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Retrieved from the Queensland Geotechnical Database http://qgd.org.au/

Soil Surveys Engineering Pty. Limited Specialist in Applied Geotechnics **BOREHOLE RECORD SHEET Location Number: BH 317** Milton: ph +61 7 3369 6000 brisbane@soilsurveys.com.au Gold Coast: ph +61 7 5500 0465 goldcoast@soilsurvevs.com.au Project Number: 110-12936 Northern Rivers: ph +61 7 5523 4577 northernrivers@soilsurveys.com.au Mackay: ph +61 7 4942 2907 mackay@soilsurvevs.com.au Project Name: Cross River Rail SOIL SURVEYS Location: Brisbane Easting: 501503 Client: AECOM Northing: 6955771 RL: 18.76 m Date: 06/02/2012 Page: 1 OF 4 Logger: BM / CB Operator: Phil Machine: MC450 Drilling Method Defect Strength Rec (%) Samples and Spacing Depth Description Neathering Estimated Remarks 0.10 **BITUMEN** 0.30 FILL Gravelly SAND (SP) Medium dense, fine to medium grained, brown, fine to coarse size 0.60 gravel, moist. NATURAL CLAY (CH) Stiff to very stiff, high plasticity, brown, moist. 1 10 CLAY (CH) Very stiff, high plasticity, grey yellow brown mottled, moist. CLAY (CL-CI) Hard, low to medium plasticity, light grey, trace of fine to coarse grained sand, 3.90 MUDSTONE (XW) Extremely weak, grey. 4.00 ORGANIC CLAY (CL) Hard, low plasticity, dark grey, moist. CLAY (CL) Hard, low plasticity, light grey, moist. MUDSTONE (XW-DW) Very weak, grey red brown, with some clay seams. 6.0 MUDSTONE, fine grained, brown, DW cryptocrystalline, with closely spaced fractures and trace limonite veins. XW - DW 6.87 m; J, 10°, P, R, O, L 37 7.26 MUDSTONE, fine grained, brown, 7.57 cryptocrystalline, non-intact and trace limonite veins MUDSTONE, fine grained, brown, 8.07 cryptocrystalline, fragmented and trace limonite veins SILTSTONE, with coal seams, fine grained, dark brown to black, cryptocrystalline, non-intact. 8.90 MUDSTONE, fine grained, brown, 100 cryptocrystalline, fragmented. 9.62 MUDSTONE, fine grained, brown, cryptocrystalline, non-intact, with a 10mm coal 10.00 Defects - 1.54m : F,60°,P,R,O,C 1) Groundwater not observed. 2) ATV survey carried out. 3) Monitoring well installed to 16.5m on completion. U50 Rock Strength SPT Approved: Disturbed - Water First Noted - Water Steady Level Date:

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SOIL SURVEYS

Easting: 501503 Northing: 6955771 RL: 18.76 m

BOREHOLE RECORD SHEET

Location Number: BH 317

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

Logger: Bl	M / CB Operat		Machine: MC450	ate: 06/02/2012				Page: 2 OF 4
Drilling Method RW NMIC Casing	Depth	Graphic	Description	Weathering	Strength Space	ing 3	RQD	Samples and Remarks
		1	band at 9.71m.	xw		1 10	_	
	10.4		MUDSTONE, fine grained, brown,					
	- 10.4		cryptocrystalline, fragmented. MUDSTONE, fine grained, brown with	orango XW - DW		1		<u> </u>
	=		mottles, cryptocrystalline, non-intact.	orange		1 10	0 38	
	<u>_ 1</u> 1.0		MUDSTONE, fine grained, grey brown			1		_
	=		cryptocrystalline, thinly laminated, with spaced fractures, 50mm clay band at 1	closely 0.71m.		-		
								11.09-11.87 m; B, 5° , P, S, O, Z
	E			DW	- ₩₩	i		
	<u> </u>			DW - SW		1		
	F					i		12.00 m; J, 70° , P, S, O, L
	<u> </u>							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
	L					9	7 70	12.43 m; J, 40° , P, R, O, L 12.66 m; J, 60° , P, R, O, L
	_ _ 13.0		1			$\ \cdot\ ^{2}$, ., ., ., ., ., .
	E		1			$ \cdot $		
	13.3	4	MUDSTONE fine grained dark gray h	COMP				13.23 m; Z, O, L
	 		MUDSTONE, fine grained, dark grey b cryptocrystalline, thinly laminated, with	closely		$ \cdot $		13.00-14.20 m; DI, 5° , P, S, O,
	F.,,		spaced fractures.	.				Z
	<u>14.0</u>		1			į		
	14.2		MUDSTONE, fine grained, dark grey b	rown,				
	_		cryptocrystalline, thinly laminated, with					
	E		widely spaced fractures.					
	<u> </u>							
	F							
	<u> </u>					9		15.25 m; DI, 5° , P, S, O, Z
						⊗ ₉	7 90	
	- 16.0 ^{15.9}	5						15.79 m; DI, 5° , P, S, O, Z
	16.1	3	MUDSTONE, fine grained, light brown cryptocrystalline, thinly laminated, with	moderately				
	_		widely spaced fractures.	moderatery				
	_		Interbedded SANDSTONE and MUDS			∦		
			grained, light green brown, granular, m widely spaced fractures.	oderately		 		16.76 m; Z, O, W
	<u> </u>					∛		
	17.3		CANDSTONE for to be a firm and	light		 	+]
	_		SANDSTONE, fine to medium grained green brown with black laminations fro	m 17.60m		∦		
	F		to 18.00m, granular, laminated, moder to widely spaced fractures.	ately widely		∦		
	<u> </u>		to widely spaced fractures.			10		
	Ē					∦		18.17 m; DI, 5° , P, R, O, Z
	18.6	<u>, </u>						18.45 m; DI, 5°, P, R, O, Z
	F 10.0	<u> </u>	SANDSTONE, fine to medium grained			10	0 91	18.52 m; Dl, 5° , P, R, O, Z
	<u> </u>	7	granular, laminated, moderately widely fractures.	spaced		∦		
	L		SANDSTONE, fine to medium grained	light		 		
	19.4	1	green brown, granular, laminated, mod	erately		∦		
	E		widely spaced fractures, with a clay ba 19.07m to 19.10m.	iu iroiii		∦		40.00 51.75 5
	E - 20.0							19.68 m; DI, 5° , P, V, O, W 19.80 m; DI, 5° , P, V, O, W
Comments	s:		Defects - 1.54m : F,	<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	Veathering Grades RS - Residual Soil	Samp	oles	
1) Groundwa 3) Monitoring	ater not observed. g well installed to 1	2) ATV : 6.5m on		ess Aperature Infill	XW - Extremely weathered DW - Distinctly weathered SW - Slightly weathered FR - Fresh	ı	J50	
,			F. Foliation P. Planar R. Rou H. Schistosity S. Subplanar S. S. m. J. Joint T. Stepped V. Ven L. Cleavage U Undutating R. Fracture	oth O - Open L - Limonite rough S - Stain Q - Quartz S - Secondary mineral	FR - Fresh Rock Strength VW - Very weak W - Weak	5	SPT	
√ \Motor ===	t Noted Water	Stooder	S - Shear zone T - Contact V - Vein	U - Unidentified mineral W - Weathered rock X - Carbonaceous Z - Clean	W - Weak MS - Medium strong S - Strong VS - Very strong	Distur		Approved: Date:
<u> </u>	st Noted Water	oleady Le	2 - Jesunipuseu zurie Di - Oriling Induced break		FS - Extremely strong	San	ipie L	Date.

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SOIL SURVEYS

Easting: 501503 Northing: 6955771

Logger: BM / CB Operator: Phil Machine: MC450

BOREHOLE RECORD SHEET

Location Number: BH 317

Project Number: 110-12936 Project Name: Cross River Rail

Location: Brisbane Client: AECOM

Page: 3 OF 4 Date: 06/02/2012

L	Jy	ge	i. D	M/CB O	perato	r: Pnii	Machine:	MC450	Date: 06/02	2/2012					Page: 3 OF 4	ŀ
		_	ethod	_	h	Graphic		Description		Weathering	Strength Strength Estimated RS VW W MS S VS ES	Defect Spacing	Rec (%)	RQD	Samples and Remarks	
				E	20.30		brown, granula	, fine to coarse grain ar, laminated, moder		SW - FR	V V V V V V V V		100	91		_
					20.66		SANDSTONE, grey, granular,	, medium to coarse of widely spaced fract	ures.						20.81 m; Dl, 10° , P, R, O, Z	
│ │ │ 					SANDSTONE, granular, widel carbonaceous	, fine to coarse grain ly spaced fractures, laminations.	ed, light grey, with trace						21.24 m; J, 11° , P, R, O, X			
	granular, close											100	100			
						granular, close	, fine to coarse grain ely spaced fractures, prounded gravel.	ed, light grey, with some fine						. 22.63 m; J, 50° , P, R, O, W		
							CANDOTONE	Contract discountry	and Balak survey							_
	: granular, with : granular with : granular is granular.					granular, with and trace subr	, fine to medium grai moderately widely sp ounded gravel, with veins from 23.70m t	paced fractures thin irregular	FR							
	<u>- 2</u> 4.0					I I'K										
	<u>- 2</u> 5.0											97	95	24.64 m; J, 5° , P, R, O, X	_	
				<u>26</u> .0	26.30		SANDSTONE	, fine to medium grai	ned. light grev.							-
	granular, with			granular, with	moderately widely spounded gravel, with											
					27.50			, fine to medium grai								
	granular, with						granular, with i fractures, with	moderately widely sp fine to medium subr				100	96			
															28.96 m; J, 20° , P, R, O, Coal 29.05 m; J, 25° , P, R, O, Coal	
					29.50			, fine to medium grai moderately widely sp					100	86		_
	on	nm	nen!	30.0	30.00	: : : : :		fine to medium subr	ounded gravel,	<u> </u>	Weathering Gra	des S	ample	s		
Comments: 1) Groundwater not observed. 2) ATV survey 3) Monitoring well installed to 16.5m on comp				erved. 2 ed to 16	2) ATV s 3.5m on	survey carried out. completion.	Depth (m) Type Dip (deg) Planarity B - Bedding C - Curvilinear C - Clay seam D - Discontinuou F - Foliation H - Schistosity L - Lorentee	Roughness Aperature Infill L-Slickensides C - Closed C - Clay S P - Polished F - Filled F - Iron O R - Rough N - Clean K - Calcite S - Smooth O - Open L - Limoni V - Verrough S - Stain O - Open L - Limoni C	ide	RS - Residual So XW - Extremely weath DW - Distinctly weath SW - Slightly weath FR - Fresh Rock Streng VW - Very weak W - Weak	il nered nered ered	U5 SP	0			
⊽	_ W	Vate	er Fir	st Noted	Water S	iteady Le	evel	L - Cleavage T - Stepped R - Fracture S - Shear zone T - Contact V - Vein Z - Decomposed Zone DI - Drilling Induced break	U - Unider W - Weatl X - Carbor Z - Clean	dary mineral htified mineral hered rock naceous	MS - Medium stroi S - Strong VS - Very strong ES - Extremely stro	. Di	sturbe Sampl		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

Page: 4 OF 4 Date: 06/02/2012

Log	ger.	DI	// CB Operator		Machine:	MC450		Date: 06/02	2/2012						Page: 4 OF 4	J
Drilling				Graphic						Streng	gth	Defect Spacing	Rec (%)	D	Samples and	1
TC	R MLC	asing	Depth	Эгар		Description	n		Weathering	Estimal		20 60 200 600	Sec	RQD	Remarks	
F >	<u> </u>		_	Ŭ	with thin carbo	naceous vei	ns			KSVW W MS	S VS ES	20 60 200 600	_			╡
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¥			40.0			5.1	oto 4 54 5	: 60° D D O O	<u> </u>	/eatherin	g Gra		ample			4
_	nme) ATV s	urvey carried out.	Depth (m) Type Dip (de	g) Planarity Roug	Aperdure Infill		/eatherin RS - Resid CW - Extremel DW - Distinct	lv weath	ered				
2¶ 3)Ñ	lonito	oring	ater not observed. 2) y well installed to 16.	5m on	completion.	B - Bedding C - Clay seam F - Foliation H - Schistosity	C - Curvilinear L - SI D - Discontinuous P - Po P - Planar R - Ro S - Subplanar S - Si	ckensides C - Closed C - Clay blished F - Filled F - Iron Ox ough N - Clean K - Calcite nooth O - Open L - Limonit	ide te	DW - Distinctl SW - Slightly FR - F Rock St VW - Ver	weatheresh renat	red h	U5	=		
						H - Schistosity J - Joint L - Cleavage R - Fracture S - Shear zone T - Contact	T - Stepped V - Ve U - Undulating	ery rough S - Stain Q - Quartz S- Second U - Uniden W - Weath	dary mineral htified mineral hered rock	W - W MS - Mediu	/eak ım stror	ıa	SP	_	Approved:	
r e	Vater	First	Noted Water St	eady Le	vel	T - Contact V - Vein Z - Decomposed : DI - Drilling Induct	Zone ed break	X - Carbon Z - Clean	naceous	S - Str VS - Very ES - Extrem	rong strong	DIS	sturbe Sampl	d e L	Date:	
																_



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IMPORTANT NOTE

COMPOSITE LOG

BOREHOLE TELEVIEWER LOGS AND STRUCTURES

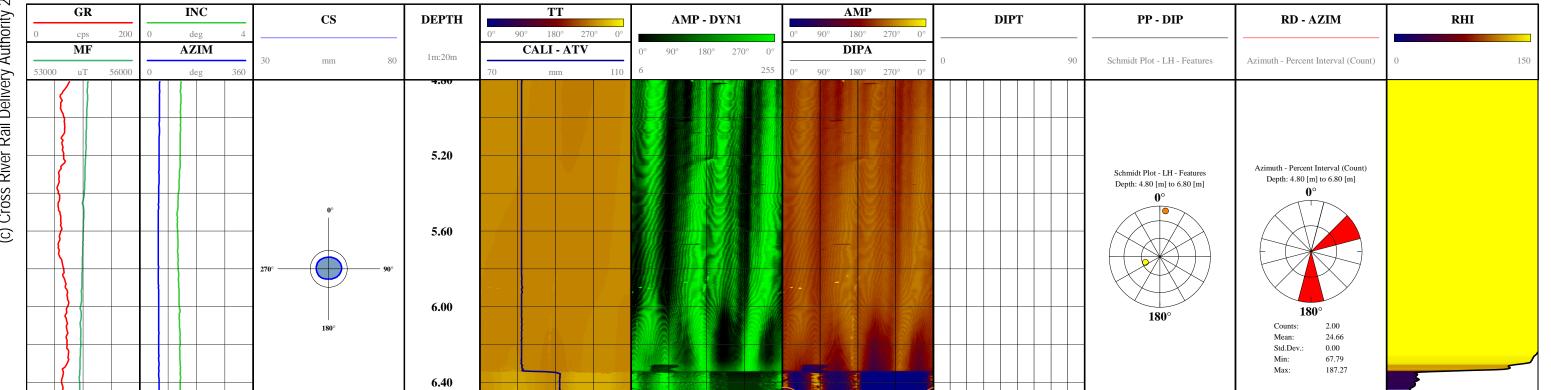


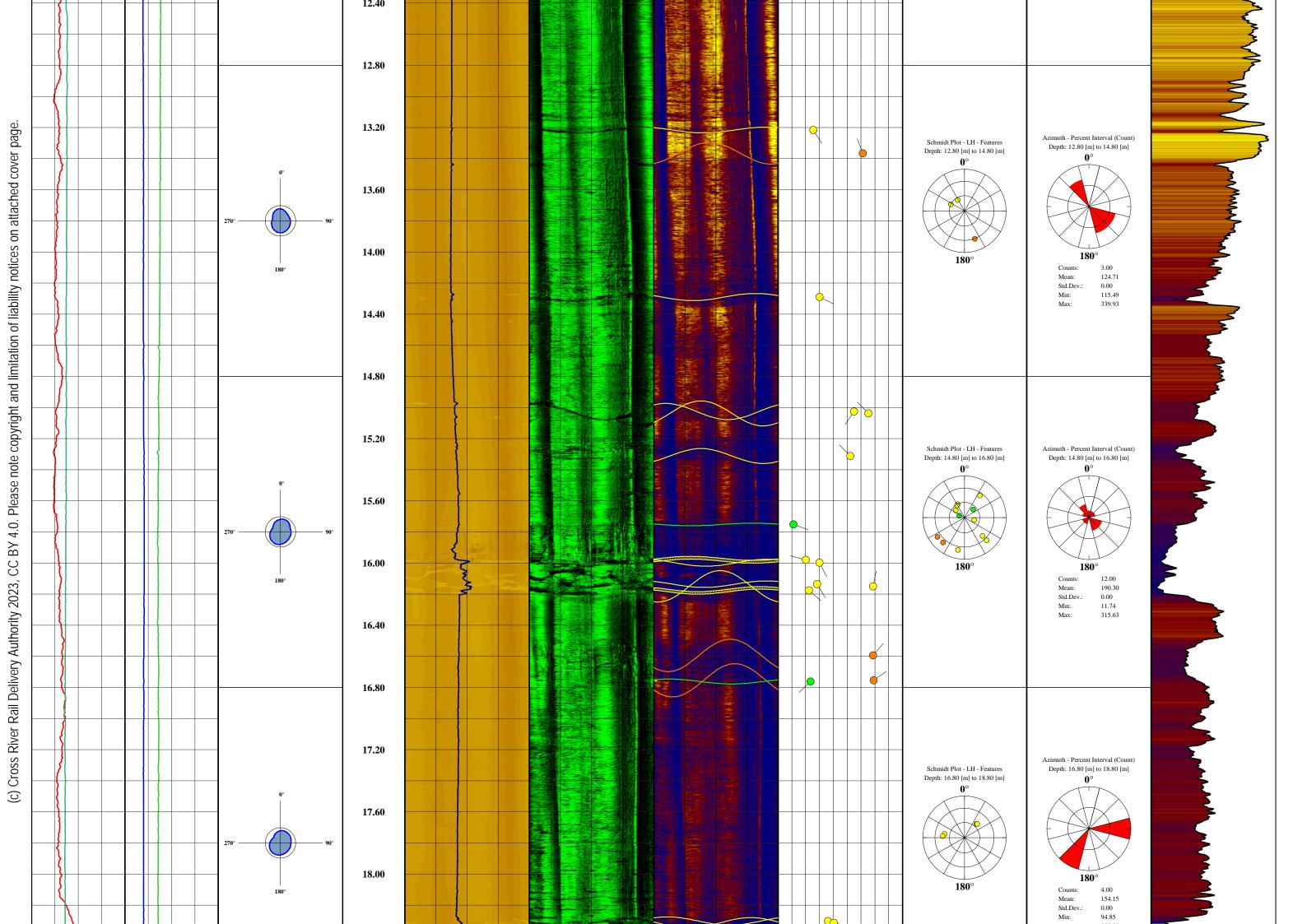
Hole Name Field Log Date Location	CRR317 Brisbane City 8th Mar, 2012 QLD ELEVIEWER LOGS	Drill Depth Bit Size Casing Typ Casing Dep	76cm e N/A	Grid Name N/A Collar Easting N/A Collar Northing N/A Reduced Level N/A TADPOLES	Logging Unit SV031 Engineer J.Mackay Client Represent Julian Irons Service Type Televiewer COMMENTS
MF GR INC AZIM TT AMP AMP - DYN1	Mag Field Gamma Tool Inclination (0 = Vertical Down) Tool Azimuth Travel Time Image Amplitude Image Amplitude Image Dynamic 1	DIPA DIPT PP - DIP RD - AZIM CS	Structures Apparent (Sinusoid Presentation) Structures True (Tadpole Presentation) Polar Projection Dip (Schmidt) Rose Diagram - Azimuth Cross Section	Partially Open Fracture Closed Fracture Foliation/Banding/Bedding	Image data and the Azimuth are oriented to True North. Magnetic Declination = 10.97 deg Cross Sections are plotted at 2m intervals: White: Tool Position, Light Blue: Nominal Hole Size and Blue: Actual Hole Size
CALI - ATV	PROCESS Calliper Average from ATV	SED LOGS RHI	Rock Hardness Index		

The following interpretations are opinions based upon inferences from borehole logs,

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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:CRRBH No.:317Packer type:DoublePROJECT No.:110-12936Test No.:1Packer pressure:2500kPa

Date: 8/02/2012 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	Flow reading	1912.0	1912.5	1912.5	1912.6	Flow (I/min)
100	Water Take	0.00	0.50	0.00	0.10	0.040
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1914.5	1914.6	1914.6	1914.6	Flow (I/min)
200	Water Take	0.00	0.10	0.00	0.00	0.007
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1916.1	1916.1	1916.1	1916.1	Flow (I/min)
300	Water Take	0.00	0.00	0.00	0.00	0.000
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1915.3	1915.3	1915.5	1915.5	Flow (I/min)
200	Water Take	0.00	0.00	0.20	0.00	0.013
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure	Flow reading	1914.1	1914.1	1914.1	1914.1	Flow (I/min)
100	Water Take	0.00	0.00	0.00	0.00	0.000

Period	Flow (q)	Gauge Press	Gauge Press	Friction Loss (m)*		Total Head	Lugeon	Perm.
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value	(m/s)
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