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### Soil Surveys Engineering Pty. Limited Specialist in Applied Geotechnics

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SOIL SURVEYS

Easting: 502970 Northing: 6958948 RL: 24.38 m Logger: SO/DT Operator: SO Machine: Scout 2

# BOREHOLE RECORD SHEET

Location Number: BH 330

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 23/02/2012

Page: 1 OF 3

-																	
Drilling Method MB Casing Casing				Graphic	Description	Weathe	ring	Stren Estima		Defect Spacing	Rec (%)	RQD	Samples and Remarks				
TC	MB	R	NZ S	3						RSVW W MS		20 60 200 600	R	Ľ.	Remarks		
					0.10		FILL Cement FILL Clayey Sandy GRAVEL (GP) Dense, fine to medium size, brown and orange, fine to coarse grained sand, low to medium plasticity fines, moist.										
				<u> </u>	1.50		NATURAL Clayey SAND (SC) Dense, fine to medium grained, brown orange and red, medium to high plasticity fines, moist.										
F						× × × × × × × × ×	TUFF, fine grained, pale grey stained orange brown and red, porphyritic, fragmented to closely spaced fractures. Diagenetic quartz in weathered		'		++		100	0			
				<u> </u>		× × × × × × × × ×	areas; tending to clay.								-		
				E E	2.60 2.70	× × ×	CORE LOSS 0.10m (2.60-2.70)	_/ xw - c					100	0	-		
				<u>3.</u> 0	<u>.</u> 0 × × ×	× × × × × × × × × × × ×	TUFF, fine grained, pale grey stained orange brown and red, porphyritic, fragmented to closely spaced fractures, with some Diagenetic quartz		500				100	46			
Datgel				<u> </u>	3.94	× × × × × × × × ×	TUFF, pale grey, porphyritic, closely spaced fractures.	sw	'						4.04 m; J, <b>30</b> °, S, S, O, Z 4.17 m; J, <b>15</b> °, U, S, O, Z 4.30 m; J, <b>35</b> °, S, R, O, L		
eveloped by					4.48 4.70 4.80	×××	JFF, fine grained, pale grey stained orange XW				104	4 38	4.30 III, 3, <b>39</b> , 3, K, U, L	1111			
8.30.002 D				<u>- 5.</u> 0 		× × × × × × × × ×	spaced fractures, with some Diagenetic quartz. CORE LOSS 0.10m (4.70-4.80) TUFF, fine grained, pale grey stained orange	Xw	'				100	0			
36 NEW.GPJ < <drawingfile>&gt; 21/05/2012 14:34 8:30.002 Developed by Datgel</drawingfile>				  	5.50	.50 × × ×	5.50 × × ×	, brown and red, porphyritic, fragmented to closely spaced fractures, with some Diagenetic quartz. MUDSTONE, fine grained, dark grey, thinly laminated, extremely closely spaced to		- 1							
trawingFile>> 21				0				moderately widely spaced fractures.									
NEW.GPJ < <d< td=""><td>0 0</td><td></td><td></td><td>*****</td><td>🗱 i i i</td><td></td><td></td><td>100</td><td>21</td><td></td><td>1111</td></d<>				0 0				*****	🗱 i i i			100	21		1111		
111-129						3.55											
00 LIBRARY 2012-05.GLB Log SOIL SURVEY BOREHOLE LOG				<u> </u>	1.00		CORE LOSS 0.70m (7.85-8.55)				K         	⊠                  	0	0			
OIL_SURVEY							MUDSTONE, fine grained, dark grey, thinly laminated, extremely closely spaced fractures.	SW	′				73	0		1111	
GLB Log SC				<u>- 9.</u> 0		9.00 9.15		~ ~	CORE LOSS 0.15m (9.00-9.15) MUDSTONE, fine grained, dark grey, thinly	sw	'	₩¦¦ ₩!!					
RY 2012-05.0					0.00		laminated, extremely closely spaced to moderately widely spaced fractures.						101	54			
و tó 13.5m on completion. و C-Currier L-sincereines C-Coale C-Current S-Subject S-Coale S-Current S-Subject S-Coale S-Current S-Research S-Coale S-Current S-Research S-Coale S-Current S-Research S-Coale S-Current S-Subject S-Coale S-Current S-Subject S-Coale S-Current S-Subject S-Current S-Subject S-Current S-Subject S-Current S-Subject S-Current S-Subject S-Current S-Current S-Subject S-Current S-Current S-Current S-Current S-Subject S-Current S-Current S-Current S-Subject S-Current S-Subject S-Current S-Current S-Current S-Subject S-Current S-Current S-Subject S-Current S-Current S-Subject S-Current S-Current S-Current S-Subject S-Current S-Current S-Current S-Current S-Current S-Current S-Subject S-Current S-Subject S-Current S-Cu								50									
	<u>⊽</u> _v	Vate	er Fir	st NotedW	/ater S	Steady Le	R - FriexLine U - Undulating S-Se S - Security U - Undulating U - U S - Shear zone W - V T - Constact V - V V - Vein X - C	identified mineral identified mineral /eathered rock irbonaceous ean		W - V MS - Mediu S - St VS - Ven ES - Extrem	Veak um stro rong		sturb Sam	ed 📕	Approved: Date:		

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SOIL SURVEYS

Easting: 502970Northing: 6958948RL: 24.38 mLogger: SO/DTOperator: SOMachine:Scout 2

## BOREHOLE RECORD SHEET

Location Number: BH 330

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 23/02/2012

Page: 2 OF 3

Drilling Method										
NMLC Asing Casing		Graphic	Description	Weathering	Strength Estimated	Defect Spacing 20 60 200 600	Rec (%)	RQD	Samples and Remarks	
			Interlaminated SILTSTONE and MUDSTONE, fine grained, dark grey banded pale grey, granular, thinly laminated, closely spaced to moderately widely spaced fractures. Trace sandstone laminae. <i>(continued)</i>	FR			101	54	10.34 m; S, <b>40°</b> , P, P, O, L	
	<u>12.0</u> 12.43		CORE LOSS 0.80m (11.63-12.43)				0	0	_	
	<u>13.0</u> 13.23		SANDSTONE, fine grained, pale grey, granular, thickly bedded, closely spaced to moderately widely spaced fractures. Interbedded SANDSTONE and SILTSTONE, fine grained, alternating pale grey and dark grey, granular, thinly bedded to laminated, extremely	FR			100	54	12.84 m; J, <b>61°</b> , S, R, O, W 13.39 m; J, <b>5°</b> , P, S, O, Coal	
veruped by Datger	4.0 		closely spaced to closely spaced fractures. Trace of fine gravel in sandstone.				100	21	13.66 m; J, <b>40°,</b> C, S, O, C	
	14.90 <u>15</u> .0 <u>16.0</u> <u>16.24</u>		CORE LOSS 0.15m (14.75-14.90) Interbedded SANDSTONE and SILTSTONE, fine grained, alternating pale grey and dark grey, granular, thinly bedded to laminated, extremely closely spaced to closely spaced fractures. Trace of fine gravel in sandstone, trace coal stringers.				93	79	15.47 m; J, <b>10°</b> , P, S, O, L 15.67 m; B, <b>2°</b> , P, S, O, L	
	  17.0		Interbedded CONGLOMERATE and SANDSTONE, coarse grained, pale grey speckled grey, granular, thinly bedded, moderately widely spaced fractures. Conglomerate clasts are fine gravel sized quartz, mudstone and tuff. Trace coal stringers.						16.22 m; J, <b>15°</b> , P, R, O, W 	
	17.88 <u>18</u> .0 	· · · · · · · · · · · · · · · · · · ·	CONGLOMERATE, coarse grained, pale green grey, granular, thickly bedded, moderately widely spaced fractures. Clasts are medium gravel sized, with trace cobbles, of quartz, mudstone, tuff, quartzite and phyllite in a sand matrix.	_					17.90 m; J, <b>85°</b> , S, R, O, W 18.30 m; J, <b>80°</b> , U, V, O, Z	
Comment: 1) Groundw to 13.5m on	19.0 19.26 	00000000000000000000000000000000000000		-			100	75	19.30 m; DI, <b>10°</b> , U, S, O, Z 19.62 m; J, <b>40°</b> , U, R, O, W	
	20.0 s: ater not observed. 2 completion.	-	C - Ciby etcm F - Foliation F - Foliation J - John S - Schoptan S - Schoptan S - Schoptan S - Call - John S - Schoptan	y Oxide cite artz andary mineral dentified mineral eathered rock bronaceous	Veathering Gr RS - Residual S XW - Extremely wea DW - Distinctly weat FR - Fresh Rock Streng W - Very wea W - Weak MS - Medium strr S - Strong	ades Sa bil thered hered thered hered th wng Dis	U5 U5 SP	0 T	Approved:	
- <u>▼</u> - Water Firs	st Noted Water S	teady Le		an	VS - Very stron ES - Extremely str		Sampl		Date:	

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#### SOIL SURVEYS

Easting: 502970Northing: 6958948RL: 24.38 mLogger: SO/DTOperator: SOMachine:Scout 2

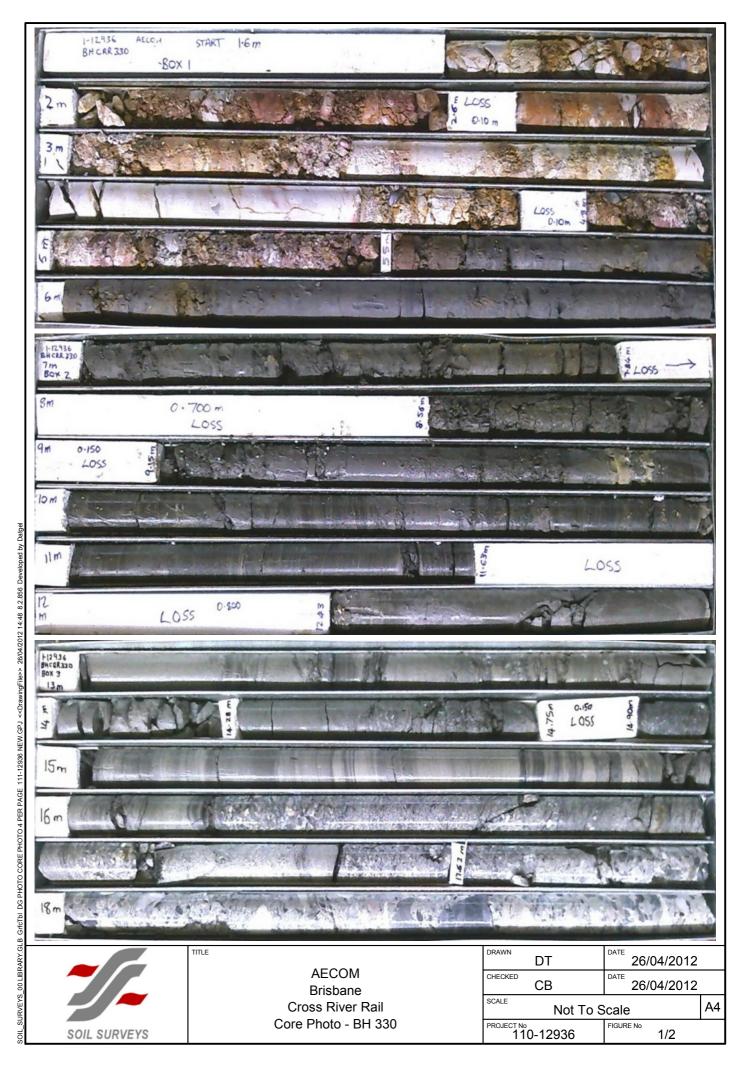
### BOREHOLE RECORD SHEET

Location Number: BH 330

Project Number: 110-12936 Project Name: Cross River Rail Location: Brisbane Client: AECOM Date: 23/02/2012

Page: 3 OF 3

Drilling Metho SI NWN SI NWN	Depth	Graphic		Description	V	Weathering	Strength Estimated	Defect Spacing	Rec (%)	RQD	Samples and Remarks	
	20.27	0 0 : . 0 0 0 0 0 0 0	SANDSTONE,	ONGLOMERATE and coarse grained, pale grey		FR			100	75		
	<b>—</b>	0000	speckled grey, moderately wid	granular, thinly bedded, dely spaced fractures.								
	E	0 0 0 0 0 0 0 0 0 0 0 0	Conglomerate	clasts are fine gravel sized	quartz,							_
	<u> </u>	0000	(continued)	tuff. Trace coal stringers.				i i 🕅				
	E	0 0 0 0 0 0 0 0	CONGLOMER	ATE, coarse grained, pale	green							=
	E_	0 0 0 0 0 0 0 0 0 0 0 0	grey, granular, spaced fracture	thickly bedded, moderately es. Clasts are medium grav	widely				×			
	F	0 0 0 0 0 0 0 0	sized, with trac	ce cobbles, of quartz, muds	tone,				8			_
	22.0	0000	tuff, quartzite a	and phyllite in a sand matrix	•				100	84		_
	<b>_</b>	0 0 0 0 0 0 0 0 0 0 0 0							8			=
	F	0 0 0 0 0 0 0 0										_
	E	0000							8			_
	- 23.0	0000							8			=
	-	0000							4			
		0000										_
		0000							8			
	F	0000										=
	<u>        24</u> .0	0000										
naige	F	0000									24.21 m; DI, <b>30°,</b> S, V, O, Z	=
ed by	<b>—</b>	0 0 0 0 0 0 0 0							8		24.33 m; J, <b>50°,</b> U, V, O, Z	
avelob	E	0000										-
	<u> </u>	0000						I i 🕅 i	99	88		
0.00	E	0 0 0 0 0 0 0 0	2 2									-
4.34	<b></b>	0000										
20102	-	0 0 0 0 0 0 0 0						i i 🕅			25.50 m; J, <b>80°,</b> U, V, O, Z	_
190/17	<u>25.88</u> <u>26.0</u> 25.99	$\stackrel{\circ}{\overset{\wedge}} \stackrel{\circ}{\overset{\wedge}} \stackrel{\circ}{\overset{\wedge}} \stackrel{\circ}{\overset{\circ}} \stackrel{\circ}{\overset{\circ} } \stackrel{\circ}{\overset{\circ} }$	Volcanic BREC	CCIA, fine grained, pale gre	en arev							
	E	00000	anu speckieu p	pale orange, porphyritic, ma	ssively						26.10 m; J, <b>85°,</b> U, V, O, W	_
	<u> </u>	0 0 0 0 0 0 0 0		rately widely spaced fractur ATE, coarse grained, pale								
10 NEW GPV KSLTAWINGPIREY Z 1705/ZU IZ 14:34 8:30.10/Z UBWBIOBBO DV UBIOBI	26.72	0 0 0 0 0 0 0 0	grey, granular,	thickly bedded, moderately	widely							=
29.	<u> </u>		sized, with trac	es. Clasts are medium gravitic cobbles, of quartz, muds	tone,							
Q NEA	E		tuff, quartzite a	and phyllite in a sand matrix	. //							_
	F		and speckled p	CCIA, fine grained, pale gre bale orange, porphyritic, ma	en grey						27.23 m; DI, <b>5°,</b> P, R, O, Z	_
2	E		bedded, mode	rately widely spaced fractur	es.				1		27.47 m; DI, <b>10°,</b> P, R, O, Z	=
SURVET BOREHOLE LOG 111-129	28.0				Ŀ	RS			400		27.88 m; J, <b>70°,</b> S, R, O, Z	=
	E					∖_ <u>SW</u> _∕ SW-FR		🕅	100	91		_
	F								1		28.30 m; DI, <b>10°,</b> C, R, O, W	=
	E								1			
	E 29.0								1			_
	- 23.0								1			
	E								1		29.34 m; J, <b>20°,</b> P, R, O, Z	_
).cu-∠		^ ^ ^	BOREHOLE E	3H 330 TERMINATED AT 2	9.50 m				+		<del>20.30 m</del> ; DI, <b>5°,</b> S, R, O, Z	
	E											=
Commer 1) Ground	<u>30.0</u> nts:	<b>I</b>		Defects - <u>1.54m</u> : F,60°,	<u>, R,O,C</u>		/eathering Gra	li	ample	s		
1) Ground	water not observed. 2 on completion.	2) Monito	oring well installed	Depth (m) Type Dip (deg) Planarity Roughness B - Bedding C - Curvilinear L - Slickensides C - Clay seam D - Discontinuous P - Polished F - Foliation P - Planar R - Rough		e X	W - Extremely weat W - Distinctly weat SW - Slightly weath FR - Fresh	hered	U5	0		
				J - Joint T Steened V Venumush	N - Clean K - Calcite O - Open L - Limonite S - Stain Q - Quartz S - Secondan	n mineral	FR - Fresh Rock Streng VW - Very weak W - Weak	th	SP	-		
B - Trackary U - Undusting S - Sectoral ymmeral W - Weak S - Shear rone S - Shear rone V - Veak V - Veak S - Strong Disturbed T Approved:												
– <u>¥</u> – Water F	irst Noted Water S	teady Le	vei	V - Vein Z - Decomposed Zone DI - Drilling Induced break	2 - Gean		VS - Very strong ES - Extremely strong	3	Sampl	e L	Date:	



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### **IN-SITU PACKER PERMEABILITY TEST RESULT**

PROJECT: PROJECT No.:	CRR 110-12936	BH No.: Test No.:	330 1		Packer type: Packer pressure:		Double 3000kPa		
	110 12000	Date:	24/02/2012		Gauge pressures		kPa		
		Duto.	21/02/2012		Tested by:		CB		
Vertical depth to:	Top of test section	n (m):	15.00		Depth of centre of	of test section (m	) 15.75		
	Base of test section	on (m):	16.50		Length of test se	ction (m):	1.50		
	Centre of test sect	ion(m):	15.75		<u></u>				
	Base of casing (m	):	14.00		Gauge Height ab	0.00			
	Ground water (m)		NR		Hole Diameter in	า 75			
	1st period	Time (mins)	0	5	10	15	Average		
	Gauge Pressure	Flow reading	3809.0	3815.0	3821.6	3828.6	Flow (l/min)		
	100	Water Take	0.00	6.00	6.60	7.00	1.307		
	2nd period	Time (mins)	0	5	10	15	Average		
	Gauge Pressure	Flow reading	3832.6	3844.0	3857.0	3872.4	Flow (l/min)		
	200	Water Take	0.00	11.40	13.00	15.40	2.653		
	3rd period	Time (mins)	0	5	10	15	Average		
	Gauge Pressure	Flow reading	3878.0	3900.0	3919.2	3942.0	Flow (l/min)		
	300	Water Take	0.00	22.00	19.20	22.80	4.267		
	4th period	Time (mins)	0	5	10	15	Average		
	Gauge Pressure	Flow reading	3944.6	3956.0	3972.0	3985.0	Flow (I/min)		
	200	Water Take	0.00	11.40	16.00	13.00	2.693		
	5th period	Time (mins)	0	5	10	15	Average		
	Gauge Pressure	Flow reading	3983.7	3988.2	3994.0	3999.0	Flow (l/min)		
	100	Water Take	0.00	.00 4.50 5.80 5.00					
							-		
Period	Flow (q)	Gauge Press	Gauge Press	Friction Lo	- · · ·	Total Head	Lugeon		
	(l/min)	(kPa)	(m of water)	Basic	In extra rods	(m)	Value		
1st	1.307	100.00	10.220	0.000	0.000	25,970	3.427		

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	1.307	100.00	10.220	0.000	0.000	25.970	3.427	3.28E-07
2nd	2.653	200.00	20.440	0.000	0.000	36.190	4.993	4.78E-07
3rd	4.267	300.00	30.660	0.000	0.000	46.410	6.261	5.99E-07
4th	2.693	200.00	20.440	0.000	0.000	36.190	5.068	4.85E-07
5th	1.020	100.00	10.220	0.000	0.000	25.970	2.675	2.56E-07

\*Where friction loss is assumed to be negligible.

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

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