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Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	N/M/LC									
				0.0		FILL Sandy Gravelly CLAY (CH) Stiff, high plasticity, brown, fine to medium size gravel, fine to coarse grained sand, moist.						SPT 2.6, 10 N=16
				2.0								
				4.0		FILL CLAY, SAND and GRAVEL, with fragments of metal, wood, tile and brick.						SPT 2.2, 4 N=6
				5.80								
				6.0		NATURAL CLAY (CH) Firm, high plasticity, grey, trace of tree roots.						U50 PP=100
				7.10		CLAY (CH) Soft, high plasticity, grey, trace of tree roots.						U50 PP=40
				8.20		Sandy CLAY (CI) Soft, medium plasticity, grey, fine to coarse grained sand, some fine size gravel and ash.						
				9.40		Clayey Sandy GRAVEL (GP) Medium dense, fine to medium size, grey, fine to coarse grained sand, medium to high plasticity fines.						SPT 0.0, 15 N=15
				10.0								

Comments:
1) Groundwater not observed. 2) ATV survey carried out.
3) Monitoring well installed to 28.5m on completion.

Defects - 1.54m : F,60°,P,R,O,C

Depth (m)	Type	Dip (Deg)	Planarity	Roughness	Aperture	Width
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	F - Fault		P - Planar	R - Rough	N - Clean	K - Kaolinite
	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: _____

SOIL SURVEYS 00: LIBRARY 2012:05:G.LB Log SOIL SURVEY BOREHOLE LOG 111-12936 NEW.GPJ <<DrawingFiles>> 21/05/2012 14:33 8.30.002 Developed by Dargel



Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	FR	NW/CL									
				10.30		Sandy CLAY (CH) Hard, high plasticity, grey, fine to medium grained sand.						SPT 6, 29, 21 N=50
				11.0								
				12.0								
				12.70								SPT 28, 30/130mm N=R
				12.76		SANDSTONE, fine to medium grained, dark grey.	SW					
				13.0		Interbedded MUDSTONE and SILTSTONE, fine grained, alternating light brown and dark grey, cryptocrystalline, medium bedded, with closely spaced fractures, and trace coal stringers.	DW - SW					
				14.0			SW - FR			100	52	14.15m, Is50 = 1.19 MPa
				15.0			DW - SW					14.8m, Is50 = 0.64 MPa
				16.0								12.70-17.45 m; DI, 10°, S, R, O, Z 15.27m, Is50 = 0.39 MPa
				17.0								12.70-17.45 m; DI, 10°, S, R, O, Z
				17.23		SANDSTONE, fine grained, grey, granular, massively bedded, closely spaced fractures.	SW - FR					16.73 m; J, 80°, S, R, O, Z
				18.0								17.25 m; J, 80°, P, R, O, Z
				18.00		Interbedded MUDSTONE and SILTSTONE, fine grained, alternating light brown and dark grey, cryptocrystalline, medium bedded, with closely spaced fractures.	DW - SW					
				19.0								19.27m, Is50 = MPa
				20.0								19.51 m; J, 80°, P, R, O, Z

Comments:
1) Groundwater not observed. 2) ATV survey carried out.
3) Monitoring well installed to 28.5m on completion.

Defects - 1.54m : F,60°,P,R,O,C

Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Width
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - 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: _____

Water First Noted Water Steady Level



Easting: 502294 Northing: 6957049 RL: 7.46 m
Logger: SO/CB Operator: SO Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	FR	NW/LC									
				20.24		Clayey SAND, stiff, grey, low plasticity fines.	DW - SW			100	32	
				20.59		SILTSTONE, fine grained, grey, with closely spaced fractures.	RS					
				21.0								
				21.66								
				22.0		CONGLOMERATE, coarse grained, grey, massively bedded, closely spaced fractures, with trace thin mudstone bands and some mudstone lenses.	FR			100	73	21.86 m; J, 26°, U, R, O, Z
				22.00		SILTSTONE, fine grained, dark grey, thinly laminated, moderately widely spaced fractures, with loose sand bands from 23.33m to 23.37m, 29.31m to 29.35m and 25mm sandstone bands at 30.55 and 31.57m, a 200mm sandstone band at 31.15m, and a 20mm clay band at 32.23m.						22.5m, Is50 = 0.29 MPa
				23.0								
				24.0								23.8m, Is50 = 0.25 MPa
				25.0								24.4m, Is50 = 0.72 MPa
				26.0								
				27.0						100	83	27.24 m; J, 80°, U, R, O, Z
				28.0								22.00-33.64 m; DI, 5°, P, S, O, Z
				29.0								28.15m, Is50 = 0.27 MPa
				30.0						100	87	28.94 m; C, 5°, P, S, O, C

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Comments:
1) Groundwater not observed. 2) ATV survey carried out.
3) Monitoring well installed to 28.5m on completion.

Defects - 1.54m : F,60°,P,R,O,C

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



Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NM/LC									
				31.0		SILTSTONE, fine grained, dark grey, thinly laminated, moderately widely spaced fractures, with loose sand bands from 23.33m to 23.37m, 29.31m to 29.35m and 25mm sandstone bands at 30.55 and 31.57m, a 200mm sandstone band at 31.15m, and a 20mm clay band at 32.23m. (continued)	FR			100	87	30.15m, Is50 = 2.04 MPa 30.7m, Is50 = 0.89 MPa
				32.0								
				33.0								
				33.63						100	77	30.00-34.32 m; DI, 5°, P, S, O, Z
				34.0		Interbedded SILTSTONE and SANDSTONE, fine to medium grained, grey, laminated, moderately widely to widely spaced fractures.						34.08m, Is50 = 0.5 MPa
				34.53								34.53 m; J, 20°, P, R, O, X
				35.0		SANDSTONE, fine to medium grained, light grey, granular, massively bedded with widely spaced fractures, with some fine to medium size rounded gravel.						34.90 m; DI, 10°, S, V, O, W 35.12m, Is50 = 3.9 MPa 35.02 m; J, 20°, U, R, O, X 35.18 m; J, 10°, P, R, O, X
				35.37								35.61 m; J, 30°, C, R, O, Z
				36.0		CONGLOMERATE, coarse grained, light grey, granular, massively bedded, with widely spaced fractures. Cast supported. Clasts are fine to coarse size gravel, with trace fine cobbles of rounded to subrounded siltstone, sandstone and quartz.						36.86m, Is50 = 1.08 MPa 36.80 m; DI, 10°, S, R, O, Z 37.16 m; DI, 30°, S, R, O, Z 37.48 m; DI, 40°, C, R, O, Z 37.75 m; J, 20°, S, R, O, W 37.80 m; J, 10°, S, S, O, C
				37.0								
				38.0								
				39.0								
				40.0						100	95	38.9m, Is50 = 1.34 MPa 38.95m, Is50 = 1.58 MPa 38.85 m; DI, 15°, U, R, O, Z 39.43 m; DI, 5°, S, R, O, Z 39.91 m; DI, 15°, U, R, O, Z

Comments: BOREHOLE BH 322 TERMINATED AT 40.00m
 1) Groundwater not observed. 2) ATV survey carried out. 3) Monitoring well installed to 28.5m on completion.

Weathering Grades: RS - Residual Soil, XW - Extremely weathered, DW - Distinctly weathered, SW - Slightly weathered, FR - Fresh

Rock Strength: VVW - Very very weak, W - Weak, MS - Medium strong, S - Strong, VS - Very strong, ES - Extremely strong

Samples: U50, SPT, Disturbed Sample

Approved: [Signature] **Date:** [Date]

Legend: Water First Noted, Water Steady Level

Depth (m) Symbols: Type (B, C, F, H, J, L, R, S, T, V, Z, DI), Dip (Deg), Planarity (C, D, P, S, U), Roughness (L, P, R, S, V), Aperture (C, F, N, O, S), Fills (C, F, N, O, S)

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SOIL_SURVEYS.00.LIBRARY.GLB.Grtctbl.DG.PHOTO.CORE.PHOTO.4.PER.PAGE.111-12936.NEW.GPJ <<DrawingFile>> 26/04/2012 14:47 8.2.856 Developed by Datgel



TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 322

DRAWN	DT	DATE	26/04/2012
CHECKED	CB	DATE	26/04/2012
SCALE	Not To Scale		A4
PROJECT No	110-12936	FIGURE No	1/2

SOIL_SURVEYS_00.LIBRARY.GLB G:\c\tbl DG PHOTO CORE PHOTO 4 PER PAGE 111-12936 NEW.GPJ <<DrawingFile>> 26/04/2012 14:47 8.2.856 Developed by Datgel



TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 322

DRAWN	DT	DATE	26/04/2012
CHECKED	CB	DATE	26/04/2012
SCALE	Not To Scale		A4
PROJECT No	110-12936	FIGURE No	2/2



COMPOSITE LOG

BOREHOLE TELEVIEWER LOGS AND STRUCTURES



Hole Name CRR322
Field Brisbane City
Log Date 9th Mar,2012
Location QLD

Drill Depth 40m
Bit Size 76mm
Casing Type PVC
Casing Depth N/A

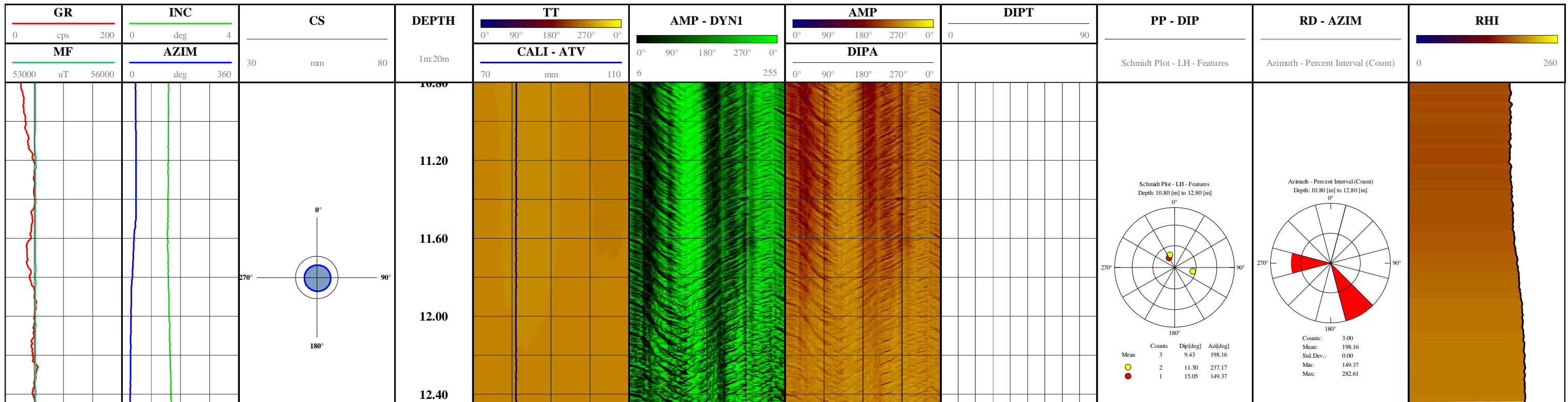
Grid Name N/A
Collar Easting N/A
Collar Northing N/A
Reduced Level N/A

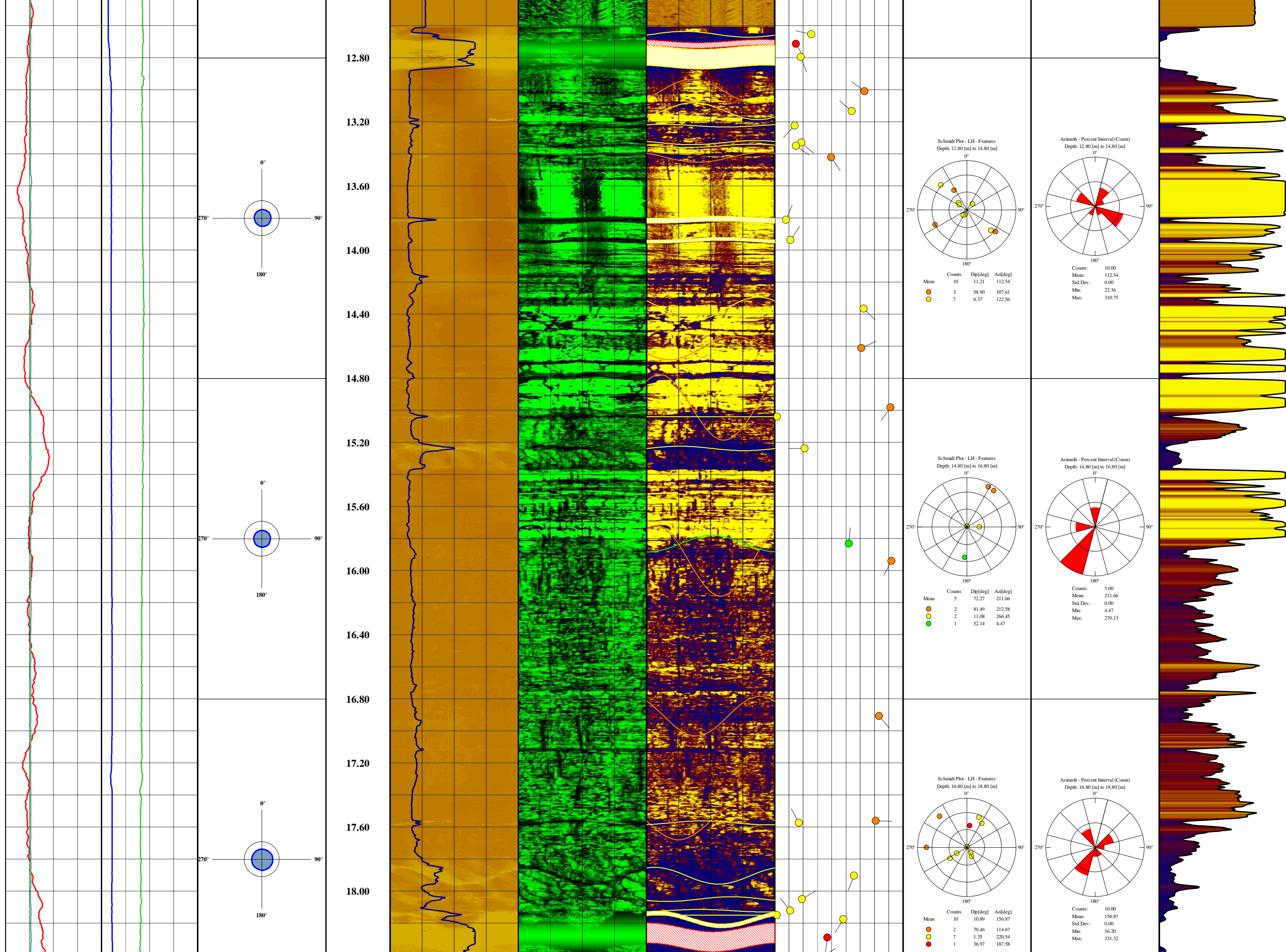
Logging Unit SV031
Engineer J.Mackay
Client Represent Julian Irons
Service Type Televiewer

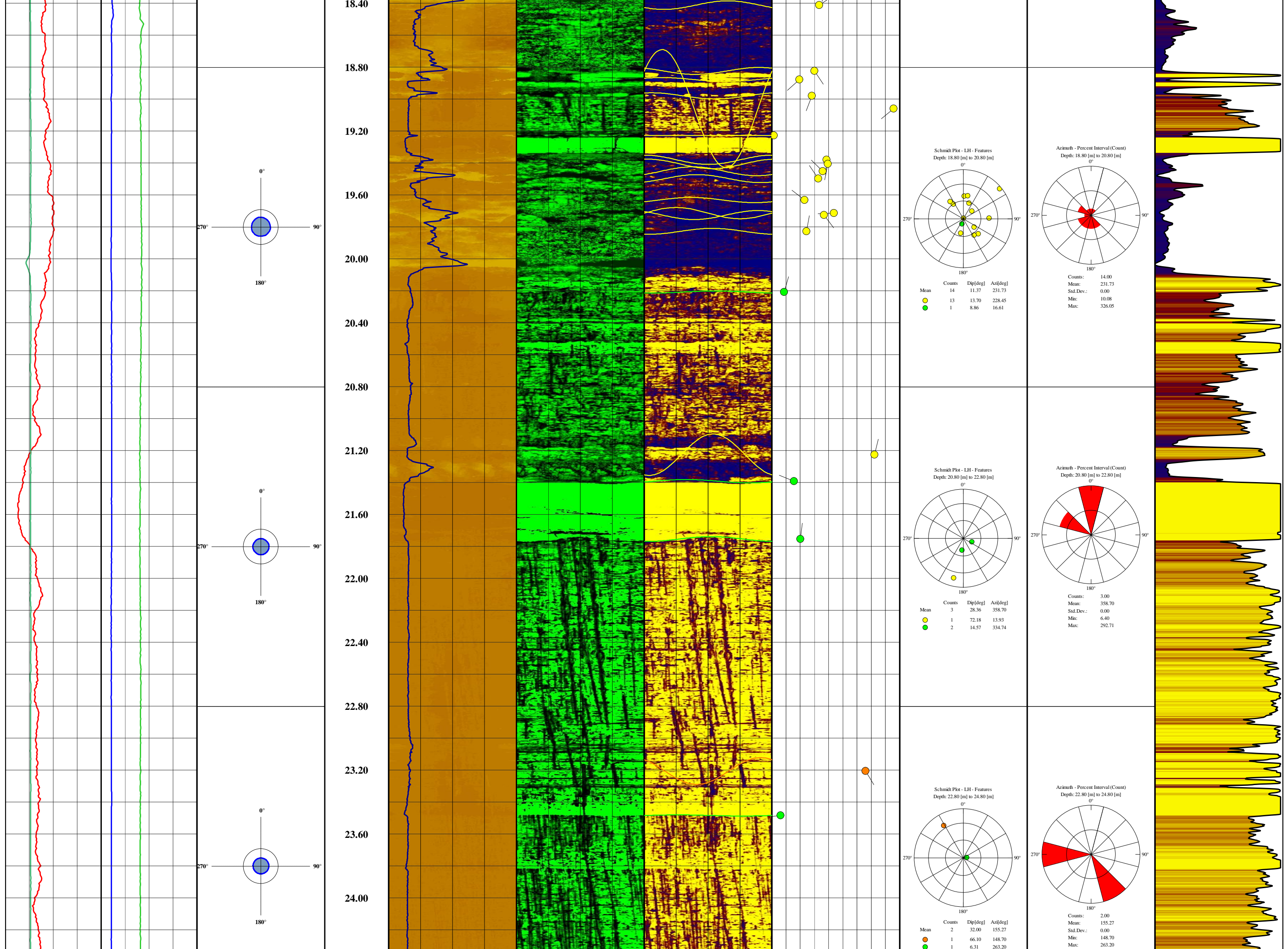
TELEVIEWER LOGS	STRUCTURAL LOGS	TADPOLES	COMMENTS
<p>MF Mag Field GR Gamma INC Tool Inclination (0 = Vertical Down) AZIM Tool Azimuth TT Travel Time Image AMP Amplitude Image AMP - DYN1 Amplitude Image Dynamic 1</p>	<p>DIPA Structures Apparent (Sinusoid Presentation) DIPT Structures True (Tadpole Presentation) PP - DIP Polar Projection Dip (Schmidt) RD - AZIM Rose Diagram - Azimuth CS Cross Section</p>	<ul style="list-style-type: none"> ● Open Fracture ● Partially Open Fracture ● Closed Fracture ● Foliation/Banding/Bedding ▼ Drilling Induced Feature 	<p>Image data is presented oriented to True North.</p> <p>Magnetic Declination = 10.97 deg</p> <p>Cross Sections are plotted at 2m intervals: White : Tool Position, Light Blue : Nominal Hole Size and Blue : Actual Hole Size</p>
PROCESSED LOGS			
CALI - ATV Calliper Average from ATV	RHI Rock Hardness Index		

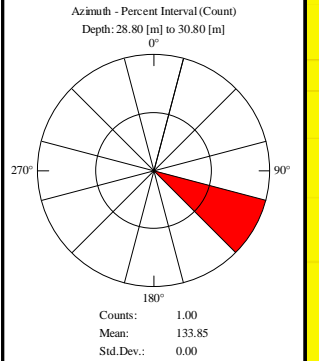
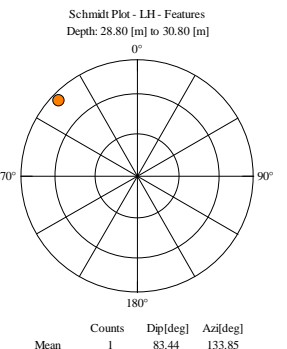
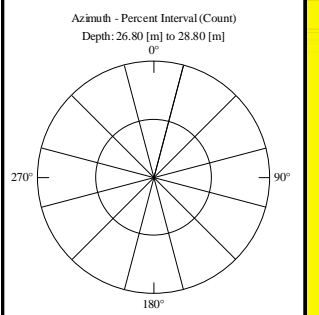
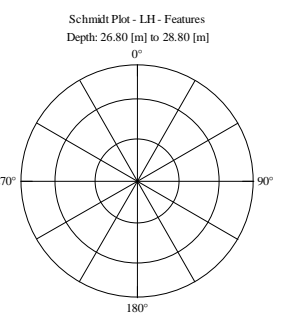
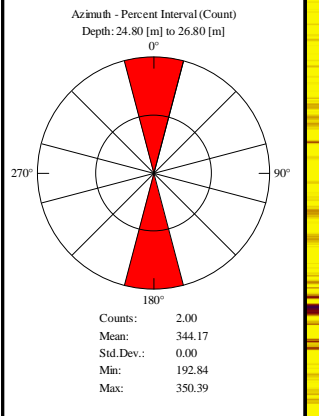
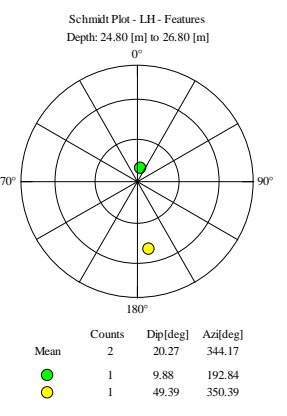
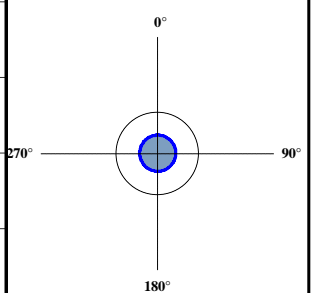
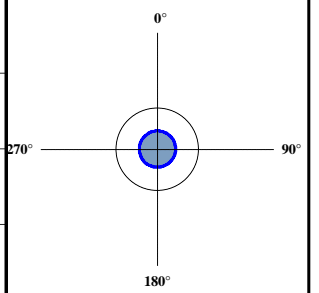
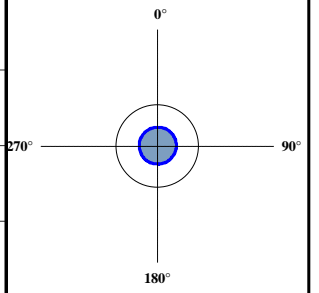
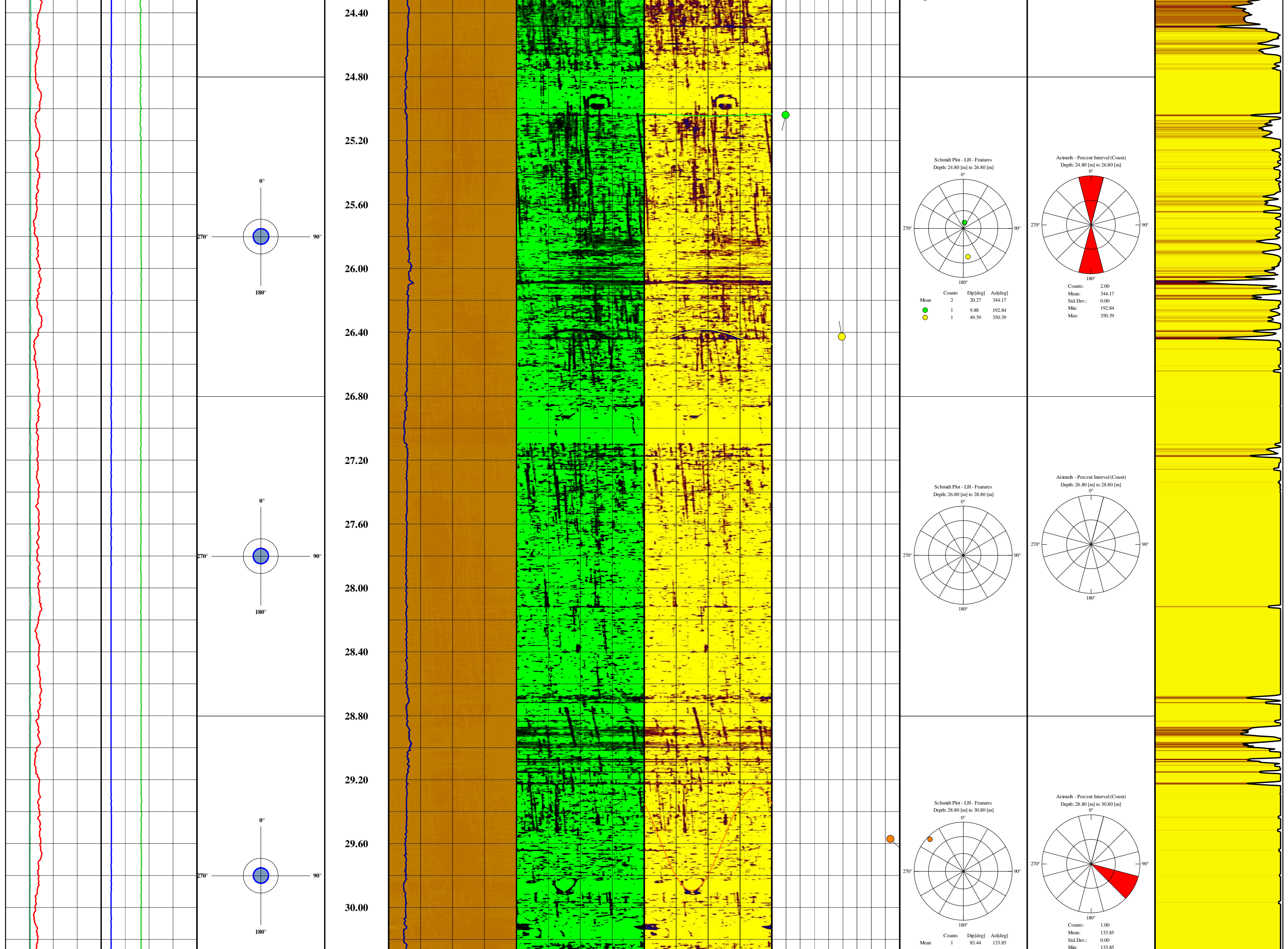
IMPORTANT NOTE

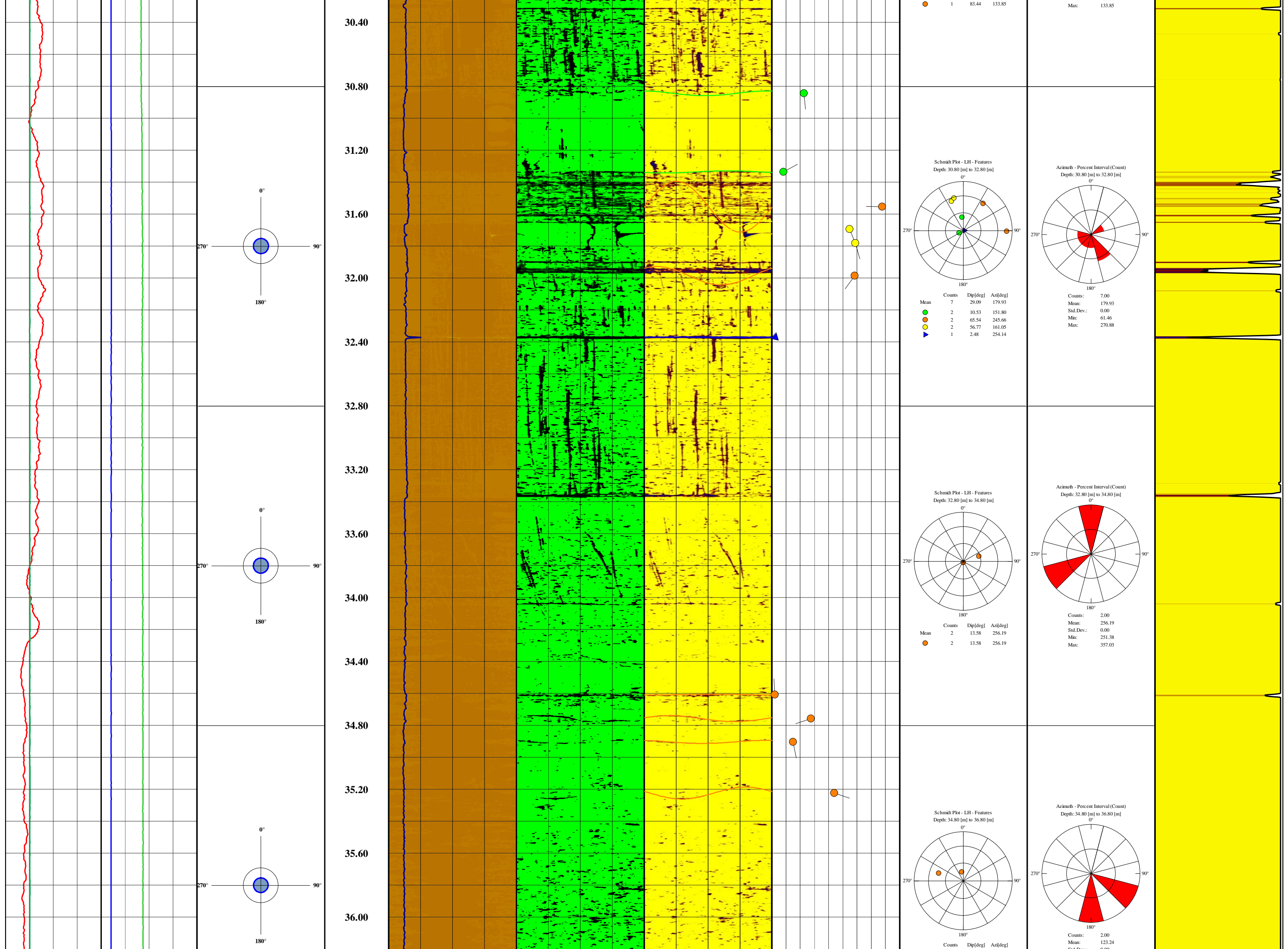
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 Therefore Surtron Technologies (Australia) Pty Ltd shall not be liable or responsible for any loss, damage, cost or expense incurred or sustained by anyone resulting from any interpretations.

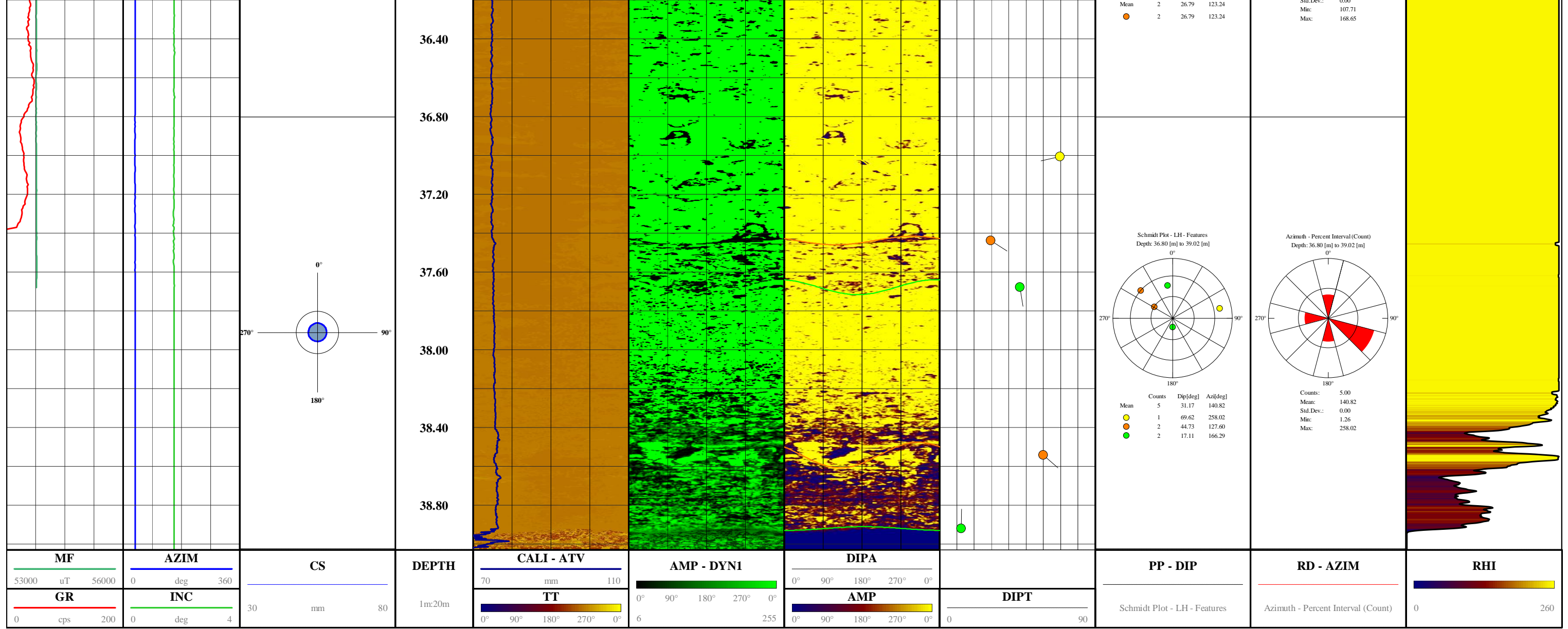












IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: CRR
PROJECT No.: 110-12936

BH No.: 322
Test No.: 1
Date: 2/03/2012

Packer type: Double
Packer pressure: 2000kPa
Gauge pressures measured in: kPa
Tested by: CS

Vertical depth to:

Top of test section (m):	31.00
Base of test section (m):	32.50
Centre of test section(m):	31.75
Base of casing (m):	30.00
Ground water (m)	NR

Depth of centre of test section (m)	31.75
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	5458.2	5459.0	5460.4	5462.0	Flow (l/min)
	Water Take	0.00	0.80	1.40	1.60	0.253
2nd period	Time (mins)	0	5	10	15	Average
	Flow reading	5462.5	5463.2	5465.5	5467.9	Flow (l/min)
Gauge Pressure 250	Water Take	0.00	0.70	1002.30	-997.60	0.360
	Time (mins)	0	5	10	15	Average
Gauge Pressure 600	Flow reading	5468.6	5477.0	5487.0	5490.0	Flow (l/min)
	Water Take	0.00	8.40	10.00	3.00	1.427
4th period	Time (mins)	0	5	10	15	Average
	Flow reading	5488.2	5488.5	5488.9	5489.1	Flow (l/min)
Gauge Pressure 400	Water Take	0.00	0.30	0.40	0.20	0.060
	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	5489.0	5489.1	5489.1	5489.2	Flow (l/min)
	Water Take	0.00	0.10	0.00	0.10	0.013

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	0.253	100.00	10.220	0.000	0.000	41.970	0.411	3.93E-08
2nd	0.360	250.00	25.550	0.000	0.000	57.300	0.428	4.09E-08
3rd	1.427	600.00	61.320	0.000	0.000	93.070	1.044	9.98E-08
4th	0.060	400.00	40.880	0.000	0.000	72.630	0.056	5.38E-09
5th	0.013	200.00	20.440	0.000	0.000	52.190	0.017	1.66E-09

*Where friction loss is assumed to be negligible.

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

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: CRR
PROJECT No.: 110-12936

BH No.: 322
Test No.: 2
Date: 2/03/2012

Packer type: Double
Packer pressure: 2000kPa
Gauge pressures measured in: kPa
Tested by: CS

Vertical depth to:

Top of test section (m):	21.00
Base of test section (m):	22.50
Centre of test section(m):	21.75
Base of casing (m):	20.00
Ground water (m)	NR

Depth of centre of test section (m)	21.75
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	5500.0	5550.0	5599.0	5620.0	Flow (l/min)
	Water Take	0.00	50.00	49.00	21.00	8.000
2nd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 250	Flow reading	5640.0	5684.0	5770.0	5846.0
	Water Take	0.00	44.00	86.00	76.00	13.733
	3rd period	Time (mins)	0	5	10	15
Gauge Pressure 500		Flow reading	5880.0	5902.0	6018.0	6080.0
	Water Take	0.00	22.00	116.00	62.00	13.333
	4th period	Time (mins)	0	5	10	15
Gauge Pressure 300		Flow reading	6077.0	6117.0	6174.3	
	Water Take	0.00	40.00	57.30		6.487
	5th period	Time (mins)	0	5	10	15
Gauge Pressure		Flow reading				
	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	8.000	100.00	10.220	0.000	0.000	31.970	17.042	1.63E-06
2nd	13.733	250.00	25.550	0.000	0.000	47.300	19.774	1.89E-06
3rd	13.333	500.00	51.100	0.000	0.000	72.850	12.465	1.19E-06
4th	6.487	300.00	30.660	0.000	0.000	52.410	8.429	8.06E-07
5th	0.000	0.00	0.000	0.000	0.000	21.750	0.000	0.00E+00

*Where friction loss is assumed to be negligible.

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

Note - Packer burst part way through period 4 - test abandoned