BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH05

CLIENT : TMR	POSITION : E: 358647, N: 8137056 (55 MGA94)	PAGE : 1 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 320.2 (AHD)	DATE DRILLED : 1/8/13 TO 1/8/13
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			320.2	0.0			0.10m ASPHALT: (0.10).			FILL
		H						GM	SANDY GRAVEL (GM): Grey brown, fine to medium gravel, fine to coarse grained sand, trace of fines.			
									0.40m			
		F						CI	SILTY CLAY (CI): Red brown, orange brown, medium plasticity, with fine to medium grained, sub-angular gravel, trace of fine grained sand.	D	St - VSt	RESIDUAL SOIL
									From 0.70 m becoming pale orange brown.			
									0.85m			
		H		1.00m SPT 18/75mm N=R 1.08m	319.2	1.0			QUARTZITE: Pale brown, orange brown, highly weathered, very low to low strength.			HIGHLY WEATHERED ROCK
WB												
									1.50m			
		H-VH							QUARTZITE: Brown, orange brown, extremely to highly weathered, very low to low strength, appears as CLAYEY GRAVEL (GC), fine to medium grained angular gravel, with fine to coarse grained sand.		D	EXTREMELY TO HIGHLY WEATHERED ROCK
		VH			318.2	2.0			2.10m			
			NOT OBSERVED						Continued as Cored Drill Hole			
					317.2	3.0						
					316.2	4.0						
					315.2	5.0						
					314.2	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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CORED BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH05

CLIENT : TMR	POSITION : E: 358647, N: 8137056 (55 MGA94)	PAGE : 2 OF 4
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 320.2 (AHD)	DATE DRILLED : 1/8/13 TO 1/8/13
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
			320.2	0.0						GENERAL
			319.2	1.0						
			318.2	2.0		START CORING AT 2.10m				
NMLC		100% TCR 65% RQD	317.2	3.0		QUARTZITE: Brown grey, green grey, orange brown, dark green grey.	MW			2.19 JT 60° Fe PR RF 1 mm 2.35 JT 40° Fe PR RF 1 mm 2.65 JT 40° Fe PR RF 1 mm 2.86 JT 40° Fe Clay IR RF 12 mm 3.13 JT 60° Fe IR RF 1 mm 3.38 JT 20° Fe IR RF 1 mm 3.52 JT 30° Fe IR RF 1 mm
				3.70						
			316.2	4.0		From 3.95 m becoming green grey, dark grey.				3.90 JT 40° Fe IR RF 1 mm
						From 4.20 m to 4.25 m green grey and red brown band.				4.20 JT 30° Fe IR RF 1 mm 4.25 JT 20° Fe PR S 1 mm 4.32 JT 30° Fe PR RF 1 mm
		100% TCR 94% RQD				From 4.45 m becoming orange brown, grey green.				4.43 JT 30° Fe PR S 1 mm 4.70 JT 40° Fe PR S 1 mm 4.73 JT 30° Fe PR S 1 mm 4.74 JT 10° Fe PR S 1 mm 4.86 JT 30° Fe IR RF 1 mm
			315.2	5.0						5.11 JT 30° Fe IR RF 1 mm 5.12 JT 30° Fe IR RF 1 mm 5.15 JT 60° Fe PR RF 1 mm 5.19 JT 60° Fe PR RF 1 mm 5.27 JT 60° Fe PR RF 1 mm 5.31 JT 30° Fe PR RF 1 mm 5.43 JT 60° Fe PR RF 1 mm 5.50 JT 60° Fe PR RF 1 mm 5.61 JT 10° Fe IR RF 1 mm
				5.50		From 5.50 m red brown staining along joints.				
		87% TCR 45% RQD				From 5.80 m becoming grey green, red brown.				5.80 JT 20° Fe PR S 1 mm
			314.2	6.0		CORE LOSS 0.40m (5.85-6.25)				

JT 70 - 90 Fe PR-IR S-RF 1 mm

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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

CORED BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH05

CLIENT : TMR | POSITION : E: 358647, N: 8137056 (55 MGA94) | PAGE : 3 OF 4

PROJECT : SAFER ROADS SOONER PROJECT | SURFACE ELEVATION : 320.2 (AHD) | DATE DRILLED : 1/8/13 TO 1/8/13

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	DEFECT SPACING (mm)	Description of joints, seams, defects, additional observations and comments
NMLC		8.25	314.2	6.0		CORE LOSS 0.40m (5.85-6.25) *(continued)*			
						QUARTZITE: Grey green, dark grey green and pale orange brown	MW		6.25 JT 20° Fe PR RF 1 mm
						From 6.55 to 6.78 m 3 mm to 8 mm thick quartz veins at 30° to 50°.			6.49 JT 10° Fe UN RF 1 mm 6.53 JT 30° Fe UN RF 1 mm 6.78 JT 40° Fe IR RF 1 mm
		87% TCR 45% RQD	313.2	7.0		From 7.00 m becoming orange brown, green grey.			7.00 JT 20° Fe Clay IR RF 1 mm
						From 7.20 m becoming orange brown.			7.29 JT 40° Fe PR RF 1 mm 7.32 JT 40° Fe PR RF 1 mm
									7.70 JT 50° Fe PR RF 1 mm
									7.89 JT 30° Fe IR RF 1 mm
			312.2	8.0					
		105% TCR 39% RQD	311.2	9.0		From 9.29 m becoming green grey, orange brown.			8.77 JT 20° Fe PR RF 1 mm 9.13 JT 10° Fe PR RF 1 mm 9.23 JT 20° Fe IR RF 1 mm
						From 9.53 m becoming orange brown.			9.38 JT 30° Fe UN RF 1 mm 9.46 JT 10° Fe UN RF 1 mm 9.52 JT 10° Fe UN RF 1 mm 9.58 JT 30° Fe IR RF 1 mm
							HW		9.66 JT 90° GC PR RF 5-25 mm
							MW		9.75 JT 60° Fe PR RF 1 mm 9.80 JT 50 - 70° Fe IR RF 1 mm 9.90 JT 30° Fe IR RF 1 mm 10.00 JT 30° Fe PR RF 1 mm
			310.2	10.0					
		10.20							10.12 JT 60° Fe PR RF 1 mm 10.15 JT 60° GC IR RF 5-25 mm 10.20 JT 60° Fe PR RF 1 mm 10.26 JT 20° Fe PR RF 1 mm 10.30 JT 20° Fe PR RF 1 mm 10.39 JT 30° Fe IR RF 1 mm 10.41 CZ 0 - 40° Fe PR RF 10.53 JT 10° Fe PR RF 10.58 JT 10° Fe CU RF 1 mm 10.61 JT 10° Fe IR RF 15-20 mm 10.73 JT 50° GC PR RF 10 mm 10.76 JT 30° Fe IR RF 1 mm 10.92 JT 30° Fe PR RF 1 mm 10.93 JT 10° Fe CU RF 1 mm 10.96 JT 40° Fe CU RF 1 mm 11.08 JT 10° Fe CU RF 1 mm
							EW		
							HW		
		94% TCR 25% RQD	309.2	11.0			MW		
									11.43 SS 60 - 80° GC SL 80 mm
		11.80					HW		
							MW		
			308.2	12.0					

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

GENERAL: JT 70 - 90 Fe PR-IR S-RF 1 mm

DRILLING

NMLC NMLC Coring | HQ HQ Coring
NQ NQ 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 | ES Env Soil Sample
W Water Sample | EW Env Water Sample
SPT SPT Sample
U Undisturbed Tube Sample

DEFECT ABBREVIATIONS

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

ROCK STRENGTH (Is50 MPa)

0-0.03	Extremely Low
0.03-0.1	Very Low
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CORED BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH05

CLIENT : TMR | POSITION : E: 358647, N: 8137056 (55 MGA94) | PAGE : 4 OF 4

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

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NMLC		100% TCR 28% RQD	308.2	12.0		QUARTZITE: Grey green, dark grey green and pale orange brown *(continued)* From 12.02 m CLAYEY GRAVEL (CG) 330 mm thick.	HW MW HW		11.99 JT 40° Fe IR RF 1 mm 12.02 SS 60 - 80° GC PR POL 330 mm 12.41 JT 40° Fe IR RF 1 mm 12.44 JT 40° Fe PR RF 1 mm 12.65 JT 30° Fe PR RF 1 mm 12.74 JT 50° Fe IR RF 5-10 mm 12.78 JT 60° Fe IR RF 12.82 JT 60° Fe IR RF 12.86 JT 30° Fe IR RF 1-6 mm 12.93 SS 20° GC IR RF 15-20 mm 13.00 JT 20° Fe PR S 1 mm 13.23 SS 10 - 20° GC IR RF 30-40 mm 13.33 JT 0° Fe IR RF 1 mm 13.50 JT 70° Fe PR RF 1 mm 13.60 SS 70 - 90° GC IR RF 50 mm
			307.2	13.0					
		13.75							
			306.2	14.0		End of Cored Drill Hole at 13.75 m			
			305.2	15.0					
			304.2	16.0					
			303.2	17.0					
			302.2	18.0					

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
GENERAL: JT 70 - 90 Fe PR-IR-S-RF 1 mm

DRILLING

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

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

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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

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0.3-1.0	Medium
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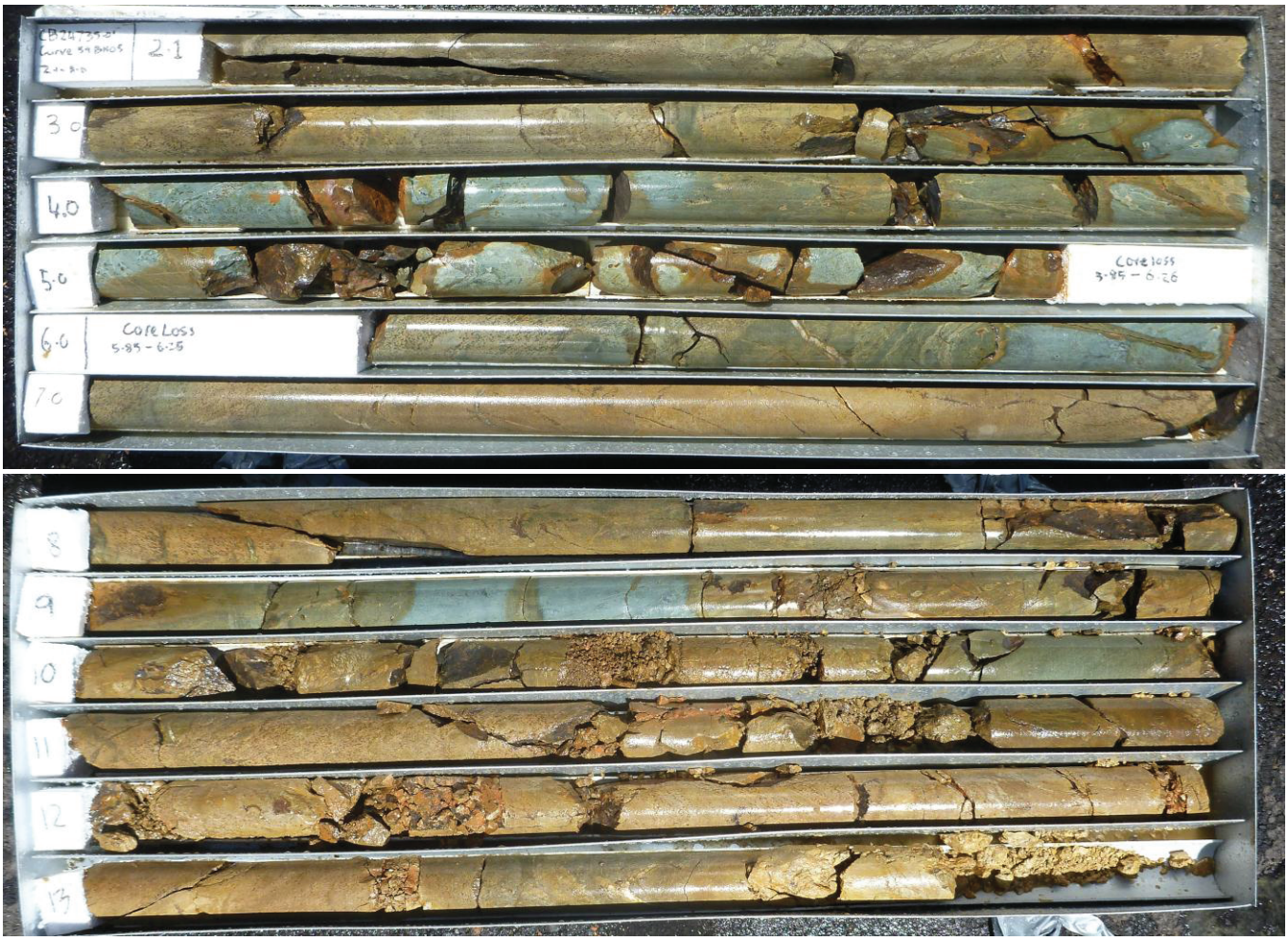

SINCLAIR KNIGHT MERZ SKM		Client: Transport and Main Roads	
drawn	AJ	Project: Safer Road Sooner	
date	14/08/2013	Core Photograph – Curve 59_BH05	
scale	NTS	Project no. CB24735.01	Photo No: Curve 59_BH05 1 of 1