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Soil Surveys Engineering Pty. Limited
Specialist in Applied Geotechnics

Milton: ph +61 7 3369 6000 brisbane@soilsurveys.com.au
Gold Coast: ph +61 7 5500 0465 goldcoast@soilsurveys.com.au
Northern Rivers: ph +61 7 5523 4577 northernrivers@soilsurveys.com.au
Mackay: ph +61 7 4942 2907 mackay@soilsurveys.com.au

BOREHOLE RECORD SHEET

Location Number: BH 312

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 05/01/2012

Page: 1 OF 5

Easting: 503217 Northing: 6960886 RL: -5.67 m
Logger: DA/DT Operator: DA/SO Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NM/LC									
				1.0		Clayey SAND (SC) Very loose, fine to medium grained, dark grey, high plasticity fines.						
				2.0								
				2.50								
				3.0		SAND (SP) Medium dense, fine to medium grained, grey brown.						
				4.0								
				4.20								
				5.0		SAND (SP) Medium dense, fine to coarse grained, grey brown.						
				6.0								
				7.0								
				7.80								
				8.0		Clayey SAND (SC) Loose, fine to coarse grained, grey, high plasticity fines.						
				9.0								
				9.40								
				9.80		Sandy GRAVEL (GP) Medium dense, fine to coarse size, grey and brown, fine to coarse grained sand.						
				10.0								

Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NM/LC. 3) Borehole grouted 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	Width	Frequency	Remarks	Notes
	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:



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BOREHOLE RECORD SHEET

Location Number: BH 312

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 05/01/2012

Page: 2 OF 5

Easting: 503217 Northing: 6960886 RL: -5.67 m
Logger: DA/DT Operator: DA/SO Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated rs vw w ms s vs es	Defect Spacing 20 60 200 600	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NM/LC									
				11.0		Gravelly SAND (SP) Medium dense, fine to coarse grained, grey brown, fine size gravel. (continued)						
				12.0								
				13.0								
				14.0								
				14.10								
				15.0		Sandy GRAVEL (GP) Medium dense, fine to coarse size, grey brown, fine to coarse grained sand.						
				15.10								
				16.0		TUFF (DW) Moderately strong, brown, highly fractured, with some clay seams.						
				16.10								
				16.25		Sandy GRAVEL (GP) Dense, fine to coarse size, grey brown, fine to coarse grained sand.						
				16.90		CONGLOMERATE (DW) Strong, grey mottled.						
				17.0								
				17.80		Clayey SAND (SC) Dense, fine to coarse grained, dark grey, high plasticity fines, with fine to medium size gravel from 17.65m.						
				18.0								
				18.10		COBBLES & GRAVELS						
				18.70		GRAVEL, fine to coarse size, with some cobbles of tuff, quartzite and metasediments.						
				19.0		CORE LOSS 0.57m (18.70-19.27)				49	0	
				19.27								
				19.39		GRAVEL, fine to coarse size, with some cobbles of tuff, quartzite and metasediments.	DW SW			100	85	19.34 m; J, 70°, P, S, O, Z 19.39 m; J, 25°, S, R, O, Z 19.70 m; B, 14°, P, S, O, Z
				20.0								

Comments:
1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NM/LC. 3) Borehole grouted on completion.

Water First Noted Water Steady Level

Defects - 1.54m : F, 60° P, R, O, C											
Depth (m)	Type	Qty (No)	Planarity	Roughness	Aperture	With	Planarity	Roughness	Aperture	With	Planarity
	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 - Undifferentiated 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
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Samples
U50
SPT
Disturbed Sample

Approved:
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BOREHOLE RECORD SHEET

Location Number: BH 312

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 05/01/2012

Easting: 503217 Northing: 6960886 RL: -5.67 m

Logger: DA/DT Operator: DA/SO Machine: Scout 2

Page: 3 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC									
				20.59		SANDSTONE, medium grained, light grey, granular, medium bedded, closely to moderately spaced fractures, 5mm thick coal bed at 20.46m. (continued)	SW					20.28 m; DI, 3°, P, R, O, Z 20.39 m; B, 11°, P, S, O, Z 20.46 m; V, 2°, P, R, O, X 20.52 m; J, 23°, P, R, O, Z 20.55 m; DI, 77°, S, R, O, Z 20.75m, Is50 = 0.55 MPa
				21.0		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, closely spaced to moderately widely spaced fractures. Clasts are fine to medium gravel sized, trace of coarse gravel of sub-rounded siltstone, sandstone and quartz. Clast supported.	FR			100	85	21.36 m; DI, 40°, S, R, O, Z 21.58 m; DI, 20°, S, R, O, Z 21.91 m; B, 14°, S, R, O, Z 22.2m, Is50 = 0.54 MPa
				22.0								22.45 m; J, 21°, P, R, O, Z
				23.0								22.68-23.10 m; DI, 2°, S, R, O, Z 23.20 m; B, 14°, P, R, O, Z 23.45 m; DI, 30°, U, R, O, Z 23.6m, Is50 = 1.39 MPa
				24.0						100	75	23.76 m; J, 20°, P, R, O, Z 24.19 m; DI, 25°, P, R, O, Z
				24.46		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, very closely spaced to moderately widely spaced fractures. Clasts are medium to coarse gravel sized, sub-rounded, of siltstone, phyllite, sandstone and quartz. Clast supported.						24.59m, Is50 = 0.8 MPa 24.58 m; DI, 15°, P, R, O, Z 24.61 m; DI, 75°, S, R, O, Z 24.80 m; J, 52°, P, R, O, Z
				25.0								25.04 m; DI, 3°, S, R, O, Z 25.11 m; J, 60°, S, R, O, Z
				25.28		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, very closely spaced to moderately widely spaced fractures. Clasts are fine to medium gravel sized, with some coarse gravel, sub-rounded, of siltstone, sandstone and quartz. Clast supported, muddy matrix from 25.41m to 25.59m. Mudstone band from 25.59m to 25.66m. Medium to coarse sandstone lenses from 25.80m to 25.86m. Quartzite band from 26.84m to 26.90m.						25.46-26.76 m; DI, 5°, S, R, O, Z 26.45m, Is50 = 0.93 MPa
				26.0								26.85 m; J, 10°, C, S, O, Z
				27.0						100	80	27.43 m; DI, 60°, C, R, O, Z
				28.0								28.23 m; DI, 35°, S, R, O, Z
				28.30		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, moderately widely spaced fractures. Clasts are medium to coarse gravel sized, sub-rounded, of siltstone, sandstone and quartz. Clast supported.						28.59m, Is50 = 1.48 MPa
				29.0								28.89 m; DI, 2°, P, R, O, Z
				29.15						102	102	29.15 m; J, 9°, P, R, O, Z
				29.51		Interlaminated SILTSTONE and MUDSTONE, fine grained, alternating pale grey and dark grey, granular, thinly laminated, closely spaced fractures, some fine sandstone laminae and coal						29.56m, Is50 = MPa 29.8m, Is50 = 0.25 MPa
				30.0						99	91	

Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC. 3) Borehole grouted 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	Width	Frequency	Remarks	Notes
	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 - Limestone			
	J - Joint		T - Stepped	V - Very rough	S - Slain	Q - Quartz			
	L - Cleavage					S - Secondary mineral			
	R - Fracture					U - Undersized 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	
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MS - Medium strong	
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Samples	
U50	
SPT	
Disturbed Sample	

Approved:
Date:



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BOREHOLE RECORD SHEET

Location Number: BH 312

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 05/01/2012

Page: 4 OF 5

Easting: 503217 Northing: 6960886 RL: -5.67 m
Logger: DA/DT Operator: DA/SO Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated				Defect Spacing		Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC					rs	rw	ws	ss	ls	es			
				31.0		stringers. Interbedded SANDSTONE and SILTSTONE, fine grained, alternating pale grey and dark grey, granular, laminated to thinly bedded, closely spaced to moderately widely spaced fractures, with some coal stringers. (continued)	FR							99	91	31.87m, Is50 = 2.49 MPa
				32.0												
				33.0	33.00	Interlaminated SILTSTONE and MUDSTONE, fine grained, alternating pale grey and dark grey, thinly laminated, moderately widely spaced fractures, some fine sandstone laminae, coal bed from 39.65m to 39.70m.										33.25m, Is50 = 0.77 MPa
				34.0												34.42m, Is50 = 0.8 MPa
				35.0										100	97	29.26-40.32 m; B, 2°, P, S, O, Z
				36.0												35.55m, Is50 = 0.65 MPa
				37.0												36.4m, Is50 = 1.36 MPa
				38.0										100	95	37.5m, Is50 = 0.49 MPa 37.63 m; J, 40°, P, S, O, Z
				39.0												38.5m, Is50 = 1.28 MPa
				40.0	39.90									99	75	39.5m, Is50 = MPa

Comments:

1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC. 3) Borehole grouted 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	With
	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

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Rock Strength
VW - Very weak
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MS - Medium strong
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Samples

U50
SPT
Disturbed Sample

Approved:
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BOREHOLE RECORD SHEET

Location Number: BH 312

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

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Date: 05/01/2012

Page: 5 OF 5

Easting: 503217 Northing: 6960886 RL: -5.67 m
Logger: DA/DT Operator: DA/SO Machine: Scout 2

Drilling Method					Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NMLC	Casing									
					41.0		CONGLOMERATE, coarse grained, grey with some darker clasts, granular, very thickly bedded, fragmented to closely spaced fractures. Clasts are fine to medium gravel sized, with some coarse gravel, sub-rounded, of siltstone, mudstone and phyllite, with trace of quartz and sandstone. Clast supported. Interlaminated siltstone and sandstone from 40.20m to 40.33m and 41.29m to 41.39m. Mudstone lenses from 40.83m to 40.86m and 41.23m to 41.29m.	FR			99	75	40.46 m; DI, 4°, S, R, O, Z 40.6m; Is50 = 0.37 MPa 40.54 m; DI, 6°, S, R, O, Z 40.67 m; DI, 9°, S, R, O, Z 40.83 m; J, 2°, P, S, O, Z
					41.70		Interlaminated SILTSTONE and MUDSTONE, fine grained, alternating pale grey and dark grey, granular, thinly laminated, fragmented to very closely spaced fractures, fine grained sandstone lenses from 42.09m to 42.23m, 42.30m to 42.33m and 42.64m to 42.68m.				98	63	41.2m; Is50 = 0.82 MPa 41.13 m; DI, 4°, P, R, O, Z 41.24 m; B, 20°, P, S, O, Z 41.27 m; B, 34°, U, S, O, Z
					42.0		Interlaminated SILTSTONE and MUDSTONE, fine grained, alternating pale grey and dark grey, granular, thinly laminated, fragmented to very closely spaced fractures, fine grained sandstone lenses from 42.09m to 42.23m, 42.30m to 42.33m and 42.64m to 42.68m.				99	60	42.12 m; J, 19°, P, S, O, Z 41.71-42.65 m; B, 2°, P, S, O, Z
					42.68		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, closely spaced fractures. Clasts are fine to medium gravel sized, with some coarse gravel, of sub-rounded siltstone, sandstone and quartz. Clast supported.						42.75m; Is50 = 1.48 MPa 42.85m; Is50 = 1.95 MPa 42.94 m; DI, 8°, S, R, O, Z
					43.0		CONGLOMERATE, coarse grained, pale grey with some darker clasts, granular, very thickly bedded, closely spaced fractures. Clasts are fine to medium gravel sized, with some coarse gravel, of sub-rounded siltstone, sandstone and quartz. Clast supported.						43.21 m; J, 26°, P, R, O, Z 43.32 m; DI, 6°, P, S, O, Z
					43.37		BOREHOLE BH 312 TERMINATED AT 43.37 m						
					44.0								
					45.0								
					46.0								
					47.0								
					48.0								
					49.0								
					50.0								

Comments:
1) Drilled from floating barge - all depths measured from river bed level. 2) Note: the coring method used was NQ3 not NMLC. 3) Borehole grouted on completion.

Defects - 1.54m : F, 60°, P, R, O, C									
Depth (m)	Type	Dip (deg)	Planarity	Roughness	Aperture	Width	Remarks	Remarks	Remarks
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay			
	F - Foliation		D - Discontinuous	P - Polished	F - Filled	P - 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	
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Rock Strength	
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MS - Medium strong	
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Samples	
U50	
SPT	
Disturbed Sample	

Approved:
Date:



TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 312

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



TITLE

AECOM
Brisbane
Cross River Rail
Core Photo - BH 312

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

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: CRR
PROJECT No.: 110-12936

BH No.: 312
Test No.: 1
Date: 9/01/2012

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

Vertical depth to:
(below bed level)

Top of test section (m):	34.00
Base of test section (m):	36.50
Centre of test section(m):	35.25
Base of casing (m):	33.00
Ground water (m)	TIDAL

Depth of centre of test section (m):	35.25
Length of test section (m):	2.50

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

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	1031.4	1032.2	1033.0	1034.0	Flow (l/min)
	Water Take	0.00	0.80	0.80	1.00	0.173
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1036.0	1037.0	1037.6	1038.5	Flow (l/min)
	Water Take	0.00	1.00	0.60	0.90	0.167
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	1039.5	1040.5	1041.5	1041.6	Flow (l/min)
	Water Take	0.00	1.00	1.00	0.10	0.140
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1041.5	1041.5	1041.5	1041.5	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading					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	0.173	100.00	10.220	0.000	0.000	45.470	0.156	1.70E-08
2nd	0.167	200.00	20.440	0.000	0.000	55.690	0.122	1.33E-08
3rd	0.140	300.00	30.660	0.000	0.000	65.910	0.087	9.45E-09
4th	0.000	200.00	20.440	0.000	0.000	55.690	0.000	0.00E+00
5th	0.000	100.00	10.220	0.000	0.000	45.470	0.000	0.00E+00

*Where friction loss is assumed to be negligible.

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

Note - zero flow in period 4 - test ended

IN-SITU PACKER PERMEABILITY TEST RESULT

PROJECT: CRR
PROJECT No.: 110-12936

BH No.: 312
Test No.: 2
Date: 9/01/2012

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

Vertical depth to:
(below river bed)

Top of test section (m):	25.00
Base of test section (m):	27.50
Centre of test section(m):	26.25
Base of casing (m):	24.00
Ground water (m)	TIDAL

Depth of centre of test section (m):	26.25
Length of test section (m):	2.50

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

1st period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading	1045.8	1046.1	1046.5	1046.9	Flow (l/min)
	Water Take	0.00	0.30	0.40	0.40	0.073
2nd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1049.5	1050.5	1052.0	1053.5	Flow (l/min)
	Water Take	0.00	1.00	1.50	1.50	0.267
3rd period	Time (mins)	0	5	10	15	Average
Gauge Pressure 300	Flow reading	1053.9	1054.0	1054.0	1054.0	Flow (l/min)
	Water Take	0.00	0.10	0.00	0.00	0.007
4th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 200	Flow reading	1054.0	1054.0	1054.0	1054.0	Flow (l/min)
	Water Take	0.00	0.00	0.00	0.00	0.000
5th period	Time (mins)	0	5	10	15	Average
Gauge Pressure 100	Flow reading					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	0.073	100.00	10.220	0.000	0.000	36.470	0.082	8.95E-09
2nd	0.267	200.00	20.440	0.000	0.000	46.690	0.233	2.54E-08
3rd	0.007	300.00	30.660	0.000	0.000	56.910	0.005	5.21E-10
4th	0.000	200.00	20.440	0.000	0.000	46.690	0.000	0.00E+00
5th	0.000	100.00	10.220	0.000	0.000	36.470	0.000	0.00E+00

*Where friction loss is assumed to be negligible.

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

Note - zero flow in period 4 - test ended