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# Soil Surveys Engineering Pty. Limited

Specialist in Applied Geotechnics

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## BOREHOLE RECORD SHEET

Location Number: BH 317

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 06/02/2012

Easting: 501503 Northing: 6955771 RL: 18.76 m

Logger: BM / CB Operator: Phil Machine: MC450

Page: 1 OF 4

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated				Defect Spacing		Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NWLC					rs	sl	wl	ms	vs	es			
				0.10		BITUMEN										
				0.30		FILL Gravelly SAND (SP) Medium dense, fine to medium grained, brown, fine to coarse size gravel, moist.										
				0.60		NATURAL CLAY (CH) Stiff to very stiff, high plasticity, brown, moist.										
				1.10		CLAY (CH) Very stiff, high plasticity, grey yellow brown mottled, moist.										
				1.0		CLAY (CL-CI) Hard, low to medium plasticity, light grey, trace of fine to coarse grained sand, moist.										
				2.0												U50 PP >600
				3.0												
				4.0		MUDSTONE (XW) Extremely weak, grey.										
				3.80		ORGANIC CLAY (CL) Hard, low plasticity, dark grey, moist.										
				3.90		CLAY (CL) Hard, low plasticity, light grey, moist.										
				4.00		MUDSTONE (XW-DW) Very weak, grey red brown, with some clay seams.										
				4.20												
				5.0												
				6.0												
				6.10		MUDSTONE, fine grained, brown, cryptocrystalline, with closely spaced fractures and trace limonite veins.	DW									
				7.0			XW - DW									6.10 m; J, 10°, P, S, O, L
				7.26		MUDSTONE, fine grained, brown, cryptocrystalline, non-intact and trace limonite veins.										
				7.57		MUDSTONE, fine grained, brown, cryptocrystalline, fragmented and trace limonite veins.										
				8.0		SILTSTONE, with coal seams, fine grained, dark brown to black, cryptocrystalline, non-intact.										
				8.07												
				8.90		MUDSTONE, fine grained, brown, cryptocrystalline, fragmented.										
				9.0												
				9.62		MUDSTONE, fine grained, brown, cryptocrystalline, non-intact, with a 10mm coal										
				10.0												

### Comments:

- Groundwater not observed. 2) ATV survey carried out.
- Monitoring well installed to 16.5m on completion.

### Defects - 1.54m : F, 60° P, R, O, C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Silts	Q - Quartz
	L - Cleavage		U - Undulating			S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
	T - Contact					X - Carbonaceous
	V - Vein					Z - Clean
	Z - Decomposed Zone					
	DI - Drilling induced break					

### Weathering Grades

RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
ES - Extremely strong

### Samples

U50
SPT
Disturbed Sample

Approved:  
Date:



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## BOREHOLE RECORD SHEET

Location Number: BH 317

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 06/02/2012

Page: 2 OF 4

Easting: 501503 Northing: 6955771 RL: 18.76 m  
Logger: BM / CB Operator: Phil Machine: MC450

Drilling Method					Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NWLC	Casing									
					10.22		band at 9.71m.	XW			100	0	
					10.49		MUDSTONE, fine grained, brown, cryptocrystalline, fragmented.						
							MUDSTONE, fine grained, brown with orange mottles, cryptocrystalline, non-intact.	XW - DW			100	38	
					11.0		MUDSTONE, fine grained, grey brown, cryptocrystalline, thinly laminated, with closely spaced fractures, 50mm clay band at 10.71m.						11.09-11.87 m; B, 5°, P, S, O, Z
					12.0			DW DW - SW					12.00 m; J, 70°, P, S, O, L 12.21 m; J, 5°, P, R, O, L 12.23 m; J, 5°, P, R, O, L 12.26 m; J, 5°, P, R, O, L 12.43 m; J, 40°, P, R, O, L 12.66 m; J, 60°, P, R, O, L
					13.0						97	70	
					13.34		MUDSTONE, fine grained, dark grey brown, cryptocrystalline, thinly laminated, with closely spaced fractures.						13.23 m; Z, O, L 13.00-14.20 m; DI, 5°, P, S, O, Z
					14.0								
					14.20		MUDSTONE, fine grained, dark grey brown, cryptocrystalline, thinly laminated, with moderately widely spaced fractures.						
					15.0								15.25 m; DI, 5°, P, S, O, Z
					15.95						97	90	15.79 m; DI, 5°, P, S, O, Z
					16.0								
					16.18		MUDSTONE, fine grained, light brown, cryptocrystalline, thinly laminated, with moderately widely spaced fractures.						
							Interbedded SANDSTONE and MUDSTONE, fine grained, light green brown, granular, moderately widely spaced fractures.						16.76 m; Z, O, W
					17.0								
					17.30		SANDSTONE, fine to medium grained, light green brown with black laminations from 17.60m to 18.00m, granular, laminated, moderately widely to widely spaced fractures.	SW - FR					18.17 m; DI, 5°, P, R, O, Z 18.45 m; DI, 5°, P, R, O, Z 18.52 m; DI, 5°, P, R, O, Z
					18.0								
					18.60						100	91	
					18.97		SANDSTONE, fine to medium grained, light grey, granular, laminated, moderately widely spaced fractures.						
					19.0								
					19.41		SANDSTONE, fine to medium grained, light green brown, granular, laminated, moderately widely spaced fractures, with a clay band from 19.07m to 19.10m.						19.68 m; DI, 5°, P, V, O, W 19.80 m; DI, 5°, P, V, O, W
					20.0								

### Comments:

- Groundwater not observed. 2) ATV survey carried out.
- Monitoring well installed to 16.5m on completion.

### Defects - 1.54m : F, 60° P, R, O, C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
B - Bedding	C - Curvilinear	D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide	T -
C - Clay seam	P - Planar	R - Rough	N - Clean	K - Calcite	L - Limonite	Q - Quartz
F - Foliation	S - Subplanar	S - Smooth	O - Open	S - Secondary mineral	U - Unidentified mineral	W - Weathered rock
H - Schistosity	T - Stepped	V - Very rough	S - Silts		Z - Carbonaceous	
J - Joint	U - Undulating					
L - Cleavage						
R - Fracture						
S - Shear zone						
T - Contact						
V - Vein						
Z - Decomposed Zone						
DI - Drilling induced break						

### Weathering Grades

RS - Residual Soil
XW - Extremely weathered
DW - Distinctly weathered
SW - Slightly weathered
FR - Fresh
Rock Strength
VW - Very weak
W - Weak
MS - Medium strong
S - Strong
VS - Very strong
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### Samples

U50
SPT
Disturbed Sample

Approved:  
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## BOREHOLE RECORD SHEET

Location Number: BH 317

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 06/02/2012

Easting: 501503 Northing: 6955771 RL: 18.76 m

Logger: BM / CB Operator: Phil Machine: MC450

Page: 3 OF 4

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated s/s w/w h/s s/s v/s	Defect Spacing 20 60 200 600	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NWLC									
				20.30		SANDSTONE, fine to coarse grained, light green brown, granular, laminated, moderately widely spaced fractures. (continued)	SW - FR			100	91	20.81 m; DI, 10°, P, R, O, Z
				20.66		SANDSTONE, medium to coarse grained, light grey, granular, widely spaced fractures.						
				21.0		SANDSTONE, fine to coarse grained, light grey, granular, widely spaced fractures, with trace carbonaceous laminations.						21.24 m; J, 11°, P, R, O, X
				21.80						100	100	
				22.0		SANDSTONE, fine to coarse grained, light grey, granular, closely spaced fractures, with some fine to medium subrounded gravel.						22.63 m; J, 50°, P, R, O, W
				23.0								
				23.20								
				24.0		SANDSTONE, fine to medium grained, light grey, granular, with moderately widely spaced fractures and trace subrounded gravel, with thin irregular carbonaceous veins from 23.70m to 23.78m.	FR					
				25.0						97	95	24.64 m; J, 5°, P, R, O, X
				26.0								
				26.30		SANDSTONE, fine to medium grained, light grey, granular, with moderately widely spaced fractures and trace subrounded gravel, with a possible gravel band at 26.65m.						
				27.0								
				27.50								
				28.0		SANDSTONE, fine to medium grained, light grey, granular, with moderately widely spaced fractures, with fine to medium subrounded gravel.				100	96	
				29.0								28.96 m; J, 20°, P, R, O, Coal
				29.50								29.05 m; J, 25°, P, R, O, Coal
				30.0		SANDSTONE, fine to medium grained, light grey, granular, with moderately widely spaced fractures, with fine to medium subrounded gravel,				100	86	

### Comments:

- 1) Groundwater not observed. 2) ATV survey carried out.
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Water First Noted Water Steady Level

### Defects - 1.54m : F, 60°, P, R, O, C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Silty	Q - Quartz
	L - Cleavage		U - Undulating			S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
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	Z - Decomposed Zone					
	DI - Drilling induced break					

### Weathering Grades

RS - Residual Soil
XW - Extremely weathered
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Rock Strength
VW - Very weak
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MS - Medium strong
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**Location Number: BH 317**

**Project Number: 110-12936**

**Project Name: Cross River Rail**

**Location: Brisbane**

**Client: AECOM**

**Date: 06/02/2012**

**Page: 4 OF 4**

**Easting: 501503      Northing: 6955771      RL: 18.76 m**

**Logger: BM / CB      Operator: Phil      Machine: MC450**

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated					Defect Spacing			Rec (%)	RQD	Samples and Remarks
TC	WB	RR	Casing					RS	W	MS	S	VS	ES	20	60	200	600	
						with thin carbonaceous veins. BOREHOLE BH 317 TERMINATED AT 30.00 m												
				31.0														
				32.0														
				33.0														
				34.0														
				35.0														
				36.0														
				37.0														
				38.0														
				39.0														
				40.0														

**Comments:**

- 1) Groundwater not observed. 2) ATV survey carried out.
- 3) Monitoring well installed to 16.5m on completion.

Water First Noted      Water Steady Level

**Defects - 1.54m : F,60° P,R,O,C**

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Fill
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	P - Iron Oxide
	F - Foliation		P - Planar	R - Rough	N - Clean	K - Calcite
	H - Schistosity		S - Subplanar	S - Smooth	O - Open	L - Limonite
	J - Joint		T - Stepped	V - Very rough	S - Stain	Q - Quartz
	L - Cleavage		U - Undulating			S - Secondary mineral
	R - Fracture					U - Unidentified mineral
	S - Shear zone					W - Weathered rock
	T - Contact					X - Carbonaceous
	V - Vein					Z - Clean
	Z - Decomposed Zone					
	DI - Drilling induced break					

**Weathering Grades**

RS - Residual Soil  
XW - Extremely weathered  
DW - Distinctly weathered  
SW - Slightly weathered  
FR - Fresh  
**Rock Strength**  
VW - Very weak  
W - Weak  
MS - Medium strong  
S - Strong  
VS - Very strong  
ES - Extremely strong

**Samples**

U50  
SPT  
Disturbed Sample

Approved:  
Date:







TITLE

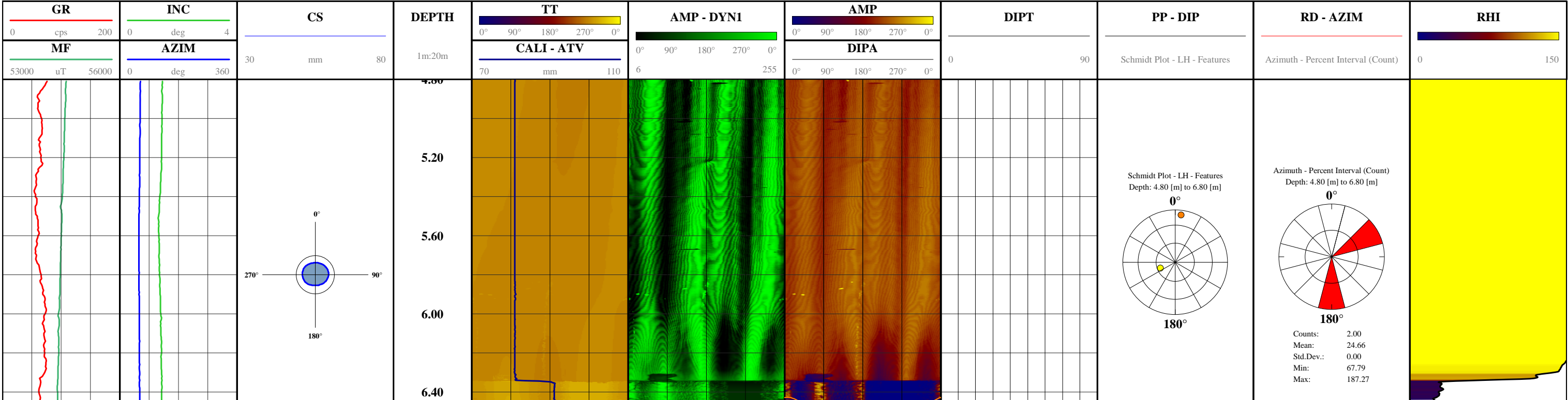
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Brisbane  
Cross River Rail  
Core Photo - BH 317

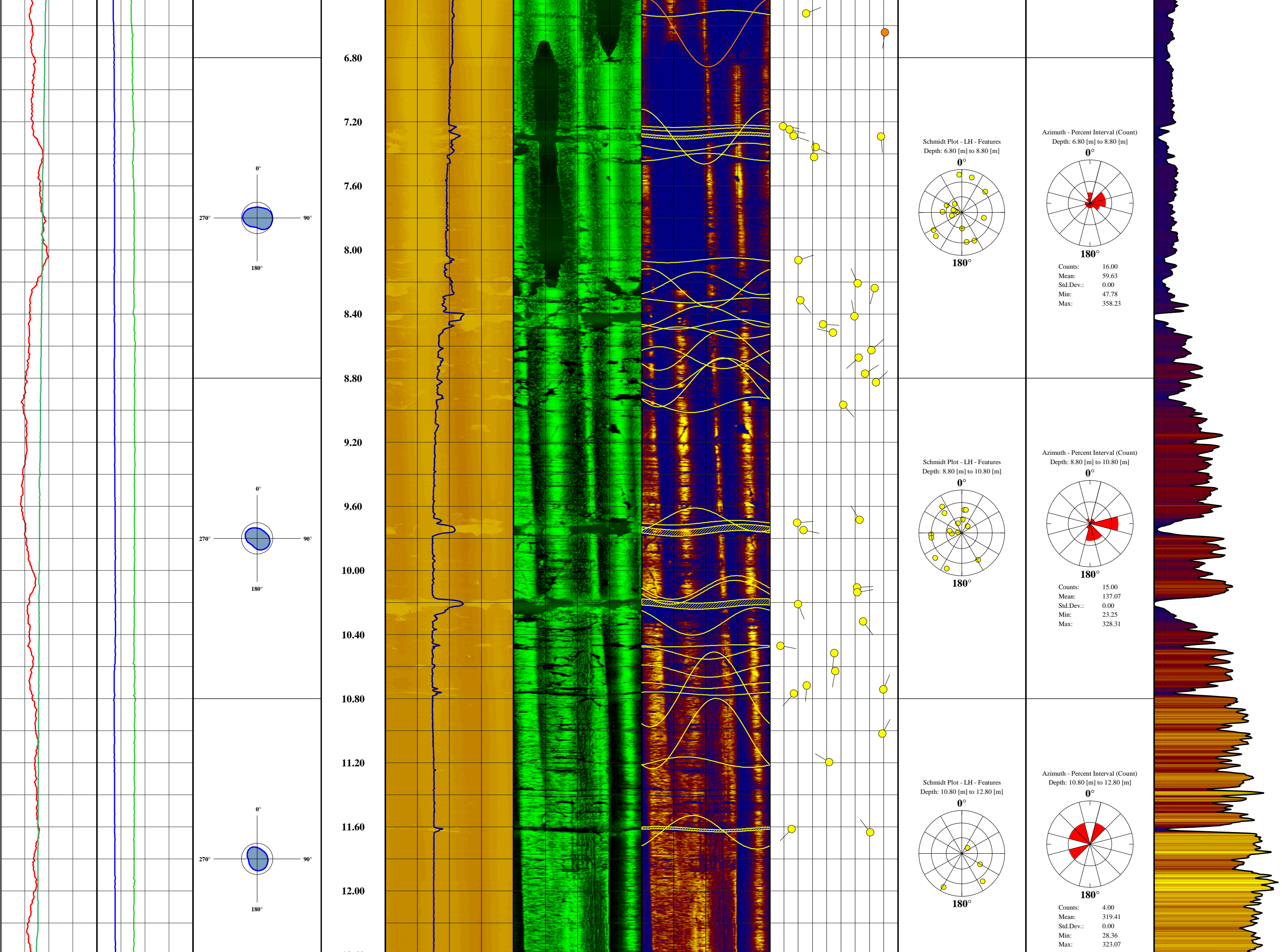
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PROJECT No	110-12936	FIGURE No	1/1



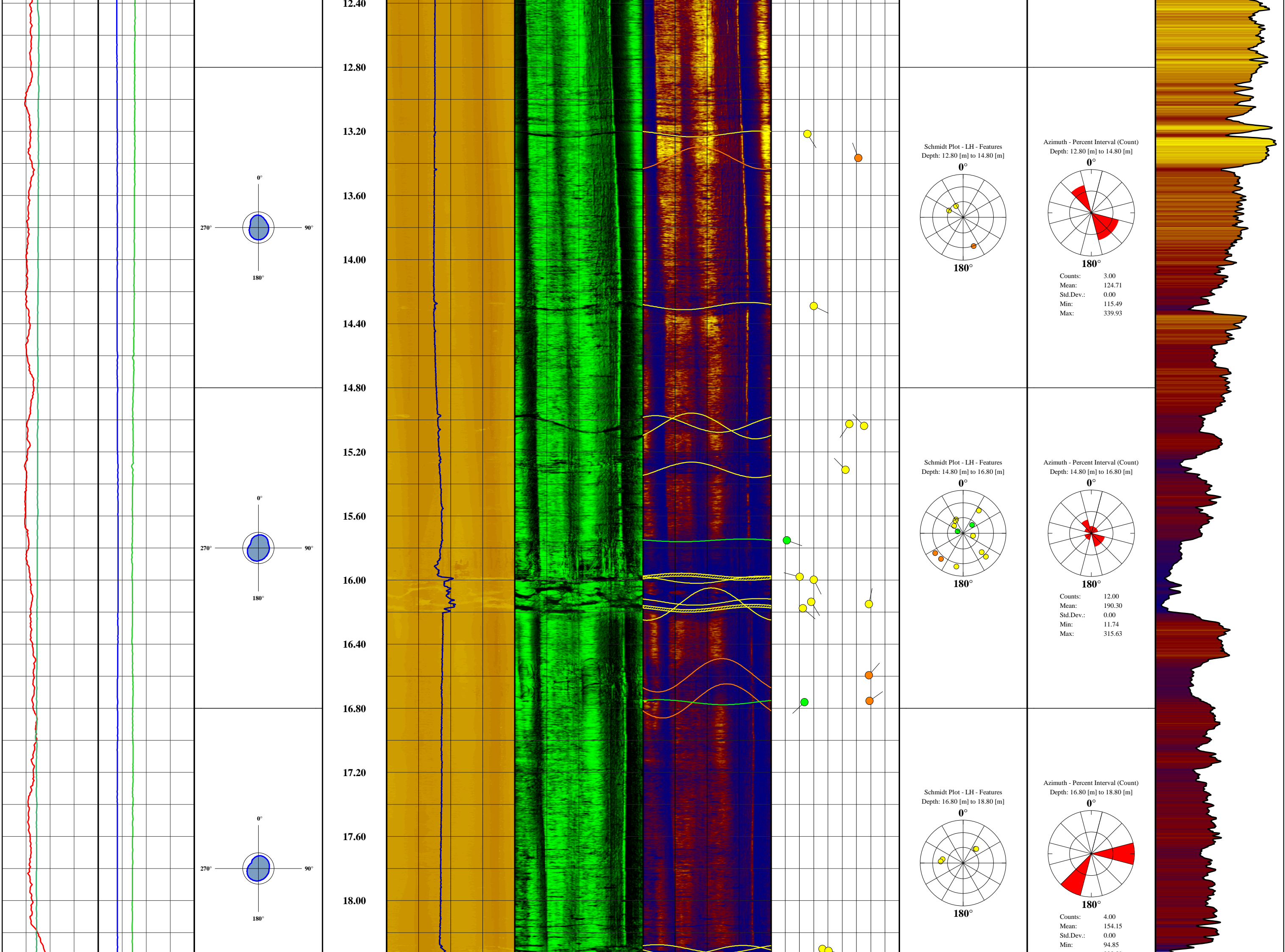
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		<div>COMPOSITE LOG</div> <div>BOREHOLE TELEVIEWER LOGS AND STRUCTURES</div>				 <div>INTERPRETATION SERVICES</div>	
<div>Hole NameCRR317</div> <div>FieldBrisbane City</div> <div>Log Date8th Mar, 2012</div> <div>LocationQLD</div>		<div>Drill Depth30m</div> <div>Bit Size76cm</div> <div>Casing TypeN/A</div> <div>Casing DepthN/A</div>		<div>Grid NameN/A</div> <div>Collar EastingN/A</div> <div>Collar NorthingN/A</div> <div>Reduced LevelN/A</div>		<div>Logging UnitSV031</div> <div>EngineerJ.Mackay</div> <div>Client RepresentJulian Irons</div> <div>Service TypeTeleviewer</div>	
TELEVIEWER LOGS		STRUCTURAL LOGS		TADPOLES		COMMENTS	
<div>MFMag Field</div> <div>GRGamma</div> <div>INCTool Inclination (0 = Vertical Down)</div> <div>AZIMTool Azimuth</div> <div>TTTravel Time Image</div> <div>AMPAmplitude Image</div> <div>AMP - DYN1Amplitude Image Dynamic 1</div>		<div>DIPAStructures Apparent (Sinusoid Presentation)</div> <div>DIPTStructures True (Tadpole Presentation)</div> <div>PP - DIPolar Projection Dip (Schmidt)</div> <div>RD - AZIMRose Diagram - Azimuth</div> <div>CSCross Section</div>		<div><div></div>Partially Open Fracture</div> <div><div></div>Closed Fracture</div> <div><div></div>Foliation/Banding/Bedding</div>		<div>Image data and the Azimuth are oriented to True North.</div> <div>Magnetic Declination = 10.97 deg</div> <div>Cross Sections are plotted at 2m intervals: White : Tool Position, Light Blue : Nominal Hole Size and Blue : Actual Hole Size</div>	
PROCESSED LOGS							
<div>CALI - ATVCalliper Average from ATV</div>		<div>RHIRock Hardness Index</div>					
<div>IMPORTANT NOTE</div> <div>The following interpretations are opinions based upon inferences from borehole logs, Surtron Technologies (Australia) Pty Ltd cannot and does not guarantee the correctness or accuracy of any interpretations. Therefore Surtron Technologies (Australia) Pty Ltd shall not be liable or responsible for any loss, damage, cost or expense incurred or sustained by anyone resulting from any interpretations.</div>							

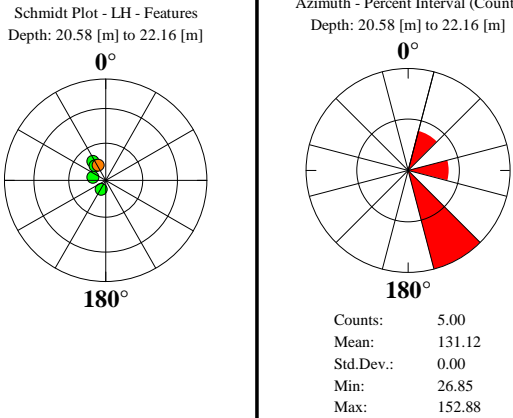
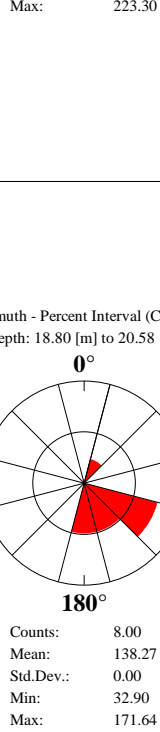
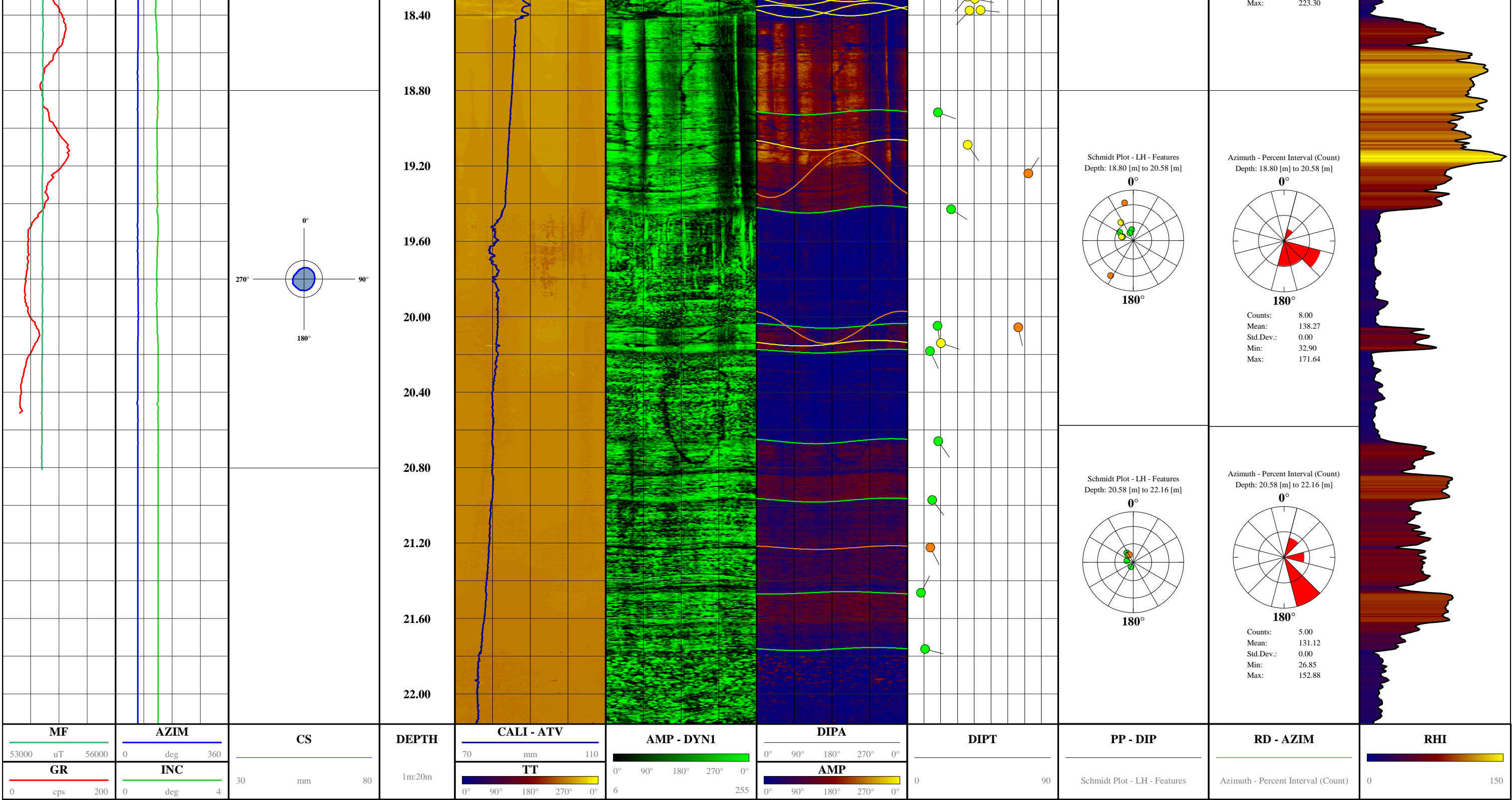












## IN-SITU PACKER PERMEABILITY TEST RESULT

**PROJECT:** **CRR**  
**PROJECT No.:** **110-12936**

**BH No.:** **317**  
**Test No.:** **1**  
**Date:** **8/02/2012**

Packer type: Double  
Packer pressure: 2500kPa  
Gauge pressures measured in: kPa  
Tested by: CS

Vertical depth to:

Top of test section (m):	23.00
Base of test section (m):	24.50
Centre of test section(m):	23.25
Base of casing (m):	22.00
Ground water (m)	NR

Depth of centre of test section (m)	23.25
Length of test section (m):	1.50

Gauge Height above ground level	0.00
Hole Diameter in test section (mm)	75

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	1912.0	1912.5	1912.5	1912.6	Flow (l/min)
	Water Take	0.00	0.50	0.00	0.10	0.040
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1914.5	1914.6	1914.6	1914.6	Flow (l/min)
	Water Take	0.00	0.10	0.00	0.00	0.007
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	1916.1	1916.1	1916.1	1916.1	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1915.3	1915.3	1915.5	1915.5	Flow (l/min)
	Water Take	0.00	0.00	0.20	0.00	0.013
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	1914.1	1914.1	1914.1	1914.1	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q) (l/min)	Gauge Press (kPa)	Gauge Press (m of water)	Friction Loss (m)*		Total Head (m)	Lugeon Value	Perm. (m/s)
				Basic	In extra rods			
1st	0.040	100.00	10.220	0.000	0.000	33.470	0.081	7.78E-09
2nd	0.007	200.00	20.440	0.000	0.000	43.690	0.010	9.94E-10
3rd	0.000	300.00	30.660	0.000	0.000	53.910	0.000	0.00E+00
4th	0.013	200.00	20.440	0.000	0.000	43.690	0.021	1.99E-09
5th	0.000	100.00	10.220	0.000	0.000	33.470	0.000	0.00E+00

\*Where friction loss is assumed to be negligible.

N.B. Pressure Conversion: 1 bar = 100 kPa = 14.503 psi