BOREHOLE ENGINEERING LOG

HOLE NO : GE057M_BH01

CLIENT : TRANSPORT AND MAIN ROADS	POSITION : E: 358886, N: 8136930 (56 MGA94)	PAGE : 1 OF 4
PROJECT : TNRP	SURFACE ELEVATION : 304.2 (AHD)	DATE DRILLED : 5/11/12 TO 5/11/12
JOB NO : CB27000.F687	DIP / AZIMUTH : 90°	LOGGED BY : KMF
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/V		H	NOT OBSERVED		304.2	0.0		GP	SANDY GRAVEL (GP): Grey, fine to medium gravel, angular, fine to coarse grained sand.			FILL
									0.65m			
		F			303.2	1.0		CI-CH	GRAVELLY CLAY (CI-CH): Pale brown, medium to high plasticity, fine to coarse grained angular gravel, with medium to coarse grained sand.			
				1.50m SPT 8, 11, 12/30mm HB N*=R 1.83m					1.50m	D		
								CH	SILTY CLAY (CH): Red brown to brown, high plasticity, with fine to coarse grained sand.			
									1.80m			
		H			302.2	2.0			SOIL (30%) AND ROCK FRAGMENTS (70%): Pale red brown, soil comprises of SILTY CLAY (CH), high plasticity, with some fine to medium grained sand, rock fragments comprise of fine to coarse grained angular gravel and cobbles.		F - St	COLLUVIUM
									2.50m			
		F		3.00m SPT 5, 9, 12 N*=21	301.2	3.0		CI-CH	SILTY CLAY (CI-CH): Red brown, medium to high plasticity, with fine to medium grained angular to subangular gravel.	W	VSt	
				3.45m					3.80m			
		H			300.2	4.0			SOIL (60%) AND ROCK FRAGMENTS (40%): Red brown, blue grey, pale orange brown, soil comprises of SILTY CLAY (CH), high plasticity, with some fine to medium grained sand, rock fragments comprise of fine to coarse grained angular gravel and cobbles which comprise of extremely high strength quartzite.	M	H	
		F		4.50m SPT 17, 23, 21 N*=44								
		H		4.95m	299.2	5.0						
		H-VH		6.00m	298.2	6.0			5.90m		D -	EXTREMELY WEATHERED ROCK

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
ES Env Soil Sample
EW Env Water Sample
SPT Standard Penetration Test
U Undisturbed Tube 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 : GE057M_BH01

CLIENT : TRANSPORT AND MAIN ROADS	POSITION : E: 358886, N: 8136930 (56 MGA94)	PAGE : 2 OF 4
PROJECT : TNRP	SURFACE ELEVATION : 304.2 (AHD)	DATE DRILLED : 5/11/12 TO 5/11/12
JOB NO : CB27000.F687	DIP / AZIMUTH : 90°	LOGGED BY : KMF
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/V		H-VH		SPT 24/150mm HB N*=R 6.15m	298.2	6.0			EXTREMELY WEATHERED PHYLLITE: Red brown, extremely low to low strength, remolds to CLAYEY GRAVEL (GC), fine to coarse grained angular gravel, with some fine to medium grained sand, trace of cobbles , with some fine to medium grained sand and trace of cobbles. *(continued)*		VD D - VD	EXTREMELY WEATHERED ROCK
					297.2	7.0			7.00m Continued as Cored Drill Hole			
					296.2	8.0						
					295.2	9.0						
					294.2	10.0						
					293.2	11.0						
					292.2	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

= 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 : GE057M_BH01

CLIENT : TRANSPORT AND MAIN ROADS	POSITION : E: 358886, N: 8136930 (56 MGA94)	PAGE : 3 OF 4
PROJECT : TNRP	SURFACE ELEVATION : 304.2 (AHD)	DATE DRILLED : 5/11/12 TO 5/11/12
JOB NO : CB27000.F687	DIP / AZIMUTH : 90°	LOGGED BY : KMF
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
			298.2	6.0							
						START CORING AT 7.00m					
NMLC		50% TCR 0% RQD 7.50	297.2	7.0		PHYLLITE: Dark green grey, indistinct bedding.	SW			7.04 JT 70° PR RF 7.07 JT 20° PR RF 7.10 JT 50° UN RF 7.17 SS 50° Clay UN RF 140 mm 7.31 SS 50° GC UN RF 190 mm	
		100% TCR 0% RQD 8.20	296.2	8.0						7.56 JT 20° PR RF 7.60 JT 20° ST RF 7.64 JT 60° UN RF 7.67 JT 30° UN RF 7.74 JT 30° UN RF 7.77 JT 40° ST RF 7.87 JT 70° PR RF 7.93 JT 50° ST RF 8.00 SS 60° GC PR RF 140 mm	
		100% TCR 0% RQD 8.80								8.14 JT 60° IR RF 8.25 JT 60° PR RF 8.32 JT 60° PR RF 8.40 JT 60 - 70° PR RF 8.51 JT 70° ST RF 8.55 JT 80° ST RF 8.59 JT 40° IR RF 8.61 SS 50° GC IR RF 270 mm	
		50% TCR 0% RQD 10.00	295.2	9.0		CORE LOSS 0.60m (8.80-9.40)				9.40 SS Clay PR RF 40 mm	
						PHYLLITE: Dark green grey, pale grey, indistinct to distinct bedding at 20°.	SW			9.53 JT 20° UN RF 9.62 JT 50° PR RF 9.67 JT 40° IR RF 9.73 SS 30° GC ST RF 280 mm	
		50% TCR 11% RQD 11.00	294.2	10.0		CORE LOSS 0.50m (10.00-10.50)				10.50 SS 30° GC ST RF 30 mm 10.55 JT 10° CU RF 10.62 JT 70° UN RF	
						PHYLLITE: Green grey, orange brown, brown, indistinct bedding.	SW			10.73 JT 20° CU RF 10.79 JT 30° CU RF 10.83 SS 60° UN RF 20 mm 10.89 JT 60° PR RF 10.93 JT 70° PR RF	
		60% TCR 0% RQD	293.2	11.0		CORE LOSS 0.50m (11.00-11.50)					
						PHYLLITE: Green grey, orange brown, indistinct bedding.	SW			11.59 JT 10° Clay CU RF 90 mm 11.68 JT 20° CU RF 11.72 JT 30° Clay UN RF 70 mm 11.79 SS 40° IR RF	
			292.2	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

HOLE NO : GE057M_BH01

CLIENT : TRANSPORT AND MAIN ROADS | POSITION : E: 358886, N: 8136930 (56 MGA94) | PAGE : 4 OF 4

PROJECT : TNRP | SURFACE ELEVATION : 304.2 (AHD) | DATE DRILLED : 5/11/12 TO 5/11/12

JOB NO : CB27000.F687 | DIP / AZIMUTH : 90° | LOGGED BY : KMF

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
NMLC		12.25	292.2	12.0	PHYLLITE: Green grey, orange brown, indistinct bedding. *(continued)*	SW			11.83 JT 60° ST RF 11.89 JT 70° ST RF 11.92 JT 30° IR RF 11.96 JT 60° PR RF 12.00 SS 60° ST RF 250 mm
					CORE LOSS 0.20m (12.25-12.45)				
		82% TCR 0% RQD	291.2	13.0	PHYLLITE: Green grey	SW			12.56 SS 60° ST RF 30 mm 12.65 JT 50° ST RF 12.71 CS 30° CU RF 10 mm 12.83 SS 60° ST RF 12.91 JT 50° PR RF 12.98 JT 40° IR RF 13.10 SS 40° IR RF 60 mm 13.22 SS 40° IR RF 60 mm 13.32 JT 20° CU RF
		13.35			Cored Drill Hole Terminated at 13.35 m.				
			290.2	14.0					
			289.2	15.0					
			288.2	16.0					
			287.2	17.0					
			286.2	18.0					

GENERAL

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
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	KMF	Project: Transport Network Reconstruction Program	
date	8/11/2012	Core Photograph – GE057M_BH01	
scale	NTS	Project no. CB27000	Photo No: GE057M_BH01 1 of 1