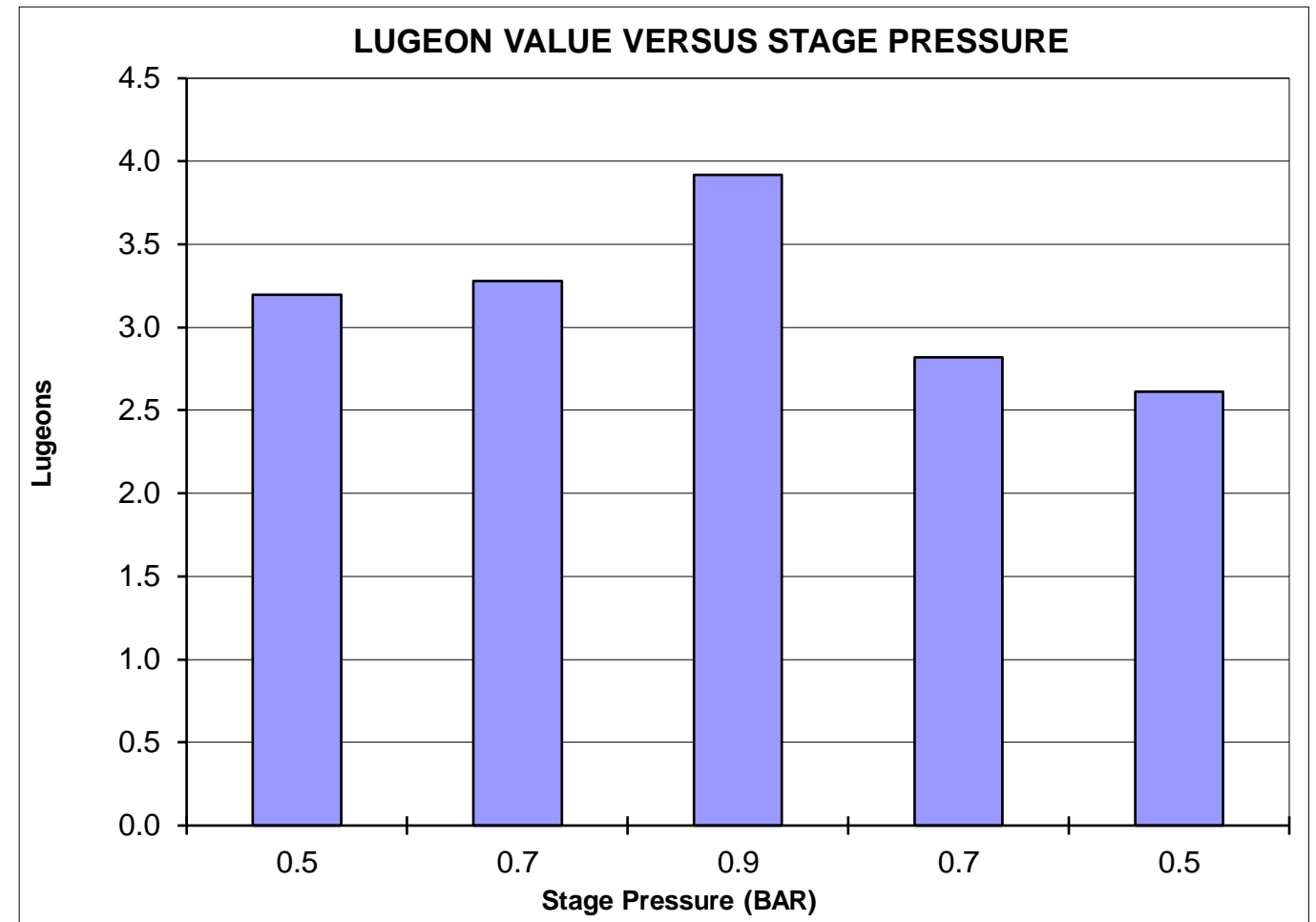
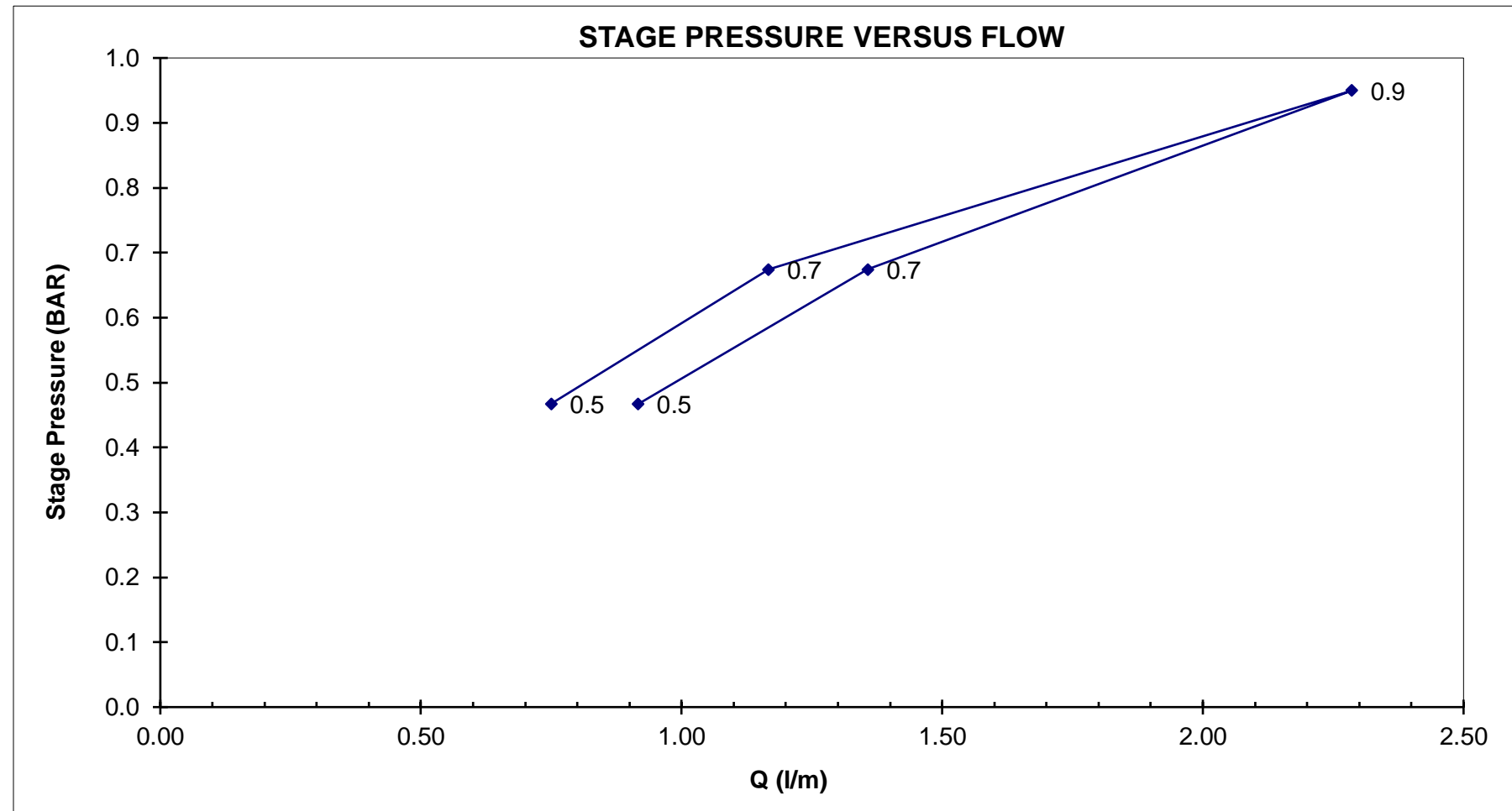
GAUGE HEIGHT ABOVE GROUND: 0.7 m

DATE: 30-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 41.67 12.70 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3							FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
0.28	0.00	0.47	0	17.60	17.60	17.61	17.61	17.61	17.61	17.61	0.9	3.2
			1	1.00	1.00	0.50	1.00	1.00	1.00			
			Take litres									
			Average Take l/m		1.00	1.00	0.50	1.00	1.00			
0.48	0.00	0.67	0	17.63	17.63	17.64	17.64	17.64	17.64	17.64	1.4	3.3
			1	1.50	1.50	1.00	1.00	1.50	1.50			
			Take litres									
			Average Take l/m		1.50	1.50	1.00	1.00	1.50			
0.76	0.00	0.95	0	17.65	17.65	17.65	17.66	17.66	17.66	17.67	2.3	3.9
			1	2.50	2.50	2.50	2.00	2.50	2.00			
			Take litres									
			Average Take l/m		2.50	2.50	2.50	2.00	2.50			
0.48	0.00	0.67	0	17.67	17.67	17.67	17.67	17.67	17.67	1.2	2.8	
			1	1.00	1.00	1.00	1.00	1.50	1.50			
			Take litres									
			Average Take l/m		1.00	1.00	1.00	1.00	1.50			
0.28	0.00	0.47	0	17.67	17.67	17.67	17.68	17.68	17.68	0.8	2.6	
			1	0.50	0.50	1.00	0.50	1.00	1.00			
			Take litres									
			Average Take l/m		0.50	0.50	1.00	0.50	1.00			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 3

K = 3.E-05 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 3.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE

MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-006 - Lugeon Spreadsheet_r0.xlsx\TEST 1

0	29JUN17	ISSUED WITH REPORT VA101-594/02-2	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-006

AREA: Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 39.57 12.06 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

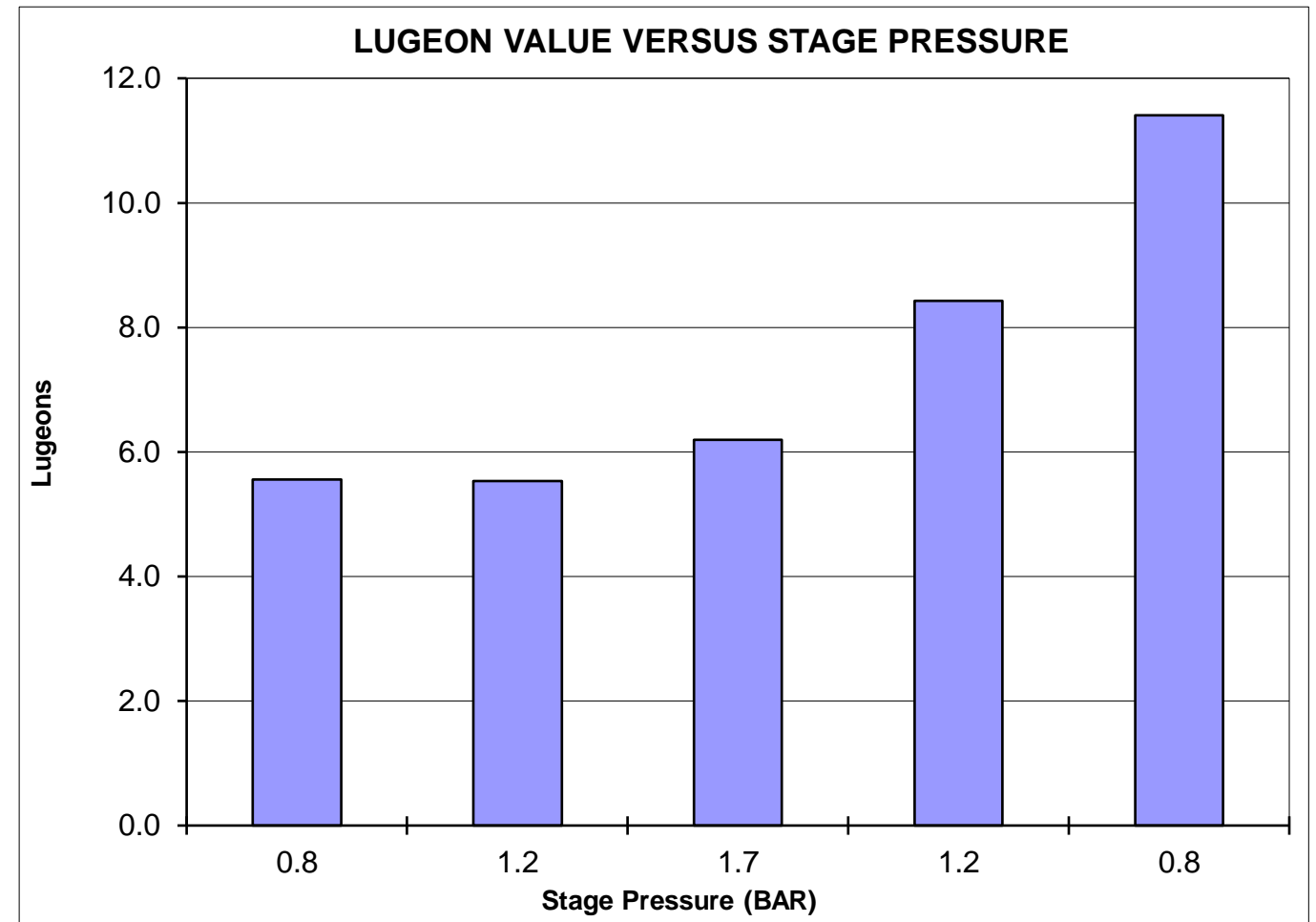
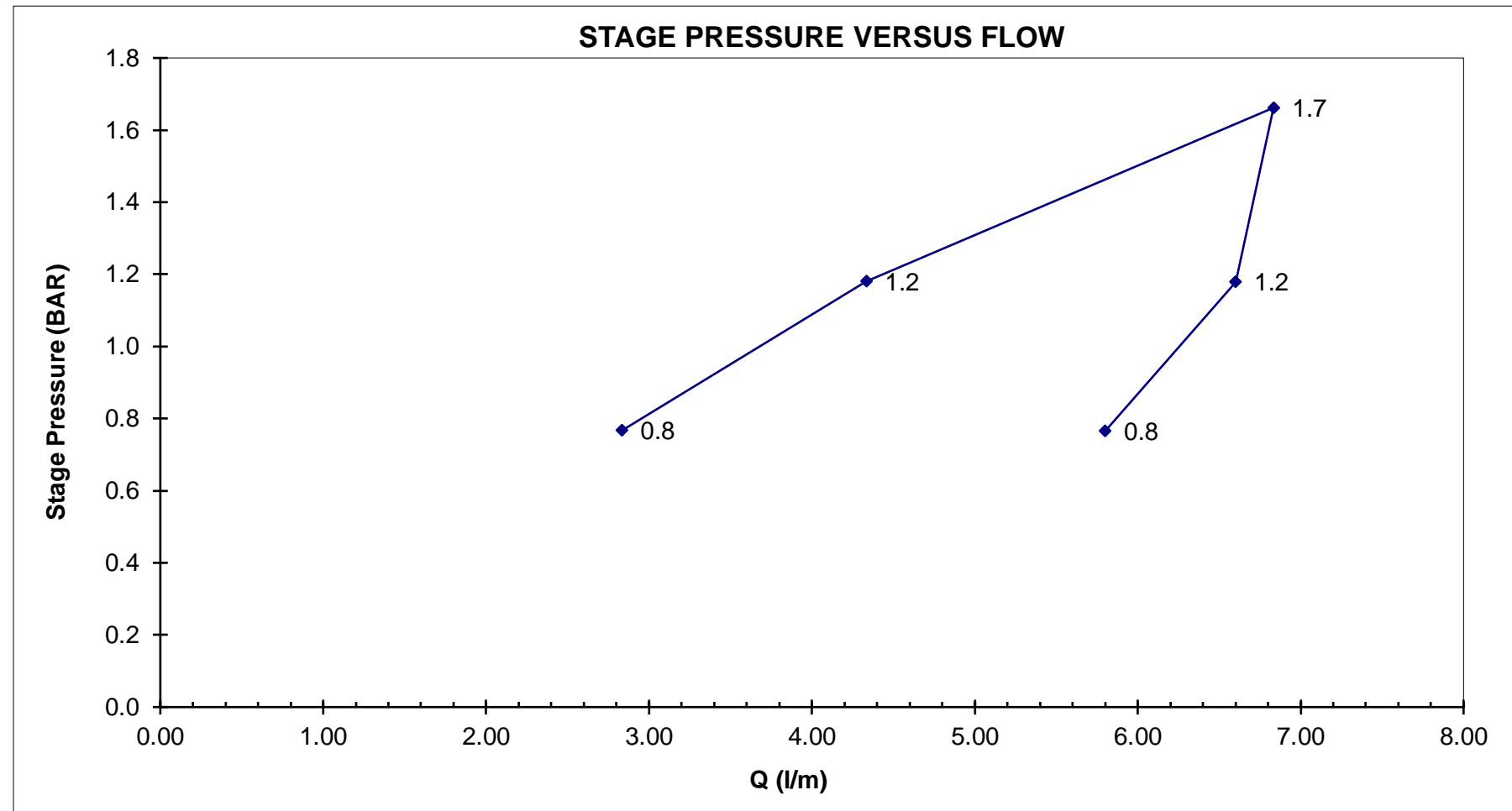
GAUGE HEIGHT ABOVE GROUND: 0.7 m

DATE: 30-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 61.35 18.70 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.48	0.00	0.77	Flowmeter m3	18.11	18.11	18.11	18.11	18.12	18.12	18.12			
			Take litres		2.50	3.00	3.00	2.50	3.00	3.00			
			Average Take l/m		2.50	3.00	3.00	2.50	3.00	3.00		2.8	5.6
0.90	0.00	1.18	Flowmeter m3	18.14	18.14	18.15	18.15	18.16	18.16	18.16			
			Take litres		4.00	4.00	4.50	4.50	4.50	4.50			
			Average Take l/m		4.00	4.00	4.50	4.50	4.50	4.50		4.3	5.5
1.38	0.00	1.66	Flowmeter m3	18.18	18.19	18.19	18.20	18.21	18.21	18.22			
			Take litres		7.00	6.50	7.00	6.50	7.00	7.00			
			Average Take l/m		7.00	6.50	7.00	6.50	7.00	7.00		6.8	6.2
0.90	0.00	1.18	Flowmeter m3	18.24	18.25	18.25	18.26	18.27	18.27				
			Take litres		6.50	6.50	6.50	6.50	7.00				
			Average Take l/m		6.50	6.50	6.50	6.50	7.00			6.6	8.4
0.48	0.00	0.77	Flowmeter m3	18.29	18.30	18.30	18.31	18.31	18.32				
			Take litres		5.50	6.00	5.50	6.00	6.00				
			Average Take l/m		5.50	6.00	5.50	6.00	6.00			5.8	11.4



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 11

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE

MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-006 - Lugeon Spreadsheet_r0.xlsx\TEST 2

0	29JUN17	ISSUED WITH REPORT VA101-594/02-2	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-006

AREA: Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.4 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 60.86 18.55 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

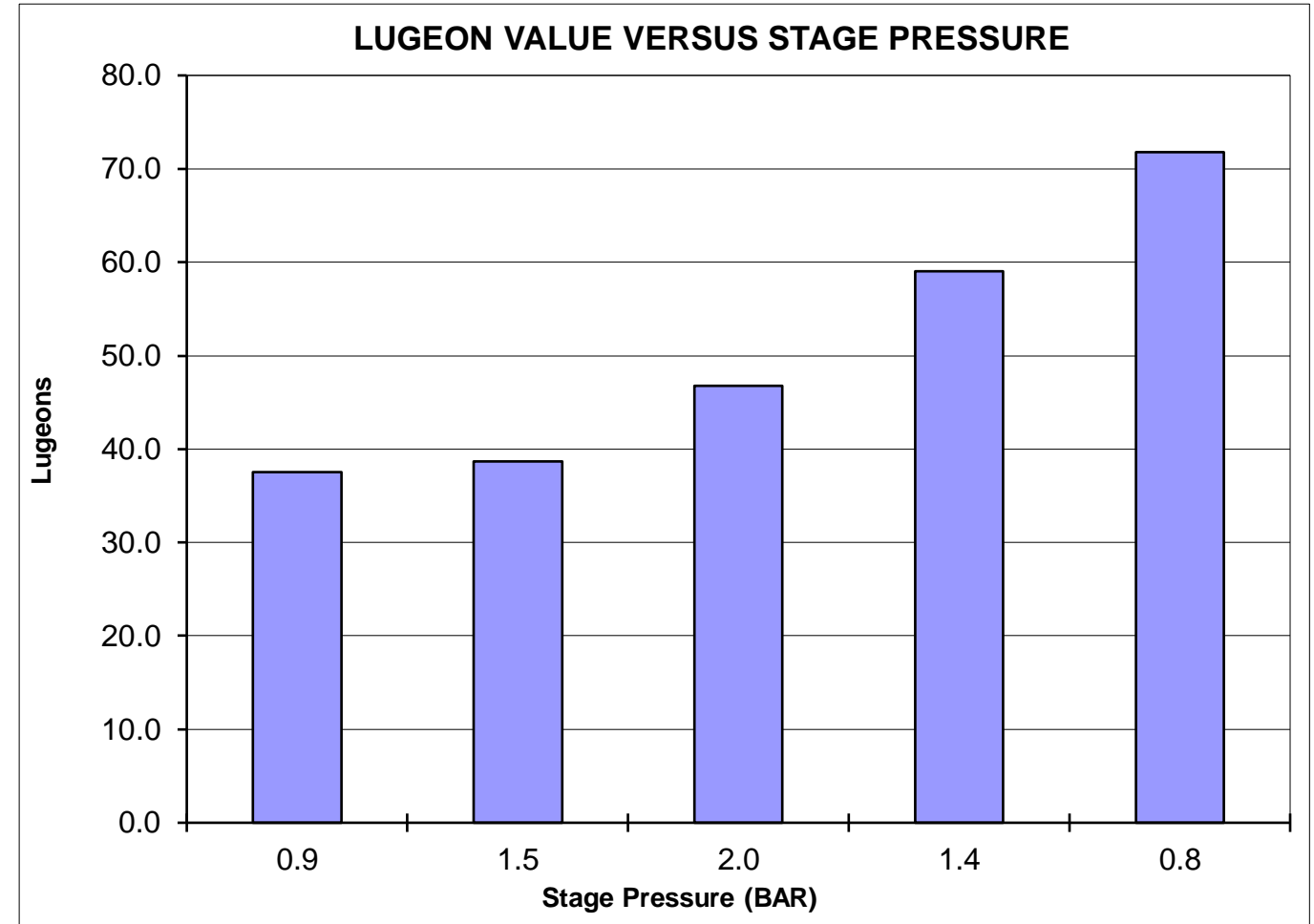
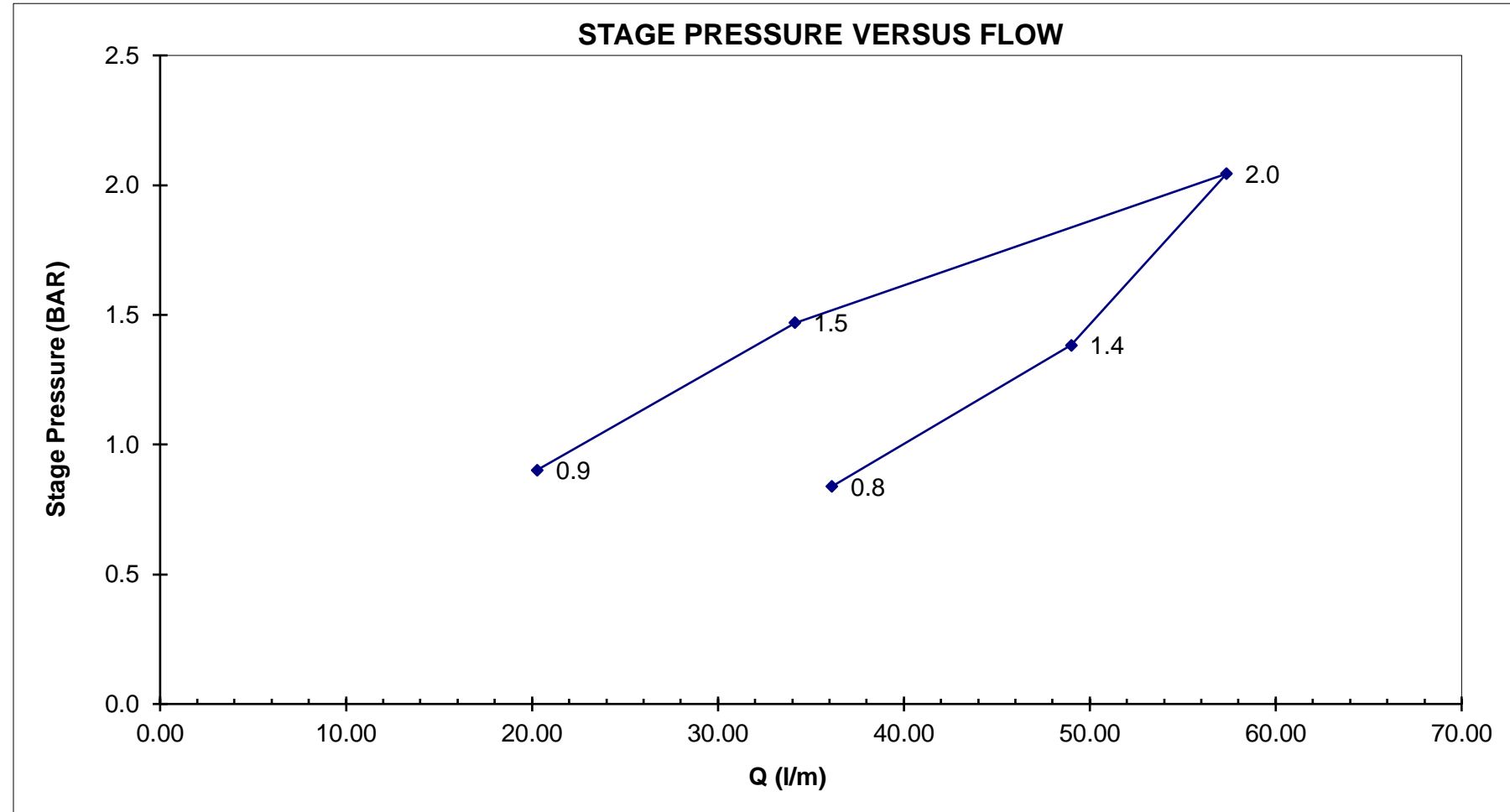
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 30-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 80.55 24.55 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3	Take litres	Average Take l/m	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
							Flowmeter m3	Take litres	Average Take l/m							
0.69	0.03	0.90	0	18.66			0	18.67	18.69	18.71	18.73	18.76	18.78	18.80	20.3	37.5
			1		19.00	20.00	20.00	20.50	21.00	20.50	21.00					
			2		19.00	20.00	20.00	20.50	21.00	20.50	21.00					
			Average		19.00	20.00	20.00	20.50	21.00	20.50	21.00					
1.31	0.08	1.47	0	18.92			0	18.95	18.99	19.02	19.06	19.09	19.12	19.16	34.1	38.7
			1		34.00	34.00	33.50	34.50	34.00	34.50	34.50					
			2		34.00	34.00	33.50	34.50	34.00	34.50	34.50					
			Average		34.00	34.00	33.50	34.50	34.00	34.50	34.50					
2.03	0.23	2.04	0	19.86			0	19.92	19.97	20.03	20.09	20.15	20.21	20.26	57.4	46.8
			1		57.00	57.50	57.00	57.50	57.50	59.00	56.00					
			2		57.00	57.50	57.00	57.50	57.50	59.00	56.00					
			Average		57.00	57.50	57.00	57.50	57.50	59.00	56.00					
1.31	0.17	1.38	0	20.43			0	20.47	20.52	20.57	20.62	20.67	20.72	20.77	49.0	59.1
			1		49.50	48.50	49.00	49.50	49.00	48.50	49.00					
			2		49.50	48.50	49.00	49.50	49.00	48.50	49.00					
			Average		49.50	48.50	49.00	49.50	49.00	48.50	49.00					
0.69	0.09	0.84	0	20.82			0	20.85	20.89	20.92	20.96	21.00	21.03	21.07	36.1	71.8
			1		36.50	36.00	36.00	36.50	35.50	36.50	36.00					
			2		36.50	36.00	36.00	36.50	35.50	36.50	36.00					
			Average		36.50	36.00	36.00	36.50	35.50	36.50	36.00					



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 72
 K = 7.E-04 cm/s
 K = 7.E-06 m/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

TYPES OF FLOW:	LAMINAR	DILATION

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0.25 PSI; P5 +/- 0.125 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE DROPPED BY 6.75 PSI DURING P3 PRESSURE STAGE AND WATER CAME OUT BETWEEN DRILL CASING AND DRILL RODS DURING TESTING. REPEATED P3 PRESSURE STAGE. PRESSURE STILL DROPPED BY 2.5 PSI AND WATER STILL CAME OUT BETWEEN DRILL CASING AND DRILL RODS UNTIL END OF P5 PRESSURE STAGE.

TEST BY: CAG ANALYZED BY: CAG REVIEWED BY: CHS

M:\1101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-006 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	MEP/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-2		
			PREPD	RWW/D

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-006

AREA: Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 21.4 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 80.06 24.40 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

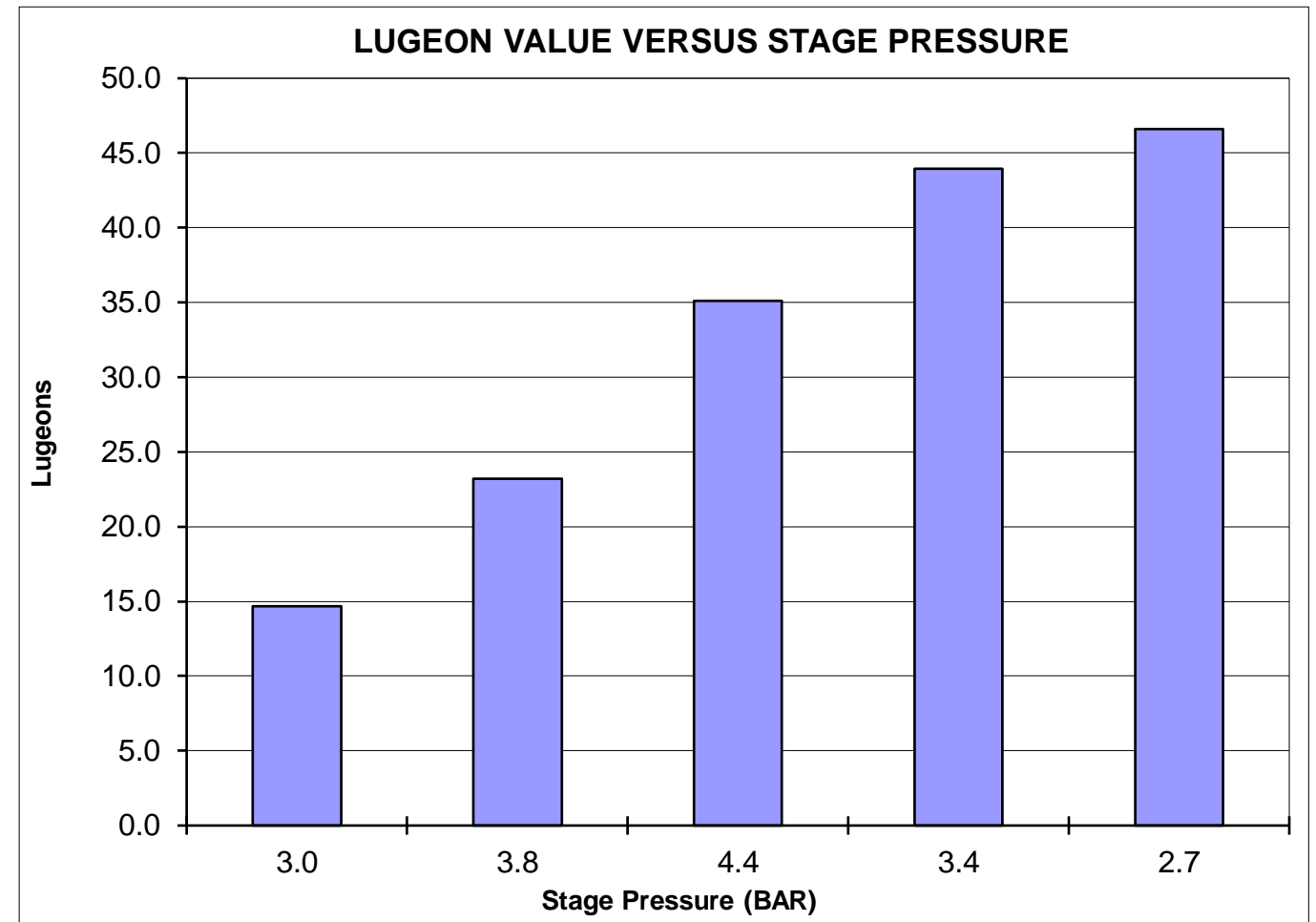
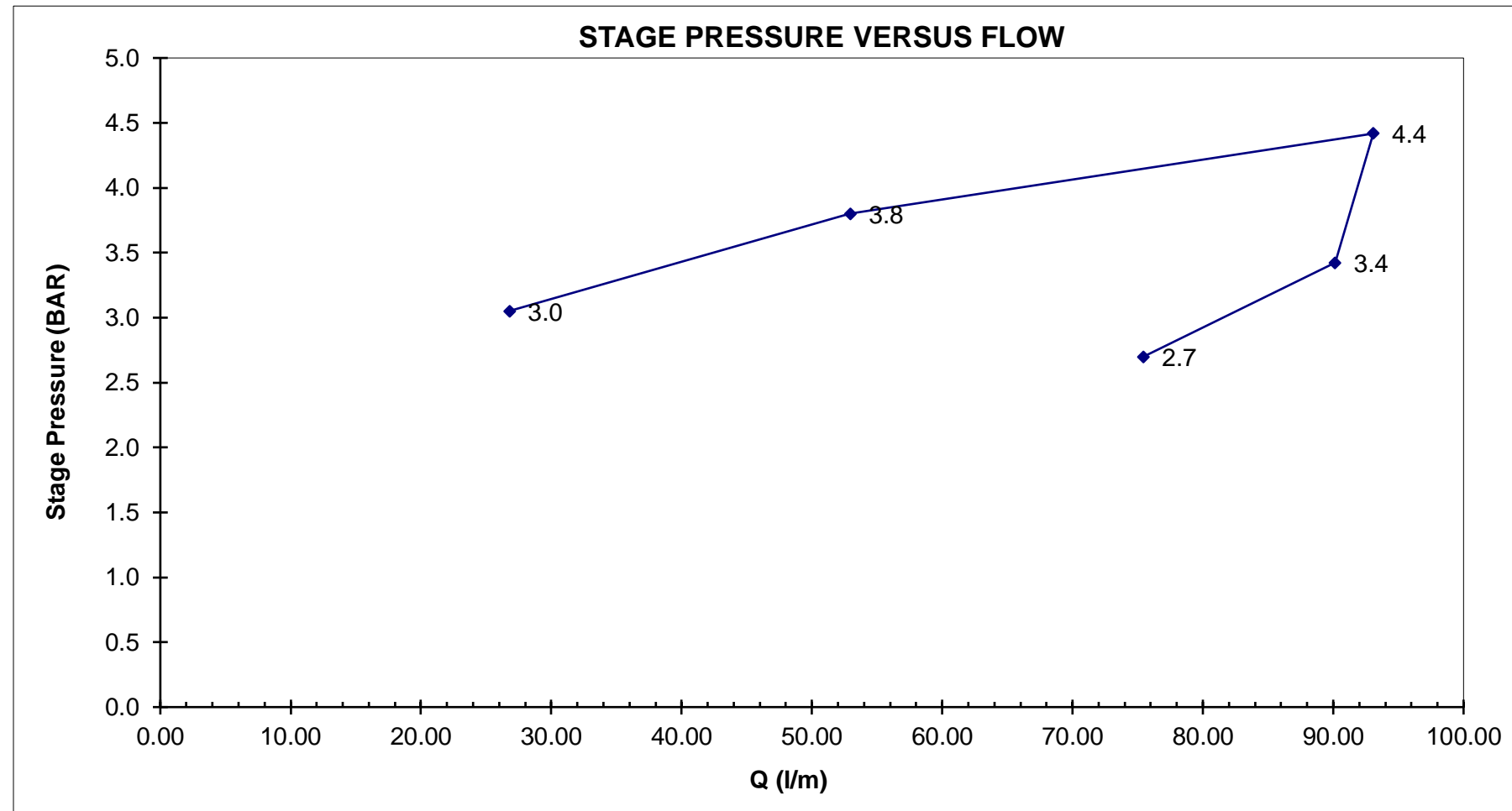
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 30-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 99.74 30.40 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
0.90	0.05	3.05	Flowmeter m3	21.38	21.40	21.43	21.46	21.48	21.51	21.54	21.56	26.8	14.6
			Take litres		27.00	27.50	27.00	27.00	26.50	26.00	26.50		
			Average Take l/m		27.00	27.50	27.00	27.00	26.50	26.00	26.50		
1.79	0.20	3.80	Flowmeter m3	21.75	21.80	21.86	21.91	21.96	22.01	22.07	22.12	52.9	23.2
			Take litres		52.00	53.00	52.50	53.00	52.00	52.50	55.50		
			Average Take l/m		52.00	53.00	52.50	53.00	52.00	52.50	55.50		
2.83	0.61	4.42	Flowmeter m3	23.94	24.03	24.12	24.21	24.31	24.40	24.49	24.59	93.1	35.1
			Take litres		93.50	93.50	92.00	94.00	92.50	93.00	93.00		
			Average Take l/m		93.50	93.50	92.00	94.00	92.50	93.00	93.00		
1.79	0.57	3.42	Flowmeter m3	24.73	24.82	24.91	25.00	25.09	25.18	25.27	25.36	90.1	43.9
			Take litres		90.50	90.50	90.00	91.00	90.00	89.50	89.50		
			Average Take l/m		90.50	90.50	90.00	91.00	90.00	89.50	89.50		
0.90	0.40	2.70	Flowmeter m3	25.54	25.62	25.69	25.77	25.85	25.92	26.00	26.07	75.4	46.6
			Take litres		75.00	75.50	76.50	75.00	75.00	75.00	76.00		
			Average Take l/m		75.00	75.50	76.50	75.00	75.00	75.00	76.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 47

K = 5.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 5.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1 +/- 0.5 PS1; P2 +/- 0.25 PS1; P3 +/- 0.3 PS1; P4 +/- 0.5 PS1; P5 +/- 0.25 PS1; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. RAN OUT OF WATER DURING P3 STAGE. REFILLED WATER TANK AND RE-RAN P3 STAGE. PRESSURE VARYING BY 3 PSI DURING P3; DID NOT REPEAT STAGE DUE TO LACK OF AVAILABLE WATER CAUSED BY HIGH TAKE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-006 - Lugeon Spreadsheet_r0.xlsx\TEST 4

REV	DATE	DESCRIPTION	PREP'D	RW'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-2	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-006

AREA: Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 94.36 28.76 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

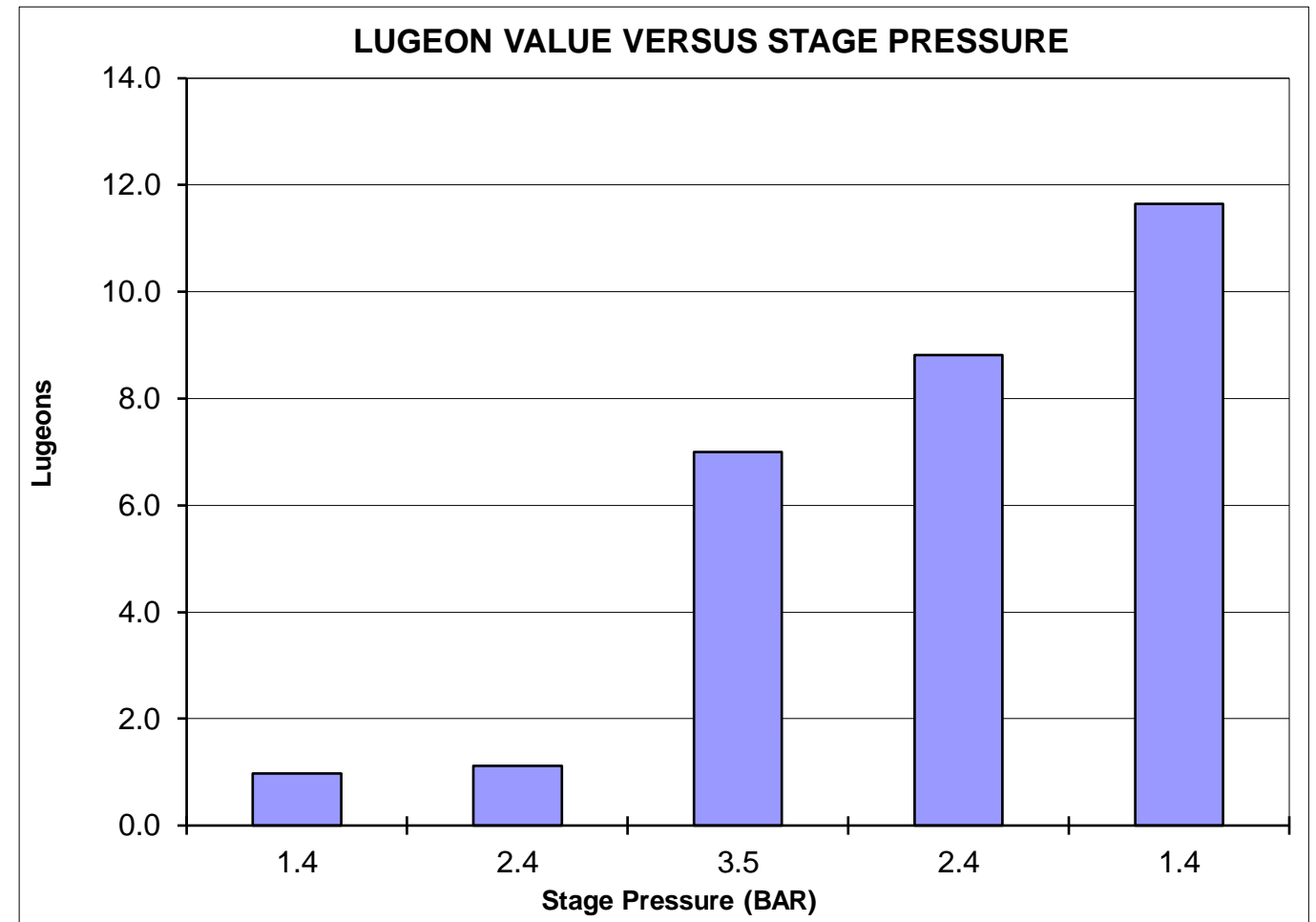
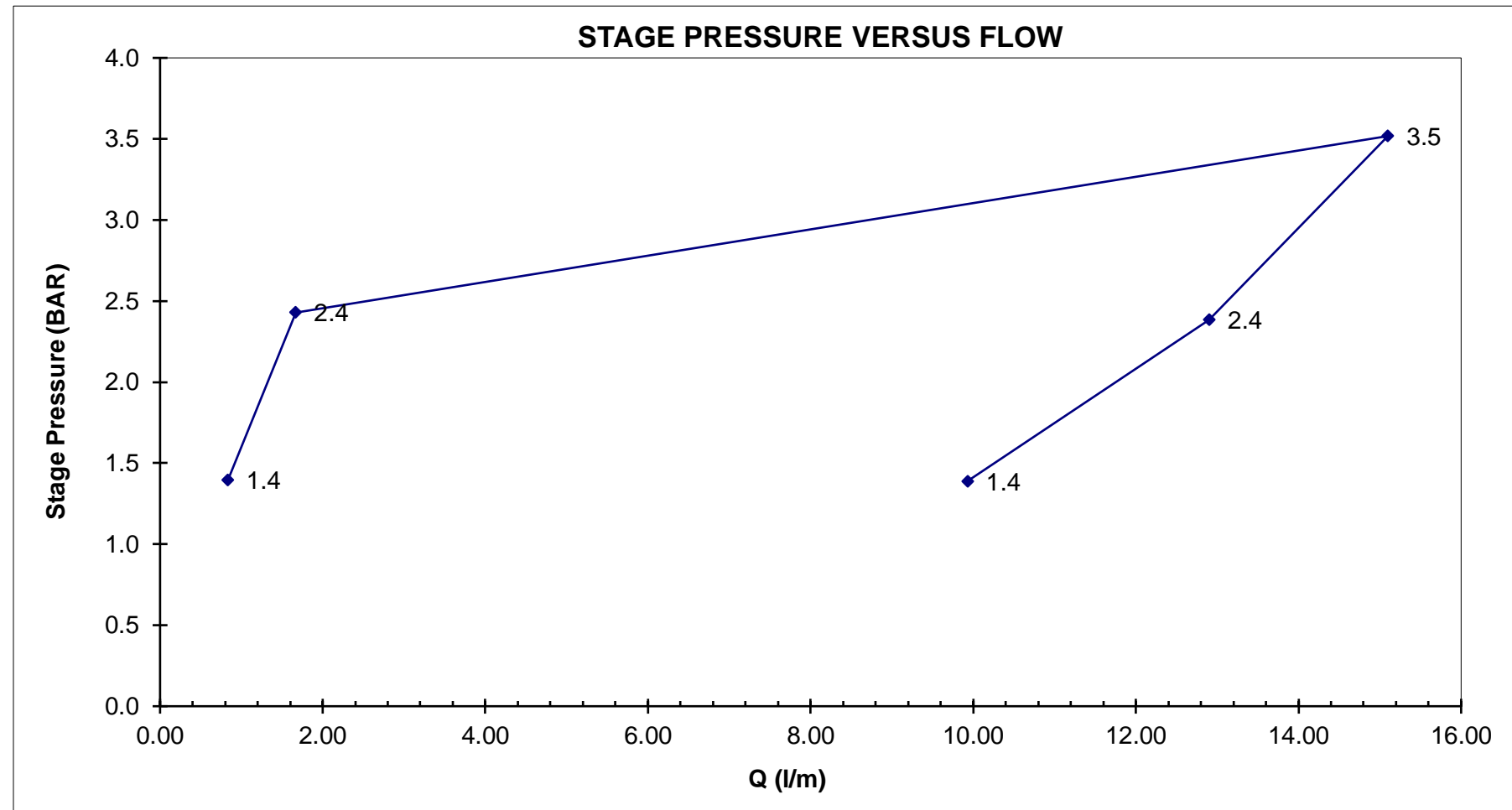
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 30-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 114.50 34.90 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.10	0.00	1.39	Flowmeter m3	26.16	26.16	26.17	26.17	26.17	26.17	26.17	26.17	0.8	1.0
			Take litres		0.50	1.00	1.00	1.00	0.50	1.00			
			Average Take l/m		0.50	1.00	1.00	1.00	0.50	1.00			
2.14	0.00	2.43	Flowmeter m3	26.17	26.17	26.18	26.18	26.18	26.18	26.18	26.18	1.7	1.1
			Take litres		1.50	1.50	2.00	2.00	1.50	1.50			
			Average Take l/m		1.50	1.50	2.00	2.00	1.50	1.50			
3.24	0.01	3.52	Flowmeter m3	26.23	26.25	26.26	26.28	26.29	26.31			15.1	7.0
			Take litres		15.50	15.50	15.00	15.00	14.50				
			Average Take l/m		15.50	15.50	15.00	15.00	14.50				
2.10	0.01	2.38	Flowmeter m3	26.35	26.36	26.37	26.39	26.40	26.41			12.9	8.8
			Take litres		13.50	13.00	13.00	12.50	12.50				
			Average Take l/m		13.50	13.00	13.00	12.50	12.50				
1.10	0.01	1.39	Flowmeter m3	26.43	26.45	26.46	26.47	26.48	26.49	26.50	26.50	9.9	11.6
			Take litres		11.50	12.00	11.50	11.00	11.00	11.00	1.50		
			Average Take l/m		11.50	12.00	11.50	11.00	11.00	11.00	1.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 12

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.25 PSI; P3 +/- 0.25 PSI; P4 +/- 0.25 PSI; P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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0	29JUN17	ISSUED WITH REPORT VA101-594/02-2	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-007

AREA: Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 8.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 15.94 4.86 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

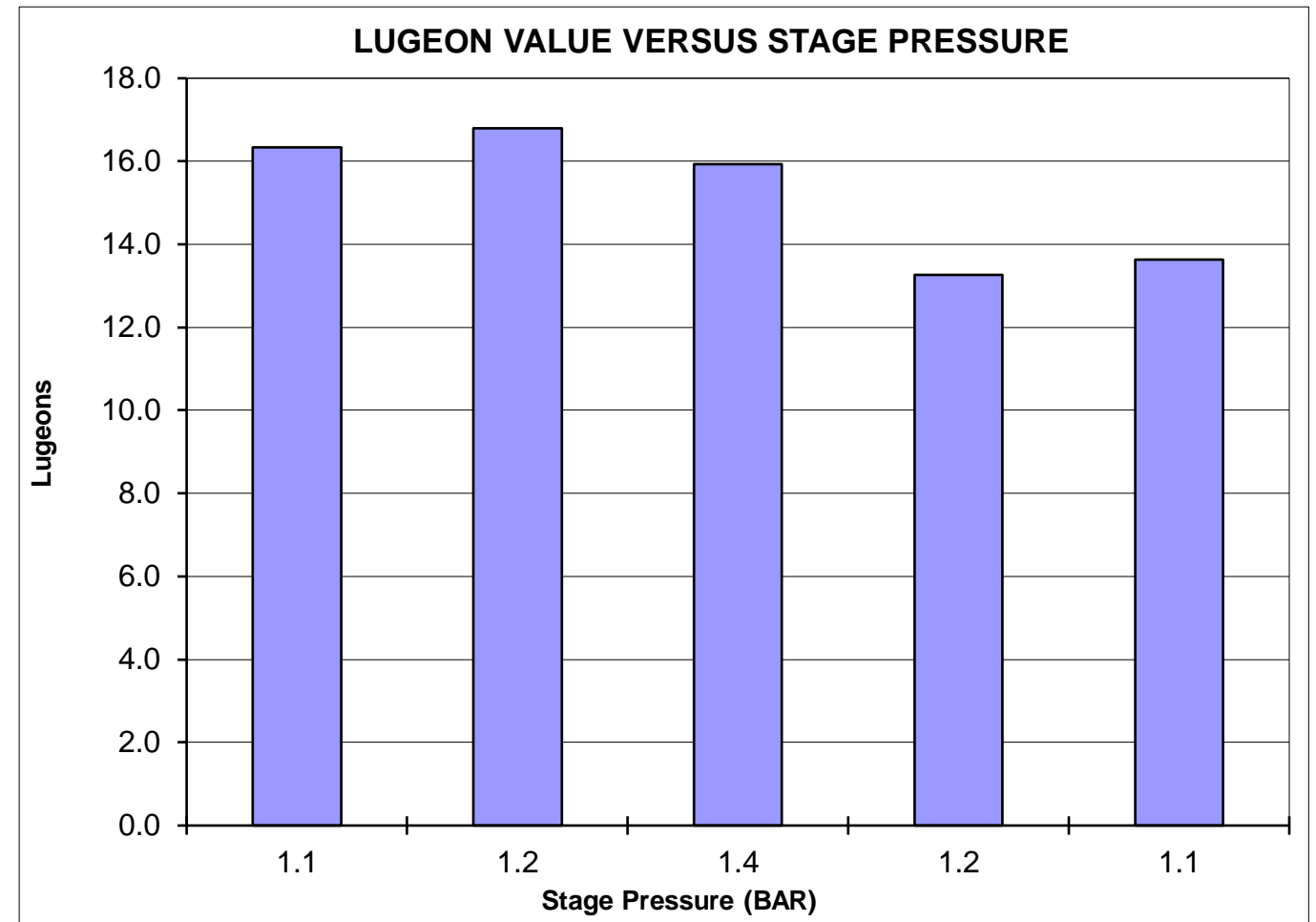
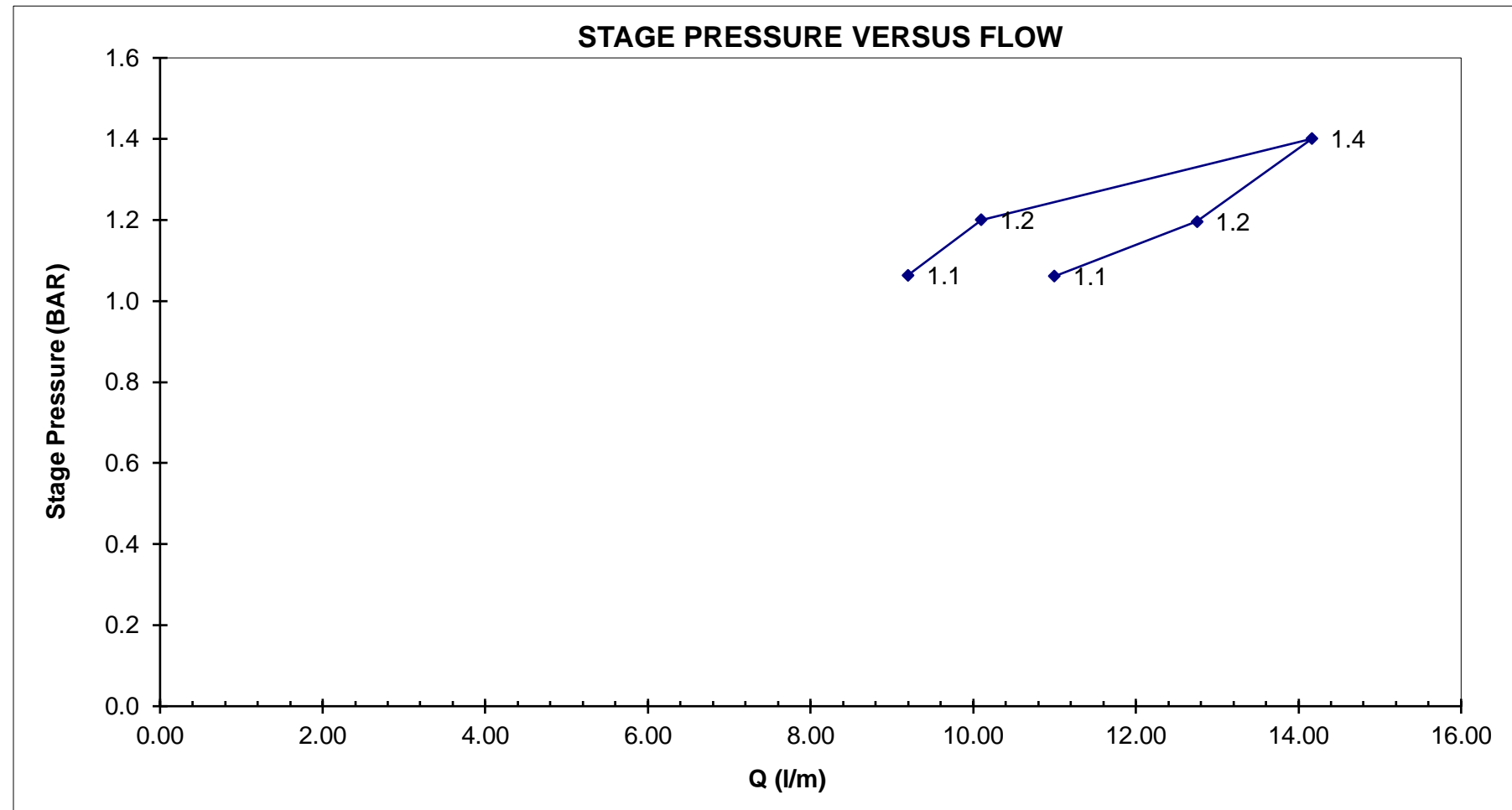
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 02-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 36.76 11.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.01	1.06	Flowmeter m3	27.02	27.03	27.04	27.05	27.06	27.07				
			Take litres		11.00	11.50	11.00	10.50	11.00			11.0	16.3
			Average Take l/m			11.00	11.50	11.00	10.50	11.00			
0.34	0.01	1.20	Flowmeter m3	27.10	27.12	27.13	27.14	27.16	27.17	27.18			
			Take litres		13.00	12.50	13.00	18.00	7.50	12.50		12.7	16.8
			Average Take l/m		13.00	12.50	13.00	18.00	7.50	12.50			
0.55	0.01	1.40	Flowmeter m3	27.25	27.26	27.28	27.29	27.30	27.32	27.33			
			Take litres		15.50	15.00	13.00	14.00	13.50	14.00		14.17	15.94
			Average Take l/m		15.50	15.00	13.00	14.00	13.50	14.00			
0.34	0.01	1.20	Flowmeter m3	27.35	27.36	27.37	27.38	27.39	27.40				
			Take litres		10.00	10.00	10.50	10.00	10.00			10.10	13.26
			Average Take l/m		10.00	10.00	10.50	10.00	10.00				
0.21	0.01	1.06	Flowmeter m3	27.41	27.42	27.43	27.44	27.45	27.46				
			Take litres		9.00	9.50	9.00	9.50	9.00			9.20	13.63
			Average Take l/m		9.00	9.50	9.00	9.50	9.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 15

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: NEGLIGIBLE
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 3.06 mbgs. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	RWW'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-007

AREA: Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 14.1 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 36.29 11.06 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

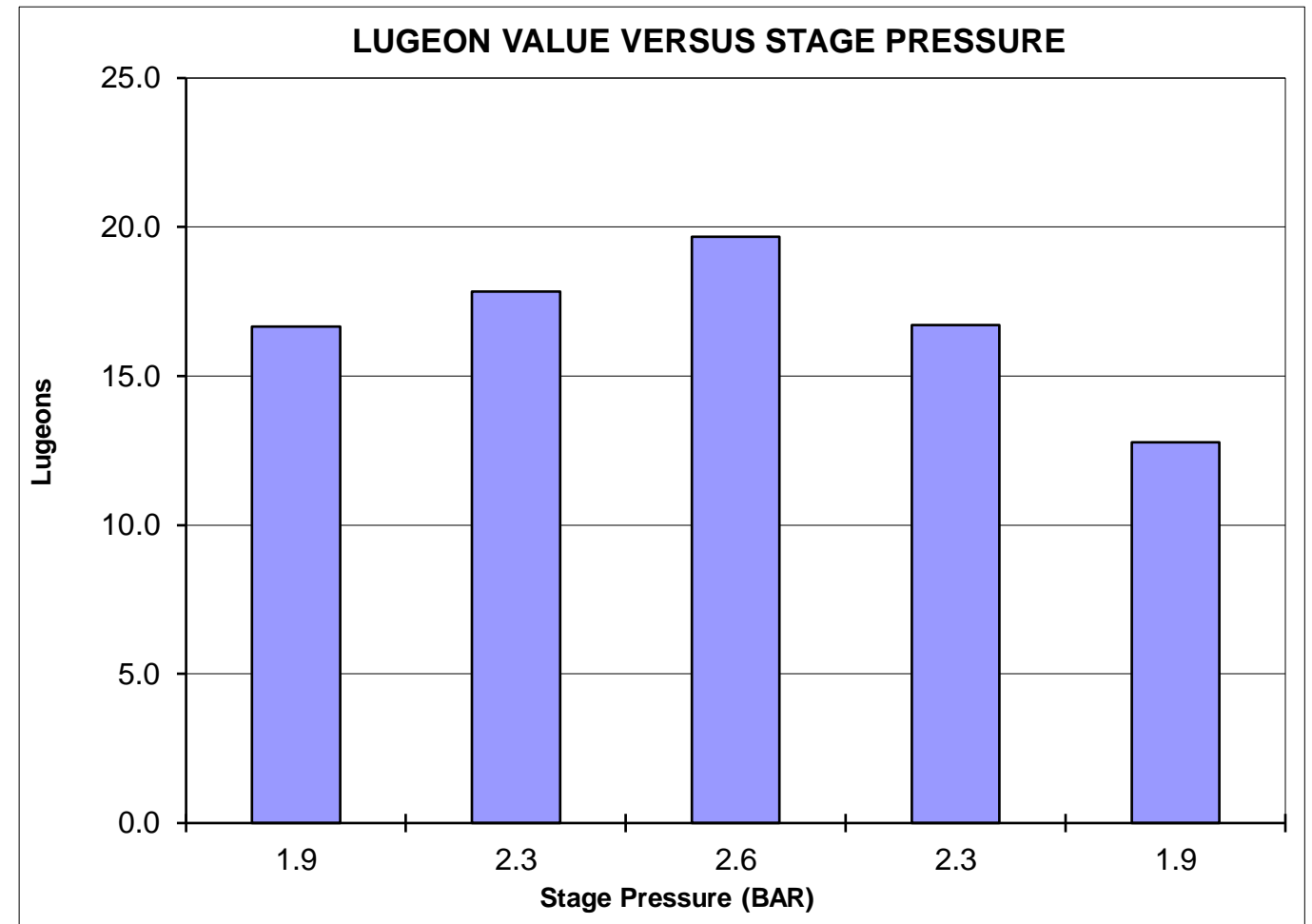
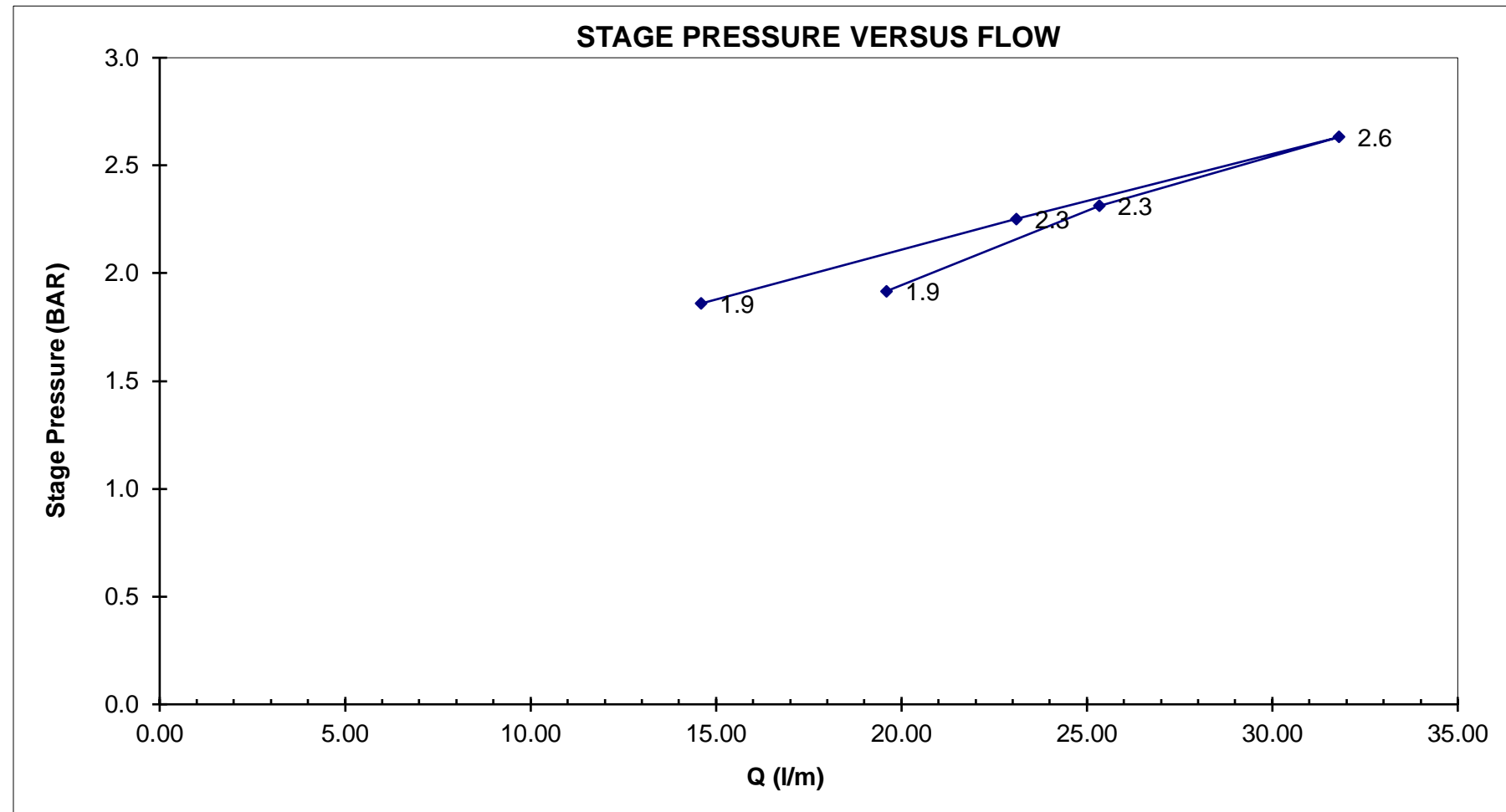
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 03-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 56.43 17.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON		
0.48	0.03	1.92	Flowmeter m3	27.79	27.81	27.83	27.85	27.87	27.89						
			Take litres		20.50	20.50	19.50	18.50	19.00						
			Average Take l/m		20.50	20.50	19.50	18.50	19.00				19.6	16.7	
0.90	0.04	2.31	Flowmeter m3	27.95	27.98	28.00	28.03	28.05	28.08	28.10	7				
			Take litres		26.50	25.00	25.00	26.00	25.00	24.50					
			Average Take l/m		26.50	25.00	25.00	26.00	25.00	24.5				25.3	17.8
1.24	0.07	2.63	Flowmeter m3	28.18	28.21	28.24	28.27	28.30	28.33						
			Take litres		32.00	32.00	32.00	31.00	32.00						
			Average Take l/m		32.00	32.00	32.00	31.00	32.00				31.8	19.7	
0.83	0.04	2.25	Flowmeter m3	28.39	28.41	28.43	28.46	28.48	28.50						
			Take litres		23.00	23.00	24.00	22.50	23.00						
			Average Take l/m		23.00	23.00	24.00	22.50	23.00				23.1	16.7	
0.41	0.01	1.86	Flowmeter m3	28.55	28.56	28.57	28.59	28.60	28.62	6	7				
			Take litres		14.50	14.50	14.50	15.00	14.50						
			Average Take l/m		14.50	14.50	14.50	15.00	14.50				14.6	12.8	



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 16

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: NEGLIGIBLE
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 9.22 mbgs. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-007 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	PREP	RWD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-007

AREA: Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 55.94 17.05 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

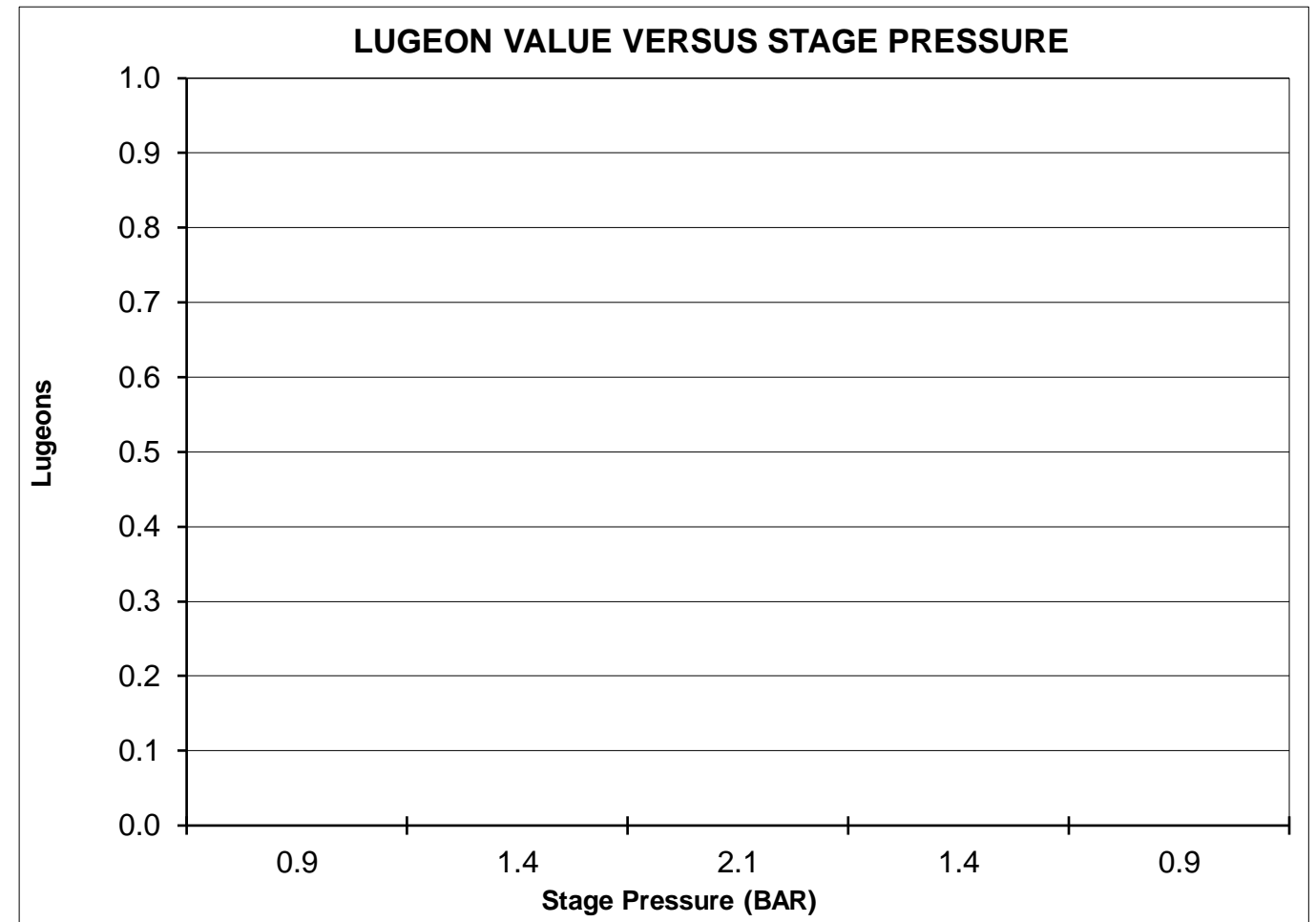
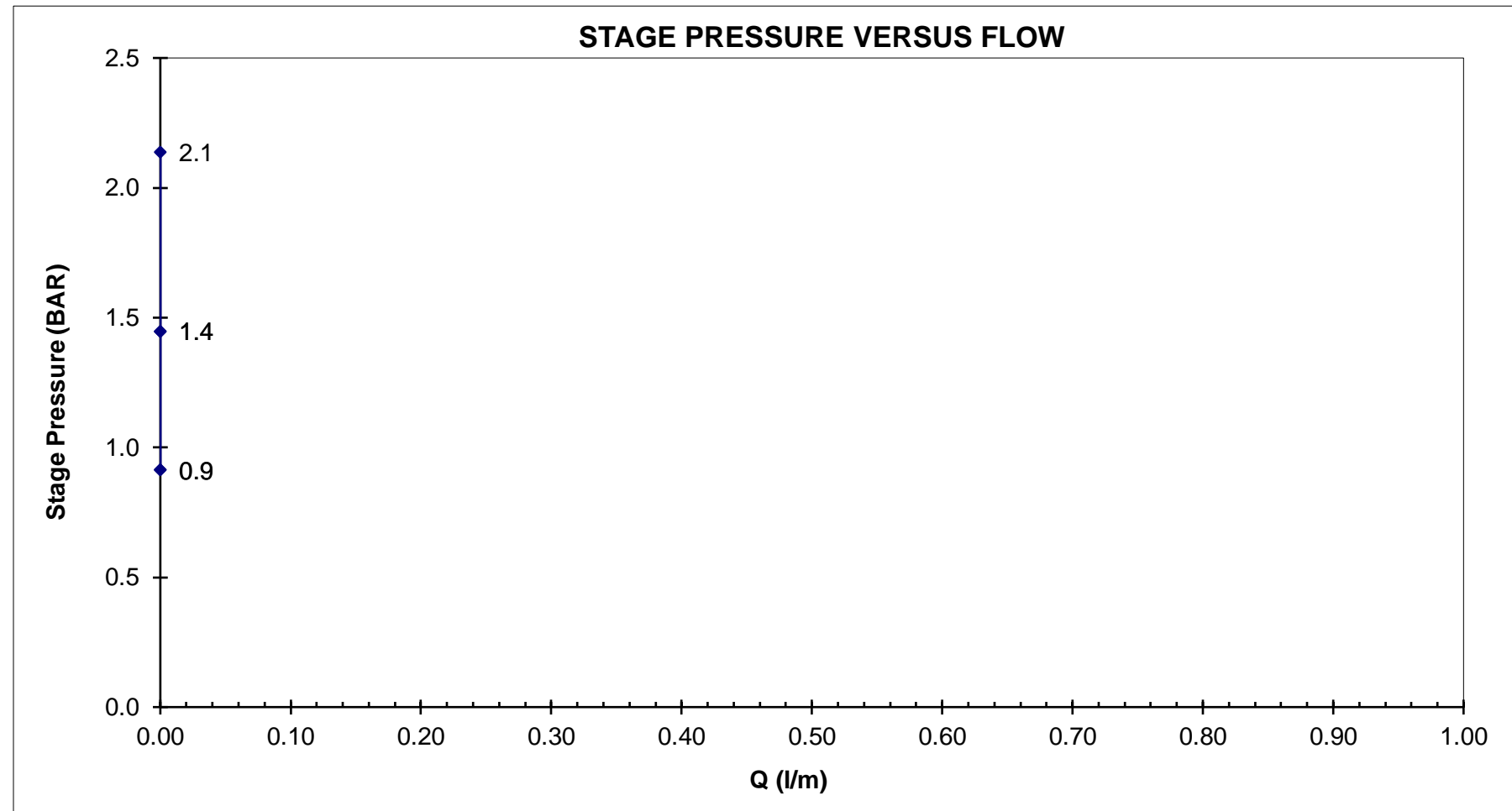
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 03-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 75.63 23.05 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.62	0.00	0.91	Flowmeter m3	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.16	0.00	1.45	Flowmeter m3	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.84	0.00	2.14	Flowmeter m3	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.16	0.00	1.45	Flowmeter m3	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.62	0.00	0.91	Flowmeter m3	28.70	28.70	28.70	28.70	28.70	28.70	28.70	28.70	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1: +/-0 PSI, P2: +/-0.25 PSI, P3: +/-0.25 PSI, P4: +/-0 PSI, P5: +/-0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-007 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-007

AREA: Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 4.7 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 75.13 22.90 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

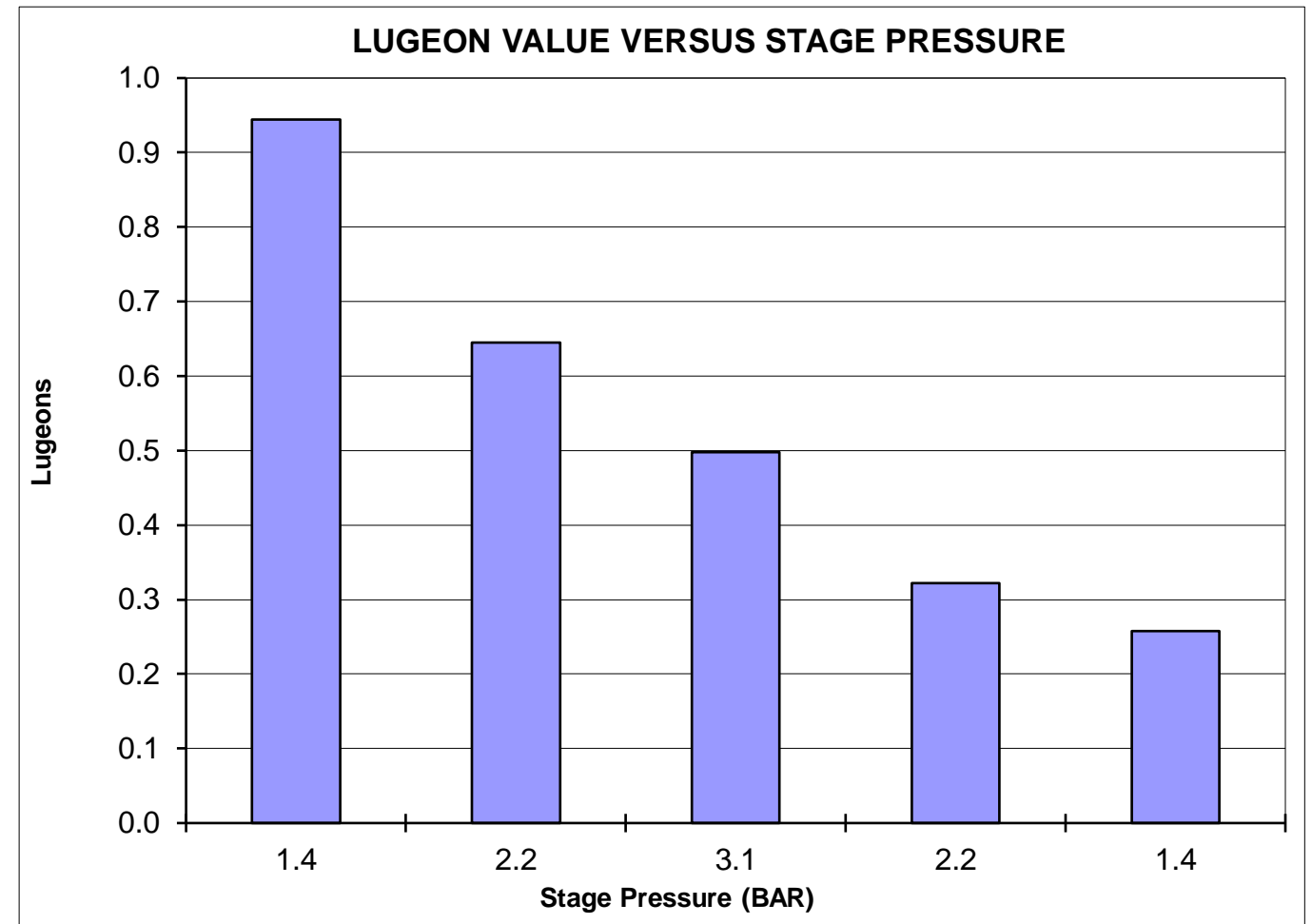
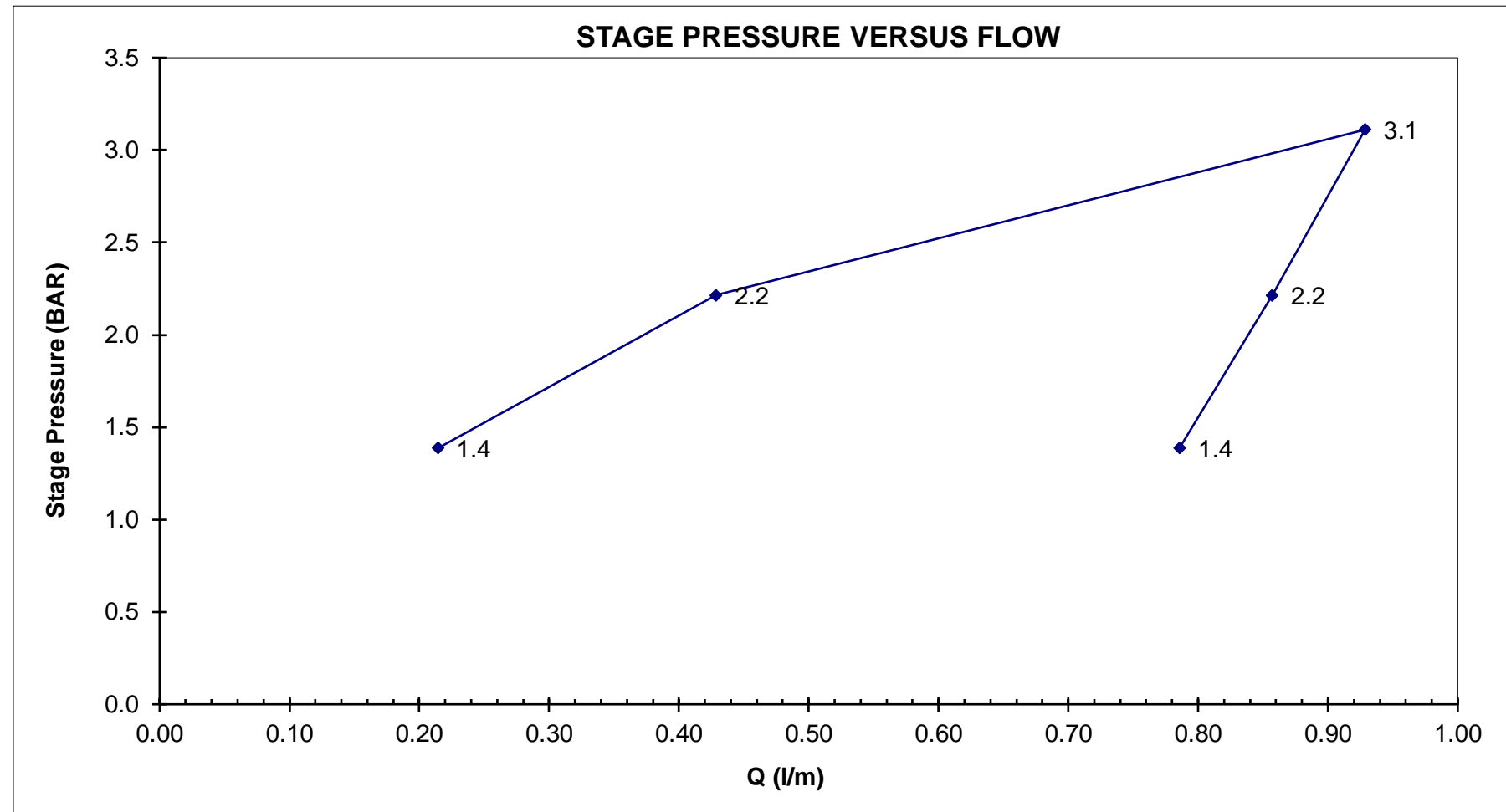
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 03-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 94.82 28.90 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3	Take litres	Average Take l/m	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON	
							Flowmeter m3	Take litres	Average Take l/m								
0.83	0.00	1.39	0	28.73			0	28.73	28.73	28.73	28.74	28.74	28.74	28.74	28.74	0.8	0.9
1.66	0.00	2.21	0	28.74			0	28.74	28.75	28.75	28.75	28.75	28.75	28.75	28.75	0.9	0.6
2.55	0.00	3.11	0	28.75			0	28.76	28.76	28.76	28.76	28.76	28.76	28.76	28.76	0.9	0.5
1.66	0.00	2.21	0	28.76			0	28.76	28.76	28.76	28.76	28.76	28.76	28.76	28.76	0.4	0.3
0.83	0.00	1.39	0	28.76			0	28.76	28.77	28.77	28.77	28.77	28.77	28.77	28.77	0.2	0.3



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.3

K = 3.E-06 cm/s

INTERPRETATION TYPE OF FLOW: VOID FILLING

K = 3.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1: +/-0.5 PSI, P2: +/-0.5 PSI, P3: +/-0.5 PSI, P4: +/-0.5 PSI, P5: +/-0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-007 - Lugeon Spreadsheet_r0.xlsx\TEST 4

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-007

AREA: Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 25.7 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 94.33 28.75 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

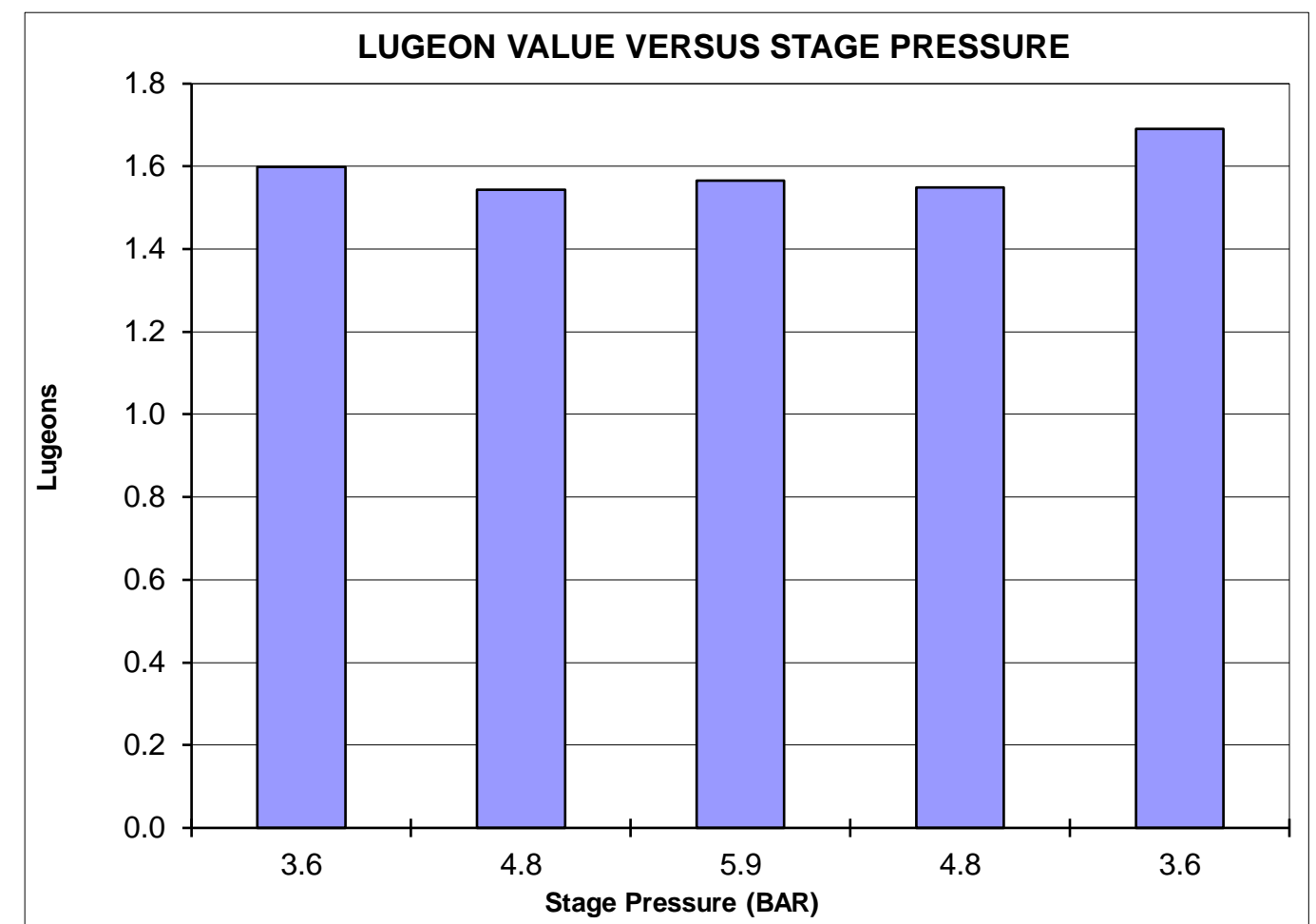
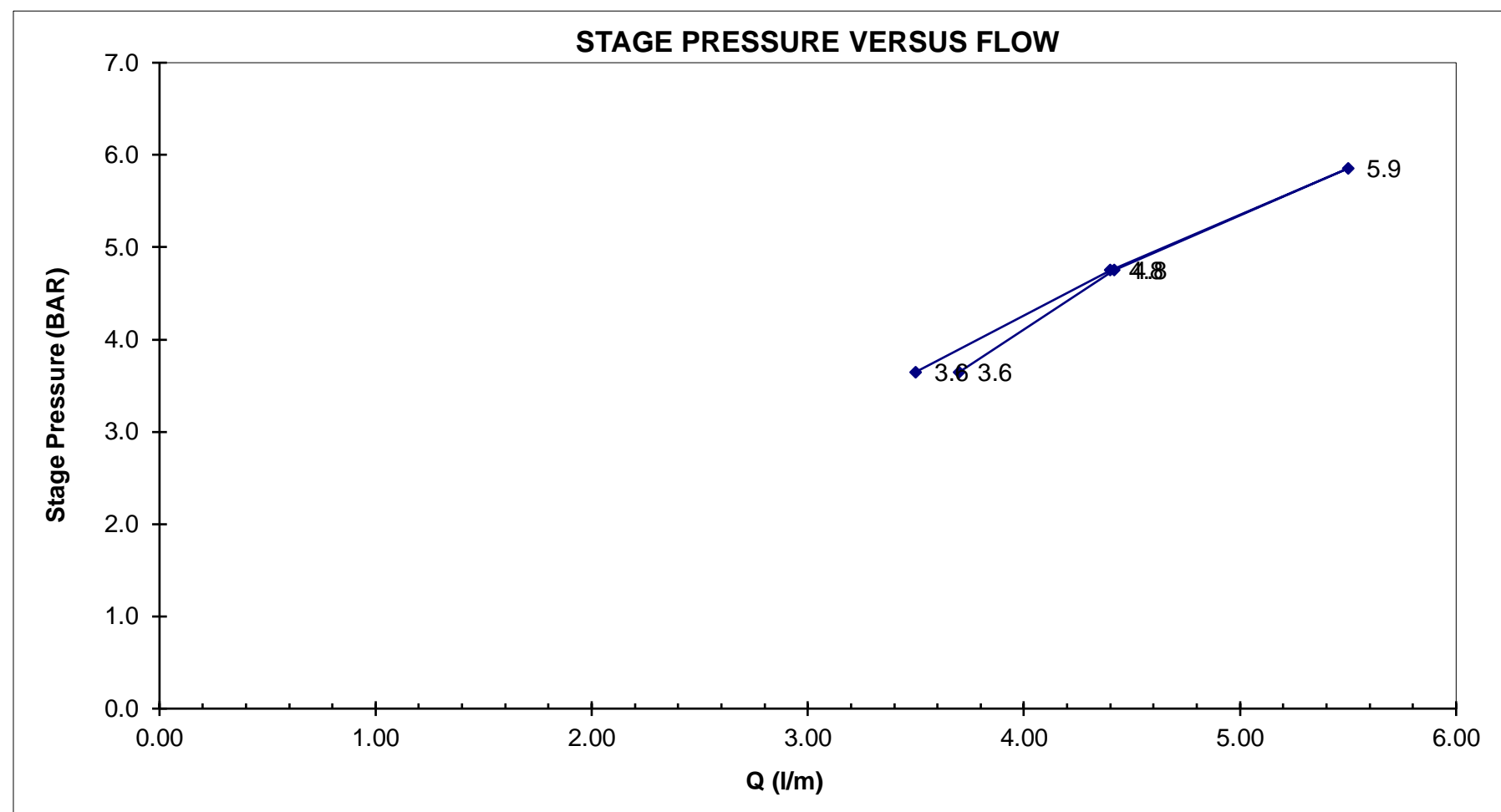
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 03-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 114.01 34.75 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.03	0.00	3.65	Flowmeter m3	28.97	28.97	28.97	28.98	28.98	28.98	28.99	28.99	3.5	1.6
			Take litres		3.00	3.50	4.00	3.50	4.00	3.00	3.50		
			Average Take l/m		3.00	3.50	4.00	3.50	4.00	3.00	3.50		
2.14	0.00	4.75	Flowmeter m3	29.00	29.01	29.01	29.02	29.02	29.03			4.4	1.5
			Take litres		4.50	4.50	4.50	4.50	4.00				
			Average Take l/m		4.50	4.50	4.50	4.50	4.00				
3.24	0.00	5.85	Flowmeter m3	29.05	29.06	29.06	29.07	29.07	29.08			5.5	1.6
			Take litres		6.00	5.50	5.00	5.50	5.50				
			Average Take l/m		6.00	5.50	5.00	5.50	5.50				
2.14	0.00	4.75	Flowmeter m3	29.09	29.10	29.10	29.11	29.11	29.12	29.12		4.4	1.5
			Take litres		4.00	5.00	4.50	4.50	4.00	4.50			
			Average Take l/m		4.00	5.00	4.50	4.50	4.00	4.50			
1.03	0.00	3.65	Flowmeter m3	29.13	29.14	29.14	29.15	29.15	29.15			3.7	1.7
			Take litres		3.50	4.00	3.50	4.00	3.50				
			Average Take l/m		3.50	4.00	3.50	4.00	3.50				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 2

K = 2.E-05 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 2.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-008

AREA: Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 8.9 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 19.06 5.81 ft (DOWNHOLE) n (DOWNHOLE)

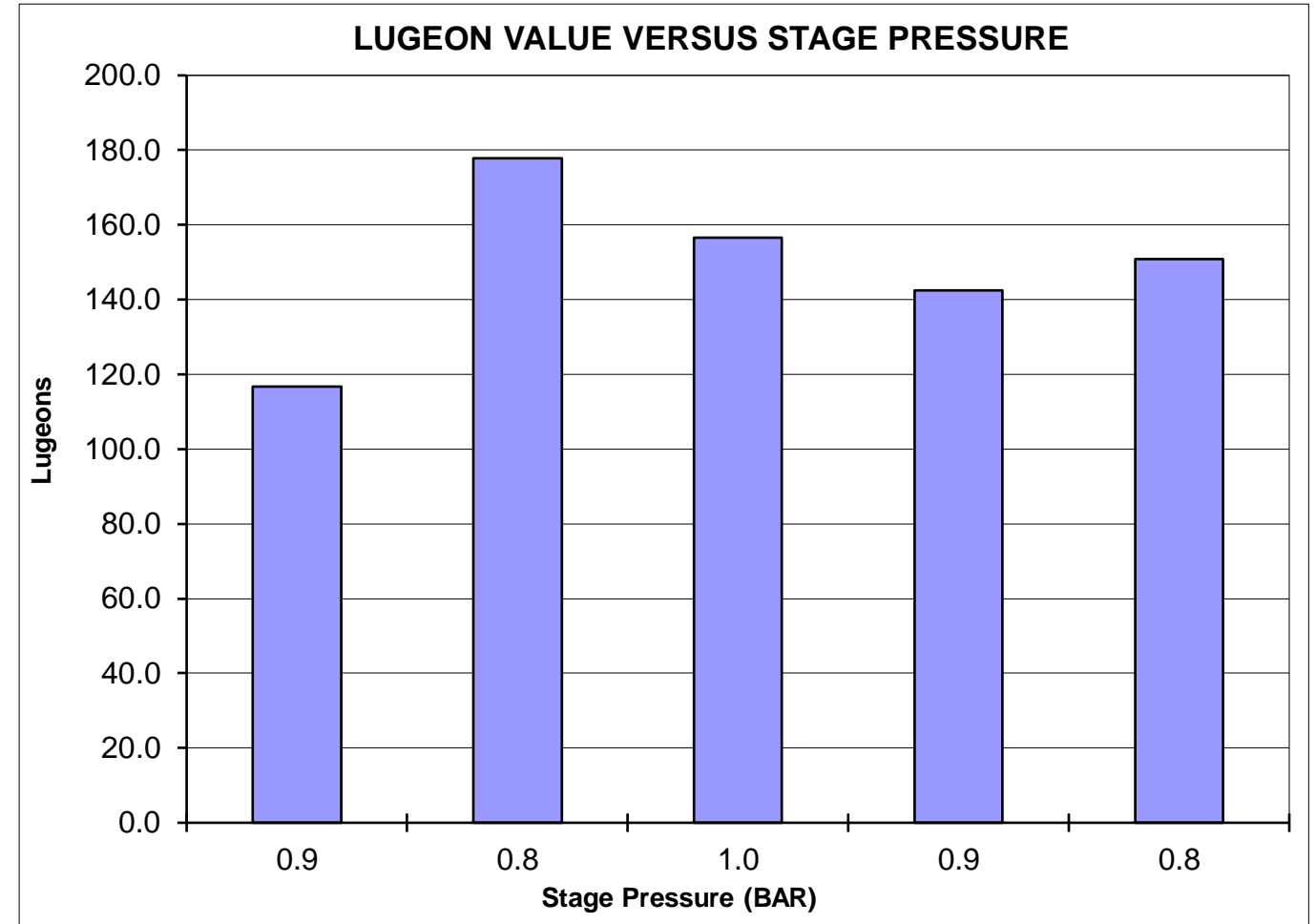
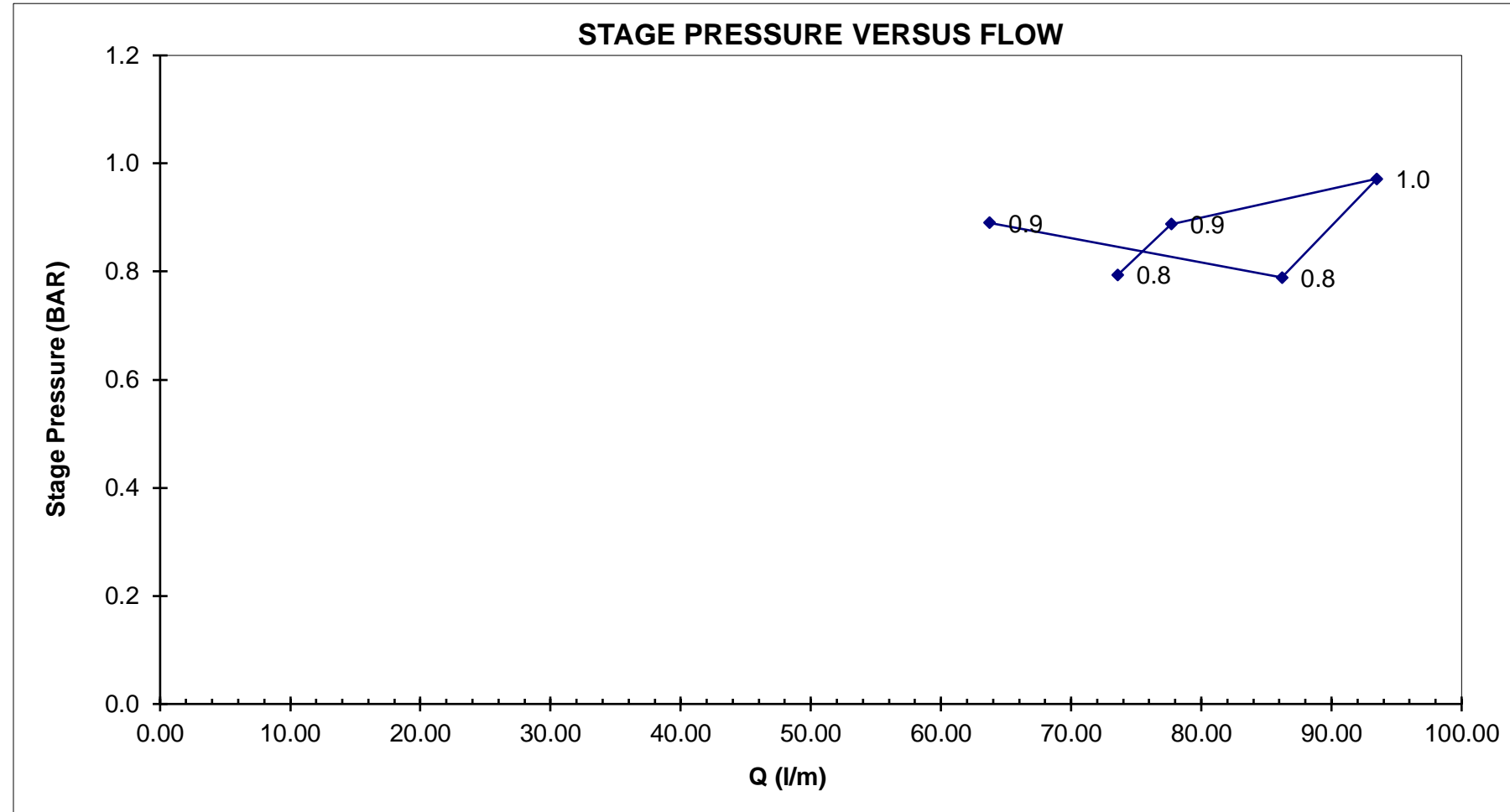
PACKER TYPE: Nitrogen

GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 04-Sep-16 UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 39.21 11.95 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON	
0.21	0.28	0.89	Flowmeter m3	0	29.63	29.69	29.76	29.82	29.89	29.95	30.02			
			Take litres			61.00	64.00	63.50	65.50	64.50	64.00			
			Average Take l/m			61.00	64.00	63.50	65.50	64.50	64.00		63.8	116.6
0.34	0.52	0.79	Flowmeter m3	0	30.24	30.32	30.41	30.49	30.58	30.67				
			Take litres			86.50	86.00	86.00	87.00	85.50				
			Average Take l/m			86.50	86.00	86.00	87.00	85.50		86.2	177.8	
0.62	0.62	0.97	Flowmeter m3	0	30.94	31.03	31.12	31.22	31.31	31.40				
			Take litres			94.00	93.50	93.50	93.00	93.50				
			Average Take l/m			94.00	93.50	93.50	93.00	93.50		93.5	156.6	
0.34	0.42	0.89	Flowmeter m3	0	31.70	31.78	31.86	31.93	32.01	32.09				
			Take litres			78.50	79.00	74.00	79.00	78.00				
			Average Take l/m			78.50	79.00	74.00	79.00	78.00		77.7	142.5	
0.21	0.38	0.79	Flowmeter m3	0	32.22	32.29	32.37	32.44	32.51	32.59	32.66			
			Take litres			74.00	74.00	73.00	73.00	74.00	73.50			
			Average Take l/m			74.00	74.00	73.00	73.00	74.00	73.50		73.6	150.8



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 149

K = 1.E-03 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 1.E-05 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 4.48 mbgs. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. PRESURE GAUGE NOISE: P1 +/- 0.5 PSI, P2 +/- 0.5 PSI, P3 +/- 0.5 PSI, P4 +/- 2 PSI, P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 5. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 6. WATER TANK RAN OUT OF WATER AFTER P2. WAITED 15 MINS AFTER P2 AND P3 FOR TANK TO FILL. PUMP CANT KEEP UP WITH FLOW.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	MEP/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1		
			PREPD	RW/D

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-008

AREA: Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 3.7 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 37.34 11.38 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

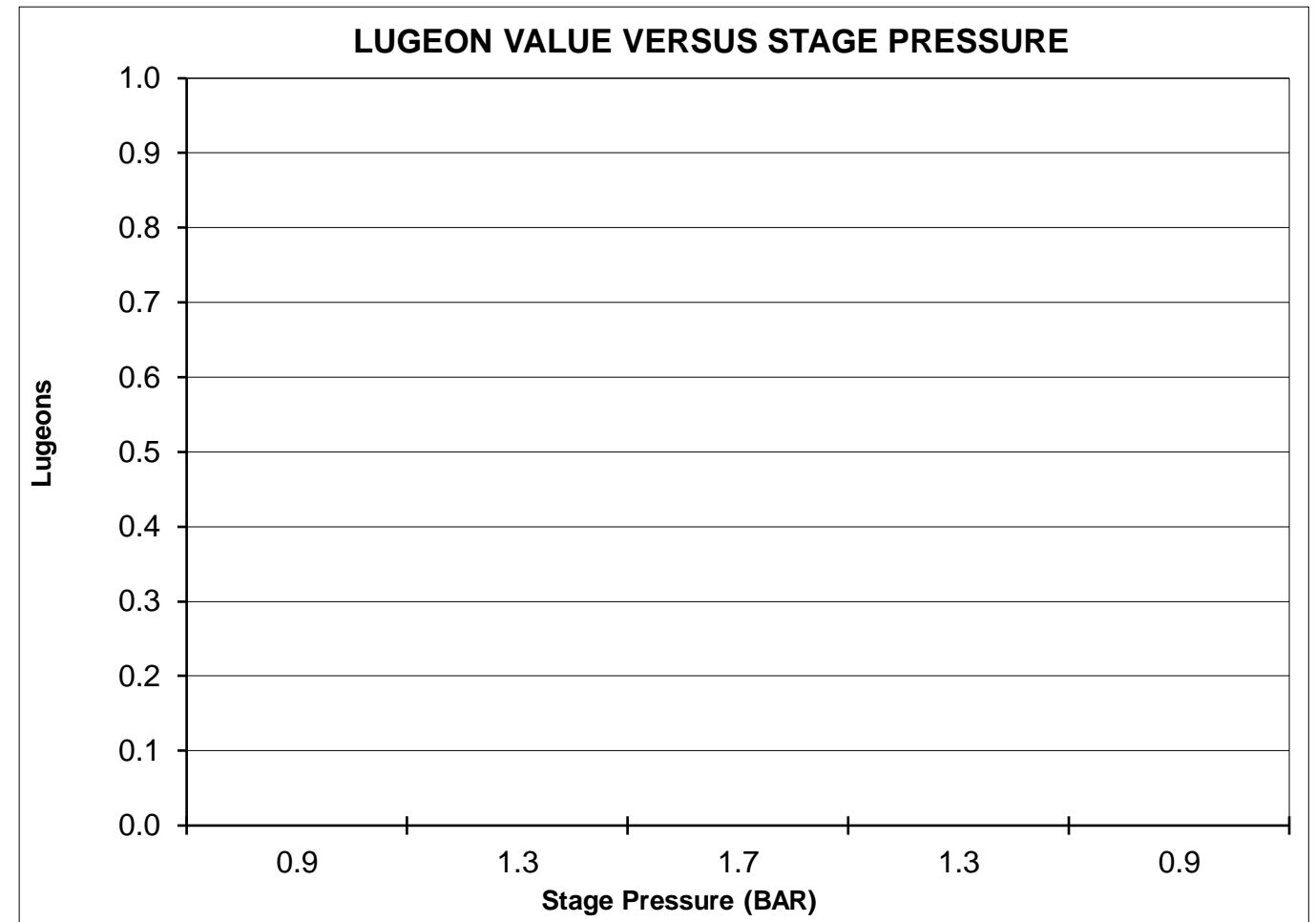
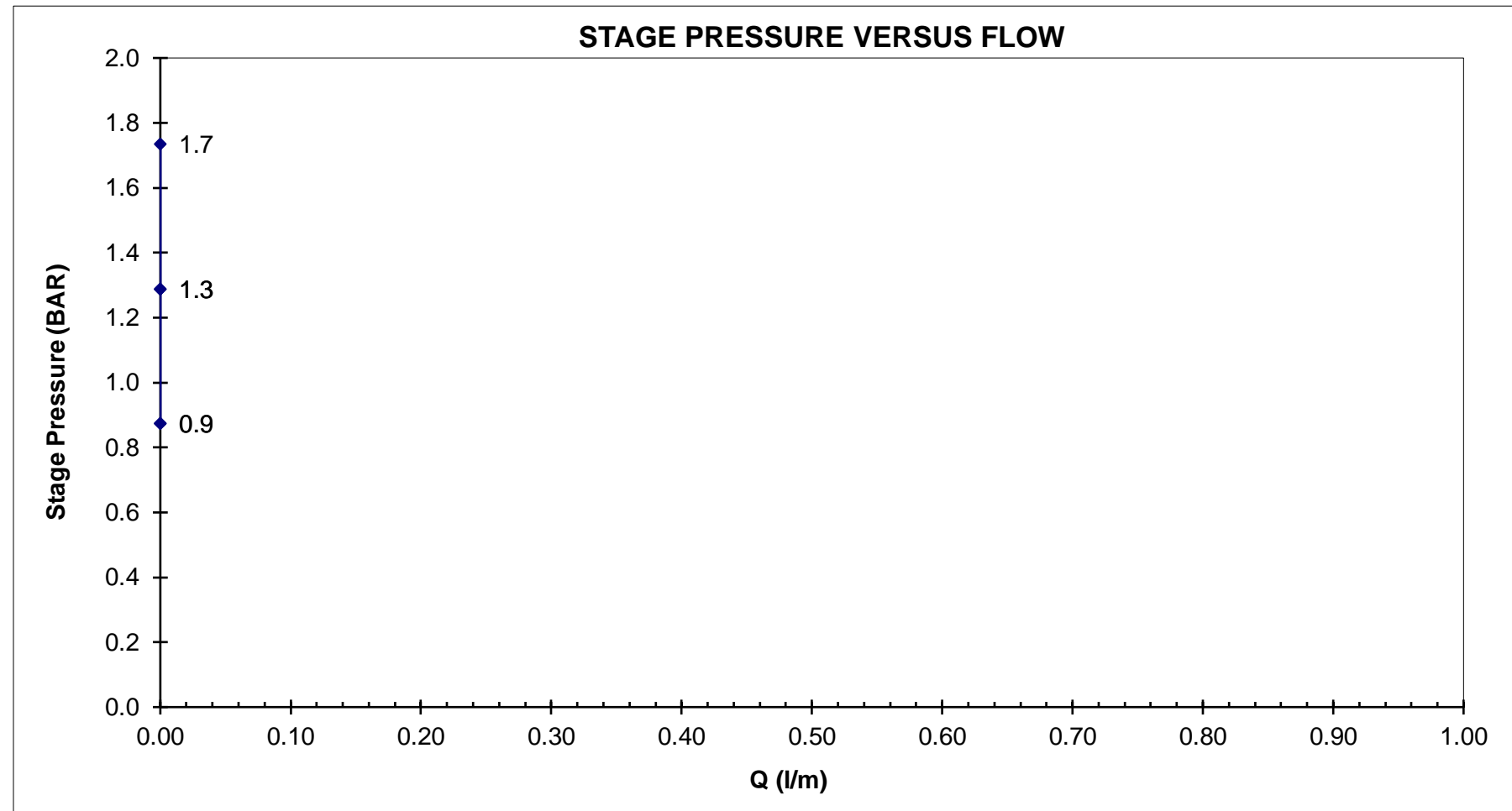
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 05-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 57.81 17.62 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.00	0.87	Flowmeter m3	34.74	34.74	34.74	34.74	34.74	34.74			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
0.83	0.00	1.29	Flowmeter m3	34.74	34.74	34.74	34.74	34.74	34.74			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
1.28	0.00	1.74	Flowmeter m3	34.75	34.75	34.75	34.75	34.75	34.75			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
0.83	0.00	1.29	Flowmeter m3	34.75	34.75	34.75	34.75	34.75	34.75			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
0.41	0.00	0.87	Flowmeter m3	34.75	34.75	34.75	34.75	34.75	34.75			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-008 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-008

AREA: Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 4.5 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 54.69 16.67 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

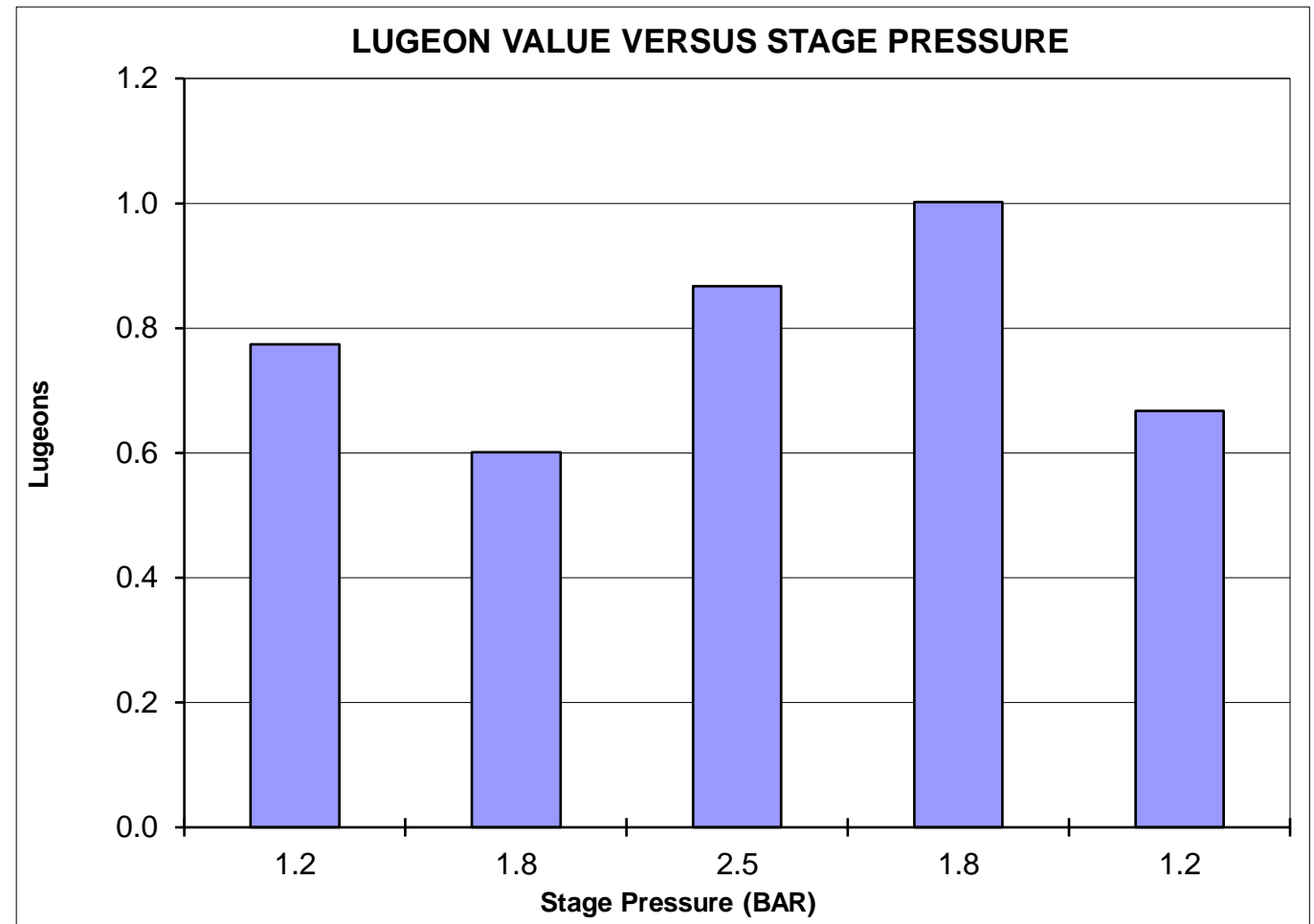
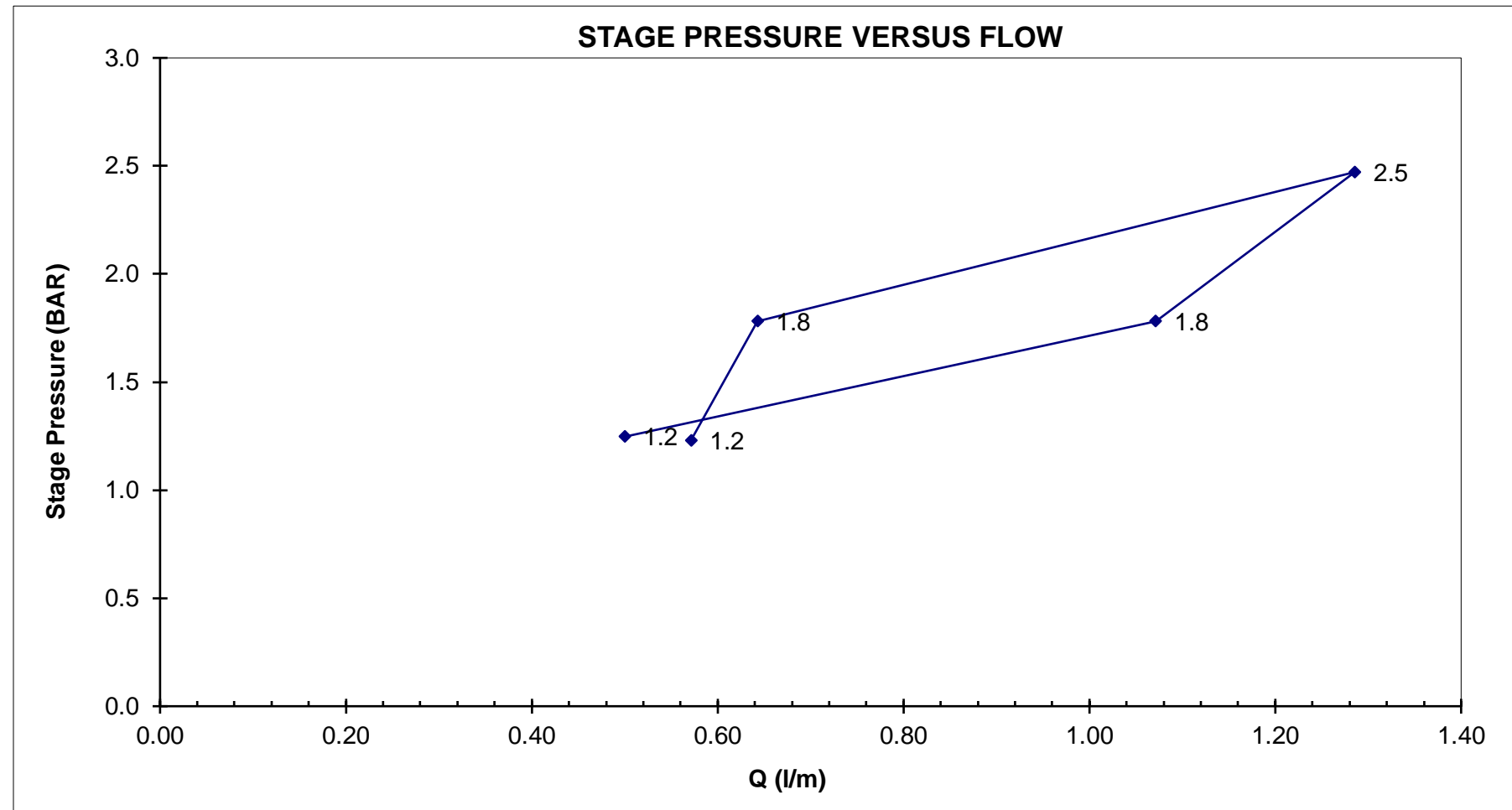
GAUGE HEIGHT ABOVE GROUND: 1.7 m

DATE: 05-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 74.38 22.67 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
0.62	0.00	1.23	Flowmeter m3	32.76	32.76	32.76	32.76	32.76	32.76	32.76	32.76	0.6	0.8
			Take litres		0.50	0.50	0.50	1.00	0.50	0.50	0.50		
			Average Take l/m		0.50	0.50	0.50	1.00	0.50	0.50	0.50		
1.17	0.00	1.78	Flowmeter m3	32.77	32.77	32.77	32.77	32.77	32.77	32.77	32.78	0.6	0.6
			Take litres		0.50	0.50	1.00	0.50	0.50	1.00	0.50		
			Average Take l/m		0.50	0.50	1.00	0.50	0.50	1.00	0.50		
1.86	0.00	2.47	Flowmeter m3	32.78	32.79	32.79	32.79	32.79	32.79	32.79	32.79	1.3	0.9
			Take litres		1.00	1.00	1.50	1.50	1.00	1.50	1.50		
			Average Take l/m		1.00	1.00	1.50	1.50	1.00	1.50	1.50		
1.17	0.00	1.78	Flowmeter m3	32.79	32.80	32.80	32.80	32.80	32.80	32.80	32.80	1.1	1.0
			Take litres		1.00	1.00	1.00	1.00	1.50	1.50	0.50		
			Average Take l/m		1.00	1.00	1.00	1.00	1.50	1.50	0.50		
0.64	0.00	1.25	Flowmeter m3	32.80	32.80	32.80	32.80	32.81	32.81	32.81	32.81	0.5	0.7
			Take litres		0.50	0.50	0.50	0.50	0.50	0.50	0.50		
			Average Take l/m		0.50	0.50	0.50	0.50	0.50	0.50	0.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.8

K = 8.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 8.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESURE GAUGE NOISE: NEGLIGIBLE

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-008 - Lugeon Spreadsheet_r0.xlsx\TEST 3

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-008

AREA: Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 9.8 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 73.89 22.52 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

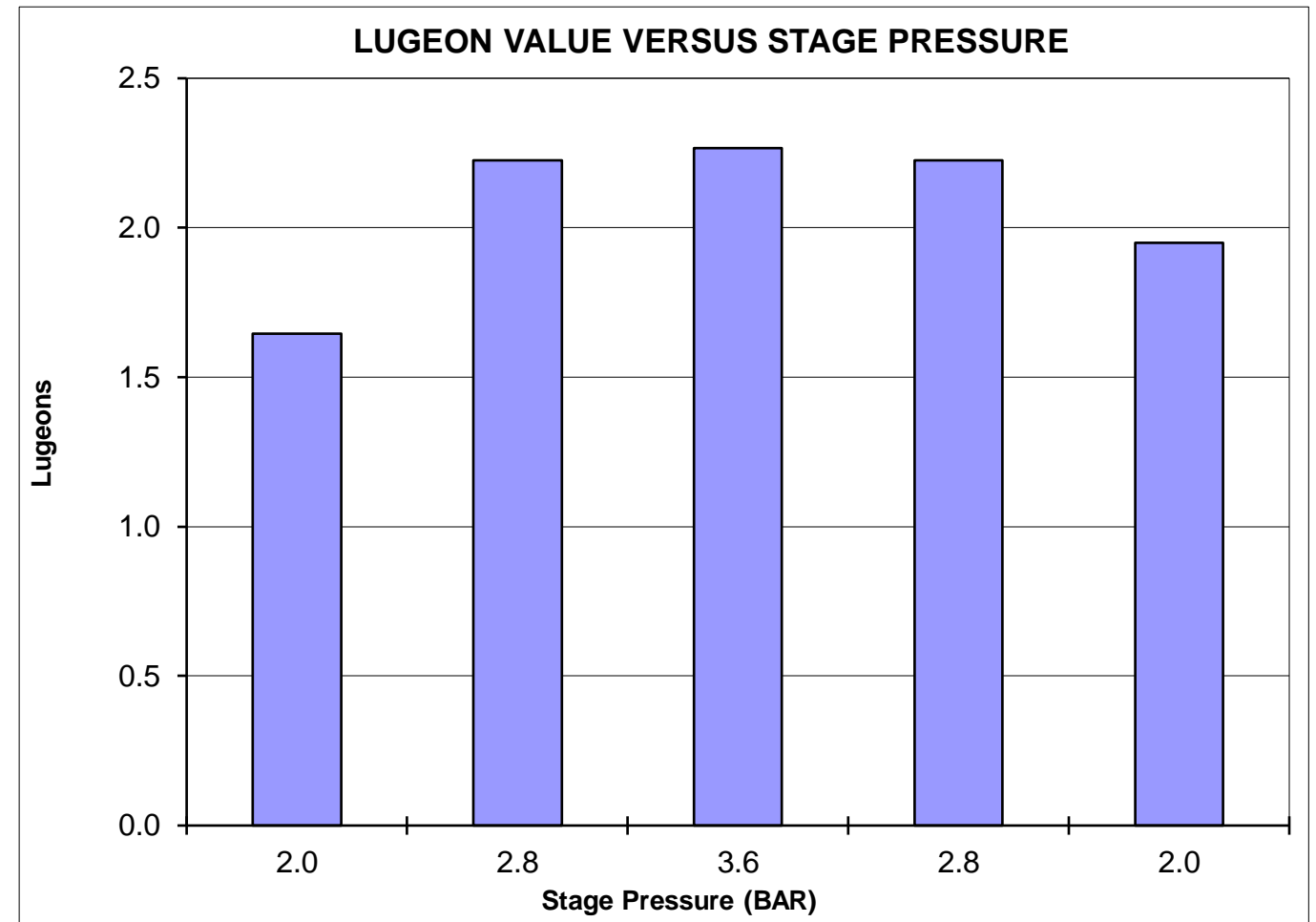
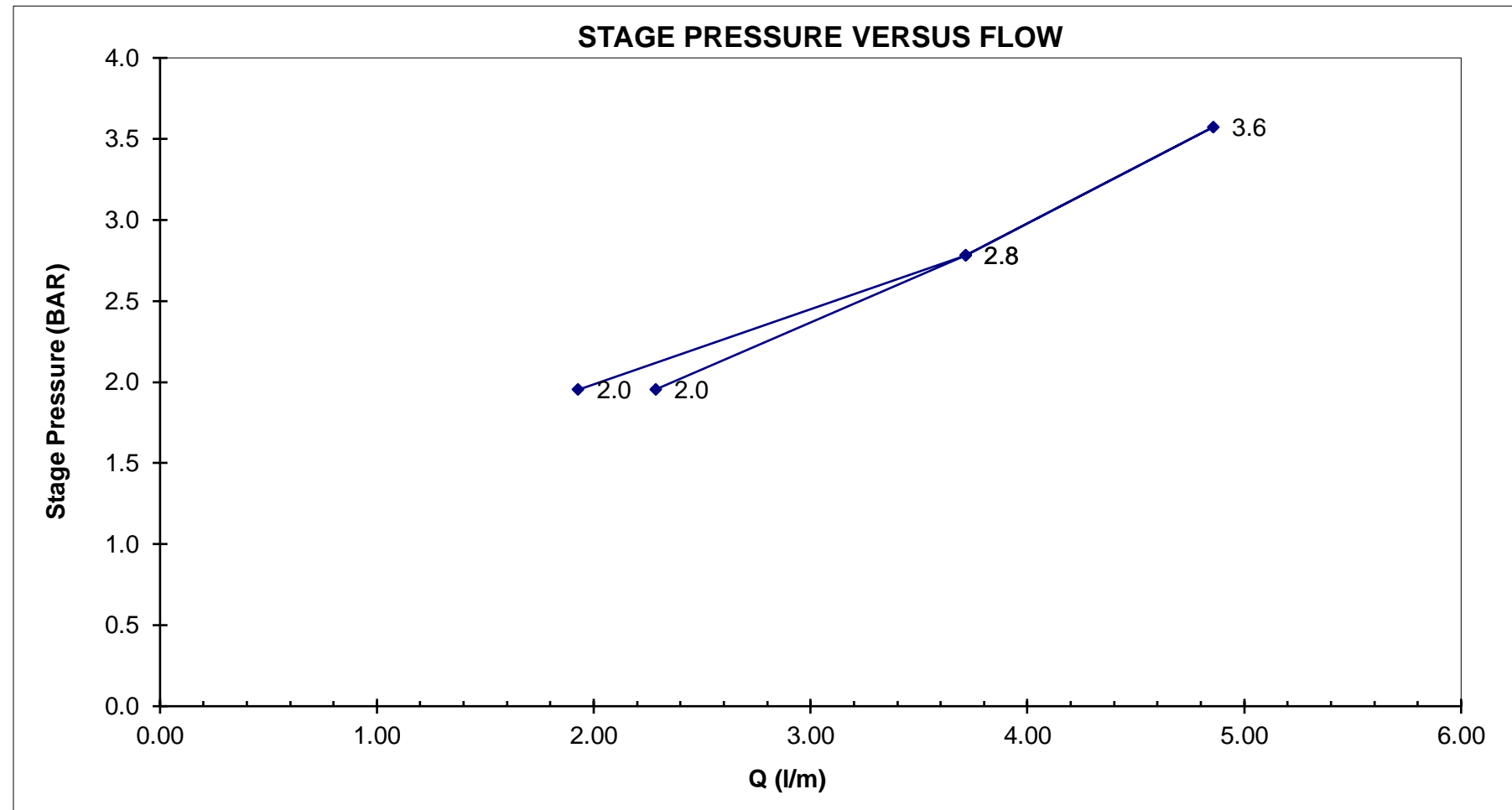
GAUGE HEIGHT ABOVE GROUND: 1.7 m

DATE: 05-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 93.57 28.52 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.00	1.95	Flowmeter m3	32.86	32.86	32.87	32.87	32.87	32.87	32.87	32.88	1.9	1.6
			Take litres		2.00	2.00	2.00	2.00	2.00	2.00	1.50		
			Average Take l/m		2.00	2.00	2.00	2.00	2.00	2.00	1.50		
1.66	0.00	2.78	Flowmeter m3	32.90	32.90	32.90	32.91	32.91	32.92	32.92	32.92	3.7	2.2
			Take litres		4.00	3.50	3.50	4.00	3.50	3.50	4.00		
			Average Take l/m		4.00	3.50	3.50	4.00	3.50	3.50	4.00		
2.45	0.00	3.57	Flowmeter m3	32.95	32.96	32.96	32.97	32.97	32.97	32.98	32.98	4.9	2.3
			Take litres		5.50	4.50	5.00	4.50	5.00	4.50	5.00		
			Average Take l/m		5.50	4.50	5.00	4.50	5.00	4.50	5.00		
1.66	0.00	2.78	Flowmeter m3	33.00	33.00	33.00	33.01	33.01	33.01	33.02	33.02	3.7	2.2
			Take litres		3.50	3.50	4.00	4.00	3.50	3.50	4.00		
			Average Take l/m		3.50	3.50	4.00	4.00	3.50	3.50	4.00		
0.83	0.00	1.95	Flowmeter m3	33.02	33.02	33.03	33.03	33.03	33.03	33.04	33.04	2.3	2.0
			Take litres		1.00	2.50	2.50	2.50	2.50	2.50	2.50		
			Average Take l/m		1.00	2.50	2.50	2.50	2.50	2.50	2.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 2

K = 2.E-05 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 2.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESURE GAUGE NOISE: P1 +/- 0.5 PSI, P2 +/- 0.5 PSI, P3 +/- 0.5 PSI, P4 +/- 0.5 PSI, P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

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0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-008

AREA: Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 11.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 83.73 25.52 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

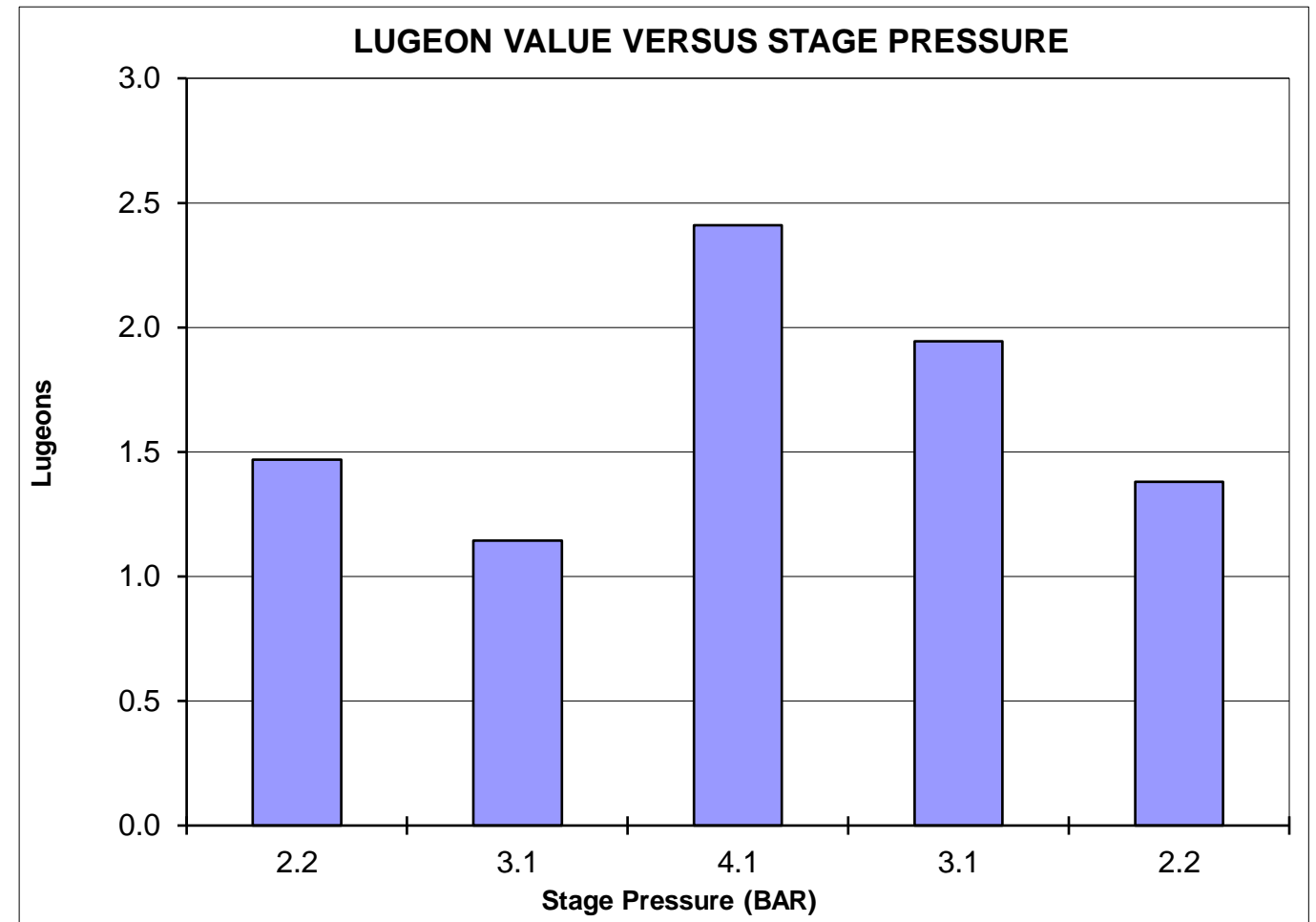
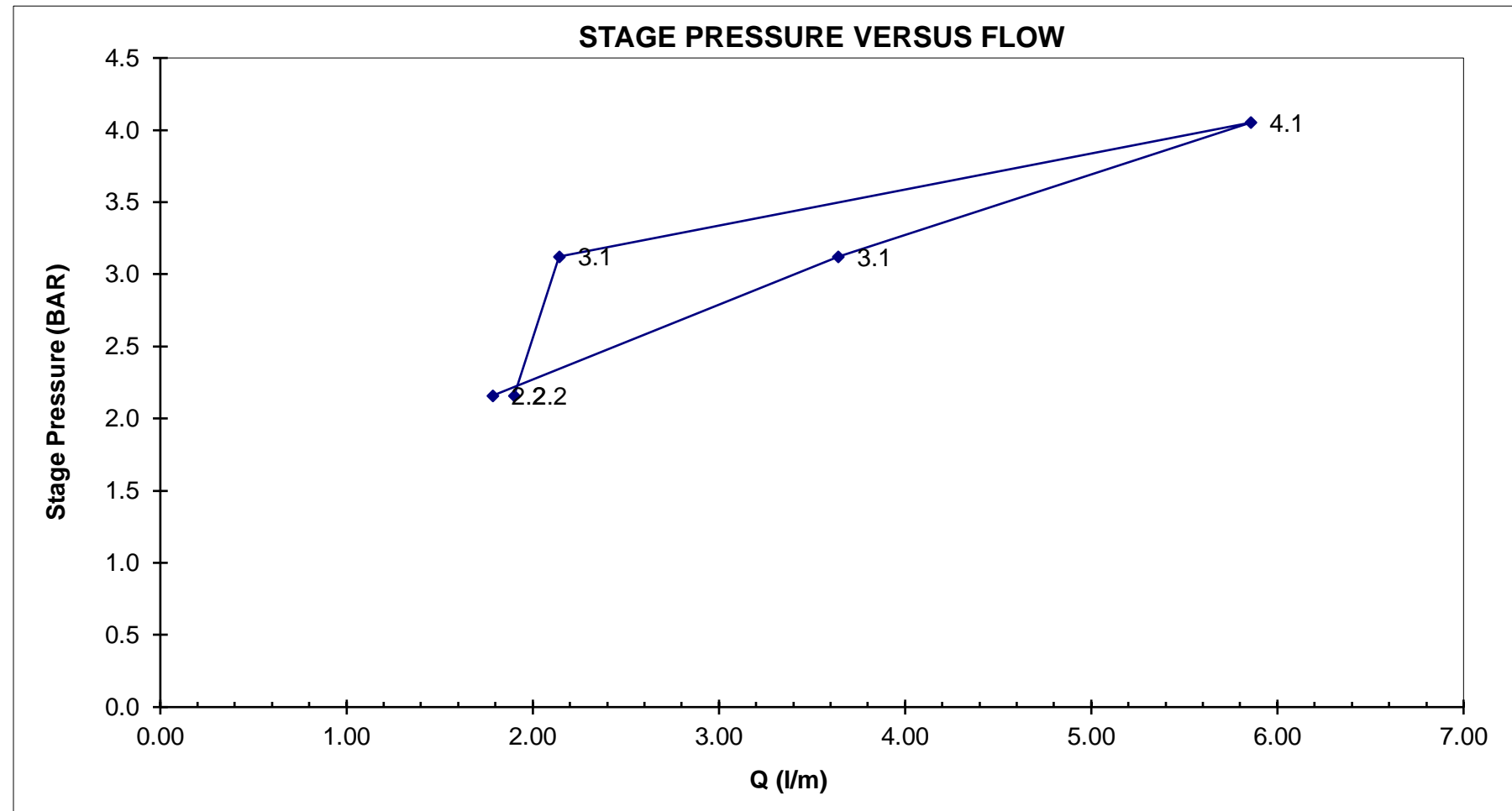
GAUGE HEIGHT ABOVE GROUND: 1.7 m

DATE: 05-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 103.42 31.52 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.90	0.00	2.16	Flowmeter m3	33.08	33.09	33.09	33.09	33.09	33.09	33.09	33.10	1.9	1.5
			Take litres		2.50	1.50	1.50	2.60	1.40	1.50	2.30		
			Average Take l/m		2.50	1.50	1.50	2.60	1.40	1.50	2.30		
1.86	0.00	3.12	Flowmeter m3	33.13	33.12	33.13	33.13	33.13	33.14	33.14	33.14	2.1	1.1
			Take litres		-6.00	3.50	3.50	4.00	4.00	3.00	3.00		
			Average Take l/m		-6.00	3.50	3.50	4.00	4.00	3.00	3.00		
2.79	0.00	4.05	Flowmeter m3	33.17	33.17	33.18	33.18	33.19	33.20	33.20	33.21	5.9	2.4
			Take litres		6.00	5.50	6.00	5.50	6.00	6.00	6.00		
			Average Take l/m		6.00	5.50	6.00	5.50	6.00	6.00	6.00		
1.86	0.00	3.12	Flowmeter m3	33.21	33.21	33.22	33.22	33.22	33.23	33.23	33.23	3.6	1.9
			Take litres		3.00	4.00	3.00	4.00	4.00	4.00	3.50		
			Average Take l/m		3.00	4.00	3.00	4.00	4.00	4.00	3.50		
0.90	0.00	2.16	Flowmeter m3	33.23	33.23	33.24	33.24	33.24	33.24	33.24	33.25	1.8	1.4
			Take litres		0.00	1.50	1.50	2.50	2.00	2.50	2.50		
			Average Take l/m		0.00	1.50	1.50	2.50	2.00	2.50	2.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 1

K = 1.E-05 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 1.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.5 PSI, P2 +/- 0.5 PSI, P3 +/- 0.5 PSI, P4 +/- 0 PSI, P5 +/- 0 PSI; USED AVERAGE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-008 - Lugeon Spreadsheet_r0.xlsx\TEST 5

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 1 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: **RED MOUNTAIN PROJECT**

PROJECT NO: **VA101-594/02**

DRILLHOLE: **BH16-009**

AREA: **Bromley Humps TMF North Embankment**

TEST NO: **1**

NOMINAL HOLE SIZE (OF INTERVAL): **HQ3**

DEPTH OF GROUNDWATER BELOW SURFACE: **11.8** m

DIP: **50**
(FROM HORIZONTAL)

TOP OF TEST INTERVAL: **26.12** **7.96**
ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: **Nitrogen**

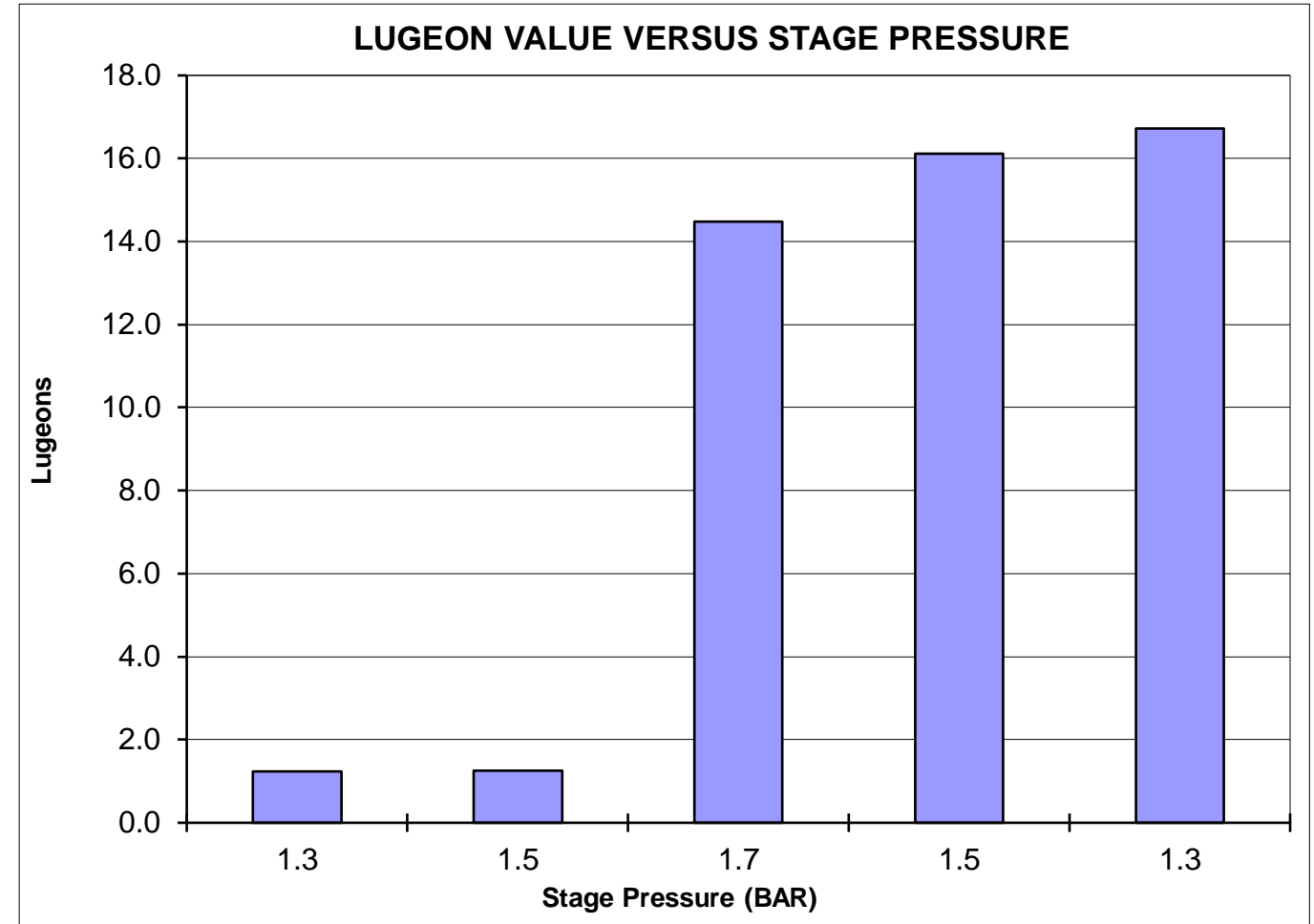
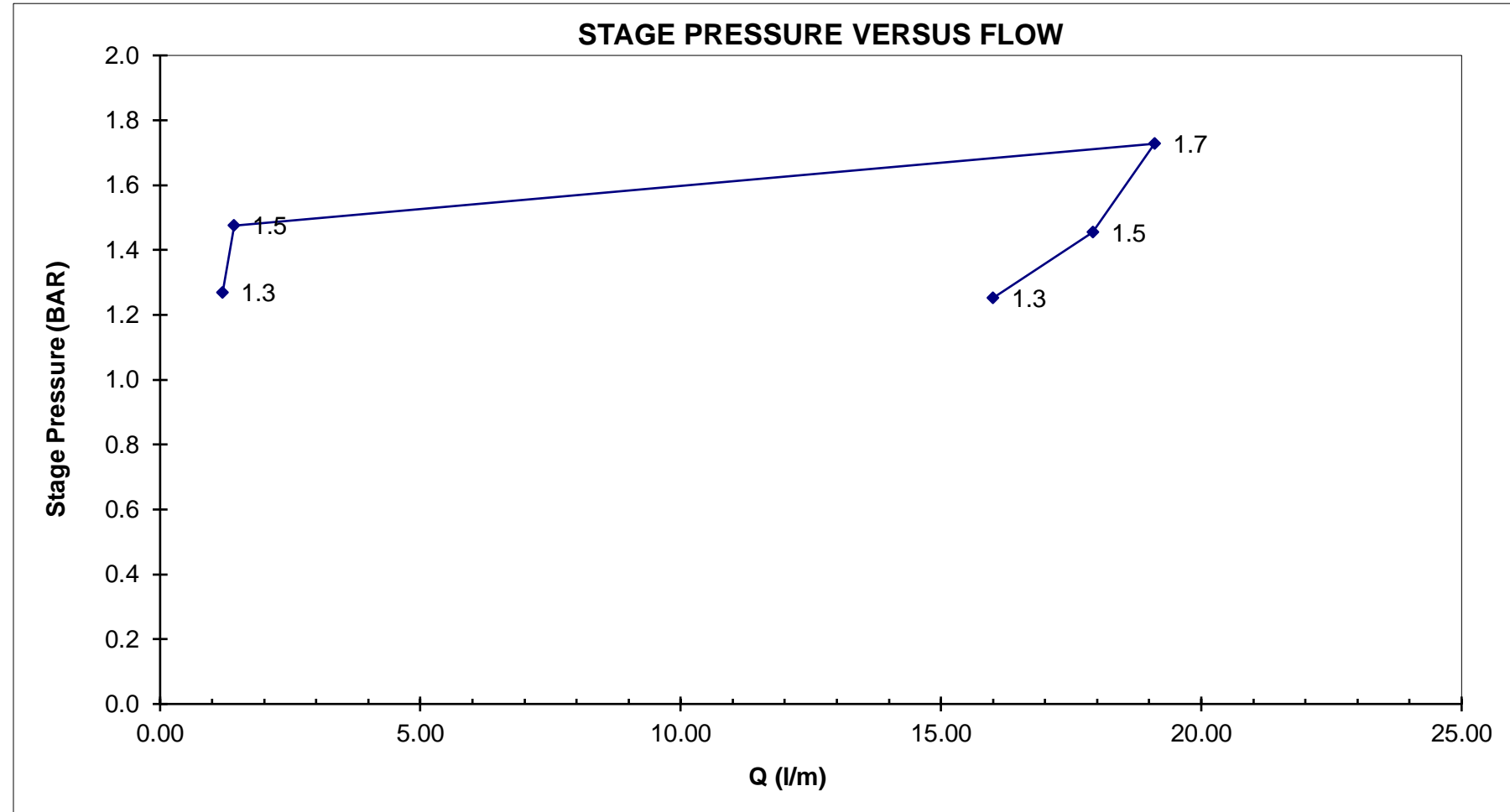
GAUGE HEIGHT ABOVE GROUND: **1.8** m

DATE: **07-Sep-16**

UNITS OF FLOWMETER: **m3**

BOTTOM OF TEST INTERVAL: **51.18** **15.60**
ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON		
				0	1	2	3	4	5	6			7	
0.21	0.00	1.27	Flowmeter m3	33.32	33.32	33.32	33.32	33.32	33.32	33.32				
			Take litres		1.00	1.50	1.50	1.00	1.00					
			Average Take l/m		1.00	1.50	1.50	1.00	1.00			1.2	1.2	
			Flowmeter m3	33.33	33.33	33.33	33.33	33.33	33.33	33.33				
0.41	0.00	1.48	Flowmeter m3	33.33	33.33	33.33	33.33	33.33	33.33	33.33				
			Take litres		1.00	1.50	1.50	1.50	1.50	1.50				
			Average Take l/m		1.00	1.50	1.50	1.50	1.50	1.50			1.4	1.3
			Flowmeter m3	33.40	33.41	33.43	33.45	33.47	33.49					
0.69	0.02	1.73	Flowmeter m3	33.40	33.41	33.43	33.45	33.47	33.49					
			Take litres		18.00	19.50	19.50	19.50	19.00					
			Average Take l/m		18.00	19.50	19.50	19.50	19.00			19.1	14.5	
			Flowmeter m3	33.52	33.54	33.56	33.58	33.60	33.61	33.63				
0.41	0.02	1.45	Flowmeter m3	33.52	33.54	33.56	33.58	33.60	33.61	33.63				
			Take litres		18.50	18.50	17.50	17.50	17.50	18.00				
			Average Take l/m		18.50	18.50	17.50	17.50	17.50	18.00			17.9	16.1
			Flowmeter m3	33.65	33.67	33.68	33.70	33.71	33.73					
0.21	0.02	1.25	Flowmeter m3	33.65	33.67	33.68	33.70	33.71	33.73					
			Take litres		16.50	16.00	15.50	16.00	16.00					
			Average Take l/m		16.50	16.00	15.50	16.00	16.00			16.0	16.7	



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: **Yes**

DRILLING FLUIDS USED / TIME FOR FLUSHING: **Drilling with water, flushed for 10 minutes**

Lu = **17**

K = **2.E-04** cm/s

INTERPRETATION TYPE OF FLOW: **WASH-OUT**

K = **2.E-06** m/s

TYPES OF FLOW:	LAMINAR	DILATION

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. NO WATER ABOVE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 5.75 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: P1 +/- 0.5 PSI, P2-P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: **MEA**

ANALYZED BY: **MEA**

REVIEWED BY: **CHS**

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REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1		
			PREPD	CHK'D

SHEET 2 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 19.4 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 50.69 15.45 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

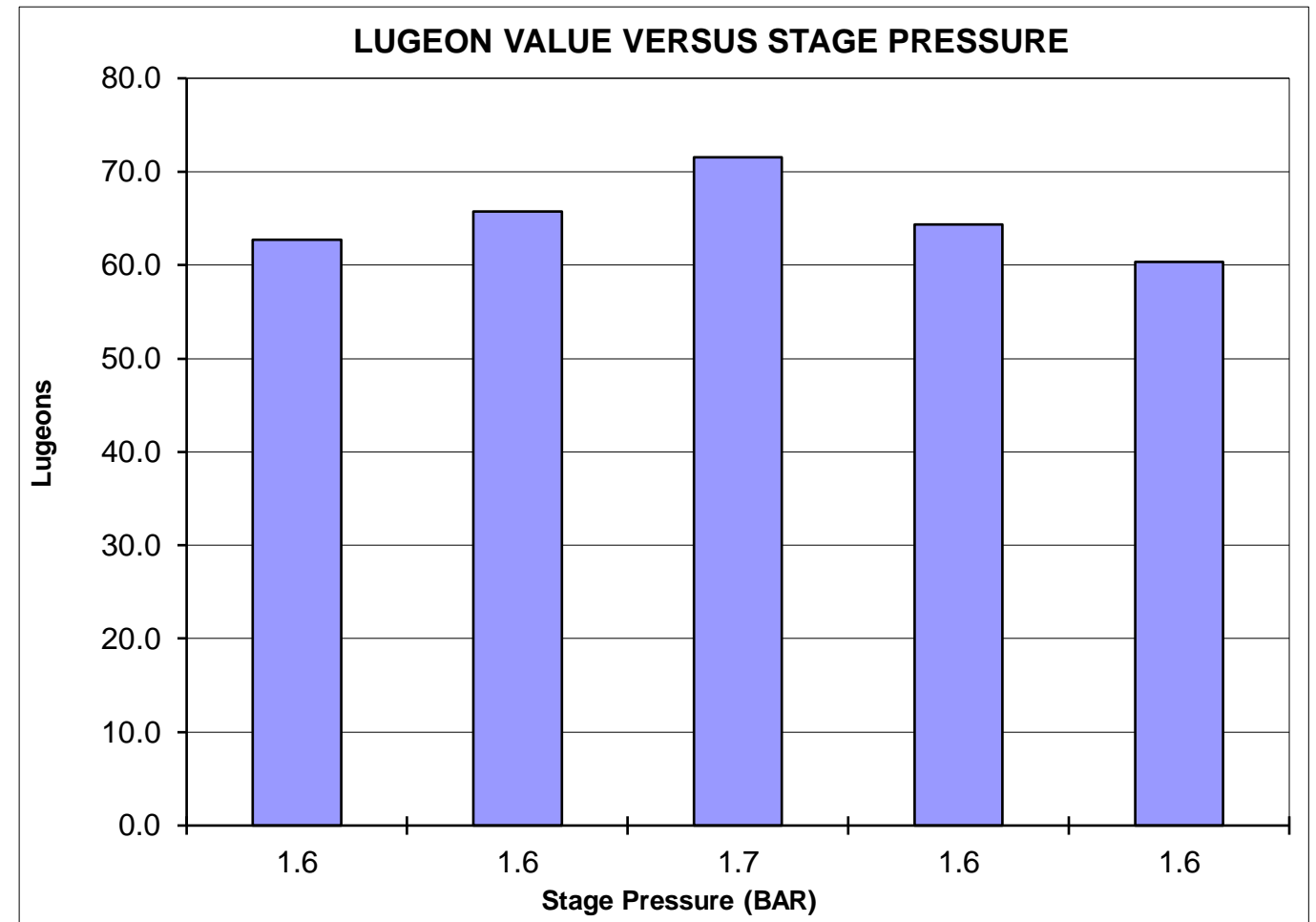
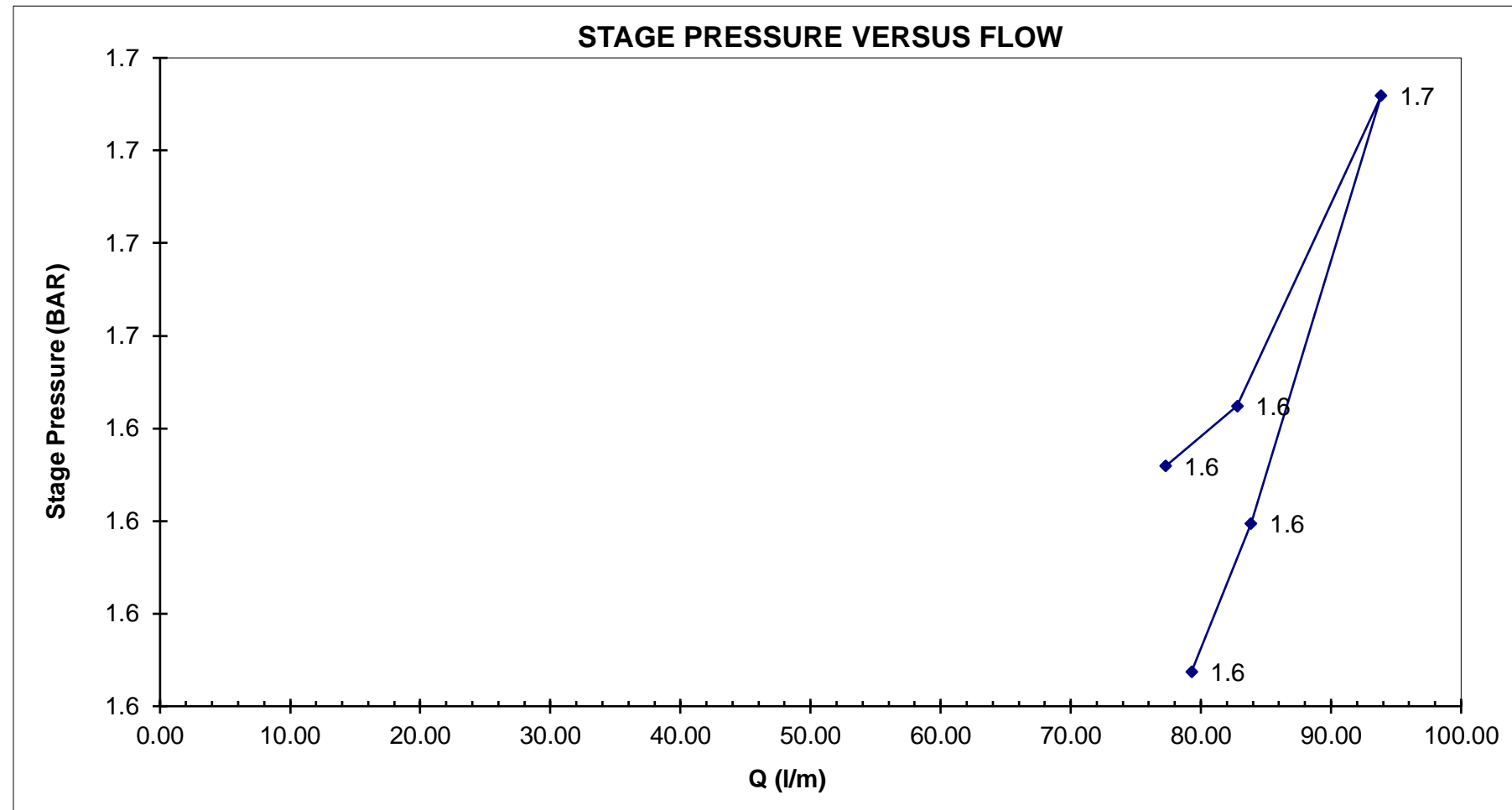
GAUGE HEIGHT ABOVE GROUND: 1.9 m

DATE: 08-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 76.38 23.28 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.44	1.61	Flowmeter m3	34.18	34.26	34.34	34.42	34.50	34.58	34.66	34.74		
			Take litres		79.00	79.00	79.00	79.00	80.00	79.00	80.00		
			Average Take l/m		79.00	79.00	79.00	79.00	80.00	79.00	80.00	79.3	62.7
0.48	0.50	1.63	Flowmeter m3	34.92	35.00	35.08	35.17	35.25	35.33	35.42	35.50		
			Take litres		84.00	84.00	84.00	83.00	84.00	84.00	84.00		
			Average Take l/m		84.00	84.00	84.00	83.00	84.00	84.00	84.00	83.9	65.7
0.66	0.62	1.68	Flowmeter m3	35.83	35.92	36.02	36.11	36.21	36.30	36.39	36.49		
			Take litres		93.00	94.00	94.00	94.00	94.00	94.00	94.00		
			Average Take l/m		93.00	94.00	94.00	94.00	94.00	94.00	94.00	93.9	71.5
0.48	0.48	1.64	Flowmeter m3	36.60	36.68	36.76	36.84	36.93	37.01	37.09	37.17		
			Take litres		83.50	83.50	82.50	82.50	83.00	82.00	82.50		
			Average Take l/m		83.50	83.50	82.50	82.50	83.00	82.00	82.50	82.8	64.4
0.41	0.42	1.64	Flowmeter m3	37.26	37.33	37.41	37.49	37.56	37.64	37.72	37.80		
			Take litres		78.50	75.50	78.00	77.00	78.00	77.00	77.00		
			Average Take l/m		78.50	75.50	78.00	77.00	78.00	77.00	77.00	77.3	60.3



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 63

K = 6.E-04 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 6.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. THE WATER TANK CAN'T ACCOMMODATE THE HIGH FLOWRATE AFTER PRESSURE STAGE P2 AS A RESULT, NEEDED TO WAIT FOR WATER TO FILL UP THE WATER TANK.
 3. SURGE TANK USED
 4. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 14.13 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 5. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 6. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI, P2-P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREPD	CHKD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 12

LUGEON TEST FIELD DATA SHEET



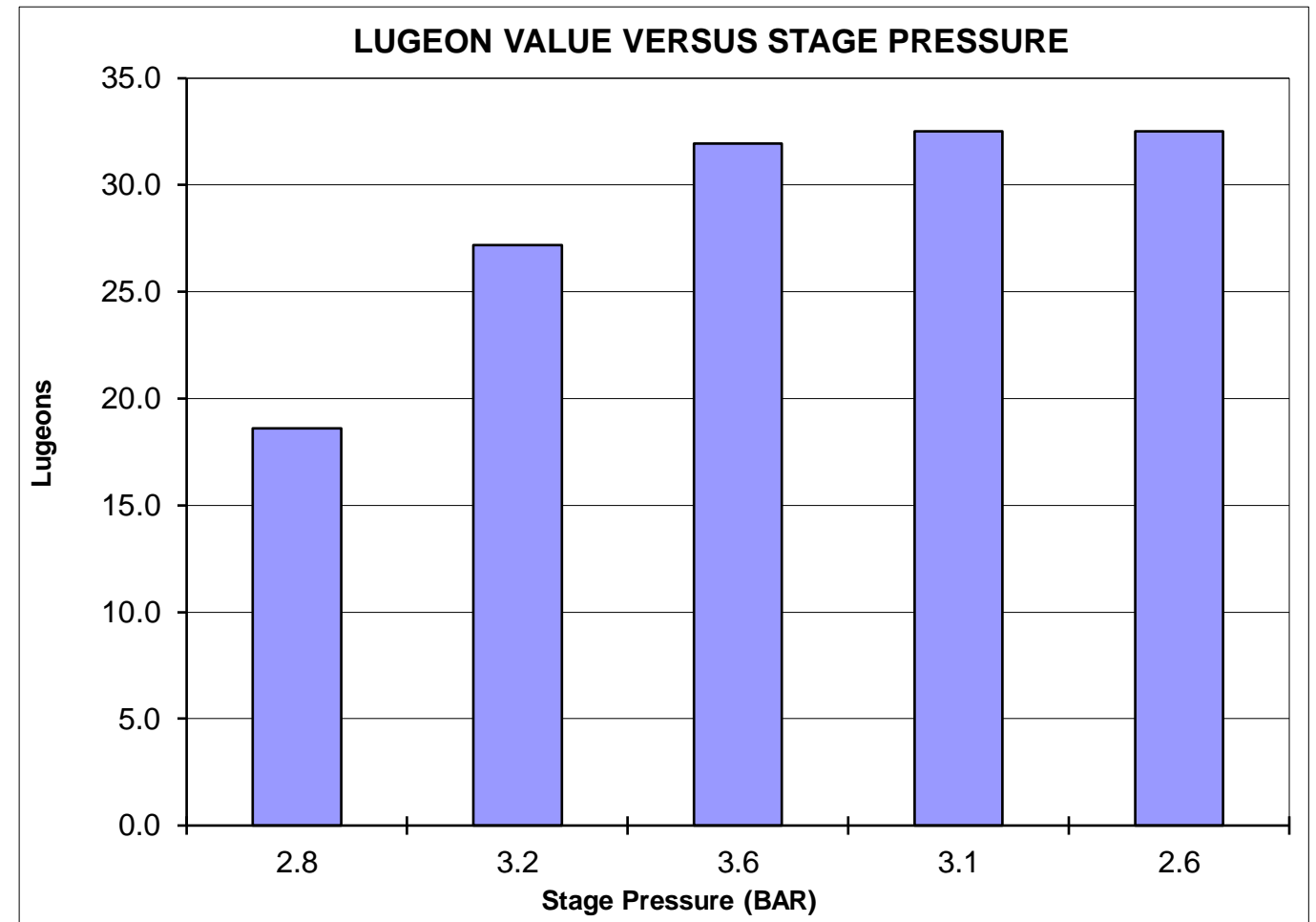
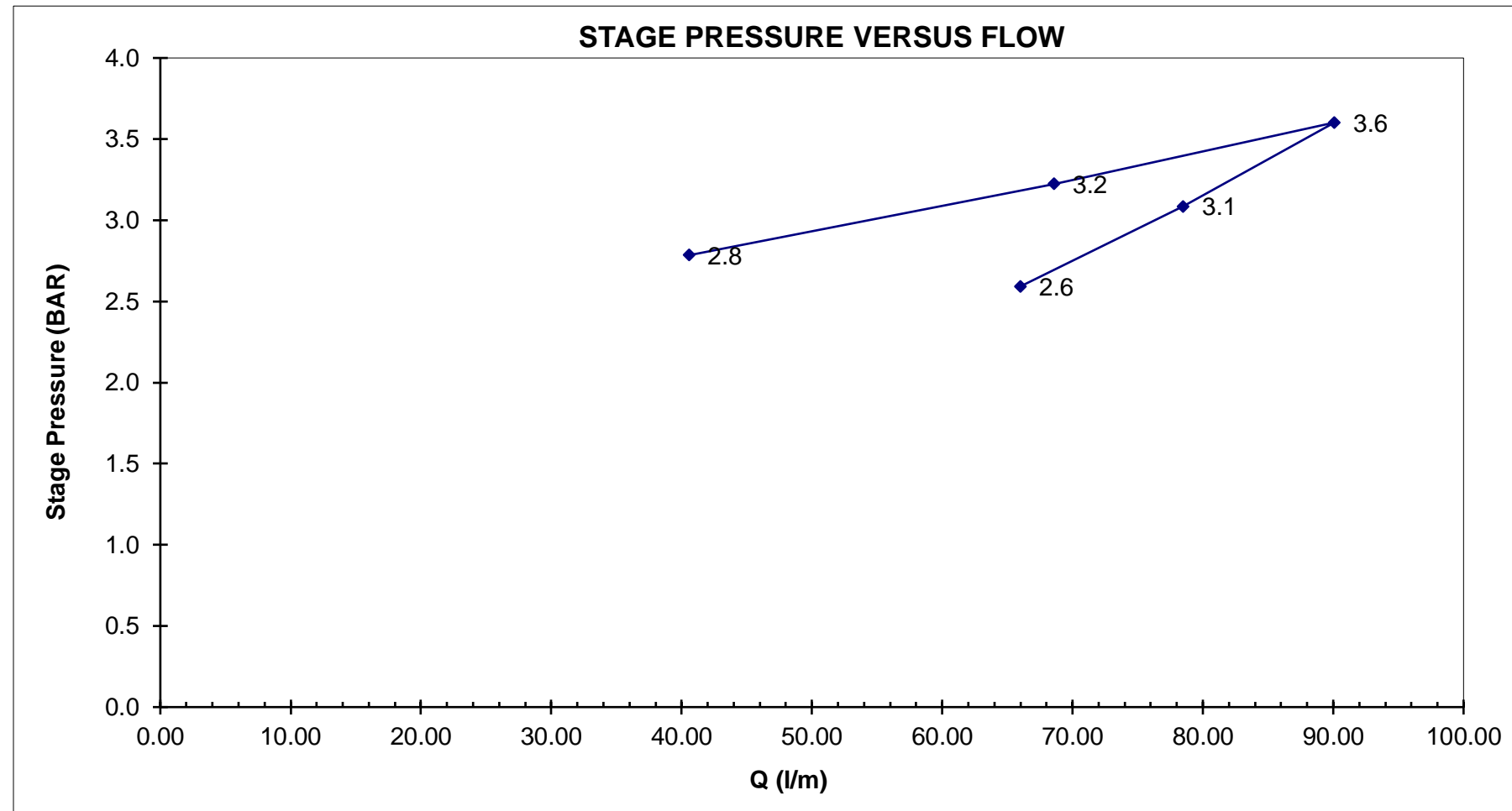
PROJECT: RED MOUNTAIN PROJECT PROJECT NO: VA101-594/02 DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3 DEPTH OF GROUNDWATER BELOW SURFACE: 27.1 m DIP: 50 (FROM HORIZONTAL) TOP OF TEST INTERVAL: 75.89 23.13 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen GAUGE HEIGHT ABOVE GROUND: 1.8 m DATE: 08-Sep-16 UNITS OF FLOWMETER: m3 BOTTOM OF TEST INTERVAL: 101.57 30.96 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.69	0.11	2.78	Flowmeter m3	38.14	38.18	38.22	38.26	38.30	38.34	38.38	38.42		
			Take litres		41.00	38.00	41.00	39.50	41.00	41.50	42.00		
			Average Take l/m		41.00	38.00	41.00	39.50	41.00	41.50	42.00	40.6	18.6
1.34	0.33	3.22	Flowmeter m3	38.73	38.80	38.87	38.94	39.00	39.07	39.14			
			Take litres		68.50	69.50	68.00	68.00	69.00	68.50			
			Average Take l/m		68.50	69.50	68.00	68.00	69.00	68.50		68.6	27.2
1.97	0.57	3.60	Flowmeter m3	39.57	39.66	39.75	39.84	39.93	40.02				
			Take litres		90.50	89.50	90.50	89.50	90.50				
			Average Take l/m		90.50	89.50	90.50	89.50	90.50			90.1	32.0
1.31	0.43	3.09	Flowmeter m3	40.20	40.28	40.36	40.44	40.51	40.59				
			Take litres		79.00	79.50	78.00	78.00	78.00				
			Average Take l/m		79.00	79.50	78.00	78.00	78.00			78.5	32.5
0.69	0.31	2.59	Flowmeter m3	40.91	40.97	41.04	41.10	41.17	41.24	41.30			
			Take litres		67.00	66.00	66.00	66.00	66.00	65.00			
			Average Take l/m		67.00	66.00	66.00	66.00	66.00	65.00		66.0	32.5



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 33

K = 3.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 3.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 19.05 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA ANALYZED BY: MEA REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 4 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 34.6 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 101.12 30.82 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

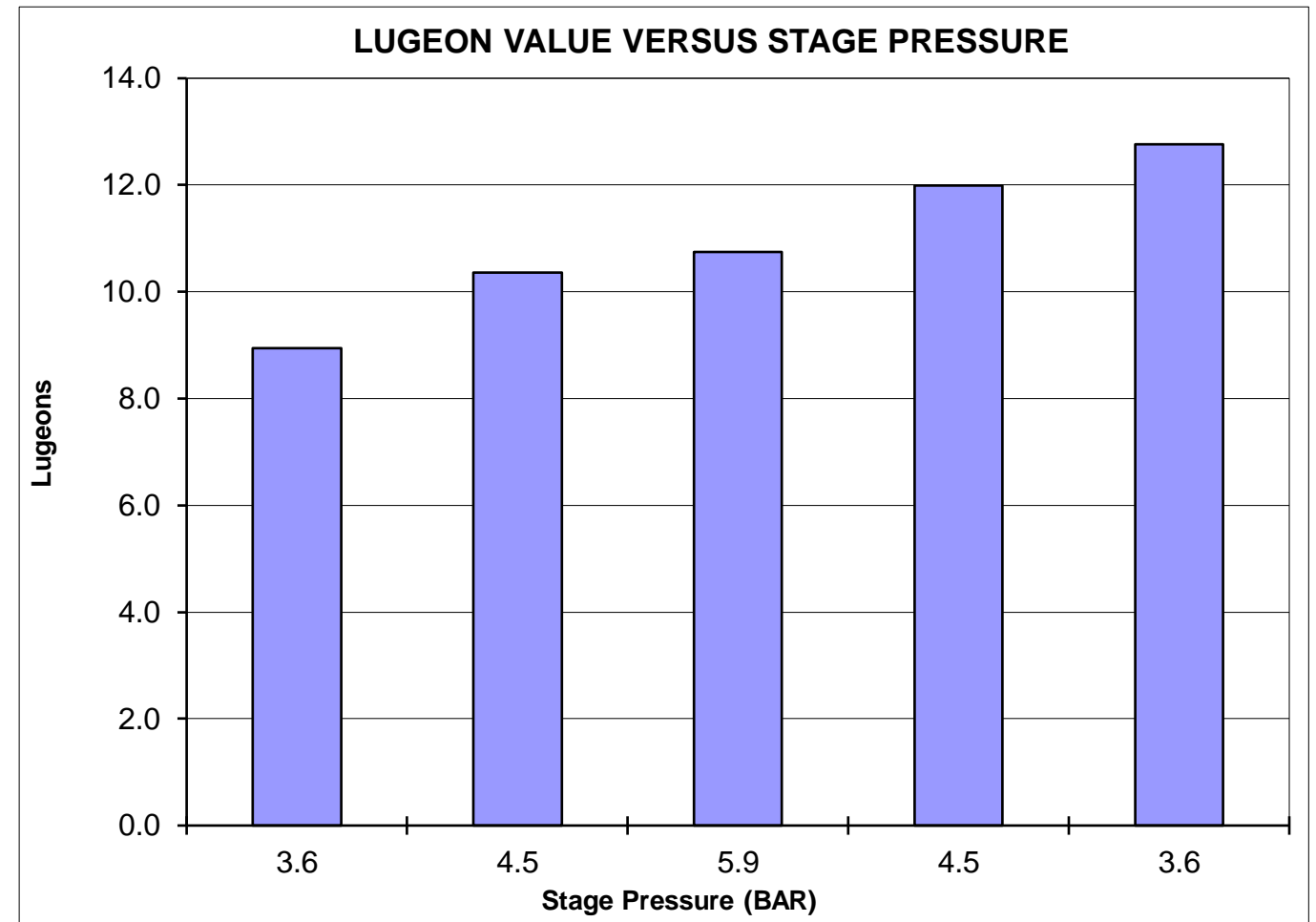
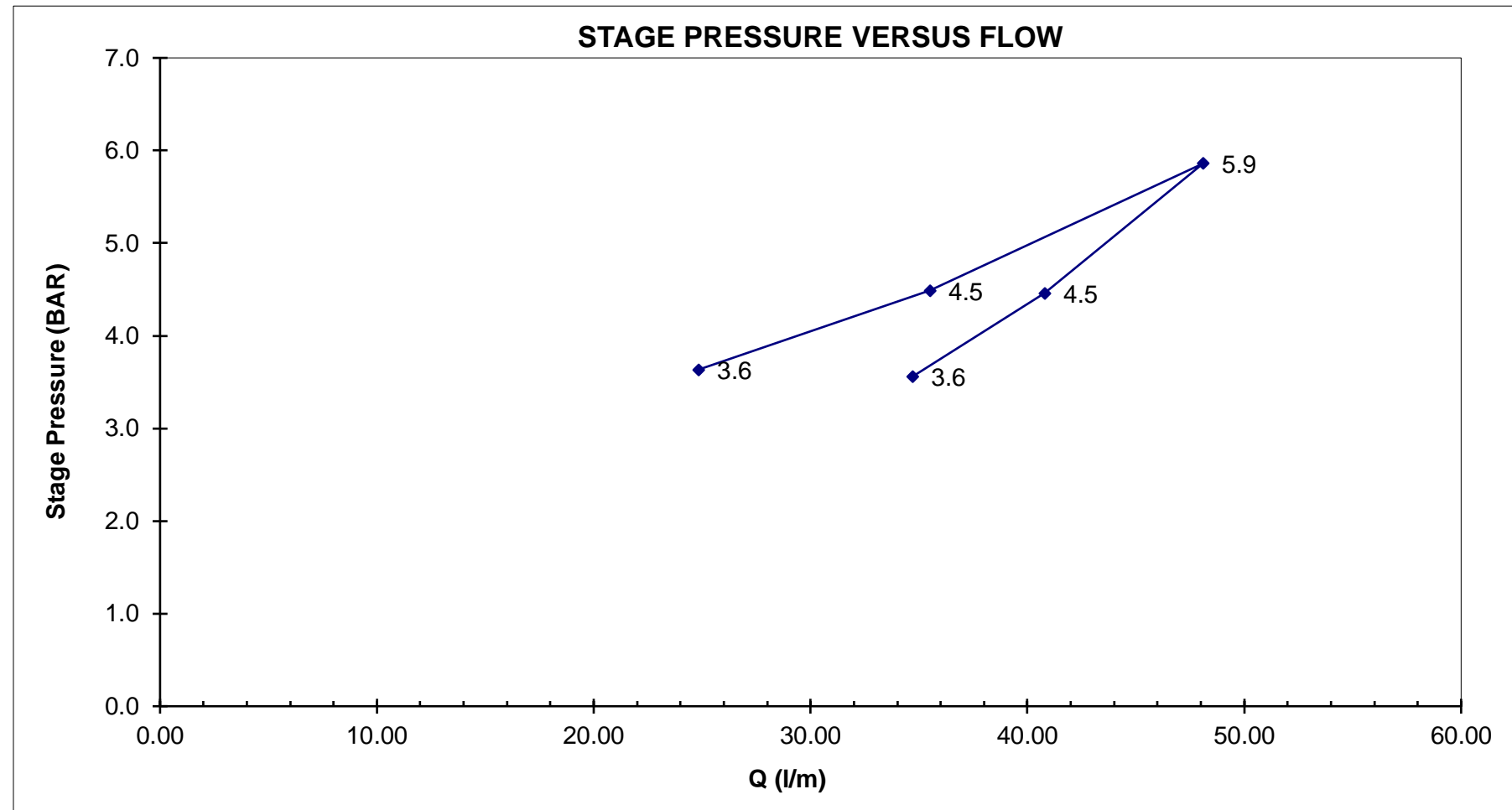
GAUGE HEIGHT ABOVE GROUND: 1.8 m

DATE: 08-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 126.18 38.46 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.90	0.04	3.63	Flowmeter m3	41.70	41.72	41.75	41.77	41.79	41.82	41.84			
			Take litres		25.00	25.00	25.00	24.00	24.50	25.50			
			Average Take l/m		25.00	25.00	25.00	24.00	24.50	25.5		24.8	8.9
1.79	0.09	4.49	Flowmeter m3	42.01	42.04	42.08	42.11	42.15	42.18				
			Take litres		35.00	36.00	34.50	35.50	36.50				
			Average Take l/m		35.00	36.00	34.50	35.50	36.50			35.5	10.4
3.24	0.16	5.86	Flowmeter m3	42.37	42.42	42.47	42.51	42.56	42.61				
			Take litres		47.00	49.50	47.50	49.00	47.50				
			Average Take l/m		47.00	49.50	47.50	49.00	47.50			48.1	10.7
1.79	0.12	4.46	Flowmeter m3	42.82	42.85	42.89	42.94	42.98	43.02				
			Take litres		38.00	41.00	42.00	42.50	40.50				
			Average Take l/m		38.00	41.00	42.00	42.50	40.50			40.8	12.0
0.86	0.08	3.56	Flowmeter m3	43.18	43.22	43.25	43.28	43.32	43.36				
			Take litres		34.00	36.00	29.00	38.40	36.10				
			Average Take l/m		34.00	36.00	29.00	38.40	36.10			34.7	12.8



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 13

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 25.09 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREPD	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 12

LUGEON TEST FIELD DATA SHEET

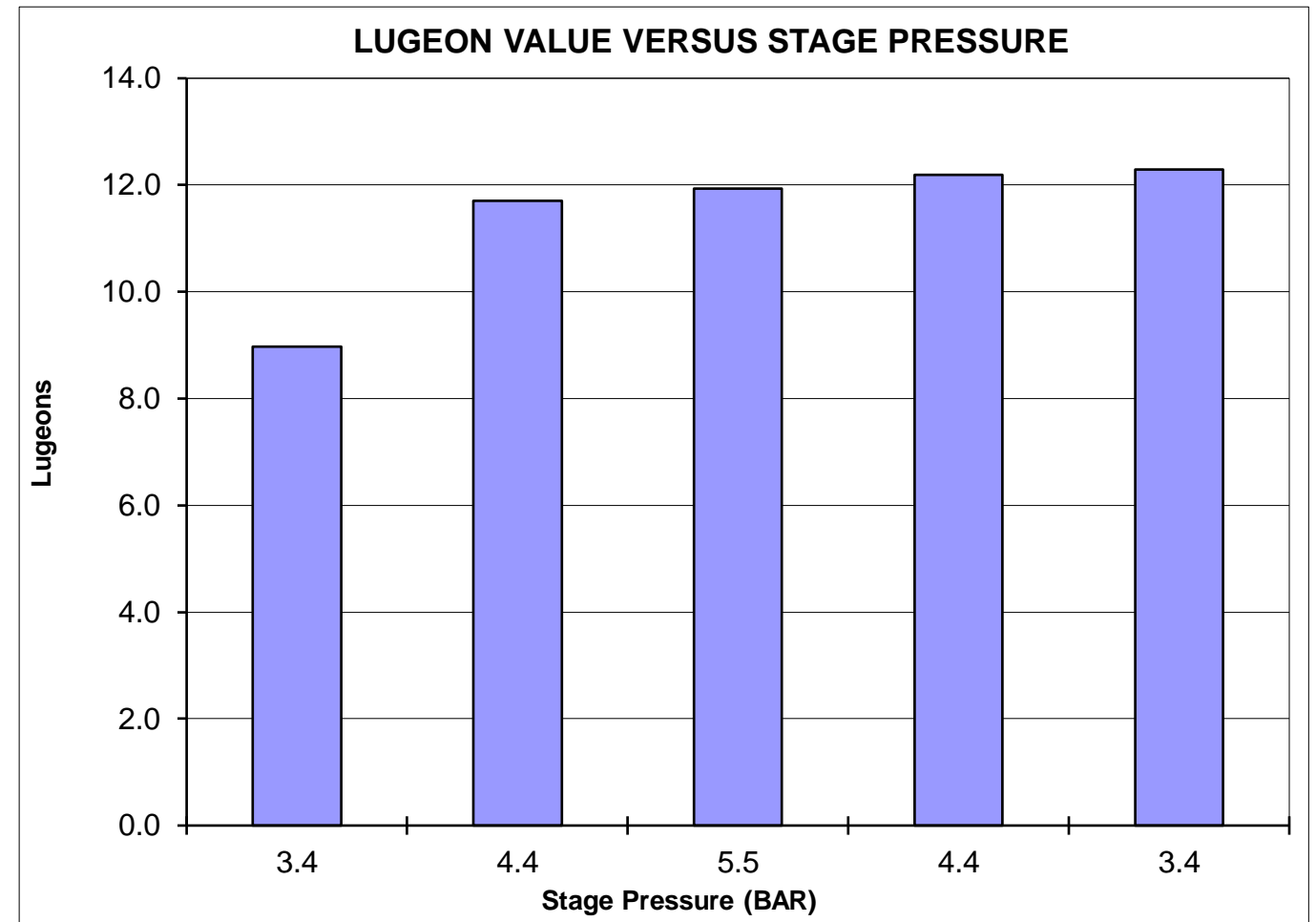
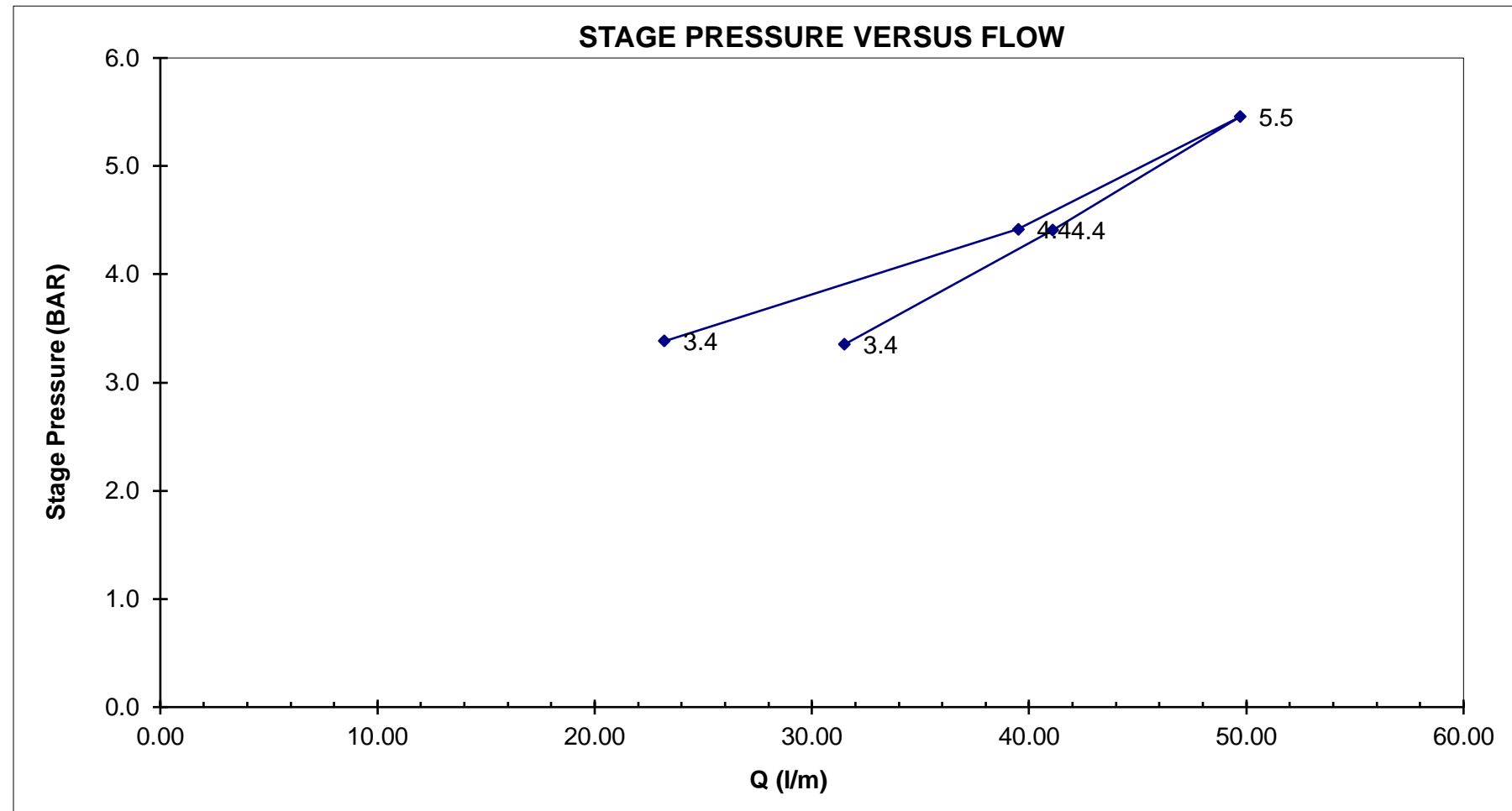


PROJECT: RED MOUNTAIN PROJECT PROJECT NO: VA101-594/02 DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3 DEPTH OF GROUNDWATER BELOW SURFACE: 29.3 m DIP: 50 (FROM HORIZONTAL) TOP OF TEST INTERVAL: 125.73 38.32 ft (DOWNHOLE) n (DOWNHOLE)
 PACKER TYPE: Nitrogen GAUGE HEIGHT ABOVE GROUND: 1.9 m DATE: 09-Sep-16 UNITS OF FLOWMETER: m3 BOTTOM OF TEST INTERVAL: 150.79 45.96 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
1.03	0.04	3.39	Flowmeter	43.60	43.62	43.64	43.67	43.69	43.71	43.74	43.76	23.2	9.0
			Take		24.00	23.50	23.50	22.50	23.00	23.50	22.50		
			Average Take		24.00	23.50	23.50	22.50	23.00	23.50	22.50		
2.14	0.11	4.42	Flowmeter	43.88	43.92	43.96	43.99	44.03	44.07	44.11	44.15	39.5	11.7
			Take		40.00	40.50	39.00	39.50	39.00	38.50	40.00		
			Average Take		40.00	40.50	39.00	39.50	39.00	38.50	40.00		
3.24	0.17	5.46	Flowmeter	44.53	44.58	44.62	44.67	44.72	44.77	44.82	44.87	49.7	11.9
			Take		50.00	49.00	50.00	49.00	50.00	50.00	50.00		
			Average Take		50.00	49.00	50.00	49.00	50.00	50.00	50.00		
2.14	0.12	4.41	Flowmeter	45.01	45.05	45.09	45.13	45.17	45.21	45.25	45.29	41.1	12.2
			Take		42.50	40.50	42.00	40.50	41.00	41.00	40.00		
			Average Take		42.50	40.50	42.00	40.50	41.00	41.00	40.00		
1.03	0.07	3.35	Flowmeter	45.43	45.46	45.49	45.53	45.56	45.59	45.62	45.65	31.5	12.3
			Take		32.00	31.00	32.00	32.00	30.50	32.00	31.00		
			Average Take		32.00	31.00	32.00	32.00	30.50	32.00	31.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 12

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE GAUGE NOISE: P1: +/-0.25 PSI, P2: +/-0.25 PSI, P3: +/-0.125 PSI, P4: +/-0.125 PSI, P5: +/-0.25 PSI,
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE DROPPED AT P3 FROM 47 TO 45.5 PSI DURING THE TEST.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 1-8)_r0.xlsx\TEST 5

REV	DATE	DESCRIPTION	PREP	CHKD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 6 OF 12

LUGEON TEST FIELD DATA SHEET

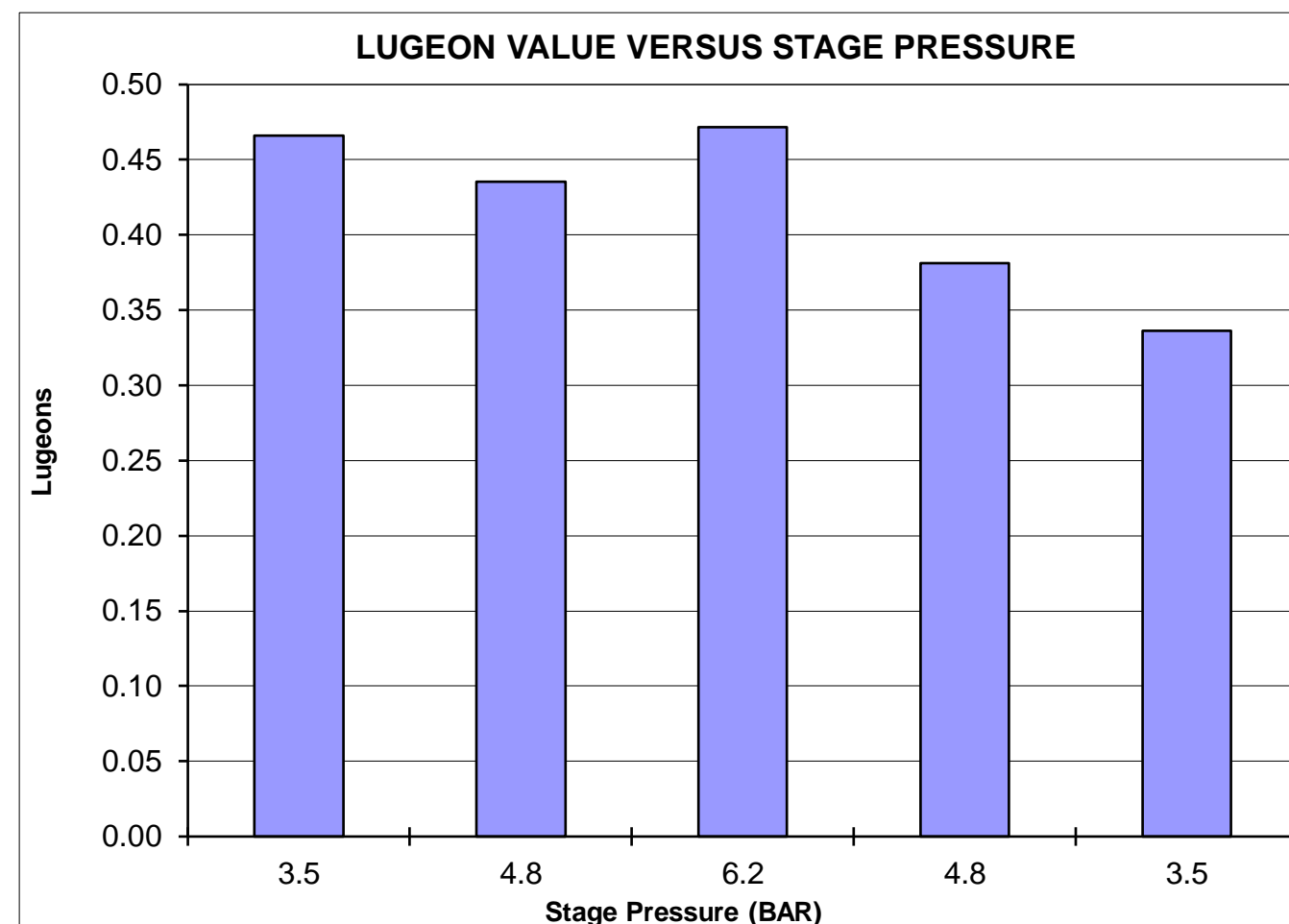
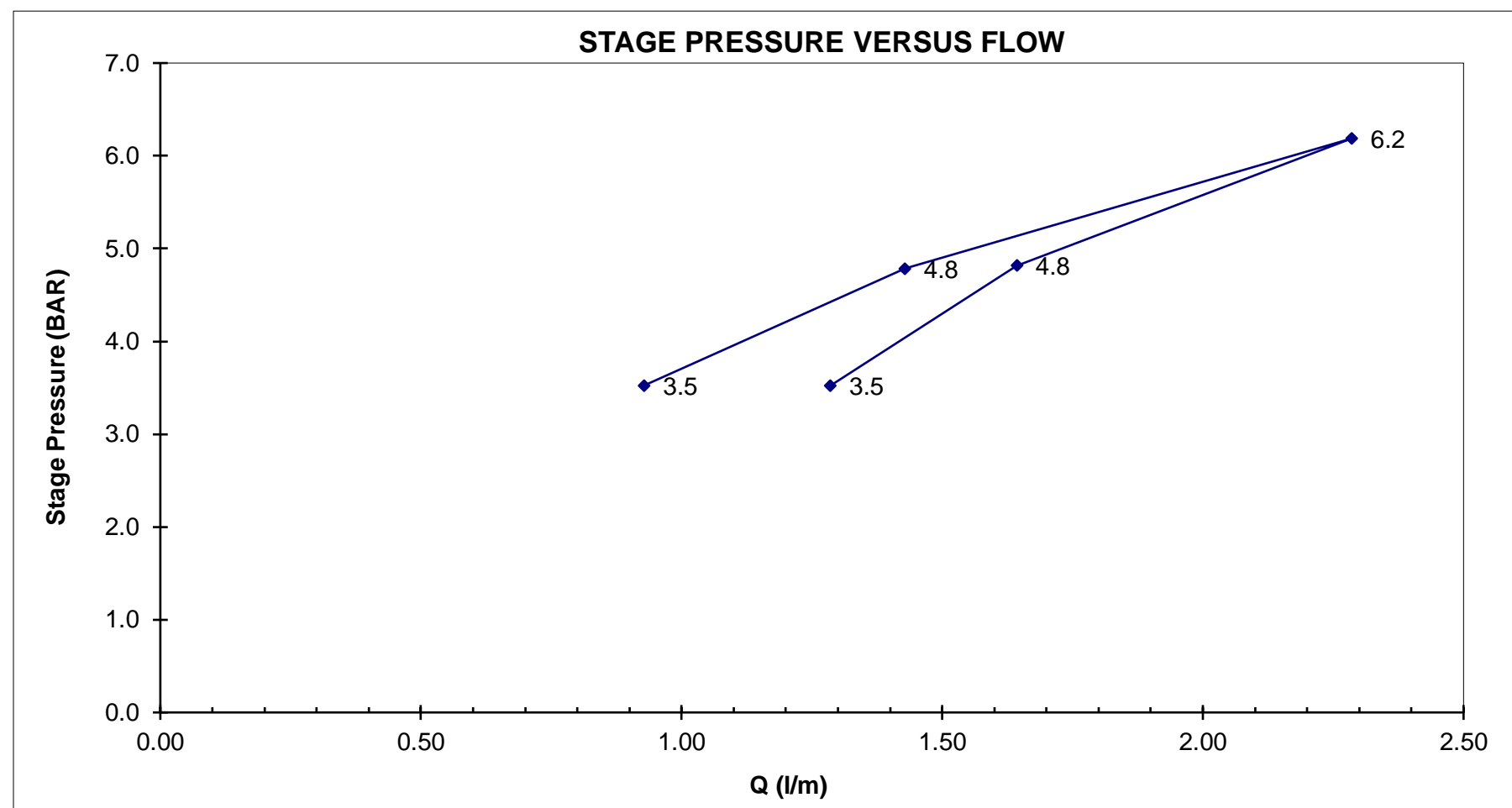


PROJECT: RED MOUNTAIN PROJECT PROJECT NO: VA101-594/02 DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment TEST NO: 6

NOMINAL HOLE SIZE (OF INTERVAL): HQ3 DEPTH OF GROUNDWATER BELOW SURFACE: 27.0 m DIP: 50 (FROM HORIZONTAL) TOP OF TEST INTERVAL: 150.30 45.81 ft (DOWNHOLE) n (DOWNHOLE)
 PACKER TYPE: Nitrogen GAUGE HEIGHT ABOVE GROUND: 2.4 m DATE: 09-Sep-16 UNITS OF FLOWMETER: m3 BOTTOM OF TEST INTERVAL: 175.99 53.64 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
1.26	0.00	3.52	Flowmeter m3	45.76	45.76	45.77	45.77	45.77	45.77	45.77	45.77	1.3	0.5
			Take litres		1.50	1.50	1.00	1.50	1.50	1.00	1.00		
			Average Take l/m		1.50	1.50	1.00	1.50	1.50	1.00	1.00		
2.55	0.00	4.82	Flowmeter m3	45.81	45.82	45.82	45.82	45.82	45.82	45.82	45.82	1.6	0.4
			Take litres		2.00	1.00	2.00	1.50	1.50	2.00	1.50		
			Average Take l/m		2.00	1.00	2.00	1.50	1.50	2.00	1.50		
3.92	0.00	6.19	Flowmeter m3	45.85	45.85	45.85	45.86	45.86	45.86	45.86	45.86	2.3	0.5
			Take litres		2.50	2.50	2.50	2.00	2.50	1.50	2.50		
			Average Take l/m		2.50	2.50	2.50	2.00	2.50	1.50	2.50		
2.52	0.00	4.78	Flowmeter m3	45.87	45.88	45.88	45.88	45.88	45.88	45.88	45.88	1.4	0.4
			Take litres		2.00	1.00	1.50	1.00	1.00	1.50	2.00		
			Average Take l/m		2.00	1.00	1.50	1.00	1.00	1.50	2.00		
1.26	0.00	3.52	Flowmeter m3	45.89	45.89	45.89	45.89	45.89	45.89	45.89	45.89	0.9	0.3
			Take litres		1.00	0.50	1.00	1.00	1.00	1.00	1.00		
			Average Take l/m		1.00	0.50	1.00	1.00	1.00	1.00	1.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.3

K = 3.E-06 cm/s

INTERPRETATION TYPE OF FLOW: VOID FILLING

K = 3.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PRESSURE DROPPED AT P1 FROM 18.25 TO 17.5 PSI, P2 FROM 37 TO 36.5 PSI, AND P3 FROM 56.875 TO 55.75 PSI DURING THE TEST
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: P1: +/-0.25 PSI, P2: +/-0.25 PSI, P3: +/-0.125 PSI, P4: +/-0.125 PSI, P5: +/-0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 1-8)_r0.xlsx\TEST 6

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	CHKD

SHEET 7 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 7

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 25.5 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 175.52 53.50 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

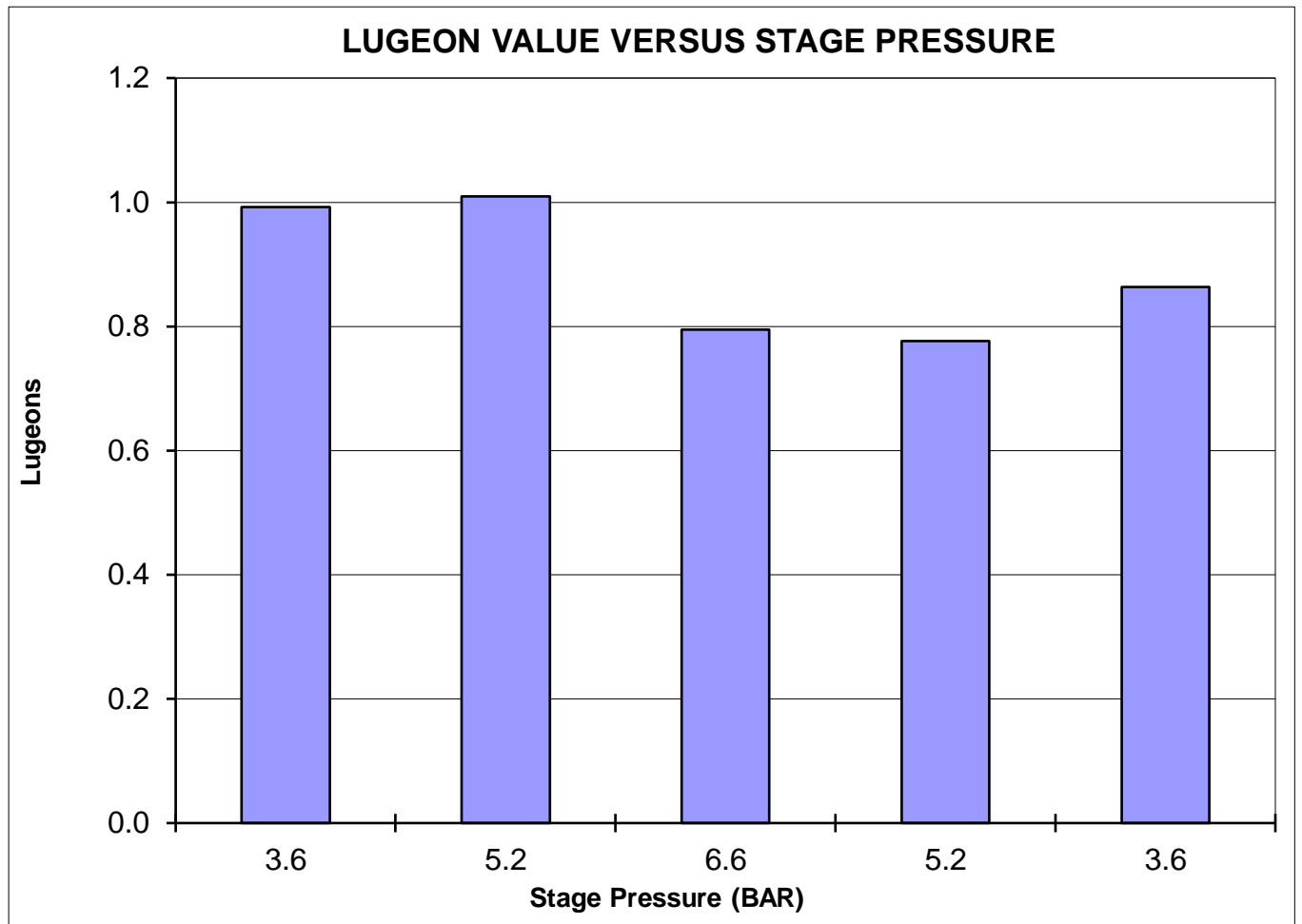
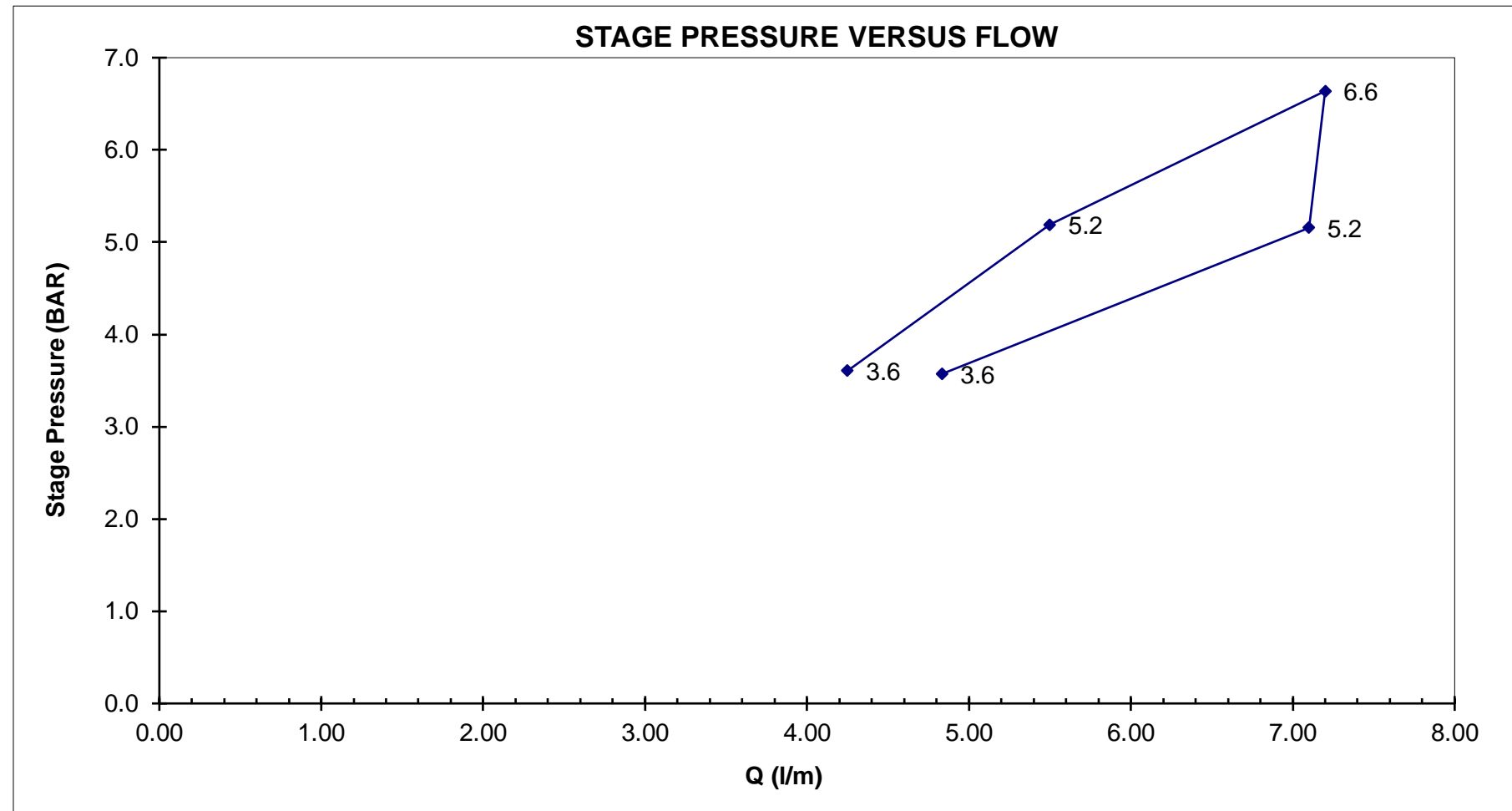
GAUGE HEIGHT ABOVE GROUND: 1.8 m

DATE: 09-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 220.28 67.14 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.48	0.00	3.57	Flowmeter m3	46.09	46.10	46.10	46.11	46.11	46.11	46.12		4.8	1.0
			Take litres		5.00	5.00	5.00	4.50	4.50	5.00			
			Average Take l/m		5.00	5.00	5.00	4.50	4.50	5.00			
3.07	0.00	5.16	Flowmeter m3	46.15	46.16	46.16	46.17	46.18	46.18	46.18		7.1	1.0
			Take litres		7.00	7.00	7.00	7.00	7.50				
			Average Take l/m		7.00	7.00	7.00	7.00	7.50				
4.55	0.00	6.64	Flowmeter m3	46.21	46.22	46.23	46.23	46.24	46.25			7.2	0.8
			Take litres		7.00	7.50	7.00	7.50	7.00				
			Average Take l/m		7.00	7.50	7.00	7.50	7.00				
3.10	0.00	5.19	Flowmeter m3	46.27	46.27	46.28	46.28	46.29	46.29	46.30		5.5	0.8
			Take litres		6.00	5.00	5.50	6.00	5.50	5.00			
			Average Take l/m		6.00	5.00	5.50	6.00	5.50	5.00			
1.52	0.00	3.61	Flowmeter m3	46.31	46.32	46.32	46.33	46.33	46.34	46.34		4.3	0.9
			Take litres		4.00	4.50	4.00	5.00	4.00	4.00			
			Average Take l/m		4.00	4.50	4.00	5.00	4.00	4.00			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.9

K = 9.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 9.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. PUMP MAXED OUT
 4. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: P1: +/- 0 PSI, P2: +/- 0.5 PSI, P3: +/- 0.5 PSI, P4: +/- 1 PSI, P5: +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 1-8)_r0.xlsx\TEST 7

REV	DATE	DESCRIPTION	PREP	CHKD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 8 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 8

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 26.8 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 219.79 66.99 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

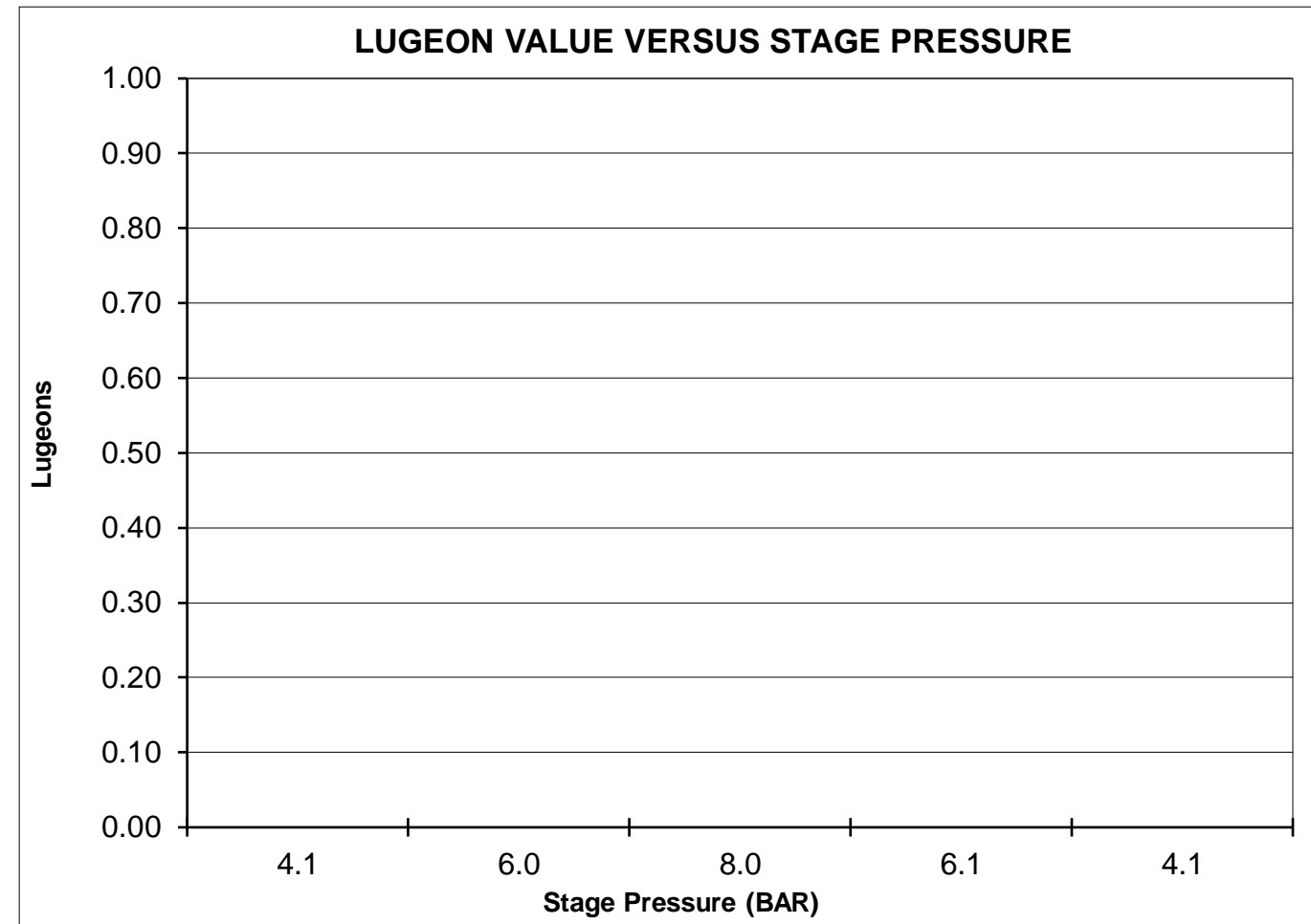
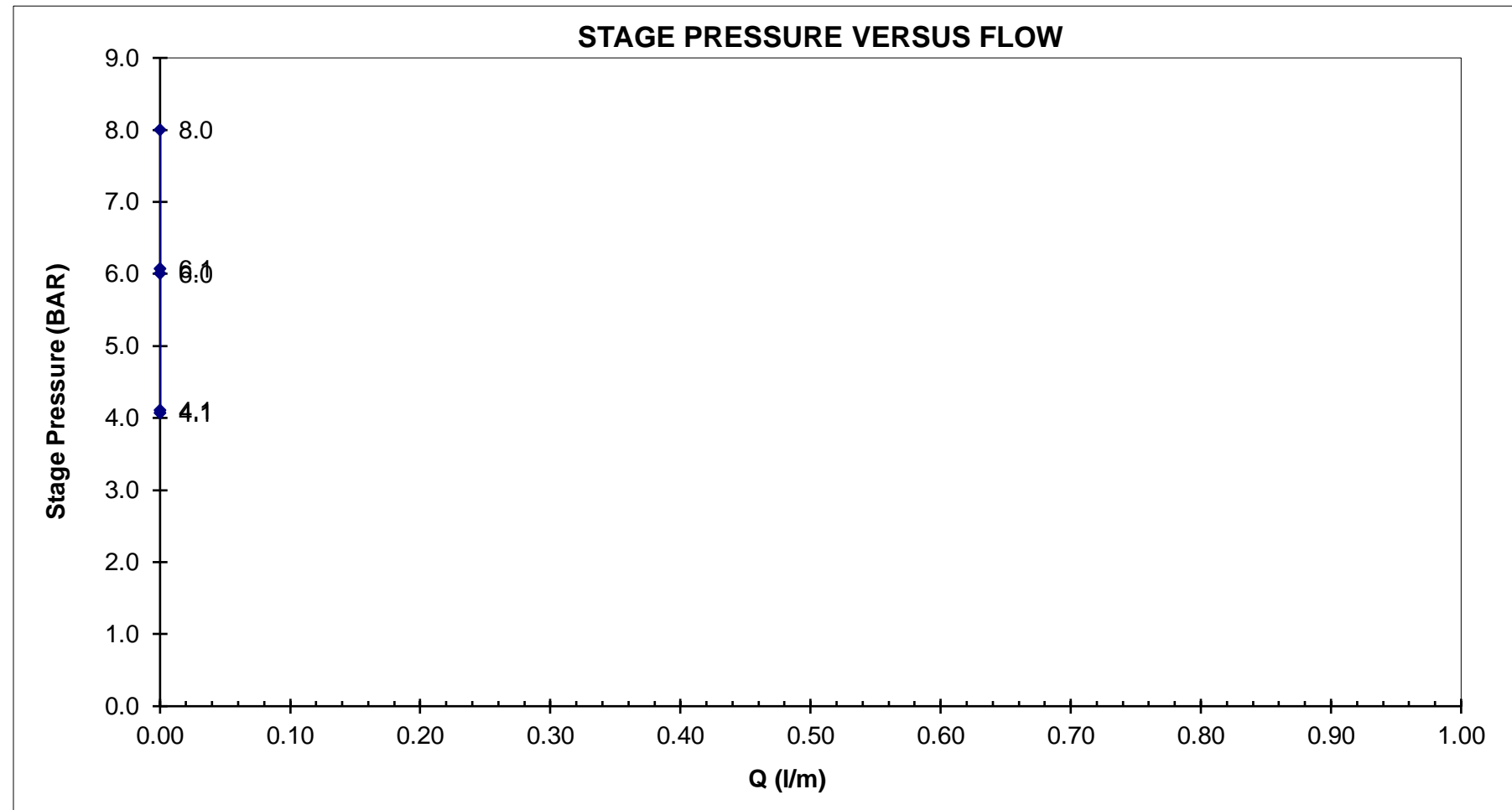
GAUGE HEIGHT ABOVE GROUND: 2.4 m

DATE: 09-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 245.48 74.82 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3							FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
1.86	0.00	4.11	0	46.44	46.44	46.44	46.44	46.44	46.44	46.44	46.44	0.0	0.0
				Take litres	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				Average Take l/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
3.76	0.00	6.01	0	46.46	46.46	46.46	46.46	46.46	46.46	46.46	46.46	0.0	0.0
				Take litres	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				Average Take l/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
5.76	0.00	8.01	0	46.46	46.46	46.46	46.46	46.47	46.47	46.47	46.47	0.0	0.0
				Take litres	0.00	0.50	0.00	0.50	1.00	0.00	0.50	0.50	
				Average Take l/m	0.00	0.50	0.00	0.50	1.00	0.00	0.50	0.50	
3.83	0.00	6.07	0	46.46	46.46	46.46	46.46	46.46	46.46	46.46	46.46	0.0	0.0
				Take litres	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				Average Take l/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.83	0.00	4.07	0	46.46	46.46	46.46	46.46	46.46	46.46	46.46	46.46	0.0	0.0
				Take litres	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
				Average Take l/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. LEAKS OBSERVED FROM THE STUFFING BOX AT P4 AND P5 WITH FLOW RATE OF 0.05 L/min
 2. SURGE TANK USED
 3. PUMP MAXED OUT
 4. PRESSURE GAUGE NOISE: P1: +/- 0.25 PSI, P2: +/- 0.25 PSI, P3: +/- 0.5 PSI, P4: +/- 0.5 PSI, P5: +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 5. DRILL RIG ENGINE OVERHEATED AND DIED AFTER P3; RESULTED TO DO RE-TEST FOR P4 AND P5
 6. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 7. PRESSURE DROPPED FROM 54.5 TO 53.5 PSI AT P2 AND FROM 83.5 TO 79.5 AT P3 DURING THE TEST

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 1-8)_r0.xlsx\TEST 8

REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 9 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 9

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 80.0 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 242.65 73.96 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

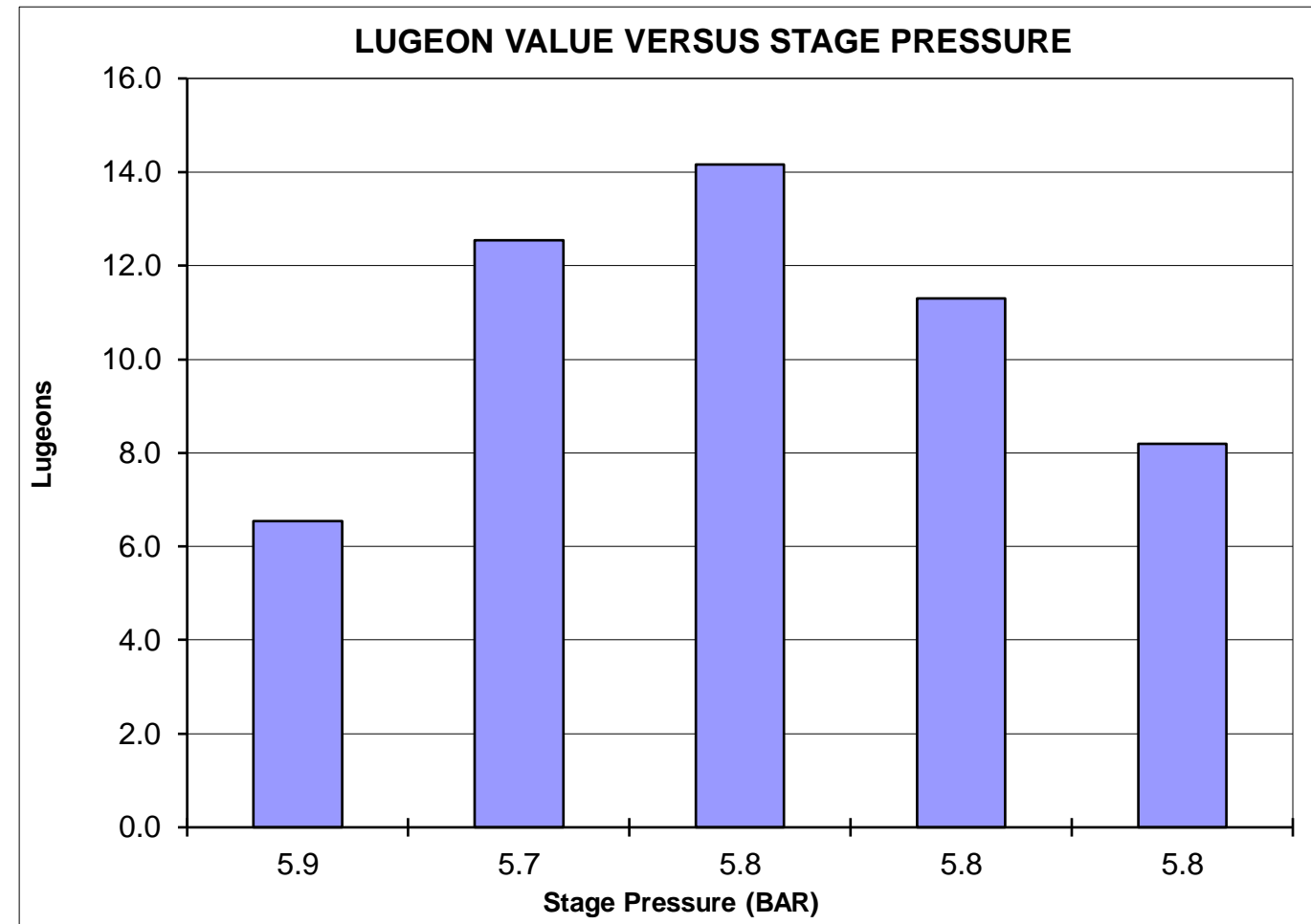
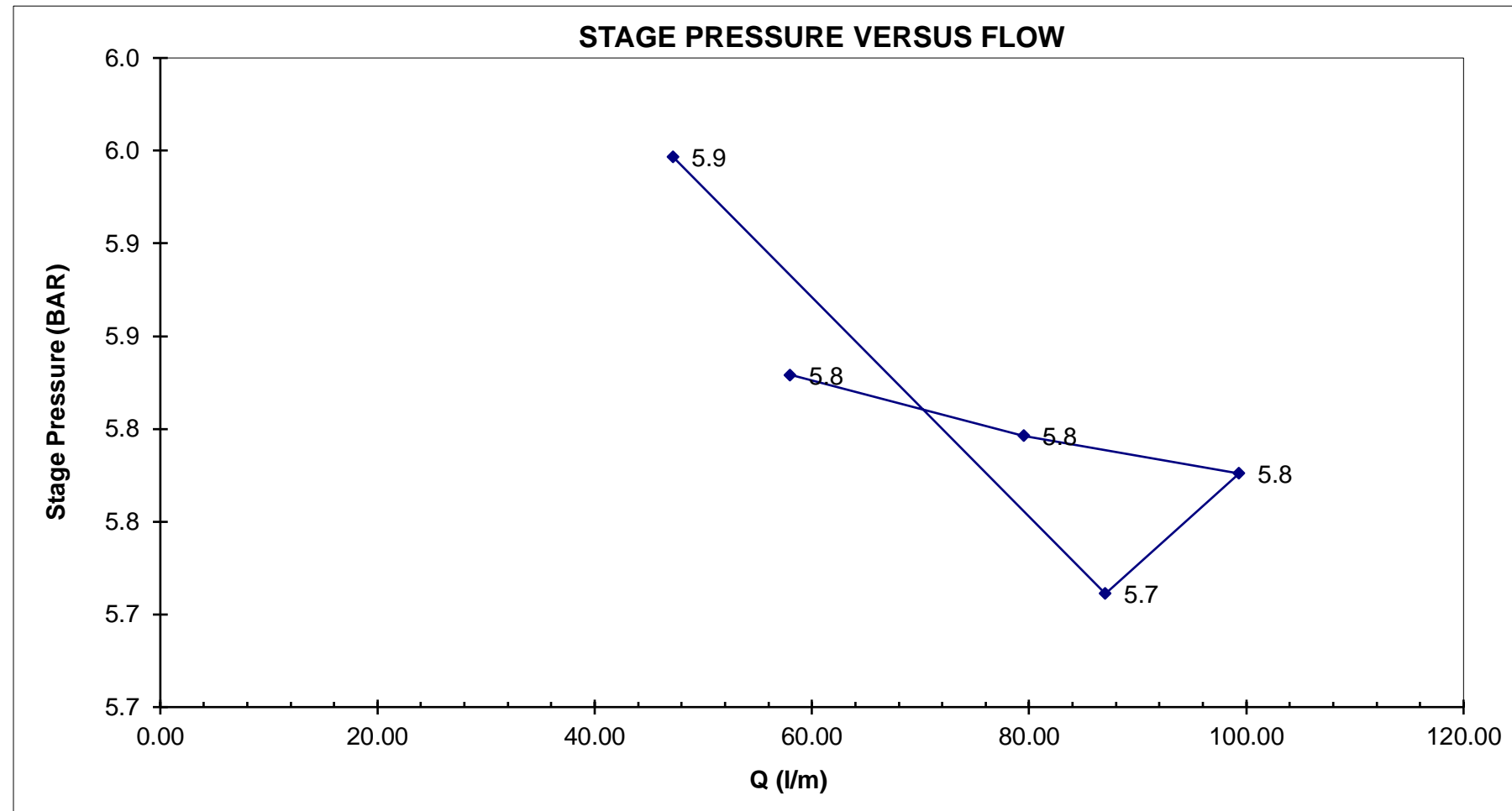
GAUGE HEIGHT ABOVE GROUND: 2.3 m

DATE: 10-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 282.49 86.10 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.49	5.95	Flowmeter m3	47.59	47.64	47.68	47.73	47.78	47.83				
			Take litres		46.00	46.50	47.50	49.00	47.00				
			Average Take l/m		46.00	46.50	47.50	49.00	47.00			47.2	6.5
0.41	0.94	5.71	Flowmeter m3	47.94	48.02	48.11	48.20	48.28	48.37				
			Take litres		87.50	87.00	87.00	88.00	85.50				
			Average Take l/m		87.50	87.00	87.00	88.00	85.50			87.0	12.5
0.62	1.08	5.78	Flowmeter m3	48.65	48.75	48.85	48.94	49.04	49.14	49.24			
			Take litres		101.00	99.00	99.50	98.50	99.00	99.00			
			Average Take l/m		101.00	99.00	99.50	98.50	99.00	99.00		99.3	14.2
0.41	0.85	5.80	Flowmeter m3	49.37	49.45	49.53	49.61	49.69	49.77				
			Take litres		79.00	79.00	79.50	79.50	80.50				
			Average Take l/m		79.00	79.00	79.50	79.50	80.50			79.5	11.3
0.21	0.61	5.83	Flowmeter m3	49.86	49.92	49.98	50.03	50.09	50.15				
			Take litres		57.50	58.50	57.50	58.00	58.50				
			Average Take l/m		57.50	58.50	57.50	58.00	58.50			58.0	8.2



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 10

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. DRY HOLE MEASURED PRIOR TO LOWERING PACKER AND AFTER INFLATION; USED MIDDLE OF TEST INTERVAL FOR ANALYSIS.
 2. NO LEAKS OBSERVED
 3. SURGE TANK USED
 4. PUMP MAXED OUT; UNABLE TO REACH PSI GREATER THAN 9 PSI; DEFLATED AND RESEATED PACKER; RE-DID THE TEST FROM P1 TO P5 AND USED THESE DATA FOR ANALYSIS.
 5. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 6. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 9-12)_r0.xlsx\TEST 9

REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 10 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 10

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 89.9 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 282.00 85.95 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

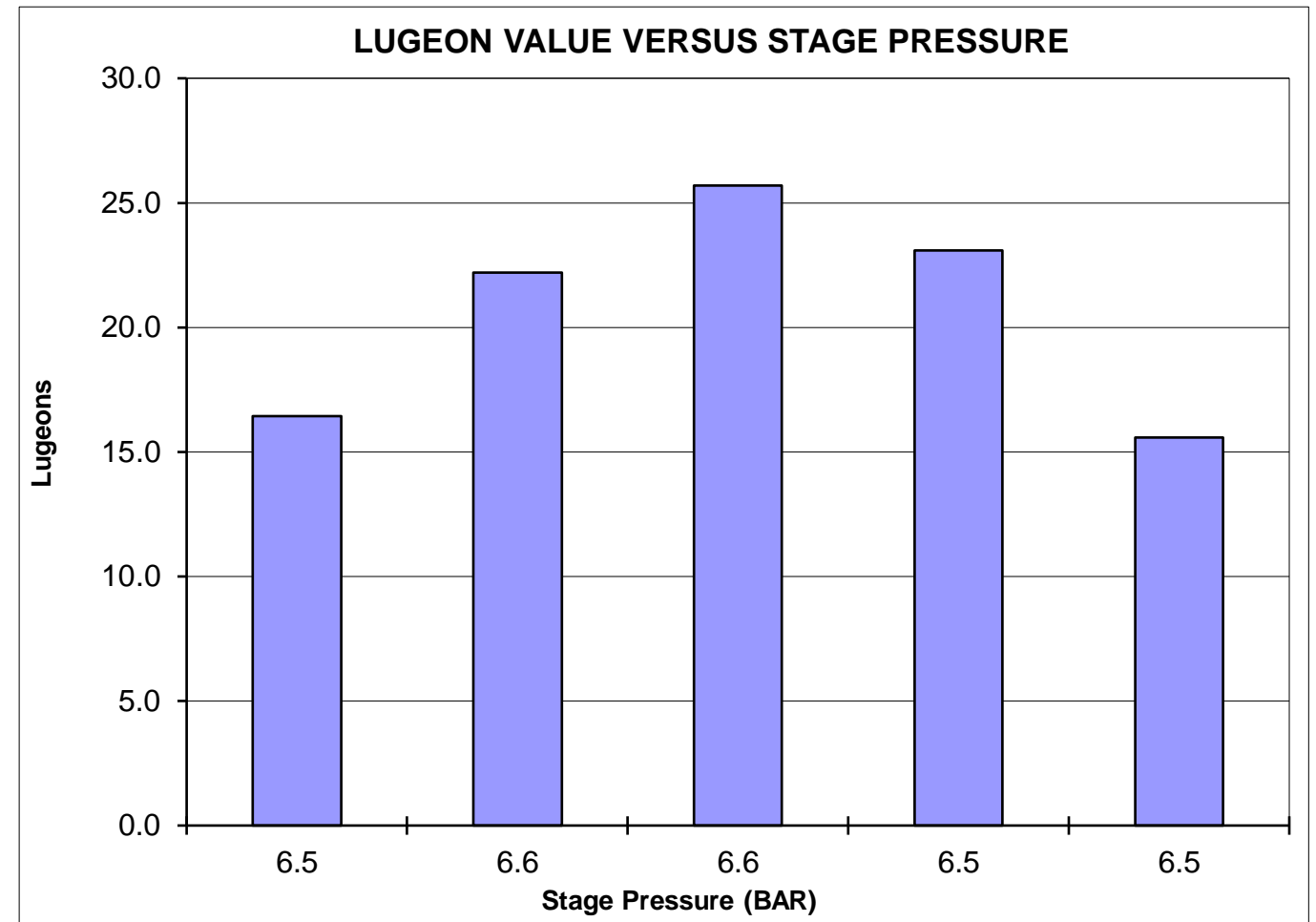
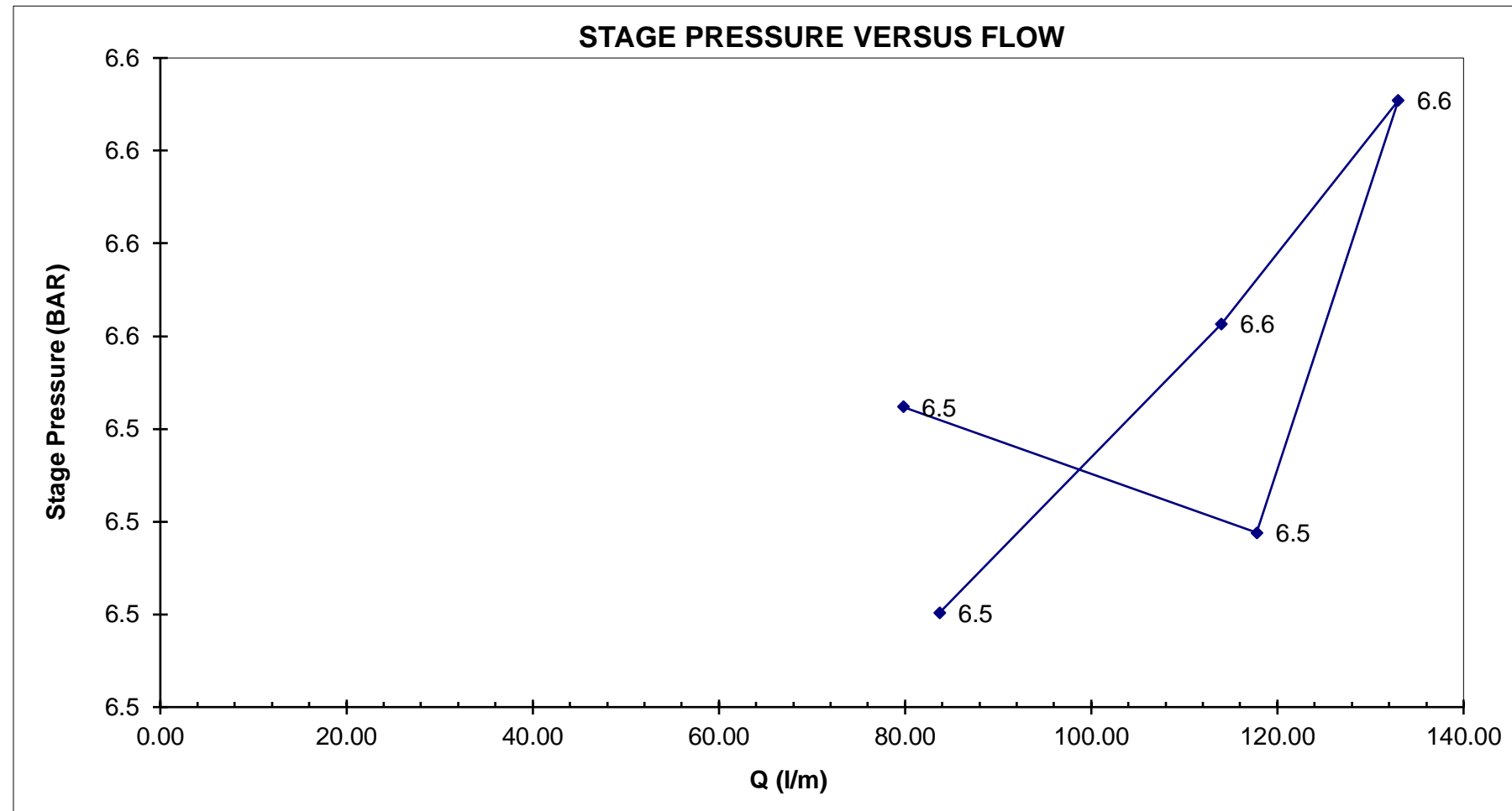
GAUGE HEIGHT ABOVE GROUND: 2.4 m

DATE: 11-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 307.69 93.78 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.90	6.50	Flowmeter m3	53.54	53.62	53.71	53.79	53.88	53.96	54.04	54.13		
			Take litres		84.00	84.00	83.00	84.00	84.00	84.00	83.00		
			Average Take l/m		84.00	84.00	83.00	84.00	84.00	84	83	83.7	16.4
0.83	1.25	6.56	Flowmeter m3	54.37	54.49	54.60	54.71	54.83	54.94				
			Take litres		115.00	113.00	114.00	113.00	115.00				
			Average Take l/m		115.00	113.00	114.00	113.00	115.00			114.0	22.2
1.10	1.48	6.61	Flowmeter m3	55.52	55.65	55.79	55.92	56.05	56.19				
			Take litres		133.00	133.00	132.00	134.00	133.00				
			Average Take l/m		133.00	133.00	132.00	134.00	133.00			133.0	25.7
0.83	1.29	6.52	Flowmeter m3	56.44	56.56	56.68	56.79	56.91	57.03				
			Take litres		119.00	116.00	117.00	119.00	118.00				
			Average Take l/m		119.00	116.00	117.00	119.00	118.00			117.8	23.1
0.41	0.85	6.54	Flowmeter m3	57.17	57.25	57.33	57.41	57.49	57.57				
			Take litres		79.00	80.00	80.00	80.00	80.00				
			Average Take l/m		79.00	80.00	80.00	80.00	80.00			79.8	15.6



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 19

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. DRY HOLE MEASURED PRIOR TO LOWERING PACKER AND AFTER INFLATION; USED MIDDLE OF TEST INTERVAL FOR ANALYSIS.
 2. SURGE TANK USED
 3. NO LEAKS OBSERVED
 4. PUMP MAXED OUT; UNABLE TO REACH PSI GREATER THAN 16 PSI. RAN OUT OF WATER AFTER P2 AND P3. WAITED TO REFILL WATER TANK BEFORE PROCEEDING WITH THE TEST.
 5. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 6. PRESSURE GAUGE NOISE: P1: +/-0 PSI, P2: +/-0.25 PSI, P3: +/-0.25 PSI, P4: +/-0.25 PSI, P5: +/-0 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 7. P4 INCREASED PRESSURE FROM 12 TO 12.5 PSI AND P5 DECREASED PRESSURE FROM 6 TO 5 PSI DURING THE TEST.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-009 - Lugeon Spreadsheet (Test 9-12)_r0.xlsx\TEST 10

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	CHKD

SHEET 11 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 11

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 97.6 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 307.20 93.63 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

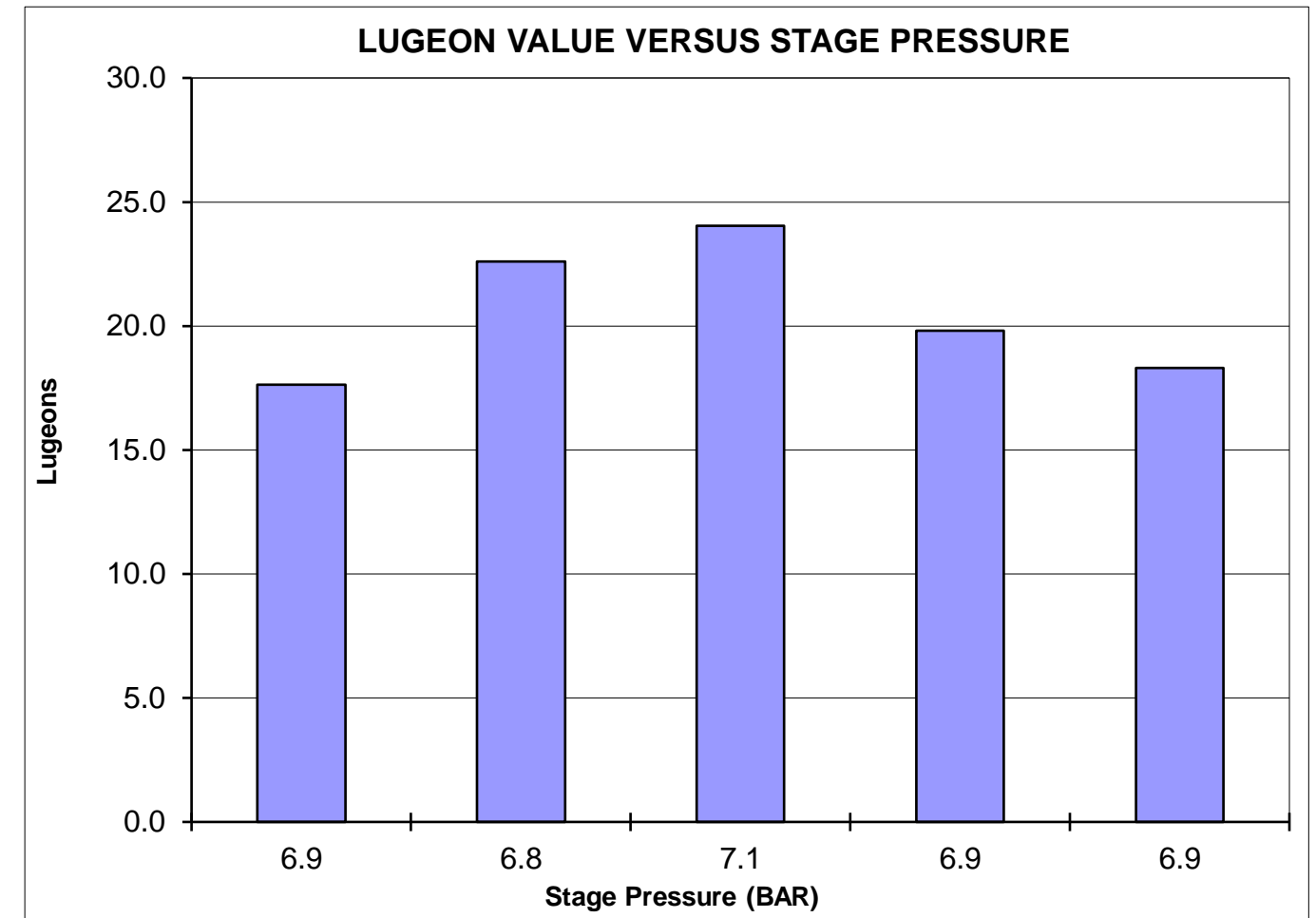
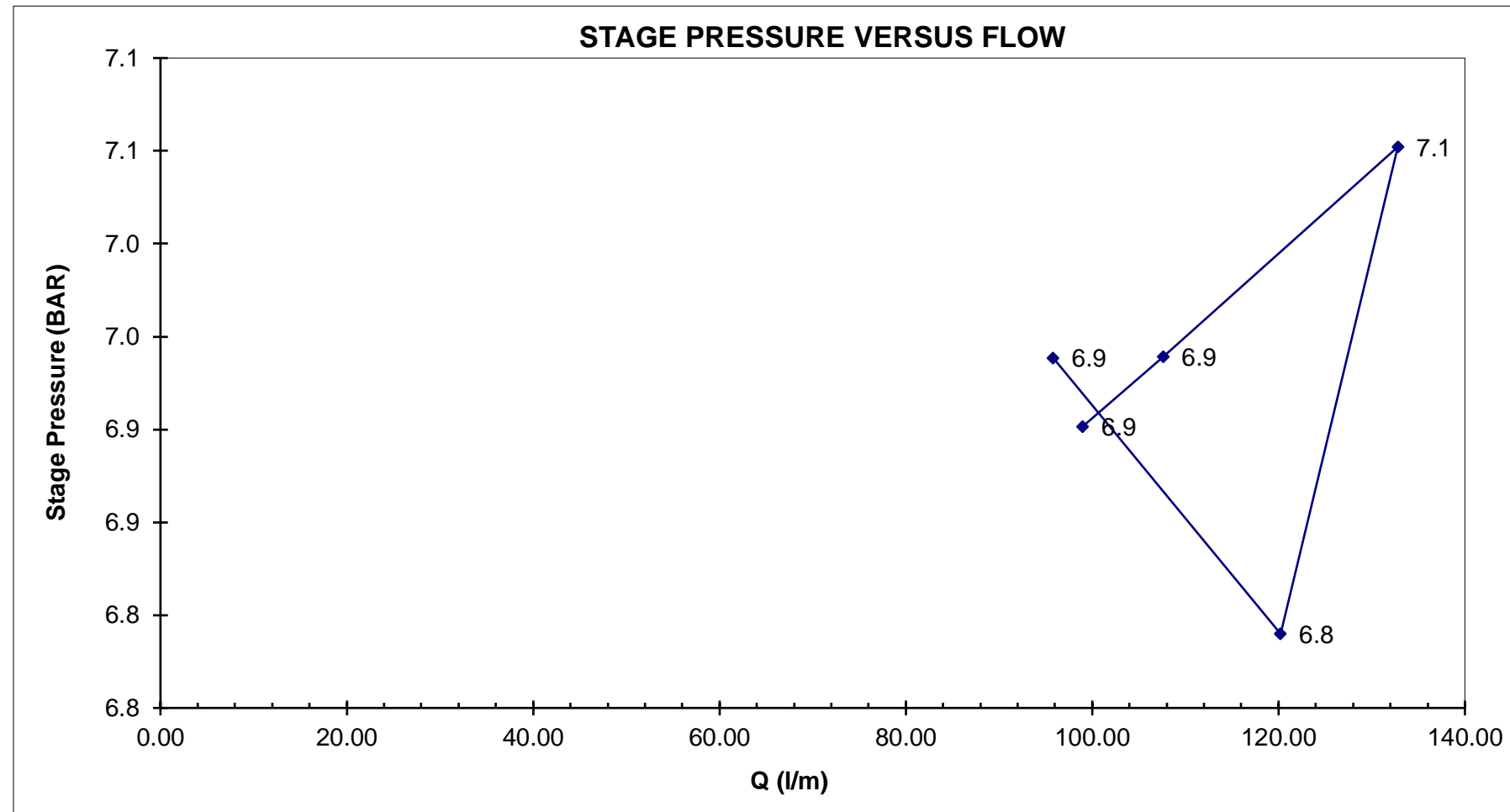
GAUGE HEIGHT ABOVE GROUND: 2.4 m

DATE: 11-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 332.89 101.46 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	1.04	6.94	Flowmeter m3	58.69	58.79	58.88	58.98	59.07	59.17				
			Take litres		96.00	95.00	96.00	96.00	96.00				
			Average Take l/m		96.00	95.00	96.00	96.00	96.00			95.8	17.6
0.55	1.32	6.79	Flowmeter m3	60.10	60.22	60.34	60.46	60.58	60.70				
			Take litres		120.00	121.00	119.00	121.00	120.00				
			Average Take l/m		120.00	121.00	119.00	121.00	120.00			120.2	22.6
0.97	1.47	7.05	Flowmeter m3	61.10	61.23	61.37	61.50	61.63	61.76				
			Take litres		133.00	133.00	134.00	131.00	133.00				
			Average Take l/m		133.00	133.00	134.00	131.00	133.00			132.8	24.0
0.55	1.17	6.94	Flowmeter m3	62.01	62.12	62.23	62.33	62.44	62.55				
			Take litres		108.00	108.00	108.00	107.00	107.00				
			Average Take l/m		108.00	108.00	108.00	107.00	107.00			107.6	19.8
0.41	1.07	6.90	Flowmeter m3	62.80	62.90	63.00	63.10	63.20	63.30				
			Take litres		99.00	100.00	99.00	98.00	99.00				
			Average Take l/m		99.00	100.00	99.00	98.00	99.00			99.0	18.3



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 20

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED
 3. PUMP MAXED OUT; UNABLE TO REACH PSI GREATER THAN 14 PSI. RAN OUT OF WATER AFTER P1 TO P4. WAITED TO REFILL WATER TANK BEFORE PROCEEDING WITH THE TEST.
 4. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 5. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 96.9 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 6. PRESSURE GAUGE NOISE: P1: +/-0 PSI, P2: +/-0.25 PSI, P3: +/-0.25 PSI, P4: +/-0.25 PSI, P5: +/-0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 7. P1 DECREASED PRESSURE FROM 6 TO 5 PSI AND P5 INCREASED PRESSURE FROM 6 TO 6.5 PSI DURING THE TEST.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	ME/CAG	CHS

SHEET 12 OF 12

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-009

AREA: Bromley Humps TMF North Embankment

TEST NO: 12

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 97.7 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 325.98 99.36 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

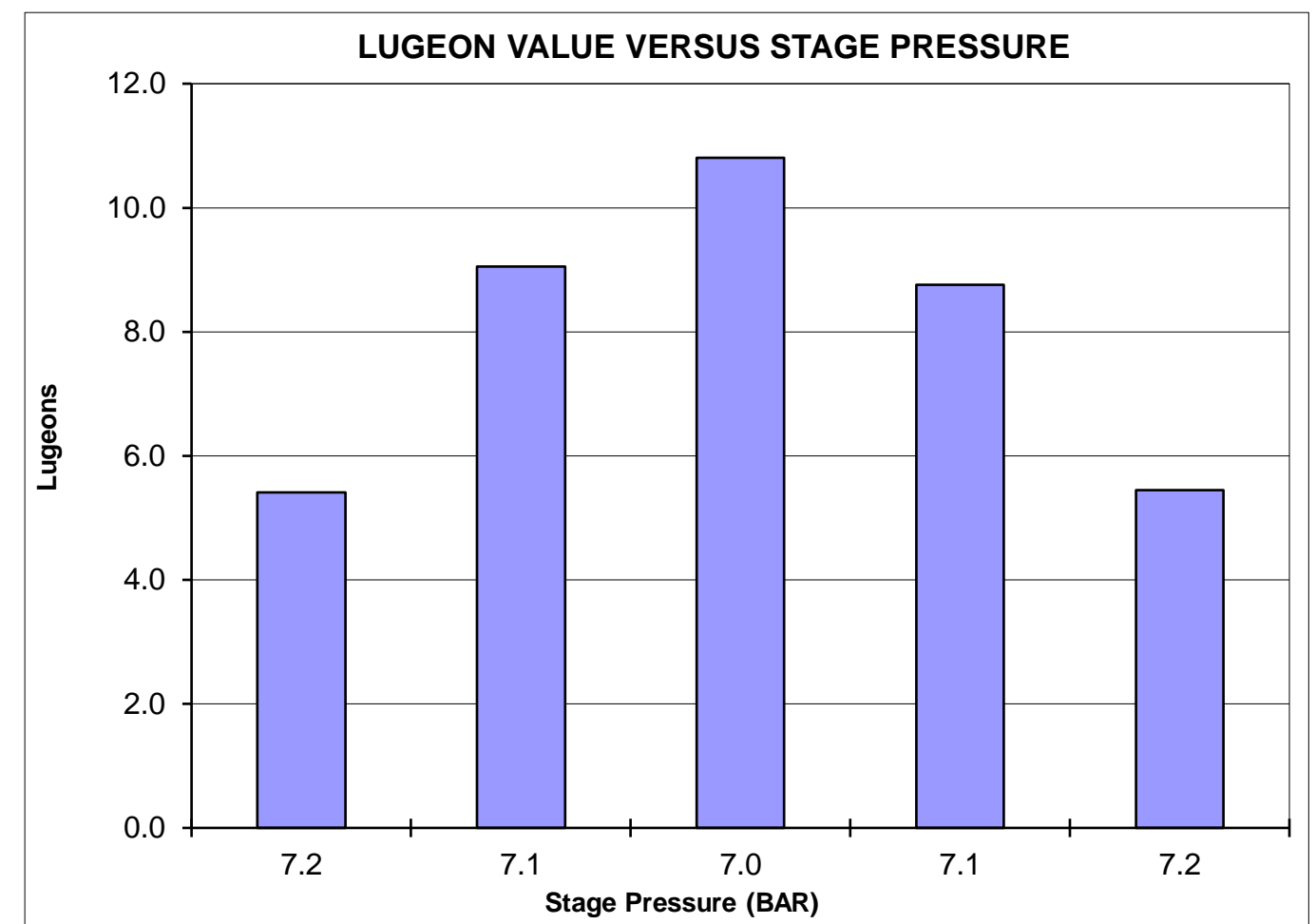
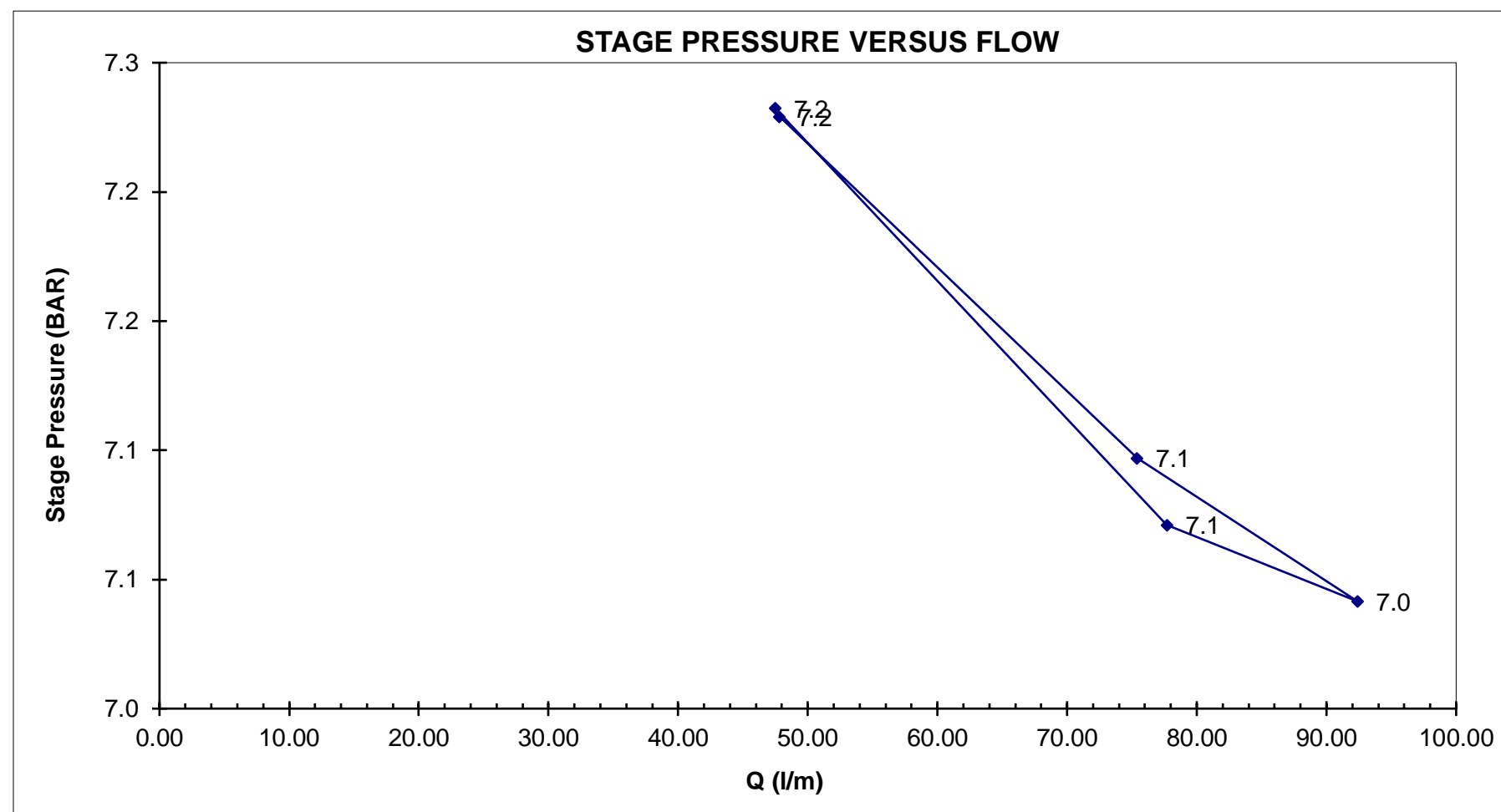
GAUGE HEIGHT ABOVE GROUND: 2.3 m

DATE: 11-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 365.81 111.50 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.17	0.50	7.23	Flowmeter m3	64.78	64.82	64.87	64.92	64.97	65.01				
			Take litres		47.00	48.00	47.00	48.00	47.50				
			Average Take l/m		47.00	48.00	47.00	48.00	47.50			47.5	5.4
0.34	0.83	7.07	Flowmeter m3	65.26	65.34	65.42	65.49	65.57	65.65				
			Take litres		77.50	78.00	77.50	78.00	77.50				
			Average Take l/m		77.50	78.00	77.50	78.00	77.50			77.7	9.1
0.48	1.00	7.04	Flowmeter m3	65.91	66.00	66.09	66.18	66.27	66.37				
			Take litres		92.50	92.50	92.00	92.00	93.00				
			Average Take l/m		92.50	92.50	92.00	92.00	93.00			92.4	10.8
0.34	0.80	7.10	Flowmeter m3	66.55	66.63	66.70	66.78	66.85	66.93				
			Take litres		76.00	76.00	74.50	76.00	74.50				
			Average Take l/m		76.00	76.00	74.50	76.00	74.50			75.4	8.8
0.17	0.50	7.23	Flowmeter m3	68.00	68.04	68.09	68.14	68.19	68.23				
			Take litres		48.00	48.00	47.50	47.50	48.00				
			Average Take l/m		48.00	48.00	47.50	47.50	48.00			47.8	5.4



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 7

K = 7.E-05 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 7.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:

- USED SURGE TANK
- NO LEAKS OBSERVED
- PUMP MAXED OUT, UNABLE TO REACH PSI GREATER THAN 14 PSI
- NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 97.65 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
- FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
- PRESSURE GAUGE NOISE: NEGLIGIBLE
- RAN OUT OF WATER DURING P2. RE-RAN TESTS P1 AND P2 THEN WAITED FOR WATER TANK TO RE-FILL BEFORE PROCEEDING WITH THE TEST.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 1 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 3.9 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 26.12 7.96 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

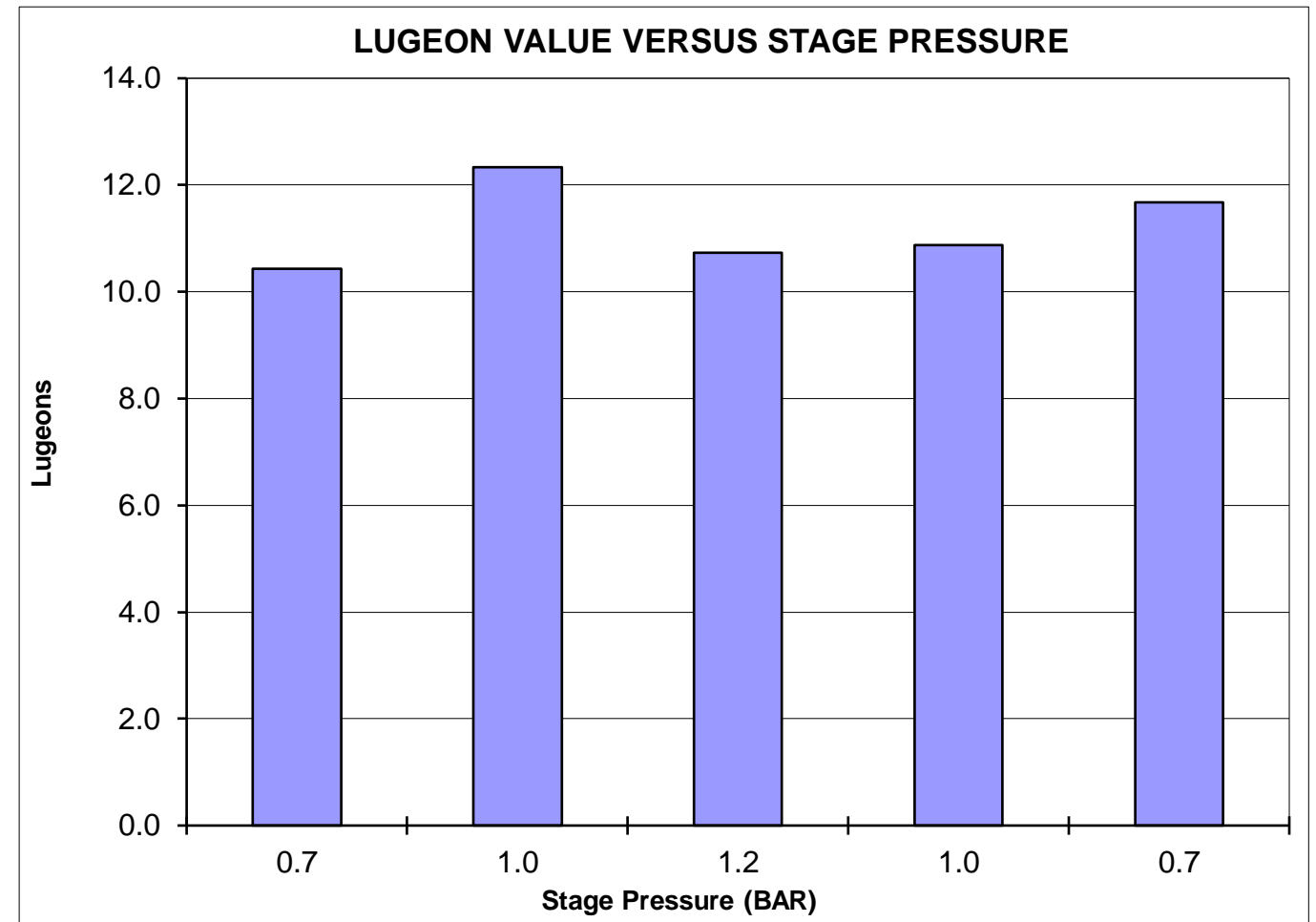
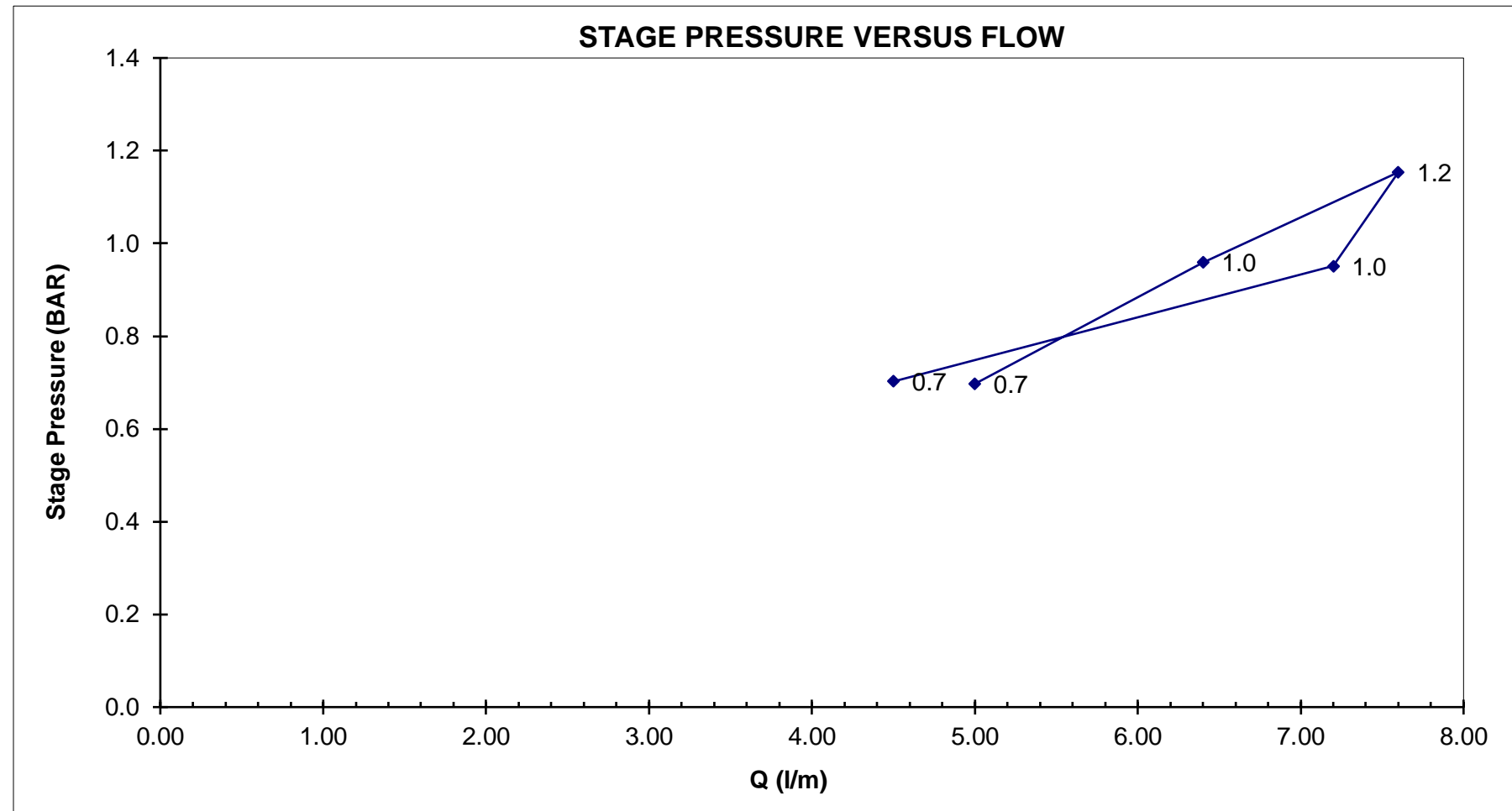
GAUGE HEIGHT ABOVE GROUND: 2.6 m

DATE: 16-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 46.26 14.10 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.05	0.70	Flowmeter m3	68.43	68.44	68.44	68.45	68.45	68.45				
			Take litres		4.50	4.50	4.50	4.50	4.50				
			Average Take l/m		4.50	4.50	4.50	4.50	4.50			4.5	10.4
0.48	0.07	0.95	Flowmeter m3	68.48	68.49	68.49	68.50	68.51	68.52				
			Take litres		7.00	7.00	7.50	7.00	7.50				
			Average Take l/m		7.00	7.00	7.50	7.00	7.50			7.2	12.3
0.69	0.08	1.15	Flowmeter m3	68.71	68.72	68.72	68.73	68.74	68.75				
			Take litres		8.00	7.00	8.00	7.50	7.50				
			Average Take l/m		8.00	7.00	8.00	7.50	7.50			7.6	10.7
0.48	0.06	0.96	Flowmeter m3	68.76	68.76	68.77	68.78	68.78	68.79				
			Take litres		6.50	6.50	6.50	6.50	6.00				
			Average Take l/m		6.50	6.50	6.50	6.50	6.00			6.4	10.9
0.21	0.05	0.70	Flowmeter m3	68.79	68.80	68.80	68.81	68.81	68.82				
			Take litres		5.00	5.00	5.50	4.50	5.00				
			Average Take l/m		5.00	5.00	5.50	4.50	5.00			5.0	11.7



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 11

K = 1.E-04 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 1.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED
 3. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-010 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREPD	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 16.4 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 41.01 12.50 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

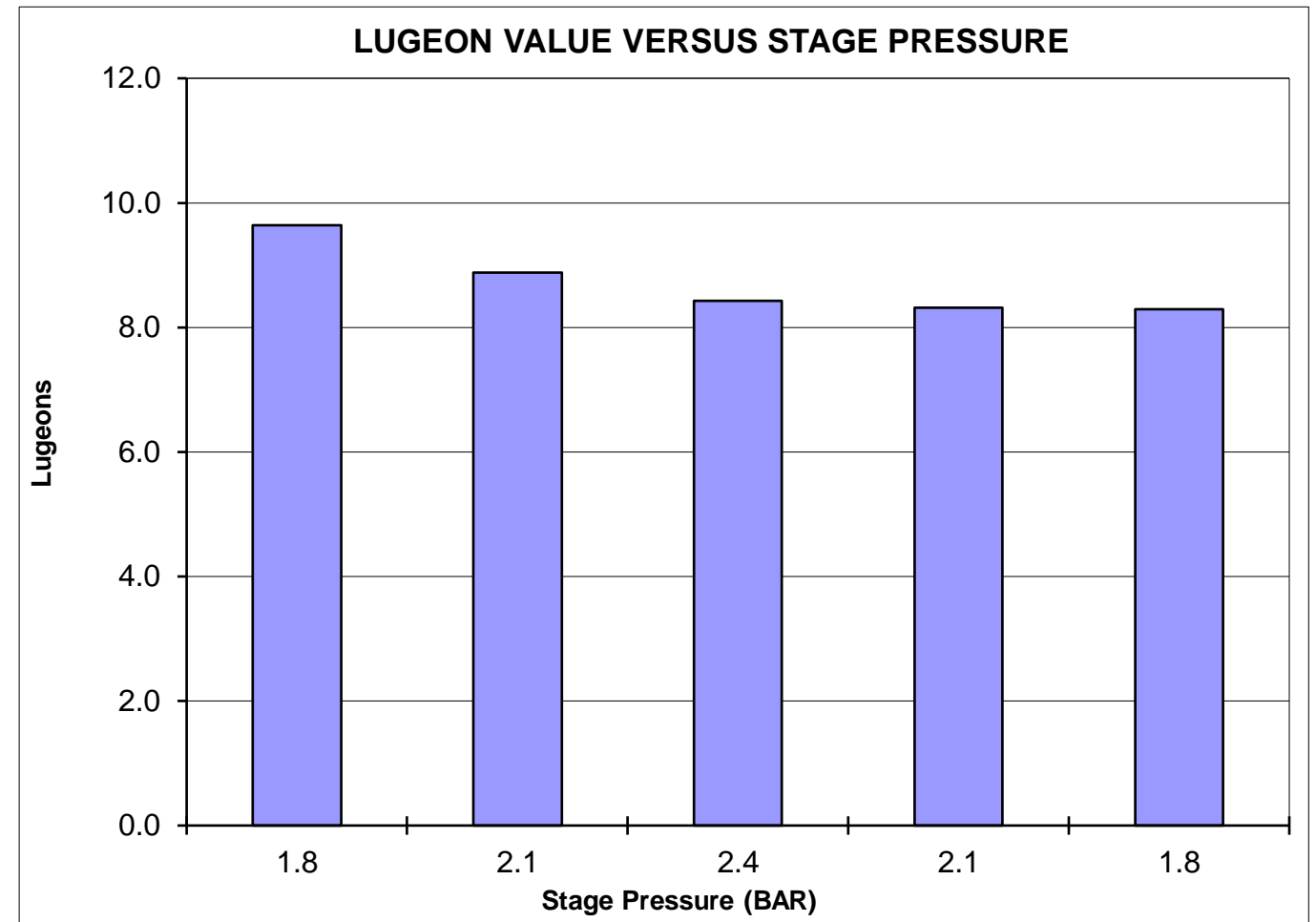
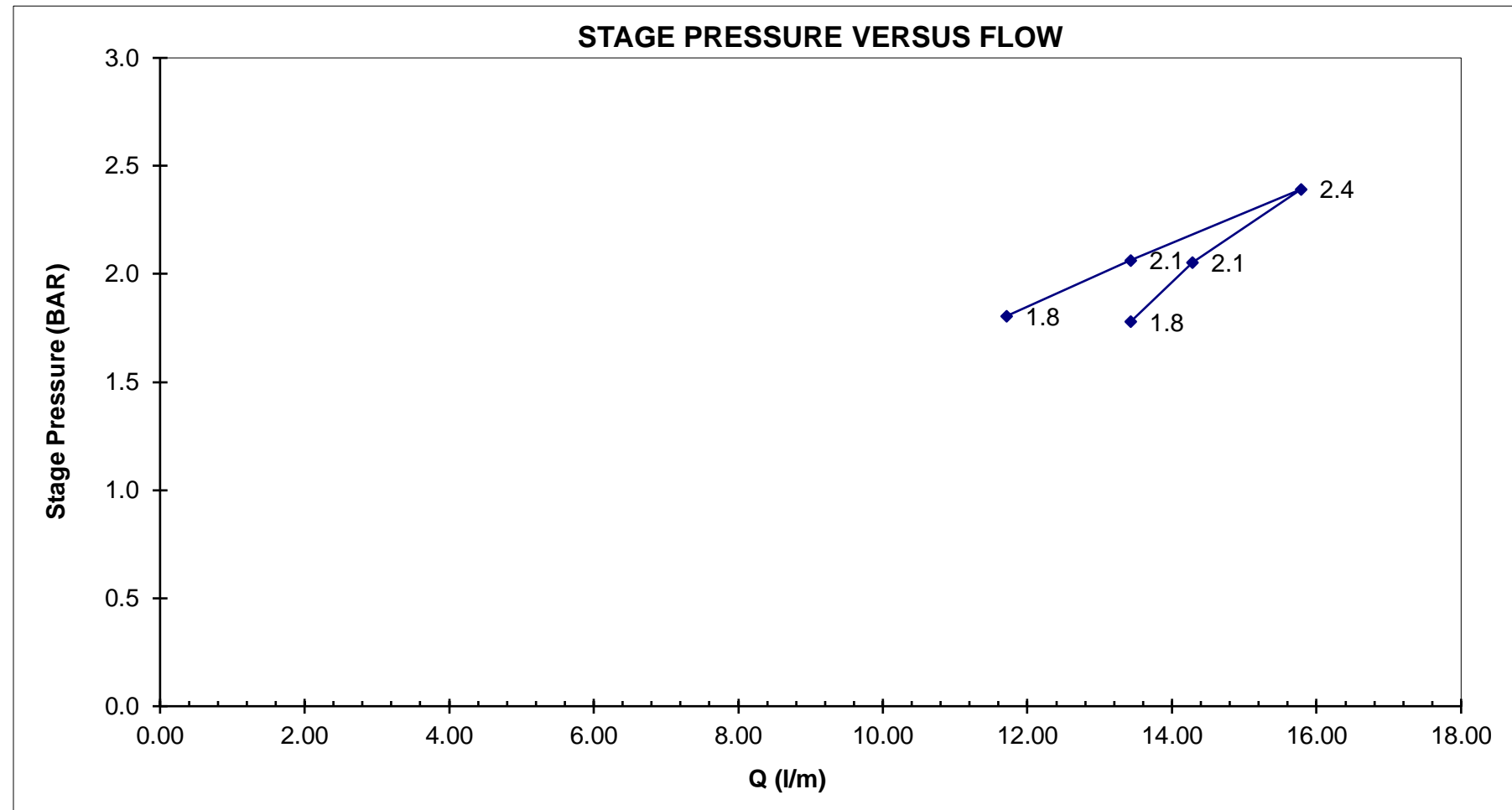
GAUGE HEIGHT ABOVE GROUND: 3.4 m

DATE: 16-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 66.70 20.33 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.34	0.14	1.78	Flowmeter m3	69.06	69.08	69.09	69.10	69.12	69.13	69.14	69.16		
			Take litres		13.00	14.00	13.00	14.00	13.00	13.50	13.50		
			Average Take l/m		13.00	14.00	13.00	14.00	13.00	13.50	13.50	13.4	9.6
0.63	0.15	2.05	Flowmeter m3	69.21	69.22	69.23	69.25	69.26	69.28	69.29	69.31		
			Take litres		15.00	14.50	14.50	14.50	13.50	14.00	14.00		
			Average Take l/m		15.00	14.50	14.50	14.50	13.50	14.00	14.00	14.3	8.9
0.98	0.16	2.39	Flowmeter m3	69.39	69.41	69.42	69.44	69.46	69.47	69.49	69.50		
			Take litres		16.00	16.50	16.50	16.00	15.00	15.00	15.50		
			Average Take l/m		16.00	16.50	16.50	16.00	15.00	15.00	15.50	15.8	8.4
0.63	0.14	2.06	Flowmeter m3	69.54	69.55	69.56	69.58	69.59	69.60	69.62	69.63		
			Take litres		14.00	13.00	13.00	13.00	13.50	13.50	14.00		
			Average Take l/m		14.00	13.00	13.00	13.00	13.50	13.50	14.00	13.4	8.3
0.35	0.12	1.80	Flowmeter m3	69.65	69.67	69.68	69.69	69.70	69.71	69.72	69.74		
			Take litres		12.00	11.00	11.00	11.50	12.50	12.00	12.00		
			Average Take l/m		12.00	11.00	11.00	11.50	12.50	12.00	12.00	11.7	8.3



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 8

K = 8.E-05 cm/s

INTERPRETATION TYPE OF FLOW: VOID FILLING

K = 8.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED
 3. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 6.95 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: P1: +/-0.25 PSI, P2: +/-0.125 PSI, P3: +/-0.25 PSI, P4: +/-0.125 PSI, P5: +/-0.125 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 6. INCREASED PRESSURE FROM 9.125 TO 9.25 PSI AT P2 DURING TEST.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

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0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	CHKD

SHEET 3 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 24.1 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 65.49 19.96 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

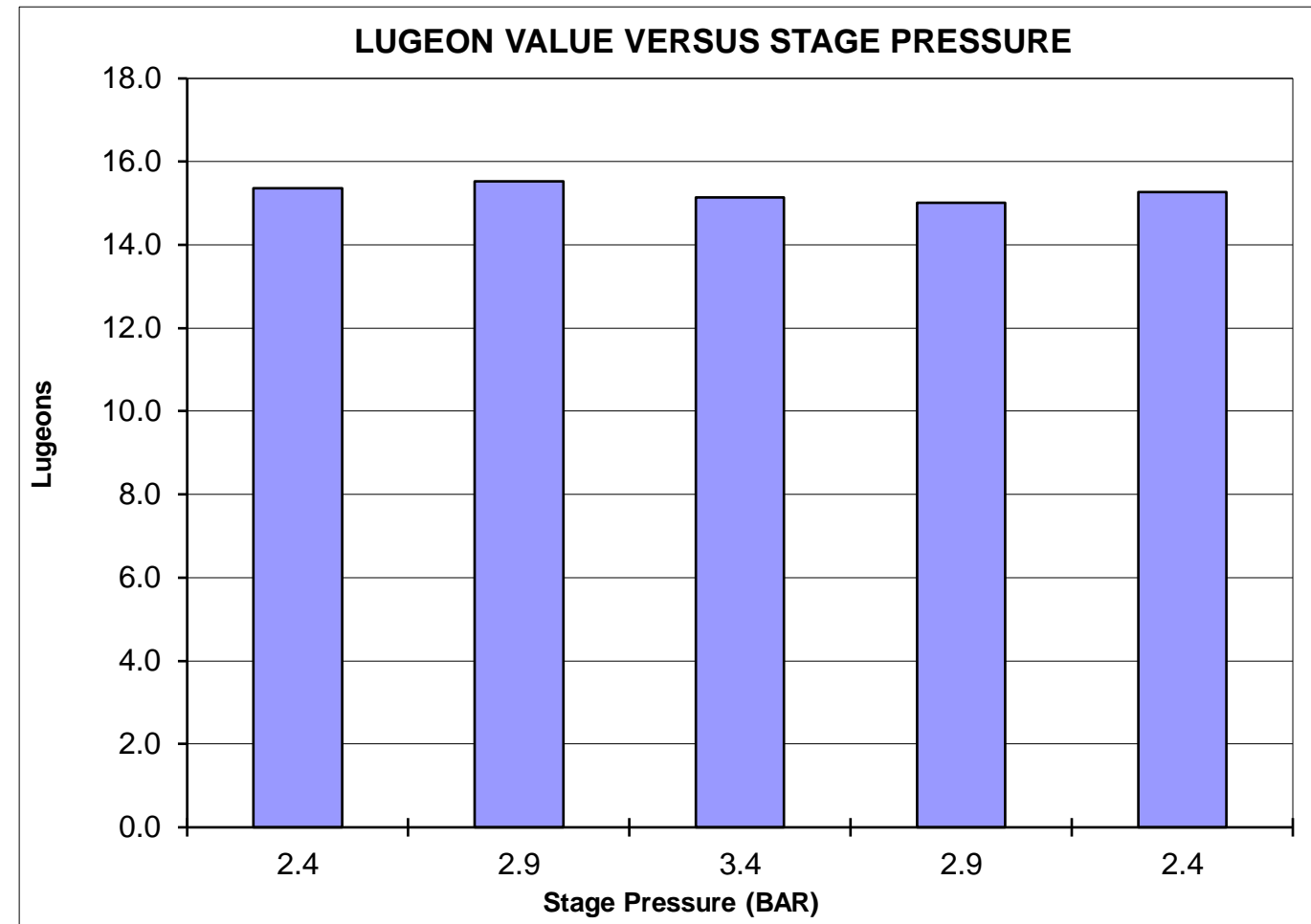
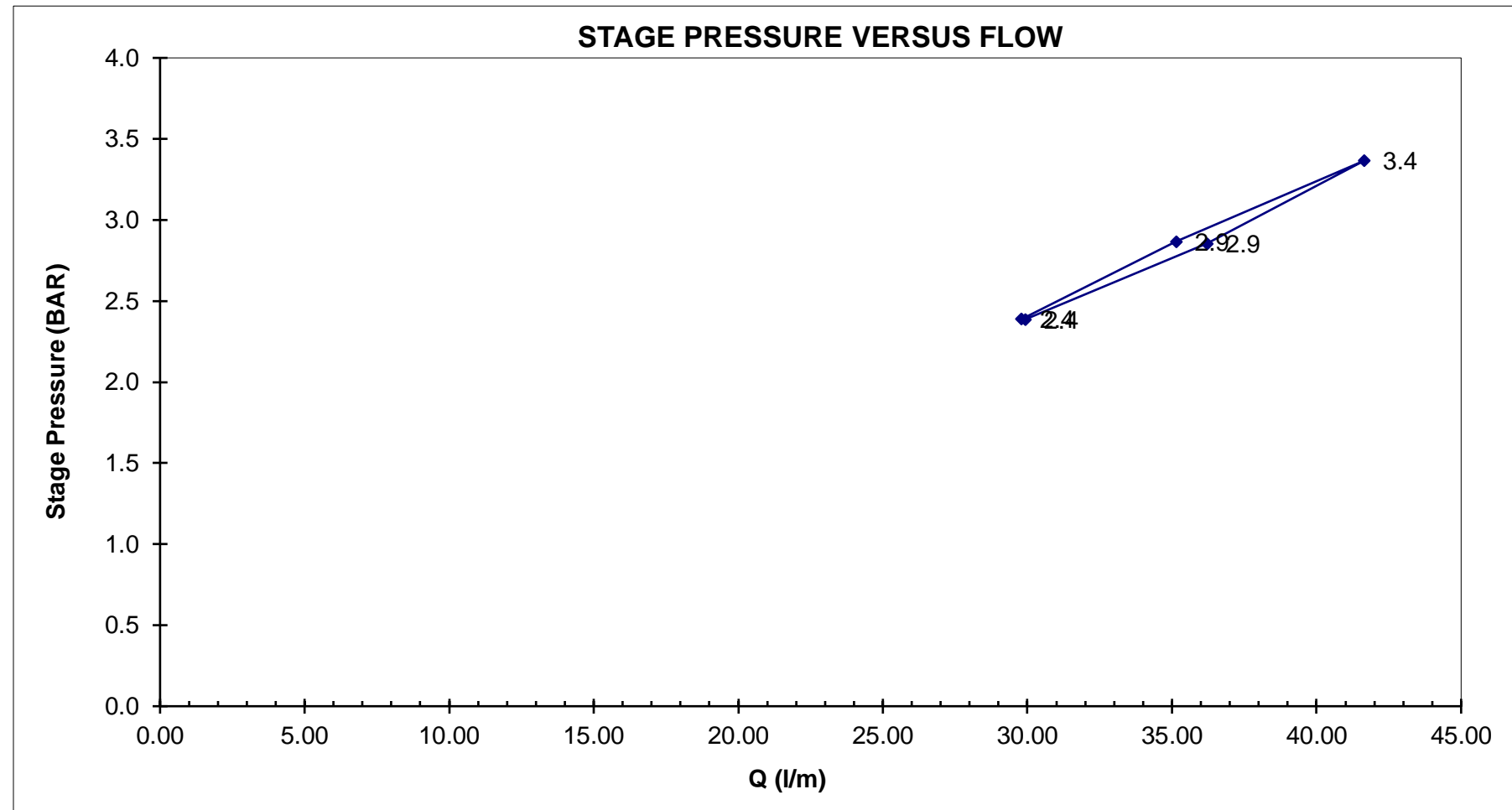
GAUGE HEIGHT ABOVE GROUND: 3.4 m

DATE: 16-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 92.29 28.13 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.55	0.31	2.39	Flowmeter m3	70.52	70.55	70.58	70.61	70.64	70.67	70.70	70.73		
			Take litres		31.50	29.50	29.50	31.00	29.50	29.00	29.50		
			Average Take l/m		31.50	29.50	29.50	31.00	29.50	29.00	29.50	29.9	15.4
1.09	0.38	2.85	Flowmeter m3	70.85	70.88	70.92	70.96	70.99	71.03	71.07	71.10		
			Take litres		36.50	36.50	37.00	35.50	37.00	36.00	35.00		
			Average Take l/m		36.50	36.50	37.00	35.50	37.00	36.00	35.00	36.2	15.5
1.66	0.43	3.37	Flowmeter m3	71.42	71.46	71.50	71.55	71.59	71.63	71.67	71.71		
			Take litres		42.50	41.00	43.00	40.50	42.00	41.50	41.00		
			Average Take l/m		42.50	41.00	43.00	40.50	42.00	41.50	41.00	41.6	15.1
1.09	0.36	2.87	Flowmeter m3	71.82	71.86	71.89	71.93	71.96	71.99	72.03	72.07		
			Take litres		36.00	34.00	35.00	35.50	34.00	35.50	36.00		
			Average Take l/m		36.00	34.00	35.00	35.50	34.00	35.50	36.00	35.1	15.0
0.55	0.31	2.39	Flowmeter m3	72.12	72.15	72.18	72.21	72.24	72.26	72.30	72.33		
			Take litres		30.50	29.00	28.50	31.50	24.50	34.00	30.50		
			Average Take l/m		30.50	29.00	28.50	31.50	24.50	34.00	30.50	29.8	15.3



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 15

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. MINOR LEAKS OBSERVED FROM THE STUFFING BOX
 3. NO WATER ABOVE THE THE PACKER BLADDER AFTER INFLATION. WATER LEVEL PRIOR TO LOWERING BLADDER DOWNHOLE WAS 18.1 m DOWNHOLE. MIDDLE OF TEST INTERVAL USED FOR ANALYSIS.
 4. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 5. PRESSURE GAUGE NOISE: P1: +/-0.25 PSI, P2: +/-0.25 PSI, P3: +/-0.25 PSI, P4: +/-0.25 PSI, P5: +/-0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 6. INCREASED PRESSURE FROM 15.5 TO 16 PSI AT P2 AND FROM 24 TO 24.5 PSI AT P3 DURING TEST.

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-010 - Lugeon Spreadsheet_r0.xlsx\TEST 3

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	CHKD

SHEET 4 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 16.9 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 90.09 27.46 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

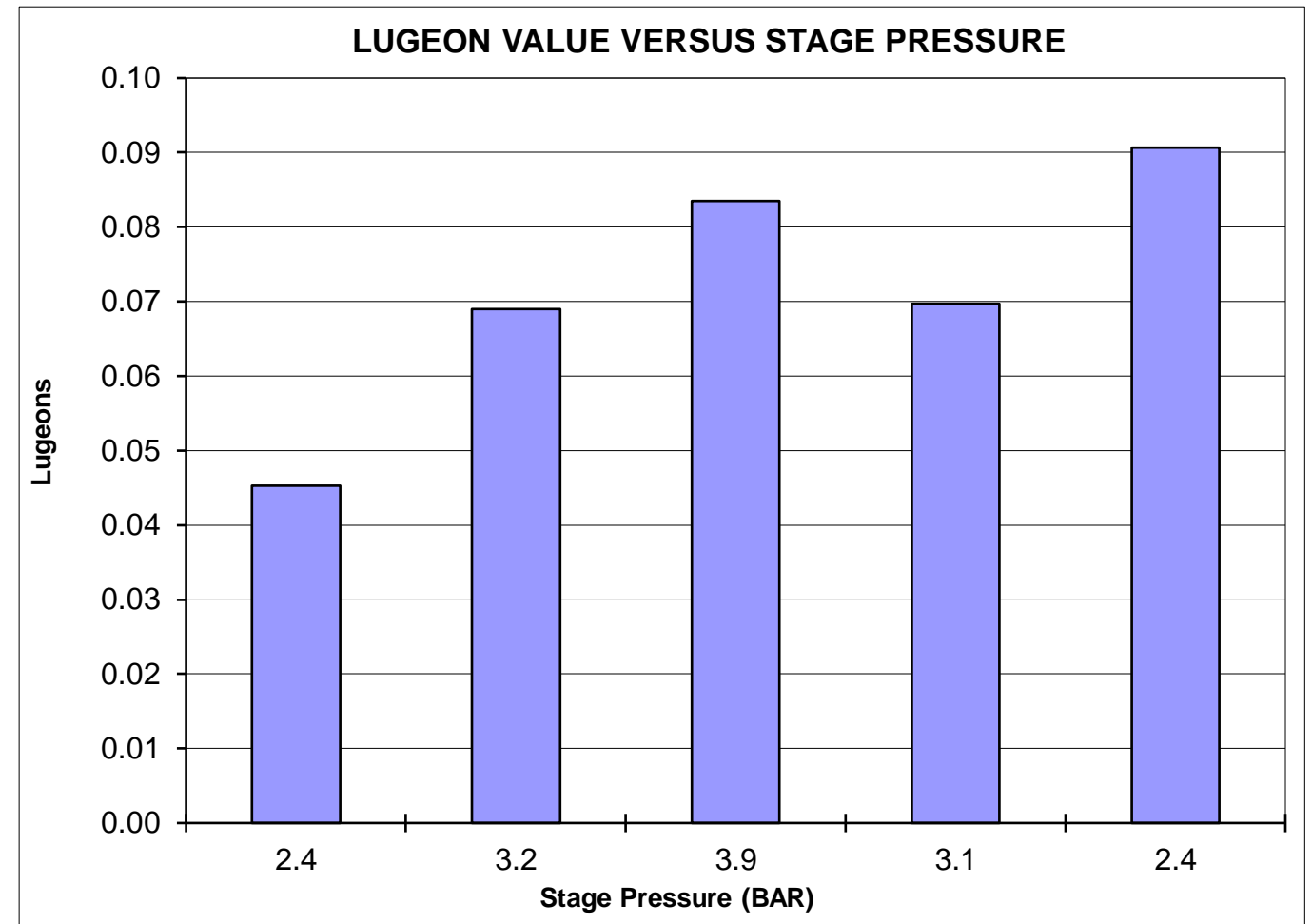
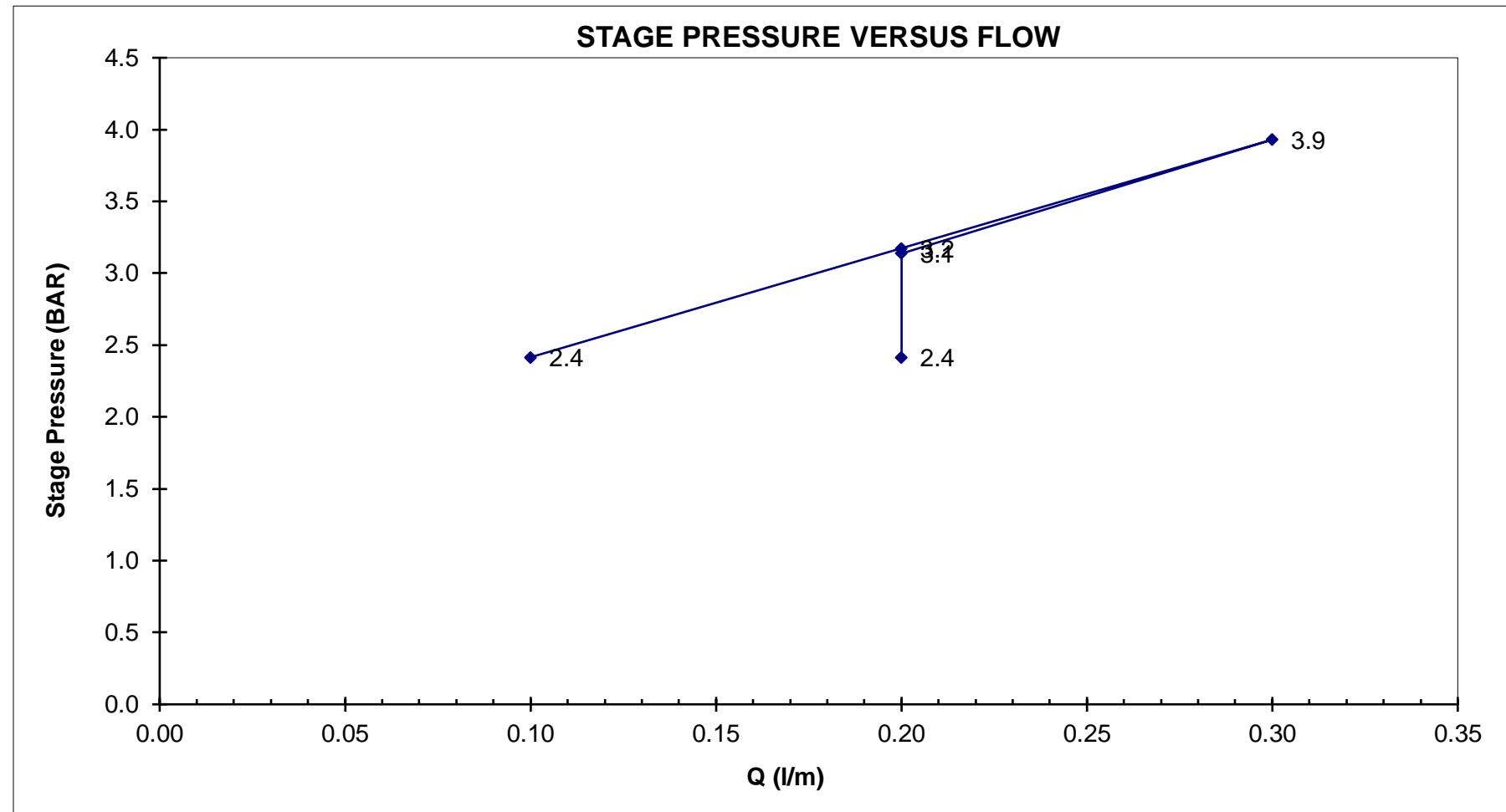
GAUGE HEIGHT ABOVE GROUND: 3.3 m

DATE: 16-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 120.08 36.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.00	2.41	Flowmeter m3	72.52	72.52	72.52	72.52	72.52	72.52				
			Take litres		0.00	0.00	0.00	0.50	0.00			0.1	0.0
			Average Take l/m			0.00	0.00	0.50	0.00				
1.59	0.00	3.17	Flowmeter m3	72.52	72.52	72.52	72.52	72.52	72.52				
			Take litres		0.50	0.00	0.00	0.50	0.00			0.2	0.1
			Average Take l/m			0.50	0.00	0.50	0.00				
2.34	0.00	3.93	Flowmeter m3	72.52	72.52	72.52	72.52	72.52	72.52				
			Take litres		0.50	0.50	0.00	0.00	0.50			0.3	0.1
			Average Take l/m			0.50	0.50	0.00	0.50				
1.55	0.00	3.14	Flowmeter m3	72.52	72.52	72.52	72.52	72.52	72.52				
			Take litres		0.00	0.50	0.00	0.50	0.00			0.2	0.1
			Average Take l/m			0.00	0.50	0.50	0.00				
0.83	0.00	2.41	Flowmeter m3	72.53	72.53	72.53	72.53	72.53	72.53				
			Take litres		0.50	0.00	0.00	0.50	0.00			0.2	0.1
			Average Take l/m			0.50	0.00	0.50	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.09

K = 9.E-07 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 9.E-09 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED
 3. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE
 5. DRILL ENGINE REVVED HIGH AND CAUSED THE PRESSURE GAUGE TO INSTANTLY SPIKED TO APPROXIMATELY 43 PSI DURING THE 4 MINUTE OF P3

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREPD	CHKD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 15.5 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 119.62 36.46 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

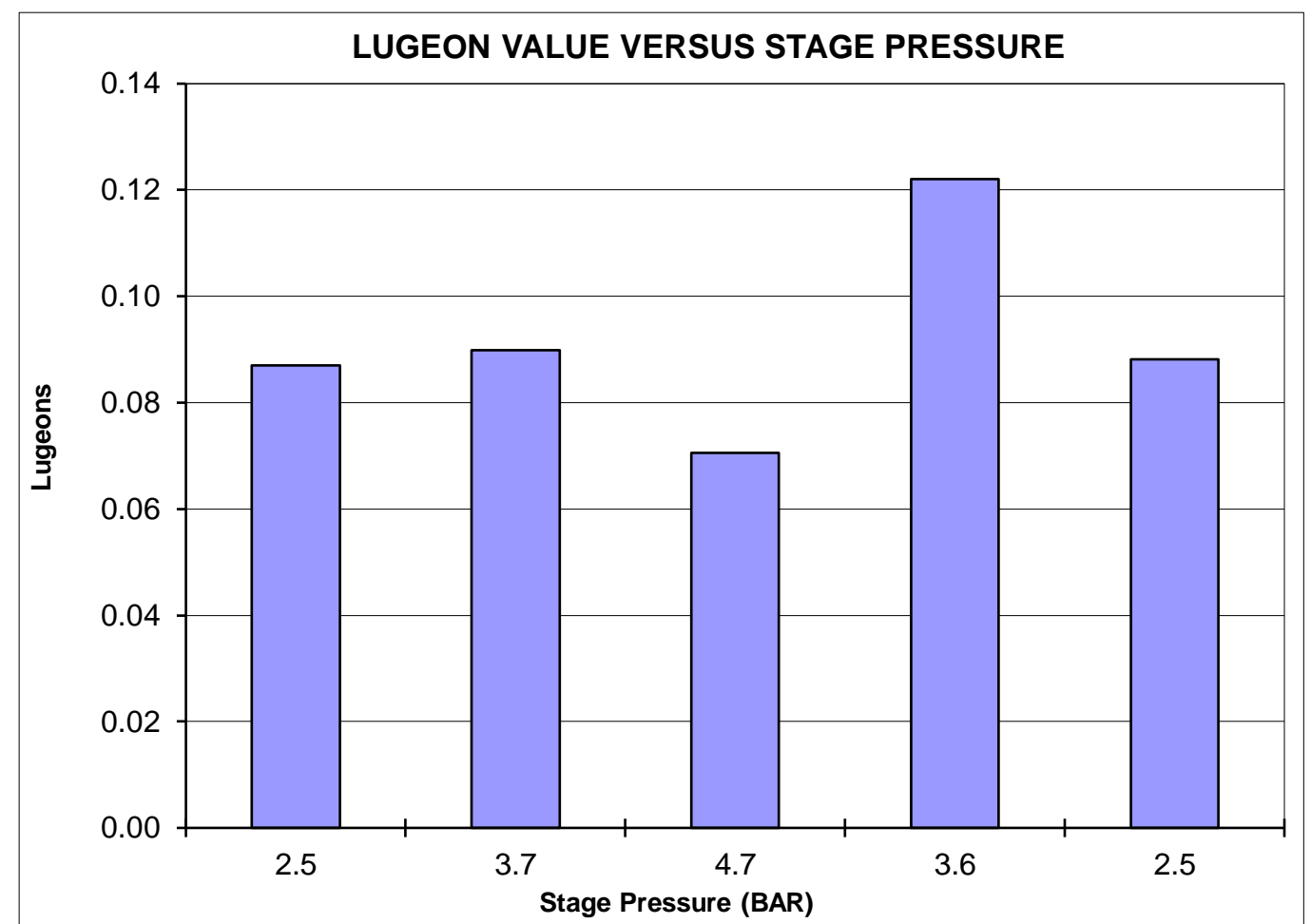
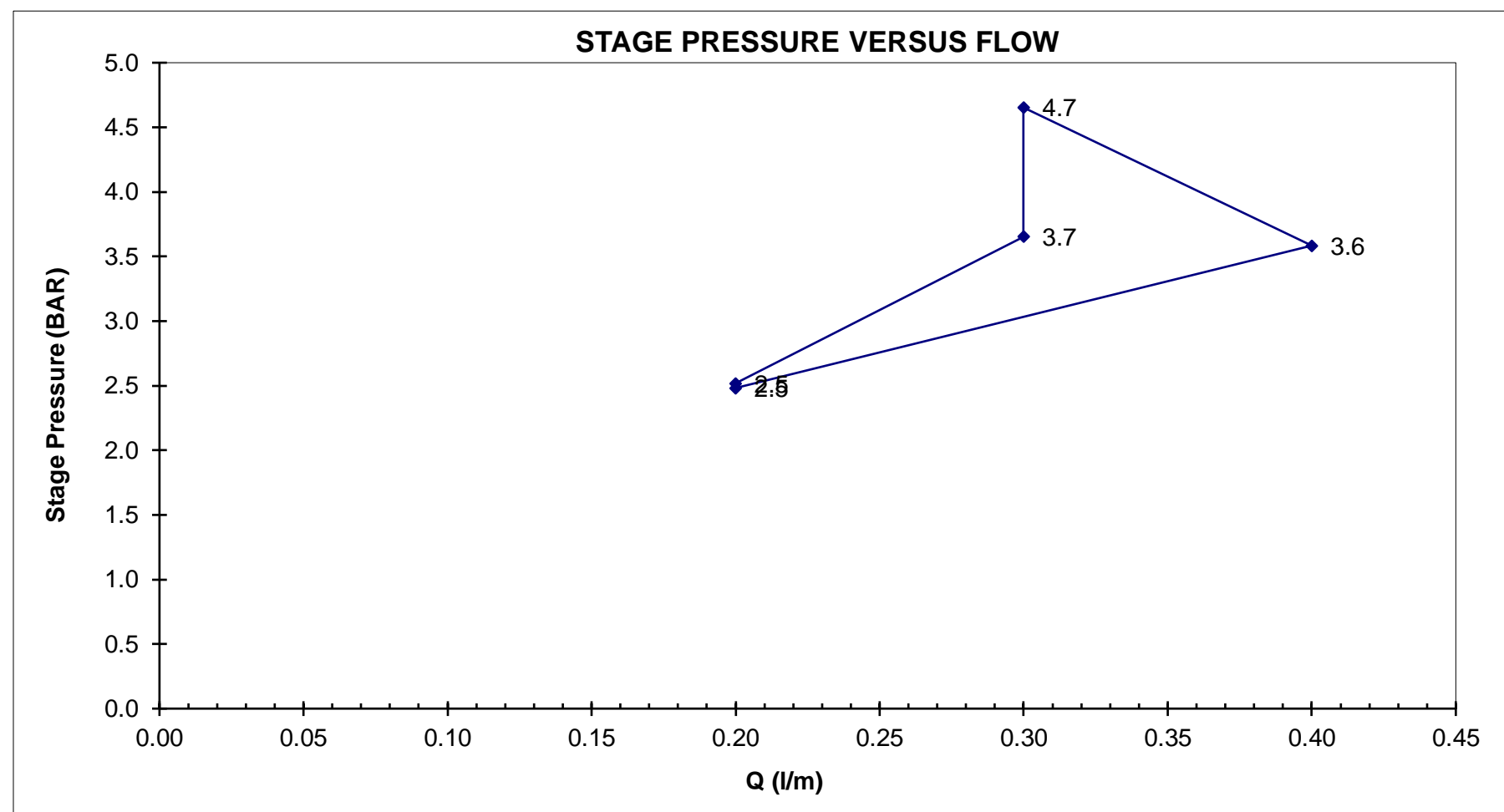
GAUGE HEIGHT ABOVE GROUND: 3.3 m

DATE: 16-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 149.61 45.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Flowmeter m3	Take litres	Average Take l/m	Time							FLOW litres/min	LUGEON	
							0	1	2	3	4	5	6			7
1.03	0.00	2.52	0	72.65	0.00		0	1	2	3	4	5	6	7	0.2	0.1
2.17	0.00	3.65	0	72.66	0.00		0	1	2	3	4	5	6	7	0.3	0.1
3.17	0.00	4.65	0	72.66	0.00		0	1	2	3	4	5	6	7	0.3	0.1
2.10	0.00	3.58	0	72.66	0.50		0	1	2	3	4	5	6	7	0.4	0.1
1.00	0.00	2.48	0	72.66	0.00		0	1	2	3	4	5	6	7	0.2	0.1



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.09

K = 9.E-07 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 9.E-09 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED
 3. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	ME/CAG	CHS
			PREPD	CHK'D

SHEET 6 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 6

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 15.5 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 149.12 45.45 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

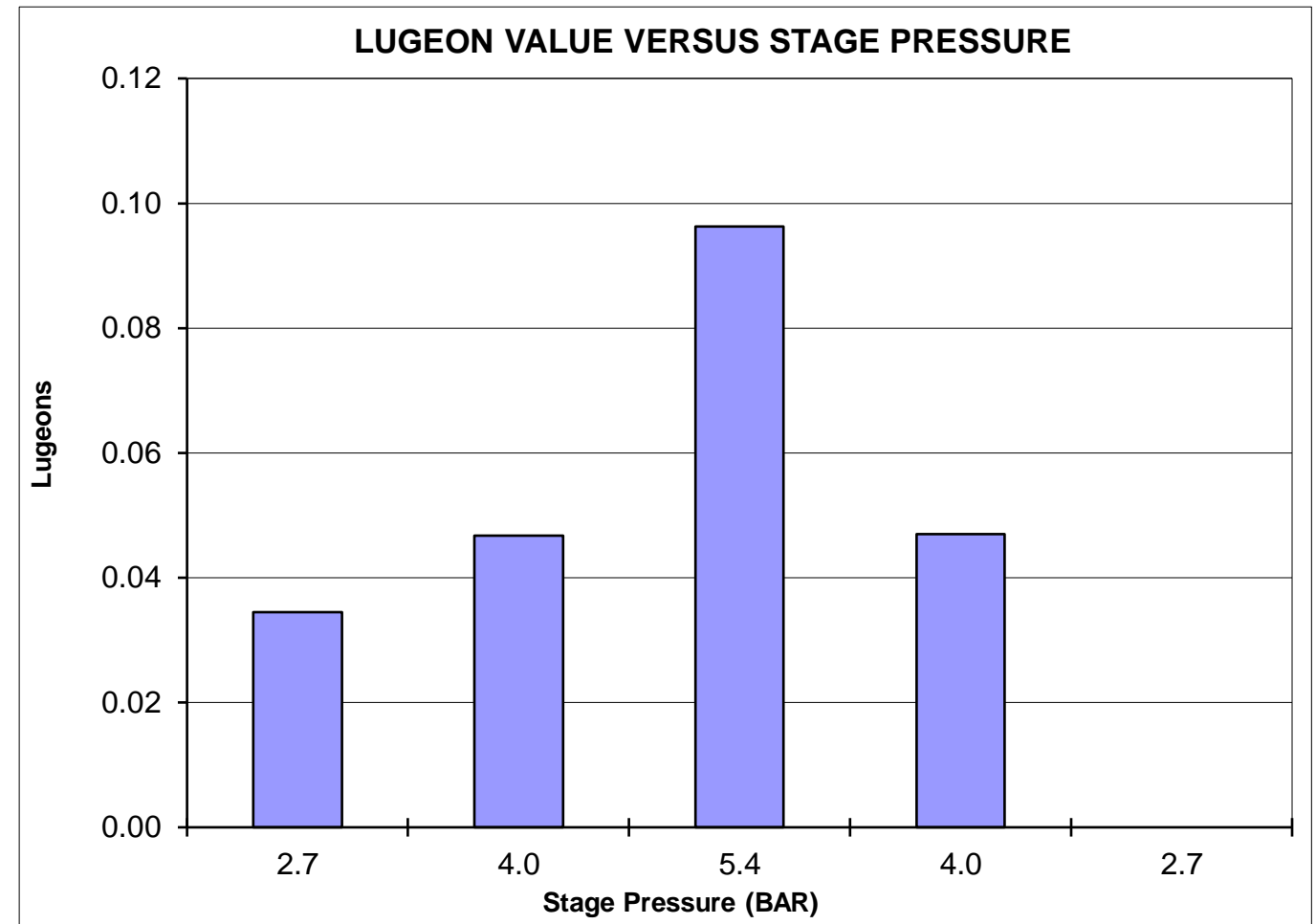
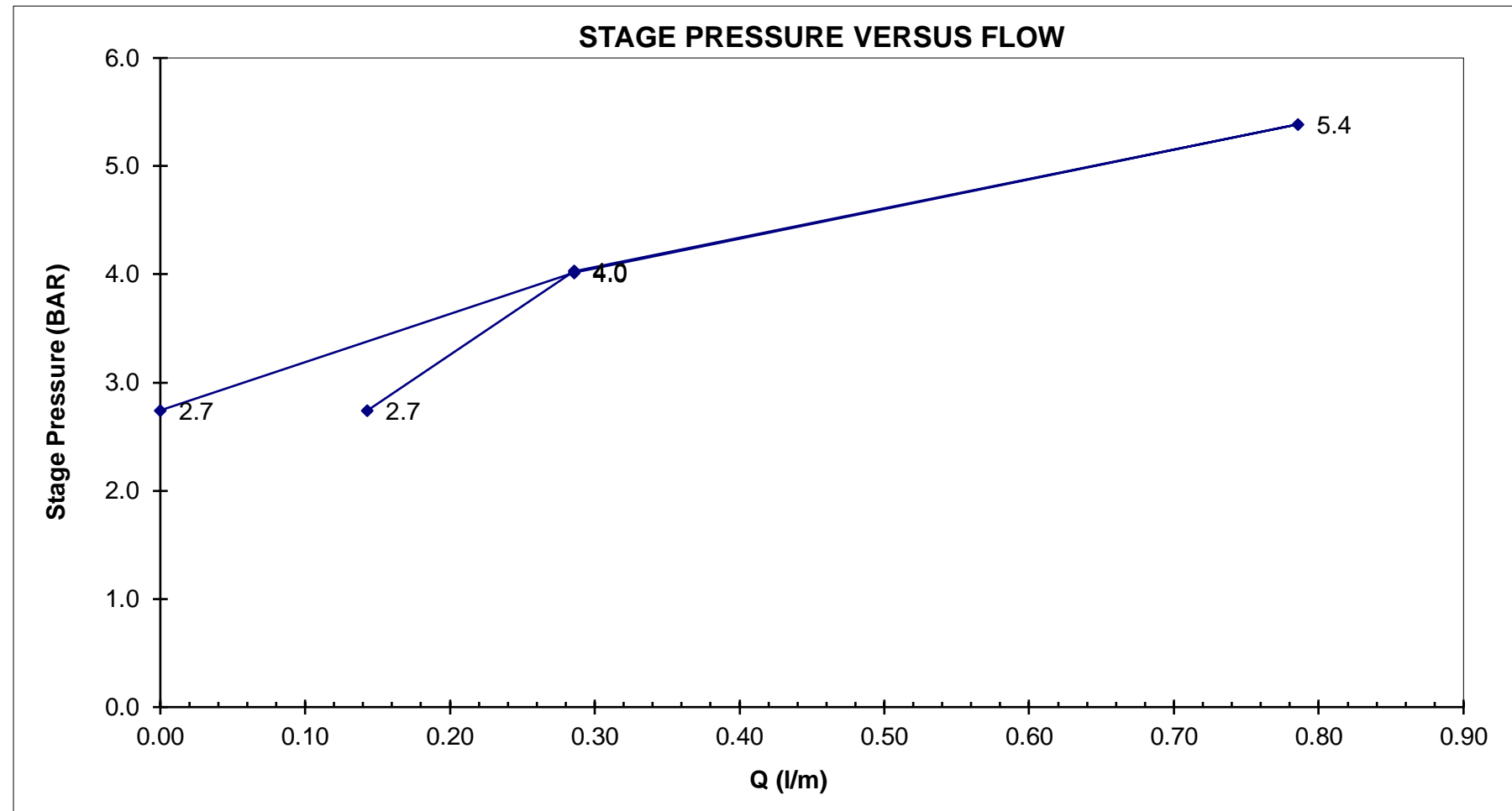
GAUGE HEIGHT ABOVE GROUND: 3.4 m

DATE: 17-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 198.83 60.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.24	0.00	2.74	Flowmeter m3	72.73	72.73	72.73	72.73	72.73	72.73	72.73	72.73	0.1	0.0
			Take litres		0.00	0.00	0.00	0.00	0.50	0.50	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.50	0.50	0.00		
2.53	0.00	4.03	Flowmeter m3	72.74	72.74	72.74	72.74	72.74	72.74	72.74	72.74	0.3	0.0
			Take litres		0.00	0.00	0.50	0.50	0.00	0.50	0.50		
			Average Take l/m		0.00	0.00	0.50	0.50	0.00	0.50	0.50		
3.90	0.01	5.39	Flowmeter m3	72.75	72.75	72.75	72.75	72.75	72.75	72.75	72.75	0.8	0.1
			Take litres		1.00	0.50	0.50	1.00	1.00	1.00	0.50		
			Average Take l/m		1.00	0.50	0.50	1.00	1.00	1.00	0.50		
2.52	0.00	4.01	Flowmeter m3	72.76	72.76	72.76	72.76	72.76	72.76	72.76	72.76	0.3	0.0
			Take litres		1.00	1.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		1.00	1.00	0.00	0.00	0.00	0.00	0.00		
1.24	0.00	2.74	Flowmeter m3	72.76	72.76	72.76	72.76	72.76	72.76	72.76	72.76	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.03

K = 3.E-07 cm/s

INTERPRETATION TYPE OF FLOW: DILATION

K = 3.E-09 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:

- SURGE TANK USED
- NO LEAKS OBSERVED
- DECREASED PRESSURE FROM 18 TO 16.75 PSI AT P1, FROM 36.75 TO 35.75 PSI AT P2, AND FROM 56.5 TO 52.5 AT P3 DURING TEST, INCREASED PRESSURE FROM 36.5 TO 37.5 PSI AT P4 DURING TEST.
- FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
- PRESSURE GAUGE NOISE: P1:±0.25 PSI, P2:±0.25 PSI, P3:±0.5 PSI, P4:±0.5 PSI, P5:±0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-010 - Lugeon Spreadsheet_r0.xlsx\TEST 6

REV	DATE	DESCRIPTION	ME/CAG	CHS
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	PREPD	CHK'D

SHEET 7 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 7

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 17.1 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 198.34 60.45 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

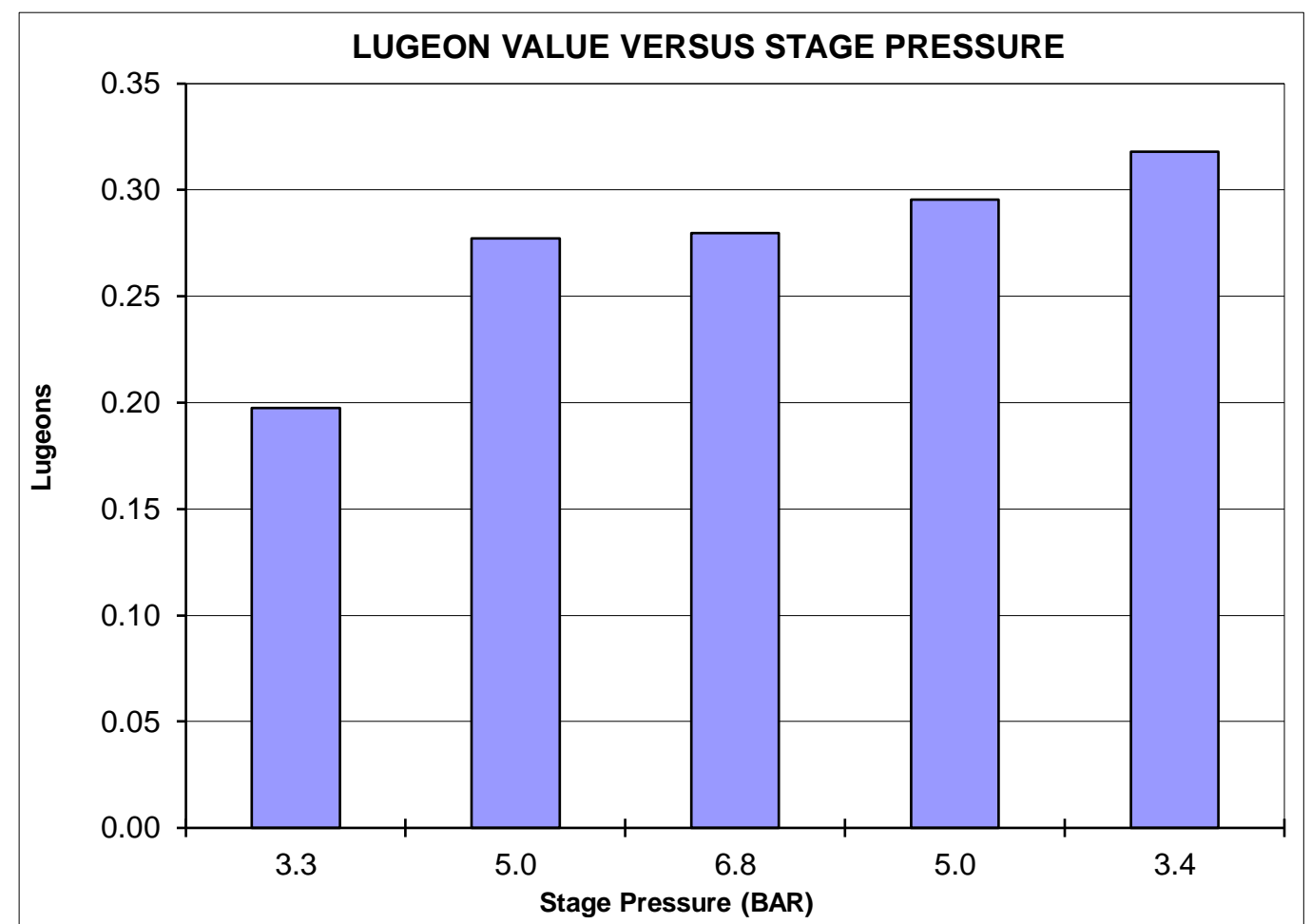
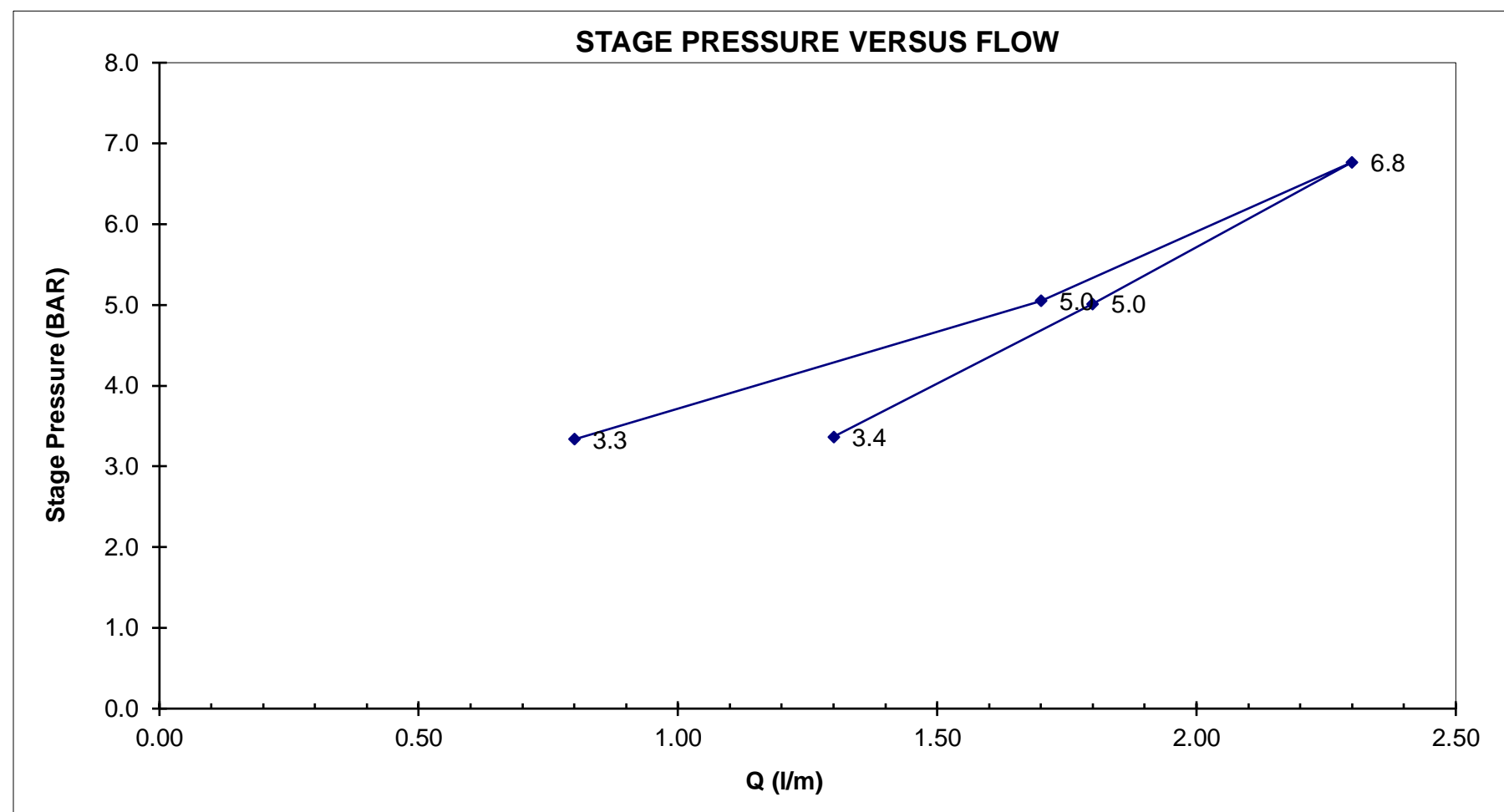
GAUGE HEIGHT ABOVE GROUND: 3.4 m

DATE: 17-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 238.20 72.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.72	0.01	3.33	Flowmeter m3	72.89	72.90	72.90	72.90	72.90	72.90				
			Take litres		1.00	1.00	0.50	0.50	1.00			0.8	0.2
			Average Take l/m		1.00	1.00	0.50	0.50	1.00				
3.45	0.02	5.05	Flowmeter m3	72.91	72.91	72.91	72.91	72.91	72.91				
			Take litres		2.00	1.50	1.50	2.00	1.50			1.7	0.3
			Average Take l/m		2.00	1.50	1.50	2.00	1.50				
5.17	0.02	6.77	Flowmeter m3	72.92	72.93	72.93	72.93	72.93	72.93				
			Take litres		2.50	2.00	2.00	2.50	2.50			2.3	0.3
			Average Take l/m		2.50	2.00	2.00	2.50	2.50				
3.41	0.02	5.01	Flowmeter m3	72.94	72.94	72.95	72.95	72.95	72.95				
			Take litres		2.00	1.50	1.50	2.00	2.00			1.8	0.3
			Average Take l/m		2.00	1.50	1.50	2.00	2.00				
1.76	0.01	3.36	Flowmeter m3	72.96	72.96	72.96	72.96	72.96	72.96				
			Take litres		1.50	1.50	1.00	1.50	1.00			1.3	0.3
			Average Take l/m		1.50	1.50	1.00	1.50	1.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.3

K = 3.E-06 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 3.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. STUFFING BOX LEAK AT P3 WITH FLOW RATE ~50mL/min
 3. PRESSURE GAUGE NOISE: P1: +/-0 PSI, P2: +/-0.5 PSI, P3: +/-0 PSI, P4: +/-0 PSI, P5: +/-0 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 4. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 8 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 8

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 14.2 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 237.73 72.46 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

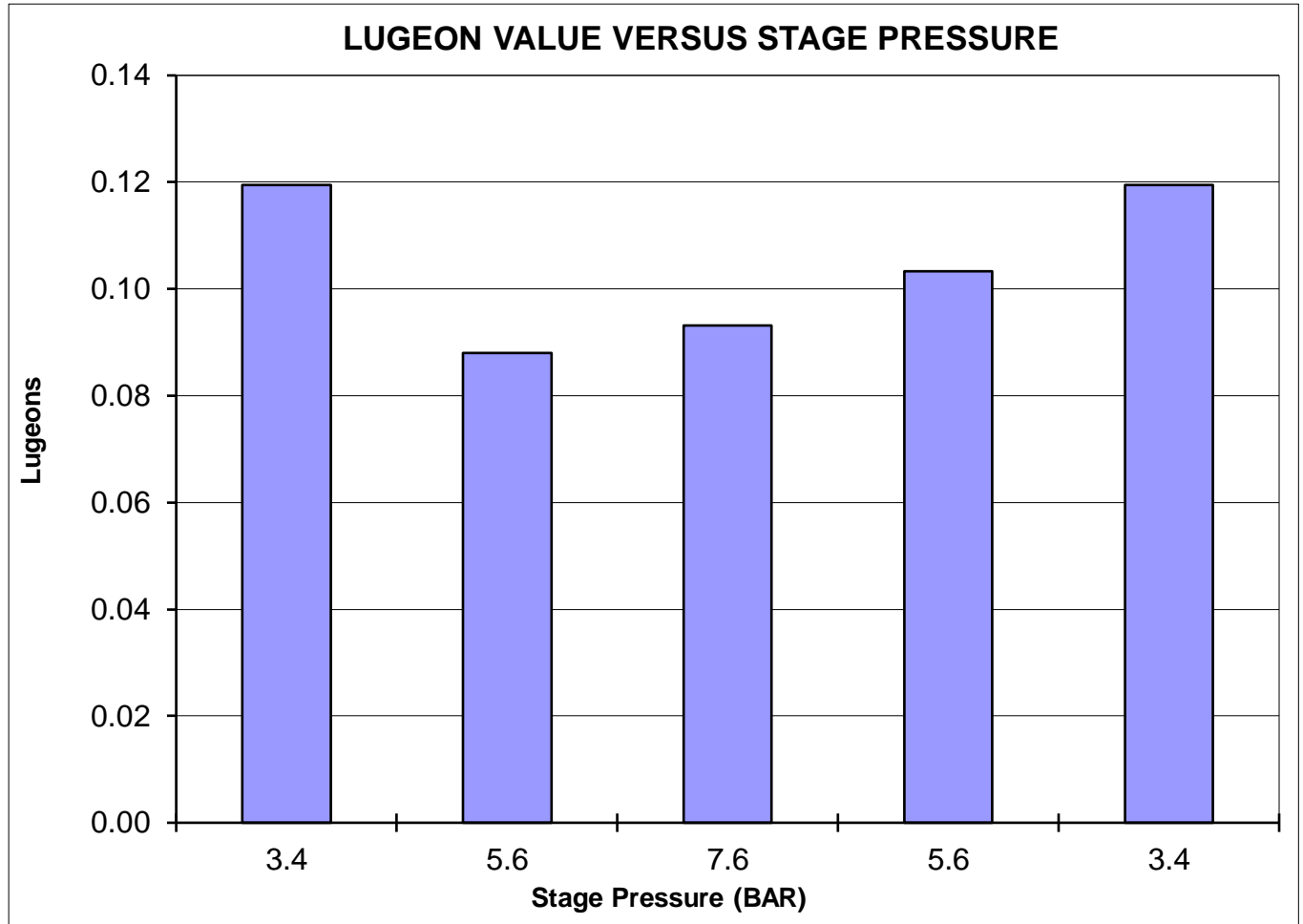
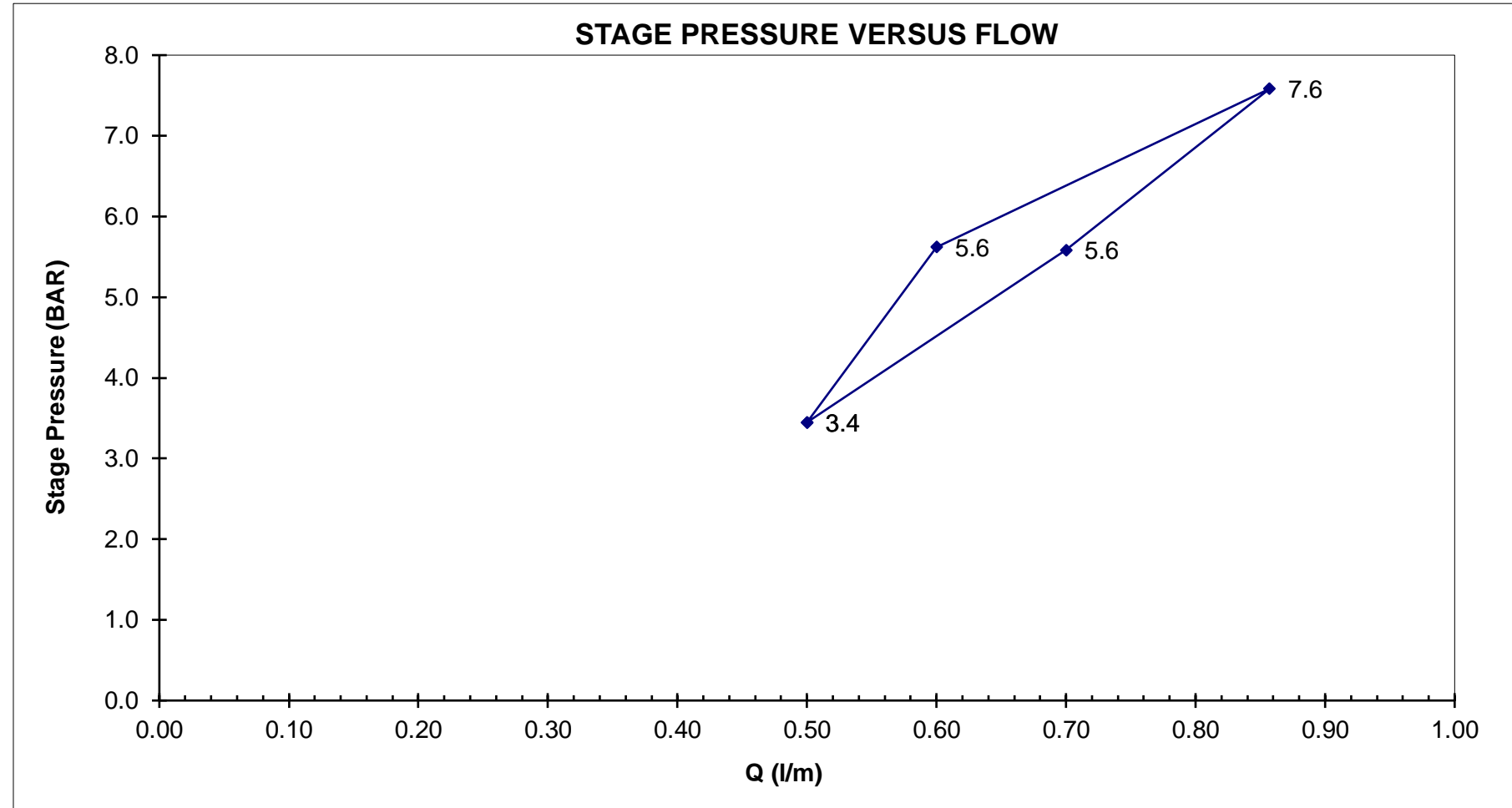
GAUGE HEIGHT ABOVE GROUND: 3.3 m

DATE: 18-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 277.56 84.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
2.07	0.01	3.45	Flowmeter m3	73.12	73.12	73.12	73.12	73.12	73.12	73.12		
			Take litres		0.50	0.50	0.50	0.50	0.50			
			Average Take l/m		0.50	0.50	0.50	0.50	0.50			
										0.5	0.1	
4.24	0.01	5.62	Flowmeter m3	73.12	73.12	73.12	73.12	73.12	73.12			
			Take litres		1.00	0.50	1.00	0.50	0.00			
			Average Take l/m		1.00	0.50	1.00	0.50	0.00			
										0.6	0.1	
6.21	0.01	7.58	Flowmeter m3	73.13	73.13	73.13	73.13	73.13	73.13	73.13		
			Take litres		1.00	1.50	1.00	0.50	0.50	1.00	0.50	
			Average Take l/m		1.00	1.50	1.00	0.50	0.50	1	0.5	
										0.9	0.1	
4.21	0.01	5.58	Flowmeter m3	73.14	73.14	73.14	73.14	73.14	73.14			
			Take litres		0.50	0.50	1.00	1.00	0.50			
			Average Take l/m		0.50	0.50	1.00	1.00	0.50			
										0.7	0.1	
2.07	0.01	3.45	Flowmeter m3	73.14	73.14	73.14	73.14	73.14	73.14			
			Take litres		1.00	1.00	0.50	0.00	0.00			
			Average Take l/m		1.00	1.00	0.50	0.00	0.00			
										0.5	0.1	



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.1

K = 1.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 1.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. MEASURED STUFFING BOX LEAKS: P3 ~50mL/min, P4 ~20mL/min
 3. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: NEGLIGIBLE
 5. DRILL ENGINE SPONTANEOUSLY REVVED AND CAUSED THE PRESSURE GAUGE TO INSTANTLY SPIKED TO APPROXIMATELY 84 PSI FOR APPROXIMATELY 5 SECONDS AFTER THE 5 MINUTE OF P4

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	CHK'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 9 OF 9

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: BH16-010

AREA: Bromley Humps TMF South Embankment

TEST NO: 9

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 16.9 m

DIP: 50 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 277.10 84.46 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

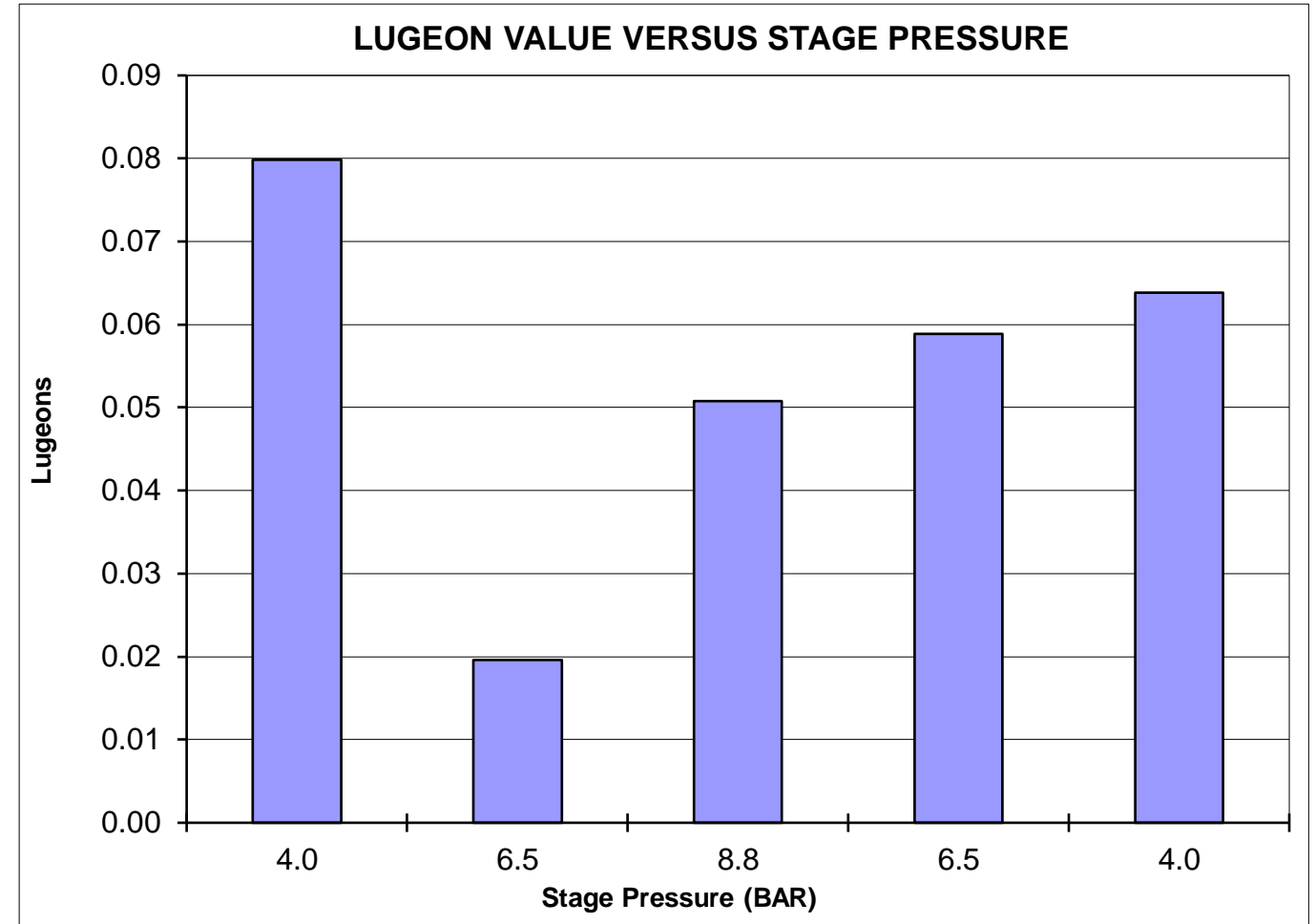
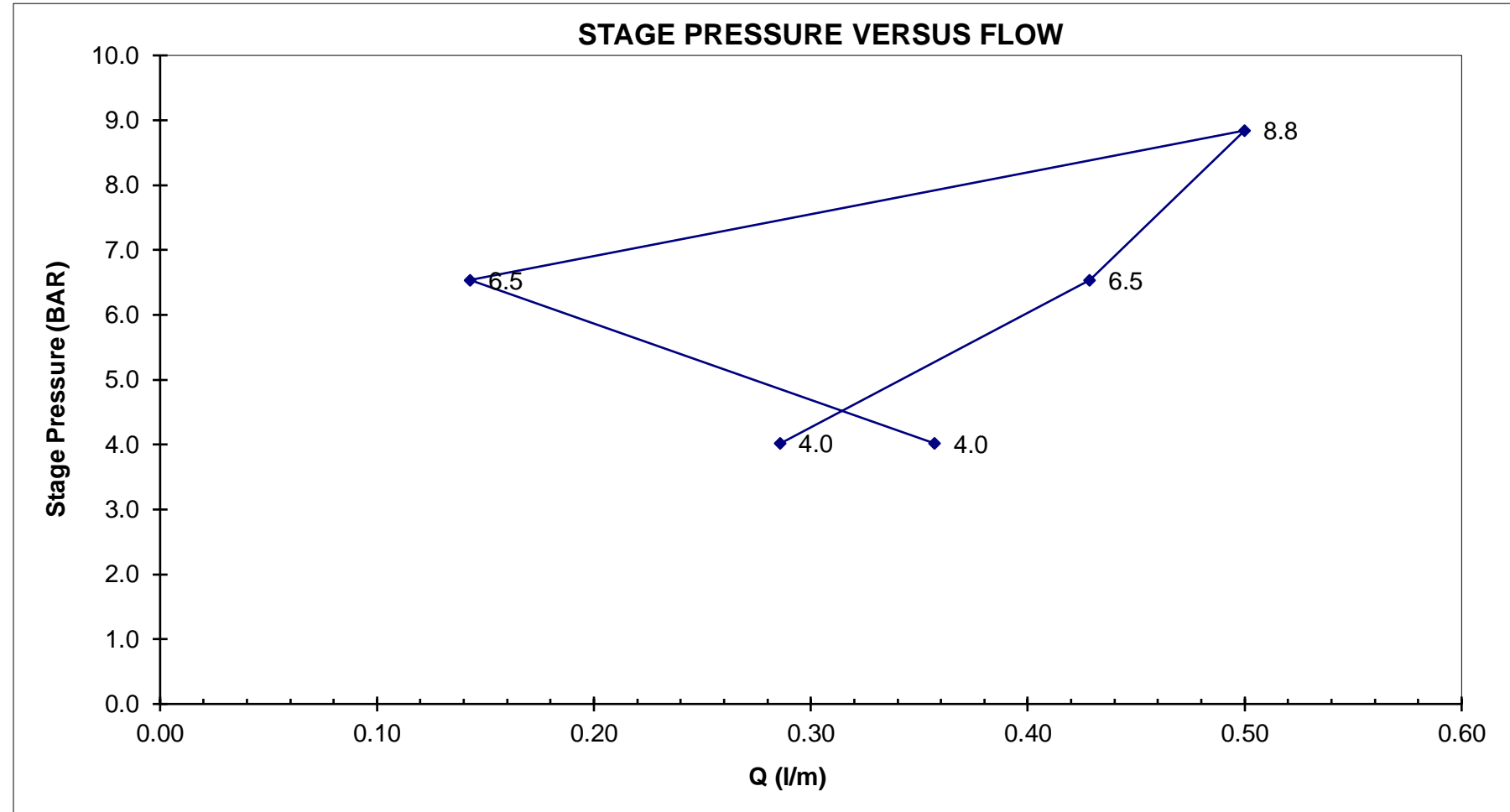
GAUGE HEIGHT ABOVE GROUND: 3.4 m

DATE: 18-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 313.65 95.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
2.41	0.00	4.02	Flowmeter m3	73.26	73.26	73.26	73.26	73.26	73.26	73.26	73.26	0.4	0.1
			Take litres		0.00	1.00	0.00	0.50	0.50	0.00	0.50		
			Average Take l/m		0.00	1.00	0.00	0.50	0.50	0.00	0.50		
4.93	0.00	6.54	Flowmeter m3	73.26	73.26	73.26	73.26	73.26	73.27	73.27	73.27	0.1	0.0
			Take litres		0.00	0.00	0.00	0.50	0.50	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.50	0.50	0.00	0.00		
7.24	0.01	8.84	Flowmeter m3	73.27	73.27	73.27	73.27	73.27	73.27	73.27	73.27	0.5	0.1
			Take litres		0.50	0.50	0.00	0.50	0.50	1.00	0.50		
			Average Take l/m		0.50	0.50	0.00	0.50	0.50	1.00	0.50		
4.93	0.00	6.53	Flowmeter m3	73.27	73.27	73.27	73.27	73.27	73.27	73.28	73.28	0.4	0.1
			Take litres		0.50	0.00	0.50	0.50	0.50	0.50	0.50		
			Average Take l/m		0.50	0.00	0.50	0.50	0.50	0.50	0.50		
2.41	0.00	4.02	Flowmeter m3	73.28	73.28	73.28	73.28	73.28	73.28	73.28	73.28	0.3	0.1
			Take litres		0.00	0.50	0.50	0.00	0.50	0.00	0.50		
			Average Take l/m		0.00	0.50	0.50	0.00	0.50	0.00	0.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.05

K = 5.E-07 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 5.E-09 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. SURGE TANK USED
 2. NO LEAKS OBSERVED.
 3. FLOWS BETWEEN 31 AND 62 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 31 AND GREATER THAN 62 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1: +/-0.25 PSI, P2: +/-0.5 PSI, P3: +/-1 PSI, P4: +/-0.5 PSI, P5: +/-0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\BH16-010 - Lugeon Spreadsheet_r0.xlsx\TEST 9

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	CHK'D

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-001

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 2.3 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 16.86 5.14 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

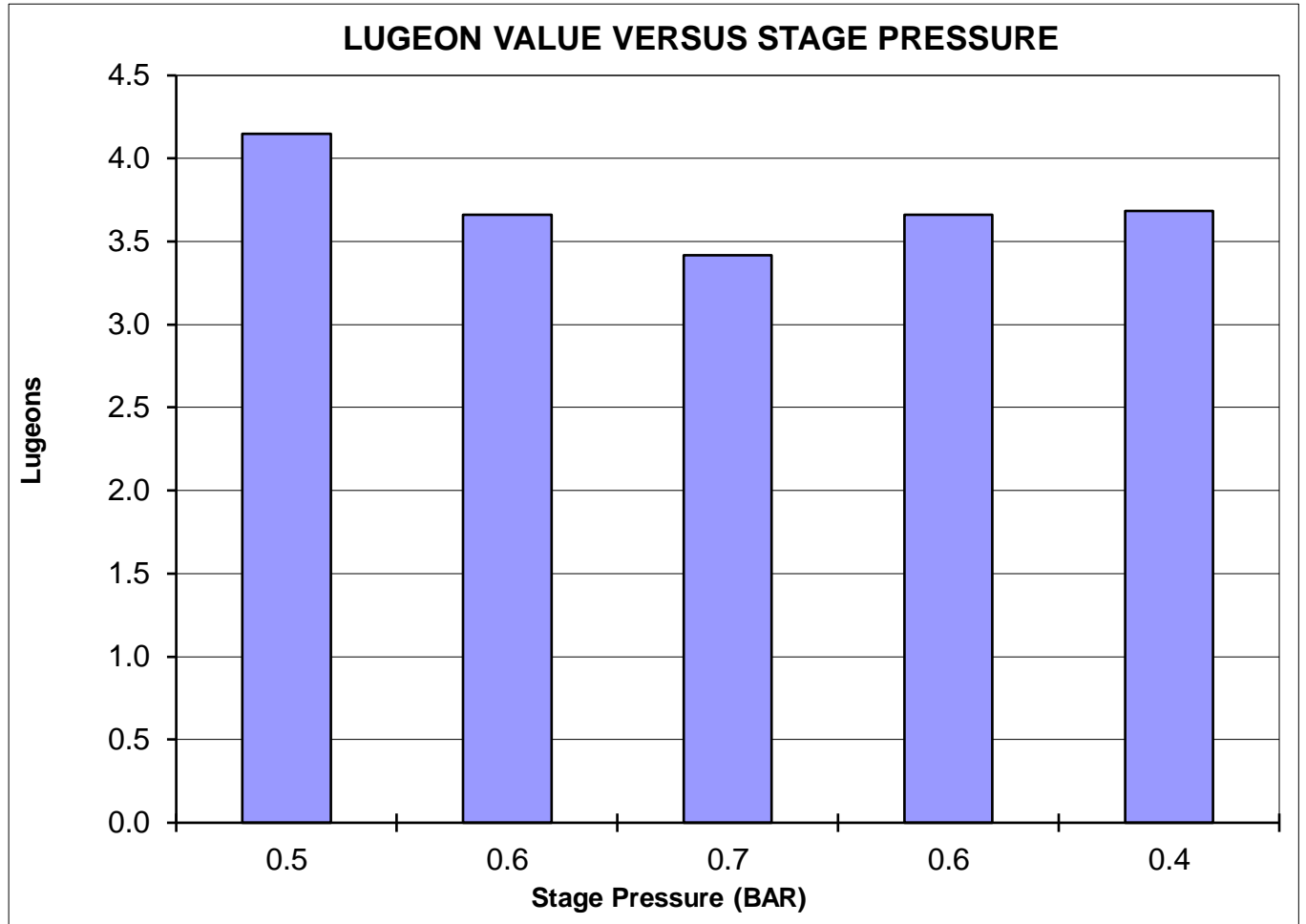
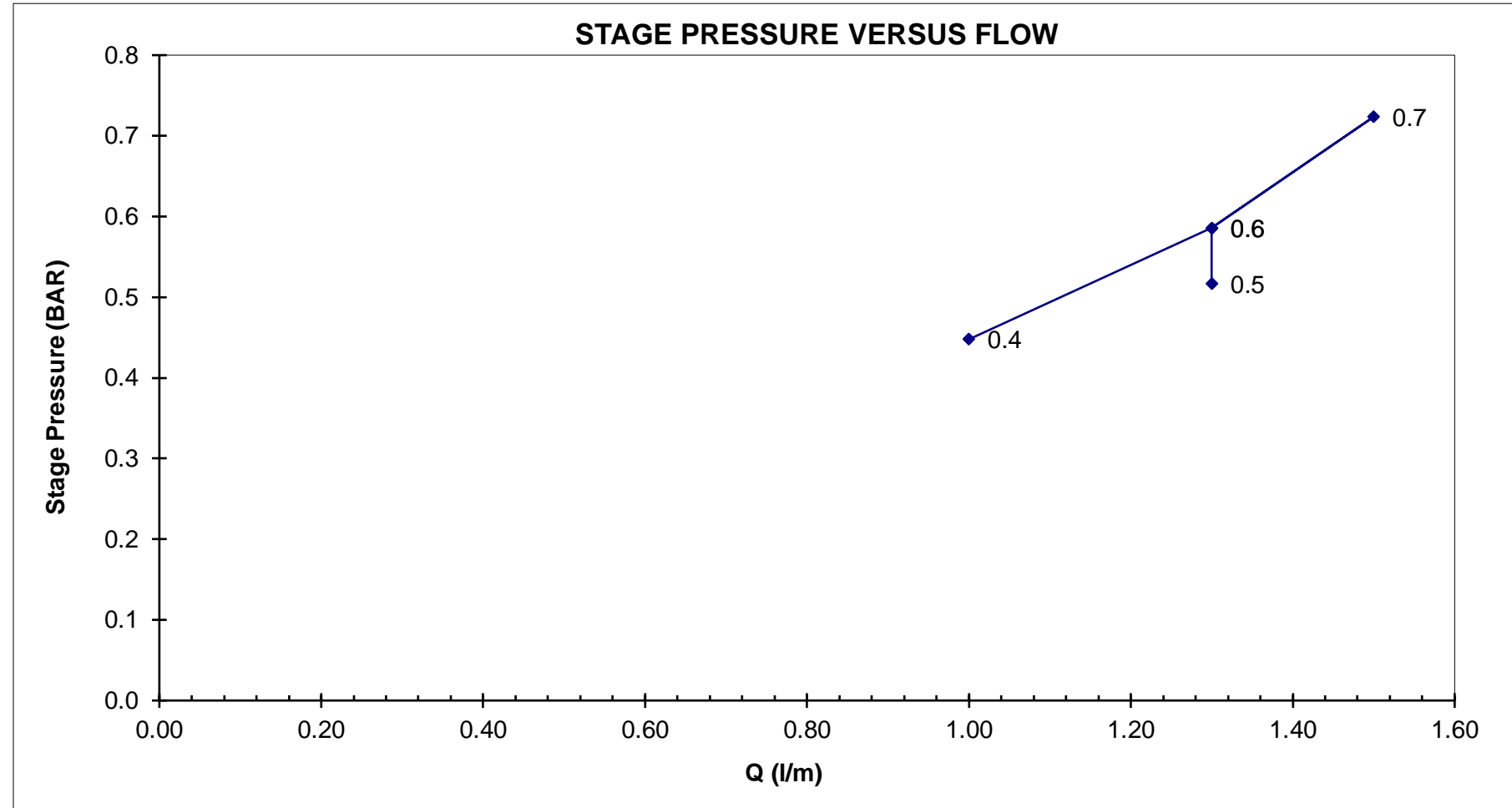
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 18-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 36.75 11.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.00	0.52	Flowmeter m3	7.76	7.76	7.76	7.76	7.76	7.76				
			Take litres		1.00	1.50	1.00	1.50	1.50				
			Average Take l/m		1.00	1.50	1.00	1.50	1.50			1.3	4.1
0.28	0.00	0.59	Flowmeter m3	7.77	7.77	7.77	7.77	7.77	7.77				
			Take litres		1.50	1.50	1.00	1.50	1.00				
			Average Take l/m		1.50	1.50	1.00	1.50	1.00			1.3	3.7
0.41	0.00	0.72	Flowmeter m3	7.77	7.77	7.78	7.78	7.78	7.78				
			Take litres		1.50	1.50	1.50	1.50	1.50				
			Average Take l/m		1.50	1.50	1.50	1.50	1.50			1.5	3.4
0.28	0.00	0.59	Flowmeter m3	7.78	7.78	7.78	7.79	7.79	7.79				
			Take litres		1.00	1.50	1.50	1.00	1.50				
			Average Take l/m		1.00	1.50	1.50	1.00	1.50			1.3	3.7
0.14	0.00	0.45	Flowmeter m3	7.79	7.79	7.79	7.79	7.79	7.79				
			Take litres		1.00	1.00	1.00	1.00	1.00				
			Average Take l/m		1.00	1.00	1.00	1.00	1.00			1.0	3.7



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 3

K = 3.E-05 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 3.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\VA101-594\02-1 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\16-001 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREP'D	R/W'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-001

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 2.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 36.48 11.12 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

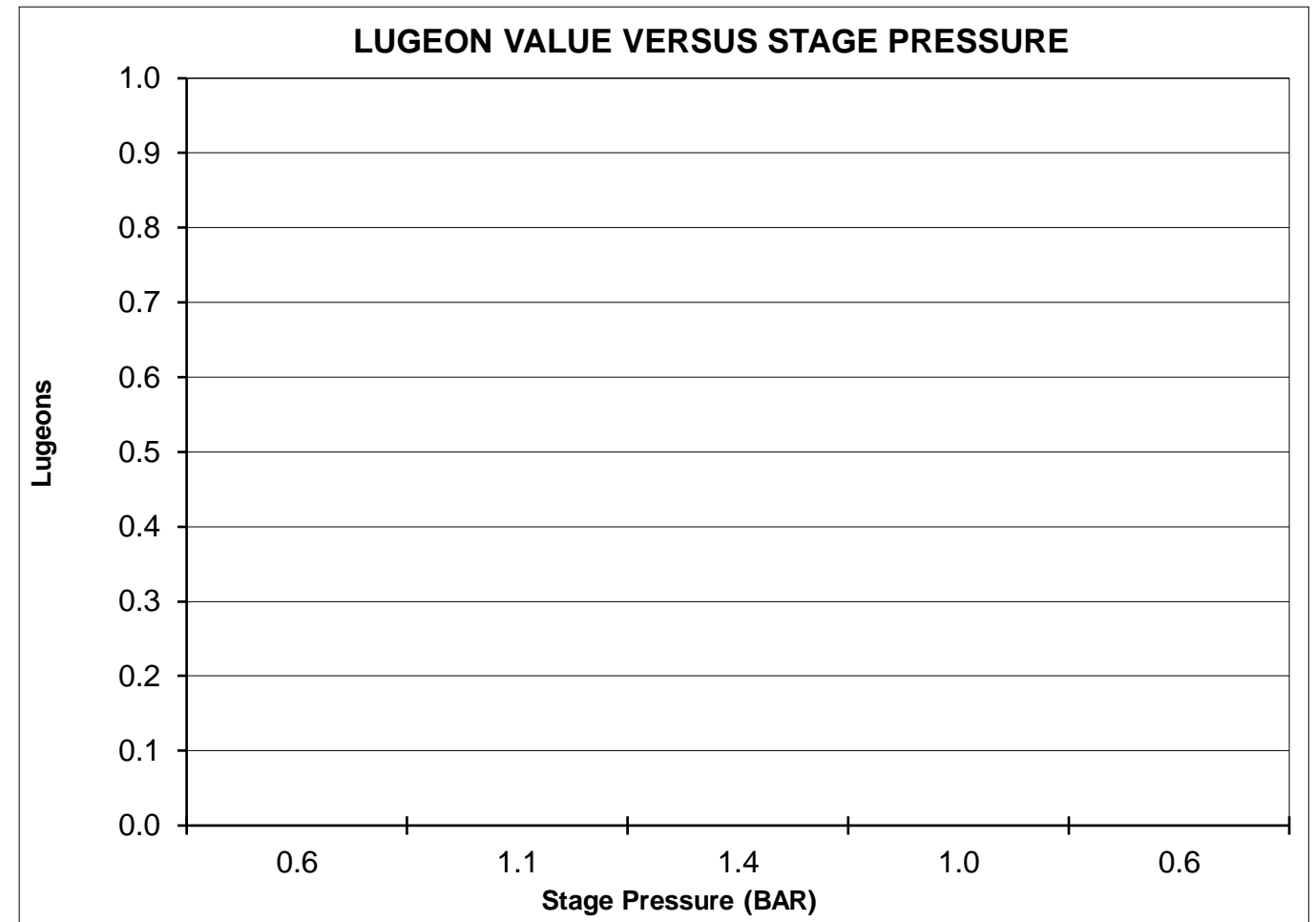
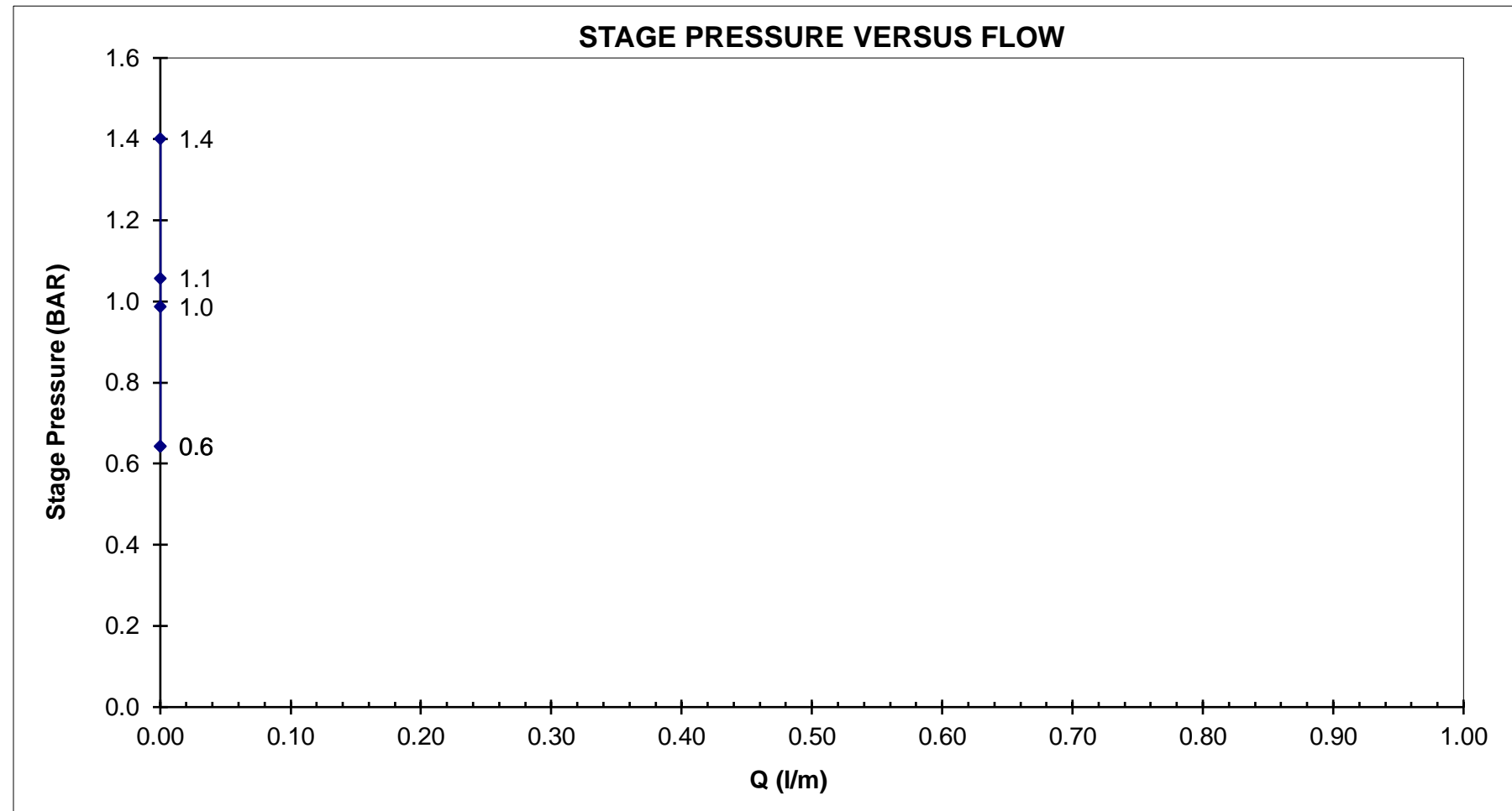
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 19-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 56.76 17.30 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
0.34	0.00	0.64	Flowmeter	7.88	7.88	7.88	7.88	7.88	7.88	7.88		
			Take		0.00	0.00	0.00	0.00	0.50			
			Average Take		0.00	0.00	0.00	0.00	0.50			
											0.0	0.0
0.76	0.00	1.06	Flowmeter	7.88	7.88	7.88	7.88	7.88	7.88	7.88		
			Take		0.00	0.00	0.00	0.00	0.00			
			Average Take		0.00	0.00	0.00	0.00	0.00			
											0.0	0.0
1.10	0.00	1.40	Flowmeter	7.88	7.88	7.88	7.88	7.88	7.88	7.88		
			Take		0.00	0.00	0.00	0.00	0.00			
			Average Take		0.00	0.00	0.00	0.00	0.00			
											0.0	0.0
0.69	0.00	0.99	Flowmeter	7.88	7.88	7.88	7.88	7.88	7.88	7.88		
			Take		0.00	0.00	0.00	0.00	0.00			
			Average Take		0.00	0.00	0.00	0.00	0.00			
											0.0	0.0
0.34	0.00	0.64	Flowmeter	7.88	7.88	7.88	7.88	7.88	7.88	7.88		
			Take		0.00	0.00	0.00	0.00	0.00			
			Average Take		0.00	0.00	0.00	0.00	0.00			
											0.0	0.0



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\VA\02\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\16-001 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	PREP'D	R/W'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-001

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 3.7 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 56.43 17.20 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

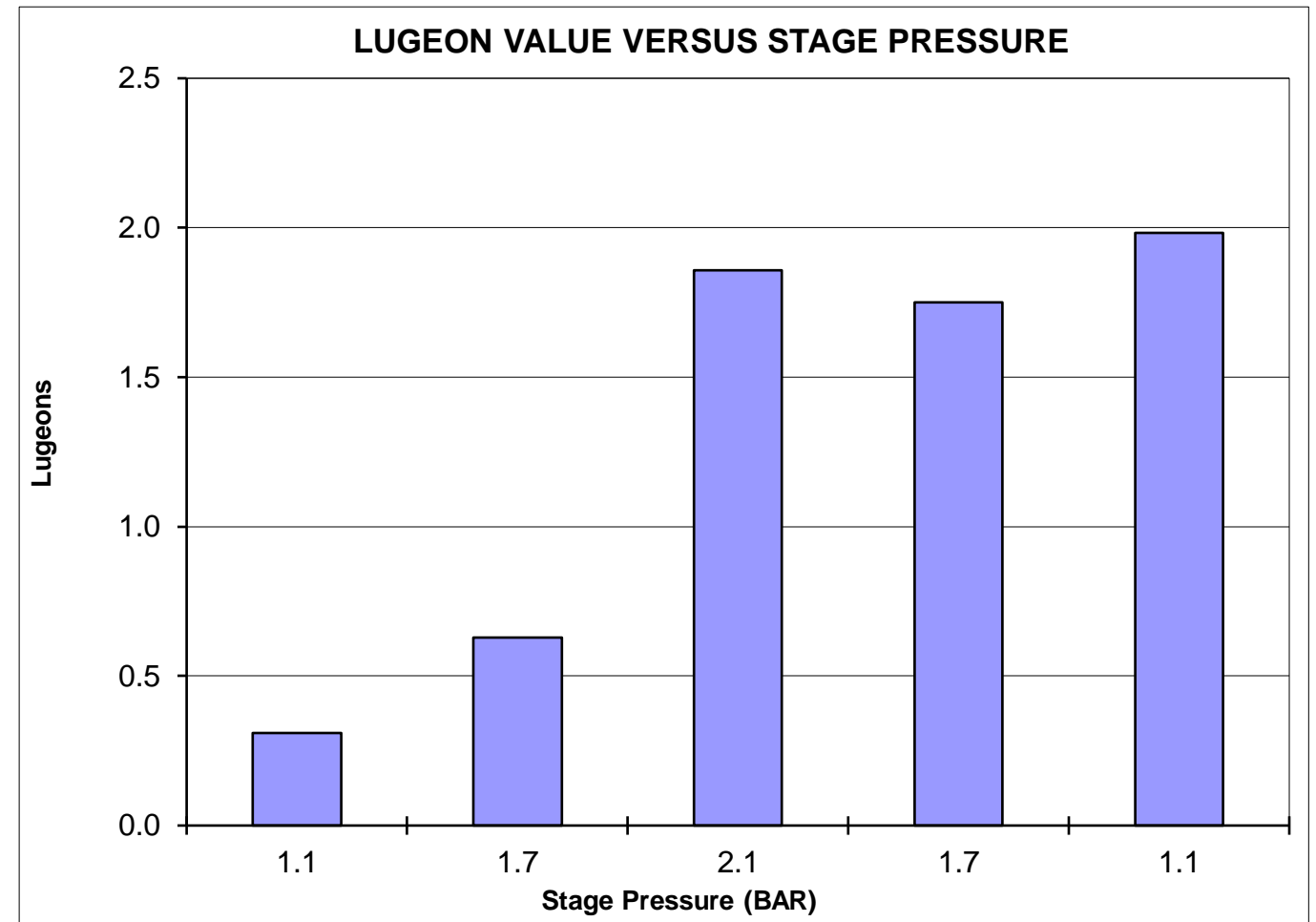
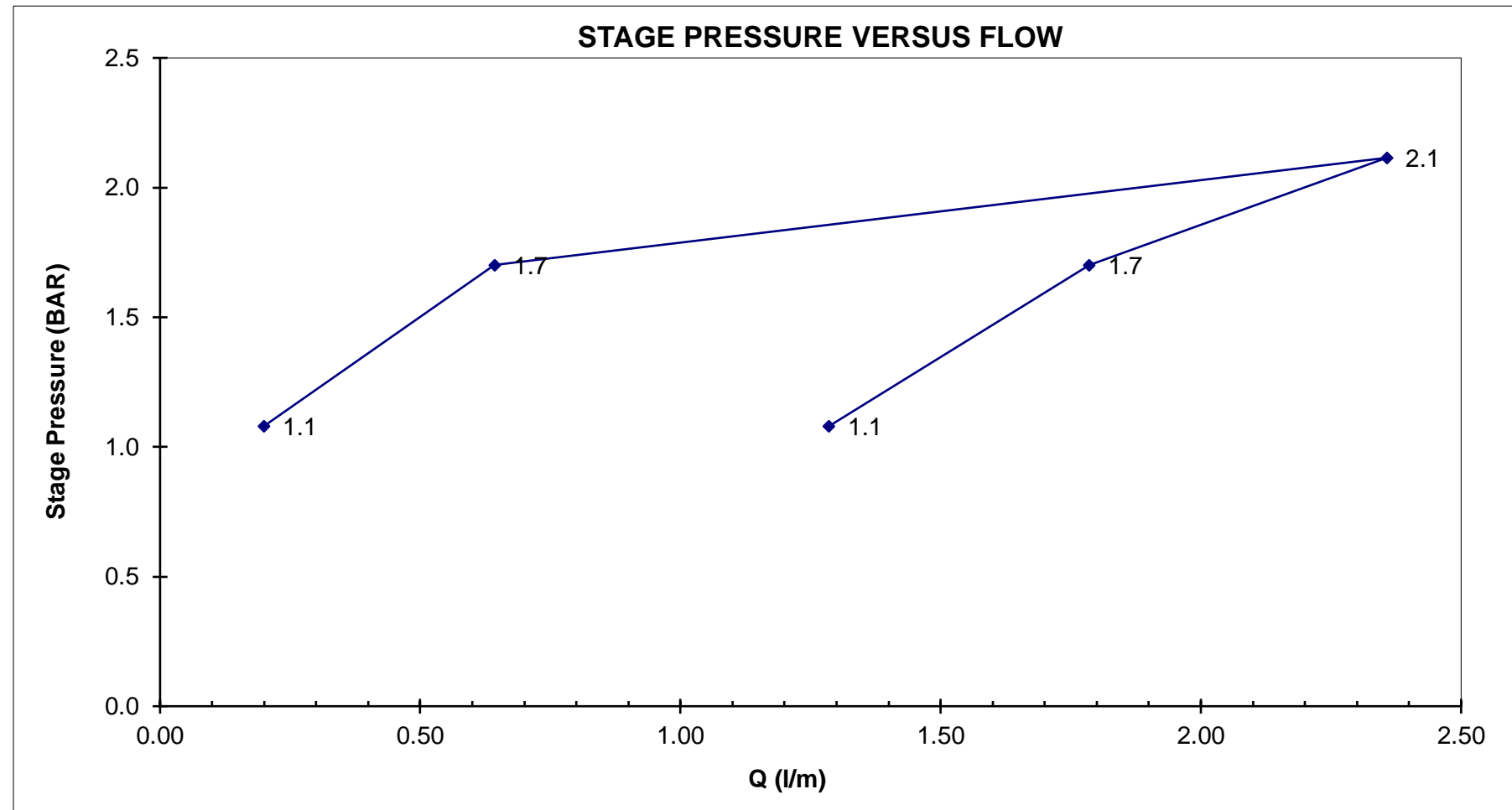
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 19-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 76.12 23.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON
				0	1	2	3	4	5	6		
0.62	0.00	1.08	0	7.90	7.90	7.90	7.90	7.90	7.90	7.90	0.2	0.3
			1	7.90	7.90	7.90	7.90	7.90	7.90			
			2	0.00	0.50	0.00	0.50	0.00	0.50			
			Average Take l/m	0.00	0.50	0.00	0.50	0.00	0.50			
1.24	0.00	1.70	0	7.91	7.91	7.91	7.91	7.91	7.91	7.91	0.6	0.6
			1	7.91	7.91	7.91	7.91	7.91	7.91			
			2	0.50	1.50	0.50	1.00	0.50	0.00			
			Average Take l/m	0.50	1.50	0.50	1.00	0.50	0.00			
1.66	0.00	2.11	0	7.92	7.93	7.93	7.93	7.93	7.94	7.94	2.4	1.9
			1	7.93	7.93	7.93	7.93	7.94	7.94			
			2	3.50	1.50	2.50	2.00	2.50	2.00			
			Average Take l/m	3.50	1.50	2.50	2.00	2.50	2.00			
1.24	0.00	1.70	0	7.95	7.95	7.95	7.95	7.95	7.96	7.96	1.8	1.7
			1	7.95	7.95	7.95	7.95	7.96	7.96			
			2	2.00	2.00	1.50	2.00	1.50	2.00			
			Average Take l/m	2.00	2.00	1.50	2.00	1.50	2.00			
0.62	0.00	1.08	0	7.96	7.96	7.96	7.96	7.96	7.97	7.97	1.3	2.0
			1	7.96	7.96	7.96	7.96	7.97	7.97			
			2	1.50	1.00	1.50	1.50	1.00	1.00			
			Average Take l/m	1.50	1.00	1.50	1.50	1.00	1.00			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 2

K = 2.E-05 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 2.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P2 +/-3 PSI, P3 +/-4 PSI, P4 +/-1 PSI, P5 +/-1 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0[MW16-001 - Lugeon Spreadsheet_r0.xlsx]TEST 3

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-001

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 2.8 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 74.93 22.84 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

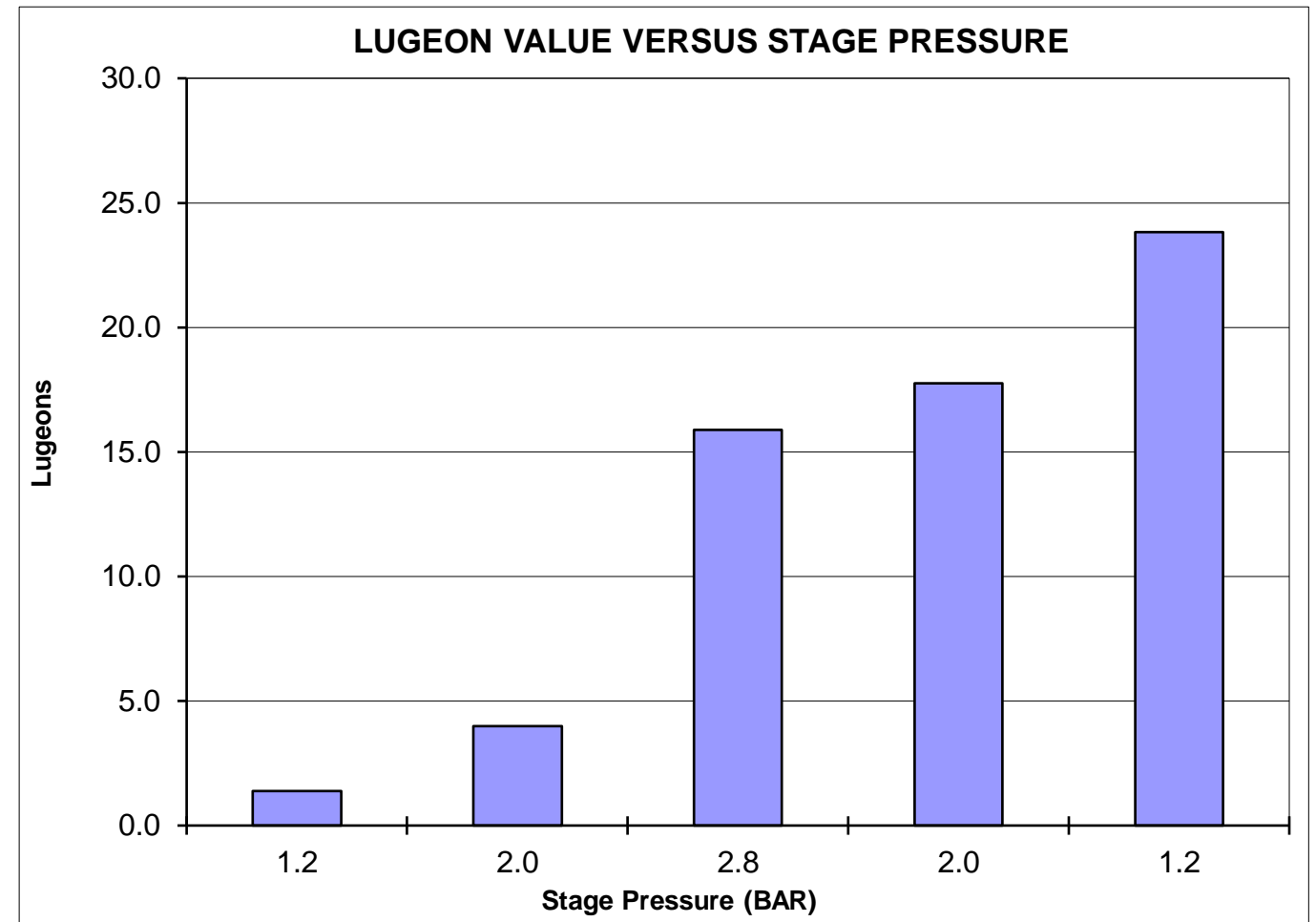
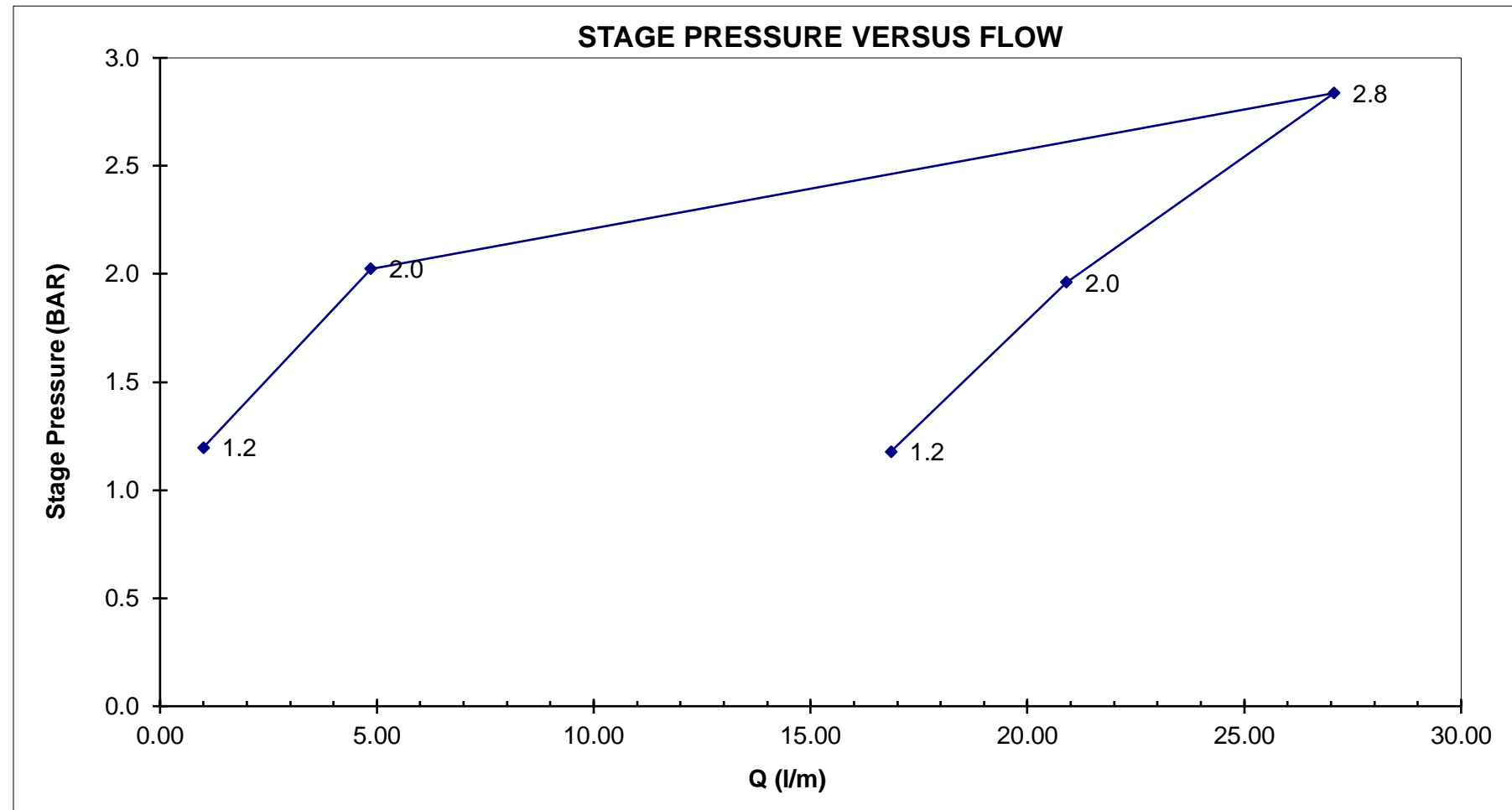
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 19-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 94.62 28.84 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min								FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
0.83	0.00	1.20	0									1.0	1.4
			Flowmeter m3	7.97	7.98	7.98	7.98	7.98	7.98	7.98			
			Take litres		1.00	1.00	1.00	1.00	1.00	1.00			
			Average Take l/m		1.00	1.00	1.00	1.00	1.00	1.00			
1.66	0.00	2.02	0									4.9	4.0
			Flowmeter m3	7.99	8.00	8.00	8.01	8.01	8.02	8.02			
			Take litres		5.00	5.00	5.00	5.00	5.00	4.50			
			Average Take l/m		5.00	5.00	5.00	5.00	5.00	4.50			
2.52	0.05	2.84	0									27.1	15.9
			Flowmeter m3	8.06	8.09	8.12	8.14	8.17	8.20	8.22			
			Take litres		27.00	27.50	27.50	27.50	25.50	27.50			
			Average Take l/m		27.00	27.50	27.50	27.50	25.50	27.50			
1.62	0.03	1.96	0									20.9	17.8
			Flowmeter m3	8.33	8.35	8.37	8.39	8.41	8.43				
			Take litres		21.50	21.50	19.50	21.00	21.00				
			Average Take l/m		21.50	21.50	19.50	21.00	21.00				
0.83	0.02	1.18	0									16.9	23.8
			Flowmeter m3	8.47	8.49	8.50	8.52	8.54	8.56	8.57			
			Take litres		16.50	16.50	17.50	17.50	17.00	16.50			
			Average Take l/m		16.50	16.50	17.50	17.50	17.00	16.50			



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 24

K = 2.E-04 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 2.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/-2 PSI, P2 +/-3 PSI, P3 +/-0.5 PSI, P4 +/-0.5 PSI, P5 +/-2 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\16-001 - Lugeon Spreadsheet_r0.xlsx\TEST 4

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-001

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 2.5 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 80.91 24.66 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

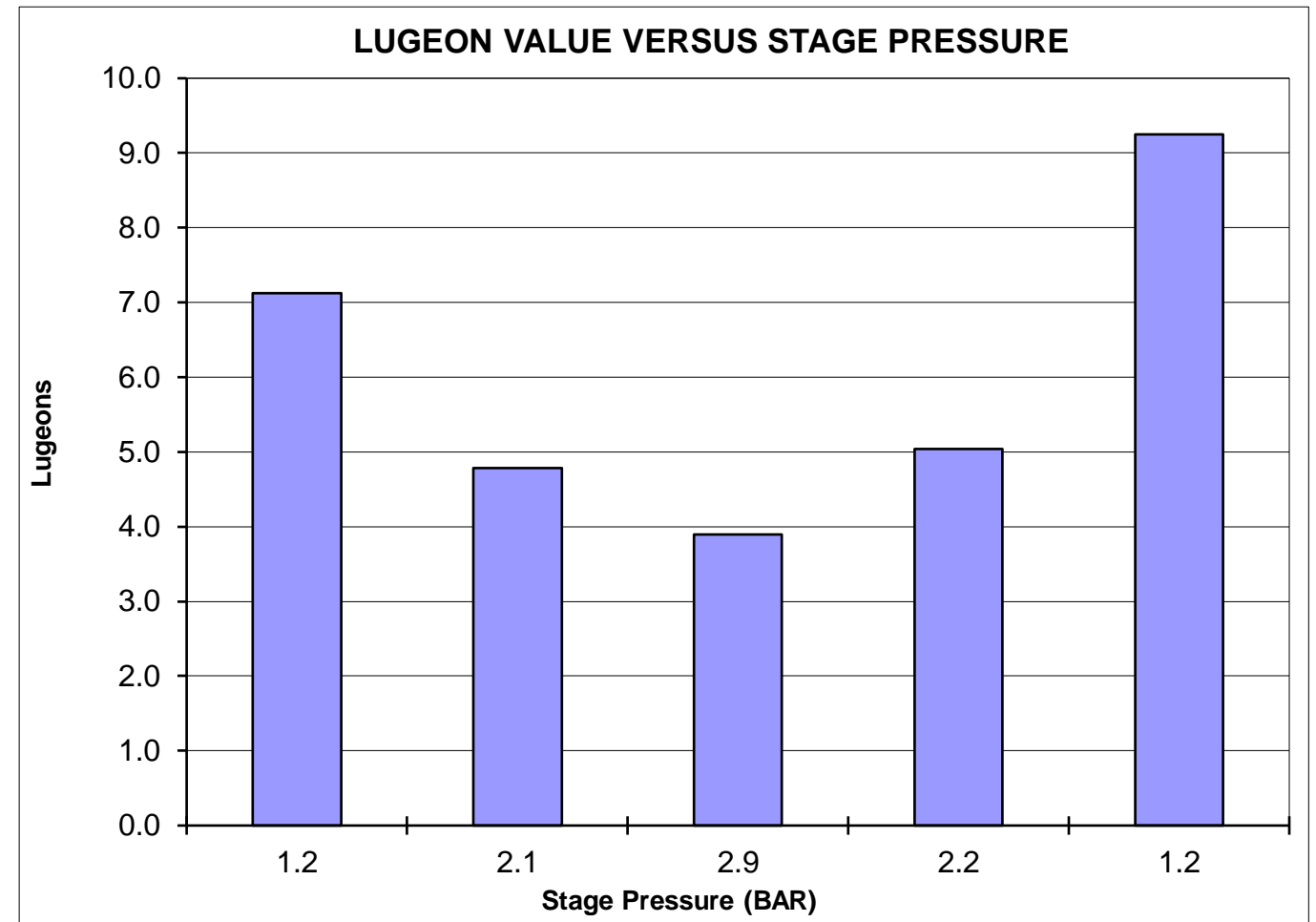
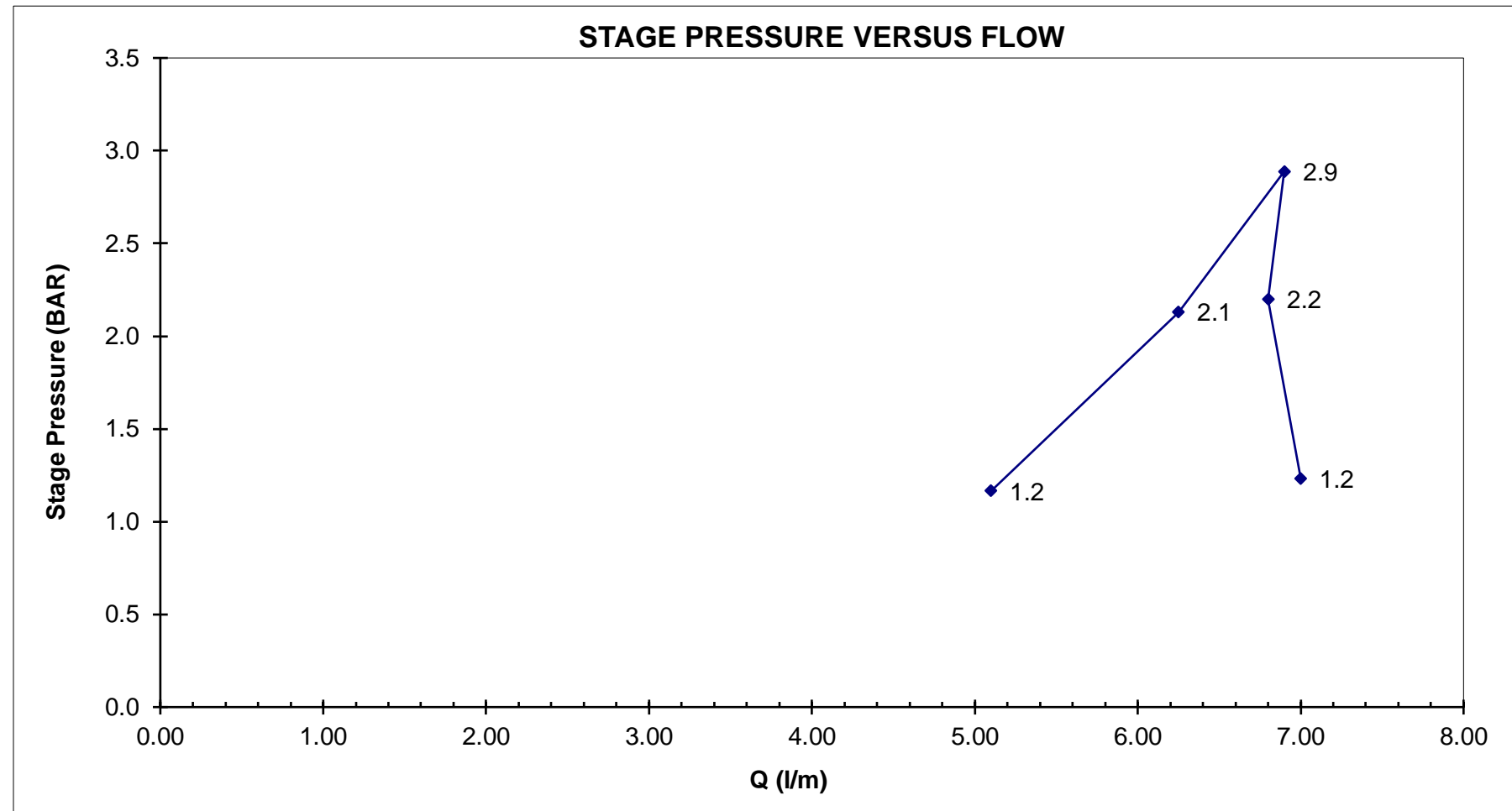
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 19-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 101.05 30.80 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.00	1.17	Flowmeter m3	9.32	9.33	9.33	9.34	9.34	9.35				
			Take litres		5.00	5.00	5.00	5.50	5.00			5.1	7.1
			Average Take l/m		5.00	5.00	5.00	5.50	5.00				
1.79	0.00	2.13	Flowmeter m3	9.36	9.36	9.37	9.38	9.38	9.39	9.40			
			Take litres		6.50	6.50	6.00	7.00	5.50	6.00		6.2	4.8
			Average Take l/m		6.50	6.50	6.00	7.00	5.50	6.00			
2.55	0.00	2.89	Flowmeter m3	9.42	9.42	9.43	9.44	9.44	9.45				
			Take litres		8.00	7.50	7.50	5.50	6.00			6.9	3.9
			Average Take l/m		8.00	7.50	7.50	5.50	6.00				
1.86	0.00	2.20	Flowmeter m3	9.46	9.46	9.47	9.48	9.48	9.49				
			Take litres		7.00	6.50	6.50	8.50	5.50			6.8	5.0
			Average Take l/m		7.00	6.50	6.50	8.50	5.50				
0.90	0.00	1.23	Flowmeter m3	9.51	9.52	9.52	9.53	9.54	9.54				
			Take litres		7.50	7.00	7.00	6.50	7.00			7.0	9.2
			Average Take l/m		7.50	7.00	7.00	6.50	7.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 4

K = 4.E-05 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 4.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/-3 PSI, P2 +/-3 PSI, P3 +/-1 PSI, P4 +/-2 PSI, P5 +/-3 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-001 - Lugeon Spreadsheet_r0.xlsx\TEST 5

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-002

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.9 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 17.71 5.40 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

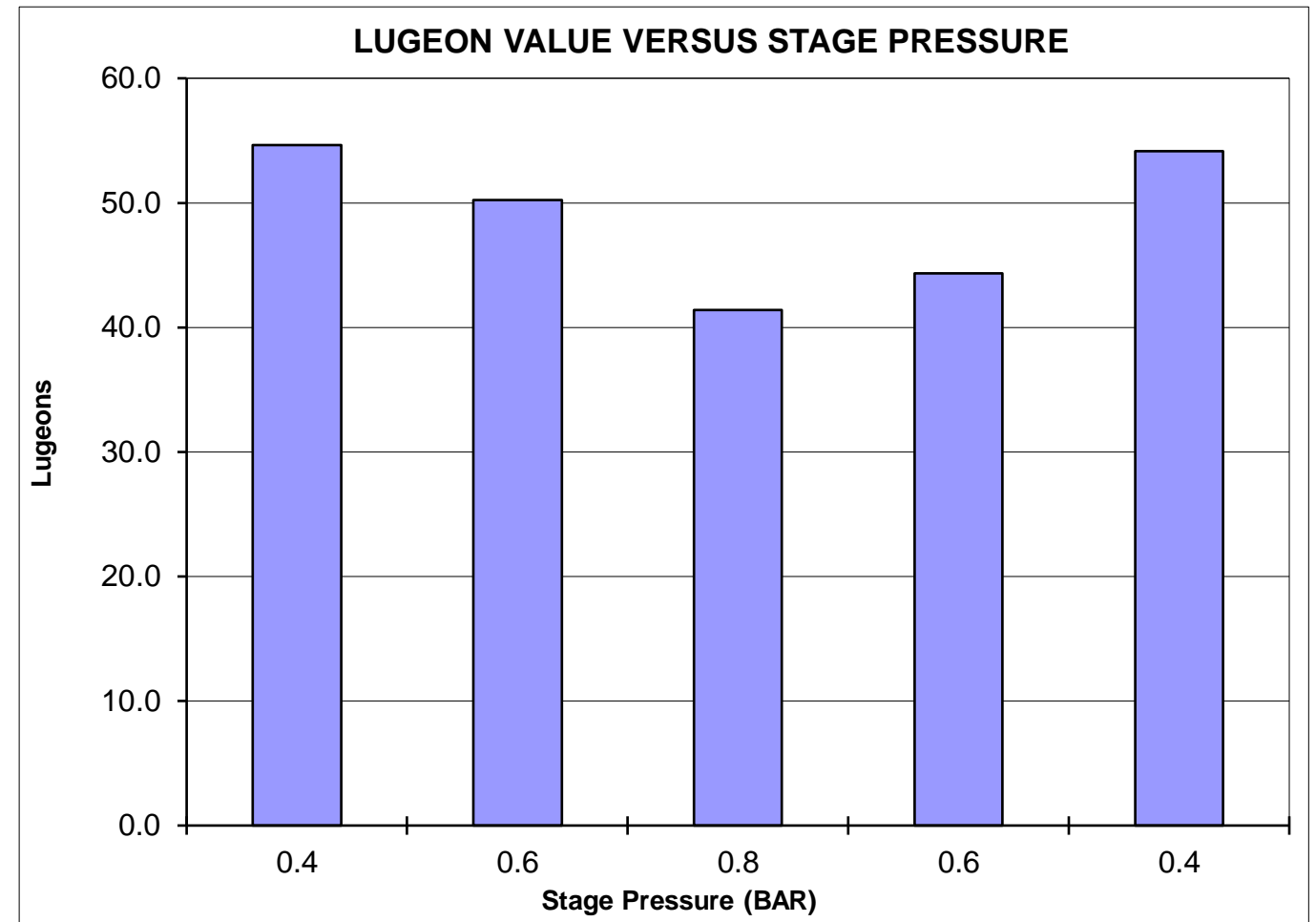
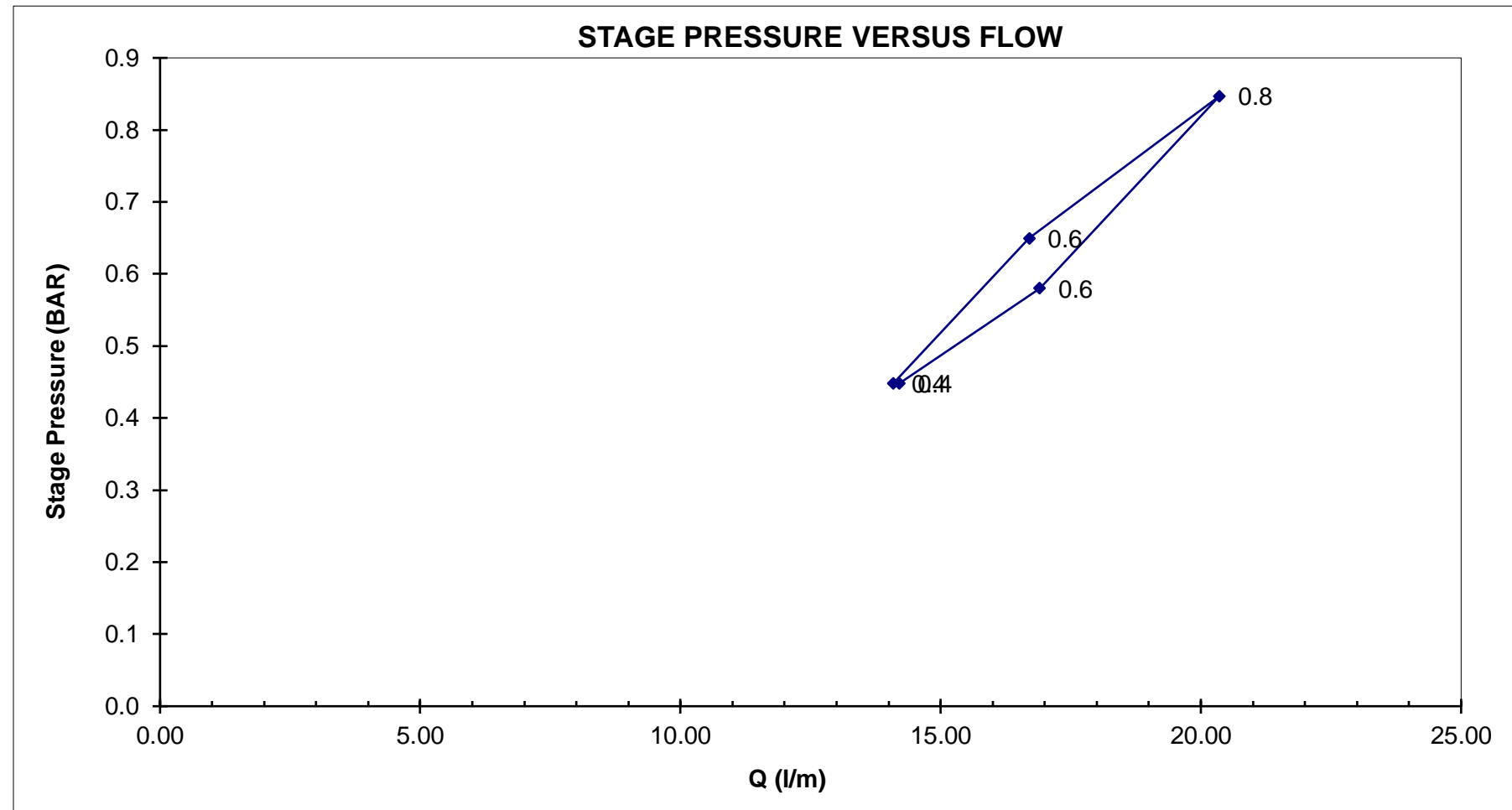
GAUGE HEIGHT ABOVE GROUND: 0.7 m

DATE: 21-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 36.75 11.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.01	0.45	Flowmeter m3	9.71	9.73	9.74	9.75	9.77	9.78				
			Take litres		14.00	14.50	14.00	14.50	14.00				
			Average Take l/m		14.00	14.50	14.00	14.50	14.00			14.2	54.6
0.34	0.02	0.58	Flowmeter m3	9.83	9.85	9.86	9.88	9.90	9.91				
			Take litres		17.00	17.00	16.50	16.50	17.50				
			Average Take l/m		17.00	17.00	16.50	16.50	17.50			16.9	50.2
0.62	0.03	0.85	Flowmeter m3	9.95	9.97	9.99	10.01	10.03	10.05	10.07	10.09		
			Take litres		20.50	21.00	19.50	21.50	19.50	20.50	20.00		
			Average Take l/m		20.50	21.00	19.50	21.50	19.50	20.50	20.00	20.4	41.4
0.41	0.02	0.65	Flowmeter m3	10.11	10.13	10.15	10.16	10.18	10.20				
			Take litres		17.00	16.50	16.50	17.00	16.50				
			Average Take l/m		17.00	16.50	16.50	17.00	16.50			16.7	44.3
0.21	0.01	0.45	Flowmeter m3	10.22	10.23	10.25	10.26	10.28	10.29	10.30			
			Take litres		14.50	14.50	13.50	14.50	13.50	14.00			
			Average Take l/m		14.50	14.50	13.50	14.50	13.50	14.00		14.1	54.2



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 41

K = 4.E-04 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 4.E-06 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/-1 PSI, P2 +/-2 PSI, P3 +/-2 PSI, P4 +/-2 PSI, P5 +/-2 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-002 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-002

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.7 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 36.61 11.16 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

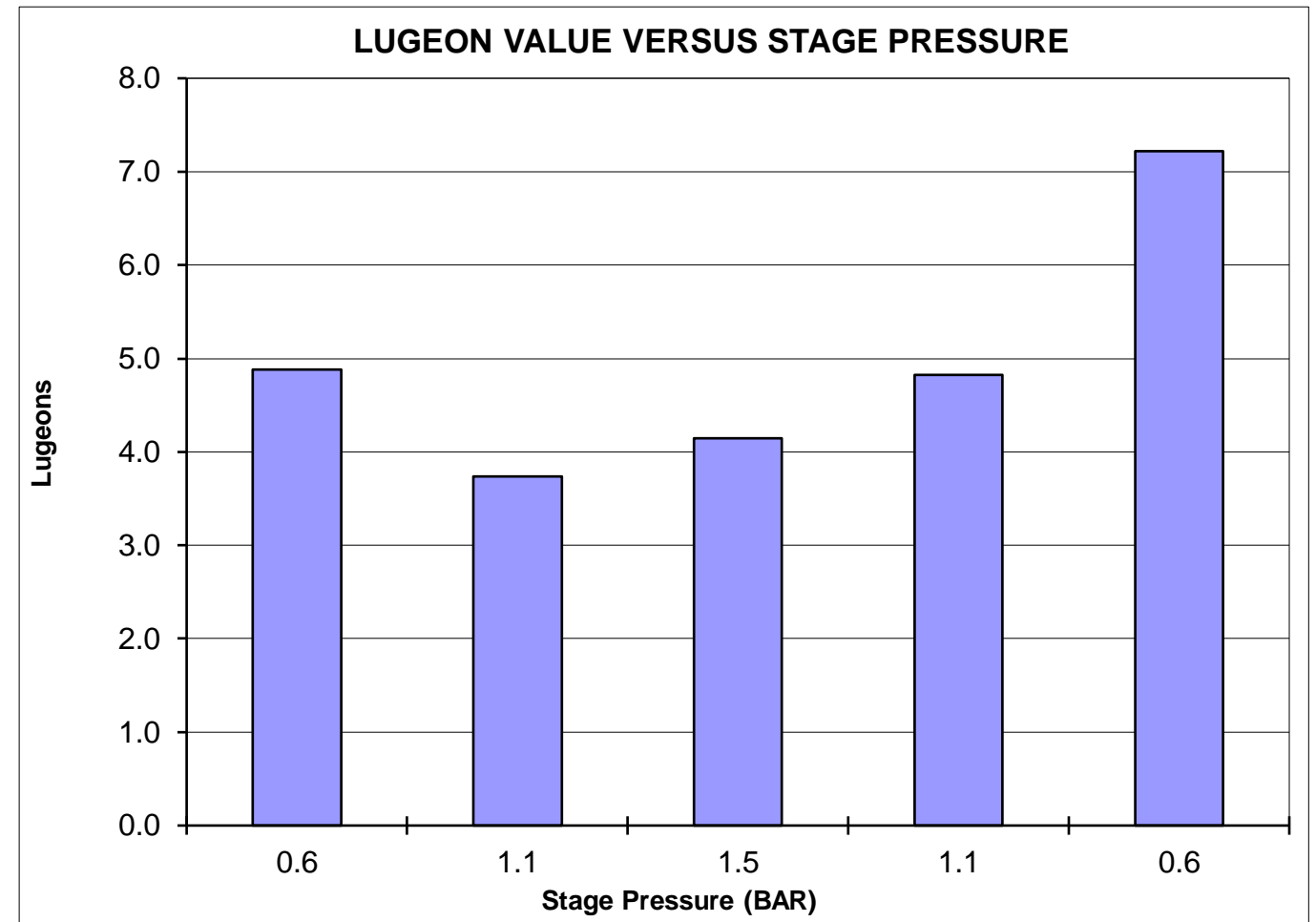
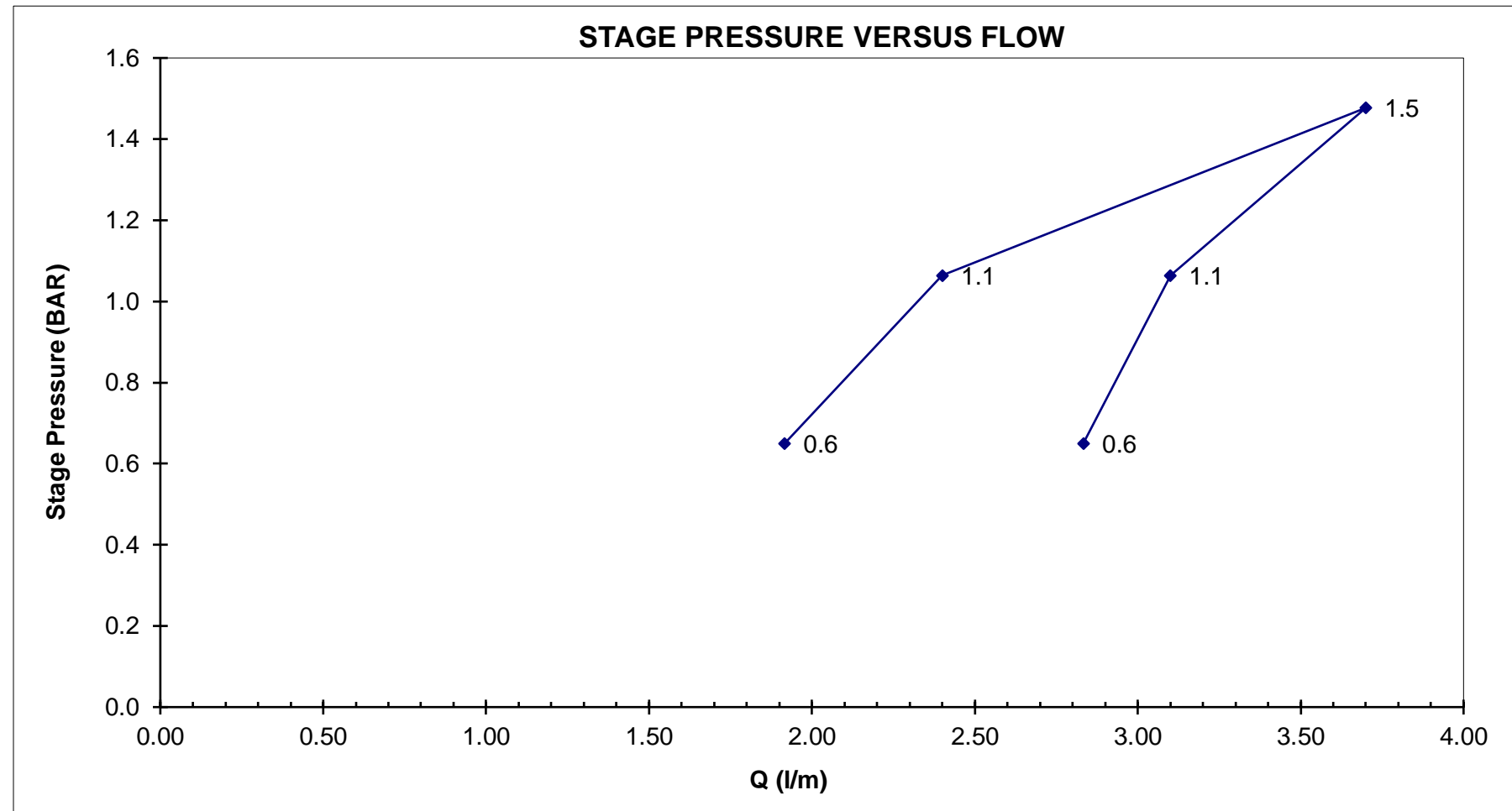
GAUGE HEIGHT ABOVE GROUND: 0.7 m

DATE: 21-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 56.43 17.20 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.00	0.65	Flowmeter m3	10.35	10.35	10.35	10.36	10.36	10.36	10.36			
			Take litres		1.50	2.50	1.50	2.00	2.00	2.00			
			Average Take l/m		1.50	2.50	1.50	2.00	2.00	2.00		1.9	4.9
0.83	0.00	1.06	Flowmeter m3	10.36	10.37	10.37	10.37	10.37	10.38				
			Take litres		2.50	2.50	2.00	2.50	2.50				
			Average Take l/m		2.50	2.50	2.00	2.50	2.50			2.4	3.7
1.24	0.00	1.48	Flowmeter m3	10.38	10.38	10.39	10.39	10.40	10.40				
			Take litres		3.50	4.00	3.50	3.50	4.00				
			Average Take l/m		3.50	4.00	3.50	3.50	4.00			3.7	4.1
0.83	0.00	1.06	Flowmeter m3	10.41	10.41	10.41	10.42	10.42	10.42				
			Take litres		3.00	3.00	3.00	3.50	3.00				
			Average Take l/m		3.00	3.00	3.00	3.50	3.00			3.1	4.8
0.41	0.00	0.65	Flowmeter m3	10.43	10.43	10.43	10.44	10.44	10.44	10.44			
			Take litres		4.00	2.50	3.00	2.00	2.50	3.00			
			Average Take l/m		4.00	2.50	3.00	2.00	2.50	3.00		2.8	7.2



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 7

K = 7.E-05 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 7.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/-2 PSI, P2 +/-3 PSI, P3 +/-0 PSI, P4 +/-0 PSI, P5 +/-1 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-002 - Lugeon Spreadsheet_r0.xlsx\TEST 2

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-002

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 0.8 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 55.94 17.05 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

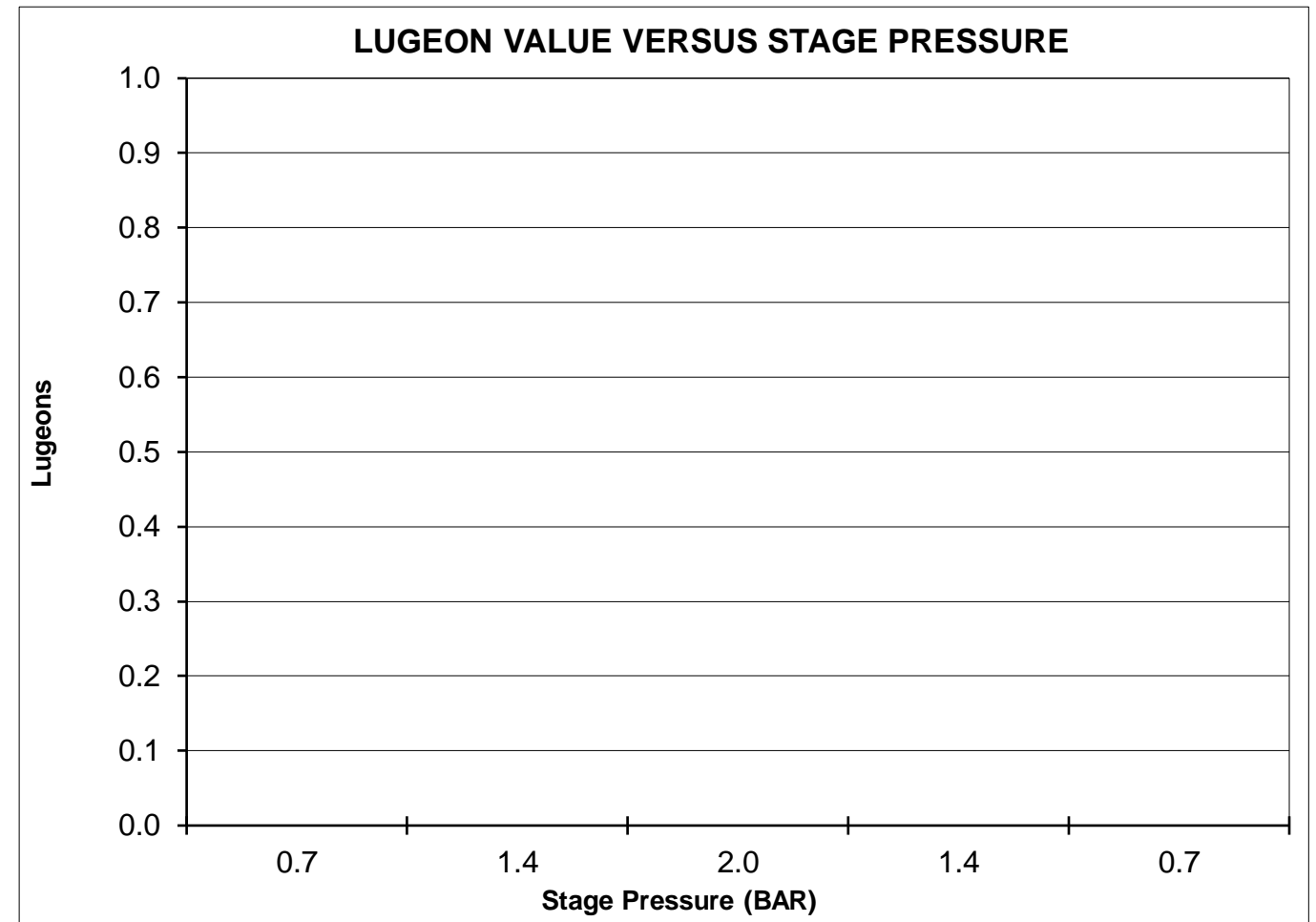
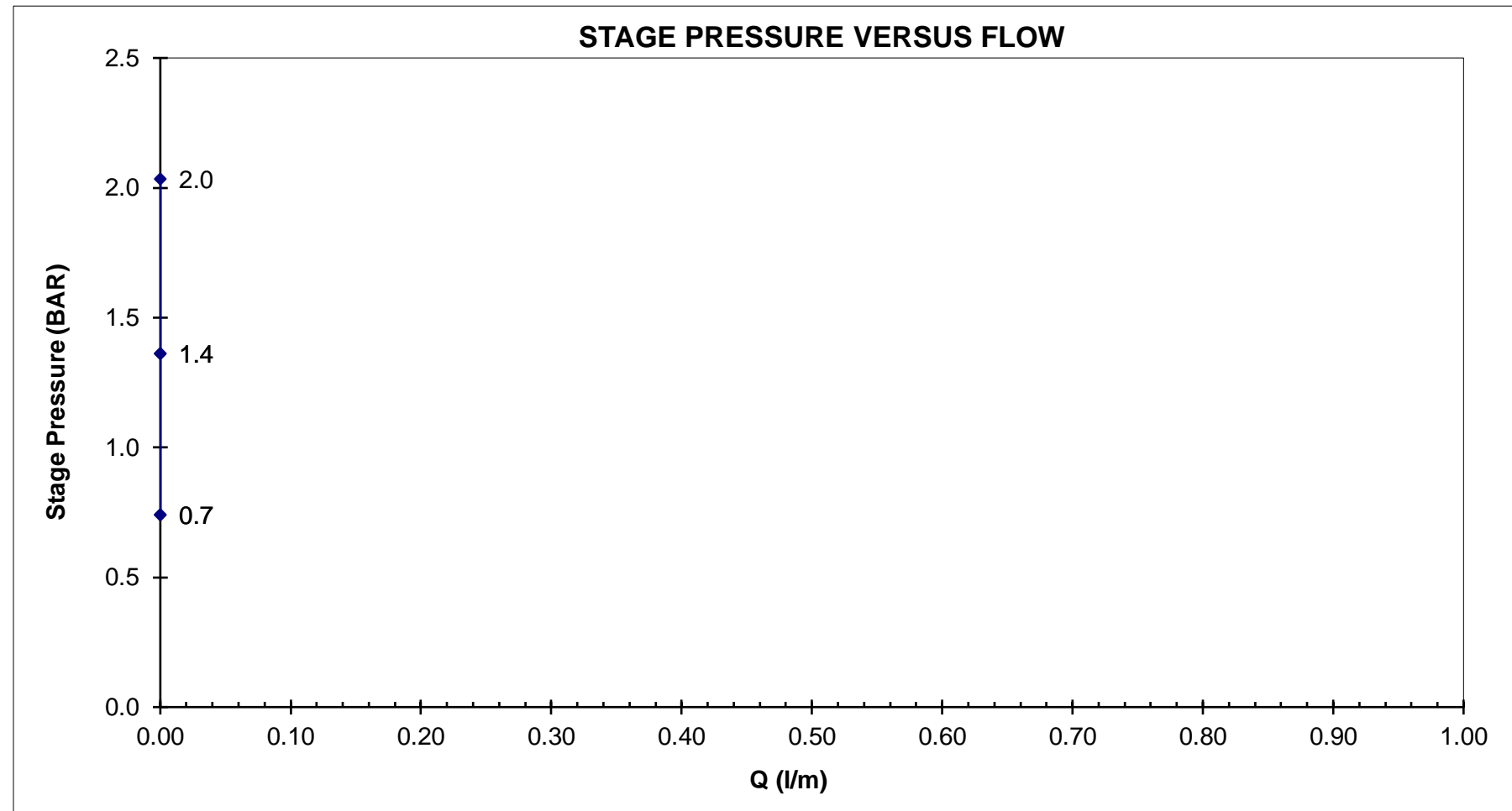
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 21-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 75.63 23.05 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.55	0.00	0.74	Flowmeter m3	10.45	10.45	10.45	10.45	10.45	10.45	10.45	10.45	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.17	0.00	1.36	Flowmeter m3	10.46	10.46	10.46	10.46	10.46	10.46	10.46	10.46	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.84	0.00	2.03	Flowmeter m3	10.46	10.46	10.46	10.46	10.46	10.46	10.46	10.46	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.17	0.00	1.36	Flowmeter m3	10.46	10.46	10.46	10.46	10.46	10.46	10.46	10.46	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
0.55	0.00	0.74	Flowmeter m3	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 1 PSI, P2 +/- 2 PSI, P3 +/- 0.25 PSI, P4 +/- 0.5 PSI, P5 +/- 0 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\16-002 - Lugeon Spreadsheet_r0.xlsx\TEST 3

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-002

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 75.13 22.90 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

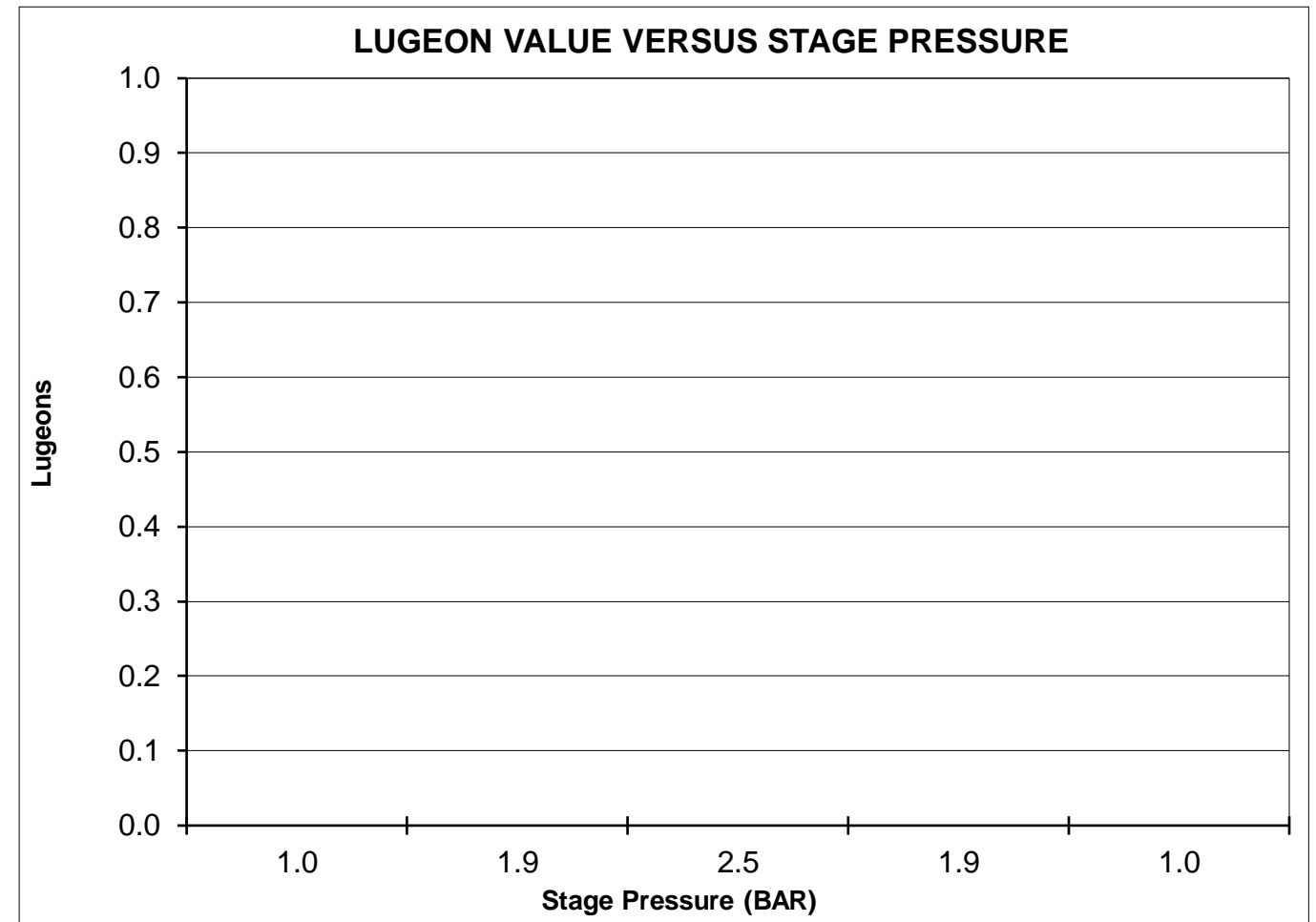
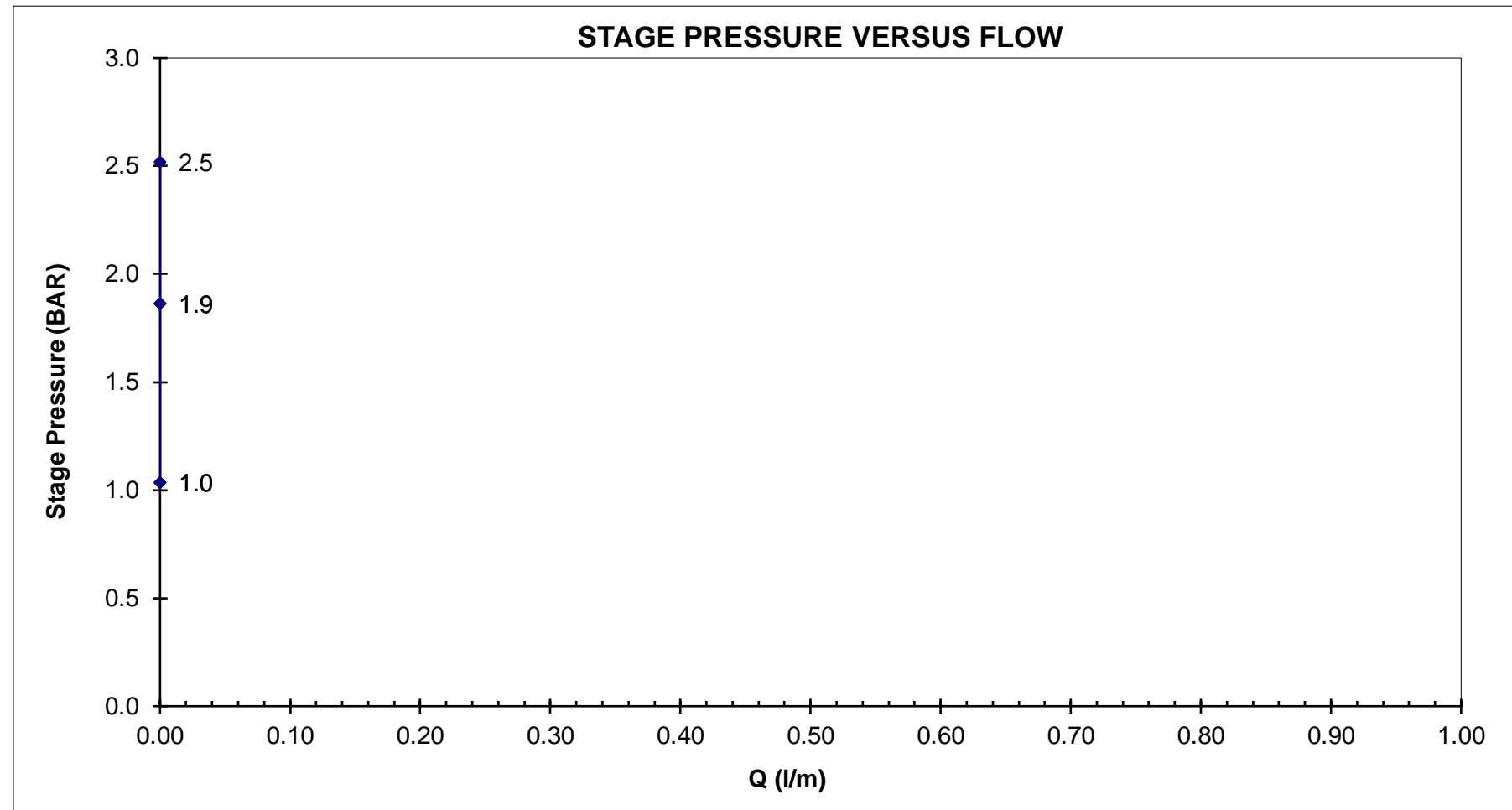
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 21-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 94.82 28.90 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.83	0.00	1.03	Flowmeter m3	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
1.66	0.00	1.86	Flowmeter m3	10.46	10.46	10.46	10.46	10.46	10.46	10.46	10.46	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2.31	0.00	2.52	Flowmeter m3	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	0.0	0.0
			Take litres		0.00	0.50	0.00	0.50	0.00	0.00	0.50		
			Average Take l/m		0.00	0.50	0.00	0.50	0.00	0.00	0.50		
1.66	0.00	1.86	Flowmeter m3	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	0.0	0.0
			Take litres		0.00	0.50	0.00	0.00	0.50	0.00	0.00		
			Average Take l/m		0.00	0.50	0.00	0.00	0.50	0.00	0.00		
0.83	0.00	1.03	Flowmeter m3	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	0.0	0.0
			Take litres		0.00	0.50	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.50	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 2 PSI, P2 +/- 3 PSI, P3 +/- 3.5 PSI, P4 +/- 3 PSI, P5 +/- 2 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-002 - Lugeon Spreadsheet_r0.xlsx\TEST 4

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-002

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.1 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 94.33 28.75 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

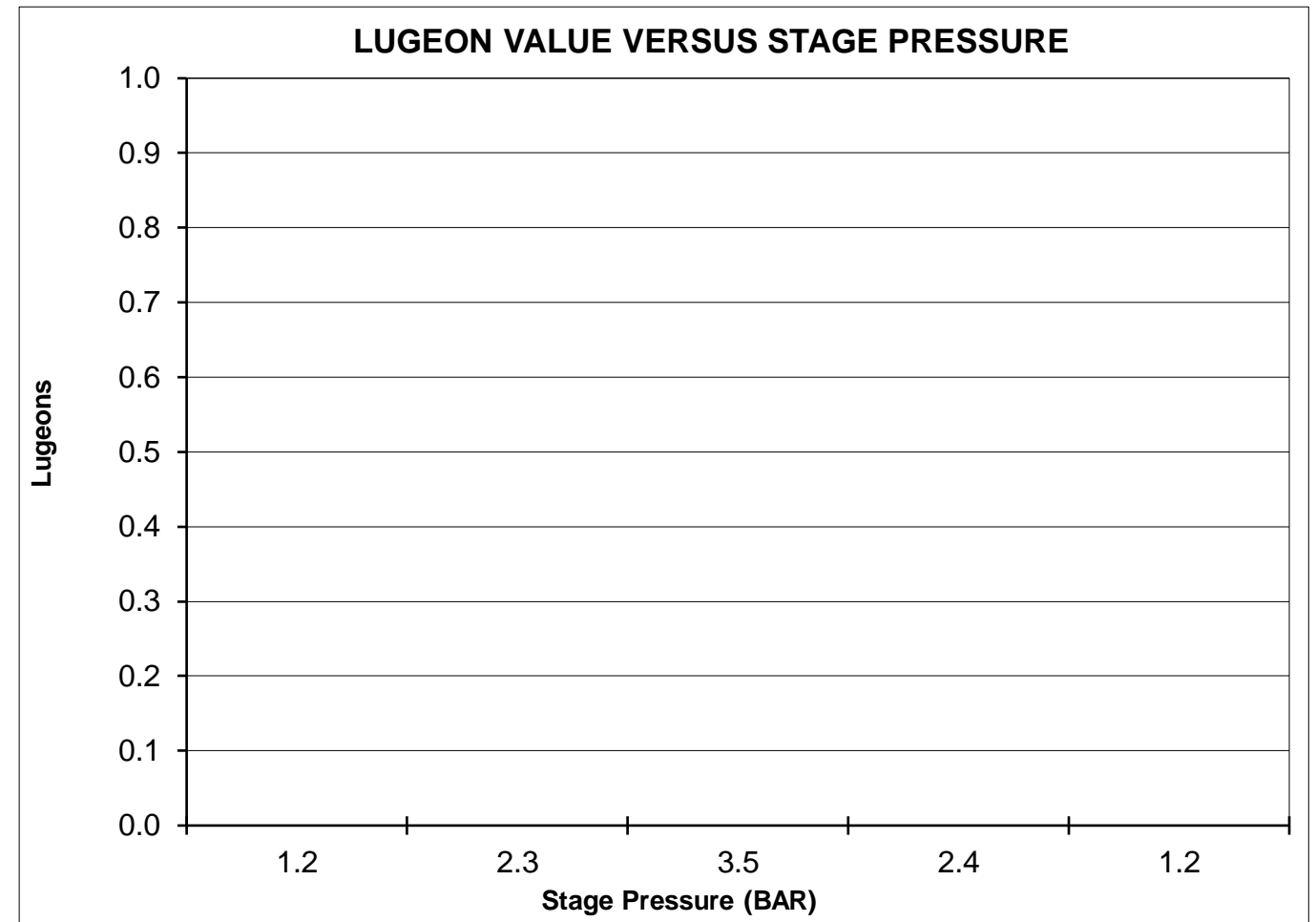
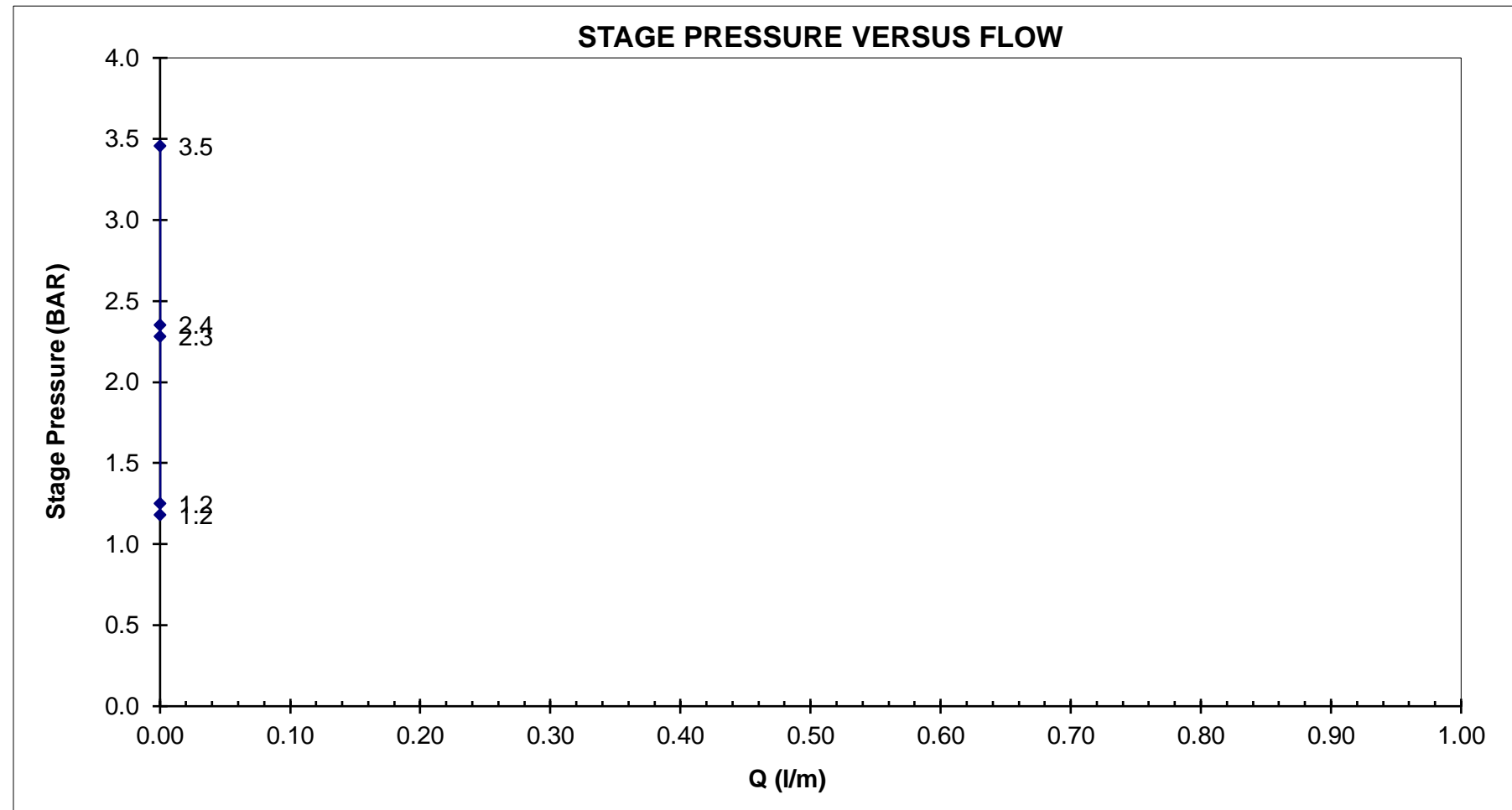
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 21-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 107.62 32.80 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.03	0.00	1.25	Flowmeter m3	10.49	10.49	10.49	10.49	10.49	10.49			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
2.07	0.00	2.28	Flowmeter m3	10.49	10.49	10.49	10.49	10.49	10.49			0.0	0.0
			Take litres		0.00	0.00	0.50	0.00	0.50				
			Average Take l/m		0.00	0.00	0.50	0.00	0.50				
3.24	0.00	3.46	Flowmeter m3	10.49	10.49	10.49	10.49	10.49	10.49			0.0	0.0
			Take litres		0.00	0.00	0.50	0.00	0.00				
			Average Take l/m		0.00	0.00	0.50	0.00	0.00				
2.14	0.00	2.35	Flowmeter m3	10.49	10.49	10.49	10.49	10.49	10.49			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
0.97	0.00	1.18	Flowmeter m3	10.49	10.49	10.49	10.49	10.49	10.49			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 2 PSI, P2 +/- 0.5 PSI, P3 +/- 1 PSI, P4 +/- 1 PSI, P5 +/- 2 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-002 - Lugeon Spreadsheet_r0.xlsx\TEST 5

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 1 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-003

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 0.3 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 17.17 5.23 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

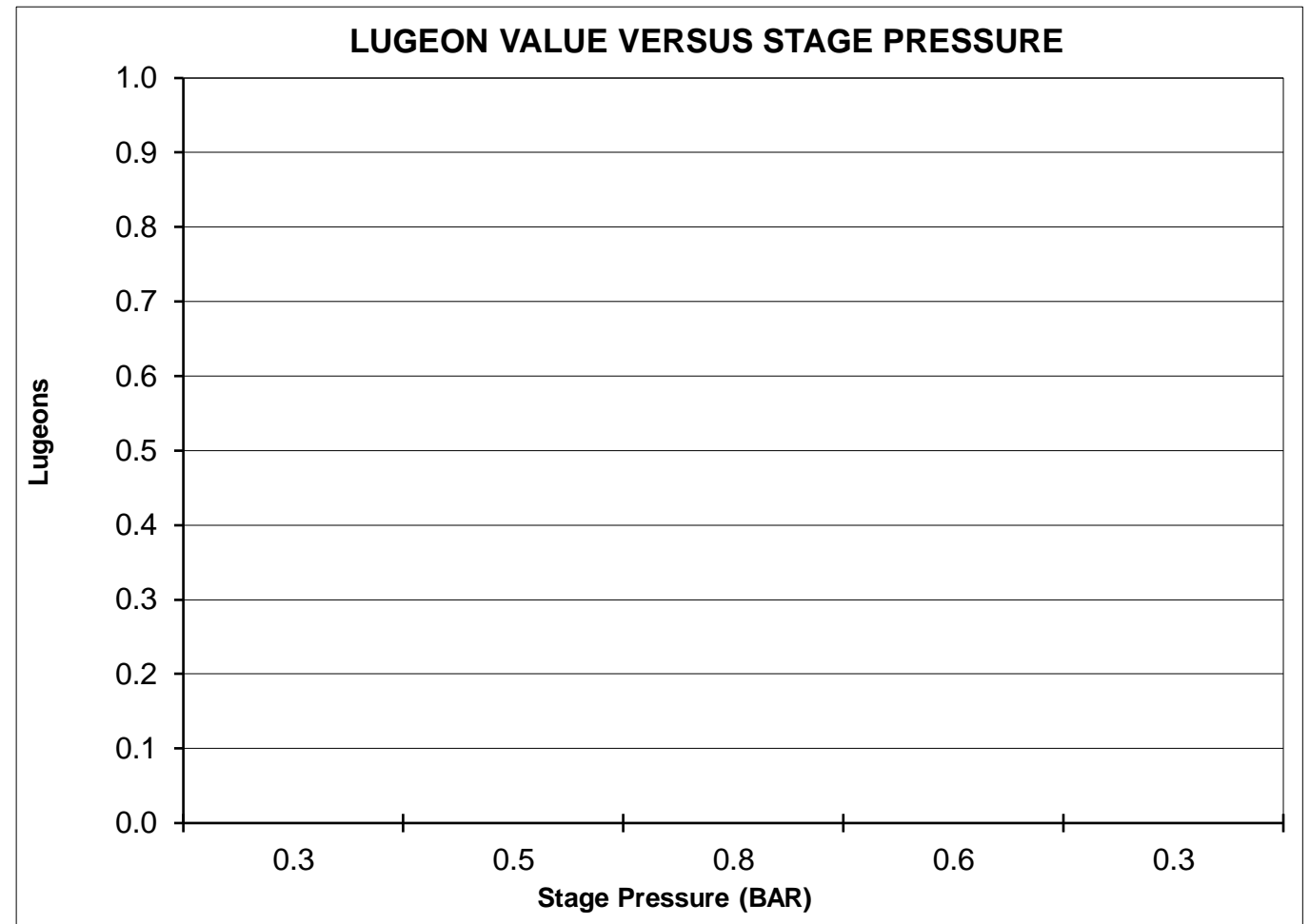
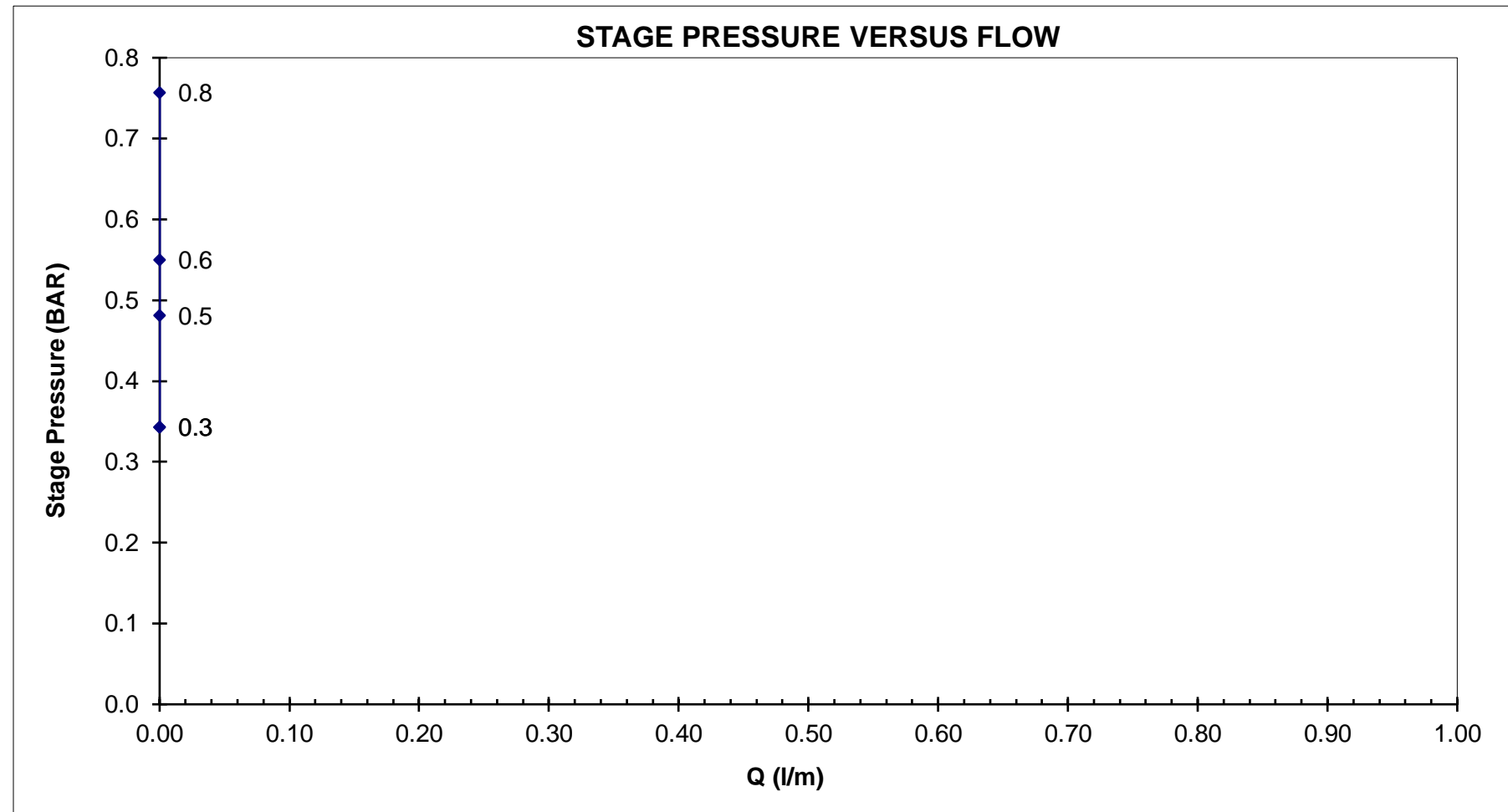
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 22-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 37.30 11.37 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.21	0.00	0.34	Flowmeter m3	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	0.0	0.0
			Take litres		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.50	0.00	0.00	0.00	0.00	0.00	0.00		
0.34	0.00	0.48	Flowmeter m3	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	0.0	0.0
			Take litres		0.00	0.50	0.00	0.50	0.00	0.50	0.00		
			Average Take l/m		0.00	0.50	0.00	0.50	0.00	0.50	0.00		
0.62	0.00	0.76	Flowmeter m3	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	0.0	0.0
			Take litres		0.00	0.50	0.50	0.00	0.50	0.00	0.00		
			Average Take l/m		0.00	0.50	0.50	0.00	0.50	0.00	0.00		
0.41	0.00	0.55	Flowmeter m3	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	0.0	0.0
			Take litres		0.50	0.00	0.50	0.00	0.00	0.00	0.00		
			Average Take l/m		0.50	0.00	0.50	0.00	0.00	0.00	0.00		
0.21	0.00	0.34	Flowmeter m3	10.52	10.52	10.52	10.52	10.52	10.52	10.52	10.52	0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.00	0.00	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 1.5 PSI, P2 +/- 3 PSI, P3 +/- 2 PSI, P4 +/- 2 PSI, P5 +/- 2 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 1

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 2 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-003

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 0.1 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 36.28 11.06 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

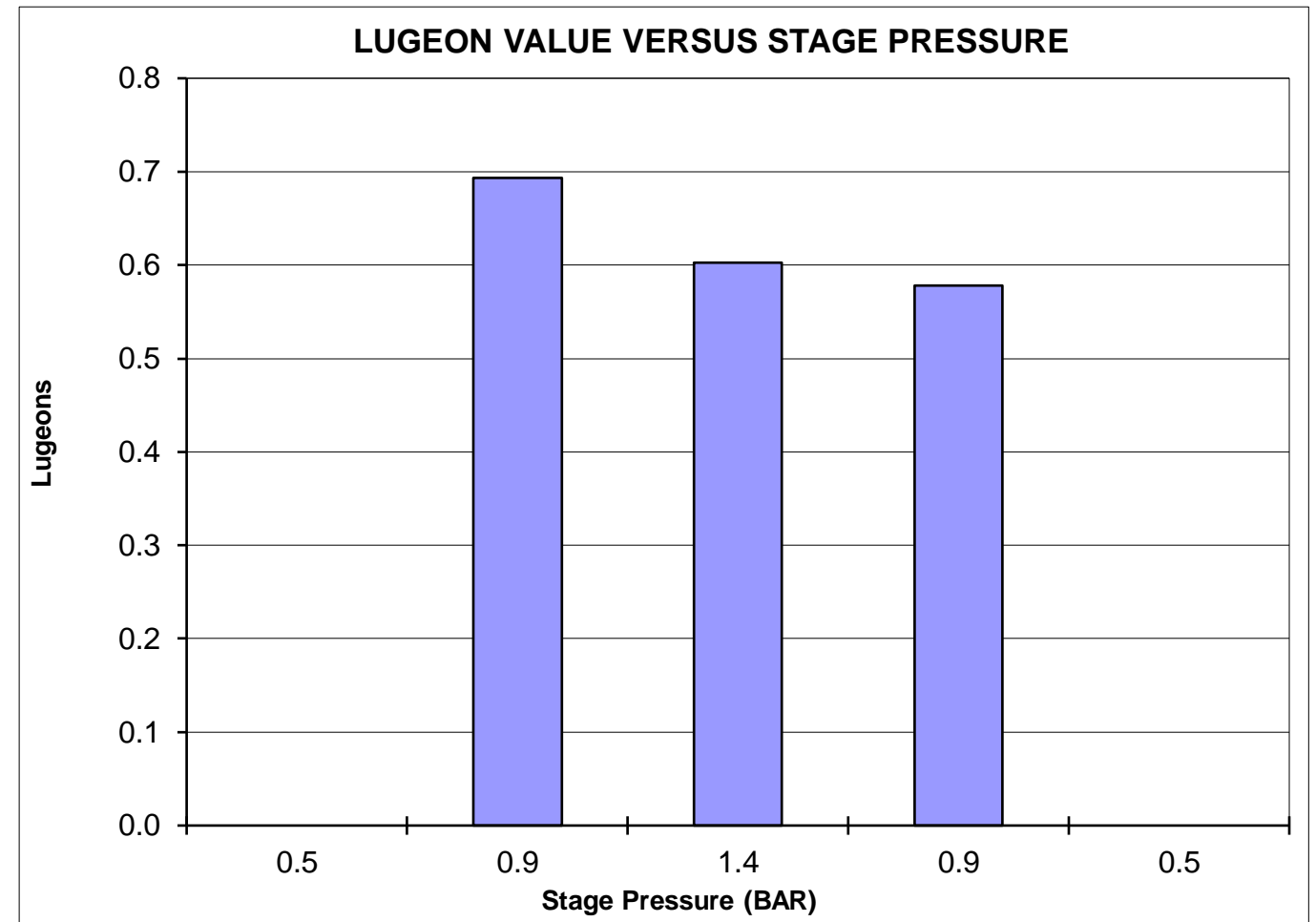
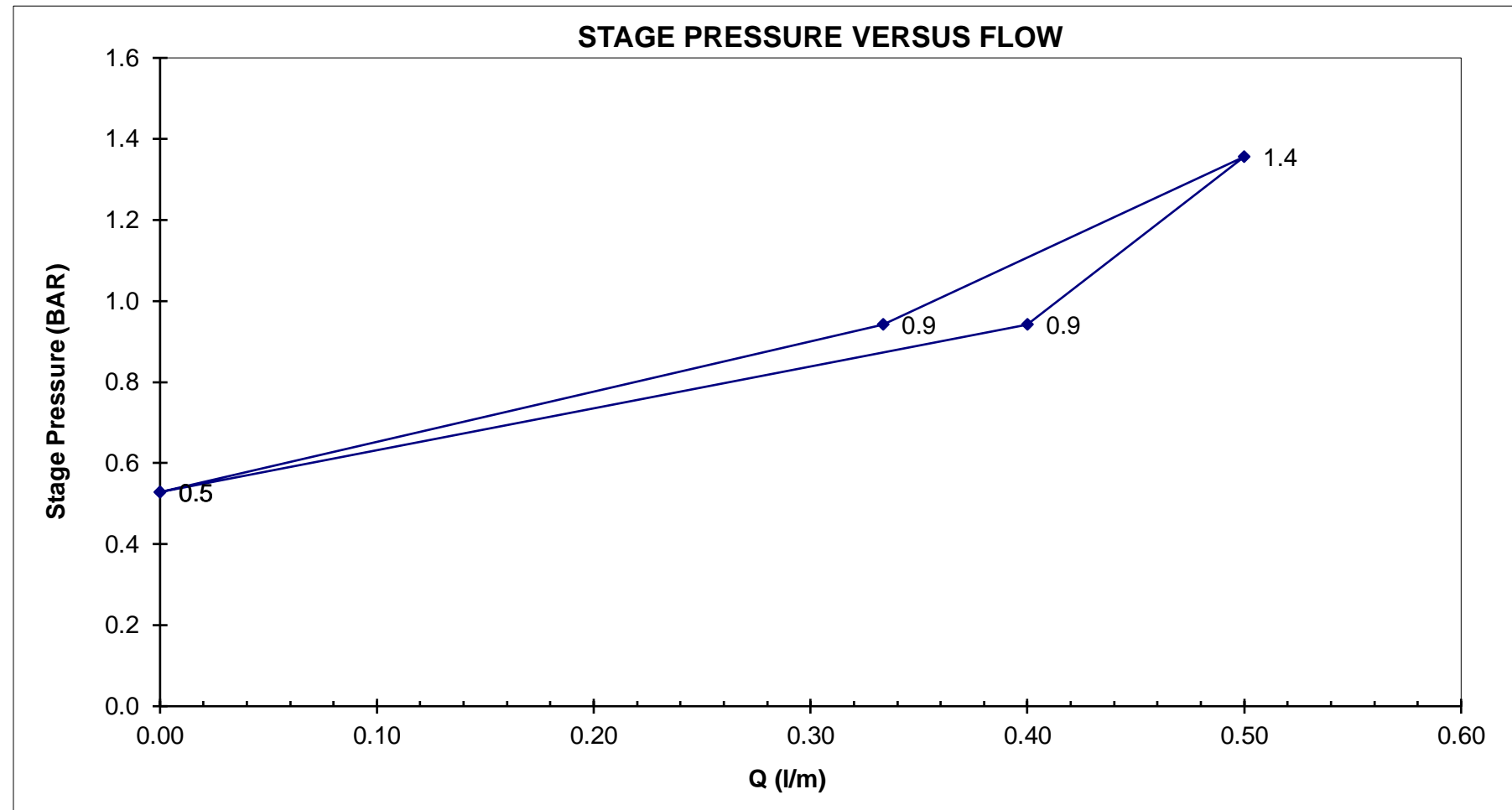
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 22-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 56.36 17.18 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.41	0.00	0.53	Flowmeter m3	10.54	10.54	10.54	10.54	10.54	10.54	0.00	0.00	0.0	0.0
			Take litres		0.50	0.00	0.50	0.00	0.00				
			Average Take l/m		0.50	0.00	0.50	0.00	0.00				
0.83	0.00	0.94	Flowmeter m3	10.54	10.54	10.55	10.55	10.55	10.55	0.00	0.00	0.4	0.7
			Take litres		0.50	0.50	0.00	0.50	0.50				
			Average Take l/m		0.50	0.50	0.00	0.50	0.50				
1.24	0.00	1.36	Flowmeter m3	10.55	10.55	10.55	10.55	10.55	10.55	10.55	0.00	0.5	0.6
			Take litres		0.00	0.50	0.50	0.50	0.50	0.50			
			Average Take l/m		0.00	0.50	0.50	0.50	0.50	0.50			
0.83	0.00	0.94	Flowmeter m3	10.55	10.55	10.55	10.55	10.55	10.55	10.55	0.00	0.3	0.6
			Take litres		0.00	0.50	0.50	0.00	0.50	0.50			
			Average Take l/m		0.00	0.50	0.50	0.00	0.50	0.50			
0.41	0.00	0.53	Flowmeter m3	10.55	10.55	10.55	10.55	10.55	10.55	10.55	10.55	0.0	0.0
			Take litres		0.00	0.50	0.50	0.00	0.50	0.00	0.00		
			Average Take l/m		0.00	0.50	0.50	0.00	0.50	0.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.4

K = 4.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 4.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.5 PSI, P2 +/- 1 PSI, P3 +/- 1 PSI, P4 +/- 1 PSI, P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 2

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-003

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 0.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 55.97 17.06 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

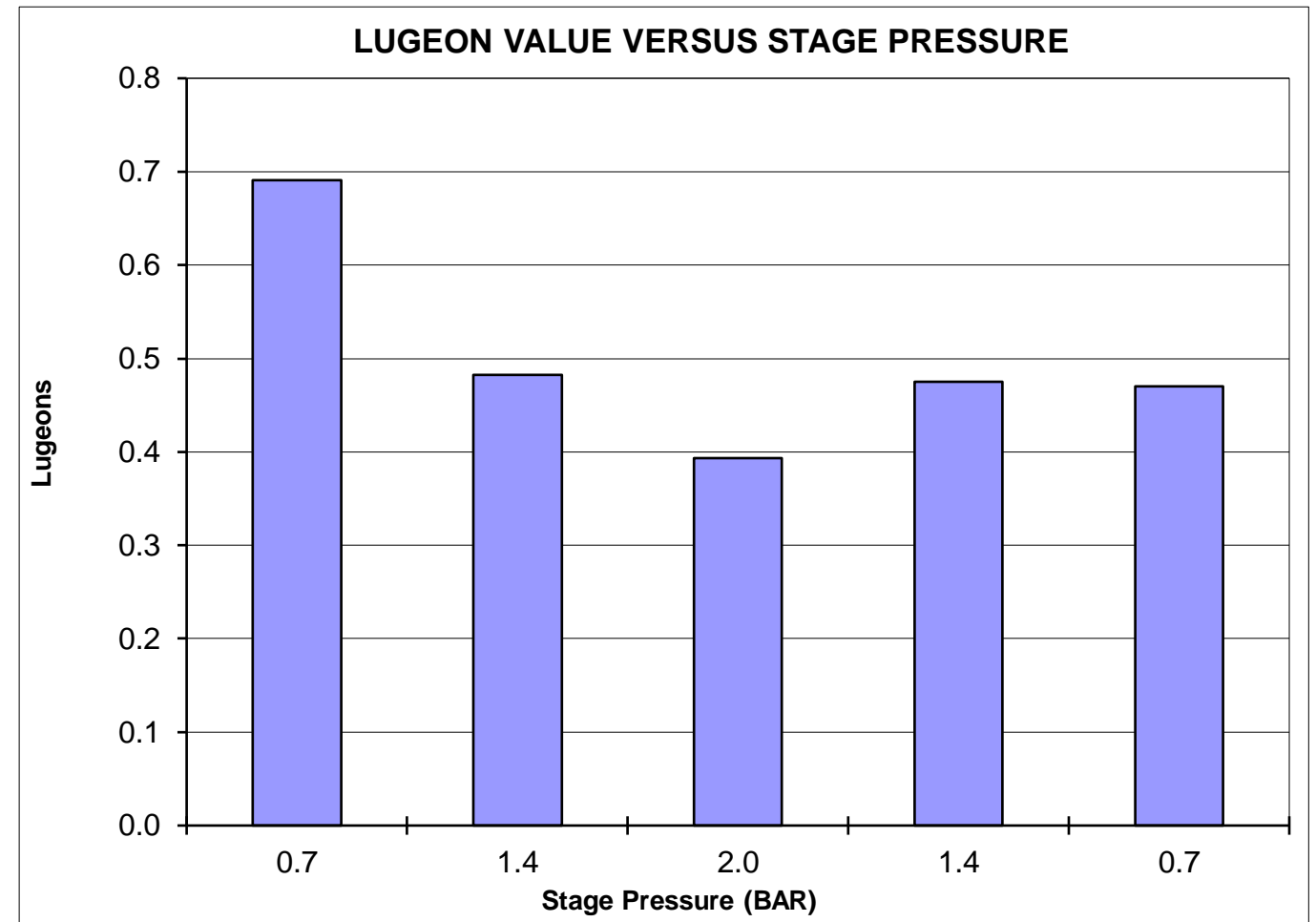
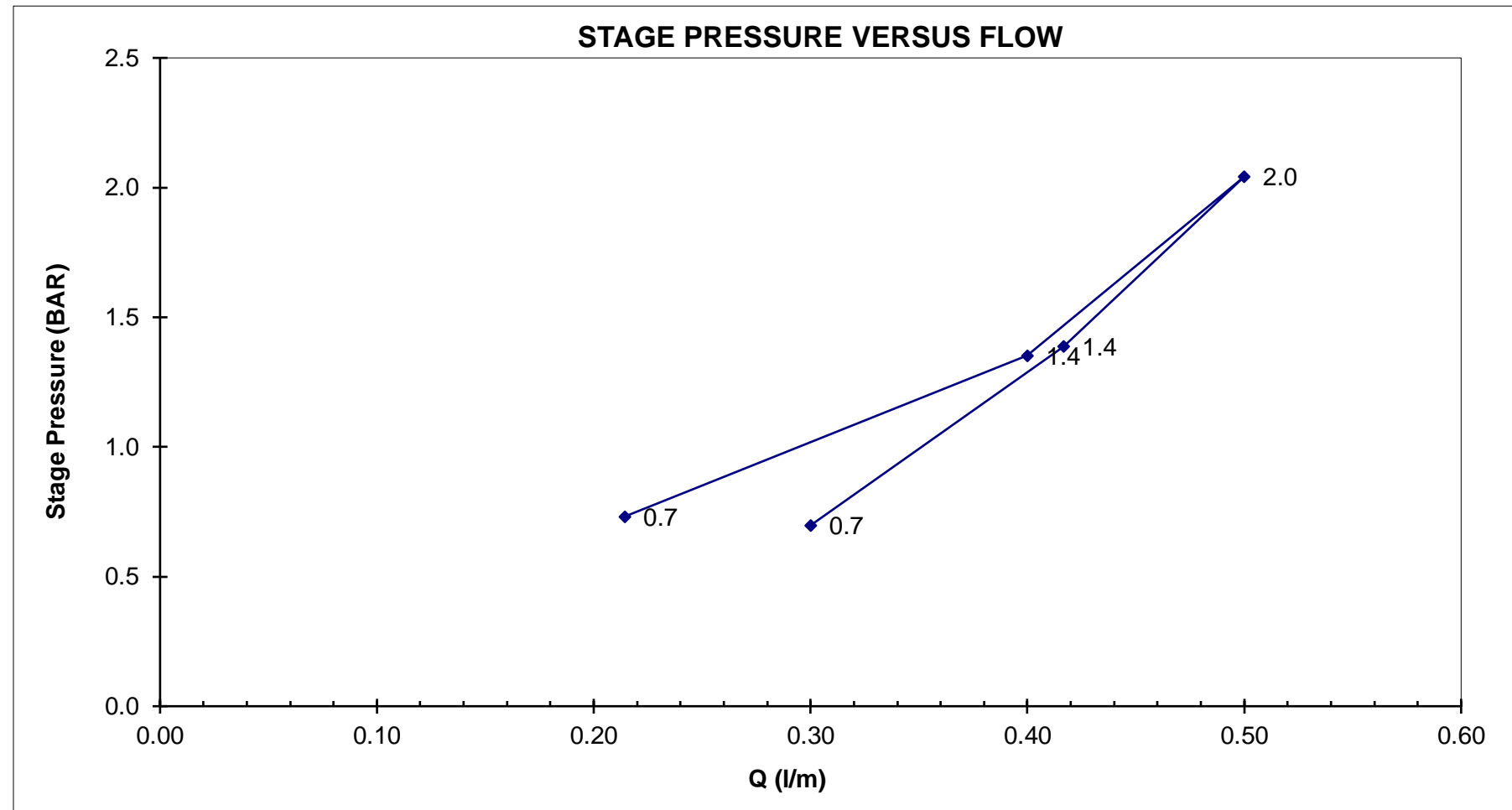
GAUGE HEIGHT ABOVE GROUND: 1.1 m

DATE: 22-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 76.41 23.29 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.59	0.00	0.70	Flowmeter m3	10.58	10.58	10.58	10.58	10.58	10.58				
			Take litres		0.00	0.50	0.50	0.00	0.50			0.3	0.7
			Average Take l/m			0.00	0.50	0.00	0.50				
1.28	0.00	1.39	Flowmeter m3	10.58	10.58	10.58	10.59	10.59	10.59	10.59	10.59	0.4	0.5
			Take litres		0.50	0.50	0.50	0.00	0.50	0.50			
			Average Take l/m		0.50	0.50	0.50	0.00	0.50	0.50			
1.93	0.00	2.04	Flowmeter m3	10.59	10.59	10.59	10.59	10.59	10.59			0.5	0.4
			Take litres		0.50	0.50	0.50	0.50	0.50				
			Average Take l/m		0.50	0.50	0.50	0.50	0.50				
1.24	0.00	1.35	Flowmeter m3	10.59	10.59	10.59	10.59	10.59	10.59			0.4	0.5
			Take litres		0.50	0.50	0.50	0.00	0.50				
			Average Take l/m		0.50	0.50	0.50	0.00	0.50				
0.62	0.00	0.73	Flowmeter m3	10.59	10.59	10.59	10.59	10.59	10.59	10.59	10.59	0.2	0.5
			Take litres		0.00	0.00	0.50	0.50	0.00	0.50	0.00		
			Average Take l/m		0.00	0.00	0.50	0.50	0.00	0.50	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.4

K = 4.E-06 cm/s

INTERPRETATION TYPE OF FLOW: TURBULENT

K = 4.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. NO SURGE TANK USED. SURGE TANK WAS NOT AVAILABLE ON SITE
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.5 PSI, P2 +/- 0.5 PSI, P3 +/- 1 PSI, P4 +/- 1 PSI, P5 +/- 1 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 3

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 4 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-003

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 4

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 1.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 71.49 21.79 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

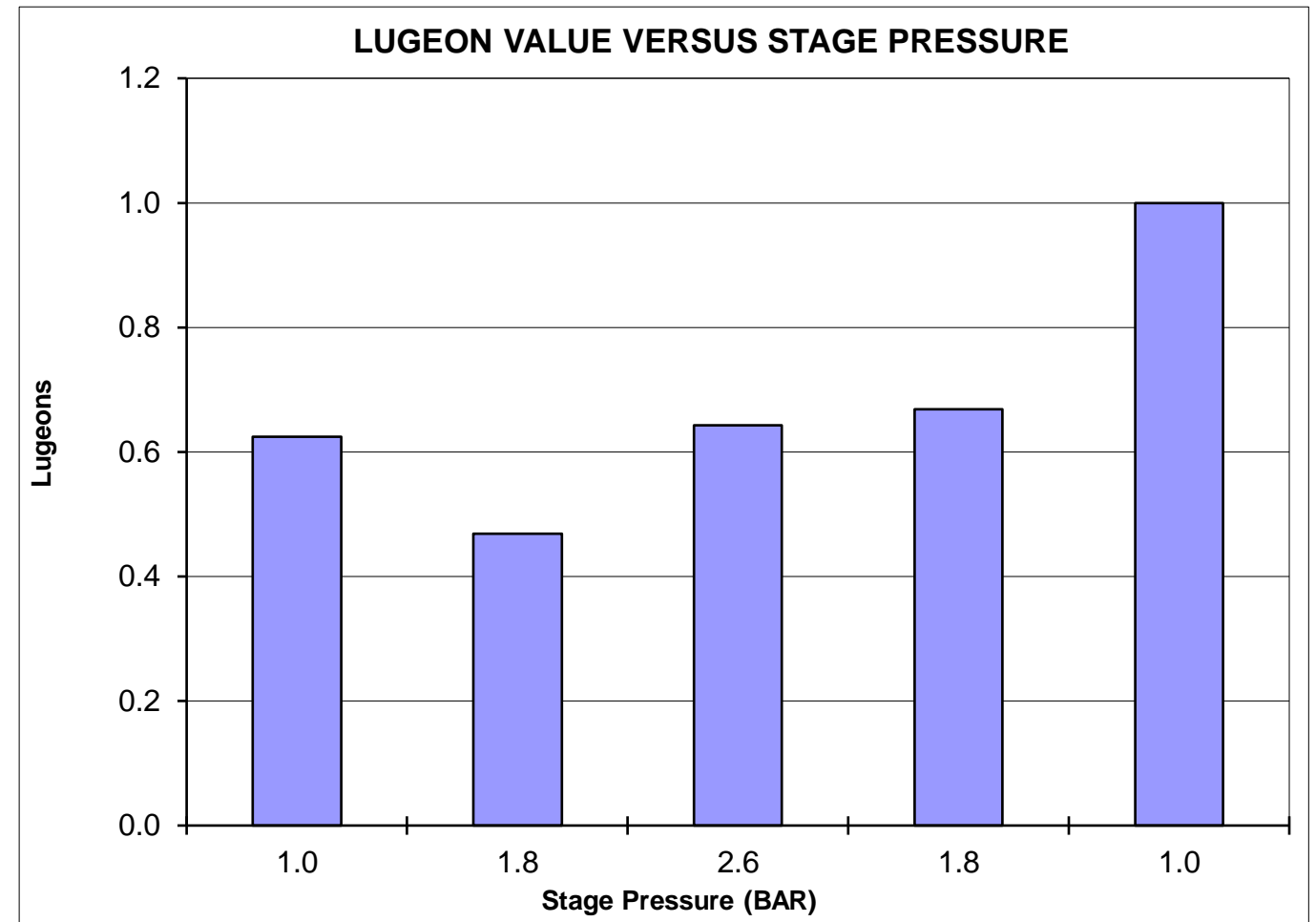
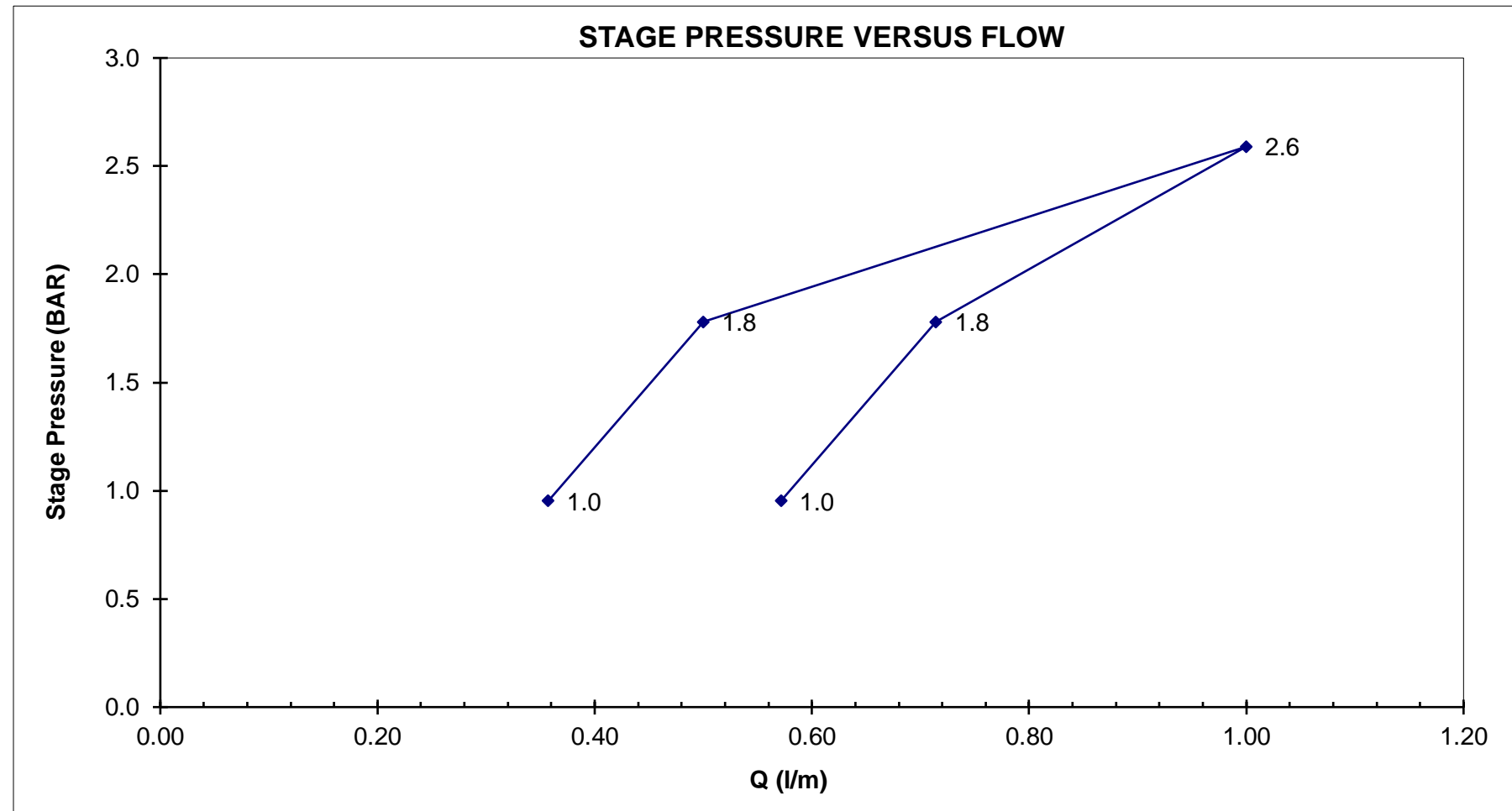
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 23-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 91.18 27.79 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
0.76	0.00	0.95	Flowmeter m3	10.60	10.60	10.60	10.60	10.60	10.60	10.60	10.60	0.4	0.6
			Take litres		0.50	0.00	0.50	0.50	0.50	0.00	0.50		
			Average Take l/m		0.50	0.00	0.50	0.50	0.50	0.00	0.50		
1.59	0.00	1.78	Flowmeter m3	10.60	10.60	10.60	10.61	10.61	10.61	10.61	10.61	0.5	0.5
			Take litres		0.50	0.50	0.50	0.50	0.50	1.00	0.00		
			Average Take l/m		0.50	0.50	0.50	0.50	0.50	1.00	0.00		
2.40	0.00	2.59	Flowmeter m3	10.61	10.61	10.62	10.62	10.62	10.62	10.62	10.62	1.0	0.6
			Take litres		0.50	1.50	1.50	0.50	1.50	1.00	0.50		
			Average Take l/m		0.50	1.50	1.50	0.50	1.50	1.00	0.50		
1.59	0.00	1.78	Flowmeter m3	10.62	10.62	10.62	10.63	10.63	10.63	10.63	10.63	0.7	0.7
			Take litres		1.00	0.50	0.50	1.00	1.00	0.50	0.50		
			Average Take l/m		1.00	0.50	0.50	1.00	1.00	0.50	0.50		
0.76	0.00	0.95	Flowmeter m3	10.63	10.63	10.63	10.63	10.63	10.63	10.63	10.63	0.6	1.0
			Take litres		0.50	1.00	0.50	0.50	0.50	1.00	0.00		
			Average Take l/m		0.50	1.00	0.50	0.50	0.50	1.00	0.00		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 1

K = 1.E-05 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 1.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.125 PSI, P2 +/- 0.25 PSI, P3 +/- 0.25 PSI, P4 +/- 0.25 PSI, P5 +/- 0.125 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0[MW16-003 - Lugeon Spreadsheet_r0.xlsx]TEST 4

REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 5 OF 5

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-003

AREA: Downstream of Bromley Humps TMF South Embankment

TEST NO: 5

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.8 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 88.42 26.95 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

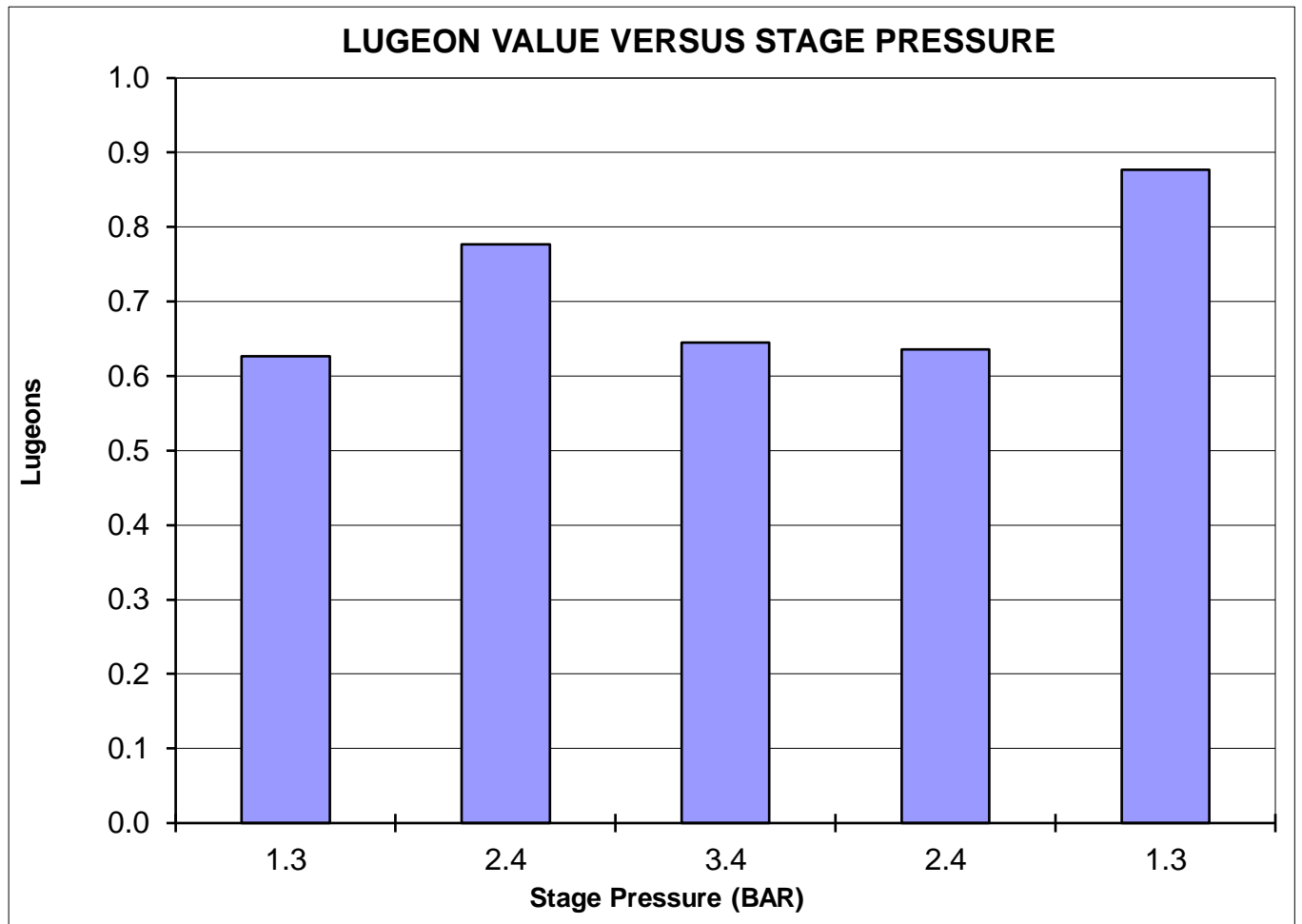
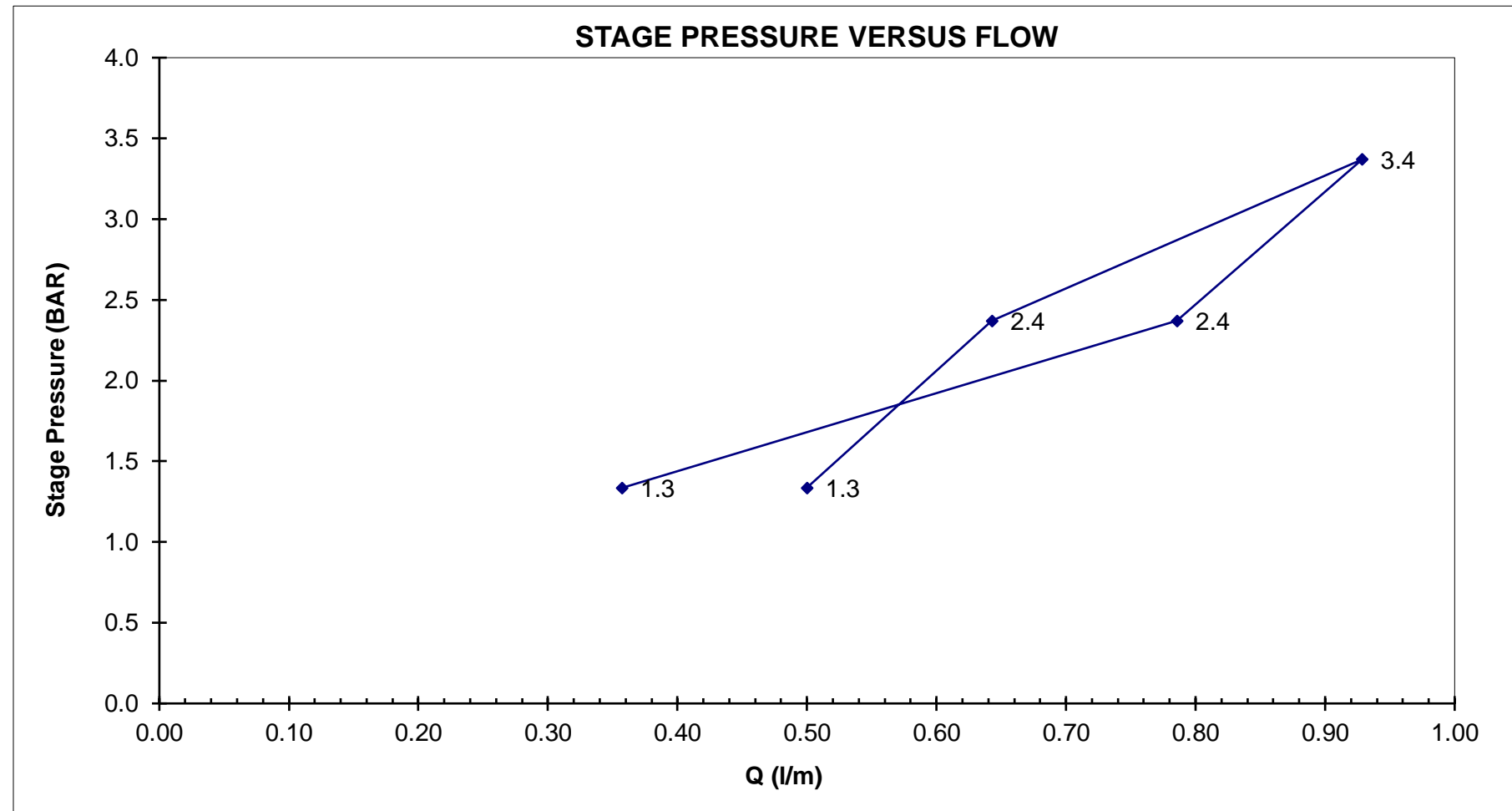
GAUGE HEIGHT ABOVE GROUND: 1.0 m

DATE: 23-Aug-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 102.43 31.22 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	Time (min)							FLOW litres/min	LUGEON	
				0	1	2	3	4	5	6			7
0.97	0.00	1.34	Flowmeter	10.64	10.64	10.64	10.64	10.64	10.64	10.64	10.64	0.4	0.6
			Take		1.00	0.00	0.00	0.50	0.50	0.00	0.50		
			Average Take		1.00	0.00	0.00	0.50	0.50	0.00	0.50		
2.00	0.00	2.37	Flowmeter	10.65	10.65	10.65	10.65	10.65	10.65	10.65	10.65	0.8	0.8
			Take		1.00	0.50	1.00	1.00	0.50	0.50	1.00		
			Average Take		1.00	0.50	1.00	1.00	0.50	0.50	1.00		
3.00	0.00	3.37	Flowmeter	10.66	10.66	10.66	10.66	10.66	10.66	10.67	10.67	0.9	0.6
			Take		1.00	2.00	0.50	0.50	1.00	0.50	1.00		
			Average Take		1.00	2.00	0.50	0.50	1.00	0.50	1.00		
2.00	0.00	2.37	Flowmeter	10.67	10.67	10.67	10.67	10.67	10.67	10.67	10.67	0.6	0.6
			Take		1.00	0.00	1.00	0.50	0.50	1.00	0.50		
			Average Take		1.00	0.00	1.00	0.50	0.50	1.00	0.50		
0.97	0.00	1.34	Flowmeter	10.67	10.67	10.67	10.68	10.68	10.68	10.68	10.68	0.5	0.9
			Take		0.50	0.50	0.50	0.50	0.50	0.50	0.50		
			Average Take		0.50	0.50	0.50	0.50	0.50	0.50	0.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 0.7

K = 7.E-06 cm/s

INTERPRETATION TYPE OF FLOW: LAMINAR

K = 7.E-08 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. SURGE TANK USED
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI, P2 +/- 0.25 PSI, P3 +/- 0.5 PSI, P4 +/- 0.25 PSI, P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-003 - Lugeon Spreadsheet_r0.xlsx\TEST 5

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREP'D	RVV'D

SHEET 1 OF 3

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-004

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 1

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: 2.2 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 100.14 30.52 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

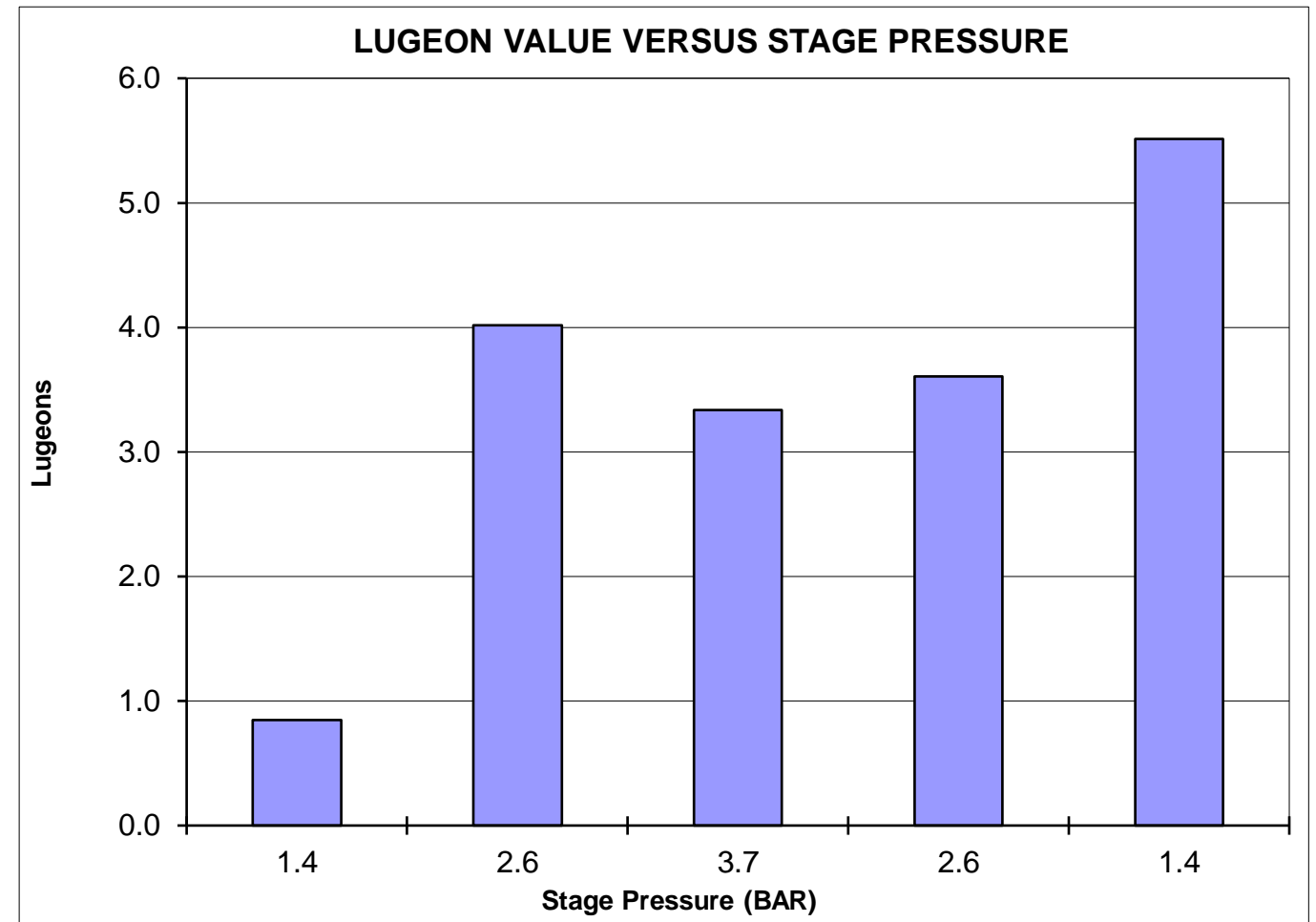
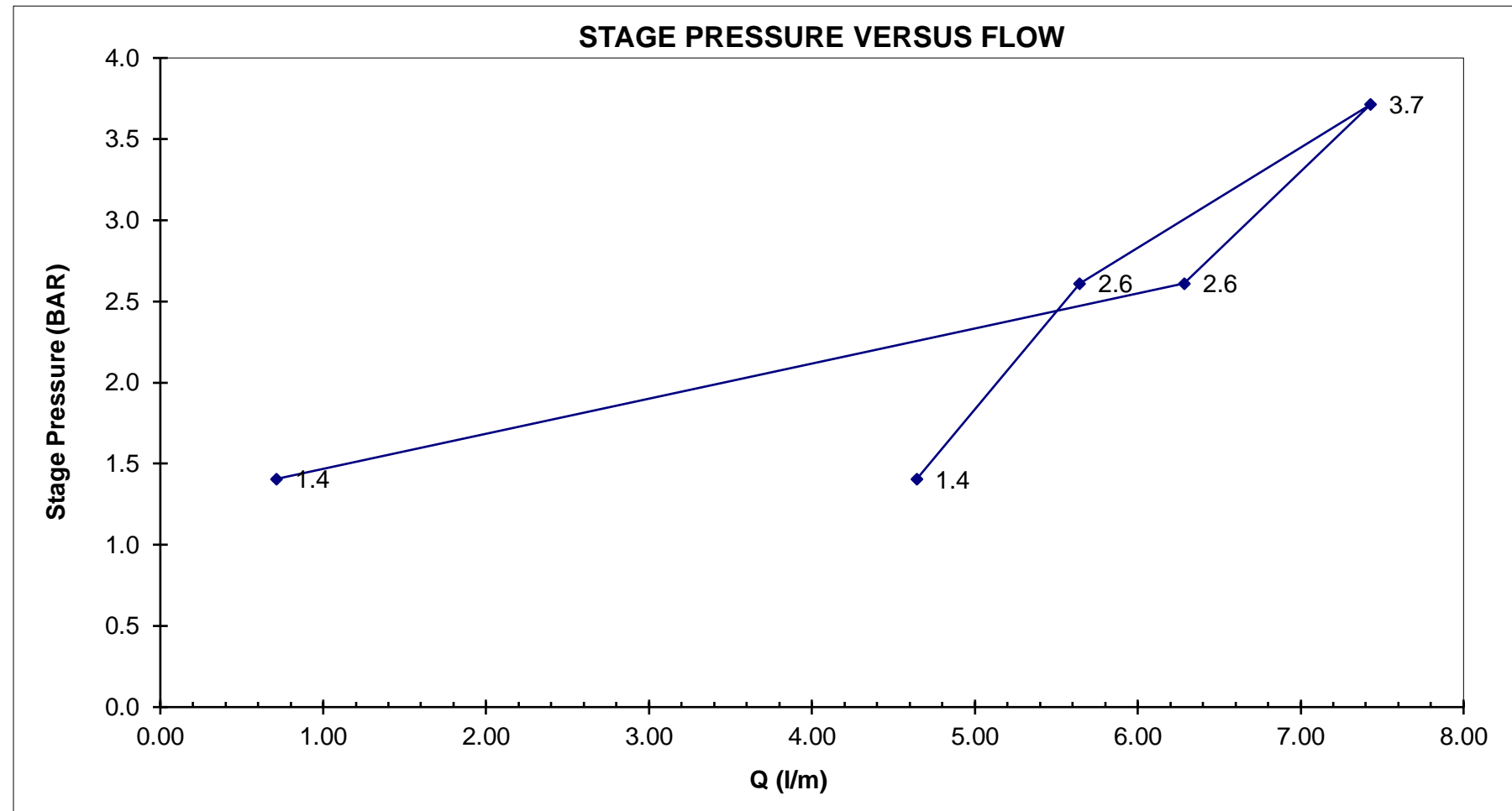
GAUGE HEIGHT ABOVE GROUND: 0.9 m

DATE: 01-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 119.82 36.52 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.10	0.00	1.41	Flowmeter m3	26.56	26.56	26.56	26.56	26.56	26.56	26.56	26.56	0.7	0.8
			Take litres		0.50	1.00	0.50	0.50	1.00	0.50	1.00		
			Average Take l/m		0.50	1.00	0.50	0.50	1.00	0.50	1.00		
2.31	0.00	2.61	Flowmeter m3	26.60	26.61	26.61	26.62	26.63	26.63	26.64	26.64	6.3	4.0
			Take litres		6.00	6.50	6.00	6.50	7.00	6.00	6.00		
			Average Take l/m		6.00	6.50	6.00	6.50	7.00	6.00	6.00		
3.41	0.00	3.71	Flowmeter m3	26.67	26.68	26.69	26.70	26.70	26.71	26.72	26.73	7.4	3.3
			Take litres		7.50	7.50	7.00	7.50	7.50	7.50	7.50		
			Average Take l/m		7.50	7.50	7.00	7.50	7.50	7.50	7.50		
2.31	0.00	2.61	Flowmeter m3	26.75	26.76	26.76	26.77	26.77	26.78	26.79	26.79	5.6	3.6
			Take litres		6.00	5.50	5.50	6.00	5.50	6.00	5.00		
			Average Take l/m		6.00	5.50	5.50	6.00	5.50	6.00	5.00		
1.10	0.00	1.40	Flowmeter m3	26.80	26.81	26.81	26.81	26.82	26.82	26.83	26.83	4.6	5.5
			Take litres		5.00	4.50	4.50	4.50	4.50	5.00	4.50		
			Average Take l/m		5.00	4.50	4.50	4.50	4.50	5.00	4.50		



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = 6

K = 6.E-05 cm/s

INTERPRETATION TYPE OF FLOW: WASH-OUT

K = 6.E-07 m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 0.25 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0.5 PSI; P5 +/- 0.25 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. SURGE TANK USED

TEST BY: CAG

ANALYZED BY: CAG

REVIEWED BY: CHS

M:\1101\00594\02\A\Data\300 - Site Investigation Program\Hydraulic Conductivity Testing\3-REV 0\MW16-004 - Lugeon Spreadsheet_r0.xlsx\TEST 1

0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS
REV	DATE	DESCRIPTION	PREPD	RVV'D

SHEET 2 OF 3

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-004

AREA: Downstream of Bromley Humps TMF North Embankment

TEST NO: 2

NOMINAL HOLE SIZE (OF INTERVAL): HQ

DEPTH OF GROUNDWATER BELOW SURFACE: 0.6 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 112.57 34.31 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

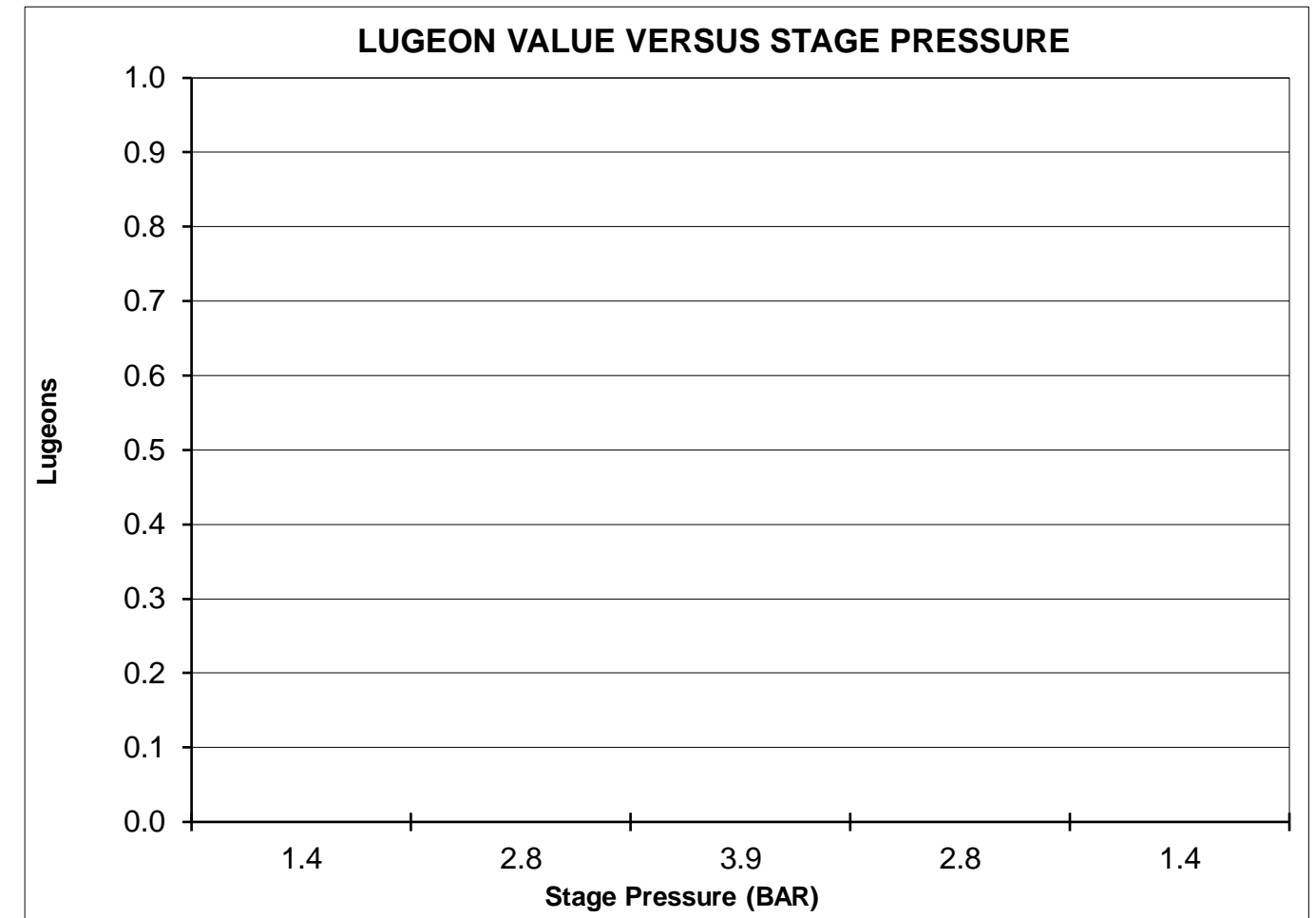
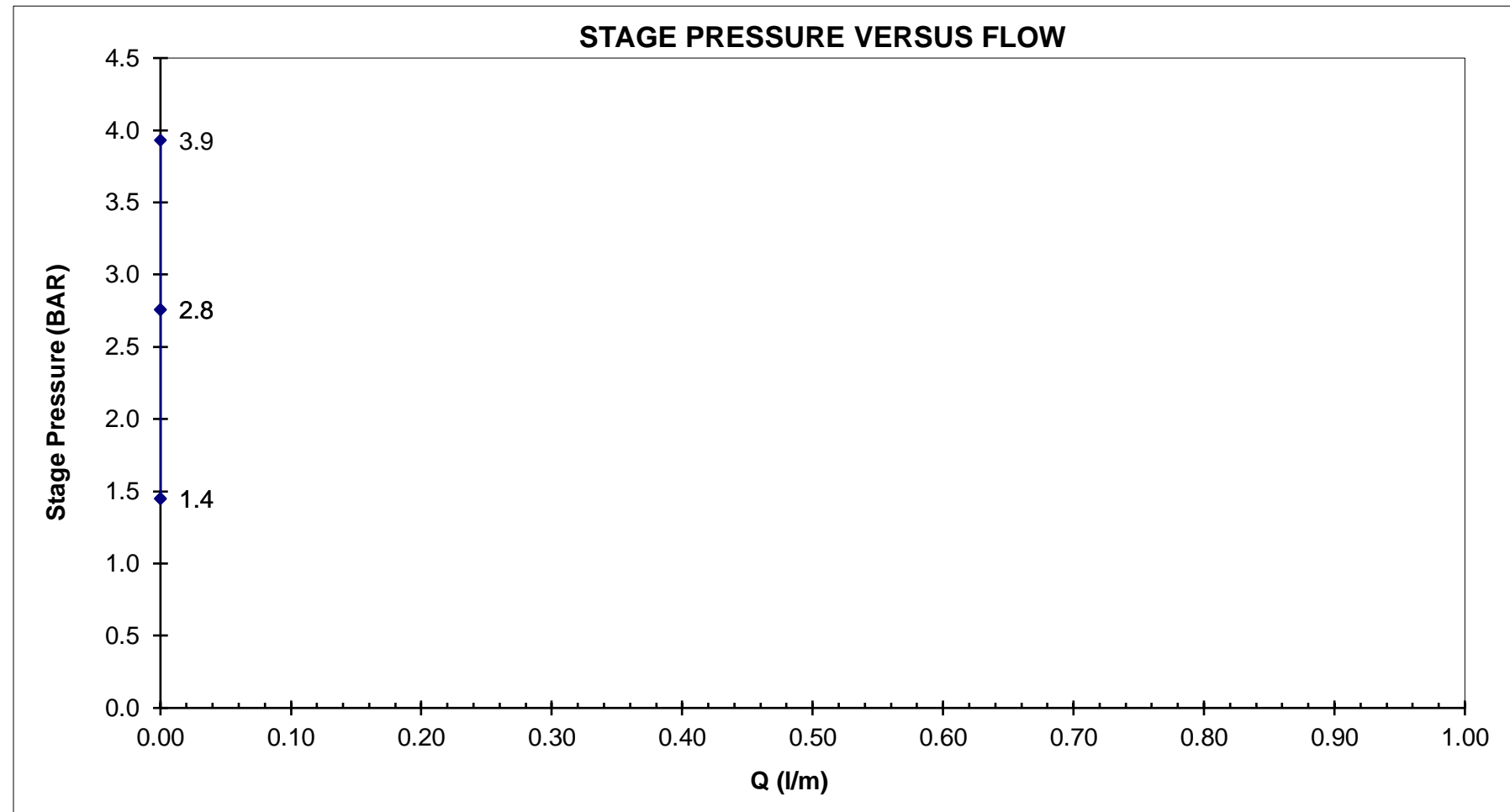
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 01-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 132.71 40.45 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.31	0.00	1.45	Flowmeter m3	25.86	25.86	25.86	25.86	25.86	25.86				
			Take litres		0.00	0.00	0.00	0.00	0.00			0.0	0.0
			Average Take l/m			0.00	0.00	0.00	0.00				
2.62	0.00	2.76	Flowmeter m3	26.86	26.86	26.86	26.86	26.86	26.86	26.86	26.86		
			Take litres		0.00	0.50	0.00	0.00	0.00	0.00	0.50		
			Average Take l/m			0.00	0.50	0.00	0.00	0.00	0.50		
3.79	0.00	3.93	Flowmeter m3	26.86	26.86	26.86	26.86	26.86	26.86				
			Take litres		0.00	0.50	0.00	0.50	0.50				
			Average Take l/m			0.00	0.50	0.50	0.50				
2.62	0.00	2.76	Flowmeter m3	26.86	26.86	26.86	26.86	26.86	26.86				
			Take litres		0.00	0.00	0.00	0.50	0.00				
			Average Take l/m			0.00	0.00	0.50	0.00				
1.31	0.00	1.45	Flowmeter m3	26.86	26.86	26.86	26.86	26.86	26.86				
			Take litres		0.00	0.00	0.50	0.00	0.00				
			Average Take l/m			0.00	0.50	0.00	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 0 PSI; P2 +/- 0.5 PSI; P3 +/- 0.5 PSI; P4 +/- 0 PSI; P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. SURGE TANK USED

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP'D	RVV'D
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS

SHEET 3 OF 3

LUGEON TEST FIELD DATA SHEET



PROJECT: RED MOUNTAIN PROJECT

PROJECT NO: VA101-594/02

DRILLHOLE: MW16-004

AREA: Downstream of TMF North Embankment

TEST NO: 3

NOMINAL HOLE SIZE (OF INTERVAL): HQ3

DEPTH OF GROUNDWATER BELOW SURFACE: -1.0 m

DIP: 90 (FROM HORIZONTAL)

TOP OF TEST INTERVAL: 129.46 39.46 ft (DOWNHOLE) n (DOWNHOLE)

PACKER TYPE: Nitrogen

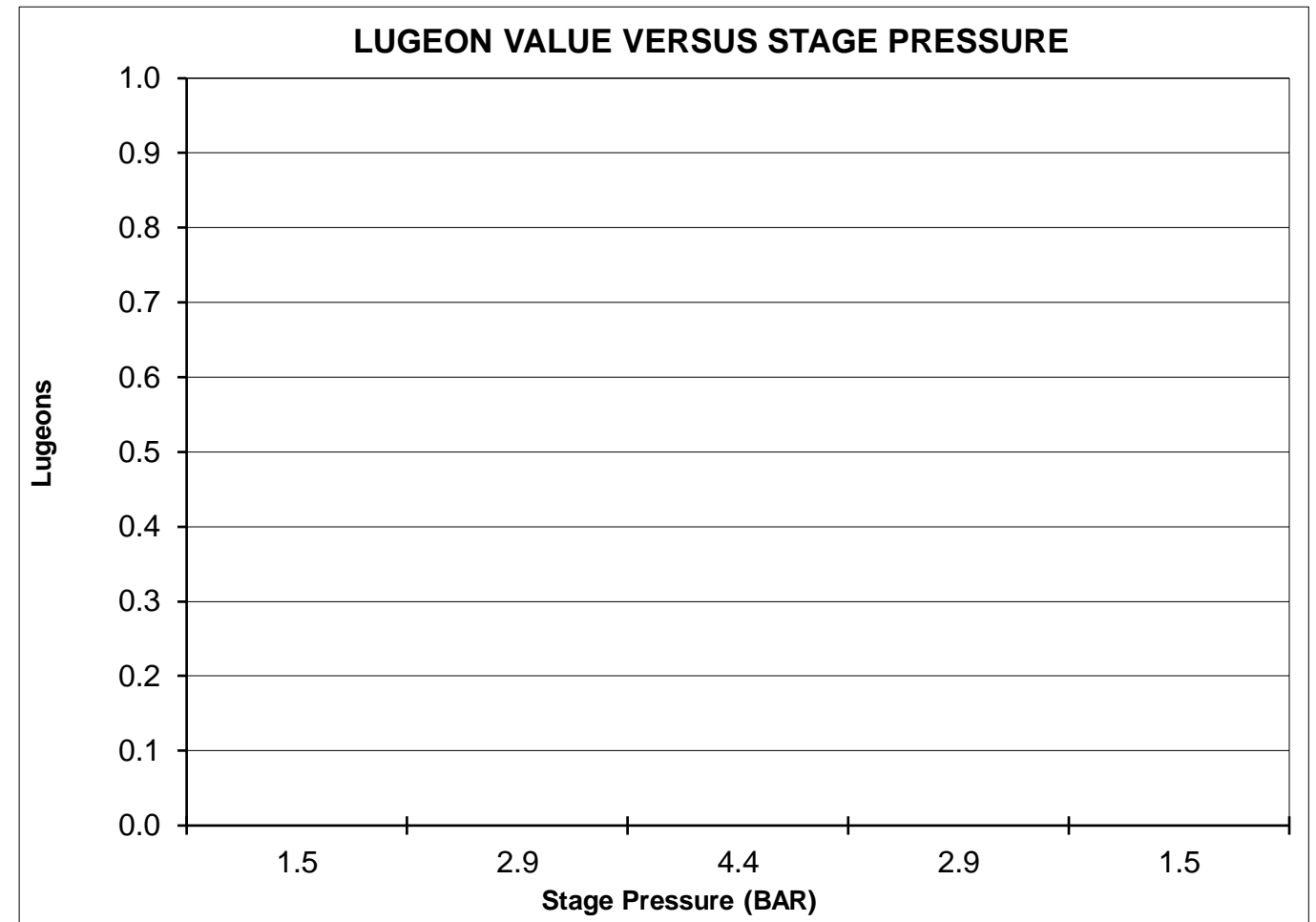
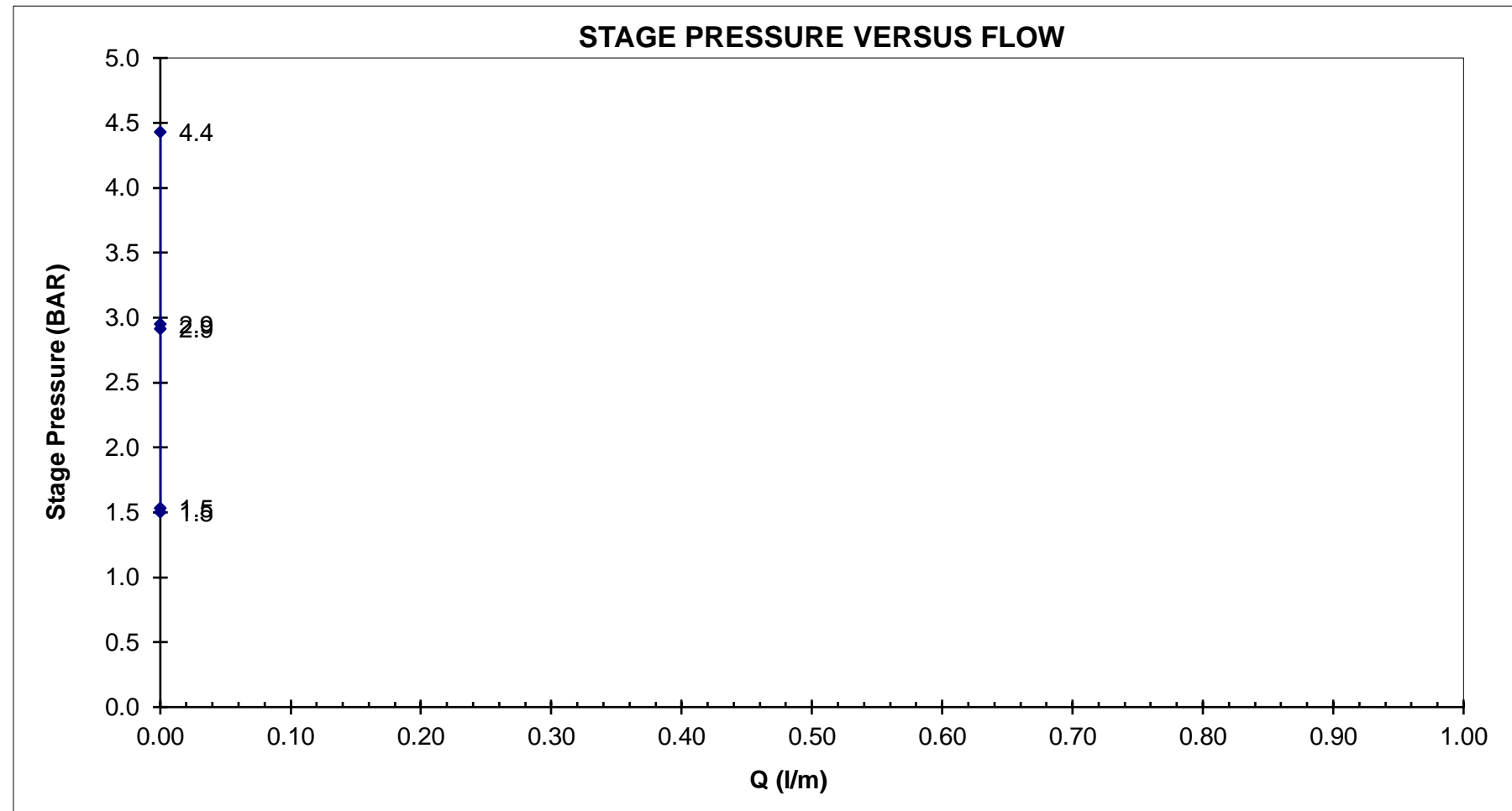
GAUGE HEIGHT ABOVE GROUND: 0.8 m

DATE: 01-Sep-16

UNITS OF FLOWMETER: m3

BOTTOM OF TEST INTERVAL: 149.61 45.60 ft (DOWNHOLE) n (DOWNHOLE)

GAUGE PRESSURE (BAR)	HEAD LOSS (BAR)	CORRECTED PRESSURE (BAR)	Time min	0	1	2	3	4	5	6	7	FLOW litres/min	LUGEON
1.55	0.00	1.53	Flowmeter m3	26.91	26.91	26.91	26.91	26.91	26.91			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
2.93	0.00	2.91	Flowmeter m3	26.91	26.91	26.91	26.91	26.91	26.91	26.91	26.91	0.0	0.0
			Take litres		0.00	0.00	0.00	0.50	0.00	0.00	0.00		
			Average Take l/m		0.00	0.00	0.00	0.50	0.00	0.00	0.00		
4.45	0.00	4.43	Flowmeter m3	26.91	26.91	26.91	26.91	26.91	26.91			0.0	0.0
			Take litres		0.00	0.50	0.00	0.00	0.00				
			Average Take l/m		0.00	0.50	0.00	0.00	0.00				
2.97	0.00	2.95	Flowmeter m3	26.91	26.91	26.91	26.91	26.91	26.91			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				
1.52	0.00	1.50	Flowmeter m3	26.91	26.91	26.91	26.91	26.91	26.91			0.0	0.0
			Take litres		0.00	0.00	0.00	0.00	0.00				
			Average Take l/m		0.00	0.00	0.00	0.00	0.00				



DEPTH TO GROUNDWATER MEASURED BEFORE TEST? IF NOT, DETERMINED BY: Yes

DRILLING FLUIDS USED / TIME FOR FLUSHING: Drilling with water, flushed for 10 minutes

Lu = NO TAKE

K = NO TAKE cm/s

INTERPRETATION TYPE OF FLOW: NO TAKE

K = NO TAKE m/s

TYPES OF FLOW:	LAMINAR	DILATION
	TURBULENT	WASH-OUT
	VOID FILLING	NO TAKE

DRILLING/PACKER TEST/RESULTS COMMENTS:
 1. NO LEAKS OBSERVED
 2. PRESSURE GAUGE NOISE: P1 +/- 0 PSI; P2 +/- 0 PSI; P3 +/- 0.5 PSI; P4 +/- 0 PSI; P5 +/- 0.5 PSI; USED AVERAGE PRESSURE IN ANALYSIS
 3. FLOWS BETWEEN 63 AND 100 L/min USED TO DEVELOP A HEAD LOSS VERSUS FLOW RATE CURVE FOR PACKER TOOL. HEAD LOSS FOR FLOWS LESS THAN 63 AND GREATER THAN 100 L/min EXTRAPOLATED FROM CURVE.
 4. WATER LEVEL ABOVE GROUND SURFACE 20 MINUTES AFTER DRILLING
 5. SURGE TANK USED

TEST BY: MEA

ANALYZED BY: MEA

REVIEWED BY: CHS

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REV	DATE	DESCRIPTION	PREP	CHKD
0	29JUN17	ISSUED WITH REPORT VA101-594/02-1	MEA/CAG	CHS