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BOREHOLE ENGINEERING LOG HOLE NO: CURVE 59 BH02 POSITION: E: 358655, N: 8137038 (55 MGA94) PAGE: 1 OF 4 CLIENT: TMR PROJECT: SAFER ROADS SOONER PROJECT SURFACE ELEVATION: 317.9 (AHD) DATE DRILLED: 31/7/13 TO 31/7/13 LOGGED BY: NC JOB NO: CB24735.01 DIP / AZIMUTH : 90° CHECKED BY: AJ LOCATION: KENNEDY HWY (CAIRNS - MAREEBA) DRILLING MATERIAL WATER LES & TESTS Œ CONSISTENCY MATERIAL DESCRIPTION MOISTURE $\widehat{\Xi}$ STRUCTURE **3RAPHIC** DEPTH & CASING Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components DRILLING GROUND V EVELS WATER & Other Observations SAMPL FIELD 1 Ζ 90 VH ASPHALT: (0.10). SANDY GRAVEL (GM): Grey brown, fine to medium F-H GM gravel, fine to coarse grained sand, with fines CLAY (CI): Pale orange brown, medium plasticity, with medium grained angular gravel comprising of highly weathered phyllite, trace of fine grained sand. RESIDUAL SOIL? CI 1.00m SPT 2, 2, 2 N=4 316.9--1.0 CLAYEY SILT (ML): Red brown, medium plasticity, with fine to coarse grained sand, trace of fine to medium grained angular gravel comprising of highly RESIDUAL SOIL AD7 weathered phyllite and quartzite. D 1.45m Ε ML S-F 2.50m SPT 3, 3, 4 N=7 OBSERVED 2.95m 314.9 -3.0 NOT EXTREMELY WEATHERED ROCK Н GNEISS: Red brown, grey, pale red, extremely weathered, extremely low strength, appears as SANDY SILT (ML), medium plasticity, fine to coarse grained sand, trace of fine to coarse grained angular 313.9-4.00: Moisture Content (%) = 25.8, Liquid Limit (%) = 38, Plastic Limit (%) = 27, Plasticity Index (%) = 11, Linear Shrinkage (%) = 6, % Passing 2.36mm: 89, % Passing 0.425mm: 79, % Passing 0.075mm: 68, % Passing 0.002mm: 16 <<DrawngFile>> 04/12/2013 14:51 WB Е 4.45m F - St 312.9 -5.0 Log BOREHOLE CB24735.01.GPJ GNEISS: Grey brown, extremely weathered, appears as GRAVELLY SILT (ML), low plasticity, fine to coarse RE grained angular gravel, with fine to coarse grained % 5.50m SPT 3, 3, 4 N=7 Н CURRENT.GLB SAMPLES & FIELD TESTS CONSISTENCY (Su) {N-value} DENSITY (SPT N-value) Hand Auger Disturbed Sample SPT Standard Penetration Test RR Rock Rolling VL Very Loose 0 - 4 VS < 12 kPa {0-2} Env Soil Sample Undisturbed Tube Sample Auger Screw AT Auger Drill TC-bit HQ Air Track HQ Coring AS Loose 4 - 10 S Soft 12 - 25 {2-4} Water Sample EW Env Water Sample **IBRARY** MD Medium Dense 10 - 30 F 25 - 50 {4-8} Auger Drill V-bit Washbore NQ NQ Coring NMLC NMLC Coring AD/V WB D Dense 30 - 50 St Stiff 50 - 100 {8-15} HP Hand Penetrometer HV Hand Vane Shear MOISTURE CONDITION
D = Dry M = Moist W = Wet DRILLING PENETRATION VD Very Dense 50 - 100 VSt Very Stiff 100 - 200 {15-30} OFFICE F Firm H Hard VE Very Easy E Easy VH Very Hard (P: Peak Su R: Residual Su) CO Compact >50/150mm Hard > 200 kPa {>30} N SPT blows per 300mm HW SPT penetration by hammer weight **GROUNDWATER SYMBOLS** RW SPT penetration by rod weight = Water level (static) = Water level (during drilling)

File: CB24735.01 CURVE 59_BH02 Page 1 OF 4

	S	K		1	В	OR	EHC	LE	ENGINEERING LO	G		ŀ	IOLE NO : CURVE	59_BH02			
CLIE	NT:	TMR							POSITION : E: 358655, N: 8137038 (55 MGA94)		F	PAGE: 2 OF 4				
			FER F	ROADS	SOONE	ER PR	OJECT		SURFACE ELEVATION : 317.9 (AHD)				DATE DRILLED: 31/7/13 TO 31/7/13				
_		CB24			/ /CAID	NC A	4A DEE	241	DIP / AZIMUTH : 90°				LOGGED BY: NC				
LOC	ATIOI	N : KE	DRIL	DY HWY LING	(CAIR	N5 - N	VIAREE	3A)	N	MATERIAL			HECKED BY: AJ				
BRILLING & CASING	WATER SENETRATION PENETRATION CEOLIS & FIELD TESTS FIELD TESTS FIELD TESTS FIELD TESTS CARAPHIC CASSIFICATION CASSIFICATION SYMBOL					DEPTH (m)	GRAPHIC LOG	ASSIFICATION	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components				STRUCTUI & Other Observ				
WB B	>	Н	93	ωII	311.9	6.0	9 7	ο ω			≥ 0						
> V		VH				-			6.25m			F - St		_			
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			ORILLII		_305.9				SAMPLES & FIELD TESTS	DEN	SITY (S	PT N-va	alue) CONSISTENC	Y (Su) {N-value}			
HA AS	Auge	d Auger er Screv er Drill	V	AT Ai	ock Rollin r Track	Ĭ	ES En	/ Soil S	d Sample SPT Standard Penetration Test umple U Undisturbed Tube Sample W Water Sample	VL Very L Loos	Loose	0 -	0 - 4 VS Very Soft < 12 kPa {0-2} 4 - 10 S Soft 12 - 25 {2-4}				
AD/I AD/I WB	/ Auge	er Drill ' hbore	√-bit	NQ NO NMLC N	Q Coring Q Coring MI C Co					MD Medi D Dens	ium Der			25 - 50 {4-8} 50 - 100 {8-15}			
1	DI			ETRATION			HV Han	d Van	trometer Shear Residual Su) MOISTURE CONDITION D = Dry M = Moist W = Wet	VD Very CO Com	Dense	50	- 100 VSt Very Stiff 0/150mm H Hard	100 - 200 {15-30} > 200 kPa {>30}			
Ĕ I	Easy	·	H Ha		•	aru	N SPT	blows	per 300mm	30 00111	μασι	~0	STOOMING IN FIGURE	~ 200 KFa {>30}			
	<u> </u>	= Wate	r level (static)			RW SP	Γpene	tration by hammer weight tration by rod weight								

IENT : T	TMR	1				POSITION : E: 358655, N: 813	37038 (55 M	GA94)			: 3 OF 4				
ROJECT B NO : (OS SOO	NER PROJECT	SURFACE ELEVATION: 317 DIP / AZIMUTH: 90°	.9 (AHD)				DRILLED : ED BY : N	31/7/13 TO 31/7/13			
				WY (CA	IRNS - MAREEBA)	Bii 77ZiiviOTTT . 00					(ED BY:				
DRILLING						MATERIAL				DEFECTS & COMMENTS					
DRILLING WATER DETAIL		(E) 12 311.9		GRAPHIC LOG	ROCK TYPE : C (texture, fabric, m	ESCRIPTION Colour, Grain size, Structure ineral composition, hardness entation, etc as applicable)	Weathering	O-E	ED STRENGTH s(50) - Axial Diametral S = F = E	DEFEC SPACIN (mm)	Desci Obser	Description of joints, seams, defects, additional observations and comments			
			- - - -			m reen, orange brown, indistinct foliation. grey, grey, distinct folidation at $40 \text{ to } 60^{\circ}$	MW . SW				-6.34 -6.39 -6.43 -6.50 -6.54	JT 70° Qz PR RF 1 - 2 mm JT 5° PR RF 1 mm JT 5° PR RF 1 mm JT 70° IR RF 1 - 2 mm JT 90° Fe IR RF JT 70° IR RF 1 mm			
7 T	00% FCR 11% RQD	310.9-	- - -7.0 - - -								6.86 6.88 6.86 6.96 6.98 7.14	JT 70° CH IR RF 7 mm JT 60 - 80° CH IR RF 1 mm JT 60 - 80° CH IR RF 1 mm JT 60° IR RF 1 mm JT 50° CH IR RF 2 mm JT 50° Fe IR RF 2 - 3 mm JT 50° IR RF 2 - 3 mm			
8.5	50_	309.9-	- - - - - - - -								7.73 · · · · · · · · · · · · · · · · · · ·	JT 60° CH IR RF			
10 Ti	00% CR	308.9-					MW				8.91 8.96 9.06	JT 60° Fe IR RF 1 mm JT 70° CH IR RF 1 - 2 mm JT 30° CH IR RF 2 - 3 mm JT 45° IR RF 1 mm JT 40° Fe IR RF 1 mm			
	19% RQD	307.9-	 - - - 10.0		From 9.58 m CLAYEY GR	RAVEL 200 mm thick.	EW		2.4		9.40 s	17 00 - 40° CH-CG IR RF 17 30° Fe IR RF 1 mm 17 30° CH IR RF 1 - 2 mm 5Z 30° CH IR RF 60 - 70 5Z 30 - 40° CH-CG IR RF			
10).30	-	- - - - -		From 10.23 m CLAYEY G At 10.38 m 13 mm quartz						10.39 10.42 10.56 10.62 10.63 10.78	SZ 30° GC IR RF 150 mm JT 60° Fe IR RF JT 60° Fe IR RF 1 mm JT 60° IR RF 1 mm JT 55° Fe IR RF 3 mm JT 70° CH PR RF 5 mm JT 70° Fe IR RF 3 mm			
5:	00% FCR 69% RQD	306.9-	11.0 		60°. From 11.35 to 11.53 m mi	ine grained, indistinct to distinct foliation inor pale grey, white banding.	at SW				— 11.05	JT 70° CH PR RF 3 mm JT 30° CH IR RF 5 mm JT 60° IR RF 3 mm			
			-								11.85	! JT 10° IR RF 2 mm i JT 60° PR RF 4 mm I JT 60° IR RF 3 - 4 mm			
NMLC NM NQ NQ TCF RQI	Corir R % D % (ro	Coring ng core ru core ru ck fracti	in > 100 on only	HQ F PQ P	Q Coring W Wat SPT SPT U Und	SAMPLES & FIELD TESTS urbed Sample ES Env Soil Sample er Sample EW Env Water San i Sample iisturbed Tube Sample	nple CZ Cru DB Drill FZ Frac JT Join IS Infille	shed Sea shed Zon Break ctured Zon t ed Seam ar Zone	am CN Cl ne CT Co SN Sta ne VR Ve POL F RF R	oating IR ain PF eneer ST Un Polished		ROCK STRENGTH (Is50 0-0.03 Extremely Lo 0.03-0.1 Very Low 0.1-0.3 Low 0.3-1.0 Medium 1.0-3.0 High 3.0-10 Very High			

	5			1	C	CORED BO	DREHOL	E ENGIN	EERI	N	G L	OG	HOL	E NC	: CURVE	59_BH	02	
Р	ROJE				S SOO	NER PROJECT		: E: 358655, N: 8137 ELEVATION : 317.9		MG	A94)		DATE	E: 4 C	ED: 31/7/13 T	O 31/7/13	i	
-	CAT	ON : k	KENNE		NY (CA	IRNS - MAREEBA)								CHECKED BY: AJ				
DRILLING		DRILL DEPTH	RL (m)	DEPTH (m)	GRAPHIC LOG	(texture, fabric,	mineral compos	ESTIMATED STRENGTH					DEFECT SPACING (mm) Desc		ECTS & COMN Description of joint defects, additions and conservations and conservations.	s, seams, onal	GENERAL	
		12.25	305.9	- 12.0 - - - -		QUARTZITE: Blue gre From 12.05 SILTY CL plasticity, with fine grain	AY 100 mm thick, ora	tinct bedding. <i>(continued)</i> ange brown, medium	EV SV	- 1					I1.96 JT 10° IR RF 12.05 SZ 60° Fe PI 12.15 JT 20° CH IR	RF 50 mm		
NMIC			304.9-	- - - - - - - - -		GNEISS: Blue grey, gr		at 30° to 40°.		353					12.57 JT 70° IR RF 12.65 JT 80° IR RF 12.70 JT 5° Fe PR 12.73 JT 50° Fe IR 12.85 JT 60° Fe IR 12.88 JT 20° Fe IR	1 mm RF 5 mm RF 3 mm RF 1 mm RF 1 mm	RP 1 - 4 mm	
		100% TCR 60% RQD	-	- - -		medium plasticity, with	fine grained sand.	ige brown and pale grey,	,						13.19 JT 10 - 30° II	R RF 2 mm	JT 30° - 40° CH IR RP	
		14.00	-303.9	- - -		QUARTZITE: Blue gre	 	e grained, massive.							3.86 JT 70° Fe PR RF 5 mm			
BRISBANE_OFFICE_LIBRARY_CURRENT.GLB Log CORED BOREHOLE CB24735.01.GPJ < <drawngfile>> 04/12/2013 13:12</drawngfile>			301.9-	- 14.0 		End of Cored Drill Hole	at 14.00 m											
RISBANE_OFFICE_LIBRARY_CURRENT.GL	NQ	RQD % (rd GR V = \	Coring ng 6 core re 6 core re 6 core re 6 core re 7 cock fract	ion only VATER vel (stati	PQ F ered Imm long measured SYMBOL	PQ Coring W N SPT S U U d)	SAMPLES Disturbed Sample Vater Sample SPT Sample Jndisturbed Tube Sa	& FIELD TESTS ES Env Soil Sample EW Env Water Samp	ble CZ C DB C FZ F JT Jo IS In SZ S	DEFECT ABBRE CS Crushed Seam CZ Crushed Zone CZ Crushed Zone DB Drill Break FZ Fractured Zone JT Joint IS Infilled Seam SZ Shear Zone VN Vein S S Sm SL Slie				Cu Curvec R Irregula PR Planar ST Steppe In Undula	d 0-0.03 ar 0.03-0.1 0.1-0.3 ed 0.3-1.0	ENGTH (Is5 Extremely I Very Low Low Medium High Very High		
ш	File: CB24735.01 CURVE 59_BH02 4 OF 4																	



	SINGLAIR KNIGHT MERZ	Client: Transport and Main Roads							
drawn	AJ	Project: Safer Road Sooner							
date	14/08/2013	Core Photograph – Curve 59	BH02						
scale	NTS	Project no. CB24735.01	Photo No: Curve 59_BH02	1 of 1					