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BOREHOLE ENGINEERING LOG HOLE NO: CURVE 22 BH05 CLIENT: TRANSPORT AND MAIN ROADS POSITION: E: 359400, N: 8137546 (56 MGA94) PAGE: 1 OF 4 PROJECT: BLACK SPOT PROJECT SURFACE ELEVATION: 111.6 (AHD) DATE DRILLED: 5/8/13 TO 5/8/13 LOGGED BY: JP JOB NO: CB24735.04 DIP / AZIMUTH : 90° CHECKED BY: AJ LOCATION: KENNEDY HWY (CAIRNS - MAREEBA) **DRILLING MATERIAL** Œ CONSISTENCY MATERIAL DESCRIPTION ES & MOISTURE $\widehat{\Xi}$ STRUCTURE DRILLING PENETRAT **3RAPHIC** & CASING DEPTH Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components GROUND V LEVELS WATER & Other Observations 귒 90 FILL VH ASPHALT: 0.10 m. SANDY GRAVEL (GM): Pale brown, fine to medium gravel, sub-angular, fine to coarse grained sand, trace of fine to coarse grained sand and clay. AD/ D GM 1.00m SPT 7, 15, 13 N=28 110.6-1.0 SILTY GRAVEL (GM): Grey brown, fine to medium gravel, angular, comprising of high to very high strength quartzite , with fine to coarse grained sand, trace cobbles. 1.45m At 2.00 m trace of rootlets. GN SPT 29, 33, 13 N=46 OBSERVED 2.95m 108.6 3.0 NOT WB 107.6-4.0 RESIDUAL SOIL? SILTY GRAVEL (GM): Red brown, grey brown, fine to medium gravel, angular, fine to coarse grained sand, 11, 12, 19 N=31 A.00: Moisture Content (%) = 10.3, Liquid Limit (%) = 26, Plastic Limit (%) = 20, Plasticity Index (%) = 6, Linear Shrinkage (%) = 3, % Passing 37.5mm: 100, % Passing 2.36mm: 49, % Passing 0.425mm: 32, % Passing 0.075mm: 21, 02/12/2013 17:26 with clay % Passing 0.002mm: 3 RESIDUAL SOIL? <<DrawingFile>> MD D GM 106.6 -5.0 CB24735.04.GPJ Log BOREHOLE SPT 4, 6, 6 N=12 RESIDUAL SOIL SILTY GRAVEL (GM): Red brown, grey, fine to medium gravel, angular, fine to coarse grained sand. GM MD CURRENT.GLB DRILLING SAMPLES & FIELD TESTS CONSISTENCY (Su) {N-value} DENSITY (SPT N-value) Hand Auger Disturbed Sample Env Soil Sample SPT Standard Penetration Test Rock Rolling RR VL Very Loose 0 - 4 VS < 12 kPa {0-2} 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} W Water Sample EW Env Water Sample **IBRARY** MD Medium Dense 10 - 30 25 - 50 {4-8} NQ NQ Coring NMLC NMLC Coring Firm Auger Drill V-bit Washbore 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)

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BOREHOLE ENGINEERING LOG HOLE NO: CURVE 22 BH05 CLIENT: TRANSPORT AND MAIN ROADS POSITION: E: 359400, N: 8137546 (56 MGA94) PAGE: 2 OF 4 PROJECT: BLACK SPOT PROJECT SURFACE ELEVATION: 111.6 (AHD) DATE DRILLED: 5/8/13 TO 5/8/13 LOGGED BY: JP JOB NO: CB24735.04 DIP / AZIMUTH : 90° LOCATION: KENNEDY HWY (CAIRNS - MAREEBA) CHECKED BY: AJ **DRILLING MATERIAL** SROUND WATER EVELS LES & TESTS (E CONSISTENCY MATERIAL DESCRIPTION MOISTURE $\widehat{\Xi}$ STRUCTURE GRAPHIC DEPTH & CASING Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components & Other Observations WATER Ζ 90. RESIDUAL SOIL SILTY GRAVEL (GM): Red brown, grey, fine to medium gravel, angular, fine to coarse grained sand. 6.00 6.00: From 6.00 m to 6.50 m drill string dropped (continued) Е RETURN GM Water 1%0 MD 104.6--7.0 HIGHLY WEATHERED ROCK GNEISS: Red brown, grey brown, highly weathered, low to medium strength. 7.45m -8.0 8.50m SPT 2, 2, 4 N=6 OBSERVED WB 8.95m 102.6 -9.0 NOT EXTREMELY TO HIGHLY WEATHERED ROCK GNEISS: Red brown orange, extremely to highly weathered, extremely to medium strength, appears as SILTY GRAVEL (GM), fine to medium grained angular Н gravel, fine to medium grained sand, with clay 101.6-10.0 10.00: Moisture Content (%) = 14.7, Liquid Limit (%) = 26, Plastic Limit (%) = 20, Plasticity Index (%) = 6, Linear Shrinkage (%) = 3, % Passing 2.36mm: 66, % Passing 0.425mm: 51, % Passing 0.075mm: 33, % Passing 0.002mm: 7 <<DrawingFile>> 02/12/2013 17:26 10.45m VH 100.6 CB24735.04.GPJ 11.50m BOREHOLE 11.55m 11/40mn HB N=R Continued as Cored Drill Hole 11.54m Log CURRENT.GLB 99.6-DRILLING SAMPLES & FIELD TESTS CONSISTENCY (Su) {N-value} DENSITY (SPT N-value) Hand Auger Disturbed Sample SPT Standard Penetration Test Rock Rolling RR 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} Firm 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: CB24735.04 CURVE 22_BH05 Page 2 OF 4

CORED BOREHOLE ENGINEERING LOG HOLE NO: CURVE 22_BH05 **CLIENT: TRANSPORT AND MAIN ROADS** POSITION: E: 359400, N: 8137546 (56 MGA94) PAGE: 3 OF 4 PROJECT: BLACK SPOT PROJECT DATE DRILLED: 5/8/13 TO 5/8/13 SURFACE ELEVATION: 111.6 (AHD) JOB NO: CB24735.04 DIP / AZIMUTH : 90° LOGGED BY: JP CHECKED BY: AJ LOCATION: KENNEDY HWY (CAIRNS - MAREEBA) **DRILLING** MATERIAL DEFECTS & COMMENTS ESTIMATED STRENGTH Is(50) DEFECT DESCRIPTION GRAPHIC LOG Weathering SPACING TCR/RQD Ξ Description of joints, seams ROCK TYPE: Colour, Grain size, Structure (mm) DEPTH DRILLING defects, additional observations and comments WATER DETAIL (texture, fabric, mineral composition, hardness 꿉 6.0 - 6 alteration, cementation, etc as applicable) Ŧ 2 2 2 2 2 104.6-7.0 103.6 -8.0 102.6 -9.0 BOREHOLE CB24735.04.GPJ <<DrawingFile>> 03/12/2013 12:01 101.6 10.0 100.6 11.0 START CORING AT 11.55m 11.56 JT 40° IR VR SM-RF spacing VN 0° - 80° Qz spacing 5 -10 Log CORED GNEISS: Dark grey, grey brown, black, white, distinct foliation at 40° to HW NMLC-87% TCR 11.73 CZ 60° GC IR VR 50 mm From 11.80 m indistinct foliation at 0° to 10° - 11.87 CZ 10° - 11.94 CZ 10° GC IR VR 0% RQD CURRENT.GLB **DRILLING** SAMPLES & FIELD TESTS **DEFECT ABBREVIATIONS** ROCK STRENGTH (Is50 MPa) ES Env Soil Sample HQ Coring CS Crushed Seam CN Clean 0-0.03 Extremely Low Disturbed Sample Cu Curved NMLC NMLC Coring HQ 0.03-0.1 Very Low 0.1-0.3 Low PQ Coring CZ Crushed Zone DB Drill Break CT Coating SN Stain IR Irregular PR Planar ΡQ Water Sample EW Env Water Sample NQ NQ Coring SPT SPT Sample LIBRARY FZ Fractured Zone VR Veneer JT Joint 0.3-1.0 TCR % core run recovered RQD % core run > 100mm long ST Stepped Medium Undisturbed Tube Sample High Very High Un Undulated (rock fraction only measured) IS Infilled Seam POL Polished BRISBANE OFFICE RF Rough S Smooth SZ Shear Zone VN Vein S Smooth SL Slickensided **GROUNDWATER SYMBOLS** = Water level (static) = Water level (during drilling)

File: CB24735.04 CURVE 22_BH05 3 OF 4

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PF	OJEC	ENT : TRANSPORT AND MAIN ROADS														
-	OCATION: KENNEDY HWY (CAIRNS - MAREEBA) CHECKED BY: AJ															
							MATERIAL	ESTIMATED STRENGTH					DEFECTS & COMMENTS DEFECT			
DRILLING	WATER DETAIL	TCR/RQD	(m) 99.6	DEPTH (m)	GRAPHIC LOG	(texture	DESCRIPTION CTYPE : Colour, Grain size, Structure to the composition, hardness atton, cementation, etc as applicable)	Weathering	ū		Is(50) I - Axial Diametr	ral °° F H	SPACING (mm)	obsei	ription of joints, seams, defects, additional rvations and comments	GENERAL
			00.0	_ 12.0		GNEISS: Dar 50° (continue	k grey, grey brown, black, white, distinct foliation at 40°d)	° to EV	/	 				260 r	nm	<u>ا</u> چا
		12.30		_	\times	CORE LOSS	SS 0.17m (12.20-12.37)			 <u> </u>				12.37	7 JT 40° IR RF	JT 0° - 80° IR SM-RF spacing 1 - 10 mm VN 0° - 80° Qz IR SM-RF spacing 5 -190 mm 1 1
		95%	-	- - - -		GNEISS: Dar foliation at 10	k grey, grey brown, white, black, indistinct to distinct of 20°	MV	/	 	 			— 12.45 ≥ 12.50	5 JT 80° ST RF) JT 30° IR RF	° - 80° acing 1 ° Oz IF 5 - 10
														12.57	3 JT 20° IR RF 7 JT 40° IR RF 5 JT 0° IR VR	JT 0' RF spe 3° - 80 pacing
														12.66	3 JT 40° IR RF 9 JT 50° IR RF 5 JT 20° ST RF	S S
		TCR 27%	98.6-	13.0		From 13.00 n	n indistinct foliation	F						12.82	2 JT 0° IR RF 4 JT 0° IR RF	
		RQD		-										12.95	3 JT 0° IR RF 5 CZ 5 - 40° IR RF 50 mm 4 JT 60° ST VR	-
				F										13.31	3 JT 50° ST RF 1 JT 40° IR RF) VN 60° Qz PR RF	1
		13.65	-	_										13.45	5 VN 10° Q2 PR RF 5 VN 10° Qz PR RF 3 VN 10° Qz PR RF 5 JT 60 - 90° IR RF	-
			97.6	_										13.68	3 JT 30° IR VR	-
				_ 14.0											05 JT 70° IR VR 18 VN 40 - 90° Qz IR RF	_
- NMLC				- 14.0								•				-
				-											5 JT 90° IR RF]
			-	_												_
				-											7 JT 70° IR RF 4 JT 90° IR RF	-
		100% TCR		L										— 14.87	7 JT 80° IR RF	
		80% RQD	96.6-	- 15.0							 			— 14.94	4 JT 80° IR VR	_
				-							 			— 15.20	2 JT 80° IR RF) JT 80 - 90° ST VR	1
				-							 				0 VN 70 - 90° Qz IR RF 5 VN 80° Qz IR RF	-
			-	_							 			— 15.45	O VIN 80 QZ IR RF	_
				_) JT 30° IR RF) JT 50° ST VR	
				Ē								•		15.60	73150 SIVK	-
*		16.10	95.6-	16.0		Terminated C	Cored Drill Hole at 16.10 m			-	Ш			— 16.02 —	2 JT 90° IR RF	
	- Terminated C					reminated C	Jorea Dilli Flore at 10.10 III									-
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H			93.6 DF	18.0 RILLING			SAMPLES & FIELD TESTS			DFF	CT A	ABRRE	VIATIONS		ROCK STRENGTH (Is	50 MPa)
NMLC NMLC Coring HQ HQ Coring D Disturbed Sample ES Env Soil Sample CS Crushed Seam CN Clean Cu Curved 0-0.03 Extremely Lov																
	Т	CR %	oring PQ PQ Coring W Water Sample EW Env Water Sample CZ Crushed Zone CT Coating IR Irregular 0.03-0.1 Very In SPT SPT Sample Semple DB Drill Break SN Stain PR Planar 0.1-0.3 Low FZ Fractured Zone VR Veneer ST Stepped 0.3-1.0 Mediu							0.1-0.3 Low 0.3-1.0 Medium						
	F	ICR % core run recovered U Undisturbed Tube Sample I Z Fractured Zone VR Veneer S1 Stepped 0.3-1.0 Medium Un Undulated 1.0-3.0 High (rock fraction only measured) IS Infilled Seam POL Polished S7 Shear Zone RE Rough														
SZ Shear Zone RF Rough VN Vein S Smooth CROUNDWATER SYMBOLS																
▼ = Water level (static) ▼ = Water level (during drilling)																
L	File: CB24735.04 CURVE 22_BH05 4 OF 4															



	SINCLAIR KNIGHT MERZ	Client: Transport and Main Roads						
drawn	AJ	Project: Black Spot						
date	14/08/2013	Core Photograph – Curve 22_BH05						
scale	NTS	Project no. CB24735.04	Photo No: Curve 22_BH05	1 of 1				