APPENDIX A

NOTES RELATING TO THIS REPORT
BOREHOLE LOGS (BORES 1 TO 8, 10, 11, 15, 201, 202, 301, 303 AND 305)
GEOPHYSICAL LOGS BORES 201, 202, 301, 303 AND 305
CORE PHOTOPLATES
TABLE A1 – PERCUSSION BORE RESULTS

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NOTES RELATING TO THIS REPORT

Introduction

These notes have been provided to amplify the geotechnical report in regard to classification methods, specialist field procedures and certain matters relating to the Discussion and Comments section. Not all, of course, are necessarily relevant to all reports.

Geotechnical reports are based on information gained from limited subsurface test boring and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard 1726, Geotechnical Site Investigations Code. In general, descriptions cover the following properties - strength or density, colour, structure, soil or rock type and inclusions.

Soil types are described according to the predominating particle size, qualified by the grading of other particles present (eg. sandy clay) on the following bases:

Soil Classification	Particle Size
Clay	less than 0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.06 to 2.00 mm
Gravel	2.00 to 60.00 mm

Cohesive soils are classified on the basis of strength either by laboratory testing or engineering examination. The strength terms are defined as follows.

Classification	Undrained Shear Strength kPa
Very soft	less than 12
Soft	12—25
Firm	25—50
Stiff	50—100
Very stiff	100—200
Hard	Greater than 200

Non-cohesive soils are classified on the basis of relative density, generally from the results of standard penetration tests (SPT) or Dutch cone penetrometer tests (CPT) as below:

Relative Density	SPT "N" Value (blows/300 mm)	CPT Cone Value (q_c — MPa)
Very loose	less than 5	less than 2
Loose	5—10	2—5
Medium dense	10—30	5—15
Dense	30—50	15—25
Very dense	greater than 50	greater than 25

Rock types are classified by their geological names. Where relevant, further information regarding rock classification is given on the following sheet.

Sampling

Sampling is carried out during drilling to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing with a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Details of the type and method of sampling are given in the report.

Drilling Methods.

The following is a brief summary of drilling methods currently adopted by the Company and some comments on their use and application.

Test Pits — these are excavated with a backhoe or a tracked excavator, allowing close examination of the in-situ soils if it is safe to descent into the pit. The depth of penetration is limited to about 3 m for a backhoe and up to 6 m for an excavator. A potential disadvantage is the disturbance caused by the excavation.

Large Diameter Auger (eg. Pengo) — the hole is advanced by a rotating plate or short spiral auger, generally 300 mm or larger in diameter. The cuttings are returned to the surface at intervals (generally of not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube sampling.

Continuous Sample Drilling — the hole is advanced by pushing a 100 mm diameter socket into the ground and withdrawing it at intervals to extrude the sample. This is the most reliable method of drilling in soils, since moisture content is unchanged and soil structure, strength, etc. is only marginally affected.

Continuous Spiral Flight Augers — the hole is advanced using 90—115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and in sands above the water

table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are very disturbed and may be contaminated. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively lower reliability, due to remoulding, contamination or softening of samples by ground water.

Non-core Rotary Drilling — the hole is advanced by a rotary bit, with water being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from 'feel' and rate of penetration.

Rotary Mud Drilling — similar to rotary drilling, but using drilling mud as a circulating fluid. The mud tends to mask the cuttings and reliable identification is again only possible from separate intact sampling (eg. from SPT).

Continuous Core Drilling — a continuous core sample is obtained using a diamond-tipped core barrel, usually 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in very weak rocks and granular soils), this technique provides a very reliable (but relatively expensive) method of investigation.

Standard Penetration Tests

Standard penetration tests (abbreviated as SPT) are used mainly in non-cohesive soils, but occasionally also in cohesive soils as a means of determining density or strength and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, "Methods of Testing Soils for Engineering Purposes" — Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of say 4, 6 and 7

  as 4, 6, 7
  N = 13

- In the case where the test is discontinued short of full penetration, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm

  as 15, 30/40 mm.

The results of the tests can be related empirically to the engineering properties of the soil.

Occasionally, the test method is used to obtain samples in 50 mm diameter thin walled sample tubes in clays. In such circumstances, the test results are shown on the borelogs in brackets.

Cone Penetrometer Testing and Interpretation

Cone penetrometer testing (sometimes referred to as Dutch cone — abbreviated as CPT) described in this report has been carried out using an electrical friction cone penetrometer. The test is described in Australian Standard 1289, Test 6.4.1.

In the tests, a 35 mm diameter rod with a cone-tipped end is pushed continuously into the soil, the reaction being provided by a specially designed truck or rig which is fitted with an hydraulic ram system. Measurements are made of the end bearing resistance on the cone and the friction resistance on a separate 130 mm long sleeve, immediately behind the cone. Transducers in the tip of the assembly are connected by electrical wires passing through the centre of the push rods to an amplifier and recorder unit mounted on the control truck.

As penetration occurs (at a rate of approximately 20 mm per second) the information is plotted on a computer screen and at the end of the test is stored on the computer for later plotting of the results.

The information provided on the plotted results comprises: —

- Cone resistance — the actual end bearing force divided by the cross sectional area of the cone — expressed in MPa.
- Sleeve friction — the frictional force on the sleeve divided by the surface area — expressed in kPa.
- Friction ratio — the ratio of sleeve friction to cone resistance, expressed in percent.

There are two scales available for measurement of cone resistance. The lower scale (0—5 MPa) is used in very soft soils where increased sensitivity is required and is shown in the graphs as a dotted line. The main scale (0—50 MPa) is less sensitive and is shown as a full line.

The ratios of the sleeve friction to cone resistance will vary with the type of soil encountered, with higher relative friction in clays than in sands. Friction ratios of 1%—2% are commonly encountered in sands and very soft clays rising to 4%—10% in stiff clays.

In sands, the relationship between cone resistance and SPT value is commonly in the range:—

q_c (MPa) = (0.4 to 0.6) N (blows per 300 mm)

In clays, the relationship between undrained shear strength and cone resistance is commonly in the range:—

q_c = (12 to 18) c_u

Interpretation of CPT values can also be made to allow estimation of modulus or compressibility values to allow calculation of foundation settlements.

Inferred stratification as shown on the attached reports is assessed from the cone and friction traces and from experience and information from nearby boreholes, etc. This information is presented for general guidance, but must be regarded as being to some extent interpretive. The test method provides a continuous profile of engineering properties, and where precise information on soil classification is required, direct drilling and sampling may be preferable.

Hand Penetrometers

Hand penetrometer tests are carried out by driving a rod into the ground with a falling weight hammer and measuring the blows for successive 150 mm increments of penetration. Normally, there is a depth limitation of 1.2 m but this may be extended in certain conditions by the use of extension rods.

Two relatively similar tests are used.

- Perth sand penetrometer — a 16 mm diameter flat-ended rod is driven with a 9 kg hammer, dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands (originating in Perth) and is mainly used in granular soils and filling.
- Cone penetrometer (sometimes known as the Scala Penetrometer) — a 16 mm rod with a 20 mm diameter cone end is driven with a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). The test was developed initially for pavement subgrade investigations, and published correlations of the test results with California bearing ratio have been published by various Road Authorities.

Laboratory Testing

Laboratory testing is carried out in accordance with Australian Standard 1289 "Methods of Testing Soil for Engineering Purposes". Details of the test procedure used are given on the individual report forms.

Bore Logs

The bore logs presented herein are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable, or possible to justify on economic grounds. In any case, the boreholes represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes, the frequency of sampling and the possibility of other than 'straight line' variations between the boreholes.

Ground Water

Where ground water levels are measured in boreholes, there are several potential problems;

- In low permeability soils, ground water although present, may enter the hole slowly or perhaps not at all during the time it is left open.
- A localised perched water table may lead to an erroneous indication of the true water table.
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report.
- The use of water or mud as a drilling fluid will mask any ground water inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water observations are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Engineering Reports

Engineering reports are prepared by qualified personnel and are based on the information obtained and on current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal (eg. a three storey building), the information and interpretation may not be relevant if the design proposal is changed (eg. to a twenty storey building). If this happens, the Company will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface condition, discussion of geotechnical aspects and recommendations or suggestions for design and construction. However, the Company cannot always anticipate or assume responsibility for:

- unexpected variations in ground conditions — the potential for this will depend partly on bore spacing and sampling frequency
- changes in policy or interpretation of policy by statutory authorities
- the actions of contractors responding to commercial pressures.

If these occur, the Company will be pleased to assist with investigation or advice to resolve the matter.

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, the Company requests that it immediately be notified. Most problems are much more readily resolved when conditions are exposed than at some later stage, well after the event.

Reproduction of Information for Contractual Purposes

Attention is drawn to the document "Guidelines for the Provision of Geotechnical Information in Tender Documents", published by the Institution of Engineers, Australia. Where information obtained from this investigation is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section

is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. The Company would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The Company will always be pleased to provide engineering inspection services for geotechnical aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

AN ENGINEERING CLASSIFICATION OF SEDIMENTARY ROCKS IN THE SYDNEY AREA

This classification system provides a standardized terminology for the engineering description of the sandstone and shales in the Sydney area, but the terms and definitions may be used elsewhere when applicable.

Under this system rocks are classified by Rock Type, Degree of Weathering, Strength, Stratification Spacing, and Degree of Fracturing. These terms do not cover the full range of engineering properties. Descriptions of rock may also need to refer to other properties (e.g. durability, abrasiveness, etc.) where these are relevant.

ROCK TYPE DEFINITIONS

Rock Type	Definition
Conglomerate:	More than 50% of the rock consists of gravel sized (greater than 2mm) fragments
Sandstone:	More than 50% of the rock consists of sand sized (.06 to 2mm) fragments
Siltstone:	More than 50% of the rock consists of silt-sized (less than 0.06mm) granular particles and the rock is not laminated
Claystone:	More than 50% of the rock consists of clay or sericitic material and the rock is not laminated
Shale:	More than 50% of the rock consists of silt or clay sized particles and the rock is laminated

Rocks possessing characteristics of two groups are described by their predominant particle size with reference also to the minor constituents, e.g. clayey sandstone, sandy shale.

DEGREE OF WEATHERING

Term	Symbol	Definition
Extremely Weathered	EW	Rock substance affected by weathering to the extent that the rock exhibits soil properties - i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.
Highly Weathered	HW	Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and other signs of chemical or physical decomposition are evident. Porosity and strength may be increased or decreased compared to the fresh rock usually as a result of iron leaching or deposition. The colour and strength of the original fresh rock substance is no longer recognisable.
Moderately Weathered	MW	Rock substance affected by weathering to the extent that staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is no longer recognisable.
Slightly Weathered	SW	Rock substance affected by weathering to the extent that partial staining or discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable.
Fresh	Fs	Rock substance unaffected by weathering, limonite staining along joints.
Fresh	Fr	Rock substance unaffected by weathering.

STRATIFICATION SPACING

Term	Separation of Stratification Planes
Thinly laminated	<6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	>2 m

ROCK STRENGTH

Rock strength is defined by the Point Load Strength Index (Is 50) and refers to the strength of the rock substance in the direction normal to the bedding. The test procedure is described by the International Society of Rock Mechanics (Reference).

Strength Term	Is(50) MPa	Field Guide	Approx. qu MPa*
Extremely Low:	0.03	Easily remoulded by hand to a material with soil properties	0.7
Very Low:	0.1	May be crumbled in the hand. Sandstone is “sugary” and friable.	2.4
Low:	0.3	A piece of core 150 mm long x 50 mm dia. may be broken by hand and easily scored with a knife. Sharp edges of core may be friable and break during handling.	7
Medium:	1	A piece of core 150 mm long x 50 mm dia. can be broken by hand with considerable difficulty. Readily scored with knife.	24
High:	3	A piece of core 150 mm long x 50 mm dia. cannot be broken by unaided hands, can be slightly scratched or scored with knife.	70
Very High:	10	A piece of core 150 mm long x 50 mm dia. may be broken readily with hand held hammer. Cannot be scratched with pen knife.	240
Extremely High:		A piece of core 150 mm long x 50 mm dia. is difficult to break with hand held hammer. Rings when struck with a hammer.	

* The approximate unconfined compressive strength (qu) shownin the table is based on an assumed ratio to the point load index of 24:1. This ratio may vary widely.

DEGREE OF FRACTURING

This classification applies to diamond drill cores and refers to the spacing of all types of natural fractures along which the core is discontinuous. These include bedding plane partings, joints and other rock defects, but exclude known artificial fractures such as drilling breaks

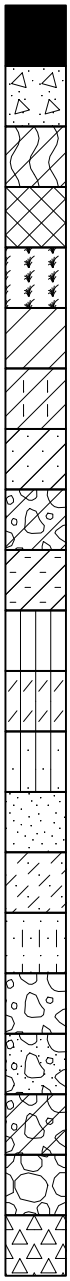
Term	Description
Fragmented:	The core is comprised primarily of fragments of length less than 20 mm, and mostly of width less than the core diameter.
Highly Fractured:	Core lengths are generally less than 20 mm - 40 mm with occasional fragments.
Fractured:	Core lengths are mainly 30 mm - 100 mm with occasional shorter and longer sections.
Slightly Fractured:	Core lengths are generally 300 mm - 1000 mm with occasional longer sections and occasional sections of 100 mm - 300 mm.
Unbroken:	The core does not contain any fracture.

REFERENCE

International Society of Rock Mechanics, Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1 Final Draft October 1972

GRAPHIC SYMBOLS FOR SOIL & ROCK

SOIL



BITUMINOUS CONCRETE

CONCRETE

TOPSOIL

FILLING

PEAT

CLAY

SILTY CLAY

SANDY CLAY

GRAVELLY CLAY

SHALY CLAY

SILT

CLAYEY SILT

SANDY SILT

SAND

CLAYEY SAND

SILTY SAND

GRAVEL

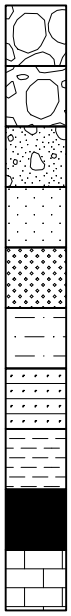
SANDY GRAVEL

CLAYEY GRAVEL

COBBLES/BOULDERS

TALUS

SEDIMENTARY ROCK



BOULDER CONGLOMERATE

CONGLOMERATE

CONGLOMERATIC SANDSTONE

SANDSTONE FINE GRAINED

SANDSTONE COARSE GRAINED

SILTSTONE

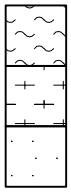
LAMINITE

MUDSTONE, CLAYSTONE, SHALE

COAL

LIMESTONE

METAMORPHIC ROCK

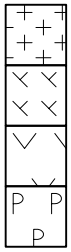


SLATE, PHYLITTE, SCHIST

GNEISS

QUARTZITE

IGNEOUS ROCK



GRANITE

DOLERITE, BASALT

TUFF

PORPHYRY

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ABBREVIATIONS USED IN DISCONTINUITIES COLUMN OF BOREHOLE LOGS

Abbreviation	Meaning
DB	Drill Break
P	Parting
J	Joint
Fr	Fracture
F	Fault
h	Horizontal
v	Vertical
sh	Subhorizontal
sv	Subvertical
he	Healed
pl	Planar
st	Stepped
un	Undulating
ro	Rough
sm	Smooth
sl	Slickensided
ti	Tight
di	Probably drilling induced
fg	Fragmented
Fe	Ironstained
cem	cemented
sty	silty
cy	clay
ca	calcite
cbs	Carbonaceous
lam	Lamination

Examples:

1. At 62.04 m, P, 30°, un, st, ro, cbs lam
   At 62.04 m Parting, 30°, undulating, stepped, rough, on carbonaceous siltstone lamination

2. At 65.08 m, Fr, 70°, pl, ro, st, fg
   At 65.08 m, fracture, planar, rough, stepped, fragmented.

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ABBREVIATIONS USED FOR STRATA DESCRIPTIONS

Abbreviation	Meaning
Lithology	
CL	Coal
MS	Mudstone
St	Siltstone
SS	Sandstone
CBS	Carbonaceous
lam	Laminations
bnd	Band
sm	Seam
Strength	
EL Str	Extremely low strength
VL Str	Very low strength
L Str	Low strength
M Str	Medium strength
H Str	High strength
VH Str	Very high strength
EH Str	Extremely high strength
Weathering	
EW	Extremely weathered
HW	Highly weathered
MW	Moderately weathered
SW	Slightly weathered
Fr	Fractured

For thin seams to save space, instead of:

From 93.03m to 93.13m depth, medium strength carbonaceous mudstone band (30mm)

write as

92.08m? MS cbs M Str, (30mm)

where abbreviation order is

Depth, Rock type, qualifier, strength, (weathering optional), thickness.

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 1 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
22	0.15	TOPSOIL - Dark grey silt topsoil with abundant organics, humid										
	0.6	CLAY - (Very stiff), brown clay with trace organics, M<Wp							A			
21	1	CLAY - Very stiff to hard, red-brown and grey clay with trace fine to medium subrounded gravel, M<Wp							A			
									S pp			4,10,12 N = 22 300->400 kPa
20	2											
	2.7	SILTSTONE / SANDSTONE - Extremely low strength, extremely weathered, light grey and brown siltstone / sandstone										
19	3											
	4.0	SANDSTONE - Extremely low strength, extremely weathered, light brown sandstone										
18	4											
	4.7	SILTSTONE - Extremely low to very low strength, extremely to highly weathered, light grey siltstone										
	5											
	5.25	CLAYSTONE - Very low to low strength, highly weathered, light grey and orange-brown claystone						5.25m to 5.35m, fragmented				
17	5.35							5.35m: CORE LOSS: 200mm	C	66	0	
	5.55	CORE LOSS -						5.55m to 5.8m, highly fractured	C	33	0	
	5.8	CLAYSTONE - Very low to low strength, highly weathered, light grey and orange-brown claystone						5.8m to 5.9m, fragmented				
	5.9							5.9m: CORE LOSS: 200mm				
16	6							6.1m to 6.16m, fragmented	C	88	59	
	6.1							6.16m: CORE LOSS: 130mm				
	6.16							6.29m to 6.37m, fragmented				
	6.29							6.42m: P,sh,un,ro				
	6.37	SILTSTONE - Medium strength, moderately weathered, grey and orange siltstone						6.52m: J,55°,pl,ro				
	7							6.55m: J,45°,un,H				
15		CORE LOSS -						6.65m: J,30°,pl,H				
		SILTSTONE - Medium strength, moderately weathered, grey and orange siltstone						6.98m: P,15°,un,ro				
		CORE LOSS -						7.1m: J,sv,pl,sm				
	7.84	SILTSTONE / CLAYSTONE - Extremely low to low strength, extremely to moderately weathered, gery-brown and orange siltstone / claystone						7.54m: J,80°,un,ro	C	84	76	
	8							7.82m: P,15°,pl,ro, cy filled (20mm)				
	8.2							7.9m: P,10°,pl,ro,cy				
14		SILTSTONE - Medium strength, moderately weathered, light grey siltstone						8m: sv fracture				
	8.55							8.11m to 8.2m, fg				
		COAL - Medium strength, fresh black coal						8.2m: CORE LOSS: 350mm				
	9											
	9.4	CORE LOSS -						9.4m: CORE LOSS: 200mm				
13	9.6	COAL - Medium strength, fresh, black coal							C	92	61	
								9.85m: sv fracture				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 2 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
12	10.65	CORE LOSS -						10.1m: P,sh,pl,ro cy filled				
		COAL - Medium strength, fresh black coal *(continued)*						10.2m: P,sh,pl,ro cy filled				
		from 10.1m to 10.2m, light brown clay, stiff						10.31m to 10.47m, fg to highly Fr				
11		CARBONACEOUS SILTSTONE - Medium to high strength, slightly weathered to fresh, light grey siltstone						10.47m: P,sh,un,ro, cy filled	C	92	61	
								10.55m: P,sh,un,ro, cy filled				
								10.65m: P,sh,un,ro				
								10.95m: J,85°,pl,sm				
								10.99m: P,sh,ro,un				
								11.11m: J,85°,pl,sm				
12	12.0	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite						11.36m to 11.56m, Fg				
								11.65m: J,85°,pl,sm				
	12.4							11.75m: J,sv,pl,sm				
	12.45	CORE LOSS -						11.85m: J,75°,pl,sm				
		LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite						11.95m: J/Fr, 80°,pl,sm				
								11.98m: J/Fr, 85°,pl,sm				
13								12.25m: J/Fr, 85°,pl, sm				
								12.4m: CORE LOSS: 50mm				
	13.26							12.48m: P,30°,ro,un, cy				
	13.41	CORE LOSS - (Possibly coal)						12.53m: P,20°, ro,un, coal	C	82	82	
		LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite						12.63m: P,10°, ro, un, coal				
14	13.92	from 13.56m to 13.92m, thin coal bands at approximately 40mm spacing						13.26m: CORE LOSS: 150mm				
	14.17							13.41m: P,sh,ro,un, cy				
	14.21	CORE LOSS - (Possibly coal)						13.48m: P,sh,pl,sm cy				
		COAL - Medium strength, fresh, black coal						13.79m: P,sh,pl,sm, cy				
								13.92m: CORE LOSS: 250mm				
15	14.95	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite						14.21m: P,sh,pl,sm, cy				
		CORE LOSS -						14.21m to 14.29m, highly fractured				
								14.95m: CORE LOSS: 690mm				
	15.64	LAMINITE - Medium to high strength, slightly weathered to fresh, light grey laminite										
16								15.93m: J,40°,ro,pl				
									C	77	75	
17												
		from 17.2m to 17.27m, thin coal bands at approximately 10mm spacings						17.5m: P,sh,H,pl				
	17.79	from 17.5m to 17.57m, high strength, fresh, grey sandstone						17.57m: P,sh,pl,ro				
18		SANDSTONE - High strength, fresh, grey sandstone						17.79m: P,15°,pl,ro				
		from 18.01m to 18.12m, pebbly band							C	100	100	
		from 18.22m to 18.32m, pebbly band						18.27m: J,40°,un,ro, coal				
	18.82							18.73m: P,10°,un,ro, coal				
19	19.04	from 18.64m to 18.82m, pebbly band						18.82m: P,15°,pl,ro	C	73	45	
	19.11							19.03m: P,sh,pl,ro				
		COAL - Medium strength, fresh, black coal						19.05m: P,sh,pl,ro, coal				
	19.44							19.11m: P,sh,pl,ro, cy				
		SANDSTONE - High strength, moderately weathered, light						CORE LOSS: 330mm				
								19.44m to 19.5m, fg	C	100	69	
								19.5m to 19.6m, highly				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 3 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		grey-light brown sandstone						fractured				
		CORE LOSS - (Possibly coal)						19.94m: P,sh,pl,sm				
		from 19.5m, medium to high strength, slightly weathered to fresh						19.5m to 20.13m, Fr, sv, un, H				
		LAMINITE - Extremely low to very low strength, highly to moderately weathered, grey laminite with some coal laminations *(continued)*						20.14m: J,75°,pl,ro 20.4m: J,sv,un,ro 20.8m: J,45°,pl,ro	C	100	69	
	21							21.25m: J, 70-80°,un,ro				
	21.72	SILTSTONE						21.72m: Fr,80°,pl,ro 21.84m: J,25°,un,ro				
	22							22.05m: J,sv,un,ro 22.3m: J,80°,H,un				
	22.65	CORE LOSS -						22.5m to 22.65m, highly fract, J,20°				
	22.9	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (80% siltstone, 20% sandstone)						22.56m: J,20°,sl,un 22.58m: J,35°,sl,pl 22.65m: CORE LOSS: 250mm 22.9m to 23.02m, fract 23.08m: J,50°,H,pl 23.4m: J,35°,pl,ro,H 23.65m: J,80°,H,un,sm 23.8m: J,85°,H,sm,pl	C	92	66	
	23											
	24											
	24.69	CORE LOSS -						24.69m: CORE LOSS: 90mm				
	24.78	LAMINITE - Medium to high strength, fresh, grey and light grey laminite						25.05m: J,60°,H,pl 25.37m: J,45°,H,un	C	94	86	
	25	from 24.8m to 24.85m, carbonaceous siltstone band										
	25.8	SILTSTONE - Medium to high strength, fresh, grey siltstone						25.7m: J,75°,H 25.82m: J,70°,H				
	26							26m: J,sv,H,pl,sm, (25.7m to 26.35m, open di from 25.95m)	C	100	70	
	27	from 26.95m to 27.39m, Core drilled twice causing increased fracturing							C	85	20	
	27.39	CORE LOSS -						27.35m: J,75°,pl,sm				
	27.5	SILTSTONE - High strength, fresh, grey siltstone						27.39m: CORE LOSS: 110mm 27.53m: J,75°,pl,sm				
	28											
	28.12	LAMINITE - High strength, fresh, grey and light grey laminite							C	100	94	
	28.7	from 28.65m, bands of coal										
	29	COAL - Medium strength, fresh black coal from 28.83m to 28.89m, bands of brown clay						28.83m: P,sh,un,ro 28.86m: P,sh,un,ro 28.89m: P,sh,un,ro 29.25m: J,80°,un,ro	C	100	100	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 369920
NORTHING: 6360590
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 4 OF 4

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
-8		COAL - Medium strength, fresh black coal *(continued)*						30.3m: J,75°,un,ro	C	100	100	
	31											
	31.15	SANDSTONE - High strength, fresh, grey sandstone						31.15m: P,sh,H,pl				
-9												
	32								C	100	100	
-10		from 32.35m to 32.38m, thin coal laminations at approximately 10mm spacings										
		from 32.7m to 32.9m, thin coal laminations at approximately 30mm spacings										
	33											
-11	33.5	from 33.39m to 33.5m, thin coal laminations at approximately 2mm to 35mm spacings										
		Bore discontinued at 33.5m, limit of investigation										
	34											
-12												
	35											
-13												
	36											
-14												
	37											
-15												
	38											
-16												
	39											
-17												

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.7m

TYPE OF BORING: Solid flight auger to 2.7m (TC-bit), then HQ wireline to 33.5m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
22	0.2	FILLING - Generally comprising grey-brown and brown sandy clayey silt with some coal fragments, bricks, dry										
		SILTY CLAY - Light grey-brown and red-brown silty clay, M<Wp										
21	1.0	SILTSTONE - Extremely low to very low strength, extremely to highly weathered, light brown and red-brown siltstone							S			10,14,19 N = 33
20	2											
	2.4	LAMINITE - Low to medium strength, moderately to slightly weathered, light grey-brown and grey laminite (70% sandstone, 30% siltstone)										
19	3											
	3.3	SILTSTONE - Very low strength, highly weathered, grey-brown and orange-brown siltstone						3.3m: P,5°,sm,un, cy veneer 3.55m: J,30°,ro,un,Fe 3.71m: J,10°,sm,un,Fe, cy filled (12mm) 3.89m: P,5°,sm,pl,Fe 3.98m: P,5°,sm,pl, cy filled (6mm) 4.06m: P,5°,sm,pl,Fe 4.2m: J,15°,sm,pl,Fe 4.6m: J,70°,h,Fe 4.65m: J,70°,h,Fe 4.7m: P,sh,ro,pl, cy filled (20mm) 4.94m: P,5°,sm,pl, cy filled (8mm)	C	100	91	
18	4	from 3.75m to 3.85m, some carbonaceous mudstone bands (2mm to 10mm)										
		from 3.85m, medium to high strength, fresh										
		from 4.12m to 4.18m, high strength sandstone band										
17	5	from 4.46m to 4.7m, high strength sandstone band										
		from 4.7m to 4.76m, low strength, moderately weathered										
		from 5.35m, very low to low strength coal bands and carbonaceous mudstone bands (2mm to 10mm)										
	5.65	CARBONACEOUS MUDSTONE - Low strength, slightly weathered, dark brown-black carbonaceous mudstone with some very low strength coal bands (1mm to 20mm)						5.8m: P,10°,ro,un 5.91m: P,5°,sm,pl, cy filled (3mm) 5.94m: J,45°,ro,pl 6.05m: J,5°,sm,pl 6.15m: P,5°,sm,pl 6.2m: P,5°,sm,pl 6.3m: P,5°,sm,un, cy veneer 7.02m: J,60°,h	C	100	97	
16	6											
	6.3	from 5.8m to 5.87m, very low strength										
15	7	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (50% sandstone, 50% siltstone)										
14	8											
	8.3	SANDSTONE - High strength, fresh, light grey, medium coarse grained sandstone						9.05m: J,50°,ro,pl,Fe 9.5m: J,60°,h	C	98	95	
13	9											
	9.75	PEBBLY SANDSTONE - Medium to										

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
12	10.0	high strength, fresh, light grey-brown medium to coarse grained pebbly sandstone						9.92m: J,80°,ro,pl 9.95m: J,85°,ro,un 10m: CORE LOSS: 50mm 10.07m: J,45°,ro,pl 10.57m: J,50°,ro,pl				
	10.05	CORE LOSS - 50mm										
	10.3	PEBBLY SANDSTONE - Medium to high strength, fresh, light grey-brown medium to coarse grained pebbly sandstone							C	98	95	
11	11	LAMINITE - Medium to high strength, fractured, light grey and grey lamination (60% siltstone, 40% sandstone) with trace coal laminations						11.22m: J,50°,ro,pl				
10	12	from 11.8m, high strength (40% sandstone, 60% siltstone)						12.4m: P,5°,ro,pl	C	100	100	
9	13							13.15m: P,5°,sm,pl				
8	14							13.68m: J,20°m,sl,st 13.74m: J,15°,sl,pl	C	100	100	
		from 14.3m, some pyrite in laminations										
7	15							15.07m: P,10°,sm,un 15.2m: J,70°,sm,pl				
		from 15.5m, high strength (80% sandstone, 20% siltstone)						15.76m: J,30°,sm,un, cy veneer 15.92m: P,10°,sm,un 16.12m: P,10°,sm,un, cy filled (8mm) 16.19m: P,10°,ro,un,Fe	C	92	78	
6	16											
5	17											
	17.08	CORE LOSS - 240mm						17.08m: CORE LOSS: 240mm				
	17.32	LAMINITE - High strength, fresh, light grey and grey laminite (80% sandstone, 20% siltstone)						17.35m: J,80°,ro,pl 17.4m: P,10°,ro,pl 17.58m: P,10°,h 17.65m: J,60°,ro,pl 17.75m: J,70°,ro,pl 17.85m: J,70°,ro,pl 18.07m: J,45°,ro,pl				
4	18								C	100	100	
	18.15	SILTSTONE - High strength, fresh, grey siltstone										
3	19	from 19m, some carbonaceous bands (5mm to 30mm thick, 50mm to 500mm spacings)						18.85m: J,65°,h,sm,un 18.93m: P,5°,sm, cy veneer 19.03m: P,5°,sm,un cy filled (3mm) 19.07m: P,5°,sm,un cy filled (2mm) 19.11m: P,5°,sm,un cy	C	98	80	
	19.95											

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.0
EASTING: 370020
NORTHING: 6360740
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 39663D
DATE: 18 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	20.0	CORE LOSS - 50mm						filled (10mm)				
		SILTSTONE - High strength, fresh, grey siltstone						19.14m: P,5°,sm,un cy filled (20mm) 19.2m: J,60°,sm,pl 19.27m: P,5°,sm,pl, cy veneer 19.66m: P,5°,sm,pl, cy veneer	C	98	80	
	21	from 21.15m, medium strength						19.95m: CORE LOSS: 50mm				
	21.37	CORE LOSS - 50mm						20.05m: P,5°,sm,un 20.07m: P,5°,sm,un 20.33m: J,45°,sm,pl 20.46m: J,40°,sm,un 20.78m: J,45°,sm,pl 21.2m: P,10°,sm,pl, cy filled (2mm) 21.32m: P,10°,sm,pl, cy filled (2mm) 21.37m: CORE LOSS: 50mm 21.51m: J,70°,sm,un 21.56m: J,30°,sm,un	C	98	90	
	21.42											
	21.6	SILTSTONE - Very low strength, moderately weathered, brown siltstone										
	22	COAL - Low strength, fresh, dull black coal with some tuff bands at 21.7m, very low strength tuff band (12mm) at 21.8m, very low strength tuff band from 21.82m to 21.87m, very low strength tuff band at 22.11m, very low strength tuff band						23.5m: J,70°,sm,un 23.7m to 23.98m, high fractured, di (10-50mm)				
	23											
	23.98	at 23.8m, medium to high strength tuff band from 23.9m to 23.98m, highly fractured, drilling induced										
	24	SANDSTONE - High to very high strength, fresh, light grey fine to medium grained sandstone						>>	C	100	100	
	25											
	26	from 26.1m, coal laminations (1mm to 3mm thick), 40mm to 200mm spacings										
	26.95	Bore discontinued at 26.95m, limit of investigation										
	27											
	28											
	29											

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HW to 2.7m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 2.7m, then HQ coring to 26.95m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
22	0.0	FILLING - Generally comprising brown and red-brown clay filling with trace fine to medium grained sand and fine gravel, M>Wp							A			
	0.75											
	0.85	Ironstone Layer							A			
21	1	SILTY CLAY - (Very stiff to hard), light grey silty clay with orange and red silty clay inclusions							S			6,9,10 N = 19
20	2											
	2.0	SHALE - Extremely low to very low strength, highly weathered, light grey and red-brown shale							S			15,20/120mm
	2.7	CLAY - (Hard), grey and red-brown clay with some fine subangular gravel inclusions, and red-brown and grey siltstone, very low strength, highly weathered										
19	3											
	3.52	from 3.07m to 3.35m, siltstone from 3.44m to 3.48m, siltstone										
18	4	SILTSTONE - Very low strength, highly weathered, red-brown and grey siltstone with bands of light grey clay							C	100	0	
	4.7	SILTSTONE - Extremely low to very low strength, extremely to highly weathered, brown-grey laminated siltstone with coal laminations 1-2mm thick at 5-20mm spacing						4.7m to 5.15m, highly fractured, ro,un, sh, (15°) 4.85m: J,50°,ro,un,coal 5.02m: J,35°,ro,pl				
17	5	from 5.15m, very low strength, highly weathered from 5.61m, low strength, moderately weathered, some coal laminations						5.15m to 5.61m, highly fractured 5.71m: P,15°,ro,pl, coal veneer 5.94m: J,sh,ro,un,Fe 6m: P,sh,or,un, clay veneer	C	100	0	
	6.3	SILTSTONE - Medium strength, fresh, light grey siltstone with some dark grey carbonaceous siltstone laminations 1-2mm thick at 1-30mm spacings						6.06m to 6.3m, highly fractured 6.48m: J,sh,ro,un 6.61m: J,sh,ro,un 6.72m: J,sh,ro,un 6.85m: J,sh,ro,un				
16	7	from 6.98m to 7.0m, slightly weathered, ironstaining						7m: J,sh,ro,pl,Fe 7.12m: J,sh,ro,un,Fe 7.32m: P,sh,ro,pl,Fe 7.47m: J,sh,ro,un,Fe 7.56m: J,sh,ro,un 7.59m: J,sh,ro,un 7.68m: J,sh,ro,un 7.85m: J,30°,ro,un,Fe 7.87m: J,sh,ro,un,Fe 7.95m: P,sh,30°,ro,un,Fe 7.99m: J,sh,20°,ro,un	C	100	78	
15	7.59	SANDSTONE - Medium strength, slightly weathered, light grey-light brown fine to medium grained sandstone										
14	8	from 8.25m, grading to pebbly sandstone										
13	9	from 9.41m to 9.6m, moderately weathered, fragmented						8.36m: J,sh,ro,un 8.49m: J,sh,ro,un 8.67m: J,sh,ro,un 8.92m: J,sh,ro,un 8.97m: J,sh,ro,un	C	100	59	
	9.6	CORE LOSS - 1m						9.11m: J,sh,5°,ro,un 9.26m: J,sh,10°,ro,un 9.32m: J,60°,ro,pl,Fe	C	49	25	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear/Benson **CASING:** HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
12		CORE LOSS - 1m *(continued)*						9.35m: J,sh,5°,ro,un 9.41m to 9.6m, Fg 9.6m: CORE LOSS: 1000mm				
	10.6							10.62m: J,25°,ro,un,Fe 10.66m: J,10°,ro,un,Fe 10.7m: J,45°,sm,pl,Fe 10.85m: J,sh,sm,pl 10.94m: J,sh,sm,pl 11.12m: J,60°,sm,pl,Fe	C	49	25	
11	11.29	COAL - Medium strength, fresh, highly fractured, dull black coal with some bright black coal lenses						11.27m: P,ro,un 11.41m: Fr, sv, sm,pl 11.45m: CORE LOSS: 100mm				
	11.45 11.55 11.59											
	11.88	CORE LOSS - 0.1m						11.27m to 11.83m, Fg 11.83m: J,5°,sm,pl, cs lam 11.89m: J,30°,ro,un 12.05m: J,sh,sm,pl, cs lam 12.24m: J,sh,ro,un 12.43m: J,sh,ro,pl 12.75m: J,70°,sm,pl 13.13m: J,5°,ro,pl	C	97	95	
10	12	SILTSTONE - Low strength, highly weathered, fragmented grey and dark grey siltstone with some carbonaceous siltstone lenses										
		SANDSTONE - Medium strength, fresh, light grey fine grained sandstone						13.39m: J,5°,ro,pl 13.66m: J,45°,ro,pl 14.01m: J,sh,ro,un 14.25m: J,5°,ro,pl				
9	13											
8	14											
7	15							14.88m: J,5°,ro,pl 15.1m: P,5°,ro,pl, cs lam 15.13m: P,5°,ro,pl, cs lam 15.16m: P,20°,ro,pl, cs lam 15.23m: J,60°,ro,pl,Fe 15.31m: P,10°,ro,pl, cs lam 15.37m: P,sh,ro,pl, cs lam 15.39m: P,sh,ro,pl, cs lam 15.41m: P,sh,ro,un 15.49m: J,sh,sm,pl	C	100	57	
	15.41	SILTSTONE - Medium strength, fresh, light grey and grey siltstone										
6	16											
	17											
	17.05	VOID - 17.05m to 19.83m						15.54m: J,5°,ro,pl 15.61m: J,sh,ro,pl 15.67m: J,sh,sm,pl 15.77m: J,sm,un,pl,sh 15.88m: J,sm,un,pl,sh 15.98m: J,sm,un,pl,sh 16.02m: J,sm,un,pl,sh 16.07m: J,60°,sm,pl 16.09m: J,sm,un,sh,pl 16.26m: J,sm,un,sh,pl 16.35m: J,sh,sm,pl 16.42m: J,60°,sm,pl,Fe 16.48m: J,sh,sm,pl 16.55m: J,sh,sm,pl 16.61m: J,sh,sm,pl 16.61m to 16.94m, fractured 16.94m: P,sh,sm,pl, cs lam 16.97m: J,60°,sm,pl	C	23	0	
5	18											
4	19											
3	19.83	SILTSTONE - Probable rubble						19.83 to 20.45, Fg				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear/Benson **CASING:** HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 22.5
EASTING: 370252.2
NORTHING: 6360816.3
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 39663D
DATE: 10 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE - Probable rubble *(continued)*							C	23	0	
	20.45	COAL - Low strength, highly weathered black coal						20.45 to 20.67, Fg				
	20.67	SANDSTONE - High strength, slightly weathered grey fragmented sandstone							C	100	100	
	22.05	Bore discontinued at 22.05m										

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear/Benson **CASING:** HW to 3.5m

TYPE OF BORING: Solid flight auger to 3.5m (TC-bit), then HQ wireline to 22.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
25	0.25	SILT - Brown silt, damp										
		CLAY - (Stiff), grey-brown clay with trace silt, M>Wp							A,pp			130-150 kPa
	0.7	CLAY - (Stiff), brown and grey-brown clay with some silt and trace sand, M>Wp							A,pp			150-200 kPa
1	1.05	CLAY - (Stiff to very stiff), orange-brown clay with some sand and inclusions of charcoal, trace rootlets, M≤Wp							pp S pp pp			170 kPa 2,6,11 N = 17 250-300 kPa >400 kPa
24	1.4	CLAY - (Hard), light grey-white clay, M<Wp										
2												
23	2.85	CORE LOSS -						2.85m: CORE LOSS: 150mm	C	62	43	
3	3.0	CLAYSTONE - Extremely low strength, extremely weathered, red-grey claystone, clay like properties						3.17m: P,10°,un,ro, coal substance				
	3.25	CORE LOSS -						3.25m: CORE LOSS: 380mm				
22	3.63	CLAYSTONE - Extremely low strength, extremely weathered, red-grey claystone, clay like properties						3.74m: J,50°, H, un, coal substance				
4	4.15	SILTSTONE - Very low to low strength, highly weathered, grey-brown siltstone with orange bands						4.51m to 4.56m, Fg	C	79	79	
21		from 4.49m, medium strength, moderately weathered						4.83m: J,75°,pl,ro, rootlets				
5	5.1	from 5m to 5.1m, very low strength, highly weathered						4.95m: J,50°,un,ro				
	5.22	CORE LOSS -						5.1m: CORE LOSS: 120mm				
	5.29	SILTSTONE - Extremely low strength, extremely weathered, grey-brown siltstone						5.33m: J,80°,pl,sm 5.34m: J,sv,pl,sm 5.38m to 5.42m, Fg 5.53m: P,sh,un,ro, coal 5.69m: J,85°, H, un 5.85m: J,70°,H,pl 5.92m: J,60°,H,pl 5.95m: J,65°,H,pl	C	92	71	
20		SILTSTONE - Low to medium strength, moderately weathered, grey siltstone with orange bands						6.13m: P,sh,un,ro, Fe 6.34m: P,sh,un,ro, Fe				
6		from 6.5m, slightly weathered						6.47m to 6.5m, P,10°,un,ro				
		from 6.7m, laminations of coal substance and Fe, ≤ 1mm thick						6.68m: J,20°, un,ro,Fe 6.83m: P,5°,un,ro,Fe	C	87	77	
19	7.36	COAL - Medium strength, fresh, black coal						7.42m: J,85°, H,un,ro 7.43m: J,75°,H,un,ro				
7	7.5	CORE LOSS -						7.5m: CORE LOSS: 150mm				
	7.65	CLAYSTONE / SILTSTONE - Medium strength, slightly weathered to fresh, grey fine siltstone / claystone with coal laminations ≤ 1mm thickness to 8.25m						7.76m: P,10°,ro,un, clay filled				
18									C	100	99	
8								8.9m: J,75°,un,ro				
17												
9												
16									C	100	100	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
									C	100	100	
15	10.58	COAL - Medium strength, fresh, black coal										
	10.77	CORE LOSS -						10.77m: CORE LOSS: 300mm				
11	11.07	SILTSTONE - Medium to high strength, fresh siltstone						11.32m: P,5°,un,ro	C	86	86	
14		at 11.75m, high strength, cobble										
	12	at 12.16m to 12.21m, high strength, cobble						12.15m: P,10°, un,ro, clay filled				
13								12.8m: J,35°,H,pl				
	13								C	80	75	
12	13.55	CORE LOSS -						13.47m: J,70°,pl,ro 13.55m: CORE LOSS: 300mm				
	13.85	SILTSTONE - Medium to high strength, fresh from 13.85m to 14.1m, cored twice and disturbed										
11	14							14.73m: J,70°,pl,ro	C	100	66	
	15							15.5m: J,85°,un,sm				
10	16	from 16.03m to 16.44m, laminations containing pyrite and coal up to 3mm thick, 10mm to 50mm spacing						15.97m: J,sv, un, H, pyrite				
9	16.71	CORE LOSS -						16.56m: P,5°,un,ro 16.62m: P,5°,un,ro, cy 16.71m: CORE LOSS: 100mm				
	16.81	SILTSTONE - High strength, fresh, grey siltstone						16.96m: P,sh,ro,un 17.02m: P,sh,ro,un 17.12m: P,sh,ro,un 17.25m: J,sv,un,ro 17.52m: J,70°,un,ro	C	90	50	
8	17											
	18	from 18.4m to 18.5m, pebbles and cobbles										
7	19	from 18.94m to 18.98m, pebbles							C	100	60	
		from 19.4m to 19.43m, grey igneous rock band										
6		from 19.75m to 19.79m, grey							C	90	45	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 25.7
EASTING: 370675.9
NORTHING: 6360727.5
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 39663D
DATE: 24 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		igneous rock band										
		SILTSTONE - High strength, fresh, grey siltstone *(continued)*							C	90	45	
	20.49	from 20.11m to 20.14m, grey clay band						20.49m: CORE LOSS: 110mm				
	20.6							20.7m: P,sh,pl, ro, clay				
	20.77	from 20.24m, extremely low to very low strength, extremely to highly weathered						20.71m to 20.77m, Fg				
								21.1m: P,5°,un,ro, cy	C	100	81	
		CORE LOSS -										
		CARBONACEOUS SILTSTONE - Extremely low strength, extremely weathered, dark grey carbonaceous siltstone						21.5m: J,sv,un,ro,H				
		from 20.63m, medium strength, moderately weathered										
		from 20.71m, tuff, low strength, highly weathered, brown						22.35m: J,75°,sv,un,ro				
		COAL - Medium strength, fresh black coal						22.68m: J,80°,un,ro				
	23.06	from 21.73m to 22.08m, white mineral inclusions							C	100	100	
		from 22.75m, dark brown carbonaceous mudstone bands										
		SANDSTONE - High strengh, fresh, grey sandstone										
		from 24.11m to 24.16m, coal laminations, thickness <1mm, spacing 2mm to 30mm										
	24.6	Bore discontinued at 24.6m, limit of investigation										

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.85m

TYPE OF BORING: Solid flight auger to 2.85m (TC-bit), then HQ wireline to 24.6m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
20	0.2	FILLING - Generally comprising light orange-brown fine to medium clayey silt sand with some gravel and cobbles, dry										
	0.8	FILLING - Generally comprising dark brown gravelly clay with trace sand and silt and coal, M>Wp										
19	1	CLAY - Stiff to very stiff, dark brown and orange-brown clay with some extremely low to very low strength claystone inclusions, M>Wp							S			2,2,11 N = 13
	2	from 2m, very stiff, light grey-brown and light yellow-brown, M<Wp										
18	2.8	WEATHERED COAL - Extremely low strength, extremely weathered, dark brown and dark orange-brown weathered coal							S			5,4,8 N = 12
	3											
17	3.8	CLAY - Very stiff, light grey-brown and light orange-brown clay with extremely low to medium, highly fractured tuffaceous claystone bands, M<Wp										
	4								S			3,6,8 N = 14
	4.3	SILTY CLAY - Very stiff, light grey and light orange-brown clay with extremely low to low strength tuffaceous claystone bands, M<Wp										
16	5	from 5.4m, grading to tuffaceous claystone										
15	6								S			5,12,11 N = 23
	6.4	WEATHERED COAL - Extremely low to very low strength, extremely to highly weathered, dark brown-black weathered, coal										
14	6.8											
	7								S			6/50mm
	7.05	COAL - Very low to low strength, fresh, black coal						7.05m: CORE LOSS: 250mm				
	7.3							7.3m to 7.37m, highly fractured (2-10mm), di				
	7.38	CORE LOSS - 250 mm										
13		COAL - Very low to low strength, fresh, dull black coal										
	8	LAMINITE - Low strength, moderately to slightly weathered, brown laminite (60% sandstone, 40% siltstone)						8.01m: P,5°,sm,pl, cy veneer 8.06m: P,5°,sm,pl, cy filled (6mm) 8.35m: P,5°,sm,pl, cy filled (15mm)	C	86	79	
12		from 7.45m, medium strength, slightly weathered										
	9	from 7.5m, medium to high strength, fresh						8.5m: J,20°,sm,pl 8.52m: J,20°,sm,pl, cy veneer 8.81m: P,5°,sm,pl, cy filled (7mm) 9.19m: P,5°,sm,pl, cy filled (3mm) 9.26m: P,5°,sm,pl, cy	C	100	87	
11		from 8.34m to 8.55m, medium strength, slightly weathered										

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** 7.0m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 7.05m, then NMLC coring to 26.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED	
Initials:	
Date:	

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
10	11	LAMINITE - Low strength, moderately to slightly weathered, brown laminite (60% sandstone, 40% siltstone) *(continued)* from 10.5m, (80% siltstone, 20% sandstone) at 10.6m, coal band (6mm) at 10.9m, high strength from 11.25m, pyrite in coaly laminations from 11.7m, (50% sandstone, 50% siltstone)						filled (4mm) 9.44m: P,5°,sm,pl, cy filled (2mm) 9.51m: P,5°,sm,pl, cy filled (6mm) 9.52m: P,5°,sm,pl, cy filled (3mm) 9.79m: P,5°,sm,pl, cy filled (12mm) 9.93m: P,5°,sm,un, cy filled (6mm) 10.25m: P,5°sm,un, cy veneer 10.41m: P,5°sm,pl, cy veneer 10.55m: J,30°,sm,un 10.66m: J,5°,sm,un 10.73m: J,10°,sm,un 10.79m: J,5°,sl,un 10.83m: P,5°,ro,un cy veneer 10.88m: J,10°,sl,un 12.93m: P,5°,sm,un 13.12m: P,5°,sm,un cy filled (6mm) 13.25m: J,80°,ro,pl 13.5m: J,80°,ro,pl 13.87m: P,5°,sm,un 14.55m: P,5°,sm,st 14.71m: P,5°,sm,pl 15.74m: J,70°,ro, pyrite	C	100	87	
9	12											
8	13								C	100	90	
7	14											
6	15											
5	16								C	98	97	
4	16.75	SILTSTONE - High to very high strength, dark grey siltstone										
3	17	from 17.48m to 17.52m, carbonaceous siltstone						17.47m: P,10°,sm,un				
	17.71 17.78	CORE LOSS -						17.71m: CORE LOSS: 70mm				
2	18	SILTSTONE - High to very high strength, fresh, dark grey siltstone						17.79m: P,5°,sm,un, cy veneer 18.37m: P,5°,sm,un				
1	19								C	100	100	
	19.3	LAMINITE - High to very high strength, fresh, light grey and grey laminite (50% sandstone, 50% siltstone)										

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** 7.0m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 7.05m, then NMLC coring to 26.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 20.7
EASTING: 370752.9
NORTHING: 6360439
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
0	20.35	SILTSTONE - High to very high strength, fresh, dark grey siltstone							C	100	100	
								20.77m: P,5°,sm,un				
-1	21							21.36m: P,5°,sm,un				
	22											
-2	22.23	COAL - Low strength, fresh, dull black coal with some tuff bands and some pyrite at 22.27m, tuff band 10mm from 22.35m to 22.43m, low to medium strength tuff band (45mm) at 22.54m, medium strength tuff band (10mm)						22.08m: J,45°,h 22.23m: P,sh,sm,pl 22.3m: J,80°,sm,pl, pyrite 22.65m: J,80°,sm,pl	C	100	96	
	23							23.5m: J,65°,sm,pl				
-3	24							23.95m: J,80°,sm,pl 24.15m to 24.28m, highly fractured (2-20mm) 24.35m: J,60°,sm,pl 24.45m: J,80°,sm,pl				
-4	24.54	SANDSTONE - Very high strength, fresh, light grey fine to medium grained sandstone, abundant pyrite in discontinuities						24.54m: P,5°,sm,pl	C	100	83	
-5	25							25.52m: P,5°,ro,pl, pyrite				
	26	26.05						25.96m: P,5°,ro,pl				
-6		Bore discontinued at 26.05m, limit of investigation										
	27											
-7												
	28											
-8												
	29											
-9												

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** 7.0m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 7.05m, then NMLC coring to 26.05m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
23	0.5	FILLING - Generally comprising light brown and red-brown silty clay with trace sand and gravel										
		FILLING - Generally comprising dark brown-black										
22	1.0	SILTY CLAY - Firm, light grey-brown mottled red-brown silty clay with trace sand gravel and rock fragments, M>Wp							pp			90 kPa
									S			2,1,3
									pp			N = 4
	2	from 2.1m, very stiff, M<Wp										90 kPa
21									pp			350-400 kPa
									S			4,7,7
	3	from 3m, hard, red-brown mottled light grey-brown, some iron-cemented bands										N = 14
20												
	4								S			6,9,11
19												N = 20
	5											
18	5.7	LAMINITE - Very low to low strength, highly to moderately weathered, light brown and red-brown laminite (70% siltstone, 30% sandstone)							S			16,10/70mm
	6	from 6.25m, light grey-brown and grey and orange-brown						6.3m: J,20°,ro,un,Fe 6.4m: J,60°,sm,st 6.48m: J,60°,ro,un,Fe 6.75m: P,5°,ro,pl,Fe				
17								7m: P,5°,ro,st,Fe 7.13m: P,5°,ro,pl,Fe				
	7											
16								7.47m: P,5°,ro,un,Fe 7.55m: P,5°,ro,un,Fe 7.7m: J,10°,ro,pl,Fe 7.75m: J,15°,ro,pl,Fe 7.83m: P,5°,ro,un, cy filled (12mm) 7.99m: P,10°,sm,pl, cy filled (30mm) 8.13m: P,10°,ro,un,Fe 8.23m: P,10°,ro,un,Fe, cy filled	C	100	84	
	7.8	SILTSTONE - Low strength, moderately weathered, dark grey and orange-brown siltstone										
	8	from 7.97m to 8m, extremely low strength										
15		from 8.65m to 8.82m, very low strength										
	9	from 8.95m, medium strength, fresh						8.32m: J,70°,sm,pl 8.41m: J,70°,sm,pl 8.6m: J,70°,sm,pl 8.8m: P,5°,sm,pl,Fe 8.85m: J,60°,sm,un 8.95m: P,10°,sm,pl, cy veneer	C	100	81	
14												

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
13	10.0	LAMINITE - Medium to high strength, fresh, light grey and grey laminite (60% siltstone, 40% sandstone)						9.22m: P,10°,sm,un 10.29m: P,10°,sm,pl, cy filled (2mm) 10.38m: P,10°,sm,pl, cy filled (2mm)				
11		from 11.15m, high strength (80% sandstone, 20% siltstone)						11.09m: J,15°,sm,pl,Fe 11.24m: J,15°,sm,pl,Fe	C	100	81	
12		from 11.36m to 11.39m, extremely low strength, extremely weathered						11.38m: P,5°,ro,un, cy filled (30mm) 11.42m: P,5°,h,Fe 11.5m: P,5°,sm,pl, cy veneer 11.57m: P,5°,sm,pl, cy veneer 11.66m: P,5°,sm,pl, cy filled (2mm)				
11	12.5	SANDSTONE - High to very high strength, fractured, light grey fine to medium grained sandstone						12.73m: J,60°,ro,pl,Fe 12.74m: P,5°,ro,pl,Fe 12.84m: J,80°,ro,pl,Fe 12.85m: J,75°,ro,pl,Fe 12.86m: P,5°,ro,pl,Fe 12.89m: P,5°,ro,pl,Fe 13.44m: P,10°,ro,pl	C	100	98	
13		from 12.7m to 12.89m, very high strength, fresh siderite band										
10		from 13.25m to 13.33m, very high strength siderite band										
14		from 13.45m to 13.55m, very high strength siderite band										
9												
15												
8												
16		from 16.1m, fresh						16.13m: P,5°,ro,pl,Fe 16.44m: P,10°,ro,un,Fe	C	100	97	
7												
17								16.78m: J,70°,h,un,Fe 16.86m: J,30°,ro,pl,Fe 17m: J,80°, h,Fe 17.17m: J,10°,ro,pl,Fe 17.19m: J,10°,ro,pl,Fe 17.3m: J,70°,h,ro,un,Fe 17.64m: J,45°,ro,pl,Fe 17.77m: J,50°,ro,pl,Fe				
6												
18								18.22m: P,5°,ro,pl,Fe 18.52m: J,50°,ro,pl,Fe 18.72m: P,10°,ro,pl,Fe				
5												
19									C	100	90	
4	19.15	SILTSTONE - Extremely low to very low strength, extremely weathered, grey-brown and orange-brown siltstone						19.16m: P,5°,ro,un,Fe 19.24m: P,5°,sm,pl,Fe 19.33m: J,60°,sm,pl 19.35m: J,80°,sm,pl 19.4m: P,5°,sm,pl,Fe 19.45m: J,80°,sm,pl				
		from 19.3m, very low to low strength,										

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 23.6
EASTING: 370940
NORTHING: 6360420
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 39663D
DATE: 23-24/10/07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		moderately weathered from 19.5m, medium to high strength, fresh						19.8m: J,80°,sm,pl 19.85m: P,5°,sm,pl, Fe, cy filled (2mm) 19.95m: P,5°,sm,pl, Fe 20.1m: P,5°,sm,pl, Fe 20.26m: J,50°,sm,pl,Fe 20.42m: P,5°,sm,pl, Fe 20.46m: P,5°,sm,pl, Fe 20.5m: J,80°,sm,pl,Fe 20.53m: J,60°,sl,un,Fe 20.57m: J,50°,sl,un,Fe 20.6m: P,5°,sm,pl, Fe 20.62m: P,5°,sm,pl, Fe 20.65m: J,50°,sl,un,Fe 20.66m: P,5°,sm,pl, Fe 21.6m: P,5°,sm,pl 21.75m: J,70°,sm,st 22.02m to 22.13m, highly fr (1mm-10mm) 22.9m: J,75°,sm,st 23.07m: J,45°,sm,un	C	100	90	
3	20.75	SILTSTONE - Extremely low to very low strength, extremely weathered, grey-brown and orange-brown siltstone *(continued)* from 20.35m to 20.45m, low strength, slightly weathered										
2	21											
		COAL - Very low to low strength, slightly weathered, dull black coal with tuff bands and bands of pyrite from 20.83m to 20.91m, very low strength tuff bands (60mm) from 21m, low strength, fractured from 21.23m to 21.25m, very low strength tuff band at 22.03m, pyrite band (8mm) from 22.82m to 22.96m, carbonaceous mudstone (bands 2mm to 12mm thick, 2mm to 10mm spacings)							C	100	100	
1	22											
	23											
0	23.1	SANDSTONE - Very high strength, fresh, light grey fine to medium grained sandstone										
	24											
	24.0	Bore discontinued at 24.0m, limit of investigation										
-1	25											
-2	26											
-3	27											
-4	28											
-5	29											
-6												

RIG: Scout 103 **DRILLER:** Sheddon **LOGGED:** Reid **CASING:** HQ to 6.2m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit) to 6.20m, then NMLC coring to 24.0m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
34	0.3	TOPSOIL - Dark grey clayey silt topsoil with abundant organics to 0.1m, humid										
	0.6	CLAY - Hard, grey-brown clay with trace to some fine to coarse sized siltstone gravel, M<Wp										
33	1	SILTSTONE - Extremely low strength, extremely weathered, light grey siltstone from 1m, (extremely low to low strength), brown							S			20,
32	2	from 2.25m, low strength										
	2.65	CORE LOSS - 0.55m						2.65m: CORE LOSS: 650mm	C	0	0	
31	3											
	3.3	CORE LOSS - 0.25m						3.3m: CORE LOSS: 250mm				
	3.55	SILTSTONE - Extremely low to low strength, extremely weathered, grey-brown siltstone						3.55m to 4.75m, fg at 0.01m to 0.05m intervals 3.8m: J,70°, cy filled 3.9m: J,70°, cy filled 4m: J,70°,h	C	86	0	
30	4											
								4.75m to 5.05m, friable				
29	5							5.1m: J,45°,h 5.25m: P,sh,un,sm 5.4m: J,70°,pl,un,Fe				
		from 5.6m to 5.65m, ironstone						5.6m: P,sh,un,ro,Fe 5.7m: J/Fr?,sv, pl,ro,Fe	C	84	19	
	5.9	CORE LOSS - 0.2m						5.9m: CORE LOSS: 200mm				
28	6											
	6.1	SILTSTONE - Very low to low strength, highly weathered light brown siltstone						6.2m: J,45°,un,ro,Fe 6.3m to 6.7m, fragmented at 0.01m to 0.05m intervals 6.7m: J,70°,pl,ro,Fe 6.8m: P,sh,h 6.88m: P,sh,h 6.9m: J,70°,h 6.96m: P,sh 7m to 7.3m, friable clayey coal 7.3m: CORE LOSS: 1300mm	C	43	0	
27	7											
	7.0	CLAYEY COAL - Extremely low strength, extremely weathered black clayey coal										
	7.3	CORE LOSS - 1.3m										
26	8											
	8.6	CORE LOSS - 0.1m						8.6m: CORE LOSS: 100mm				
	8.7	LAMINITE - High strength, fresh, grey fine to medium grained sandstone with interbedded siltstone, laminite						8.93m: P,sh,pl,sm clay smear, Fe 9.1m: P,sh,pl,sm clay smear, Fe	C	81	58	
25	9											
	9.47	CORE LOSS - 0.07m						9.3m to 9.43m, J/MFr?, sv,h,Fe 9.47m: CORE LOSS: 30mm	C	100	0	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Harris **CASING:** HW to 6m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS: from 8.6m, 20% water loss

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
24	10.15	SANDSTONE - High strength, highly weathered, brown fine to medium grained sandstone with interbedded siltstone to 9.75m *(continued)*						9.5m to 9.8m, MFr, sv,h,Fe 9.8m to 10.15m, MFr, sv,pl,ro,Fe				
	10.45	CORE LOSS - 0.3m, possible extremely weathered rock						10.15m: CORE LOSS: 300mm				
23	11	SANDSTONE - High strength, highly weathered, fine to medium grained brown sandstone						10.47m: P,sh,un,ro 10.9m to 11.6m, MFr, sv, un, ro,Fe	C	100	0	
	11.77	from 11.74m to 11.77m, ironstone layer						11.74m: P,sh,un,ro 11.77m: P,sh,un,ro				
22	12	SILTSTONE - Medium to high strength, slightly weathered grey siltstone						11.8m: J,60°,h 11.85m to 11.88m, fragmented				
	12.4	CORE LOSS - 0.5m						11.95m: J/MFr?, 45°,pl,h 12.1m: Fr,sv,h 12.2m to 12.4m, Fg 12.4m: CORE LOSS: 500mm	C	57	0	
21	12.9 13	SILTSTONE - Medium to high strength, slightly weathered grey siltstone						12.9m to 13.1m, fragmented at 0.01m intervals 13.1m to 13.35m, Frs, sv 13.35m to 13.45m, fragmented 13.6m: J/MFr,70°,h 13.66m: J,45°,un,ro-sm, clay lined	C	70	0	
20	14							13.67m: P,sh,un 13.76m to 13.84m, friable clay	C	78	0	
	14.15	CORE LOSS - 0.3m										
	14.45	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone						13.84m to 14.15m, fragmented 14.15m: CORE LOSS: 300mm 14.54m to 14.65m, fragmented	C	100	0	
19	15							14.7m: MFr?,sv,un,ro 14.83m: P,sh,pl,sm, calcite	C	80	0	
	15.55	CORE LOSS - 0.1m										
	15.65	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone						14.95m: MFr?,sv,un,sm 15.1m: MFr,45°,pl,sm 15.23m: P,sh,pl,sm, calcite 15.3m: MFr?, sv,ir,h 15.45m: MFr,sv, ir,ro, calcite 15.55m: CORE LOSS: 100mm 15.65m to 16m, fragmented 16m: MFr,sv,pl,sm, Fe 16.15m: MFr's, sv,h	C	92	6	
18	16											
	17											
	17.55	CORE LOSS - 0.15m										
	17.7	SILTSTONE - Medium strength, slightly weathered, fragmented, grey siltstone from 17.9m, high strength, fresh						16.2m to 16.3m, fragmented at 0.02m intervals 16.3m: J/MFr?, 70°,pl,sm 16.35m: J/MFr?, 70°,h 16.4m to 16.42m, friable clay seam 16.5m: MFr, sh to sv,h 16.56m to 16.6m, fragmented at 0.01m intervals 16.75m: MFr,sv,h 16.93m: Fr,sv,h 16.95m to 17.55m, MFr's, sv, h, calcite	C	96	38	
16	18											
15	19											
	19.08	CORE LOSS - 0.35m										
	19.42	COAL - Medium strength, fragmented, black coal with interbedded carbonaceous mudstone layers										

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Harris **CASING:** HW to 6m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS: from 8.6m, 20% water loss

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.1
EASTING: 369988
NORTHING: 6360526.5
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 39663D
DATE: 11-15/10/07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
14		COAL - Medium strength, fragmented, black coal with interbedded carbonaceous mudstone layers *(continued)*						17.55m: CORE LOSS: 150mm 17.7m to 17.85m, fragmented 0.01m to 0.03m intervals 18.05m: MFr,45° to sv, ir, sm, calcite 18.31m: P,sh,pl,sm 18.38m: P,sh,un,sm 18.44m: P,sh,un,sm 18.55m: P,sh,un,sm 18.65m: P,sh,pl,sm 18.8m: MFr, 45° to sv,un,ro Fe 19.08m: CORE LOSS: 340mm 19.47m: P,sh 19.57m: P,sh 19.67m to 19.7m, fragmented 19.9m: Fr,70° 20.55m: Fr,sv,h 20.6m to 20.65m, fragmented, di? 20.75m: P,sh 20.8m: P,sh 20.85m to 20.88m, fragmented at 0.01m intervals 20.92m to 20.95m, fragmented at 0.01m intervals 21.08m to 21.24m, friable clay seam 21.3m: Fr,70° 21.51m to 21.55m, friable clay seam 21.6m: P,sh 22.27m to 22.65m, fragmented at 0.01m to 0.05m intervals 22.65m: CORE LOSS: 100mm	C	96	38	
13	21											
	21.71	SANDSTONE - High strength, fresh, grey sandstone							C	85	17	
12	22											
	22.27	SILTSTONE - Medium to high strength, fresh, fragmented grey siltstone										
	22.65											
	22.75	CORE LOSS - 0.1m										
11	23	Bore discontinued at 22.75m										
10	24											
9	25											
8	26											
7	27											
6	28											
5	29											

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Harris **CASING:** HW to 6m

TYPE OF BORING: 100mm diameter solid flight auger (TC-bit to 2.65m), then HQ3 coring to 22.75m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS: from 8.6m, 20% water loss

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
34	0.3	TOPSOIL - Dark grey silt topsoil with abundant organics to 0.1m, humid										
		CLAY - Hard, red-brown clay, M<Wp from 0.5m, with trace to some siltstone gravel							S			20,-,-
33	3.0	SILTSTONE - Extremely low strength, extremely weathered brown siltstone with interbedded clay layers										
	3.95	CORE LOSS - 0.35m						3.95m: CORE LOSS: 350mm				
30	4.3	SILTSTONE - Extremely low strength, extremely weathered brown siltstone (soil like properties)						4.3m to 5.17m, friable clay				
	5.17	COAL - Extremely low strength, extremely weathered, black-brown coal (soil like properties)							C	85	17	
29		SILTSTONE - Medium strength, moderately weathered, grey siltstone from 5.35m to 5.42m, extremely weathered coal from 5.5m to 5.54m, extremely weathered coal						5.23m: P,sh, clay lined 5.35m to 5.42m, friable clay 5.5m to 5.54m, friable clay 5.56m: P,sh,pl,sm 5.7m: P,sh,pl,sm 5.87m: J/MFr?, 70°,un,ro 6.01m: P,sh,pl,sm 6.1m to 6.13m, Fg 6.25m: P,sh,pl,sm 6.3m: P,sh,pl,sm,Fe 6.4m: P,sh,pl,sm 6.43m: P,sh,pl,sm,Fe 6.5m: J,85°,pl,sm 6.59m: P,sh,pl,sm 6.78m to 6.81m, J,30°,pl,sm 6.86m to 6.99m, P,sh,pl,sm 7.13m: J,65°,pl,sm 7.39m to 7.54m, P,sh,pl,sm 7.76m: J,85°,un,ro,Fe 8.05m: J,60°,un,ro,Fe 8.15m: J,75°,pl,ro,Fe 8.17m to 8.3m, P,sh,pl,sm 8.33m: J,50°,pl,ro,Fe 8.4m: J,50°,un,ro,Fe 8.49m: J,60°,pl,ro 8.55m to 8.8m, highly fract to frag, P,sh,pl,sm 8.8m: CORE LOSS:	C	88	62	PL(D) = 1.86MPa PL(A) = 0.85MPa PL(D) = 1.22MPa PL(A) = 2.13MPa PL(D) = 2.35MPa PL(A) = 3.03MPa PL(D) = 2.26MPa PL(A) = 4.21MPa
26	8.8	CORE LOSS -										
25	9.15	SILTSTONE - Medium strength, moderately weathered, grey siltstone from 9.3m to 9.45m, extremely weathered, extremely low to very low strength, grey siltstone (clay like							C	100	74	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
24		properties)						350mm				
		SILTSTONE - Medium strength, moderately weathered, grey siltstone *(continued)*						9.18m: J,65°,pl,ro,Fe 9.22m to 9.3m, P,sh,pl,sm Fe	C	100	74	
								9.3m to 9.45m, P,sh,pl,sm, cy	C	100	58	PL(D) = 0.32MPa PL(A) = 1.12MPa
23	11	from 11m to 11.1m, very low strength, highly weathered grey siltstone						9.42m: J,50°,pl,ro, cy veneer 9.45m: P,10°,pl,sm, cy filled (20mm) 9.45m to 9.55m, P,sh,pl,sm	C	80	15	
	11.7	CORE LOSS -						9.6m: J,55°, un,ro,Fe 9.8m: J,80°,pl,ro,Fe				
	11.85	SILTSTONE - Medium strength, moderately weathered, grey siltstone						9.98m: P,sh,pl,sm cy veneer 10.07m: P,sh,un,ro, cy filled 10.14m: J,60°,un,ro 10.35m: J,75°,pl,ro, Fe	C	48	0	PL(D) = 7.22MPa
22	12.26	from 12.03m to 12.1m, very low strength, highly weathered, fragmented, light grey siltstone										
	12.81	CORE LOSS - 0.55m						10.85m to 11.1m, frag to highly fract				
	13	SILTSTONE - Very low strength, highly weathered, light grey siltstone						11.16m: P,10°,pl,ro,Fe 11.27m to 11.7m, highly fract, P, 10°,ro,pl 11.65m: J,85°,pl,ro,Fe 11.7m: CORE LOSS: 150mm 11.9m: P,sv,85°,ro,pl,Fe 11.94m to 12.1m, frag, Fe,ro,un	C	72	19	PL(A) = 0.83MPa
21		from 13m, very low strength, highly weathered, light grey siltstone										
	13.53	from 13.24m to 13.27m, medium strength, moderately weathered, grey siltstone										
	13.9	from 13.27m, low strength										
	14	from 13.47m, medium strength, moderately weathered, grey siltstone										
	14.26							12.14m: J,sh,10°,ro,un,Fe				PL(D) = 4.25MPa
20	14.34	CORE LOSS - 0.37m						12.15m: J,sh,ro,un,Fe 12.23m: P,sv,80°,ro,un,Fe				PL(A) = 2.73MPa
		SILTSTONE - Very low strength, higly weathered, light grey siltstone						12.26m: CORE LOSS: 550mm				
	15	VOID - 0.08m						12.81m to 12.85m, frag 12.85m: J,45°,ro,pl,Fe 12.95m: J,sv,ro,pl,Fe 13.25m: P,sv,ro,un,Fe 13.28m to 13.39m, frag 13.46m: J,sh,ro,pl				PL(D) = 2.17MPa PL(A) = 8.26MPa
19		SILTSTONE - Medium strength, slightly weathered, slightly fractured, light grey siltstone										
	16							13.53m: CORE LOSS: 370mm 13.9m to 14.15m, frag, Fe stained 14.24m: P,sv,80°,ro,pl,Fe	C	94	41	
	16.32	COAL - Medium strength, fresh, fractured, dull black coal with some bright black coal laminations										PL(D) = 0.6MPa PL(A) = 0.68MPa
18		from 16.37m to 16.39m, low strength, moderately weathered grey-brown siltstone						14.41m to 14.5m, frag 14.44m: P,sv,80°,ro,pl, Fe, clay veneer 14.6m to 14.63m, frag				
	16.95 17.02	CORE LOSS - 0.17m						14.63m to 15m, J,sv,85°,ro,pl				
	17	COAL - Highly fractured from 17.61m to 17.75m, fragmented						14.81m: J,sh,ro,un 14.89m: J,sh,ro,pl 15.23m: J,sh,ro,un 15.44m to 15.5m, frag 15.5m to 15.74m, fract				PL(D) = 1.77MPa PL(A) = 2.85MPa
17	17.75	CORE LOSS - 0.56m						15.91m to 16.12m, J,sv,75°,ro,un, Fe 16.25m to 16.32m, frag				
	18							16.37m: J,sh,ro,un 16.39m: J,sh,ro,un 16.43m: cleat,sv,85°,ro,pl 16.6m: J,sh,sm,pl 16.67m: J,sh,ro,pl, clay stained 16.7m to 16.77m, frag 16.83m: J,sh,ro,pl 16.87m to 17.17m, frag	C	81	57	PL(D) = 0.81MPa PL(A) = 0.61MPa
	18.31	LAMINITE - Medium strength, fresh, grey laminite										
16	18.66											
	18.74	TUFFACEOUS SILTSTONE - Low strength, moderately weathered, light brown mottled light grey tuffaceous siltstone										
	19											
	19.15	COAL - Medium strength, fresh, fractured, dull black coal with some bright black coal laminations										
15	19.64	SILTSTONE - Medium strength,										

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Date:	

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 34.5
EASTING: 370235.7
NORTHING: 6360534
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 39663D
DATE: 16 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
14	20.45	slightly weathered, light grey siltstone from 19.39m to 19.42m, some carbonaceous siltstone laminations from 19.61m to 19.64m, fragmented from 19.96m, fresh LAMINITE - Medium strength, slightly weathered, light grey and grey laminite *(continued)* Bore discontinued at 20.45m, limit of investigation						16.95m: CORE LOSS: 70mm 17.14m: J,sh,ro,pl 17.16m: J,sh,ro,pl 17.24m: J,sh,ro,pl 17.36m: J,sh,ro,pl 17.54m: J,sh,ro,pl 17.59m to 17.74m, frag 17.75m: CORE LOSS: 560mm 18.37m: J,sh,ro,un 18.39m to 18.66m, cleat, sv,ro,pl 18.44m: J,sh,ro,un 18.54m: J,sh,ro,pl 18.66m: J,sh,ro,un 18.74m: J,sh,ro,un 18.75m: J,sh,ro,pl 18.92m to 19.15m, cleat, sv (90°), ro,pl 18.99m: J,sh,ro,pl 19.03m: J,sh,ro,pl 19.1m: J,sh,ro,un 19.15m: J,sh,ro,un 19.61m to 19.64m, frag 19.68m: J,sh,10°,sm,pl, carb siltstone veneer 19.75m: J,sh,5°,sm,pl 19.84m to 19.86m, frag 19.98m: J,ro,un 20.01m: J,sv,75°,ro,pl 20.09m: J,sh,ro,pl 20.19m: J,sh (10°),ro,pl 20.23m: J,sh (10°),ro,pl 20.25m to 20.27m, frag 20.28m: P,sv, (85°), sm,pl 20.3m to 20.35m, frag 20.35m to 20.43m, P,sv,(85°),sm,pl 20.43m to 20.45m, frag	C	81	57	PL(D) = 5.29MPa PL(A) = 8.49MPa
13	21											
12	22											
11	23											
10	24											
9	25											
8	26											
7	27											
6	28											
5	29											

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 4.3m

TYPE OF BORING: Solid flight auger to 3m, then rotary to 4m, then HQ wireline to 20.45m

WATER OBSERVATIONS: Free groundwater obscured by drilling fluids

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 29.8
EASTING: 370514.7
NORTHING: 6360402.3
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
29	0.1	SILT - Brown silt with some sand and organics, humid							A			
	0.5	CLAY - Brown and orange clay with some gravel, M<Wp							A			
	1	SANDSTONE - Extremely low strength, extremely weathered, medium grained, light brown sandstone										
28	1.3	CLAYSTONE / SILTSTONE - Extremely low strength, extremely weathered, orange-brown and grey claystone / siltstone										
	2											
27	2.95	SILTSTONE - Very low to low strength, highly to moderately weathered, orange-brown and grey siltstone from 2.98m to 3.3m, grey clay bands						from 2.95m to 3.33m, fragmented to highly fractured from 3.33m to 3.87m, highly fractured to fractured	C	89	0	
	3											
26	3.93	from 3.87m to 3.93m, light grey and						3.93m: CORE LOSS: 120mm				
	4	4.05 orange-brown clay band						from 4.05m to 4.15m, fg				
	4.36	CORE LOSS						from 4.15m to 4.25m, highly fr 4.36m: P,sh,pl,sm 4.41m: P,sh,H,pl, cy filled (2mm) 4.47m: P,sh,pl,ro 4.67m: P,sh,pl, ro, cy filled	C	100	50	
25		CLAYSTONE - Very low strength, highly weathered, red-brown and grey claystone										
	5	5.0 from 4.25m, extremely low to very low strength, extremely to highly weathered, orange-brown and light grey claystone										
		SILTSTONE - Medium strength, moderately weathered, grey and orange-brown siltstone at 4.47m, ironstone band 7mm thick from 4.97m to 5m, clay band						from 4.79m to 5m, highly fr, P,sh,pl,ro cy filled 4.9m: J, 80°,un,ro 5.2m: P,sh,pl,ro, cy filled 5.3m: P,5°,un,ro 6.15m: J,70°,un,ro from 6.17m to 6.23m, P,sh,un,ro at 20mm spacing 6.35m: P,sh,un,H 6.45m: P,sh,un,H from 6.61m to 6.69m, fg, P, sh,pl,ro 6.78m: J,80°,H,un from 6.81m to 6.95m, fg 6.92m: J,50°,H,un 6.96m: J,60°,H,pl 7.02m: J,70°,H,pl 7.16m: J,50°,H,un from 7.21m to 7.33m, fg, P,sh, un,ro, H 7.32m: J,sv,un,ro,H 7.4m: P,sh,pl,H 7.67m: P,sh,pl,ro 7.69m: P,sh,un,ro clay filled (20mm) 7.71m: P,10°,un,ro 7.76m: J,80°,un,H 7.83m: J,60°,un,ro from 7.89m to 7.93m, fg from 8.02m to 8.22m, fg 8.27m: J,70°,un,ro 8.41m: P,5°,un,H	C	100	60	
24	6											
23	7											
22	8											
	8.45								C	94	45	
21	8.52	CORE LOSS										
	9	SILTSTONE - High strength, slightly weathered, grey-brown and grey siltstone							C	100	85	
20												

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 3m

TYPE OF BORING: Solid flight auger to 2.95m (TC-bit), then HQ wireline to 17.3m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 29.8
EASTING: 370514.7
NORTHING: 6360402.3
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 39663D
DATE: 22 Oct 07
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
19	11	SILTSTONE - High strength, slightly weathered, grey-brown and grey siltstone *(continued)* from 10.13m to 10.25m, sandstone bands 2mm to 40mm thick at 5mm to 30mm spacing						8.45m: CORE LOSS: 70mm 8.53m: J,sv,un,ro 8.8m: P,sh,pl,H 8.86m: P,sh,pl,ro 8.89m: P,sh,pl,ro 9.42m: J,sv,pl,ro 9.57m: J,sv,un,H 9.65m: J,80°,un,sm 9.8m: J,85°,un,ro from 10.31m to 10.45m, P,sh,un,ro, clay filled 10.49m: J,70°,un,sm 10.65m: J,85°,un,sm 11m: J,65°,pl,sm 11.24m: P,5°,pl,ro 11.27m: J,75°,un,H 11.35m: P,5°,un,ro 11.58m: J,85°,H,pl 11.61m: P,5°,pl,sm 11.82m: J,65°,un,H 12.26m: J,75°,pl,ro 12.33m: J,40°,un,ro 12.39m: J,85°,un,ro 12.78m: J,80°,un,H,ro 12.8m: J,80°,un,ro 12.98m: J,20°,pl,ro cy veneer 13.1m: P,30°,un,ro cy veneer 13.19m: P,5°,un,ro 13.3m: P,sh,un,ro 13.37m: J,sv,un,H,ro 13.44m: P,5°,un,ro 13.6m: P,sh,pl,ro 13.62m: J,85°,un,ro,H 14.55m: P,5°,pl,ro 14.97m: P,sh,un,ro 15.31m: P,sh,pl,ro 15.47m: P,sh,un,ro pyrite 15.65m: J,85°,un,ro 15.81m: P,5°,un,ro 15.86m: P,5°,un,ro, pyrite 15.95m: CORE LOSS: 50mm 16.14m: J,80°,un,sm 16.37m: J,65°,un,ro	C	100	85	
18	11.35	SANDSTONE - High strength, slightly weathered, light brown-cream sandstone from 11.68m, igneous rock band 10mm thick							C	100	88	
17	12	from 12.59m to 12.63m, coal										
16	13.1	COAL / CARBONACEOUS MUDSTONE - Medium strength, fresh, black interlayered with dark brown carbonaceous mudstone from 13.69m to 13.85m, black coal							C	100	86	
15	14	from 14.27m, black coal, medium strength, fresh										
14	15	from 15.31m to 15.43m, brown and light brown clay band							C	100	87	
13	15.95 16 16.0	CORE LOSS										
	16.25	SILTSTONE - High strength, fresh, grey siltstone							C	96	96	
		LAMINITE - High strength, fresh, grey and light grey laminite with pyrite in some laminations										
12	17											
11	17.3	Bore discontinued at 17.3m, limit of investigation										
10	18											
	19											

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 3m

TYPE OF BORING: Solid flight auger to 2.95m (TC-bit), then HQ wireline to 17.3m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
24	0.1	SILT - Brown silt with abundant organics, leaves							A,pp			>400 kPa
		CLAY - (Very stiff to hard), brown clay, M<Wp										
23	1	from 0.4m, (hard), light brown clay with ironstone bands, M<Wp							A			
									S			15,25
									pp			>400 kPa
22	2											
	2.3	CLAYSTONE - Extremely low strength, extremely weathered, light grey claystone							C	94	94	
21	3	from 2.8m, grey-brown										
	3.15	CORE LOSS -						3.15m: CORE LOSS: 50mm				
	3.2	CLAYSTONE - Very low strength, highly weathered, light grey and orange claystone						3.46m: P,10°,ro,un	C	100	100	
	3.92	from 3.7m, very low to low strength, highly weathered						3.92m: CORE LOSS: 120mm	C	83	83	
20	4							4.25m: J,80°,un,ro				
	4.04	CORE LOSS -										
	4.4	CLAYSTONE - Extremely low to very low strength, highly weathered, light grey and orange claystone						4.4m: CORE LOSS: 150mm				
	4.55	from 4.13m to 4.3m, low strength, highly weathered, light grey and orange siltstone							C	91	89	
19	5											
	5.3	CORE LOSS -										
		CLAYSTONE - Extremely low to very low strength, extremely weathered, light grey and orange-brown claystone						5.86m: J,80°,pl,H				
		from 4.75m, very low to low strength, highly to moderately weathered						5.97m: J,40°,pl,H				
18	6							6.07m: J,65°,pl,H				
		SILTSTONE - Very low to low strength, highly to moderately weathered, grey and orange-brown siltstone						6.48m: J,un,ro				
	6.63							6.58m: J,pl,ro				
	6.75							6.63m: CORE LOSS: 120mm				
17	7	from 6.16m, laminated							C	93	90	
		from 6.29m to 6.34m, extremely low to very low strength, highly weathered										
		CORE LOSS -										
	7.85	SILTSTONE - Very low strength, highly weathered, grey and brown siltstone						7.85m: CORE LOSS: 130mm				
	7.98							7.98m to 8.21m, P,10°,pl,ro (50mm spacings)				
16	8	from 6.9m to 6.96m, extremely low strength, extremely weathered						8.28m: J,65°,pl,sm	C	91	56	
		CORE LOSS -						8.44m to 8.53m, highly fract				
		SILTSTONE - Medium strength, slightly weathered, grey siltstone						8.77m: J,35°,un,ro				
15	9							8.82m: J,50°,H,un				
	9.25	from 8.21m, high strength, fresh						9.12m: J,60°,un,sm				
		from 8.31m to 8.44m, undulating laminations						9.19m: P,sh,pl,sm, cy veneer				
	9.5	from 8.98m to 9.03m, extremely low strength, extremely weathered, light						9.21m: P,5°,un,ro	C	80	62	
								9.25m: CORE LOSS: 250mm				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.3m

TYPE OF BORING: Solid flight auger to 2.3m, (TC-bit), then HQ wireline to 22.7m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
14		grey						9.54m: J,65°,H,un				
		from 9.03m to 9.07m, low strength, moderately weathered, light grey						9.8m: P,sh,un,ro, cy 10.09m: J,50°,un,ro	C	80	62	
	10.5	CORE LOSS -						10.2m: J,60°,un,ro				
	10.58	SILTSTONE - High strength, fresh, grey siltstone *(continued)*						10.29m: J,25°,un,H 10.32m: J,15°,un,ro 10.33m: J,80°,H,un 10.45m: J,85°,un,ro	C	91	81	
13	11	from 10.05m, fresh from 10.27m, slightly weathered from 10.38m, very low to low strength, highly to moderately weathered						10.5m: CORE LOSS: 80mm 10.78m: J,80°,un,ro 10.94m: J,60°,un,ro 11.03m: P,5°,un,ro cy	C	100	91	
		CORE LOSS						11.24m: J,85°,H,un 11.4m: P,5°,un,ro, cy 11.62m: J,85°,H,pl 11.64m: P, sh,un,ro				
12	12	SILTSTONE - Low to medium strength, moderately weathered, grey siltstone from 10.7m, high strength, fresh from 11.67m to 11.8m, medium strength, slightly weathered						11.67m to 11.7m, P,sh,un,ro, cy 11.91m: J,55°,H,pl 12.48m: J,sv, H,un 12.63m: P,5°,ro,un 12.77m: J,80°,un,ro, white mineral inclusion 12.87m: J,40°,un,ro 13.05m: J,55°,un,ro 13.18m: J,85°,un,ro 13.4m: J,50°,pl,ro	C	100	86	
11	13							13.49m: J,85°,un,ro 13.68m: J,80°,un,H 13.77m: J,70°,pl,ro 13.91m: P,sh,ro,un, cy 13.97m: P,10°,ro,un, cy 14.07m: P,sh,ro,un 14.15m: P,5°,ro,un 14.26m: J,85°,un,sm 14.54m: J,55°,un,ro	C	96	85	
10	14											
	14.84	from 14.67m to 14.84m, low strength, moderately to highly weathered						14.67m to 14.82m, P,5°, un,ro, cy (50mm spacing) 14.71m: J,70°,un,sm	C	79	40	
9	14.89 15 15.1	CORE LOSS -						14.84m: CORE LOSS: 50mm 15.1m: CORE LOSS: 150mm				
	15.25	SILTSTONE - High strength, fresh, grey siltstone (laminated)						15.41m: P,10°,un,ro,cy 15.53m to 15.72m, highly fract	C	100	80	
		CORE LOSS -						15.53m: J,75°,un,ro 15.8m: P,5°,ro,un, cy				
8	16	SILTSTONE - High strength, fresh, grey siltstone (laminated) from 16.17m to 16.4m, medium strength, slightly weathered from 16.2m, band of conglomerate 15mm thick						15.95m: P,un,sm, white mineral inclusions 16.02m: J,80°,un,ro 16.05m: P,sh,H,un	C	100	100	
7	17	from 16.5m, medium strength, slightly weathered from 16.69m, extremely low strength, extremely weathered from 16.78m, very low to low strength, highly weathered from 16.82m, low to medium strength, moderately weathered						16.17m: P,sh,pl,ro, cy filled 16.37m: J,75°,pl,ro 16.44m: P,5°,un,H 16.66m: J,65°,un,sm 17.15m: J,70°,sv, un,ro 17.41m: J,80°	C	100	86	
6	18	from 16.88m, high strength, fresh from 17.42m, light grey siltstone						17.5m: P,10°,un,ro 17.67m: P,10°,un,ro, cy 17.84m: P,sh,pl,sm 18.13m: P,5°,un,ro 18.14m: J,50°,un,ro 18.18m: J,sh,pl,ro				
	18.55 18.65	VOID										
5	19	SANDSTONE - Medium to high strength, slightly weathered, pale brown sandstone						18.46m: P,60°,pl,ro,Fe 18.51m: J,pl,ro	C	38	20	
	19.15	VOID						18.55m: Void 0.1m 18.65m to 18.78m, highly fract 18.94m: P,45°,ro,un,Fe 19.1m: P,sv,80°,ro,un,				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.3m

TYPE OF BORING: Solid flight auger to 2.3m, (TC-bit), then HQ wireline to 22.7m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.1
EASTING: 370628.3
NORTHING: 6360071.5
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 39663D
DATE: 31 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
4		VOID *(continued)*						Fe 19.15m: Void 2.15m				
3	21											
	21.3	CORE LOSS -						21.3m: CORE LOSS: 250mm	C	38	20	
	21.55							21.55m to 21.6m, frag				
	21.6	COAL - Medium strength, fresh, dull black coal with shiny black coal laminations										
2	22											
	22.1	VOID						22.18m: J,sh,ro,un				
		SILTSTONE - Medium strength, slightly weathered, grey and light grey siltstone with some carbonaceous siltstone laminations						22.34m: P,30°,ro,un, Fe 22.4m: J,sh,ro, un, carbonaceous siltstone veneer 22.44m to 22.6m, frag 22.64m: P,45°,ro,un,Fe 22.66m: P,30°,ro,un, Fe				
	22.7	Bore discontinued at 22.7m, limit of investigation										
1	23											
0	24											
-1	25											
-2	26											
-3	27											
-4	28											
-5	29											

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.3m

TYPE OF BORING: Solid flight auger to 2.3m, (TC-bit), then HQ wireline to 22.7m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
24	0.2	SILT - Brown grey silt topsoil with abundant organics, damp										
		CLAY - (Stiff) grey brown clay (alluvium) with red brown mottling							A			
1									S,pp			1,3,4 N = 7 150-190kPa
23	2.0	CLAYSTONE - Extremely low strength, extremely weathered grey brown claystone										
		From 2.45m, increased drilling resistance										
22		From 2.8m, extremely low to very low strength, extremely to highly weathered, grey brown							C	100	100	
3		From 3.2m, grey brown and light grey										
		From 3.4m, light grey										
21		From 4.0m to 4.32m, very low to low strength, highly weathered red siltstone inclusions							C	100	75	
4		From 4.23m, very low to low strength, highly weathered										
20		From 4.6m to 5.0m, red and orange siltstone inclusions						4.74m: J, 15°, pl, ro 4.77m: J, 30°, pl, ro, rootlets, H 4.83m: J, 30°, H, pl 4.86m: J, 55°, H, pl 4.87m: J, 55°, H, un 4.92m: J, 40°, un, ro				
5		From 5.15m to 5.2m, red and orange siltstone inclusions										
		From 5.35m to 6.15m, red and orange siltstone and light grey claystone, very low to low strength, highly weathered							C	100	75	
19	6.15	CLAYSTONE/CARBONACEOUS SILTSTONE - Very low to low strength, moderately weathered orange claystone interlayered with dark grey carbonaceous siltstone										
6	6.5	CARBONACEOUS SILTSTONE - Very low to low strength, moderately weathered dark grey carbonaceous siltstone with laminations of coal 1mm to 5mm thick at 1mm to 90mm spacing						6.6m: P, sh, poss DI 6.61m: P, sh, poss DI 6.64m: P, sh, poss DI 6.73m: P, sh 6.74m: J, 45° 6.82m: P, sh, poss DI 6.95m: P, sh, poss DI 4.92m to 14.2m, Frs generally at 0.05m spacings 7.05m: P, sh, poss DI 7.15m: P, sh, poss DI 7.2m: P, sh, poss DI 7.3m: CORE LOSS: 100mm 7.5m: P, sh 7.8m: P, sh 8m: Fr, 45°, pl 8.15m: P, sh, poss DI 8.4m to 8.45m fg 8.55m: P, sh 8.6m: P, sh 8.68m: P, sh 9.02m: P, sh 9.07m: P, sh			
18	7.2											
	7.3											
	7.4											
	7.5											
17		COAL - Medium strength, fresh black coal							C	97	65	
8		CORE LOSS - 0.1m										
	8.4	COAL - Medium strength, fresh black coal										
	8.56	LAMINITE - Medium to high strength, fresh grey and light grey laminite										
16		CARBONACEOUS SILTSTONE - Low strength, highly weathered fragmented dark grey/grey carbonaceous siltstone with some 1-2mm thick coal laminations at										
9												
15									C	97	60	

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.8m

TYPE OF BORING: Solid flight auger to 2.8m, (TC-bit), then HQ wireline to 25.95m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
14	10.12	5mm spacings From 9.4m to 9.48m, slightly weathered From 9.97m, moderately weathered with some 1-2mm coal laminations at 2-10mm spacings LAMINITE - Medium to high strength, fresh highly fractured grey and light grey laminite *(continued)*						9.65m: P, sh, poss DI 9.85m: P, sh, poss DI 9.9m: P, sh 9.93m: P, sh 9.98m to 10.03m, multiple partings 10.47m to 10.50m, fg 10.9m to 10.92, fg 11.05m: P, sh 11.1m: P, sh, poss DI 11.33m: P, sh, poss DI 11.53m: P, sh, cy lined (20mm) 11.7m to 11.90m, fr, sv	C	97	60	
11												
13		COAL - Low to medium strength, moderately weathered black coal										
12	11.95	SANDSTONE - High strength, slightly weathered grey fine to medium grained sandstone						12m: P, sh, poss DI 12.65m: J, 45°				
12								12.85m: P, sh, poss DI 12.95m: P, sh, cy lined (10mm) 13m: P, sh 13.20m to 13.50m, multiple p, sh, 50-100mm spacing 13.65m: J, 45°, poss DI 13.8m: J, sh, poss DI 13.90m to 13.92m, fg 13.92m to 14.0m, J, 70° 14m: J, 45° 14.05m: P, sh 14.24m: P, sh, un ro	C	100	75	
13												
11		From 13.8m to 14.2m, conglomerate, high strength, slightly weathered grey conglomerate										
14	14.2	SANDSTONE - High strength, slightly weathered grey fragmented sandstone From 14.74m to 14.99m, high strength fresh grey conglomerate										
10								15.03m: P, sh, un ro				
15		From 15.38m to 15.81m, high strength fresh conglomerate										
9								15.81m: P, sh, un ro	C	100	100	
16	15.95	SILTSTONE - Low to medium strength, moderately weathered dark grey siltstone						15.95m to 16.67m, P, sh, un, ro @ 20-70mm				
8	16.74	COAL - Low strength, moderately weathered black coal						16.67m to 17.05, Fg	C	81	81	
17	17.05	CORE LOSS - 0.25m						17.05m: CORE LOSS: 250mm				
	17.3	SILTSTONE - Low strength, moderately weathered grey siltstone						17.30m to 18.27m, P, sh, un, ro @ 10-20mm 17.48m: P, sh, un ro				
7									C	100	31	
18												
	18.24	LAMINITE - Medium to high strength, moderately to slightly weathered grey siltstone						18.53m: P, sh, un ro 18.7m: Fg				
6								18.88m: P, sh, un, sm 18.91m: P, sh, un, sm				
19								19.18m: P, sh, un, sm 19.46m: P, sh, un, sm	C	100	91	
5								19.85m to 19.90, J, 45°,				

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.8m

TYPE OF BORING: Solid flight auger to 2.8m, (TC-bit), then HQ wireline to 25.95m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: 24.8
EASTING: 369867.5
NORTHING: 6360744.2
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 39663D
DATE: 26 Oct 07
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
4	21	LAMINITE - Medium to high strength, moderately to slightly weathered grey siltstone *(continued)*						un, Fg 19.99m to 20.06m, J, 60°, un, ro 20.12m: P, sh, un, ro 20.16m: P, sh, un, ro 20.17m: P, sh, un, ro 20.32m: P, sh, un, ro 20.36m: P, sh, un, ro 20.4m: P, sh, un, ro 20.48m: P, sh, un, ro 20.58m to 20.63m, Fg 20.90m to 21.70m, P, sh, un, ro @20-100mm	C	100	29	
3	22								C	100	29	
2	23							21.70m to 23.55m, P, sh, pl, ro	C	92	0	
	23.18	SILTSTONE - Low strength, moderately weathered grey siltstone										
	23.45	CORE LOSS - 0.15m						23.45m: CORE LOSS: 150mm				
1	23.6	SILTSTONE - Low strength, moderately weathered grey siltstone						23.60m to 24.30m, P, sh, un, ro @ 20-50mm				
	24											
	24.3	VOID - 24.3m to 25.4m							C	100	15	
0	25											
	25.4	SILTSTONE - Very low strength, highly weathered grey siltstone, highly fragmented (possible rubble)										
-1	25.64	CORE LOSS - 0.15m						25.64m: CORE LOSS: 200mm				
	25.84	SILTSTONE - Low strength, highly weathered grey siltstone (possible floor)										
	25.95	Bore discontinued at 25.95m, limit of investigation										
-2	26											
	27											
-3	28											
-4	29											
-5												

RIG: Edson 3000 **DRILLER:** Simon (APS) **LOGGED:** Bear **CASING:** HW to 2.8m

TYPE OF BORING: Solid flight auger to 2.8m, (TC-bit), then HQ wireline to 25.95m

WATER OBSERVATIONS:

REMARKS:

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 1 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0.2	CLAY - Grey brown clay with some silt with sandstone							A			
	0.55	SANDSTONE - Orange brown mottled grey brown sandstone with clay inclusions										
	1	SILTSTONE AND SANDSTONE - Orange brown sandstone interbedded with grey brown and orange siltstone layers							S			9,14,9 N = 23
		From 1.5m, light grey siltstone										
	2	From 2.2m, increased drilling resistance							S			18/110mm refusal, bouncing
	3	From 3.0m, orange brown sandstone/siltstone										
	4								S			25/90mm, refusal
	5											
	5.4	SANDSTONE - Low strength, moderately to highly weathered orange brown fine grained sandstone						5.44m: DB 5.5m: DB 5.58m: P, 10°, un, ro 5.69m: DB 5.77m: DB 5.8m: DB 5.84m: DB 5.87m: DB	C	100	100	
	6											
	6.51	SILTSTONE/SANDSTONE - Low to very low strength, moderately to highly weathered orange and orange grey siltstone/sandstone						5.91m: DB 5.94m: DB 5.97m: DB From 6.07m to 6.21m, J, 70°, un, fg 6.24m: DB 6.5m: DB From 6.52m to 6.57m, J, 70°, un, fg	C	96	85	
	6.57	CORE LOSS - From 6.57m to 6.62m						6.57m: CORE LOSS: 50mm				
	6.62	SILTSTONE/SANDSTONE - Low to very low strength, moderately to highly weathered orange and orange grey siltstone/sandstone						6.98m: DB 7m: P, sh, stepped, sm From 7.05m to 7.10m, fg 7.14m: DB 7.21m: DB 7.24m: DB	C	100	83	
	7											
	7.75	From 6.62m to 6.68m - fragmented, higher strength material										
	8											
	8.3	SANDSTONE - Low strength, moderately weathered grey, fine grained sandstone						From 7.26m to 8.06m, J, sv, un, he From 7.33n to 7.39m, fg 7.43m: DB 7.57m: DB 7.63m: P, sh, pl, ro 8.04m: DB From 8.12m to 8.19m, fg	C	97	78	
	9											
	9.06	SILTSTONE/CLAYSTONE - Low strength, moderately to high weathered grey-dark grey siltstone/claystone										
	9.11	CORE LOSS - From 9.06m to 9.11m										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 2 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE/CLAYSTONE - Low strength, moderately to highly weathered grey-dark grey siltstone/claystone *(continued)*						From 8.20m to 8.364m, DB at 10mm spacing 8.51m: P, sh, un, sm 8.59m: DB	C	97	78	
	11							From 8.61m to 8.64m, J, 45°, pl, sm From 8.76m to 8.8m, fg 8.87m: P, sh, pl, sm 8.9m: P, sh, pl, sm 9.06m: CORE LOSS: 50mm From 9.11m to 9.24m, J, sv, un, ro	C	100	81	
	12							9.18m: DB 9.2m: DB 9.24m: DB 9.26m: DB 9.3m: DB 9.33m: P, clay filled 9.4m: P, sh, pl, sm 9.42m: P, sh, pl, sm 9.55m: P, sh, pl, sm 9.57m: P, sh, pl, sm 9.66m: P, 10°, pl, sm	C	81	69	
	12.6	From 12.55m, coal lenses										
	12.8	CORE LOSS - From 12.6m to 12.8m										
	13 13.05	CLAYSTONE - Very low to low strength, moderately weathered, grey claystone with coal laminations						From 9.74m to 9.78m, J, 45°, pl, sm 9.86m: P, sh, pl, sm 9.95m: P, sh, un, sm 10.06m: P, sh, un, sm	C	60	0	
	13.35											
	13.6	CORE LOSS - From 13.05m to 13.35m										
	14	CLAYSTONE - Low to medium strength, moderately weathered, grey claystone From 13.57m, clay						From 10.12m to 10.29m, J, 60°, fg 10.52m: DB 10.62m: DB 10.69m: DB 10.8m: P, sh, pl, sm	C	60	40	
		COAL - Medium strength, moderately weathered, black coal, with seams of 5mm to 330mm thick clay at approximately 160mm spacing						From 10.8m to 11.25m, J, sv, un, ro From 11.05m to 11.25m, fg 11.36m: DB 11.46m: DB 11.56m: DB 11.57m: DB From 11.74m to 11.84m, J, 50°, pl, ro 11.87m: DB 11.95m: DB 11.97m: DB 12.0m to 12.07m, J, 50°, un, ro 12.16m to 12.31m, fg 12.42m: DB 12.47m: DB	C	100	87	
	15											
	16											
	17							12.6m: Core loss, 0.2m CORE LOSS: 200mm	C	93	42	
	17.5							13.05m: Core loss, 0.3m CORE LOSS: 300mm				
	17.55	CORE LOSS - From 17.5m to 17.55m										
	18	LAMINITE - High strength, slightly weathered, grey laminite (70% siltstone/30% sandstone)						From 13.35m to 13.7m, highly fractured to fg 13.77m: J, 80°, un, ro 14.31m: P, 10?8, un, sm, cy From 14.39m to 14.45m, fg 14.5m: P, 10°, un, ro, cy filled 14.58m: P, 10°, un, sm, cy From 14.75m to 15.25m, highly fr to fg 15.25m: P, 5°, un, ro, cy filled 15.45m: J, sv, pl, ro 15.49m: P, 5°, un, ro, cy	C	100	94	
	19											
		From 19.4m, very high strength (90% sandstone/10% siltstone)										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 3 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, slightly weathered, grey laminite (70% siltstone/30% sandstone) *(continued)*						filled 15.6m: J, 75°, un, ro 15.66m: P, 5°, un, ro 15.72m: P, 10°, un, he 15.77m: P. 5°, un, he 15.83m: P, 5°, un, he	C	100	94	
	21							From 15.99m to 16.02m, fg 16.1m: J, sv, un, ro (16.05m to 16.2m) 16.3 16.3m: J, sv, pl, he 16.4m: J, 80°, pl, ro From 16.95m to 17.07m, highly fr From 17.13m to 17.22m, highly fr From 17.27m to 17.5m, fg to higly fr 17.5m: Core loss, 0.05m CORE LOSS: 50mm Unless otherwise stated, discontinuities are partings, sh-10°, un, ro 17.69m: DB 17.88m: DB 18m: Sh-10°, un, ro 18.06m: Sh-10°, un, ro	C	100	100	
	22											
	23											
	24							18.14m: Sh-10°, un, ro 18.17m: Sh-10°, un, ro 18.33m: J, 80°, pl, sm, part he (18.17m to 18.48m) with DB on laminations 18.49m: DB 18.54m: DB 18.56m: DB 18.78m: J, 60°, un, he 18.84m: DB 18.91m: DB 18.98m: DB 19.01m: DB 19.07m: DB 19.08m: DB 19.19m: J, 70°, pl, sm (19.11m to 19.26m) 19.39m: DB 19.6m: DB 19.78m: DB 20.21m: DB	C	100	95	
	25											
	26											
	27							20.51m: DB 20.78m: DB 20.8m: DB 20.81m: DB 20.84m: DB 20.85m: DB 20.87m: DB 21.01m: DB 21.11m: DB 21.14m: DB 21.27m: DB 21.3m: DB	C	100	100	
	28											
	29							From 21.33m to 21.44m, J, (MFr), 70°, stepped, sm From 21.49m to 21.64m, J (MFr?), 70°, un, sm 21.64m: DB From 21.66m to 21.78m, J, (MFr?), 70°, pl, sm 21.76m: DB 21.97m: DB 22.51m: DB	C	100	100	
								22.64m: DB	C	98	72	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

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BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 4 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	30.34	Medium to high strength, Fg						22.79m: DB From 22.81m to 23.06m, J, (MFr), 70°, pl, sm 22.95m: DB 22.99m: DB 23.07m: DB 23.39m: DB From 23.39m to 23.50m, J (MFr), 70°, pl, sm 23.5m: DB 23.52m: DB 23.61m: DB 23.69m: DB From 23.76m to 23.89m, J (MFr), 70°, pl, sm 23.8m: DB 23.84m: DB 23.91m: DB From 23.91m to 24.07m, J (MFr), sv, un, ro 23.92m: DB	C	98	72	
	31.7	COAL - Low strength, moderately to highly weathered, black coal From 32.21 to 32.25 laminite low to medium strength, highly weathered, yellow brown laminite										
	32.78	LAMINITE - High to very high strength, slightly weathered blue-grey laminite From 33.72m to 34.01m coal, low strength, moderately to highly weathered black coal						23.99m: DB 24.24m: DB From 24.59m to 24.66m, J (MFr), 70°, stepped, ro 24.78m: DB From 24.88m to 25.06m, J (MFr), 70°, pl, sm From 25.23m to 25.37m, Fr, fg 25.5m: DB 25.6m: DB 25.79m: DB From 25.79 to 25.87m, J (MFr), 60°, pl, ro	C	100	48	
								From 25.88m to 25.91m, J, 30°, un, ro 25.98m: DB 26.07m: MFr, irregular, stepper ro From 26.18m to 26.34m, MFr, irregular un, ro From 26.34m to 26.41m, fr, fg	C	100	100	
								From 26.92m to 27.13m, MFr, 80°, pl, sm, fe, ca 27.21m: DB 27.37m: DB 27.47m: DB 27.6m: DB 27.67m: DB From 27.82m to 28.49m, MFr, 80°, pl, sm, multiple Frs 28.72m: DB 28.78m: DB From 28.85m to 28.95m, MFr, 70°, un, ro 28.88m: DB 28.95m: DB 28.99m: DB 29.09m: DB 29.36m: DB 29.65m: DB 29.87m: DB	C	100	89	
		From 37.88m to 38.07m, low strength, moderately to highly weathered laminite						30.09m: DB 30.27m: DB 30.29m: DB 30.47m: DB 30.53m: DB 30.56m: DB 30.67m: DB 30.75m: DB 31.01m: DB	C	100	90	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

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BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 5 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High to very high strength, slightly weathered blue-grey laminite *(continued)*						31.29m: DB 31.6m: DB 31.69m: DB 31.74m: DB 31.77m: DB 31.8m: DB 31.87m: DB From 31.94m to 31.95m, P, sh, fg From 32.04m to 32.21m, Fr, fg From 32.28m to 32.78m, Fr, fg	C	100	90	
	41											
								33m: DB From 33.3m to 33.45m, J (MFr?), 75°, pl, sm From 33.45m to 33.46m, P, sh, un, clay filled From 33.46m to 33.56m, J (MFr?), 80°, curved slickensided From 33.50m to 33.58m, J (MFr?), 80°, irregular, slickensided 33.58m: DB 33.65m: DB From 33.75m to 34.01m, Fr, fg From 34.06m to 34.07m, Fr, fg	C	100	98	
	42											
	43											
								34.11m: P, sh, pl, fg 34.28m: DB 34.46m: DB From 37.40m to 37.49m, J, 60°, pl, sm	C	100	84	
	44											
								35.17m: DB 36.43m: DB 36.48m: DB 36.55m: DB 36.74m: DB 36.75m: DB From 36.79m to 36.82m, J, sv, un, sm, fe 36.82m: DB 36.84m: DB 36.87m: DB 36.88m: DB 36.91m: DB 36.94m: DB From 36.94m to 37.01m, J (MFr?), 80°, pl, sm, fe 36.95m: DB 36.97m: DB 36.99m: DB 37.01m: DB From 37.03m to 37.07m, Fr, fg 37.07m: DB 37.09m: DB 37.15m: DB From 37.21m to 37.4m, J, 70°, un, sm 37.24m: DB 37.28m: DB 37.33m: DB 37.36m: DB 37.37m: DB 37.41m: DB 37.44m: DB 37.48m: DB 37.57m: DB 37.59m: DB 37.67m: DB 37.74m: DB	C	100	100	
	45											
	46											
	47											
	48								C	100	97	
	49											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
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BOREHOLE LOG

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BORE No: 201
PROJECT No: 39663D
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SHEET 6 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High to very high strength, slightly weathered blue-grey laminite *(continued)*						From 37.77m to 37.89m, Fr, sv, irregular, sm, ca 37.89m: P, sh, fg 37.92m: P, sh, fg 37.98m: DB 38.05m: DB	C	100	97	
	50.8	COAL - Medium to high strength, moderately weathered, black coal highly fractured						38.11m: P, sh, pl, clay filled 38.17m: P, sh, pl, clay filled From 38.23m to 38.29m, J, (MFr?), 65°, pl, sm 38.29m: DB 38.31m: DB	C	100	66	
51								38.43m: DB 38.46m: DB 38.71m: DB 38.89m: DB 38.9m: DB 38.96m: DB 39.32m: DB 39.43m: DB From 39.51m to 39.56m, J, 60°, pl, sm From 39.57m to 39.60m, J, 60°, pl, sm 39.65m: DB 39.77m: DB	C	100	100	
52												
53		From 53.14m to 53.24m very low to low strength, moderately to highly weathered light grey/white tuff										
	53.8	LAMINITE - High to very high strength slightly weathered, blue grey slightly fractured laminite						39.81m: DB 39.87m: P, sh, un, stepped, sm, ca From 38.87m to 40.04m, J, 80°, un, sm-ro 40.04m: DB 40.15m: DB 40.48m: DB From 40.63m to 40.7m, J, 70°, un, sm 40.75m: P, sh, pl, sm, ca 40.81m: P, sh, pl, clay filled 40.83m: DB 40.92m: DB 41.26m: DB 41.27m: DB 41.39m: DB 41.42m: DB 41.44m: DB 41.46m: DB 41.53m: DB	C	100	89	
54		From 54.28m, coal lenses 2mm thick approximately 120mm spacing										
	54.48	COAL - Medium to high strength, moderately to slightly weathered, black coal with bands of carbonaceous mudstone, approximately 50mm to 100mm spacing, highly fractured										
55	55.0											
	55.32	LAMINITE - High to very high strength, slightly weathered, blue grey laminite, slilghtly fractured										
56												
	56.21	COAL - Medium to high strength, moderately to slightly weathered, black coal										
		LAMINITE - High strength, fresh, grey laminite (90% siltstone/10% sandstone) with carbonaceous laminations										
57								42.13m: DB 42.16m: DB 42.31m: DB From 42.41m to 42.5m, J, 75°, pl, sm 42.45m: DB 42.5m: DB From 42.50m to 42.63m, J, sv, un,, he From 42.61m to 42.95m, J, sv, pl, sm 42.64m: DB 42.87m: DB From 42.92m to 42.97m, Fr, fg 43.14m: DB 43.18m: DB 43.37m: DB 43.46m: DB 43.49m: DB 43.55m: DB 43.58m: DB	C	100	90	
58												
59												
								43.68m: DB	C	100	96	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
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U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
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DIP/AZIMUTH: 90°/--

BORE No: 201
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DATE: 23 Apr 08
SHEET 7 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	61	From 59.9m to 61m (90% siltstone/10% sandstone) LAMINITE - High strength, fresh, grey laminite (90% siltstone/10% sandstone) with carbonaceous laminations *(continued)*						43.7m: DB 43.79m: DB 43.83m: DB 43.89m: DB 43.94m: DB 43.97m: DB 44.04m: DB 44.13m: DB 44.24m: DB 44.35m: DB 44.41m: DB From 44.51m to 44.70m, Fr, fg From 44.71m to 44.82m, J, 70°, pl, sm 44.97m: DB 45.09m: DB 45.3m: DB 45.35m: DB 45.43m: DB 45.61m: DB	C	100	96	
	62											
	63	From 63.13m to 63.42m, sandstone inclusions light grey From 63.6m, sandstone inclusion at 70° From 64.05m, sandstone inclusion, sh-70°						From 45.61m to 45.81m (MFr), irregular, ro, fr 45.79m: DB 45.86m: DB From 45.88m to 45.94m, J (MFr), 50°, irregular, sm 45.95m: DB 46m: DB 46.05m: DB From 46.05m to 46.27m, J (MFr), 70°, pl, sm, fr, multiple joint sets 46.1m: DB 46.15m: DB 46.24m: DB 46.4m: DB From 46.5m to 46.71m, J (MFr), sv, irregular, he 46.84m: DB From 46.84m to 46.9m, J, sv, un, ro, ca	C	100	92	
	64											
	65											
	66							46.9m: DB 46.93m: DB From 46.98m to 47.11m, J (MFr), 70°, pl, sm 47m: DB 47.05m: DB 47.14m: DB 47.24m: DB 47.35m: DB 47.4m: DB 47.51m: DB From 47.61m to 47.7, J (MFr), fr From 47.76m to 47.88m, J (MFr), 65°, un, ro From 47.83m to 47.99m, J (MFr), 70°, irregular, sm 48.16m: DB 48.19m: DB 48.24m: DB From 48.26m to 48.34m, J (MFr), 70°, un, sm	C	100	100	
	67											
	68											
	69							48.34m: DB 48.36m: DB 48.43m: DB 48.48m: DB 48.62m: DB 48.64m: DB 48.82m: DB 48.9m: DB	C	100	100	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 8 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, fresh, grey laminite (90% siltstone/10% sandstone) with carbonaceous laminations *(continued)*						48.98m: DB 49.02m: DB 49.18m: DB From 49.25m to 49.33m, J (MFr), sv, pl, sm 49.33m: DB From 49.44m to 49.5m, J (MFr), 50°, pl, sm 49.51m: DB From 49.52m to 49.65m, J (MFr), 70°, pl, sm	C	100	100	
		From 70.5m, (sandstone 90%)										
71												
	71.38	VOID						49.6m: DB 49.78m: DB 49.92m: DB 50.17m: DB 50.25m: DB From 50.30m to 50.45m, J (MFr?), 75°, un, sn-ro, pyrite 50.72m: DB From 50.8m to 51.17m, Fg				
72												
		From 72.88m, rubble										
73	73.1	SILTSTONE/LAMINITE - High strength, fragmented grey siltstone/laminite						51.25m: DB 51.4m: DB From 51.51m to 51.71m, Fg From 52.26m to 52.37m, J, sv, un, ro From 52.87m to 53.0m , J, 80°, un, ro From 53.40m to 53.50m, J, 80°, un, fg From 54.11m to 54.32m, Fr, 5° to 30°, un, sm From 54.43m, J, 30°, un, sm, coal	C	76	71	
	73.3											
	73.66	VOID										
	73.82	From 73.55m, rubble										
74		COAL - Medium strength, moderately weathered, black coal										
		SANDSTONE - Very high strength, fractured, grey sandstone										
75								From 54.48m to 55.0m, highly fractured, P, sh-10°, pl, sm, spacing 50mm to 100mm 54.82m: J, 70°, un, ro, pyrite 55.11m: P, sh, un, sm, coal 55.3m: P, 5°, un, sm, coal From 55.54m to 55.83m, Fr, sh-30°, 10mm to 80mm spacing, sm-sl 56.21m: P, 5°, un, sm, pyrite 56.39m: P, 5°, un, sm, pyrite, coal 56.68m: DB 56.84m: P, 5°, un, ro, CBS, he 56.98m: P, 5°, un, ro, CBS, he	C	100	100	
76												
77												
	77.9	Bore discontinued at 77.9m, limit of investigation						57.17m: P, 5°, un, sm, CBS 57.22m: DB 57.37m: P, 5°, un, sm, CBS 57.5m: DB 57.6m: P, 5°, un, sm, CBS, poss DB 57.62m: P, 5°, un, sm, CBS, poss DB 57.66m: P, 5°, un, sm, CBS, poss DB 57.68m: P, 5°, un, sm, CBS, poss DB 57.73m: DB 58.06m: P, 5°, un, sm,				
78												
79												

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
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U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
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C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
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DIP/AZIMUTH: 90°/--

BORE No: 201
PROJECT No: 39663D
DATE: 23 Apr 08
SHEET 9 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	81							CBS, poss DB 58.23m: J, 20°, un, sm 58.35m: DB From 58.48m to 58.7m, J, 30°, un, sm spacing 10mm to 40mm 58.77m: J, 40°, un, he 58.85m: DB 59.05m: P, 5°, un, ro, CBS, poss DB 59.07m: J, sh-20°, cu, sl, CBs, he 59.21m: J, 20°, un, sm 59.39m: DB 59.51m: DB 59.59m: DB 59.66m: DB 60.45m: DB 60.61m: DB 60.9m: J, 65°, un, he, ca (60.83m to 60.96m) 60.94m: J, 65°, un, he, ca (60.87m to 61.01m) 61.02m: J, 70°, un, sm, ca (60.94m to 61.09m) 61.22m: J, 80°, un, he 61.46m: J, 65°, pl, sm, ca (61.4m to 61.53m) 61.61m: J, 50° to 70°, pl, sm, ca (61.55m to 61.67m) 61.94m: J, 70°, pl, sm (61.85m to 62.02m) 62.34m: J, 70°, pl, sm (62.22m to 62.46m) 62.53m: DB 62.63m: DB 62.7m: DB 62.76m: DB 62.85m: P, 5°, un, sm, coal - 10mm 63.1m: DB 63.32m: DB, coal lense 63.38m: DB 63.57m: DB From 63.62m to 63.79m, fractures, sv-60°, un, he 63.85m: J, 40°, un, sm 63.95m: J, 50°, un, sl From 64.0m to 71.38m, DB spaced 0.05m to 0.75m 74.72m: DB 75.4m: DB 75.7m: DB 75.89m: Di on CBS lam 75.98m: Di on CBS lam 77.11m: DB 77.73m: DB				
	82											
	83											
	84											
	85											
	86											
	87											
	88											
	89											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear/Benson **CASING:** HW to 5.4m

TYPE OF BORING: Solid flight auger to 5.4m. HQ wireline from 5.4m to 77.9m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 50% water loss in coal at 13.6m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 1 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CLAY - Very stiff to hard, light grey brown mottled orange brown clay							A			
									pp S			400 kPa 4,9,10 N = 19
	0.75	SILTSTONE/CLAYSTONE - Extremely low to very low strength, extremely to highly weathered, light grey mottled orange siltstone/claystone										
	1								S			9,11,10 N = 21
		From 1.8m, increased drilling resistance										
	2								S			
	3							From 38.35m to 38.55m, fr and p, 5mm to 50mm spacing				
	3.95	SILTSTONE - Very low to low strength, highly to moderately weathered, grey brown mottled orange laminated siltstone						4.04m: J, sv, un, sm, cy, extend to 4.14m 4.6m: P, 0°-10°, un, ro 4.75m to 4.87m, J, 80°, pl, ro, fe 4.98m to 5.07m, J, 80°, un, sm, cy 5.16m: P, 0°-10°, un, ro 5.42m: P, 0°-10°, un, ro 5.65m: P, 0°-10°, un, ro	C	100	97	
	4											
	5											
	6	From 6.0m, interbedded sandstone						5.95m: CB 5.98m: P, 0°-10°, un, ro 6.1m: J, 45°, he 6.17m: Di 6.44m: J, 10°, he 6.5m: J, 65°, he 6.91m: Cy filled (10mm)	C	100	90	
	7											
		SANDSTONE - Medium strength, moderately to slightly weathered grey-brown mottled orange sandstone From 7.75 to 8.45m carbonaceous laminations spacing 5mm to 140mm						7.14m: DB 7.16m: DB 7.2m: DB 7.27m: Cy filled (10mm), he 7.4m: Fe 7.42m: Fe 7.47m: Fe 7.78m: DB 8.15m: DB 8.5m: CORE LOSS: 50mm	C	97	96	
	8											
	8.5	From 8.47m, clay and gravel band										
	8.55	CORE LOSS - From 8.5m to 8.55m										
	8.78	SANDSTONE - Medium strength, moderately to slightly weathered, orange brown sandstone						8.78m: CORE LOSS: 270mm				
	9								C	91	87	
	9.05	CORE LOSS - From 8.78m to 9.05m										
		From 9.55m, medium strength, moderately weathered, orange						9.78m: J, sv, un, ro, fe				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 2 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		brown						9.94m: J, 35°, he				
		SANDSTONE - Extremely low strength, extremely weathered, grey brown sandstone (clayey sand properties) *(continued)*						10.1m: J, 60°, he, cy From 10.3m to 10.45m, highly fractured				
	11	At 10.02m to 10.18m, increased weathering along joint, extremely low to low strength, extremely to highly weathered						10.75m: P, 0°-10°, un, ro 11m: Cy filled (10mm)	C	91	87	
		From 10.18m, very low to medium strength, highly to moderately weathered						11.23m: P, 0°-10°, un, ro 11.28m: J, sv, un, sm, di 11.46m: J, 80°, pl, ro, fe				
	12	From 10.38m, extremely low strength, extremely weathered						11.5m: Possible DB 11.77m: DB 11.83m: DB				
	12.15	From 10.45m, low to medium strength, moderately weathered, interbedded sandstone with carbonaceous laminations to 10.75m						12.15m: CORE LOSS: 650mm				
	12.8											
	13	From 11.1m to 11.25m, carbonaceous laminations 5mm to 50mm spacing						12.93m: P, 0°-10°, un, ro 13.02m: P, 0°-10°, un, ro 13.06m: P, 0°-10°, un, ro	C	77	61	
	13.08	From 11.28m to 11.4m, siltstone, grey										
		From 11.65m to 12.1m, carbonaceous laminations spacing 1mm to 60mm						13.2m: J, sv, un, ro, fe (13.08m to 13.3m) From 13.3m to 13.38m, P, spacing 20mm				
	13.82											
	14	CORE LOSS - From 12.15m to 12.8m						13.5m: J, 80°, un, ro 13.74m: J, 55°, he, un, fe				
		SILTSTONE - Very low strength, highly weathered, grey brown siltstone						13.78m: P, fe 13.84m: J, 40°, he, fe 13.86m: J, 40°, he, fe				
	15	From 12.93m, medium strength, moderately weathered						13.96m: he 14.05m: P, 0°-10°, un, ro				
		From 13.02m to 13.06m, extremely low to very low strength, extremely to highly weathered						14.18m: J, 70°, pl, ro, fe 20mm wide From 14.25m to 14.4m, highly fr to fg (10mm to 20mm)	C	83	67	
		From 13.06m to 13.08m, clay band						14.65m: DB 14.68m: DB 14.7m: DB				
	16	SANDSTONE - Medium strength, moderately weathered, light brown sandstone						14.96m: P 15.45m: J, 75°, pl, ro, fe 90mm wide (15.38m to 15.56m)				
		From 13.30m to 13.38m, extremely low to low strength, extremely to highly weathered						15.92m: P 16m: J, 60°, he				
	16.75	From 13.38m to 13.77m, carbonaceous laminations, spacing 1mm to 30mm						16.07m: P, 0°-10°, un, ro 16.15m: P, fg, 16.12m to 16.16m				
	17	From 13.44m, clay band 8mm						From 16.27m to 16.35m, fg From 16.65m to 16.75m, fg				
	17.2							16.75m: CORE LOSS: 450mm	C	92	29	
	17.3							17.3m: CORE LOSS: 250mm				
	17.55	CLAYSTONE - Very low to low strength, moderately weathered, grey claystone						17.55m to 17.72m, fg 17.81m to 17.89m, fg (0.01m) 17.89m to 18.0m, fg (0.03m)				
	17.81											
	18	From 14.05m, extremely weathered at parting										
		At 14.96m, increased weathering at parting, extremely low strength, extremely weathered (possible core loss)										
		At 15.14m, clay band, 5mm										
	19	At 15.3m to 15.56m, highly weathered, increased weathering at joint										
		At 15.92m, extremely low to low strength, extremely weathered, inceased weathering at parting (possible core loss)										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 3 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	20.25	At 16.15m, extremely low to low strength, extremely weathered, inceased weathering at parting (possible core loss)						20.25m: CORE LOSS: 80mm	C	92	29	
	20.33	From 16.27m to 16.35m, extremely low to very low strength, highly weathered						20.33m to 250.5m, fr 0.02m 20.82m: J, sv, un, ro (20.75m to 20.9m)_				
	21	CORE LOSS - From 16.75m to 17.2m						21.13m: J, 45°, he, pl, cy 21.35m: J, sv, un, ro (21.18m to 21.52m)	C	93	0	
	21.52	CLAYSTONE - Extremely low to low strength, highly weathered, grey claystone						21.66m: J, 60°, he, un 21.75m: J, 50°, un, ro 21.85m: DB 21.95m: J, 70°, un, he 22.04m: DB				
	22	CORE LOSS - From 17.3m to 17.55m						From 22.1m to 22.32m, fg 22.33m: J, 30°, un, ro 22.38m: J, 30°, pl, sm 22.43m: J, 15°, un, ro 22.52m: P, 10°, un, ro, di 22.58m: J, 20°, pl, sm 22.69m: J, 40°, un, sm 22.74m: J, 35°, un, sm	C	100	56	
	22.95	CARBONACEOUS SILTSTONE - Very low to medium strength, highly weathered, grey carbonaceous siltstone						From 22.82m to 22.86m, fg 22.95m: P, sh, he, un 23.2m: Possible DB 23.28m: Possible DB 23.37m: J, 75°, pl, he (23.28m to 23.46m) 23.47m: DB 23.97m: Possible DB 24.25m: DB 24.4m: DB 24.43m: P, 0°-10°, un, ro 24.46m: J, 15°, un, sm 24.56m: DB, on laminations	C	100	95	
	23	COAL - Medium strengthm, moderately weathered, black coal with seams of 5mm to 250mm thick clay/tuff at 10mm to 270mm spacing *(continued)*										
	23.93	CORE LOSS - From 20.25m to 20.33m										
	24	COAL - Medium strength, moderately weathered, black coal with bands of light brown/brown 5mm to 200 thick clay/tuff at approximately 5mm to 400mm spacing										
	25	CARBONACEOUS SILTSTONE - Medium strength, moderately weathered, grey carbonaceous siltstone From 21.58m, high strength, slightly weathered										
	25.75 25.8	SANDSTONE - High strength, slightly weathered, fractured, grey sandstone with carbonaceous laminations 10mm to 100mm apart						24.6m: DB, on laminations 24.68m: P, sh, un, ro, pyrite 24.8m: DB 24.96m: J, 10°, un, sm, pyrite, coal	C	95	85	
	26	LAMINITE - High strength, slightly weathered, grey/dark grey laminite										
	27	CORE LOSS - From 25.75m to 25.8m LAMINITE - High strength, slightly weathered, grey/dark grey laminite (80% siltstone/20% sandstone) with carbonaceous laminations From 27.0m to 27.1m, sandstone From 27.3m to 28.18m, sandstone						25.02m: Set of joints, 15°, un, ro, pyrite, coal 25.04m: Set of joints, 15°, un, ro, pyrite, coal 25.25m: DB 25.36m: DB 25.47m: DB 25.48m: J, 70°, un, ro, fe (25.35m to 25.58m) 25.66m: DB 25.75m: CORE LOSS: 50mm 25.81m: DB 25.93m: DB 25.99m: DB 26.09m to 26.19m, highly fr 26.3m: P, 5°, un, ro, pyrite	C	100	96	
	28											
	29	From 29.43m to 29.5m, heat affected zone						26.35m: DB on laminations 26.45m: DB on laminations	C	100	100	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

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BOREHOLE LOG

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LOCATION: Minmi

SURFACE LEVEL: --
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BORE No: 202
PROJECT No: 39663D
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SHEET 4 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, slightly weathered, grey/dark grey laminite (80% siltstone/20% sandstone) with carbonaceous laminations *(continued)*						26.65m: DB on laminations 26.75m: DB 26.81m: Possible DB 27.06m: Possible DB 27.16m: Possible DB 27.26m: Possible DB 27.4m: Possible DB 27.58m: Possible DB 27.7m: Possible DB 27.9m: P, 15°, un, ro 28.19m: P, 0°-10°, un, ro 28.42m: J, 60°, ro, un, pyrite 28.52m: J, 65°, ro, un, pyrite 28.65m: Possible DB 28.75m: Possible DB 28.93m: Possible DB 29.07m: P, pyrite 29.3m: J, 85°, pl, he, sm 29.5m: J, 75° to 90°, un, sm 29.68m: J, 75°, un, sm 29.71m: Possible DB 29.81m: Possible DB 30.06m: Possible DB 30.4m: J, 70° to sv, un, ro (30.17m to 30.62m) 30.68m: Possible DB 30.83m: Possible DB 31.15m: J, 80°, un, ro, some fe 31.33m: J, 10°, pl, ro 31.77m: DB 32.18m: DB 32.33m: DB 32.65m: DB 32.91m: DB 33.15m: DB 33.34m: DB 33.55m: DB 33.78m: DB 34.08m: DB 34.2m: DB 34.36m: J, 80°, he un 34.4m: DB 34.88m: J, 80°, un, ro 35.38m: DB 35.65m: DB 36.23m: DB 36.45m: P, 0°-10°, un, ro 36.61m: P, 0°-10°, un, ro 36.72m: P, 0°-10°, un, ro 36.83m: P, 0°-10°, un, ro 37.03m: P, 0°-10°, un, ro 37.25m: J, sv, st, sl From 37.34m, to 37.44m, fg 38.27m: P, 0°-10°, un, ro 38.3m: P, 0°-10°, un, ro 38.55m: CORE LOSS: 100mm 38.71m to 37.77m, fg 38.79m: P, 0°-10°, un, ro 38.82m: DB	C	100	100	
	31											
		From 31.4m to 31.65m, sandstone										
	32											
	33								C	99	100	
	34											
		From 34.1m to 35.4m, sandstone										
	35											
	35.4	LAMINITE - High strength, slightly weathered, light grey/dark grey laminite with carbonaceous laminations (70% sandstone, 30% siltstone)										
	36											
	36.42	From 36.27m to 36.33m, heat affected zone with calcite in fractures							C	100	92	
		COAL - Medium strength, moderately weathered, black coal with bands of 3mm to 40mm thick clay/tuff at ~ 250mm spacing										
	37											
	37.44	LAMINITE - High strength, slightly weathered, light grey/dark grey laminite (80% siltstone/20% sandstone) with carbonaceous laminations										
	38											
	38.55	CORE LOSS - From 38.55m to 38.65m										
	38.65											
	38.77	COAL - Medium strength, moderately weathered, black coal							C	97	83	
	39											
		LAMINITE - High strength, slightly weathered, light grey/grey laminite (60% sandstone/40% siltstone) with carbonaceous laminations										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 5 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, slightly weathered, light grey/grey laminite (60% sandstone/40% siltstone) with carbonaceous laminations *(continued)*						39.35m: DB 39.69m: DB 39.94m: J, 10°, un, ro From 40.45m to 40.50m, sv fractures 40.75m: DB	C	97	83	
	41							41.15m: J, 20°, un, sm 41.42m: J, 35°, un, sl 41.45m: DB 41.64m: Possible DB 41.69m: Fr, sh - 30°, st, sm 41.75m: DB 41.88m: J, 40°, un, sm 41.94m: J, 50°, un, sm From 41.94m to 42.42m, J, 60° - sv, un, sm, mineral deposits and highly fractured along joint	C	96	66	
	42											
	42.52 42.62	From 42.5m to 42.52m, clay/tuff CORE LOSS - From 42.52m to 42.62m										
	43	LAMINITE - High strength, slightly weathered, light grey/grey laminite (50% sandstone/50% siltstone0						42.2m: J, 10°, un, sm 42.29m: J, 15°, un, sm 42.4m: J, 30°, un, ro, mineral deposit 42.43m: DB 42.5m: P, 0°-10°, un, ro 42.52m: CORE LOSS: 100mm From 42.62m to 42.78m, parallel joints J, 70°, un, ro	C	100	89	
	44	From 44m, fresh						42.97m: J, sv, un, ro 43.23m: P, 0°-10°, un, ro 43.68m: J, 55°, he, un 43.73m: Joint sets, 5°, st, sm 43.8m: Joint sets, 5°, st, sm 43.81m: J, 60°, sv, un, ro 43.84m: J, 70°, un, he 43.85m: Joint sets, 5°, st, sm 43.99m: Parallel joints, 75°, un, he 44.05m: Parallel joints, 75°, un, he	C	100	95	
	45											
	46	From 45.76m to 45.81m, grey brown heat affected zone? From 46.20m to 46.29m, dark grey band From 46.36m to 46.61m, bedding angle changes rapidly?										
	47	From 47.1m to 47.35m, blue grey siltstone From 47.35m to 47.5m, pale brown At 47.55m, clay, 10mm thick										
	48	From 47.95m to 48.65m, green-grey						44.18m: Parallel joints, 75°, un, he 44.25m: F, 70°, sv, un, sm 44.66m: DB 44.82m: Possible DB 44.92m: Possible DB 45.03m: DB 45.19m: DB 45.23m: J, 5°, pl, sm 45.42m: J, 75°, un, sm, he (45.34m to 45.5m) 45.5m: J, 75°, un, he 45.7m: J, 85°, pl, sm (45.6m to 45.8m) 46.02m: DB 46.17m: DB 46.65m: J, 70°, pl, he 46.68m: P, 0°-10°, un, ro 46.71m: DB 46.78m: ??	C	100	93	
	48.71 49	LAMINITE - High strength, slightly weathered, light grey/grey laminite (70% siltstone/30% sandstone) From 49m, carbonaceous lamination From 49.95m, grey green (various shades)										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 6 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, slightly weathered, light grey/grey laminite (70% siltstone/30% sandstone) *(continued)*						46.96m: Possible DB 47.07m: Possible DB 47.43m: Possible DB 47.54m: P, 0°-10°, un, ro 47.6m: P, sh, un, ro, he 47.61m: P, sh, un, ro, he 47.65m: P, 5°, un, ro, fg to 47.68m 47.67m: J, 75°, un, he 47.78m: P, un, ro, cy	C	100	84	
	51	From 51.0m to 51.15m, grey From 51.19m to 51.55m, grey						48.04m: J, 20°, un, ro 48.37m: J, 60°, un, ro 48.71m: P, 0°-10°, un, ro 49.24m: DB 49.39m: Possible DB 49.72m: Possible DB 49.88m: Possible DB 49.9m: Possible DB 50.16m: P, 5°, un, sm, cy	C	100	84	
	52											
	53	At 53.62m, clay band, 25mm thick						50.31m: DB 50.48m: p, 5°, pl, sm, possible DB 50.62m: DB 50.75m: J, 60°, pl, he 50.82m: J, sv, pl, he 50.94m: J, 60°, un, sm 51m: Possible DB 51.05m: Possible DB 51.3m: J, 65°, un, he 51.38m: J, 10°, un, sm 51.42m: J, 10°, un, sm 51.46m: J, 10°, un, sm 51.48m: J, sv, un, sm with fr 51.51m: J, 10°, un, sm 51.78m: J, 75°, pl, he 52.35m: Possible DB 52.56m: Possible DB 52.66m: Possible DB 52.85m: J, 75°, un, ro, he	C	100	96	
	54 53.98	SANDSTONE - High strength, slightly weathered, pale brown/cream sandstone with significant clay content										
	55											
	55.85	COAL - Medium strength, moderately weathered, black coal (Young Wallsend) with bands of tuff and carbonaceous mudstone						52.91m: Fr 53.08m: J, 60°, un, he (53m to9 53.15m) 53.26m: J, 55°, cu, he 53.34m: DB 53.4m: DB 53.5m: J, 75°, un, sm 53.58m: DB 53.62m: Cy filled 25mm From 53.69m to 53.97m, fr 10mm to 60mm spacing 53.7m: J, 70° to sv, sm, un, he 53.8m: J, 70° to sv, sm, un, he 53.94m: J, 70° to sv, sm, un, he 54.13m: P, 0°-10°, un, ro 54.25m: J, 10°, un, ro, calcite	C	100	100	
	56											
	57											
	58											
	59 59.0	CARBONACEOUS SILTSTONE - High strength, fractured, dark grey carbonaceous siltstone From 59.35m, coal laminations						54.27m: J, 20°, un, ro, calcite 54.31m: P, 0°-10°, un, ro 54.49m: J, 70°, un, ro, he 54.9m: J, 75°, un, ro, he 55.7m: J, 60°, un, ro, h	C	100	87	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 7 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		COAL - Medium strength, moderately weathered, black coal (Young Wallsend) with bands of 10mm to 200mm thick carbonaceous mudstone and clay at 20mm to 400mm spacing *(continued)*						55.81m: P, 0°-10°, un, ro 55.91m: P, 5°, pl, sm, tuff/clay 55.96m: P, 10°, st, ro 56.12m: Fr 56.17m: P, un, ro, tuff				
61	61.05	LAMINITE - High strength, fractured, grey/dark grey laminite with carbonaceous laminations (80% sandstone/20% siltstone)						56.17m to 56.23m, J, 80°, un, ro 56.29m: DB 56.35m: Fr 56.4m: P, 0°-10°, un, ro 56.54m: Fr, sh 56.6m: Fr, sh 56.65m: Fr, sh	C	100	87	
62		From 62.40m to 62.42m, fragmented						56.7m: Fr, sh 56.74m: Fr, sh 56.79m: Fr, sh 56.87m: J, 60°, un, ro 57.1m: Fr 57.2m: J, sv, he, un 57.3m: Fr				
63		From 63.18m to 63.19m, coal lense						57.37m: P, sh, pl, CBS MS 57.5m: Fr 57.6m: J, sv, un, ro 57.8m: J, 20°, pl, he 57.95m: J, sv, un, he 58m: J, sv, un, he	C	100	100	
64								58.30m to 58.48, fg along joints 58.4m: J, 75°, un, ro 58.55m: P, sh, pl, ro, CBS MS 58.77m: P, 10°, pl, ro 59.12m: P, 10°, pl, sm 59.15m: P, sh, DB				
65								59.16m: J, 30°, un, sm 59.18m: J, 30°, un, he 59.20m to 59.26m, fractures 59.26m: DB 59.27m: DB 59.39m: DB 59.43m: DB 59.53m: DB 59.59m: DB 59.64m: DB				
66								59.7m: P, 0°-10°, un, ro 59.89m: J, 80°, pl, ro	C	100	100	
67		At 66.96m, clay 15mm From 66.97m to 67.05, coal						60.04m: P, 0°-10°, un, ro 60.08m: P, 0°-10°, un, ro 60.35m: J, 20°, un, ro 60.41m: J, 20°, un, he 60.53m: J, 20°, pl, sm, cu 60.62m: J, 40°, un, ro				
68								60.73m: P, 0°-10°, un, ro 60.78m: J, 80°, un, ro 60.80m to 60.89m, highly fractured 61.01m: J, 30°, un, ro				
69								61.18m: P, 0°-10°, un, ro 61.22m: P, 0°-10°, un, ro 61.35m: J, 85°, pl, sm, possible DB 62.05m: J, 40°, un, sm 62.24m: Possible DB 62.42m: J, 20°, pl, he	C	100	100	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 8 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - High strength, fractured, grey/dark grey laminite with carbonaceous laminations (80% sandstone/20% siltstone) *(continued)*						62.48m: P, sh, pl, ro 62.59m: J, 25°, pl, he 62.82m: Fr, sh, un, ro 62.93m: Fr, 30°, st, sm 63.17m: DB 63.55m: DB 63.8m: DB 64.07m: J, 30°, pl, he 64.23m: DB	C	100	100	
71								64.58m: DB 64.95m: DB 65.02m: DB 65.24m: DB 65.4m: P, sh, pl, sm 65.62m: p, sh, un, sm, DB?				
72								65.73m: P, sh, un, sm, core grind 65.92m: P, sh, pl, ro, DB?				
73								66.07m: P, sh, un, sm 66.26m: DB 66.7m: J, 30°, un, sm, cy? 66.93m: P, sh, pl, sm 66.97m to 67.05, miltiple fractures coal filled 67.17m: P, sh, un, ro, di 67.31m: P, sh, un, ro, di 67.66m: P, sh, un, ro, di 67.9m: J, 40°, pl, sm 67.94m: J, 70°, pl, he	C	100	100	
74								68.05m: DB 68.16m: DB 68.2m: DB 68.38m: DB 68.49m: DB 68.69m: DB 68.81m: DB				
75								69.08m: DB 69.29m: DB 69.45m: DB 69.58m: DB 69.86m: DB 69.89m: DB 70.03m: DB 70.24m: DB	C	100	100	
76	76.3	VOID: Water filled (when rods lowered air pushed out)						70.51m: DB 70.79m: DB 71.08m: DB 71.54m: DB 71.73m: DB 72.12m to 72.22m, fault 5mm to 1mm 72.14m: J, 25?8, un, ro, possible m fr 72.15m: J, 75°, un, he 72.22m: DB 72.8m: DB 72.96m: DB 73.11m: DB				
77								73.38m: J, 70°, pl, ro calcite (73.29m to 73.46m) 73.82m: DB 73.98m: DB, possible m fr, 10°, un, ro 74.1m: DB 74.3m: ?? 74.69m: P, 0°-10°, un, ro 74.85m to 75.23m, M fr, sv, un, ro, he 75.11m: P, 0°-10°, un,	C	55	49	
78	78.25 78.35	CORE LOSS - From 78.25m to 78.35m										
	78.68	COAL - Extremely low strength, extremely weathered, black coal, fragmented/silty										
79		From 78.4m, medium strength, moderately weathered, fragmented to highly fragmented At 78.58m, floor coal divide										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 202
PROJECT No: 39663D
DATE: 14 Apr 08
SHEET 9 OF 9

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SANDSTONE - Very high strength, fresh, grey sandstone with carbonaceous laminations, spacing 0.1m to 1.0m *(continued)*						ro 75.28m to 75.74m, M fr, 70° - sv, un, ro 75.7m to 75.8m, M Fr, 60°, un, ro 75.82m to 76.03m, M Fr , 75°, un, ro, he 76.1m to 76.2m, M Fr, 80°, un, ro, he 78.25m: CORE LOSS: 100mm From 78.35m to 78.68m, fg to highly fr 79.31m: DB 79.71m: DB 80.1m: DB 80.75m: DB 80.88m: DB	C	55	49	
81	80.95	Bore discontinued at 80.95m, limit of investigation										
82												
83												
84												
85												
86												
87												
88												
89												

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 3.95m, then HQ wireline coring from 3.95m to 80.95m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: 10% water loss from 12.15m (approximately). 100% water loss at 34.8m. At 37.45m, 75% water return. Water flow from approximately 37m to 47m (into and out of fractures), 100% water loss 76.3m

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
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U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 1 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CLAY - Brown clay with some weathered coal, M> Wp										
	1.0	CLAYSTONE/SILTSTONE - Extremely weathered, extremely low strength, grey brown claystone/siltstone. From 1.5m, increased strength and less weathering siltstone							D			
									D			
									D			
									D			
		From 9.5m, brown							D			

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 2 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CLAYSTONE/SILTSTONE - Extremely weathered, extremely low strength, grey brown claystone/siltstone. *(continued)* From 10.5m to 11m, clay, brown										
	11 11.0	SANDSTONE/SILTSTONE - Brown sandstone and siltstone interbedded							D			
	12											
	13								D			
	14											
	15											
	16								D			
	17											
	18											
	19	At 19.0m, silty clay							D			
		From 19.6m to 20.6m, coal, black (yard seam)										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 3 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SANDSTONE/SILTSTONE - Brown sandstone and siltstone interbedded *(continued)*							D			
	21	At 21.0m, coal, black (200mm)										
	21.2	LAMINITE - Grey laminite (80% sandstone)							D			
	22											
	23											
	24											
	24.5	CLAYSTONE/SILTSTONE - Grey interbedded claystone and siltstone							D			
	25											
	26											
	27											
	28								D			
	29											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 4 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		CLAYSTONE/SILTSTONE - Grey interbedded claystone and siltstone *(continued)*										
	31								D			
	32											
	33											
	34								D			
	35											
	36											
	37	From 37.2m, uneven drilling, possible goaf							D			
	37.7	COAL - black coal (Young Wallsend Seam)										
	38											
	39								D			
	39.9											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 5 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	41	COAL/CBS SILTSTONE - Interbedded *(continued)*							D			
	42											
	42.5	LAMINITE - Grey laminite										
	43								D			
	44											
	45											
	45.05	LAMINITE - High strength, slightly weathered, grey laminite						From 45.05m to 45.18m, highly fr 45.29m: DB 45.31m: DB 45.4m: DB 45.56m: DB 45.66m: DB 45.85m: DB 46.05m: DB 46.18m: DB 46.25m: DB 46.48m: DB 46.61m: DB 46.64m: DB 46.74m: DB 46.77m: DB 46.95m: DB 47.19m: DB 47.45m: DB 47.59m: DB 47.77m: DB 47.91m: DB 47.97m: J, 65°, pl, sm 48.14m: DB 48.38m: J, 35°, pl, sm, poss MFr 48.44m: DB 48.53m: DB 48.58m: DB 48.63m: J, 20°, un, sm, poss DB/MFr 48.68m: J, 65°, pl, he, poss MFr 48.78m: DB 49m: J, 20°, pl, sm, poss MFr	C	100	0	
	46								C	100	100	
	47	From 46.75m to 46.77m, clay From 46.79m to 46.81m, clay										
	48											
	48.7	SANDSTONE - High strength, slighly weathered, fragmented, grey sandstone							C	100	10	
	49											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 6 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SANDSTONE - High strength, slighly weathered, fragmented, grey sandstone *(continued)*						49.09m: J, 10°, un, sm, poss MFr 49.3m: DB 49.68m to 50.11m, M Fr, 70°, sv, un, ro 50.37m: DB 50.62m: J, 30°, un, ro, poss MFr 50.64m: J, 35°, un, ro, Poss MFr	C	100	10	
	51							51.65m: DB/MFr 51.77m: DB/MFr	C	100	100	
	52											
	53							53.42m: DB 53.71m: P, 10°, un, ro, coal, di 53.97m: DB 54.2m: DB				
	54								C	100	100	
	55							54.61m: DB 54.71m: DB 54.83m: DB 54.91m: DB 55.06m: DB 55.37m: DB 55.59m: P, 10°, un, ro				
	56 56.0	VOID										
		From 56.8m, rubble										
	57 57.0	SILTSTONE/SANDSTONE - High strength, fragmented, grey siltstone/sandstone										
	57.3	VOID						57.25m: Fr, 80¨, pl, sm				
	58								C	100	100	
		From 58.65m, rubble										
	58.87 59 58.95	SILTSTONE - High strength, fragmented, grey siltstone										
	59.4	VOID										
	59.51	From 59.26, rubble										
	59.76	CLAYSTONE - Medium strength, fresh						59.65m: J, 50°, un, ro, poss Fr				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⧗ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 301
PROJECT No: 39663D
DATE: 12-13/05/08
SHEET 7 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		COAL - Medium strength, moderately weathered, black coal										
		SANDSTONE - High to very high strength, fresh, grey sandstone with some CBS laminations *(continued)*										
	61							61m: DB				
								61.24m: DB				
								61.31m: DB	C	100	100	
	62							62.04m: DB				
	63	63.05						63m: DB				
		Bore discontinued at 63.05m, limit of investigation										
	64											
	65											
	66											
	67											
	68											
	69											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 2.2m

TYPE OF BORING: Air percussion drill 0m to 44.85m. HQ wireline coring from 45.05m to 63.05m.

WATER OBSERVATIONS:

REMARKS: Air loss at 37.2m. 41.85m holding water. 100% water loss at 55.59mm

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

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LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 1 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTY CLAY - Light brown silty clay with some sand, and dark brown weathered coal, M<Wp										
	1								A			
									D			
	1.4	COAL - Dark brown weathered coal/carbonaceous mudstone										
	2								A			
									S			
	3											
	3.5	SILTSTONE - Grey siltstone with carbonaceous laminations										
	4	From 4.1m, medium strength, slightly weathered										
	4.65	CLAYSTONE - Medium to high strength, slightly weathered, grey claystone							C	100	80	
	5	From 5.05m to 5.17m, high strength, moderately weathered, red brown volcanic inclusion										
		From 5.7m to 5.8m, heat affected rock										
	6	6.0 From 5.75m, low strength										
		SILTSTONE - Medium strength, slightly weathered to fresh, grey siltstone							C	88	88	
		From 6.6m to 6.9m, rotational shearing of rock from jamming in barrel										
	6.9							6.9m: CORE LOSS: 150mm				
	7	7.05 CORE LOSS - (Possibly at 5.75m to 5.9m)										
		CLAYSTONE - Medium strength, slightly weathered, grey claystone										
	7.7	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone							C	100	92	
	8	8.27 From 8.2m, very low to low strength, moderately weathered										
	8.75	SANDSTONE - High strength, fresh, grey sandstone						8.57m: J, 35°, un, ro, Fe				
	8.85							8.61m: J, 35°, un, ro, Fe				
	9	CORE LOSS - From 8.75m to 8.85m						8.75m: Core Loss, 01.m CORE LOSS: 100mm				
		LAMINITE - High strength, fresh, grey laminite						8.9m: J, 40°, un, ro, Fe	C	95	60	
								From 8.9m to 9.07m, highly fr				
								9.3m: DB				
								9.47m: DB				
								From 9.7m to 9.9m,				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
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LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
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DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 2 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.0	LAMINITE (Continued)						highly fr, ca, Fe 9.95m: M, fr, sv, pl, ro				
		From 10.3m to 10.45m, claystone, low strength, highly weathered						From 10.3m to 10.45m, fr From 10.45m to 10.6m, sv, MFr	C	95	60	
	10.52	CLAYSTONE - Medium strength, moderately to slightly weathered, grey claystone with bands of orange brown weathering										
	11							10.7m: J, 80°, pl, ro, poss MFr 10.87m: J, 80°, un, ro 10.93m: DB 10.97m: DB 11.25m: J, 75°, pl, sm, poss MFr 11.28m: DB 11.38m: J, 75°, pl, sm, poss MFr 11.4m: DB 11.45m: J, 75°, pl, sm, poss MFr 11.52m: DB 11.57m: DB 11.62m: P, sh, un, ro, Fe 11.82m: P, sh, un, ro, Fe 11.98m: P, sh, un, ro, coal 12.15m: P, sh, un, ro, he From 12.33m to 12.56m, P, sh, 5°, un, ro, Fe spacing 10mm to 60mm	C	100	65	
	12	At 12.07m, coal lens From 12.08 to 12.21, very low to low strength, highly weathered At 12.23m, coal lens										
	12.77	From 12.3m, with siltstone										
	13	SANDSTONE - Low strength, highly to moderately weathered, orange brown sandstone At 13.1m, 100% water loss				▽						
		From 13.65m, medium to high strength, moderately to slightly weathered, grey and orange brown with carbonaceous laminations										
	14	At 14.27m, weak, weathered lens						12.45m: J, 80°, pl, he 12.67m: P, 10°, un, ro, he 12.77m: P, 15°, un, ro, he 12.93m: P, 5°, un, ro From 12.93m to 13.65m, MFr 60°, sv, un, ro, fe				
		At 14.77m, weak, weathered lens										
	15	From 15.11m to 15.16m, low strength, highly to moderately weathered inclusion						13.65m: P, 5°, un, ro 13.85m: DB 14.06m: DB 14.26m: DB 14.46m: DB 15.11m: Parallel p, 15°, pl, he 15.16m: Parallel p, 15°, pl, he 15.24m: P, 15°, un, ro, di 15.31m: DB 15.64m: DB 16.04m: DB	C	100	96	
	16	From 16.41, high strength										
	17							16.15m: J, sv, un, sm, Fe 16.41m: DB 16.81m: P, sh, pl, sm, di 16.99m: DB 17.15m: DB	C	100	100	
	18							17.73m: P, 5°, un, ro, Fe 17.76m: DB 17.78m: DB 17.81m: DB 17.83m: DB 17.91m: J, 50°, un, ro	C	100	90	
	19							18m: Fr, 5°, un, ro 18.16m: DB From 18.2m to 18.27m, Fr, sh-sv, un, ro, Fe 18.35m: DB 18.43m: J, 50°, pl, sm 19.1m: J, 65°, pl, ro, Fe 19.2m: DB 19.3m: J, 35°, pl, ro 19.55m: J, 65°, pl, ro, Fe	C	100	100	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
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BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 3 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	20.0	SANDSTONE (Continued)						19.68m: DB	C	100	100	
								20.45m: J, 65°, pl, ro, Fe				
	21							20.85m: DB, 15° From 20.93m to 20.98m, Fr/J at 60° and 50°, un, sm, cy				
	21.69	CORE LOSS - Possibly goaf						21.62m: DB				
	22							21.69m: Core Loss, 0.45m CORE LOSS: 450mm	C	85	75	
	22.14	SILTSTONE AND CLAY - Extremely low to medium strength, extremely to highly weathered						22.41m: P, 5°, un, ro				
	22.32	From 22.2m, siltstone, high strength, fragmented						22.72m: P, 5°, un, sm				
	22.99	From 22.26m, very low to low strength, highly weathered						22.8m: P, sh, un, ro From 22.8m to 22.99m, fg				
	23							23.01m: J, 80°, pl, sm				
	23.31	COAL - Medium strength, moderately weathered, black coal (yard seam)						23.45m: J, sv, st, ro				
	23.58	From 22.41 to 22.48m, very low to low strength, highly weathered						23.65m: DB				
		From 22.52m to 22.58m, extremely low to very low strength, extremely to highly weathered						23.71m: DB				
	24							23.72m: DB				
		From 22.75m to 22.8m, tuff						23.8m: MFr, 80°, sv, cu, sm				
		SILTSTONE - High strength, fragmented, grey siltstone						23.94m: DB				
								24m: DB				
	25	COAL - Medium strength, moderately weathered coal (yard seam)						24.05m: MFr, 80°, un, sm				
								24.14m: DB				
		SILTSTONE - High strength, fragmented, grey siltstone						24.23m: MFr, sv, un, sm	C	100	68	
								24.25m: DB				
		From 24.3m to 24.4m, heat affected						24.26m: MFr, 20°, sv, un, sm				
	26	From 24.79m to 24.88m, heat affected						24.27m: MFr, 20°, sv, un, sm				
								24.3m: MFr, 20°, sv, un, sm				
								24.31m: MFr, 20°, sv, un, sm				
	26.65	CORE LOSS - Possibly goaf						24.4m: MFr, 20°, sv, un, sm				
								24.43m: MFr, 20°, sv, un, sm				
	27							24.48m: MFr, 20°, sv, un, sm				
	27.4	SILTSTONE/CLAYSTONE - Medium strength, slightly weathered, grey siltstone/claystone						24.62m: MFr, 20°, sv, un, sm (some pl)	C	30	0	
								24.65m: MFr, 20°, sv, un, sm (some pl)				
		From 27.75m to 27.88, very low to medium strength, highly to moderately weathered, with clay						24.66m: J, 40°, un, ro				
	28	From 28.02m to 28.05m, clay						24.67m: MFr, 20°, sv, un, sm (some pl)				
		From 28.13m to 28.15m, clay						24.72m: MFr, 20°, sv, un, sm (some pl)				
		From 28.15m, high strength						24.75m: MFr, 20°, sv, un, sm (some pl)				
		From 28.17m to 28.43m, fine cracks						24.81m: MFr, 20°, sv, un, sm (some pl)	C	100	87	
	29	From 28.45m to 28.6m, heat affected						24.85m: MFr, 20°, sv, un, sm (some pl)				
		From 29.0m to 16m, heat affected						24.88m: MFr, 20°, sv, un, sm (some pl)				
								24.89m: J, 80°, pl, sm				
								24.93m: MFr, 20°, sv, un, sm (some pl)				
								From 26.22m to 26.41m,	C	100	70	

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 4 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	30.0	SILTSTONE/CLAYSTONE (Continued)						fg to highly fr 26.5m: J, 80°, pl, sm 26.57m: MFr, 20°, un, sm 26.6m: J, 20°, pl, sm 26.65m: Core loss, 0.75m CORE LOSS: 750mm	C	100	70	
		From 30.43m to 30.57m, fine cracking From 30.7m to 30.82m, chalky From 30.88m to 30.12m, fine cracking						27.4m to 27.75m, fg to highly fr 28m: DB 28.05m: DB 28.3m: P, 5°, un, sm 28.34m: MFr, sv, pl, sm 28.38m: DB 28.39m: DB 28.46m: P, sh, pl, he, cy filled (5mm) 28.6m: P, sh, un, ro, cy filled (10mm)	C	100	65	
	31	At 31.33m, clay (15mm)										
		At 31.7m, clay (5mm) At 31.74m, clay (10mm)										
	32											
		At 32.58m, clay (10mm) At 32.62m, clay (5mm)						28.63m: MFr 28.73m: DB 28.79m: J, sv, un, he, poss MFr (28.66m to 28.92m) 28.82m: DB 28.88m: DB 28.94m: DB 29.14m: J, 15°, un, sm 29.25m: DB 29.35m: J, 75°, pl, ro From 29.46m to 29.66m, MFr, sv 29.56m: P, sh, un, sm 29.73m: J, 65°, un, he 29.84m: DB 29.85m: DB 29.86m: Fr, sv, pl, sm (x 2) 29.93m: DB 30m: DB	C	100	33	
	33											
	34											
	35											
		From 35.65m to 35.97m, moderately weathered, medium to low strength						30.05m: DB 30.1m: J, 75°, un, sm, poss MFr (30.0m to 30.2m) 30.13m: J, 80°, un, he 30.14m: DB From 30.16m to 30.18m, fg 30.2m: DB 30.25m: DB From 30.25m to 30.38m, MFr, sv 30.35m: J, 70°, pl, sm, poss MFr 30.77m: J, 10°, un, sm, poss DB 30.85m: P, sh, st, sm, poss Fr 30.86m: DB 30.9m: DB	C	100	62	
	36											
		From 36.32m to 36.4m, fine cracks										
	37											
	38											
								31.24m: P, 5°, un, ro, poss Fr 31.26m: Fr, 5°, un, ro	C	100	26	
		At 38.65m, pale grey						31.29m: P, sh, un, sm, cy filled (10mm) 31.3m: J, 60°, un, ro 31.37m: DB 31.54m: J, sv, un, sm, ca (31.44m to 31.64m) 31.55m: Fr, 10°, un, ro (wedge) 31.6m: J, 80°, un, he, ca 31.65m: J, 15°, pl, sm,	C	69	57	
	39											
	39.65	SANDSTONE - High strength, slightly weathered, pale grey										

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 5 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	39.97	sandstone						ca				
	40.0							31.69m: J, 10°, un, ro, cy				
	40.03	COAL - Medium strength, moderately weathered, black coal						31.85m: J, 60°, sv, un, ro	C	69	57	Cave in
		COAL (Continued)						31.86m: J, 80°, un, ro				
		RUBBLE/VOID						31.93m: J, 10°, un, sm, poss DB				
41	41.1	COAL - Medium strength, moderately weathered, black coal						32.02m: MFr, 50°, sv, un, he (31.93m to 32.11m)	C	70	57	
								32.2m: MFr, sv, un, he, ca (32.09m to 32.31m)				
								32.31m: Fr, sh, 5°				
42								32.39m: Fr, sh, 5°				
								32.43m: MFr, sv, 60°, un, ro (32.31m to 32.55m)				
	42.19	SILTSTONE - Medium to high strength, slightly weathered, grey siltstone						32.45m: Fr, sh, 5°				
	42.2							32.55m: Fr, sh, 5°				
	42.35							32.65m: DB				
	42.42	RUBBLE/VOID						32.67m: DB				
43	42.98	COAL - Medium strength, moderately weathered, black coal						32.69m: J, 80°, un, sm				
		SILTSTONE - High strength, slightly weathered, grey siltstone						32.7m: J, 80°, un, sm				
		CARBONACEOUS SILTSTONE - High strength, moderately weathered, dark grey carbonaceous siltstone with bands of coal (medium strength, moderately weathered, black) 5mm to 50mm spacing						32.81m: DB				
								32.96m: DB				
								33.05m: P, sh, un, ro, cy (5mm)	C	94	87	
								33.07m: MFr, sv, sm, pl (33.05m to 33.11m)				
								33.09m: P, sh, pl, sm, cy filled				
44								33.11m: P, sh, pl, sm, cy filled				
								From 33.11m to 33.28m, MFr/J, sv, un, sm, he, ca				
		From 43.25m to 43.35m, coal						33.28m: J, 10°, un, sm, cy				
		From 43.39m to 43.61m, coal						From 33.36m to 33.39m, P, sh, 5°, pl, sm, di				
		From 43.77m to 43.83m, coal						33.43m: DB				
45		From 44.1m to 44.34m, coal						33.47m: DB				
	45.1	From 44.5m to 44.66m, extremely low to very low strength, extremely to highly weathered						From 33.47m to 33.95m, MFr, sv, un, sm (50mm spacing)				
		From 44.66m to 45.1m, coal						33.74m: DB	C	100	76	
		LAMINITE - Medium strength, slightly weathered, grey laminite						33.9m: MFr, 10°, un, ro				
46		From 45.14m to 45.19m, very low to low strength, highly weathered						33.96m: P, 10°, un, sm, di				
		From 45.19m, high strength, fresh						34.05m: P, sh, un, sm, poss DB				
		From 45.56m to 45.6m, coal laminations						34.1m: P, 10°, pl, sm, cy veneer				
		From 46.66m to 46.8m, heat affected						34.2m: MFr, sv, un, ro (34.1m to 34.35m)				
47		From 47.17m to 47.2m, very low strength, highly weathered, due to joints						From 34.35m to 34.5m, MFr, sv, un, he (50mm spacing)				
		From 47.46m, clay (10mm)						34.53m: J, 65°, un, ro				
								34.55m: DB				
48								34.57m: DB				
		From 48.27m to 48.45m, coal laminations						34.65m: J, 60°, pl, sm				
								From 34.65m to 34.75m, Fr				
								34.89m: DB	C	100	92	
								From 35.0m to 35.55m, MFr/J, sv, un with secondary fracturing				
49								35.6m: J, 60°, un, sm, ca				
								35.61m: MFr, sv, un, sm				
								35.65m: DB				
								35.69m: J, 60°, un, he				
								35.81m: J, 10°, un, sm,				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 6 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	50.0	From 50.m to 50.04m, heat affected LAMINITE (Continued)						poss DB 35.82m: J, sv, un, he, poss MFr 35.9m: P, 5°, un, sm, di	C	100	92	
	51							From 35.98m to 36.23m, J, un, sm, ca 35.99m: J, sv, pl, sm 36.03m: J, sv, pl, sm 36.08m: J, 45°, un, ro 36.22m: J, 80°, un, ro 36.23m: DB 36.26m: DB 36.28m: DB From 36.47m to 36.8m, P and fr, spacing 5mm to 50mm	C	100	96	
	52	From 52.23m to 52.27m, affected/stain						36.93m: DB 37.02m: DB From 37.07m to 37.15m, sv, un, he 37.15m: J, 10°, un, ro, Fe 37.28m: J, 35°, un, ro, Fe 37.37m: J, sv, un, sm 37.53m: J, 65°, pl, sm, Fe				
	53							37.58m: J, 70°, pl, sm, Fe 37.73m: DB 38m: J, 25°, un, ro 38.05m: J, 40°, un, sm, cy veneer	C	100	100	
	54							From 38.15m to 38.28m, Fr, spacing 20mm 38.32m: J, 80°, pl, sm (38.28m to 38.34m) poss MFr 38.35m: J, sv, un, sm (38.28m to 38.41m) poss MFr 38.48m: J, sv, un, sm (38.36m to 38.65m) poss MFr 38.55m: J, sv, pl, sm (38.5m to 38.65m) poss MFr 38.6m: J, 60°, sv, cu, sm (38.48m to 38.65) 38.75m: J, 80°, un, sm, Fe				
	55								C	100	100	
	56											
	57							38.94m: DB 39.18m: DB 39.29m: DB 39.32m: Fr, sv, un, ro 39.42m: J, sv, pl, sm, Fe (39.3m to 39.54m) 39.45m: J, 85?8, un, sm, Fe (39.38m to 39.52) 39.54m: P, sh, un, he, cy filled	C	50	50	
	57.52	VOID										
	58											
	58.25	From 58.25m, rubble						39.65m: J, 60°, pl, un 39.88m: J, sv, pl, ro 39.9m: P, 5°, un, ro, di From 41.4m to 41.35m, di, P, sh - 10°, un, sm spacing 10mm to 50mm 41.93m: J, 60°, sv, un, ro (41.83m to 42.05m) 42.2m: Core loss, 0.15m 42.45m: J, 75°, un, sm, Fe 42.46m: Fr, 75°, un, he,	C	50	37	
	59											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 7 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	60.0	SILTSTONE/CLAYSTONE/RUBBLE - Extremely low to very low strength, extremely weathered to highly weathered, siltstone/claystone/rubble						Fe 42.49m: P, 10°, un, ro, cy 42.56m: J, 60°, un, he, Fe 42.59m: P, 5°, un, ro, Fe 42.62m: J, 55°, un, ro, Fe 42.65m: P, 10°, pl, ro, coal 42.68m: P, 10°, pl, ro, coal 42.79m: P, sh, pl, ro, coal 42.83m: J, 70°, pl, he 42.89m: J, 30°, pl, he, coal From 42.98m to 43.03m, Fg 42.95m: P, 5°, un, ro, coal 43.11m: P, 5°, un, ro 43.22m: P, 5°, un, ro From 43.3m to 43.48m, P/Fr, sh - 5°, un, ro (50mm) 43.61m: P, sh, pl, ro 43.77m: P, 10°, pl, ro From 44.75m to 45.1m, highly fractured 45.14m: P, sh, un, ro, poss DB 45.19m: P, sh, un, ro, poss DB 45.26m: P, 5°, un, ro 45.31m: DB 45.43m: DB 45.56m: DB 45.75m: DB 45.85m: DB 45.91m: DB 46.17m: DB 46.6m: J, 50°, pl, sm 46.7m: J, 40°, un, he 46.88m: J, 20°, un, ro, poss DB/Fr 46.96m: J, 20°, un, ro, poss DB/Fr 47.08m: J, 20°, un, ro, poss DB/Fr 47.17m: J, 30°, un, ro 47.2m: J, 40°, un, ro 47.34m: DB 47.48m: J, 75°, pl, sm 47.56m: J, 30°, un, sm 47.74m: DB 48m: DB 48.15m: DB 48.35m: DB 48.61m: DB 48.77m: DB 48.87m: DB 48.93m: DB 49.04m: J, 25°, pl, sm 49.09m: J, 20°, un, ro, coal 49.22m: DB 49.36m: DB 49.41m: DB 49.5m: DB 49.66m: DB 49.71m: DB 49.82m: DB 50.04m: P, 5°, cu, ro	C	50	37	
	60.25											
	60.35											
	61											
	61.25	SILTSTONE/CLAYSTONE (Continued)										
	61.5	SILTSTONE - Medium to high strength, slightly weathered, siltstone										
	62	VOID										
		COAL - Medium strength, moderately weathered, black coal										
		SANDSTONE - High to very high strength, fresh, grey sandstone										
	63								C	100	100	
	64											
	65											
	65.85	Bore discontinued at 65.85m, limit of investigation										
	66											
	67											
	68											
	69											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 303
PROJECT No: 39663D
DATE: 14-20/05/08
SHEET 8 OF 8

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	71							50.25m: DB 50.3m: J, 80°, pl, sm, he 50.71m: J, 30°, un, sm 50.8m: J, 80°, un, sm 50.84m: J, 20°, un, sm 50.98m: DB 51.42m: DB 51.71m: DB 51.87m: DB 52.05m: DB 53.1m: DB 53.92m: DB 54.23m: DB 54.53m: DB 54.76m: DB 54.86m: DB 54.95m: DB 55.3m: DB 55.68m: DB 56.18m: DB 56.34m: DB 56.51m: DB 56.7m: DB 57.34m: DB 57.43m: DB From 59.9m to 60.25m, 0.02m 62.22m: DB 62.75m: DB 63.11m: DB 63.36m: DB 64.14m: DB 64.42m: DB 65.31m: DB 65.41m: DB				
	72											
	73											
	74											
	75											
	76											
	77											
	78											
	79											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** HW to 4.0m

TYPE OF BORING: Solid flight auger to 4.0m. HQ wireline coring 4.1m to 65.85m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: At 13.1m, 100% water loss. Return at 14m using drilling mud. 40.03m, 100% water loss. Return at 40.65m using drilling mud. No water in hole from void

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

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Initials:
Date:

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BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 1 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	0	SILTY CLAY - Brown silty clay with some sand, moist										
	0.5	COAL - Highly weathered, dark brown weathered coal							D			
	2.5	SILTSTONE/SANDSTONE - Grey							D			
									D			
									D			
									D			

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 2 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
	10.0	SILTSTONE/SANDSTONE - Brown siltstone/sandstone interbedded										
	11								D			
	12											
	13								D			
	14											
	15											
	16								D			
	17											
	18											
	19								D			

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⧗ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 3 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE/SANDSTONE - Brown siltstone/sandstone interbedded *(continued)*							D			
	21											
	22								D			
	22.7	COAL - Black coal										
	23											
	23.65	SILTSTONE - Grey siltstone										
	23.9	COAL - Black coal										
	24											
	24.2	SILTSTONE - Grey siltstone										
	25								D			
	26											
	27	From 27m, claystone/siltstone										
	28								D			
	29											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ⧗ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 4 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		SILTSTONE - Grey siltstone *(continued)*										
	31								D			
	32											
	33											
	34								D			
	35											
	36											
	37								D			
	38 38.0	Possible void/goaf inferred from drilling resistance, loss of air return										
		VOID										
	38.75	Possible void/goaf inferred from driling resistance										
	39											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 5 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		Possible void/goaf inferred from drilling resistance *(continued)*										
	41	LAMINITE - Grey laminite (siltstone/sandstone)										
	42											
	43											
	44											
	45											
	46								D			
	47											
	48											
	49											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 6 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		LAMINITE - Grey laminite (siltstone/sandstone) *(continued)*										
	51 51.05	LAMINITE - High strength, fresh, grey laminite (80% siltstone/20% sandstone) with lots CBS laminations						51.12m: DB 51.18m: DB 51.29m: DB 51.42m: Di on coal lens 51.61m: Di on coal lens				
		From 51.4m (90% sandstone/10% siltstone), high to very high strength and few CBS laminations						51.92m: DB				
	52							52.39m: DB	C	100	100	
		From 52.73m to 52.76m, heat affected band						52.74m: DB				
	53							53.18m: DB 53.3m: DB 53.38m: DB 53.46m: DB 53.54m: DB 53.64m: DB				
		From 53.5m, lots CBS laminations										
	54							53.75m: DB 53.83m: DB 53.94m: DB 54.17m: DB 54.4m: DB 54.66m: DB				
		From 54.05, few CBS laminations and some higher % siltstone bands						54.82m: DB				
	55	From 54.86m to 55.91m, CBS laminations 1mm-2mm spacing						55.15m: DB	C	98	100	
								55.6m: DB 55.86m: DB 56.11m: DB 56.25m: DB				
	56							56.64m: DB				
	57							57.51m: DB 57.82m: DB 57.97m: DB 58.05m: DB 58.19m: DB 58.24m: DB				
	58	From 58.0m, (90%-100% siltstone)						58.56m: DB 58.85m: DB	C	100	84	
	59							59.08m: J, 40°, un, sm, cy 59.15m: DB				
	59.3	COAL - Medium strength, moderately weathered, black coal From 59.3m to 59.32, very low to low strength, highly weathered						59.3m: P, sh, pl, sm From 59.3m to 59.6m, highly fr-fg spacing				

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater

BOREHOLE LOG

CLIENT: Coal & Allied Operations Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Minmi

SURFACE LEVEL: --
EASTING:
NORTHING:
DIP/AZIMUTH: 90°/--

BORE No: 305
PROJECT No: 39663D
DATE: 26-27/05/08
SHEET 7 OF 7

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear D - Drill Break)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		From 59.58m to 59.6m, clay						0.01m to 0.05m	C	100	84	
		COAL - Medium strength, moderately weathered, black coal *(continued)*						59.48m: J, sv, pl, sm 59.5m: J, 60°, pl, sm 59.68m: J, 75°, pl, sm 59.85m: J, 80°, pl, sm From 59.97m to 60.15m, highly fr-fg 60.2m: J, sv, un, sm x 2 60.5m: J, sv, un, sm (60.3m to 60.7m) 61.06m: J, sv, pl, he, poss fr	C	100	85	
	61											
	61.63	SANDSTONE - Very high to high strength, fresh, grey sandstone with CBS laminations						61.21m to 61.31m, fg 61.37m: J, sv, pl, sm 61.5m: J, 60°, un, sm				
	62							62.28m: DB	C	100	100	
								62.58m: DB 62.8m: DB				
	63							>>				
								63.6m: DB 63.88m: DB 64.11m: DB 64.31m: DB				
	64							64.56m: DB 64.67m: J, 10°, un, sm, pyrite 64.89m: DB	C	100	100	
	65											
		At 65.33, pebbly inclusion From 65.61m to 65.69m, pebbly inclusion						65.35m: DB 65.48m: DB				
	66							65.84m: DB 65.89m: DB 66.01m: DB				
	66.15	Bore discontinued at 66.15m, limit of investigation										
	67											
	68											
	69											

RIG: Scout 103 **DRILLER:** Total (Sheddon) **LOGGED:** Bear **CASING:** 150mm PVC to 3.0m

TYPE OF BORING: Blade bit-air to 3.0m, air-115mm hammer from 3.0m to 51.0m. HQ wireline coring 51.1m to 66.15m

WATER OBSERVATIONS:

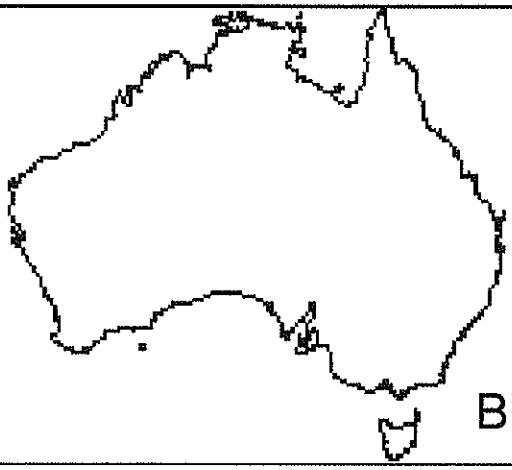
REMARKS: Air percussion drill to 51.0m, 38m - air loss/material, return at 48m - some material return. 41.8m - rubble blocked hole overnight

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	PID	Photo ionisation detector
B	Bulk sample	S	Standard penetration test
U_x	Tube sample (x mm dia.)	PL	Point load strength Is(50) MPa
W	Water sample	V	Shear Vane (kPa)
C	Core drilling	▷	Water seep ▼ Water level

CHECKED
Initials:
Date:

Douglas Partners
Geotechnics · Environment · Groundwater



GROUNDSEARCH AUSTRALIA

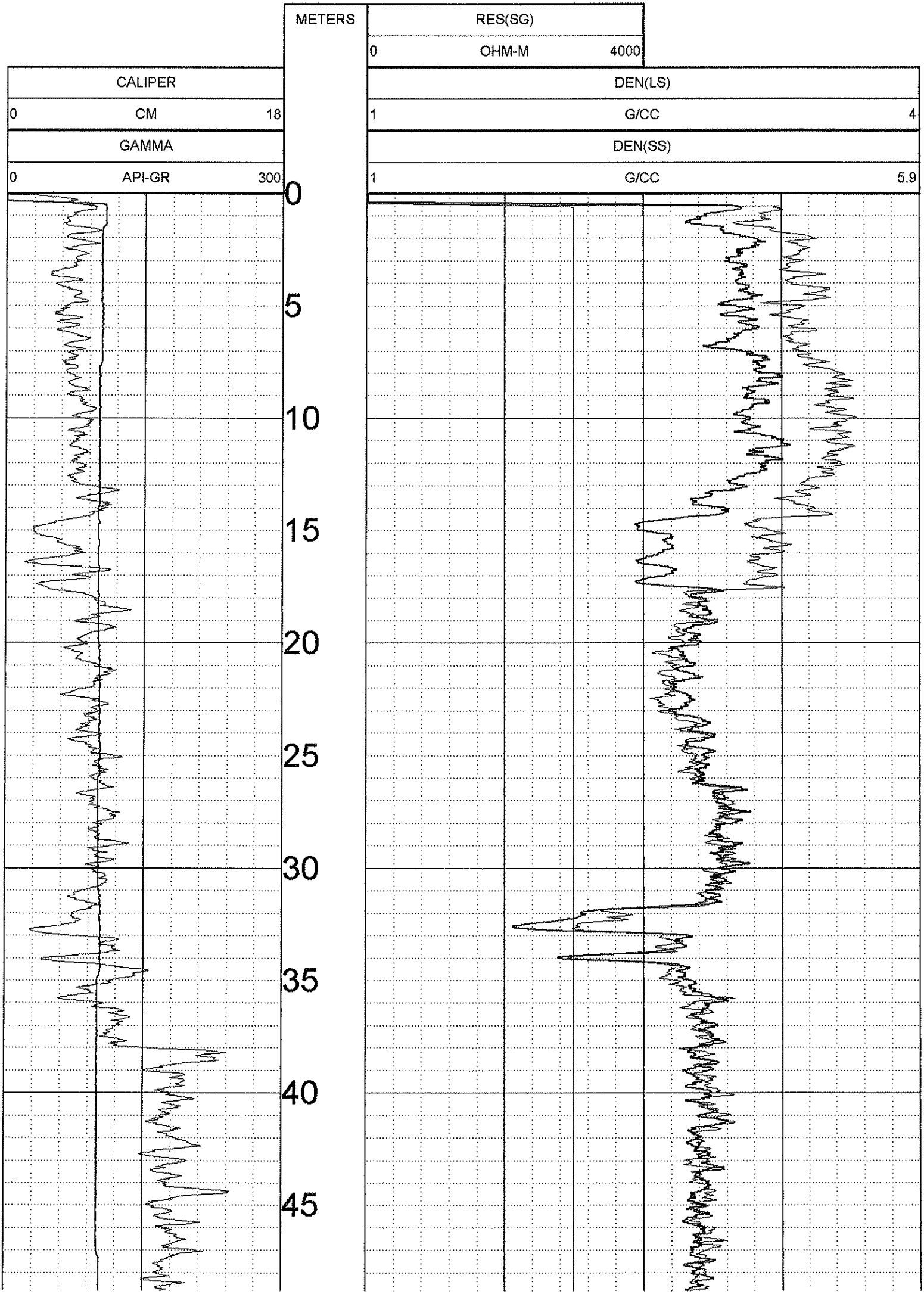
(ABN 11 057 389 152)

BH 201 DENSITY 1:200

COMPANY	: DOUGLAS PARTNERS			OTHER SERVICES:	
WELL	: BH 201 DENSITY 1:200			DEN, DE	
LOCATION/FIELD	: MINMI				
COUNTY	: AUST				
LOCATION	: NSW				
SECTION	: 0	TOWNSHIP	:	RANGE	: 0
DATE	: 04/30/08	PERMANENT DATUM	: GL		
API NO. DRILLER	: 78			KB	: 0
LOG BOTTOM	: 78.00	LOG MEASURED FROM:	GL	DF	: 0
LOG TOP	: -1.93	DRL MEASURED FROM:	GL	GL	:
CASING DIAMETER	: 10.	LOGGING UNIT	: 104		
CASING TYPE	: STEEL	FIELD OFFICE	: RUTHERFORD		
CASING THICKNESS	: .5	RECORDED BY	: M LEA		
RUN NO.	:				
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: ORIGINAL
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9035AA
MATRIX DENSITY	: 2.8	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: LIMESTONE	MATRIX DELTA T	: 144		
CASING OD	: 10.5				
				THRESH:	3000

JOB NUM 39663 D

WITNESSED BY :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RES(SG)
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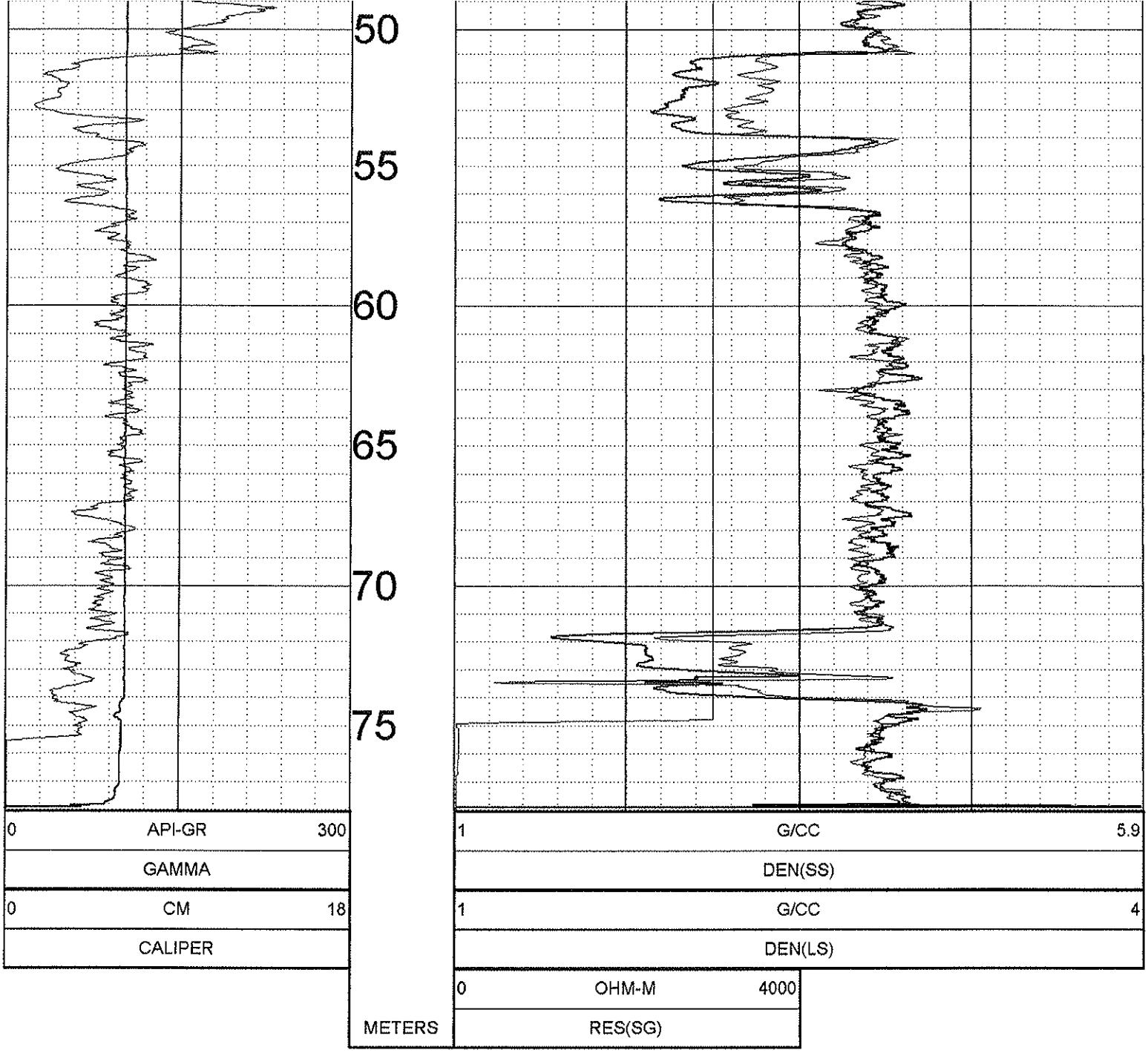
OHM-M
4000
CALIPER
0
CM
18
DEN(LS)
1
G/CC
4
GAMMA
0
API-GR
300
DEN(SS)
1
G/CC
5.9
0
5
10
15
20
25
30
35
40
45

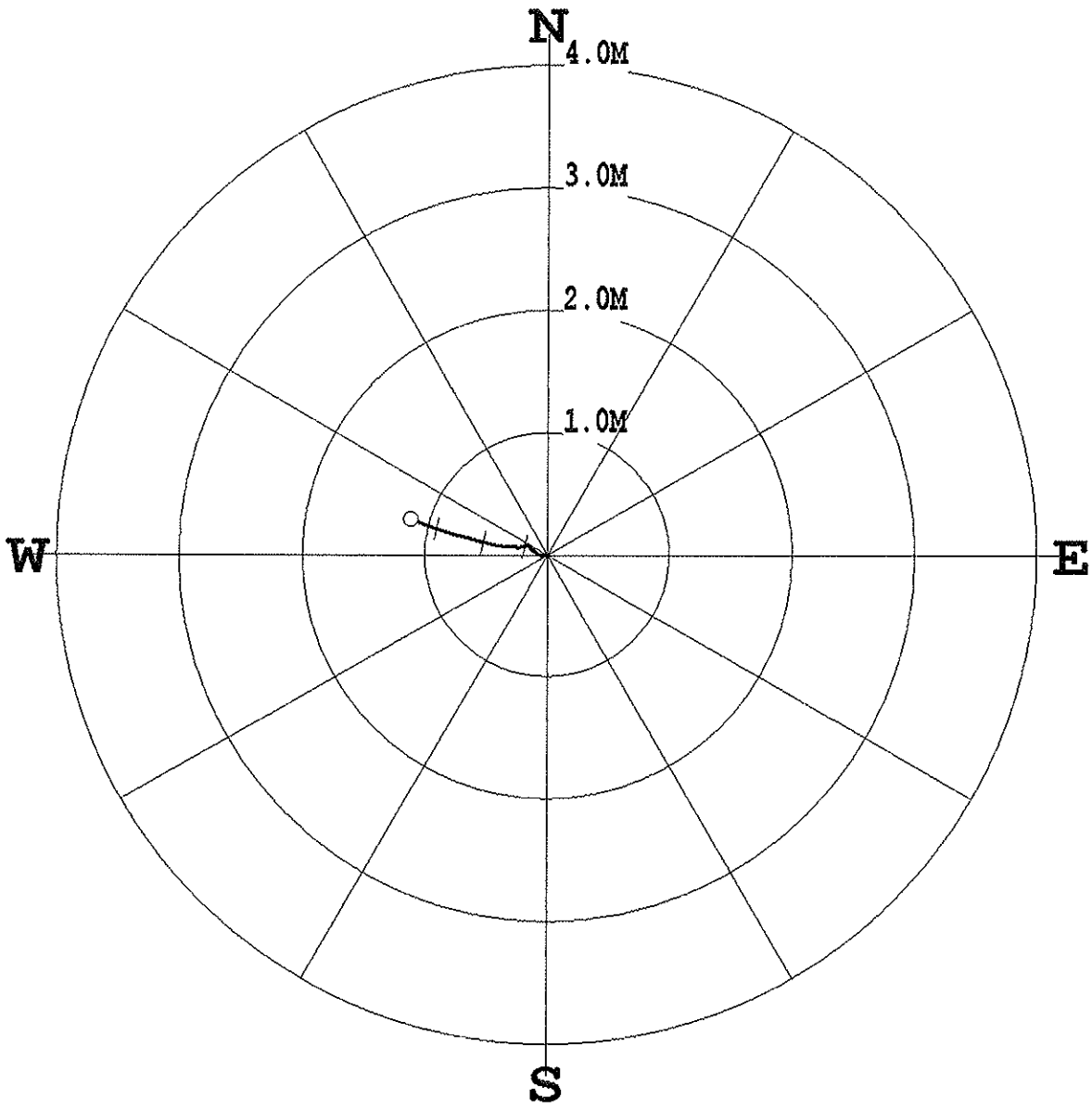

50
55
60
65
70
75
0 API-GR 300
GAMMA
0 CM 18
CALIPER
METERS
1 G/CC 5.9
DEN(SS)
1 G/CC 4
DEN(LS)
0 OHM-M 4000
RES(SG)

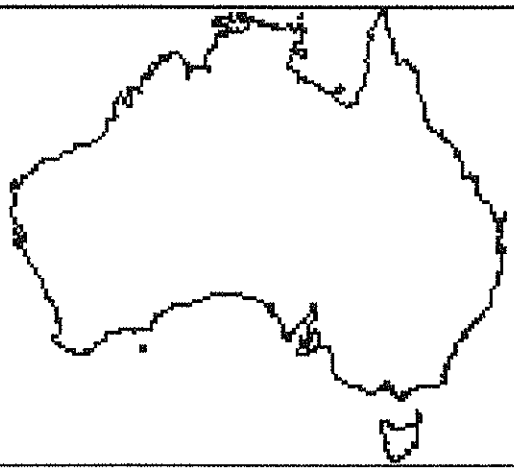
PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 201 DEVIATION
DATE OF LOG: 04/30/08
PROBE: 9702A 4359

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 70.63 M
AZIMUTH: 284.8
DISTANCE: 1.1 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

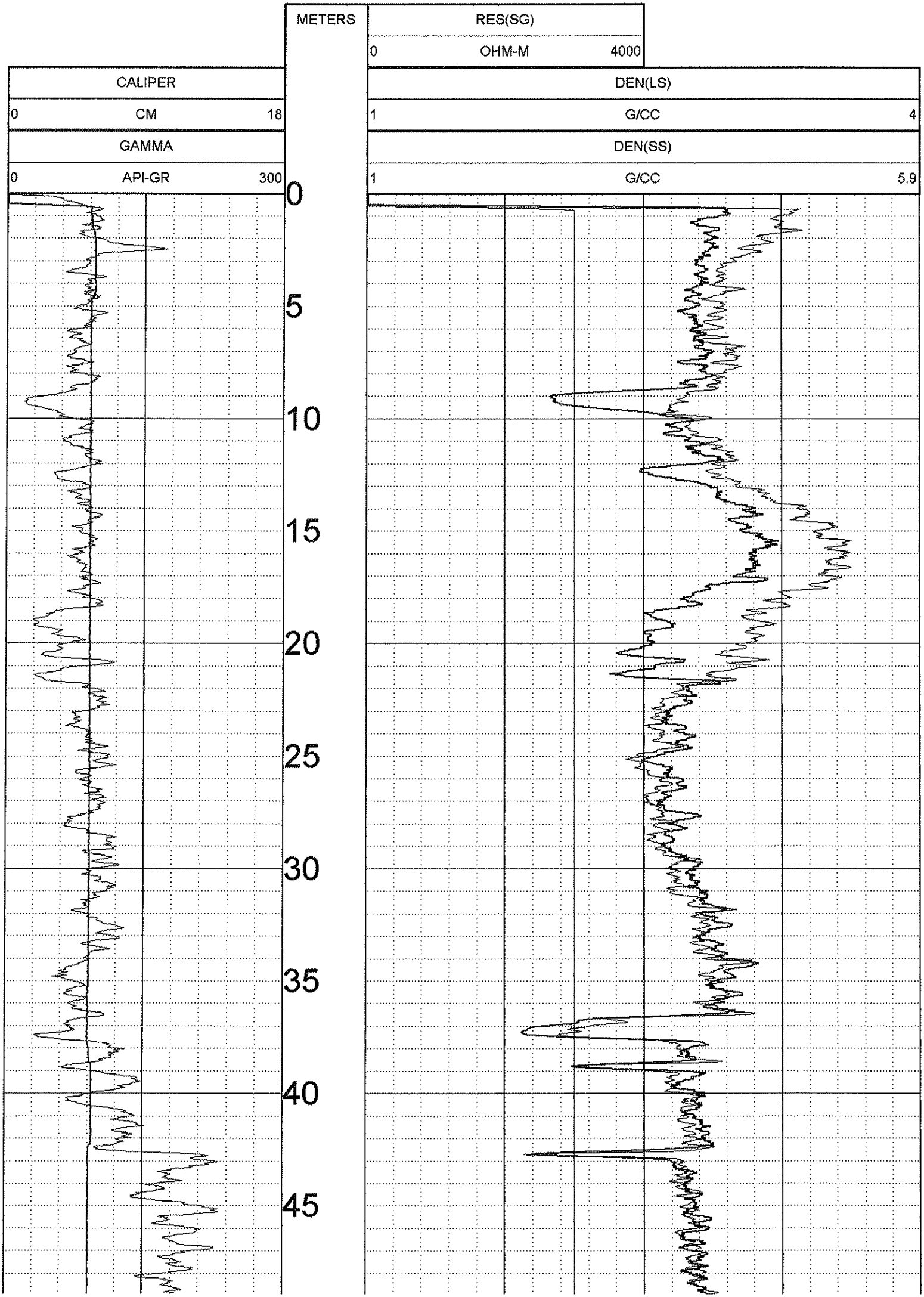
(ABN 11 057 389 152)

202 DENSITY 1:200

COMPANY	: DOUGLAS PARTNERS			OTHER SERVICES:	
WELL	: 202 DENSITY 1:200			DEN, DE	
LOCATION/FIELD	: MINMI				
COUNTY	: AUST				
LOCATION	: NSW				
SECTION	: 0	TOWNSHIP	:	RANGE	: 0
DATE	: 04/22/08	PERMANENT DATUM	: GL		
API NO. DRILLER	: 30.95			KB	: 0
LOG BOTTOM	: 80.57	LOG MEASURED FROM:	GL	DF	: 0
LOG TOP	: -1.83	DRL MEASURED FROM:	GL	GL	:
CASING DIAMETER	: 10.	LOGGING UNIT	: 104		
CASING TYPE	: STEEL	FIELD OFFICE	: RUTHERFORD		
CASING THICKNESS	: .5	RECORDED BY	: M LEA		
RUN NO.	:				
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: PROCESSED
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9035AA
MATRIX DENSITY	: 2.8	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: LIMESTONE	MATRIX DELTA T	: 144		
CASING OD	: 10.5			THRESH:	3000

JOB 39663D
LOGGED IN STEEL

WITNESSED BY :


METERS
RES(SG)
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OHM-M
4000
CALIPER
0
CM
18
DEN(LS)
1
G/CC
4
GAMMA
0
API-GR
300
DEN(SS)
1
G/CC
5.9
0
5
10
15
20
25
30
35
40
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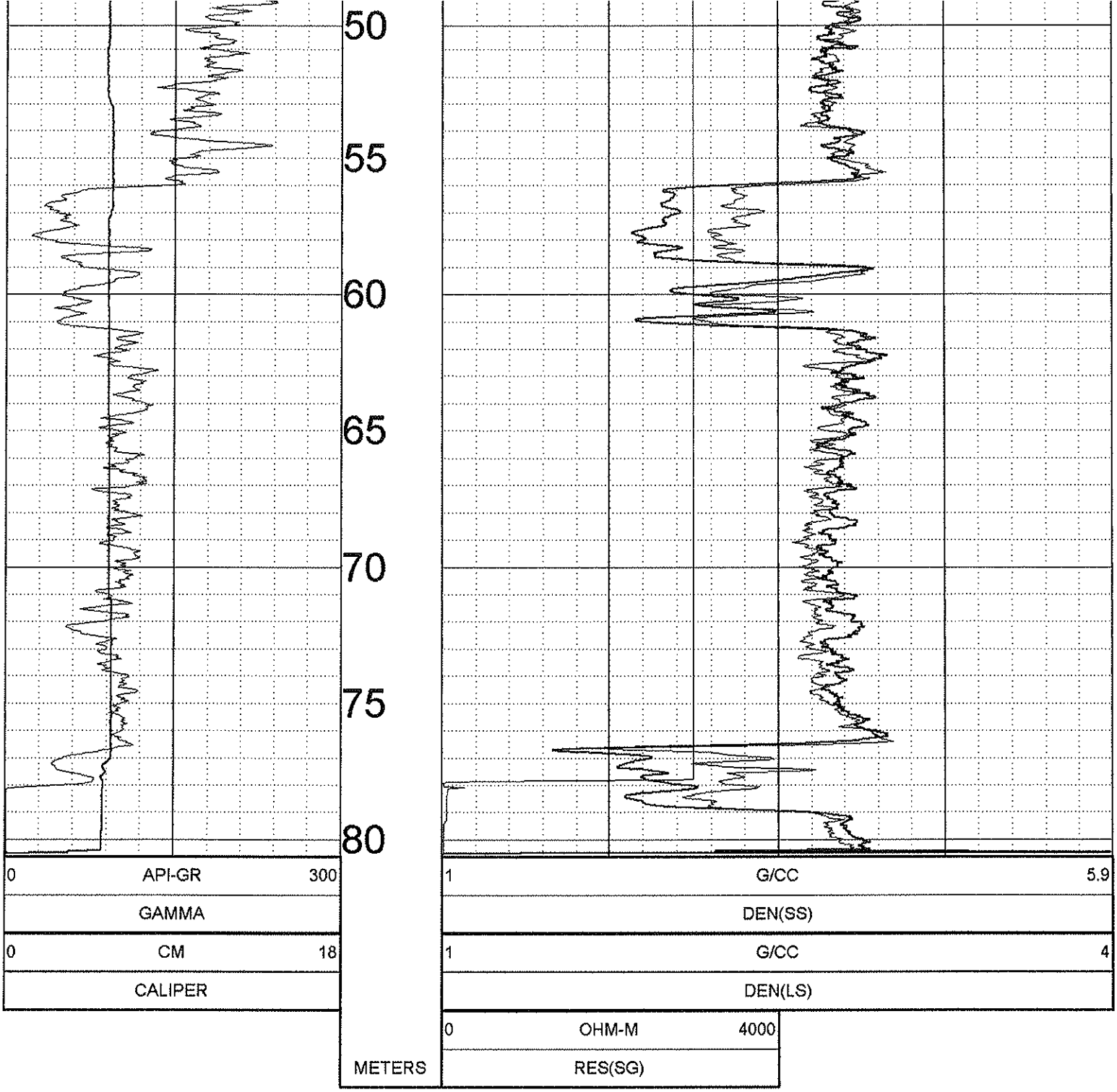
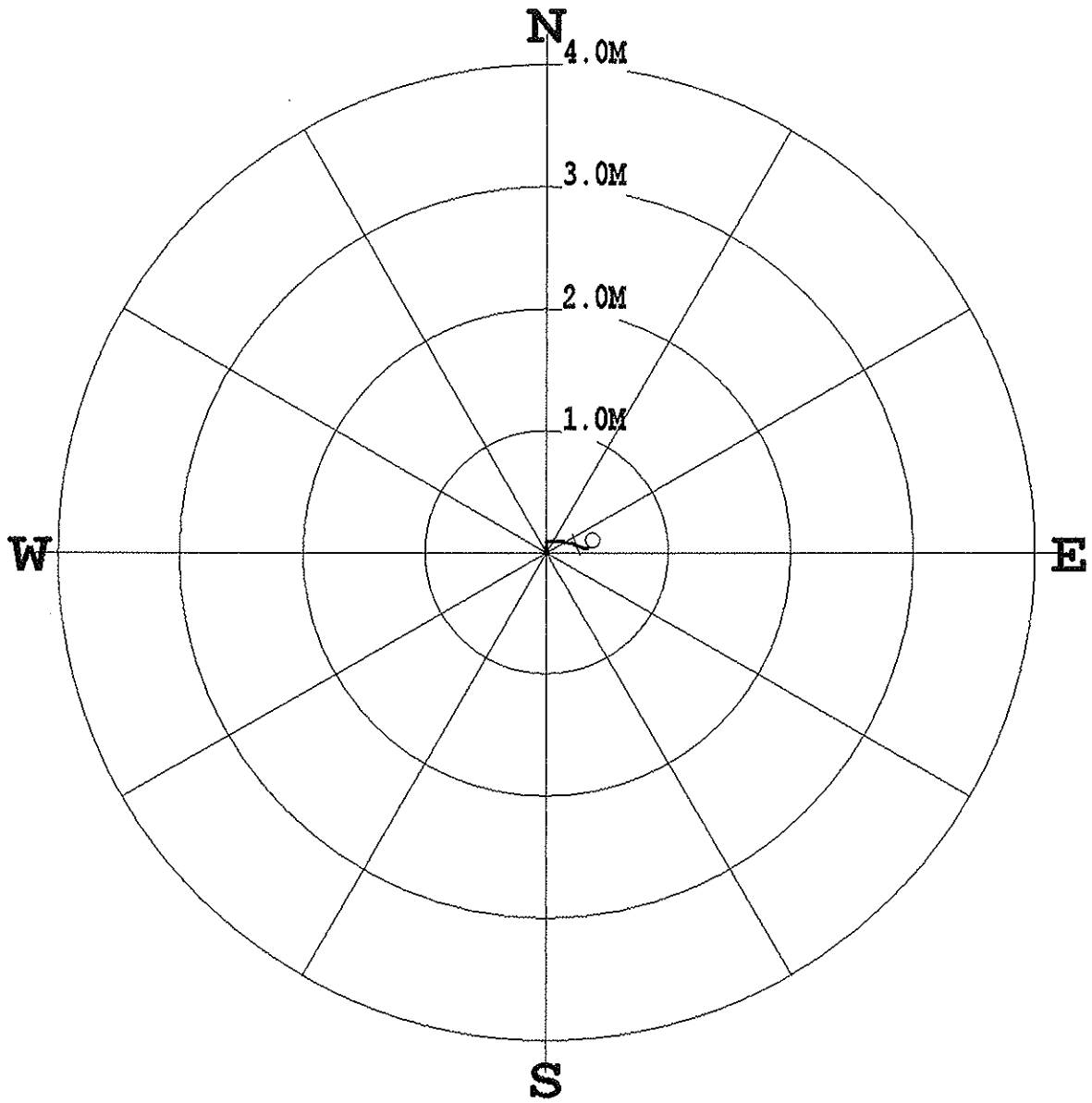

50
55
60
65
70
75
80
0 API-GR 300
GAMMA
0 CM 18
CALIPER
METERS
1 G/CC 5.9
DEN(SS)
1 G/CC 4
DEN(LS)
0 OHM-M 4000
RES(SG)

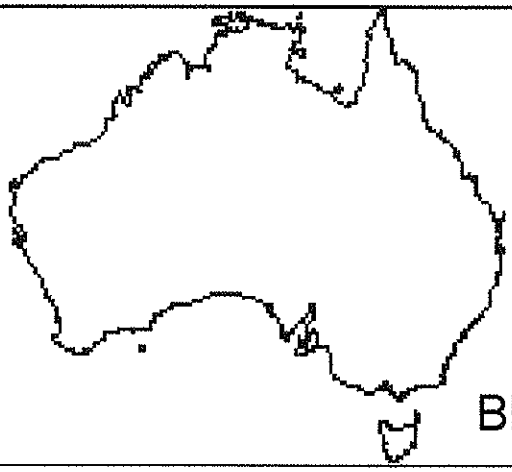
PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: 202 DEVIATION
DATE OF LOG: 04/22/08
PROBE: 9702A 4359

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 76.12 M
AZIMUTH: 74.8
DISTANCE: 0.4 M
+ = 50 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

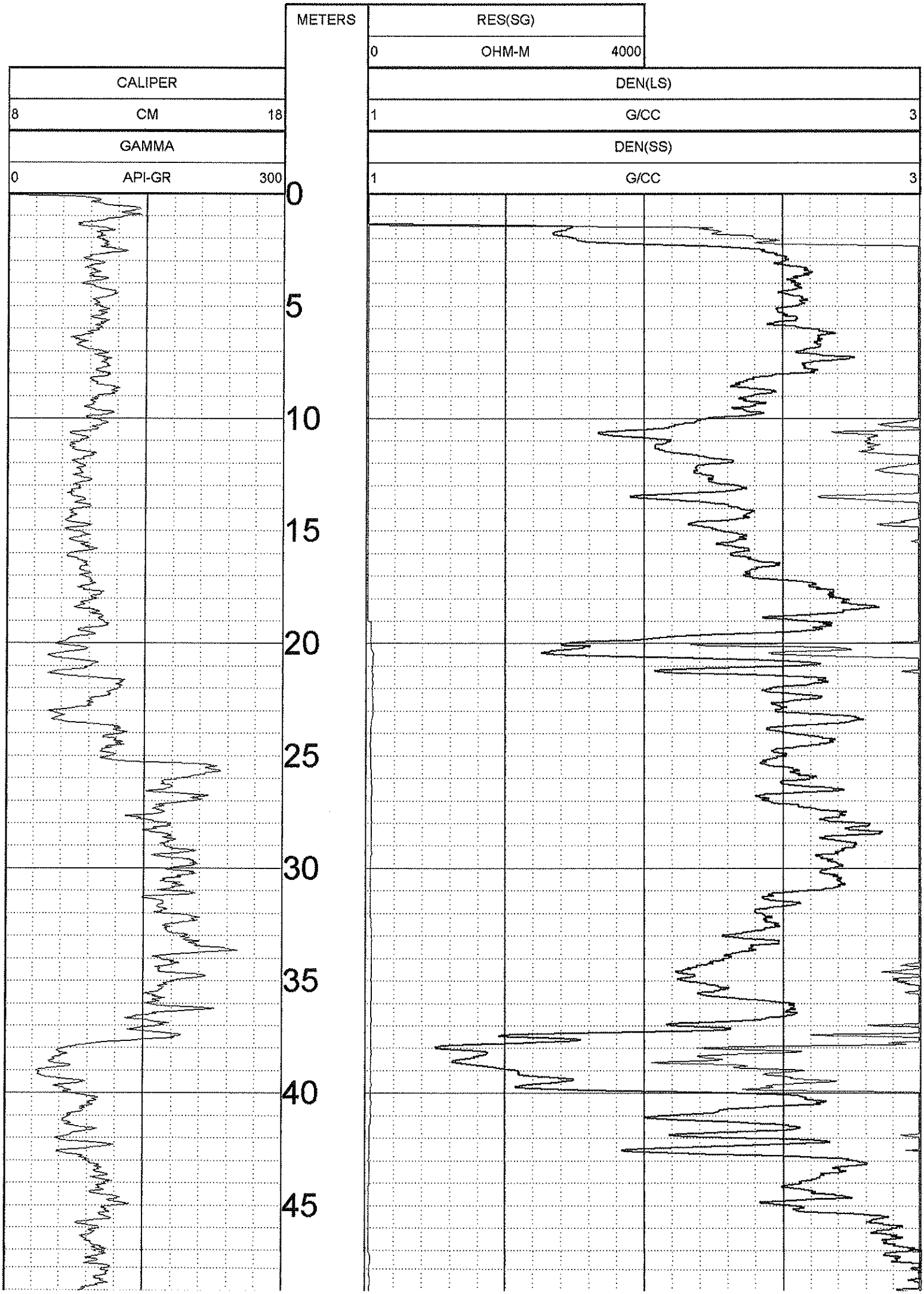
BH 301 DENSITY 1:200

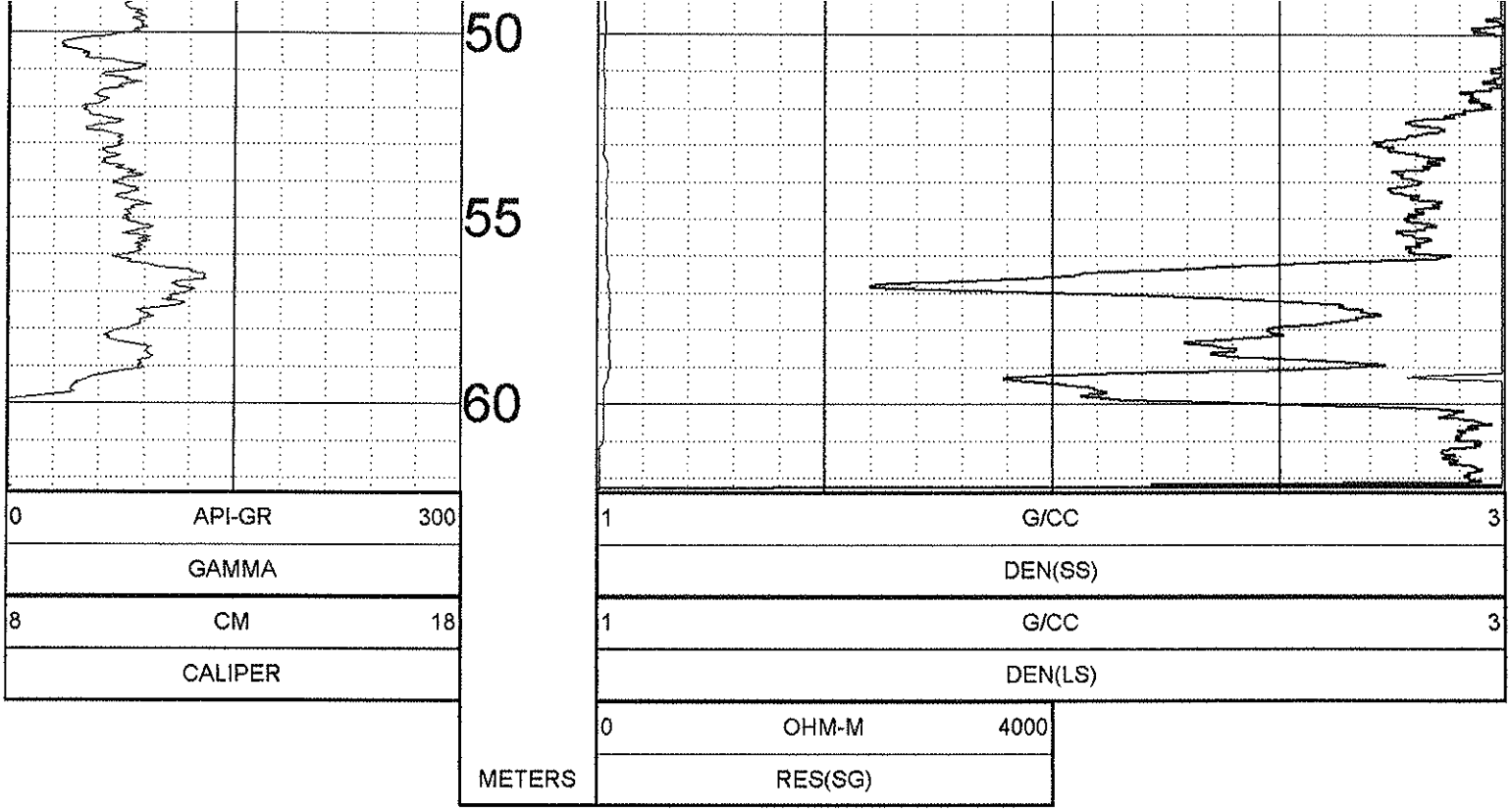
COMPANY	: DOUGLAS PARTNERS			OTHER SERVICES:	
WELL	: BH 301 DENSITY 1:200			DEN, DE	
LOCATION/FIELD	: MINMI				
COUNTY	: AUST				
LOCATION	: NSW				
SECTION	: 0	TOWNSHIP	:	RANGE	: 0
DATE	: 05/20/08	PERMANENT DATUM	: GL		
API NO. DRILLER	: 33.3			KB	: 0
LOG BOTTOM	: 62.34	LOG MEASURED FROM:	GL	DF	: 0
LOG TOP	: -1.03	DRL MEASURED FROM:	GL	GL	:
CASING DIAMETER	: 10.	LOGGING UNIT	: 104		
CASING TYPE	: STEEL	FIELD OFFICE	: RUTHERFORD		
CASING THICKNESS:	.5	RECORDED BY	: I DAVIS		
RUN NO.	:				
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: PROCESSED
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9035AA
MATRIX DENSITY	: 2.8	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: LIMESTONE	MATRIX DELTA T	: 144		
CASING OD	: 10.5			THRESH:	3000

LOGGED THROUGH STEEL

JOB NO.39663D

WITNESSED BY : ALL SERVICES PROVIDED SUBJECT TO STANDARD TERMS AND CONDITIONS


METERS
RES(SG)
0
OHM-M
4000
CALIPER
8
CM
18
DEN(LS)
1
G/CC
3
GAMMA
0
API-GR
300
DEN(SS)
1
G/CC
3
0
5
10
15
20
25
30
35
40
45



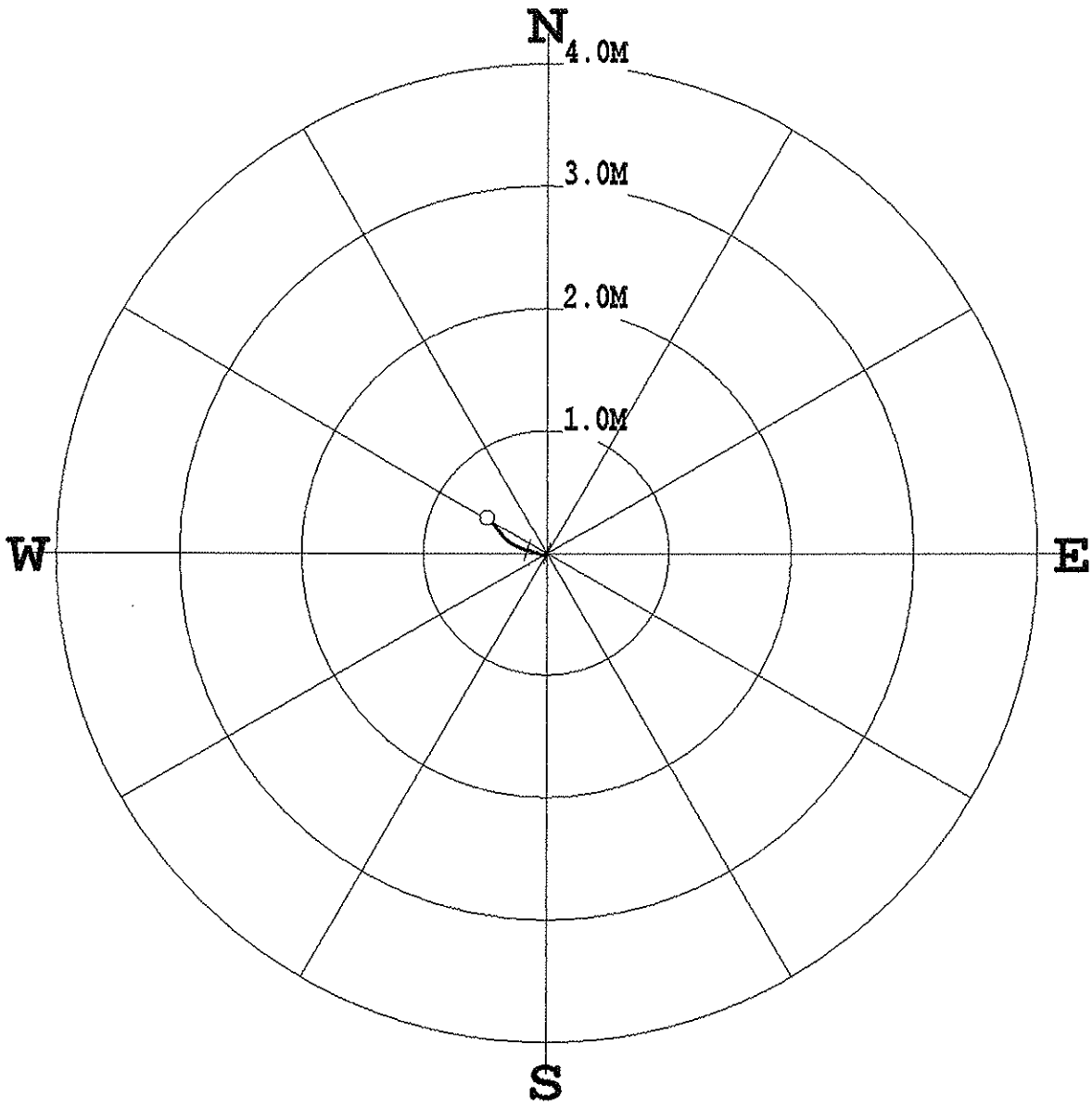
0	API-GR	300	1	G/CC	3
GAMMA			DEN(SS)		
8	CM	18	1	G/CC	3
CALIPER			DEN(LS)		
			0	OHM-M	4000
METERS			RES(SG)		

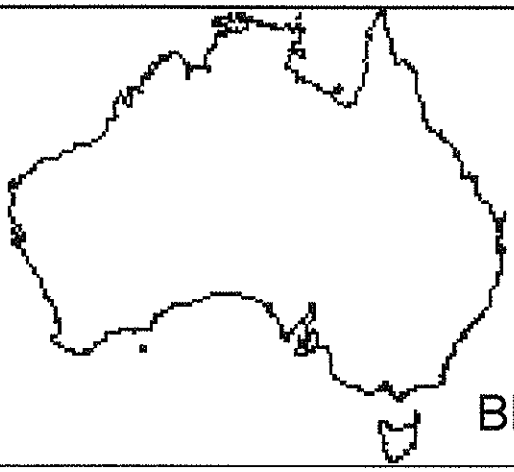
PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 301 DEVIATION
DATE OF LOG: 05/20/08
PROBE: 9055A 244

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 36.19 M
AZIMUTH: 300.9
DISTANCE: 0.6 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

(ABN 11 057 389 152)

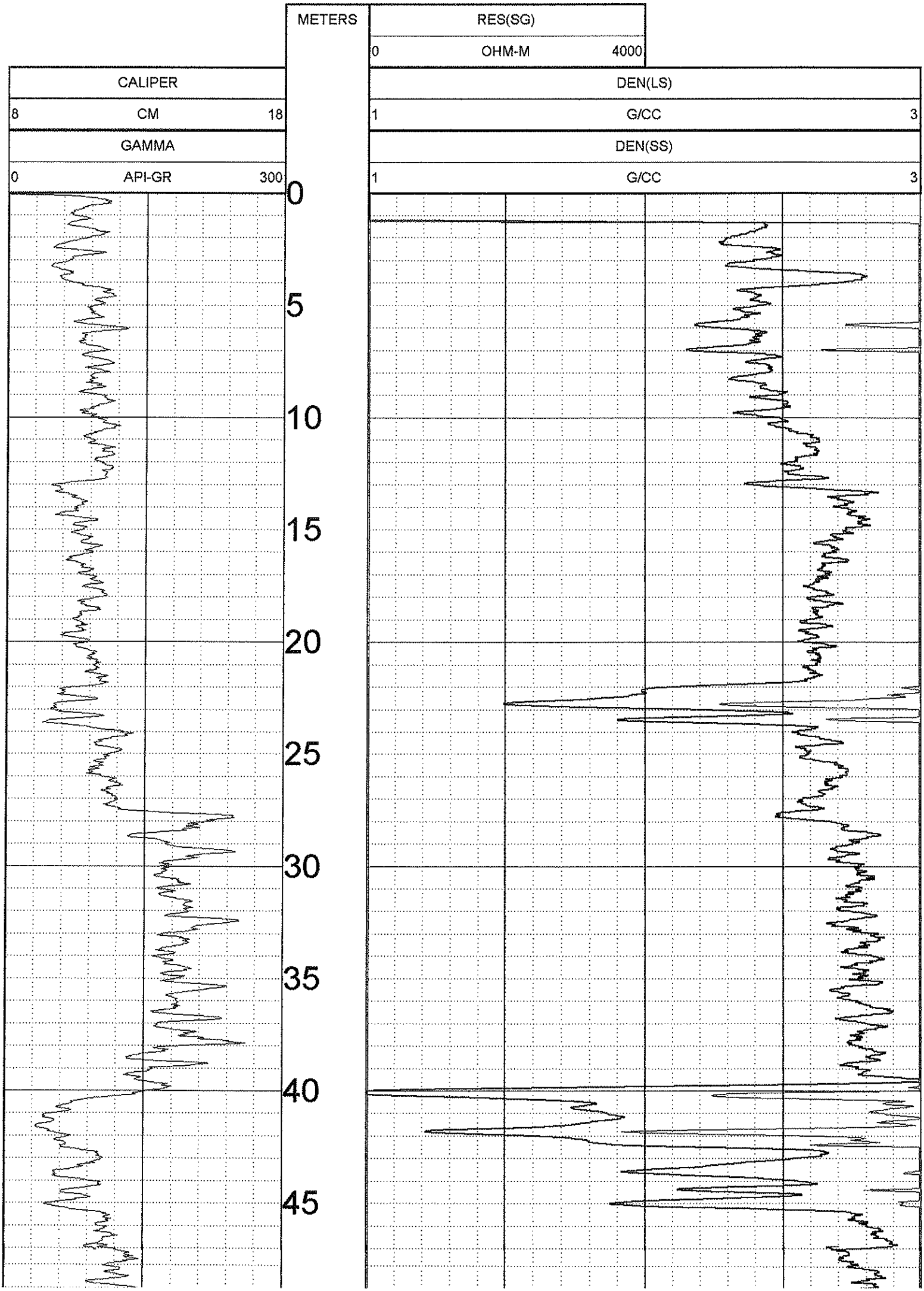
BH 303 DENSITY 1:200

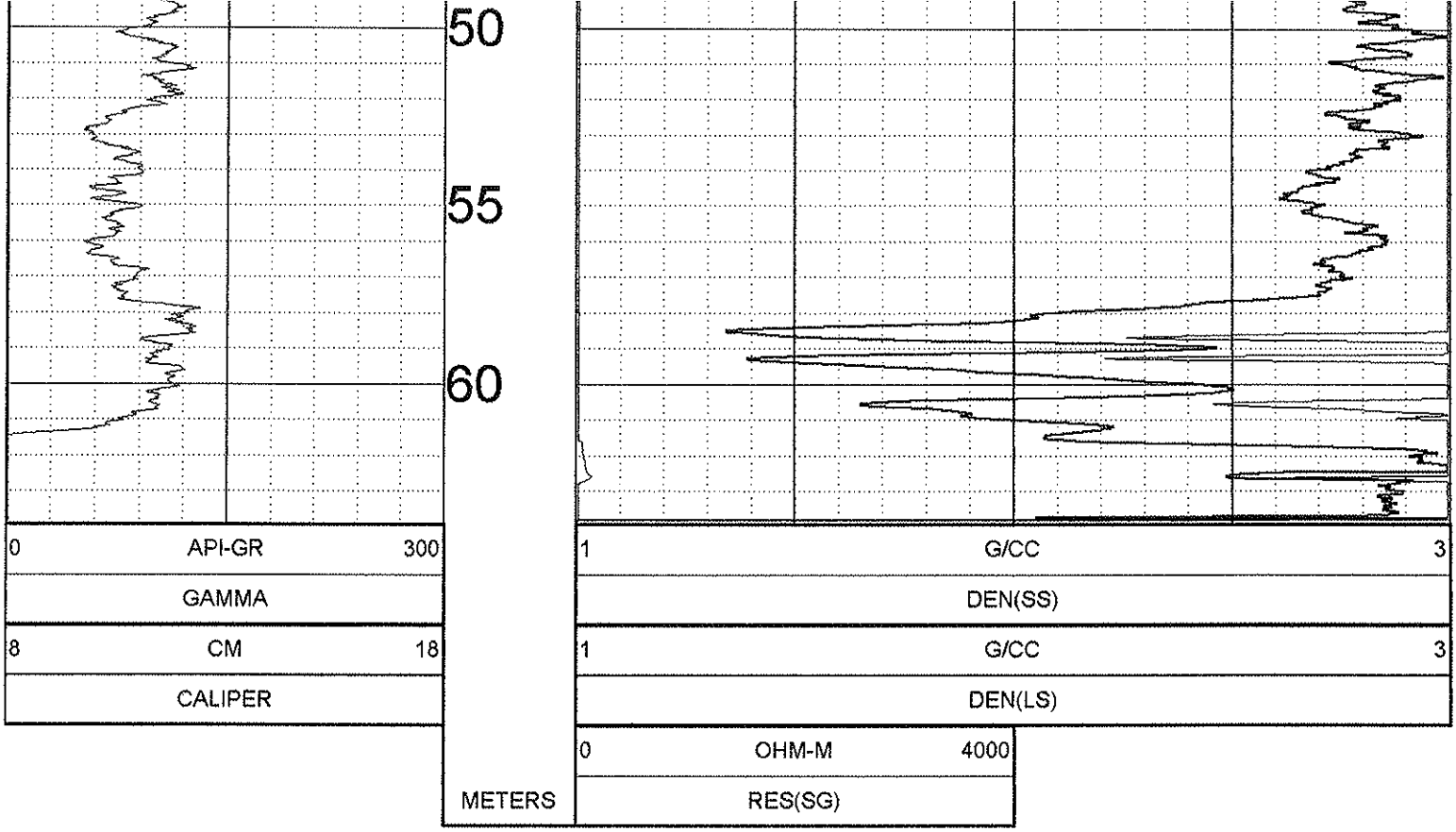
COMPANY	: DOUGLAS PARTNERS			OTHER SERVICES:	
WELL	: BH 303 DENSITY 1:200			DEN	
LOCATION/FIELD	: MINMI				
COUNTY	: AUST				
LOCATION	: NSW				
SECTION	: 0	TOWNSHIP	:	RANGE	: 0
DATE	: 05/20/08	PERMANENT DATUM	: GL		
API NO. DRILLER	: 35.85			KB	: 0
LOG BOTTOM	: 63.88	LOG MEASURED FROM:	GL	DF	: 0
LOG TOP	: -1.13	DRL MEASURED FROM:	GL	GL	:
CASING DIAMETER	: 10.	LOGGING UNIT	: 104		
CASING TYPE	: STEEL	FIELD OFFICE	: RUTHERFORD		
CASING THICKNESS	: .5	RECORDED BY	: I DAVIS		
RUN NO.	:				
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: PROCESSED
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9035AA
MATRIX DENSITY	: 2.8	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: LIMESTONE	MATRIX DELTA T	: 144		
CASING OD	: 10.5			THRESH:	3000

LOGGED THROUGH STEEL

JOB NO. 39663D

WITNESSED BY :


METERS
RES(SG)
0
OHM-M
4000
CALIPER
8
CM
18
DEN(LS)
1
G/CC
3
GAMMA
0
API-GR
300
DEN(SS)
1
G/CC
3
0
5
10
15
20
25
30
35
40
45

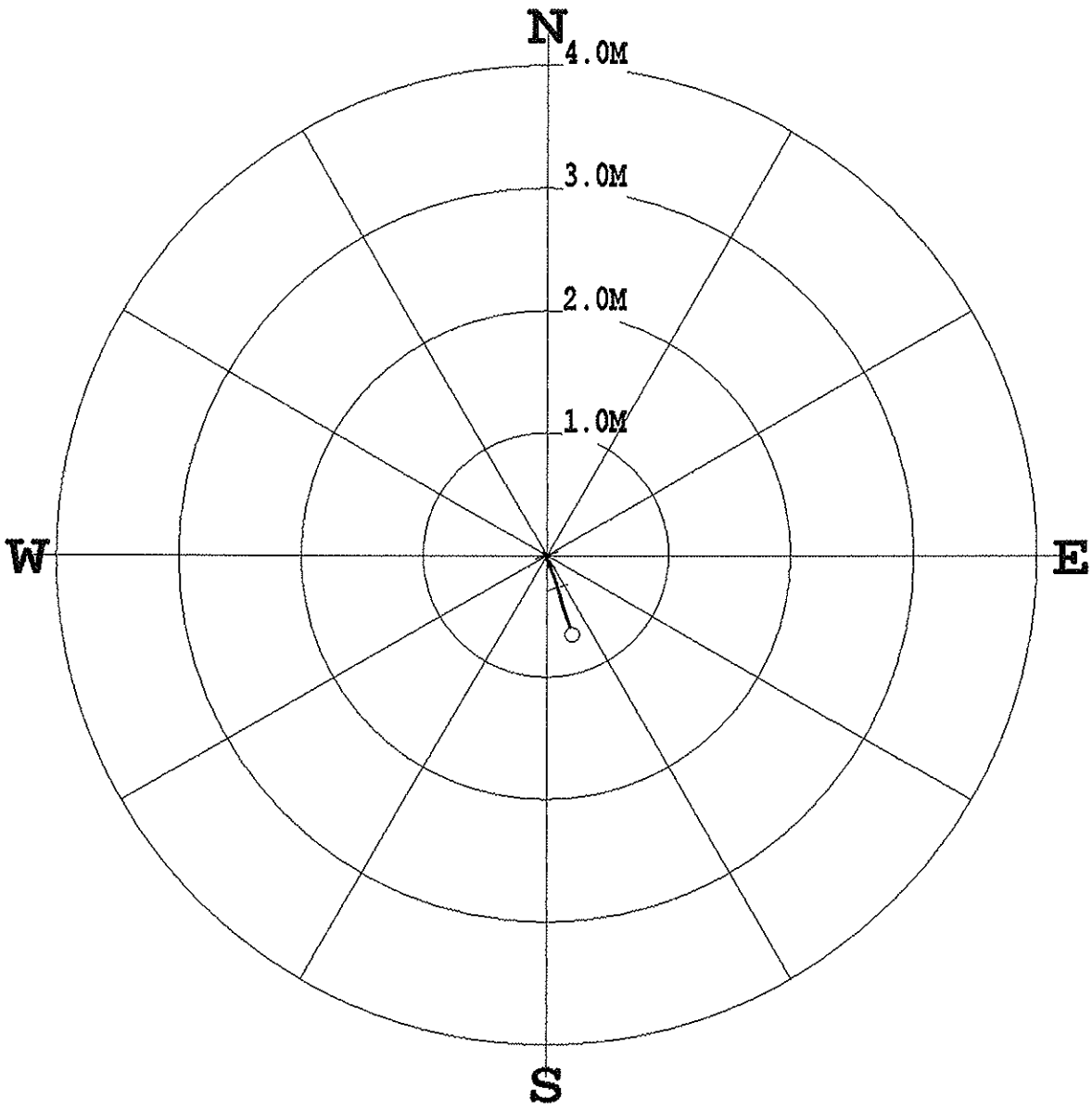

50
55
60
0
API-GR
300
GAMMA
8
CM
18
CALIPER
1
G/CC
3
DEN(SS)
1
G/CC
3
DEN(LS)
0
OHM-M
4000
METERS
RES(SG)

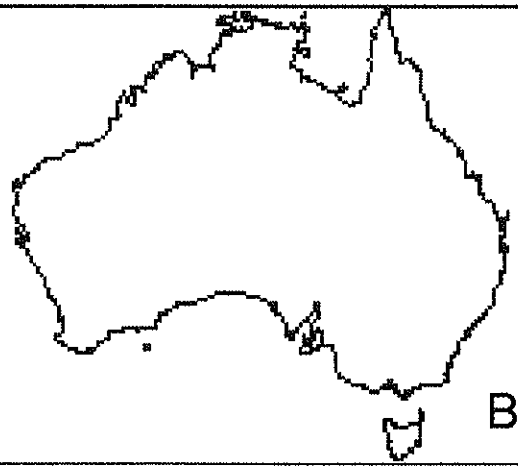
PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH 303 DEVIATION
DATE OF LOG: 05/20/08
PROBE: 9055A 244

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 39.76 M
AZIMUTH: 162.0
DISTANCE: 0.7 M
+ = 20 M INCR
○ = BOTTOM OF HOLE





GROUNDSEARCH AUSTRALIA

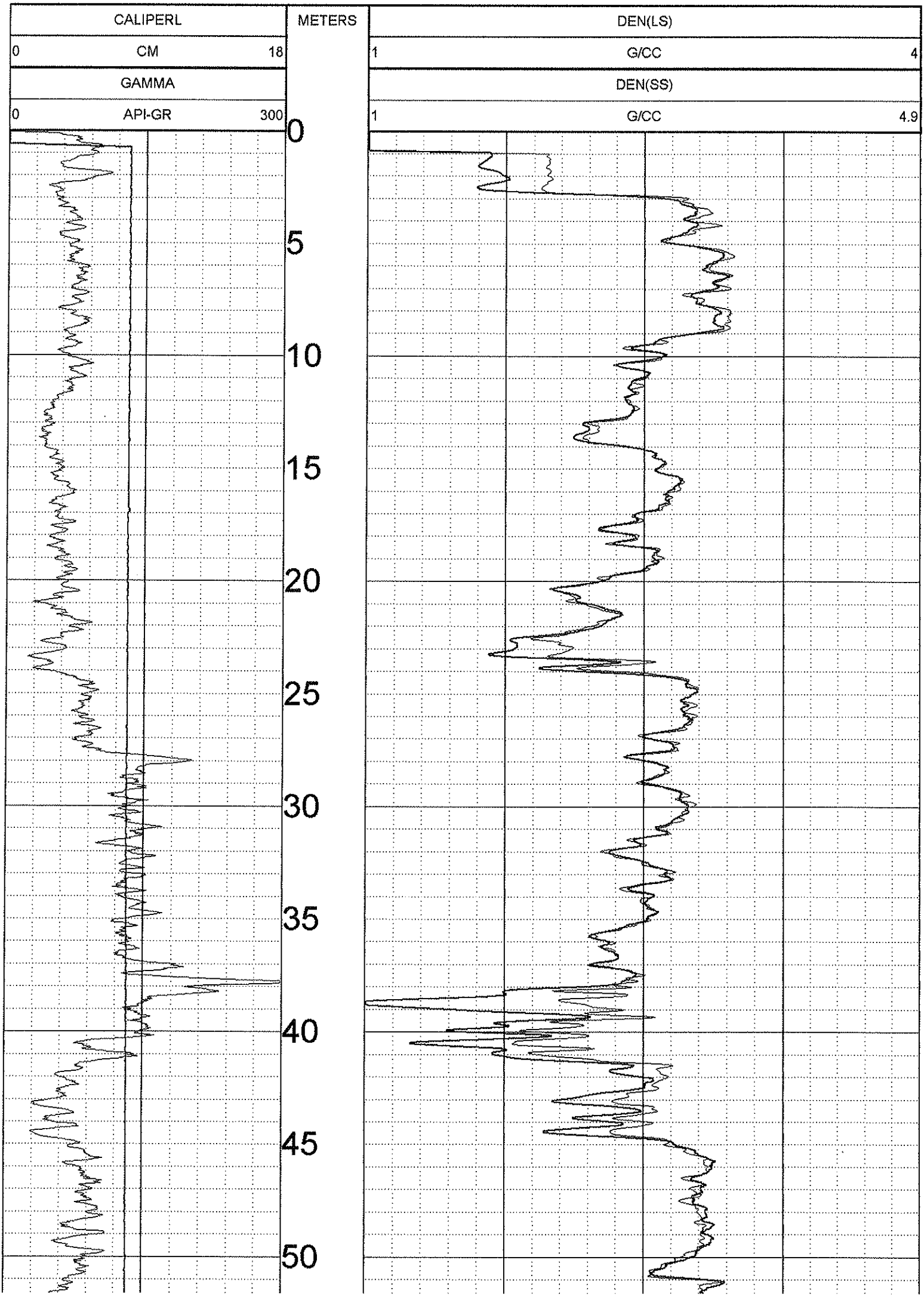
(ABN 11 057 389 152)

BH305 DENSITY 1:200

COMPANY	: DOUGLAS PARTNERS			OTHER SERVICES:	
WELL	: BH305 DENSITY 1:200			DEN,DEV	
LOCATION/FIELD	: MINMI				
COUNTY	:				
LOCATION	: NSW				
SECTION	:	TOWNSHIP	:	RANGE	:
DATE	: 05/27/08	PERMANENT DATUM	:		
API NO. DRILLER	: 66.15			KB	:
LOG BOTTOM	: 64.94	LOG MEASURED FROM:		DF	:
LOG TOP	: -1.58	DRL MEASURED FROM:		GL	:
CASING DIAMETER	: 10.	LOGGING UNIT	: 107		
CASING TYPE	: STEEL	FIELD OFFICE	: RUTHERFORD		
CASING THICKNESS	: 0	RECORDED BY	: I DAVIS		
RUN NO.	: 1				
BIT SIZE	: 9.6	BOREHOLE FLUID	: 0	FILE	: PROCESSED
MAGNETIC DECL.	: 0	RM	: 0	TYPE	: 9239B1
MATRIX DENSITY	: 2.65	RM TEMPERATURE	: 0		
NEUTRON MATRIX	: SANDSTONE	MATRIX DELTA T	: 177		
CASING OD	: 11.5			THRESH:	2500

DEN LOGGED THROUGH RODS

WITNESSED BY :


CALIPERL
0
CM
18
GAMMA
0
API-GR
300
METERS
0
5
10
15
20
25
30
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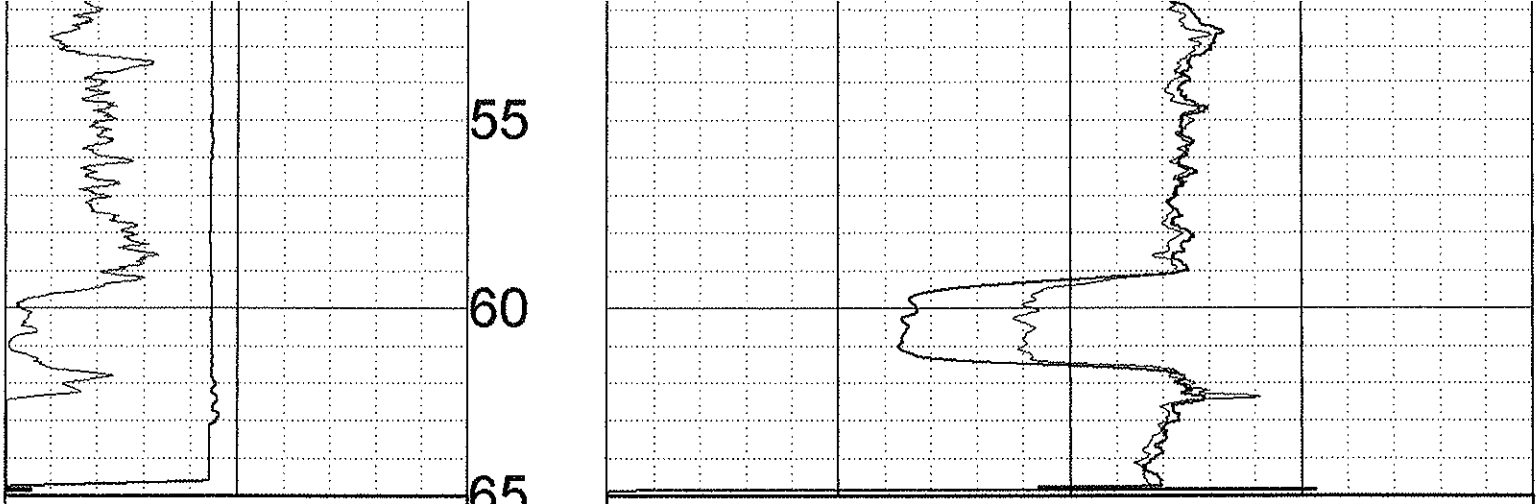
1
G/CC
4
DEN(SS)
1
G/CC
4.9



0	API-GR	300		1	G/CC	4.9
GAMMA				DEN(SS)		
0	CM	18		1	G/CC	4
CALIPERL			METERS	DEN(LS)		

PLAN VIEW
COMPU-LOG DEVIATION

CLIENT: DOUGLAS PARTNERS
LOCATION: MINMI
HOLE ID: BH305 DEVIATION
DATE OF LOG: 05/27/08
PROBE: 9057A 4455

MAG DECL: 0.0

SCALE: 1 M/CM
TRUE DEPTH: 36.97 M
AZIMUTH: 153.1
DISTANCE: 0.5 M
+ = 20 M INCR
○ = BOTTOM OF HOLE

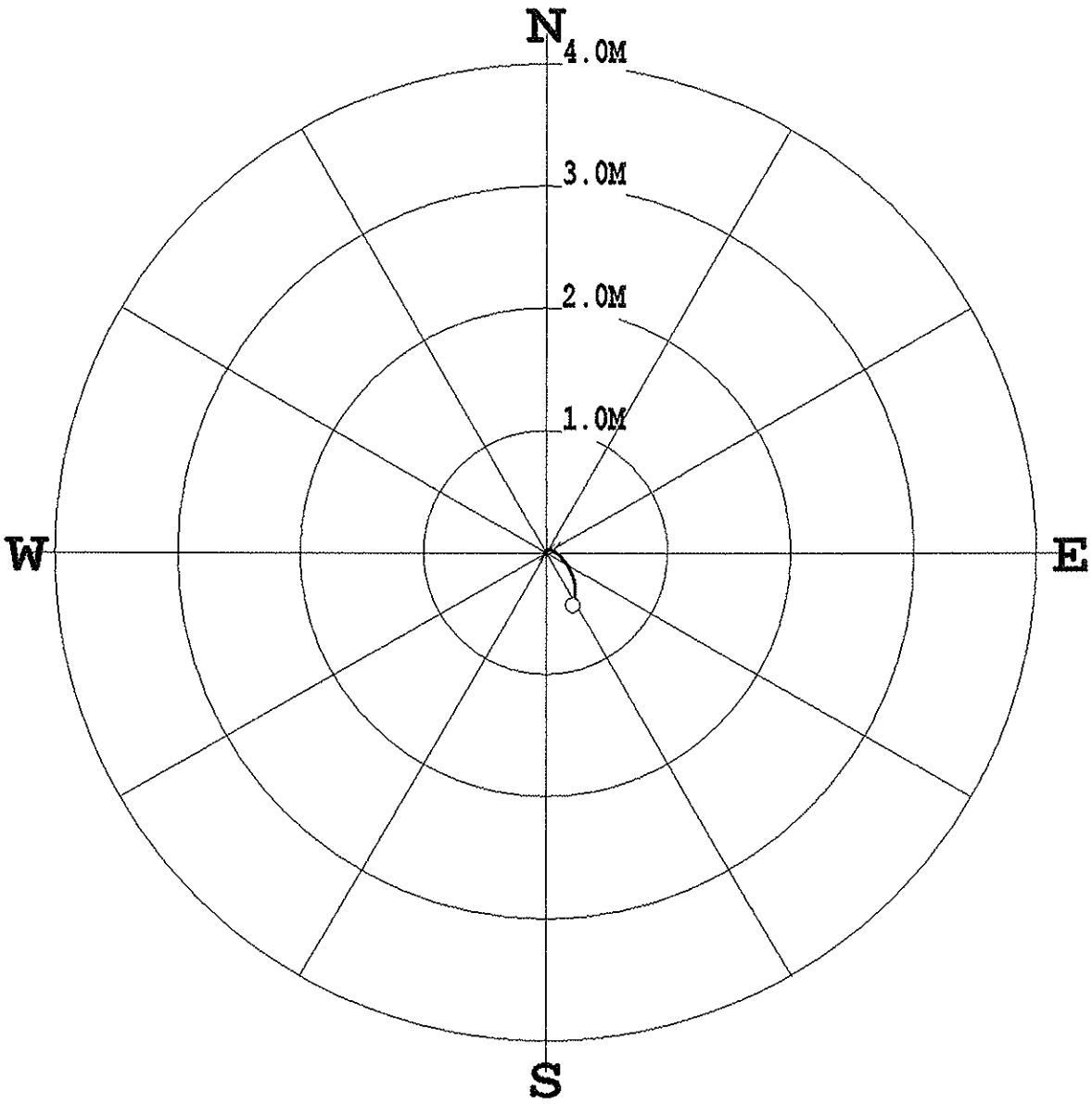


PHOTO 1: 5.25 m to 12.63 m

PHOTO 2: 12.63 m to 20.36 m

Core Photos for Borehole 1	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 3: 12.36 m to 27.50 m

PHOTO 4: 27.50 m to 33.50 m

Core Photos for Borehole 1	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 1: 2.70 m to 6.65 m

PHOTO 2: 6.65 m to 10.65 m

Core Photos for Borehole 2	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 3: 10.65 m to 14.45 m

PHOTO 4: 14.45 m to 18.20 m

Core Photos for Borehole 2	**PROJECT 39663D**	**Douglas Partners** Geotechnics - Environment - Groundwater

PHOTO 5: 18.20 m to 22.05m

PHOTO 6: 22.05 m to 25.90 m

Core Photos for Borehole 2	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 7: 25.90 m to 26.95 m

PHOTO 1: 2.70 m to 5.30 m

PHOTO 2: 5.30 m to 9.0 m

Core Photos for Borehole 3	**PROJECT 39663D**	**Douglas Partners** Geotechnics - Environment - Groundwater

PHOTO 3: 9.0 m to 12.90 m

PHOTO 4: 12.90 m to 16.70 m

Core Photos for Borehole 3	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 5: 16.70 m to 22.05 m

PHOTO 1: 2.85 m to 6.16 m

PHOTO 2: 6.16 m to 10.0 m

Core Photos for Borehole 4	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 3: 10.0 m to 14.0 m

PHOTO 4: 14.0 m to 17.8 m

Core Photos for Borehole 4	PROJECT 39663D	Douglas Partners Geotechnics · Environment · Groundwater

PHOTO 5: 17.8 m to 21.4 m

PHOTO 6: 21.4 m to 24.6 m

Core Photos for Borehole 4	**PROJECT 39663D**	**Douglas Partners** Geotechnics · Environment · Groundwater

PHOTO 1: 7.05 m to 10.90m

PHOTO 2: 10.90 m to 14.80 m

Core Photos for Borehole 5	**PROJECT 39663D**	**Douglas Partners** Geotechnics - Environment - Groundwater