BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH02

CLIENT : TMR	POSITION : E: 358655, N: 8137038 (55 MGA94)	PAGE : 1 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 317.9 (AHD)	DATE DRILLED : 31/7/13 TO 31/7/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : NC
LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)		CHECKED BY : AJ

DRILLING | MATERIAL

PROGRESS: DRILLING & CASING	PROGRESS: WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION (Soil Type, Colour, Plasticity or Particle Characteristic, Secondary and Minor Components)	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
AD/T		VH	NOT OBSERVED		317.9	0.0			0.05m ASPHALT: (0.10).			FILL
		F-H						GM	SANDY GRAVEL (GM): Grey brown, fine to medium gravel, fine to coarse grained sand, with fines. 0.30m			
								CI	CLAY (CI): Pale orange brown, medium plasticity, with medium grained angular gravel comprising of highly weathered phyllite, trace of fine grained sand.			RESIDUAL SOIL?
				1.00m SPT 2, 2, 2 N=4	316.9	1.0			1.00m CLAYEY SILT (ML): Red brown, medium plasticity, with fine to coarse grained sand, trace of fine to medium grained angular gravel comprising of highly weathered phyllite and quartzite.	D		RESIDUAL SOIL
		E		1.45m								
					315.9	2.0		ML			S - F	
				2.50m SPT 3, 3, 4 N=7								
				2.95m	314.9	3.0						
		H							3.50m 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 gravel.			EXTREMELY WEATHERED ROCK
				4.00m SPT 2, 2, 4 N=6	313.9	4.0						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
		E		4.45m								
	WB				312.9	5.0			5.10m GNEISS: Grey brown, extremely weathered, appears as GRAVELLY SILT (ML), low plasticity, fine to coarse grained angular gravel, with fine to coarse grained sand.		F - St	
	0% Water RETURN (at 5.10 m)			5.50m SPT 3, 3, 4 N=7								
		H		5.95m	311.9	6.0						

DRILLING

HA	Hand Auger	RR	Rock Rolling
AS	Auger Screw	AT	Air Track
AD/T	Auger Drill TC-bit	HQ	HQ Coring
AD/V	Auger Drill V-bit	NQ	NQ Coring
WB	Washbore	NMLC	NMLC Coring

DRILLING PENETRATION

VE	Very Easy	F	Firm	VH	Very Hard
E	Easy	H	Hard		

GROUNDWATER SYMBOLS

= Water level (static)

= Water level (during drilling)

SAMPLES & FIELD TESTS

DS	Disturbed Sample	SPT	Standard Penetration Test
ES	Env Soil Sample	U	Undisturbed Tube Sample
EW	Env Water Sample	W	Water Sample

HP Hand Penetrometer
HV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm
HW SPT penetration by hammer weight
RW SPT penetration by rod weight

MOISTURE CONDITION
D = Dry M = Moist W = Wet

DENSITY (SPT N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100
CO	Compact	>50/150mm

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

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BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH02

CLIENT : TMR	POSITION : E: 358655, N: 8137038 (55 MGA94)	PAGE : 2 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 317.9 (AHD)	DATE DRILLED : 31/7/13 TO 31/7/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : NC
LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)		CHECKED BY : AJ

DRILLING							MATERIAL				
PROGRESS											
DRILLING & CASING	WATER	DRILLING PENETRATION	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	RL (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MATERIAL DESCRIPTION Soil Type, Colour, Plasticity or Particle Characteristic Secondary and Minor Components	MOISTURE CONDITION	CONSISTENCY	STRUCTURE & Other Observations
WB		H VH			311.9	6.0			6.25m		F - St	
									Continued as Cored Drill Hole			
					310.9	7.0						
					309.9	8.0						
					308.9	9.0						
					307.9	10.0						
					306.9	11.0						
					305.9	12.0						

DRILLING

HA	Hand Auger	RR	Rock Rolling
AS	Auger Screw	AT	Air Track
AD/T	Auger Drill TC-bit	HQ	HQ Coring
AD/V	Auger Drill V-bit	NQ	NQ Coring
WB	Washbore	NMLC	NMLC Coring

DRILLING PENETRATION

VE	Very Easy	F	Firm	VH	Very Hard
E	Easy	H	Hard		

GROUNDWATER SYMBOLS

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SAMPLES & FIELD TESTS

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HV Hand Vane Shear
(P: Peak Su R: Residual Su)
N SPT blows per 300mm
HW SPT penetration by hammer weight
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MOISTURE CONDITION
D = Dry M = Moist W = Wet

DENSITY (SPT N-value)

VL	Very Loose	0 - 4
L	Loose	4 - 10
MD	Medium Dense	10 - 30
D	Dense	30 - 50
VD	Very Dense	50 - 100
CO	Compact	>50/150mm

CONSISTENCY (Su) {N-value}

VS	Very Soft	< 12 kPa {0-2}
S	Soft	12 - 25 {2-4}
F	Firm	25 - 50 {4-8}
St	Stiff	50 - 100 {8-15}
VSt	Very Stiff	100 - 200 {15-30}
H	Hard	> 200 kPa {>30}

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CORED BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH02

CLIENT : TMR	POSITION : E: 358655, N: 8137038 (55 MGA94)	PAGE : 3 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 317.9 (AHD)	DATE DRILLED : 31/7/13 TO 31/7/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : NC
LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)		CHECKED BY : AJ

DRILLING					MATERIAL				DEFECTS & COMMENTS	
DRILLING	WATER DETAIL	TCR/RQD DRILL DEPTH	RL (m)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral EL -0.03 VL -0.1 L -0.3 M -1 H -3 VH -10 EH	DEFECT SPACING (mm) 20 60 200 600 2000	Description of joints, seams, defects, additional observations and comments
			311.9	6.0		START CORING AT 6.25m				GENERAL
NMLC		100% TCR 71% RQD	310.9	7.0		QUARTZITE: Pale grey green, orange brown, indistinct foliation.	MW			6.34 JT 70° Qz PR RF 1 - 2 mm 6.39 JT 5° PR RF 1 mm 6.43 JT 5° PR RF 1 mm 6.50 JT 70° IR RF 1 - 2 mm 6.54 JT 90° Fe IR RF 6.56 JT 70° IR RF 1 mm 6.66 JT 70° CH IR RF 1 mm 6.68 JT 60 - 80° CH IR RF 1 mm 6.80 JT 60 - 80° CH IR RF 1 mm 6.88 JT 60° IR RF 1 mm 6.96 JT 50° CH IR RF 2 mm 6.98 JT 20° CH IR RF 1 mm 6.98 JT 50° CH IR RF 2 mm 7.14 JT 60° Fe IR RF 2 - 3 mm 7.56 JT 50° IR RF 2 mm 7.73 JT 60° CH IR RF
						GNEISS: Blue grey, pale grey, grey, distinct folidation at 40 to 60°.	SW			
			309.9	8.0						
		8.50					MW			8.50 JT 50° CH IR RF 5 mm 8.63 JT 60° Fe IR RF 1 mm
		100% TCR 49% RQD	308.9	9.0						8.91 JT 70° CH IR RF 1 - 2 mm 8.96 JT 30° CH IR RF 2 - 3 mm 9.06 JT 45° IR RF 1 mm 9.29 JT 40° Fe IR RF 1 mm 9.30 JT 60° Fe IR RF 1 mm 9.35 JT 30° Fe IR RF 1 mm 9.40 JT 30° CH IR RF 1 - 2 mm 9.46 SZ 30° CH IR RF 60 - 70 mm 9.56 SZ 30 - 40° CH-CG IR RF 320 mm
						From 9.58 m CLAYEY GRAVEL 200 mm thick.	EW			
			307.9	10.0			MW			
		10.30				From 10.23 m CLAYEY GRAVEL 150 mm thick.				10.23 SZ 30° GC IR RF 150 mm
						At 10.38 m 13 mm quartz vein.				10.39 JT 60° Fe IR RF 10.42 JT 60° Fe IR RF 1 mm 10.56 JT 60° IR RF 1 mm 10.62 JT 55° Fe IR RF 3 mm 10.63 JT 10° IR RF 1 - 2 mm 10.78 JT 70° CH PR RF 5 mm 10.82 JT 70° Fe IR RF 3 mm
		100% TCR 59% RQD	306.9	11.0		QUARTZITE: Blue grey, fine grained, indistinct to distinct foliation at 60°.	SW			11.05 JT 70° CH PR RF 3 mm
						From 11.35 to 11.53 m minor pale grey, white banding.				11.60 JT 30° CH IR RF 5 mm
						QUARTZITE: Blue grey, fine grained, indistinct bedding.				11.71 JT 60° IR RF 3 mm 11.72 JT 10° IR RF 2 mm 11.85 JT 60° PR RF 4 mm 11.90 JT 60° IR RF 3 - 4 mm
			305.9	12.0						

DRILLING

NMLC NMLC Coring
NQ NQ Coring
HQ HQ Coring
PQ PQ Coring

TCR % core run recovered
RQD % core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS
▼ = Water level (static)
▽ = Water level (during drilling)

SAMPLES & FIELD TESTS

D Disturbed Sample
W Water Sample
ES Env Soil Sample
EW Env Water Sample
SPT SPT Sample
U Undisturbed Tube Sample

DEFECT ABBREVIATIONS

CS Crushed Seam
CZ Crushed Zone
DB Drill Break
FZ Fractured Zone
JT Joint
IS Infilled Seam
SZ Shear Zone
VN Vein
CN Clean
CT Coating
SN Stain
VR Veneer
POL Polished
RF Rough
S Smooth
SL Slickensided
Cu Curved
IR Irregular
PR Planar
ST Stepped
Un Undulated

ROCK STRENGTH (Is50 MPa)

0-0.03	Extremely Low
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

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CORED BOREHOLE ENGINEERING LOG

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LOCATION : KENNEDY HWY (CAIRNS - MAREEBA)		CHECKED BY : AJ

DRILLING | MATERIAL | DEFECTS & COMMENTS

DRILLING	WATER DETAIL	TCR/RQD DRILL DEPTH	RL (m)	DEPTH (m)	GRAPHIC LOG	DESCRIPTION ROCK TYPE : Colour, Grain size, Structure (texture, fabric, mineral composition, hardness alteration, cementation, etc as applicable)	Weathering	ESTIMATED STRENGTH Is(50) ● - Axial ○ - Diametral EL -0.03 / VL -0.1 / L -0.3 / M -1 / H -3 / VH -10 / EH	DEFECT SPACING (mm) 20 / 60 / 200 / 600 / 2000	Description of joints, seams, defects, additional observations and comments	GENERAL
NMLC		12.25	305.9	12.0		QUARTZITE: Blue grey, fine grained, indistinct bedding. *(continued)* From 12.05 SILTY CLAY 100 mm thick, orange brown, medium plasticity, with fine grained sand.	EW / SW			11.96 JT 10° IR RF 2 mm 12.05 SZ 60° Fe PR RF 50 mm 12.15 JT 20° CH IR RF 1 mm	
		100% TCR 60% RQD	304.9	13.0		GNEISS: Blue grey, grey, distinct foliation at 30° to 40°. From 12.98 SILTY CLAY 50 mm thick, orange brown and pale grey, medium plasticity, with fine grained sand.				12.57 JT 70° IR RF 5 mm 12.65 JT 80° IR RF 1 mm 12.70 JT 5° Fe PR RF 5 mm 12.73 JT 50° Fe IR RF 3 mm 12.85 JT 60° Fe IR RF 1 mm 12.88 JT 20° Fe IR RF 1 mm 13.19 JT 10 - 30° IR RF 2 mm	JT 30° - 40° CH IR RP 1 - 4 mm
		14.00	303.9	14.0		QUARTZITE: Blue grey, fine grained, massive. GNEISS: Blue grey, grey				13.86 JT 70° Fe PR RF 5 mm	
						End of Cored Drill Hole at 14.00 m					
			302.9	15.0							
			301.9	16.0							
			300.9	17.0							
			299.9	18.0							

DRILLING

NMLC NMLC Coring
NQ NQ Coring
HQ HQ Coring
PQ PQ Coring

TCR % core run recovered
RQD % core run > 100mm long (rock fraction only measured)

GROUNDWATER SYMBOLS
▼ = Water level (static)
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SAMPLES & FIELD TESTS

D Disturbed Sample
W Water Sample
SPT SPT Sample
U Undisturbed Tube Sample
ES Env Soil Sample
EW Env Water Sample

DEFECT ABBREVIATIONS

CS Crushed Seam
CZ Crushed Zone
DB Drill Break
FZ Fractured Zone
JT Joint
IS Infilled Seam
SZ Shear Zone
VN Vein
CN Clean
CT Coating
SN Stain
VR Veneer
POL Polished
RF Rough
S Smooth
SL Slickensided
Cu Curved
IR Irregular
PR Planar
ST Stepped
Un Undulated

ROCK STRENGTH (Is50 MPa)

0-0.03	Extremely Low
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

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SINCLAIR KNIGHT MERZ SKM		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