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Easting: 503232      Northing: 6960801      RL: -7.71 m  
Logger: DA/DT      Operator: DA      Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NM/LC									
				0.0		SAND (SP) Loose, fine to coarse grained, grey and brown.						
				1.0								
				2.0								
				3.0								
				3.50								
				4.0		SAND (SP) Medium dense, fine to coarse grained, grey and brown.						
				5.0								
				5.00								
				6.0		Clayey SAND (SC) Loose, fine to medium grained, dark grey, high plasticity fines, some organics.						
				6.80								
				7.0		SAND (SC) Dense, fine to coarse grained, grey and brown.						
				8.0								
				8.55								
				9.0		Sandy GRAVEL (GP) Medium dense, fine to medium size, grey and brown, fine to coarse grained sand.						
				9.20								
				10.0		Gravelly SAND (SP) Medium dense, fine to coarse grained, grey and brown, fine to medium size gravel.						

SOIL SURVEYS 00:LIBRARY 2012:05:G.LB Log SOIL SURVEY BOREHOLE LOG 111-12936 NEW.GPJ <<DrawingFiles>> 21/05/2012 14:31 8.30.002 Developed by Dajgei

**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
	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 - 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 - 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  
S - Strong  
VS - Very strong  
ES - Extremely strong

**Samples**

U50

SPT

Disturbed Sample

Approved: \_\_\_\_\_  
Date: \_\_\_\_\_



Easting: 503232    Northing: 6960801    RL: -7.71 m  
Logger: DA/DT    Operator: DA    Machine: Scout 2

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	FR	Casing									
				11.0		Gravelly SAND (SP) Medium dense, fine to coarse grained, grey and brown, fine to medium size gravel. (continued)						
				11.65								
				12.0		Sandy GRAVEL (GP) Medium dense, fine to coarse size, grey and brown, fine to coarse grained sand.						
				13.0								
				14.0								
				15.0								
				15.55								
				16.0		TUFF (SW) fractured, with cobbles.						
				16.50								
				17.0		TUFF, fine grained, pale grey and stained orange brown, thinly bedded, very close fractures.						
				17.53								
				17.88		GRAVEL, medium dense, coarse size sub-rounded to rounded, grey stained orange. (0.16m of core loss)	DW - SW					
				18.0						82	11	
				18.50		SANDSTONE, fine grained, light grey, granular, laminated, very closely to closely spaced fracturing. trace of 1mm sized coal beds.	SW					18.56m, Is50 = 0.42 MPa
				19.0		MUDSTONE, fine grained, dark grey, cryptocrystalline, thinly laminated, closely spaced fractures	FR					19.56m, Is50 = 0.84 MPa 19.59m, Is50 = 0.82 MPa
				19.90						100	39	18.35-21.40 m; BDI, 10°, P, S,
				20.0								

**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
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	C - Clay
	C - Clay seam		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	F - Faultion		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					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  
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 14:31 8.30.002. Developed by Dajgeel



Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	FR	NMLC									
				21.0	20.95	SANDSTONE, fine grained, light grey, granular, laminated, very closely to closely spaced fracturing. trace of 1mm sized coal beds. (continued)	FR			100	39	O, Z 18.35-21.40 m; BDI, 10°, P, S, O, Z 18.35-21.40 m; BDI, 10°, P, S, O, Z 21.3m, Is50 = 0.66 MPa 18.35-21.40 m; BDI, 10°, P, S, O, Z 21.63 m; J, 60°, S, R, O, Z 21.94m, Is50 = 0.88 MPa
				22.0		CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, thickly bedded, widely spaced fractures. Clasts are medium sized sub-rounded gravel of siltstone and sandstone. Clast supported. With a thin band of Siltstone from 22.70m to 22.70m.						22.63m, Is50 = 1.03 MPa
				23.0	23.01	CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, thinly bedded. Clasts are fine sized sub-rounded gravel of siltstone and sandstone. Clast supported.				100	82	22.69 m; B, 7°, P, S, O, Z 22.76 m; DI, 4°, P, S, O, Z 22.80 m; T, 6°, P, S, O, Z 23.01 m; J, 15°, P, R, O, W 23.10 m; T, 16°, P, S, O, Z 23.20 m; DI, 19°, S, R, O, Z
				24.0	23.85	Interbedded SANDSTONE and CONGLOMERATE, medium to coarse grained, pale grey, granular, medium bedded, very closely to closely spaced fractures. Siltstone from 23.48m to 23.51m.						23.56 m; B, 8°, P, S, O, Z 23.57 m; V, 8°, U, R, O, X 23.58 m; B, 8°, P, S, O, Z 23.63 m; J, 25°, P, S, O, Z 23.67 m; T, 0°, P, R, O, Z 23.73 m; DI, 4°, S, R, O, Z 23.92m, Is50 = 1.47 MPa
				25.0	24.74	CONGLOMERATE, coarse grained, pale white grey speckled dark grey, granular, thinly bedded, widely spaced fractures. Clasts are fine to medium sized sub-rounded gravel of siltstone and sandstone. Clast supported.						23.83 m; DI, 4°, S, R, O, Z 24.00 m; DI, 4°, S, R, O, Z 24.15 m; DI, 4°, S, R, O, Z 24.27 m; DI, 4°, S, R, O, Z 24.30 m; J, 55°, D, S, O, Z 24.35 m; DI, 4°, S, R, O, Z 24.42 m; DI, 4°, S, R, O, Z
				26.0		CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, thinly bedded, widely spaced fractures. Clasts are fine to medium sized sub-rounded gravel of sandstone. Clast supported.						25.12m, Is50 = 0.96 MPa 24.67-25.74 m; DI, 5°, S, R, O, Z
				26.0	26.26	CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, medium bedded, widely spaced fractures. Clasts are medium sized sub-rounded gravel of siltstone and sandstone. Clast supported.				98	76	25.84m, Is50 = 0.8 MPa 26.00 m; T, 1°, S, R, O, Z 26.18 m; T, 25°, P, R, O, Z 26.21 m; DI, 12°, P, S, O, Z 26.38m, Is50 = 0.59 MPa
				27.0	26.67	SILTSTONE, fine grained, pale grey, granular, thinly laminated.						26.64 m; DI, 3°, P, S, O, Z 26.81 m; DI, 2°, S, R, O, Z
						SANDSTONE, medium grained, pale grey banded dark grey, thinly bedded, closely spaced fractures.						27.13 m; J, 30°, S, R, O, Z 27.24 m; J, 60°, P, S, O, Z 27.35m, Is50 = 0.52 MPa 27.27 m; DI, 2°, S, R, O, Z
				28.0		CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, medium bedded, closely to moderately widely spaced fractures. Clasts are medium sized sub-rounded gravel of siltstone and sandstone. Clast supported.						27.72-27.91 m; DI, 3°, S, R, O, Z 28.26 m; DI, 21°, U, R, O, Z
				29.0						100	91	28.55 m; DI, 20°, S, R, O, Z 28.68m, Is50 = 1.38 MPa
				30.0								28.99 m; DI, 2°, P, R, O, Z 29.96m, Is50 = 0.75 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.

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

Depth (m)	Type	Dip (deg)	Priority	Roughness	Appearance	Notes
	B - Bedding		C - Curvilinear	L - Slickensides	C - Closed	W - 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		R - Fracture			S - Secondary mineral
	R - Fracture		S - Shear zone			U - Unidentified mineral
	S - Shear zone		T - Contact			W - Weathered rock
	T - Contact		V - Vein			X - Carbonaceous
	V - Vein		Z - Decomposed zone			Z - Clean
	Z - Decomposed zone		DI - Drilling induced fracture			

**Weathering Grades**

RS - Residual Soil  
XW - Extremely weathered  
DW - Distinctly weathered  
SW - Slightly weathered  
FR - Fresh  
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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**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 307**

Project Number: 110-12936

Project Name: Cross River Rail

Location: Brisbane

Client: AECOM

Date: 15/12/2011

Easting: 503232 Northing: 6960801 RL: -7.71 m

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

Page: 5 OF 5

Drilling Method				Depth	Graphic	Description	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks
TC	WB	RR	NM/LC									
						Interlaminated MUDSTONE and SILTSTONE, fine grained, dark grey, thinly laminated, closely to widely spaced fractures. (continued)	FR					40.01 m; J, 40°, P, S, O, Z
				40.60								40.40 m; J, 37°, P, S, O, Z
				40.78		Interbedded SANDSTONE and CONGLOMERATE, fine to coarse grained, alternating pale grey and white grey, granular, thinly bedded, closely spaced fractures.				100	72	40.56 m; DI, 10°, P, S, O, Z 40.60 m; T, 20°, P, S, O, Z 40.75 m; DI, 5°, P, R, O, Z 40.87 m; J, 45°, S, R, O, Z 40.94 m; DI, 16°, U, R, O, Z 41.02 m; J, 60°, P, R, O, Z 41.12 m; DI, 11°, S, R, O, Z
				41.57		CONGLOMERATE, coarse grained, pale white grey and speckled dark grey, granular, thickly bedded, closely to moderately widely spaced fractures. Clasts are medium sized sub-rounded gravel of siltstone and sandstone. Clast supported.						41.55 m; T, 5°, P, S, O, Z
				42.0								41.83 m; DI, 10°, P, S, O, Z 41.90 m; J, 75°, C, S, O, Z 42.01 m; DI, 6°, P, S, O, Z 42.07 m; B, 6°, P, S, O, Z
				42.15		SANDSTONE, fine grained, pale grey, granular, thinly bedded, closely spaced fractures. Interbedded siltstone from 41.57m to 41.68m.						42.12 m; DI, 2°, P, S, O, Z
						BOREHOLE BH 307 TERMINATED AT 42.15 m						
				43.0								
				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 NM/LC. 3) Borehole grouted 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
	F - Fault		D - Discontinuous	P - Polished	F - Filled	F - Iron Oxide
	H - Schistosity		P - Planar	R - Rough	N - Clean	K - Kaolinite
	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**

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XW - Extremely weathered  
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**Rock Strength**

VW - Very weak  
W - Weak  
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S - Strong  
VS - Very strong  
ES - Extremely strong

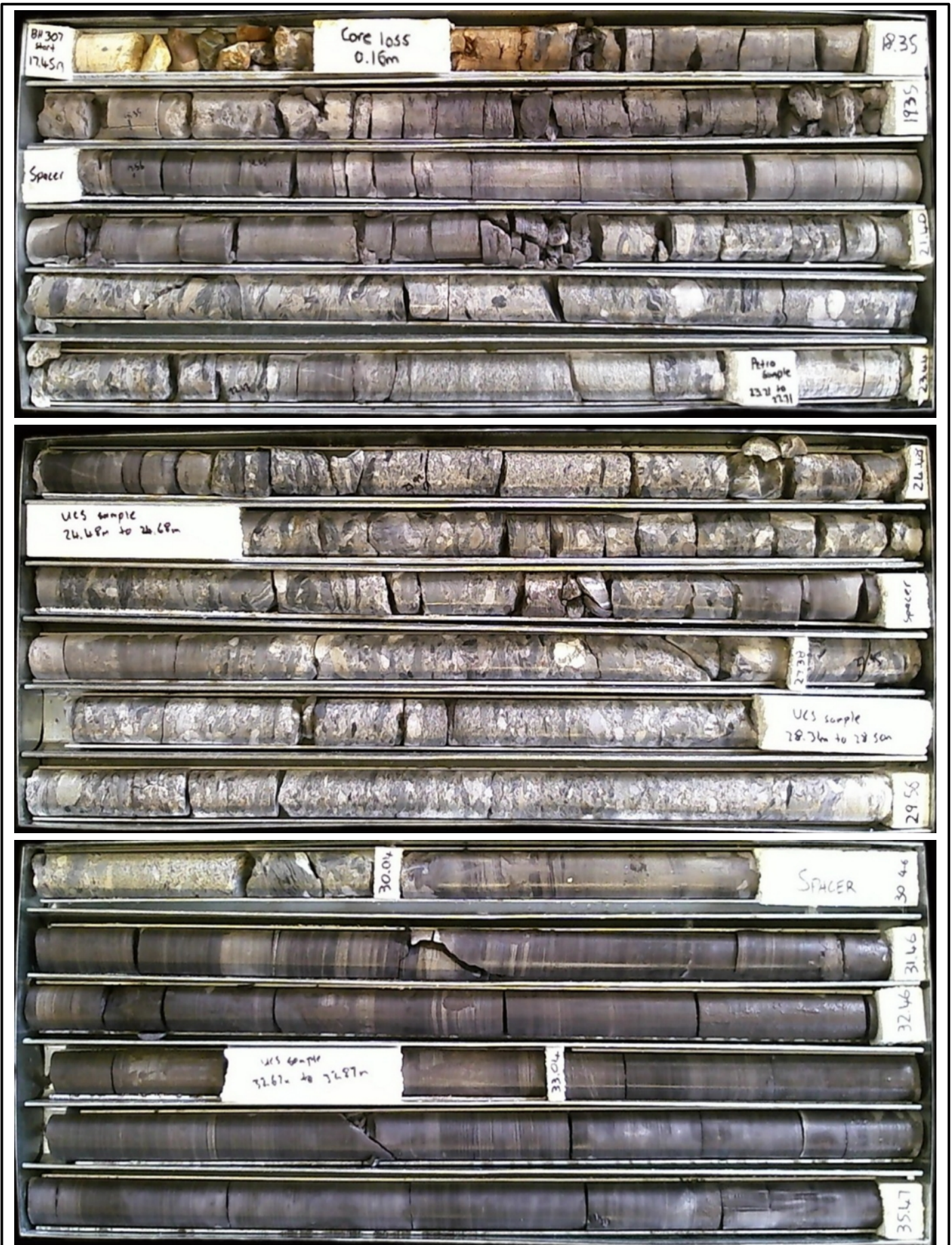
**Samples**

U50  
SPT  
Disturbed Sample

Approved: \_\_\_\_\_  
Date: \_\_\_\_\_

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TITLE

AECOM  
Brisbane  
Cross River Rail  
Core Photo - BH 307

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



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TITLE  
**AECOM  
 Brisbane  
 Cross River Rail  
 Core Photo - BH 307**

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.:** **307**  
**Test No.:** **1**  
**Date:** **12/12/2011**

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):	33.00
Base of test section (m):	35.50
Centre of test section(m):	34.25
Base of casing (m):	32.00
Ground water (m)	TIDAL

Depth of centre of test section (m):	34.25
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	825.6	526.1	827.0	827.6	Flow (l/min)
	Water Take	0.00	-299.50	300.90	0.60	0.133
2nd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 200	Flow reading	829.0	829.4	829.8	830.2
	Water Take	0.00	0.40	0.40	0.40	0.080
3rd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 400	Flow reading	831.6	832.4	832.9	833.4
	Water Take	0.00	0.80	0.50	0.50	0.120
4th period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 600	Flow reading	835.0	835.8	836.2	837.0
	Water Take	0.00	0.80	0.40	0.80	0.133
5th period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 300	Flow reading	840.0	840.0	840.0	840.0
	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	0.133	100.00	10.220	0.000	0.000	44.470	0.123	1.33E-08
2nd	0.080	200.00	20.440	0.000	0.000	54.690	0.060	6.51E-09
3rd	0.120	400.00	40.880	0.000	0.000	75.130	0.065	7.11E-09
4th	0.133	600.00	61.320	0.000	0.000	95.570	0.057	6.21E-09
5th	0.000	300.00	30.660	0.000	0.000	64.910	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 - flows in period 4 adjusted for leakage through pressure head

## IN-SITU PACKER PERMEABILITY TEST RESULT

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

**BH No.:** 307  
**Test No.:** 2  
**Date:** 17/12/2011

Packer type: Double  
Packer pressure: 2250kPa  
Gauge pressures measured in: kPa  
Tested by: CT

Vertical depth to:  
(below river bed)

Top of test section (m):	23.00
Base of test section (m):	25.50
Centre of test section(m):	24.25
Base of casing (m):	22.00
Ground water (m)	TIDAL

Depth of centre of test section (m):	24.25
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	848.2	848.5	848.8	849.1	Flow (l/min)
	Water Take	0.00	0.30	0.30	0.30	0.060
2nd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 200	Flow reading	852.0	852.5	852.9	853.3
	Water Take	0.00	0.50	0.40	0.40	0.087
3rd period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 400	Flow reading	856.0	857.7	858.9	860.8
	Water Take	0.00	1.70	1.20	1.90	0.320
4th period	Time (mins)	0	5	10	15	Average
	Gauge Pressure 200	Flow reading	859.2	859.2	859.2	859.2
	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				
	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	0.060	100.00	10.220	0.000	0.000	34.470	0.071	7.75E-09
2nd	0.087	200.00	20.440	0.000	0.000	44.690	0.079	8.63E-09
3rd	0.320	400.00	40.880	0.000	0.000	65.130	0.201	2.19E-08
4th	0.000	200.00	20.440	0.000	0.000	44.690	0.000	0.00E+00
5th	0.000	100.00	10.220	0.000	0.000	34.470	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