BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH01

CLIENT : TMR	POSITION : E: 358650, N: 8137036 (55 MGA94)	PAGE : 1 OF 3
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 318.5 (AHD)	DATE DRILLED : 1/8/13 TO 1/8/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : JP
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
		H			318.5	0.0			0.10m ASPHALT: (0.10).			FILL
								SM	SANDY SILT (SM): Orange brown, red brown, fine to coarse grained sand, with fine to coarse grained angular gravel, comprising of medium strength quartzite, trace of cobbles.			
AD/T				1.00m SPT 4, 5, 5 N=10	317.5	1.0			1.00m CLAYEY SILT (ML): Orange brown, red brown, low plasticity, with fine to medium grained sand, trace of fine to medium grained sub-angular gravel and organics.	D	F - St	RESIDUAL SOIL? 1.00: Moisture Content (%) = 24.1, Liquid Limit (%) = 47, Plastic Limit (%) = 33, Plasticity Index (%) = 14, Linear Shrinkage (%) = 6, % Passing 2.36mm: 91, % Passing 0.425mm: 84, % Passing 0.075mm: 76, % Passing 0.002mm: 13 RESIDUAL SOIL?
				1.45m								
					316.5	2.0			From 2.00 m becoming brown.			
		F		2.50m SPT 4, 0, 1 N=1				ML	From 2.50 m becoming mottled orange brown.		VS	
			NOT OBSERVED	2.95m					From 2.80 m trace of organics and rootlets.			
	WB				315.5	3.0					F - St	
				4.00m SPT 6, 10, 9 N=19	314.5	4.0			4.10m QUARTZITE: Dark brown, dark grey, extremely weathered, extremely low strength, appears as GRAVELLY CLAY (CI), medium plasticity, fine to coarse grained angular gravel, with fine to coarse grained sand.		VSt - H	EXTREMELY WEATHERED ROCK
				4.45m					4.75m			
		VH							QUARTZITE: Dark brown, dark grey, highly weathered, low to medium strength.			HIGHLY WEATHERED ROCK
					313.5	5.0			5.00m Continued as Cored Drill Hole			
					312.5	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_BH01

CLIENT : TMR	POSITION : E: 358650, N: 8137036 (55 MGA94)	PAGE : 2 OF 3
PROJECT : SAFER ROADS SOONER PROJECT	SURFACE ELEVATION : 318.5 (AHD)	DATE DRILLED : 1/8/13 TO 1/8/13
JOB NO : CB24735.01	DIP / AZIMUTH : 90°	LOGGED BY : JP
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
			318.5	0.0						GENERAL
			317.5	1.0						
			316.5	2.0						
			315.5	3.0						
			314.5	4.0						
			313.5	5.0		START CORING AT 5.00m				
NMLC		62% TCR 0% RQD 5.40				QUARTZITE: Grey, grey brown, indistinct foliation.	HW - MW			5.05 JT 60° IR RF 5.16 JT 5° CU RF 5.20 JT 80° IR RF 5.23 JT 70° IR VR
						CORE LOSS 0.15m (5.25-5.40)				
		100% TCR				QUARTZITE: Grey, grey brown, indistinct foliation.	EW - HW			5.50 JT 90° IR RF
WB		0% RQD 5.60				QUARTZITE: Brown, dark grey appears as SILTY CLAY (CI), medium plasticity, trace of fine to coarse grained sand and medium grained angular gravel, very stiff to hard.				SPT 3, 13, 24 N=27
			312.5	6.0						

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

CORED BOREHOLE ENGINEERING LOG

HOLE NO : CURVE 59_BH01

CLIENT : TMR | POSITION : E: 358650, N: 8137036 (55 MGA94) | PAGE : 3 OF 3

PROJECT : SAFER ROADS SOONER PROJECT | SURFACE ELEVATION : 318.5 (AHD) | DATE DRILLED : 1/8/13 TO 1/8/13

JOB NO : CB24735.01 | DIP / AZIMUTH : 90° | LOGGED BY : JP

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

DRILLING					MATERIAL			DEFECTS & COMMENTS	
DRILLING	WATER DETAIL	TCR/RQD DRILL DEPTH	RL (m)	DEPTH (m)	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
WB			312.5	6.0	QUARTZITE: Brown, dark grey appears as SILTY CLAY (CI), medium plasticity, trace of fine to coarse grained sand and medium grained angular gravel, very stiff to hard. *(continued)*	EW - HW			
NMLC		70% TCR 0% RQD 7.00			QUARTZITE: Grey, grey brown, indistinct foliation.	EW - HW			6.55 JT 30° IR RF 6.57 JT 90° IR RF 6.61 JT 50° IR RF 6.62 JT 5° IR RF 6.65 JT 20° IR RF 6.70 JT 50° CH IR RF 6.73 JT 70° IR RF 6.74 JT 0° ST RF 6.78 JT 30° IR RF
					QUARTZITE: Red brown, dark grey appears as SANDY CLAY (CI), medium plasticity, very stiff.				
			311.5	7.0	CORE LOSS 0.15m (6.85-7.00)				
WB					QUARTZITE: Brown, dark grey appears as SANDY CLAY (CI), medium plasticity, fine to coarse grained sand, trace of medium grained angular gravel, hard.	EW			SPT 6, 23, 30/120mm HB
NMLC		33% TCR 0% RQD 8.20			QUARTZITE: Grey, pale grey, indistinct to distinct foliation at 40° to 60°.	MW			7.82 JT 0 - 5° IR VR 7.86 JT 90° IR VR 7.88 JT 80° IR VR
			310.5	8.0	CORE LOSS 0.27m (7.93-8.20)				
		100% TCR 0% RQD 8.65			QUARTZITE: Grey, pale grey, indistinct to distinct foliation at 40° to 60°.	MW			8.20 JT 5° IR VR 8.27 JT 90° IR VR 8.32 JT 40 - 90° IR VR 8.38 JT 0° IR VR 8.43 JT 0° ST VR 8.52 JT 20° IR RF 8.54 JT 90° IR VR 8.64 JT 0 - 5° IR VR
					End of Cored Drill Hole at 8.65 m				
			309.5	9.0					
			308.5	10.0					
			307.5	11.0					
			306.5	12.0					

GENERAL

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)
▽ = Water level (during drilling)

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
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_BH01	
scale	NTS	Project no. CB24735.01	Photo No: Curve 59_BH01 1 of 1