PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL

Approval no: DEV2021/1187

Date: 24 June 2022

Queensland Government

APPENDIX C

Geotechnical Report

core
consultants pty ltd

Geotechnical Investigation Report

Vehicle Ferry Terminal

Weinam Street, Redland Bay

Prepared for:
Mr Daniel Berry
Projex Partners
Level 3, 135 Horton Parade
Maroochydore, QLD 4558

Report Number: J001183-001-R-Rev0

October 2020

Table of Contents

Figures

Appendices

1.0 INTRODUCTION

This report presents the results of a geotechnical investigation carried out for proposed upgrade works to the Redland Bay ferry terminal.

The investigation was undertaken for Projex Partners Pty Ltd (Projex) in accordance with proposal Q0026128-001-L-Rev0.

2.0 PROPOSED DEVELOPMENT

The proposed upgrade includes expanding the existing Redland Bay vehicle ferry terminal (located at Weinam Street), to provide additional barge capacity for up to three barges (refer Image 1 below). The conceptual design includes earth fill (land reclamation) and new perimeter retaining walls around the northern and eastern edge. Six mooring piles are also proposed. Design details were not available at the time of reporting.

Image 1: Proposed design upgrade to Redland Bay Ferry Terminal (Extract from Sea Transport Solutions – Project: Redlands Ferry Pier, Drawing No. 1163.1.3.2).

3.0 SITE DESCRIPTION

The existing vehicle ferry terminal is located on an earth-fill pier situated at the end of Weinam Street, Redland Bay. There are two bitumen-sealed car parking areas to the north and south of the pier access, as well as an earth fill jetty to the north. The pier has four bitumen-sealed vehicle lanes to and from the main barge landing jetty, and an unsealed side lane that accesses two secondary barge docking locations to the north. There are also some gravel and grassed car parking areas on the southern side of the pier. Structures on the site include a portable site shed and a block wall building.

The pier and car parking areas are elevated about 1.5 m above the tidal zone, which surrounds the pier on the north, east and southern sides.

The southern side of the of the pier comprises a boulder fill batter, refer Photograph 3Photograph 1. The northern side of the pier is retained by a brick retaining wall at the western end (refer Photograph 4), while the eastern end comprises a soil/rock fill batter with vegetation (refer Photograph 5).

Photograph 1: Looking north-east toward borehole BH2, at the time of our investigation on 29 September 2020.

Photograph 2: Looking east towards borehole BH2, at the time of our investigation on 29 September 2020.

Photograph 3: Looking west along the southern side of the pier

Photograph 4: Looking north east along the western end of the northern side of the pier

Photograph 5: Looking north east toward the eastern end of the northern side of the pier.

4.0 METHOD OF INVESTIGATION

4.1 Review of Available Information

To assess likely ground conditions a review of published geological maps was undertaken (refer Section 5.1).

4.2 Fieldwork

Fieldwork was carried out on 29 and 30 September 2020 and comprised the drilling of four boreholes (designated BH1 to BH4). The boreholes were drilled to depths between 14.95 m and 22.07 m using a truck-mounted investigation rig using solid flight augering and wash boring techniques. Standard penetration testing (SPT) and undisturbed (U50) tubes were undertaken at approximately 1.5 m intervals in the boreholes.

In addition, five dynamic cone (DCP) tests (designated DCP1 to DCP5) were undertaken to between 1.8 m and 4.8 m depth in the tidal zone at low tide.

Test locations are shown on the attached Figure 1. Borehole and DCP reports are provided in Appendix A, along with Explanatory Notes. Subsurface conditions are discussed in Section 5.2.

All fieldwork was carried out in the presence of a geotechnical engineer from Core, who logged the subsurface conditions in accordance with Australian Standard *AS1726-2017 Geotechnical site investigations*.

4.3 Laboratory Testing

4.3.1 Geotechnical Testing

Laboratory testing as summarised in Table 1 was performed at a NATA-accredited laboratory. The testing was conducted in accordance with procedures described in *AS1289 Methods of testing soils for engineering purposes*.

Laboratory test certificates are attached in Appendix B.

Table 1: Summary of geotechnical classification testing.

Borehole No.	Depth		Material Type	Atterberg Limits			
	From (m)	To (m)		Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Percent Fines (%)
BH1	10.0	10.45	Clayey SILT (RESIDUAL)	75	34	41	70
BH2	17.5	17.95	Sandy SILT (RESIDUAL)	-	-	-	57
BH3	8.5	8.95	Clayey SILT (RESIDUAL)	98	34	64	87
BH4	5.5	5.95	Clayey SILT (RESIDUAL)	132	31	101	93

The testing generally confirms the field soil classifications.

5.0 RESULTS OF INVESTIGATION

5.1 Published Mapping

Published information[1] indicates that the site is underlain by Cainozoic estuarine deposits typically comprising *"mud, silt, sand and clay and gravel with minor peat and coral debris".* The site is close to the boundary with the Tertiary age Lamington Group basalt flows, which are likely to underlie the estuarine deposits.

An extract of the geological map is shown in Image 1 below.

The subsurface conditions encountered in the boreholes (described in Section 5.2) generally confirm the published geology.

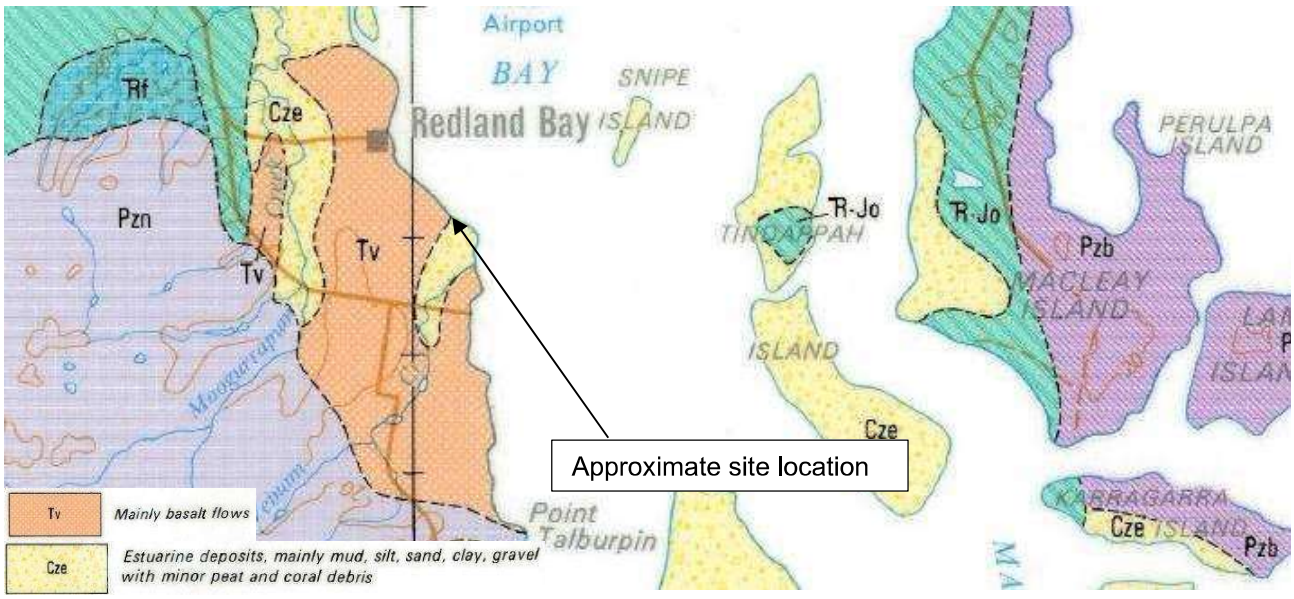


Image 1: Extract from published geology map.

[1] BEENLEIGH 1:100,000 Geol. Map, DME, First Edition 1974

5.2 Subsurface Conditions

The subsurface conditions encountered in the boreholes generally comprised fill over residual soils.

The fill is variable in composition, but is typically at least medium dense or stiff, except for some loose gravel between 2.5 m and 3.2 m depth in BH1 and loose sand between 1 m and 2.5 m depth in BH4. Fill depths range between about 2.5 m and 4 m, with the clay soil in BH3 and BH4 from 2.5 m depth to 5.5 m and 4 m, respectively, classified as possible fill. Documentation stating that the fill was placed under 'Level 1' supervision and testing as per Australian Standard AS 3798-2007 *Guidelines on earthworks for commercial and residential developments* was not available at the time of reporting, therefore the fill is deemed 'uncontrolled'.

A narrow zone of silty clay estuarine soil was encountered in BH1 from 3.2 m to 3.5 m depth.

The residual soils generally comprise firm to very stiff silty clay/clayey silt or medium dense to dense sandy silt. At the investigation depth in BH2, extremely weathered basalt was encountered, and very low strength, highly weathered basalt from 21.5 m to 22.09 m (termination depth) in BH4.

Groundwater seepage was encountered at depths ranging between 1.6 m and 2 m during drilling, with standing water levels between 1.3 m and 1.5 m on completion of drilling. Groundwater levels are likely to be influenced by tidal movement and rainfall and may rise close to the ground surface or occur as perched water tables in the higher permeability zones within the fill.

The DCP testing indicates soft/loose soils (inferred estuarine soils) from the ground/seabed surface to depths ranging between about 0.7 m and 1.2 m.

6.0 GEOTECHNICAL COMMENTS & RECOMMENDATIONS

6.1 Geological Model

The existing pier comprises variable fill soils. Although the fill is deemed 'uncontrolled', it is generally medium dense or stiff, and significant unsuitable material was not encountered during the investigation.

It is likely that the surficial alluvial/estuarine soils were generally removed from the pier footprint prior to fill placement as these were not encountered within most of the boreholes.

With the exception of a narrow zone of 'remnant' estuarine soils (in BH1), the fill is underlain by competent residual soils, over weathered rock at depth.

6.2 Earthworks

It is recommended that the proposed new fill be founded on at least stiff or medium dense residual soils. The overlying soft/loose soils estuarine soils should be removed from the ground/seabed surface, to anticipated depths ranging between about 0.7 m and 1.2 m (possible deeper further east of the existing barge).

Settlement under the anticipated fill and structure loads are anticipated to be less than about 40 mm, provided that the soft/loose soils estuarine soils are removed prior to earthworks.

The batters should comprise rock fill of sound igneous or metamorphic material that will not disintegrate in seawater or when exposed to weather. Rocks should be fresh or slightly weathered, and of very high strength (or stronger) as defined by AS 1726. The least dimension of the rock should not be less than half its greatest dimension.

Earthworks must be carried out in general accordance with the Department of Transport and Main Roads Technical Specification 'MRTS04 General Earthworks', under the direct supervision of a geotechnical engineer (RPEQ).

Temporary working platforms or progressive land reclamation (filling) will be required for construction machinery access to the tidal zone.

6.3 Footings

Lightly-loaded structures on top of the existing or proposed fill could be supported on narrow strip or pad footings, designed using an allowable bearing pressure of 100 kPa.

Retaining wall footings should found in the (at least) stiff or medium dense residual soils and can then be designed using an allowable bearing pressure of 100 kPa.

Alternatively, for higher loads or where foundation soils/water depth exclude high-level footings, retaining walls could be supported on a driven pile footing system, embedded in the residual soils or weathered rock. Piles driven into the underlying weathered rock (encountered from about 22 m depth) should be considered for the mooring piles. Design of piles driven into rock will be governed by the pile structural capacity. A specialist contractor should be consulted regarding the design and construction of piles. Further geotechnical input/analysis may be required when design details are available.

Footing excavations must be inspected by a geotechnical engineer from Core prior to construction. All footings should found such that they are not adversely affected by any adjacent excavations batter slopes, trenches, or retaining walls that are not designed to support building loads. To minimise the potential for any adverse interaction effects, footings should found at least below a plane extending 1 m horizontally from the base of trenches/batter slopes/excavations/retaining walls, then rising up at 1V:1H. This requirement is illustrated in Diagram 1.

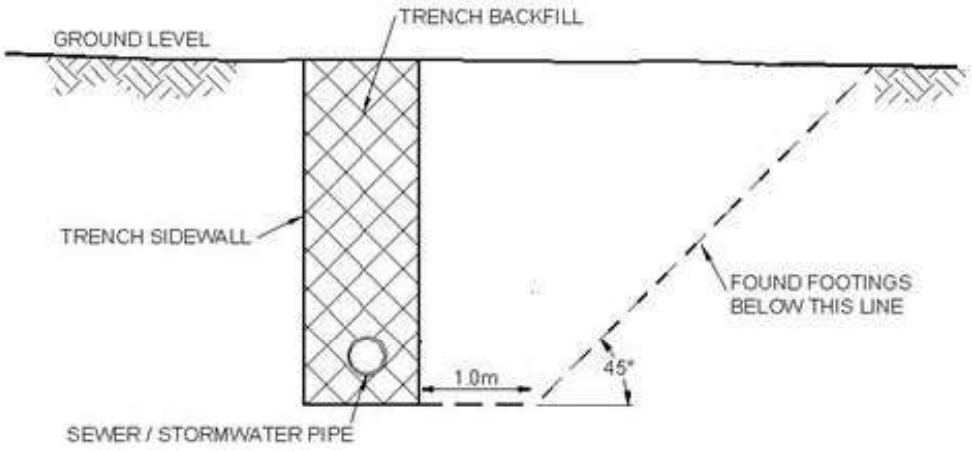


Diagram 1: Exclusion zone for base of footings.

6.4 Retaining Structures

The design of 'flexible' retaining walls may be undertaken using a triangular pressure distribution and the earth pressure coefficients provided in Table 2.

Flexible walls are those which are free to rotate or tilt (i.e. cantilevered walls or single anchored or propped walls) and should be designed using an 'active' earth pressure coefficient (K_a). Where the walls are rigid and cannot rotate or tilt, then an 'at-rest' earth pressure coefficient (K_0) should be used. Passive pressure should be ignored where there is potential for in-ground services trenches (or similar) in front of the wall.

If appropriate, an allowance of 10 kPa should be made for lateral stress induced by compaction plant operating behind the walls. The effects of surcharge should be included by multiplying the vertical pressure developed by the surcharge by the appropriate lateral earth pressure coefficient from Table 2. Allowance should be made for sloping backfill if applicable.

Retaining wall footing recommendations are provided in Section 6.3.

Table 2: Geotechnical design parameters.

Retained material	Unit weight (t/m^3)	Friction angle (degrees)	Cohesion, c_u (kPa)	Lateral earth pressure coefficient		
				Yielding		Non-yielding
				K_a (cantilever)	K_p	K_o
Firm clay	1.8	23	50	0.46	2.20	0.63
Stiff clay	1.8	25	100	0.41	2.46	0.58
Very stiff clay	1.9	28	200	0.36	2.77	0.53
Loose sand	1.7	27	N/A	0.41	2.46	0.58
Medium dense (or denser) sand	1.9	33	N/A	0.3	3.33	0.45
Rock fill (future)	2.4	37	N/A	0.26	3.85	0.41

Notes:
K_a - active; K_o - at rest; K_p - passive

For yielding walls active state develops when: Deflection > 0.001H to 0.004H (granular soil), or deflection > 0.01H to 0.04H (cohesive soil)

7.0 LIMITATIONS

Should you require any further information please contact the undersigned. We draw your attention to the document, Limitations, which is included in Appendix C.

Core Consultants Pty Ltd

Walter Mastenbroek
MEngPr MSc (Hons) NER CPEng RPEQ 16149
Associate/Senior Geotechnical Engineer

Geoff Hurley
MSc DIC C.Geol RPEQ 5716
Managing Director

WM/GAH/wm

A.B.N. 75 603 384 050

LEGEND

- Denotes approximate borehole location
- Denotes approximate dynamic cone penetration test location

Aerial image sourced from Nearmap Pty Ltd, image dated 24 September 2020. Annotations by Core Consultants Pty Ltd.

core consultants pty ltd
clarity • commitment • passion
www.coreconsultants.com.au

CLIENT: PROJEX PARTNERS				PROJECT: VEHICLE FERRY TERMINAL - WEINAM STREET, REDLAND BAY					
DRAWN BY: MC	DATE: 28/10/2020			DRAWING TITLE: TEST LOCATION PLAN					
CHECKED BY: WM	DATE: 28/10/2020								
SCALE: 1:400	SHEET SIZE: A3	PROJECT No: J001183	DOC No: 001	DOC TYPE: R	FIGURE No: 001	REVISION: 0	SHEET 1 OF 1		

Plot Date: 28 October 2020 Time:8:43:11 AM By: CAD Path: J:\2020 - J1040 -\J001183 - Projex-Vehicle Ferry Terminal-Redlands Bay\PHASE 1000\Figures Drawings - File Name:J001183-001-R-Rev0-F001.dwg

Appendix A

Reports of Boreholes, DCP's and Explanatory Notes

REPORT OF BOREHOLE: BH1

core consultants pty ltd

Client	Projex Partners	East	530542.0 m	Sheet	1 OF 3
Project	Vehicle Ferry Terminal	North	6945384.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L	29/09/20	0	0.10				GP-GC	FILL Sandy GRAVEL with clay: fine to medium grained, poorly graded, angular, brown; sand fine to medium grained, poorly graded; clay medium plasticity.	D - M w ≈ PL	VD St	FILL
				0.30				CI				
			1					GP-GC	FILL Silty CLAY with sand trace gravel: medium plasticity, red brown; sand fine to medium grained; gravel fine grained, sub-angular.			
									FILL Sandy GRAVEL with clay: fine to medium grained, poorly graded, sub-angular, pale brown; sand fine to coarse grained, well graded, sub-angular; clay medium plasticity.	M	D	
	H	at 2 m depth			SPT 1.00-1.45 m 11,16,16 N=32							
			2									
		Groundwater seepage encountered		2.50	SPT 2.50-2.95 m 4,2,2 N=4			GP	FILL Sandy GRAVEL: fine to medium grained, poorly graded, sub-angular, pale brown; sand fine to coarse grained, well graded, sub-angular.	W	VL - L	
			3	3.20				CI	Silty CLAY (ESTUARINE SOIL) with sand: medium plasticity, dark grey; sand fine to medium grained.		F	
				3.50				CI-CH	CLAY (RESIDUAL SOIL) with sand trace gravel: medium to high plasticity, pale brown, pale blue grey and orange brown; sand fine to coarse grained, sub-angular; gravel fine to medium grained, sub-angular.			
			4		SPT 4.00-4.45 m 6,5,3 N=8						F - St	
WB			5									
	L	Not observed due to the introduction of drilling fluids below 2.5 m depth		5.50	U50 5.50-5.87 m PP =250 kPa				Mottled pale blue grey and orange brown.	w ≈ PL	St	
			6									
				7.00								
			7		SPT 7.00-7.45 m 3,4,3 N=7			CH-MH	Clayey SILT (RESIDUAL SOIL) with sand trace gravel: high plasticity, pale grey to pale green grey and mottled orange brown; sand fine grained; gravel fine to medium grained, sub-angular.		F	
			8									

REPORT OF BOREHOLE: BH1

core consultants pty ltd

Client	Projex Partners	East	530542.0 m	Sheet	2 OF 3
Project	Vehicle Ferry Terminal	North	6945384.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	8					CH-MH	Clayey SILT (RESIDUAL SOIL) with sand trace gravel: high plasticity, pale grey to pale green grey and mottled orange brown; sand fine grained; gravel fine to medium grained, sub-angular.			
					U50 8.50-8.98 m PP =90 kPa							
			9									
			10	10.00	SPT 10.00-10.45 m 1,1,2 N=3				Mottled orange brown and pale grey to pale green grey.		F	
					U50 10.50-10.96 m PP =110 kPa					w ≈ PL		
			11									
					SPT 11.50-11.95 m 1,1,2 N=3							
			12									
			13	13.00	SPT 13.00-13.45 m 2,4,7 N=11			ML	Sandy SILT (RESIDUAL SOIL): low plasticity, brown to orange brown and mottled pale green grey; sand fine to medium grained, poorly graded.		St	
	L-M		14	14.50	SPT 14.50-14.95 m 10,21,29 N=50			SM	Silty SAND (RESIDUAL SOIL): fine to medium grained, poorly graded, grey brown and mottled orange brown.	M	D	
			15									
			16	16.00								

REPORT OF BOREHOLE: BH1

core consultants pty ltd

Client	Projex Partners	East	530542.0 m	Sheet	3 OF 3
Project	Vehicle Ferry Terminal	North	6945384.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L-M		16	*16.45*	SPT 16.00-16.45 m 4,14,12 N=26			CI	Sandy CLAY (RESIDUAL SOIL) trace gravel: medium plasticity, pale brown and red brown; sand fine to medium grained, poorly graded; gravel fine to medium grained, angular; tending to extremely weathered material.	w ≈ PL	VSt	
									Hole Terminated at 16.45 m Target depth Backfilled			

17 18 19 20 21 22 23 24

This report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: BH2

core consultants pty ltd

Client	Projex Partners	East	530475.0 m	Sheet	1 OF 3
Project	Vehicle Ferry Terminal	North	6945351.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L-M	29/09/20	0					GP-GC	BITUMEN WEARING SURFACE.			FILL
				0.60					FILL Sandy GRAVEL with clay: fine to medium grained, poorly graded, sub-angular, brown; sand fine to coarse grained, well graded, sub-angular; clay medium plasticity.			
			1		SPT 1.00-1.45 m 6,17,14 N=31			SC	FILL Clayey SAND: fine to coarse grained, well graded, sub-angular, dark brown; clay medium plasticity.	M	D	
				1.30					Grey brown; interbedded layers of sandy clay.			
		Groundwater seepage encountered at 1.8 m depth		1.80				GC	Possibly FILL Clayey GRAVEL with sand: fine to medium grained, poorly graded, sub-angular to angular, red brown; clay medium plasticity; sand fine to coarse grained, sub-angular.	W	MD	
			2	2.40								
WB	L				SPT 2.50-2.95 m 2,5,8 N=13			CH	Possibly FILL CLAY trace sand trace gravel: high plasticity, pale grey mottled orange brown and red brown; sand fine to medium grained; gravel fine to medium grained, sub-angular.		St	
			3									
				4.00								
			4		SPT 4.00-4.45 m 3,5,3 N=8			CI-CH	CLAY (RESIDUAL SOIL) trace sand trace gravel: medium to high plasticity, mottled pale grey, pale brown, orange brown and green grey; sand fine to medium grained; gravel fine to medium grained, sub-angular to angular.		F - St	
			5							w ≈ PL		
				5.50								
			6		SPT 5.50-5.95 m 2,3,6 N=9			CI	Silty CLAY (RESIDUAL SOIL) trace sand: medium plasticity, grey to pale green grey and mottled orange brown; sand fine to coarse grained, sub-angular.		St	
				7.00								
			7		SPT 7.00-7.45 m 2,3,4 N=7				Pale blue grey and mottled green grey.		F	
			8									

Not observed due to the introduction of drilling fluids below 2.5 m depth

This report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

REPORT OF BOREHOLE: BH2

core consultants pty ltd

Client	Projex Partners	East	530475.0 m	Sheet	2 OF 3
Project	Vehicle Ferry Terminal	North	6945351.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	8					CI	Silty CLAY (RESIDUAL SOIL) trace sand: medium plasticity, grey to pale green grey and mottled orange brown; sand fine to coarse grained, sub-angular.			
				8.50								
					SPT 8.50-8.95 m 1,2,3 N=5			MH	Clayey SILT (RESIDUAL SOIL) with sand: high plasticity, pale blue grey and mottled orange brown; sand fine to medium grained.		F	
			9									
				10.00								
			10		U50 10.00-10.45 m PP >600 kPa				With sand: dark red brown and mottled white; sand fine grained; increase in sand content.			
			11								St	
					SPT 11.50-11.95 m 3,4,7 N=11							
				11.80						w ≈ PL		
			12						Pale blue grey and mottled orange brown; decrease in sand content.			
				13.00								
			13		SPT 13.00-13.45 m 3,2,4 N=6				Grey brown mottled orange brown, black and pale blue grey; increase in sand content.			
			14									
				14.50								
					SPT 14.50-14.95 m 1,3,3 N=6				Brown to orange brown and pale blue grey.		F	
			15									
				16.00								

REPORT OF BOREHOLE: BH2

core consultants pty ltd

Client	Projex Partners	East	530475.0 m	Sheet	3 OF 3
Project	Vehicle Ferry Terminal	North	6945351.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	29/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	16		SPT 16.00-16.45 m 1,1,2 N=3			MH	Clayey SILT (RESIDUAL SOIL) with sand: high plasticity, pale blue grey and mottled orange brown; sand fine to medium grained. Grey brown mottled orange brown and pale grey.	w ≈ PL	F	
					U50 16.50-16.99 m PP =200 kPa						St	
			17	17.50	SPT 17.50-17.95 m 1,1,1 N=2			ML	Sandy SILT (RESIDUAL SOIL): low plasticity, grey brown mottled orange brown and black; sand fine to medium grained, poorly graded.		S - F	
			18									
			19	19.00	SPT 19.00-19.45 m 7,8,11 N=19			SM	Silty SAND (RESIDUAL SOIL) trace gravel: fine to medium grained, poorly graded, grey brown mottled orange brown and black; gravel fine grained, sub-angular.		MD	
	L-M		20	20.50	SPT 20.50-20.95 m 11,21,27 N=48				Trace gravel: gravel fine grained, sub-rounded; increase in silt content.	M - W	D	
			21									
	M		22	22.00	SPT 22.00-22.07 m 30/70mm HB			CL	Silty CLAY (EXTREMELY WEATHERED MATERIAL) with sand: low plasticity, grey brown and mottled orange brown; sand fine to medium grained; remnant rock structure evident.	w < PL	H	
									Hole Terminated at 22.07 m Target depth Backfilled			
			23									
			24									

REPORT OF BOREHOLE: BH3

core consultants pty ltd

Client	Projex Partners	East	530529.0 m	Sheet	1 OF 2
Project	Vehicle Ferry Terminal	North	6945348.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	30/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	H	Groundwater seepage encountered at 1.7 m depth 28/9/20	0	0.30				CI	FILL Sandy CLAY trace gravel: medium plasticity, dark red brown; sand fine to medium grained, poorly graded; gravel fine to medium grained, sub-rounded.	w < PL	St	FILL
								GP	FILL Sandy GRAVEL: fine to medium grained, poorly graded, sub-angular to angular, brown; sand fine to medium grained, poorly graded.	D - M	VD	
			1	1.00	SPT 1.00-1.45 m 5,3,2 N=5			GC	FILL Clayey GRAVEL with sand trace cobbles: medium to coarse grained, poorly graded, sub-angular to angular, brown to orange brown and grey; clay medium plasticity; sand fine to coarse grained, angular; cobbles probable.	M	L	
			2	2.20					Grey; tending to clay.	M - W		
				2.50	SPT 2.50-2.95 m 2,7,8 N=15			CH	Possibly FILL Gravelly CLAY: high plasticity, red brown mottled pale grey and yellow brown; gravel fine to medium grained, poorly graded, sub-rounded.		St - VSt	
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	3									
			4	4.00	SPT 4.00-4.45 m 5,11,13 N=24				With sand: dark red brown mottled pale grey and orange brown; sand fine to coarse grained, sub-angular; decrease in gravel content.	w ≈ PL		
			5									
				5.50	SPT 5.50-5.95 m 4,8,11 N=19			CH	Silty CLAY (RESIDUAL SOIL) trace sand: high plasticity, pale blue grey mottled orange brown and red brown; sand fine to medium grained.		VSt	
			6									
				7.00	SPT 7.00-7.45 m 2,3,5 N=8			CI	Silty CLAY (RESIDUAL SOIL): medium plasticity, mottled white, pale brown and pale green grey and orange brown.		F - St	
			7									
			8									

REPORT OF BOREHOLE: BH3

core consultants pty ltd

Client	Projex Partners	East	530529.0 m	Sheet	2 OF 2
Project	Vehicle Ferry Terminal	North	6945348.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	30/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	8					CI	Silty CLAY (RESIDUAL SOIL): medium plasticity, mottled white, pale brown and pale green grey and orange brown.		F - St	
				8.50	SPT 8.50-8.95 m 2,2,3 N=5			MH	Clayey SILT (RESIDUAL SOIL) trace sand trace gravel: high plasticity, grey to pale grey mottled orange brown and pale green grey; sand fine to medium grained; gravel fine grained, sub-rounded.	w ≈ PL	F	
			9									
			10	10.00	U50 10.00-10.46 m PP =300 kPa				Dark red brown; fine grained sand.			
			11									
				11.50	SPT 11.50-11.95 m 6,9,10 N=19				Dark brown to dark red brown mottled pale brown and white.		VSt	
			12									
			13	13.00	SPT 13.00-13.45 m 5,9,13 N=22				Dark brown to dark red brown mottled pale brown, white and grey.	w ≈ PL - w < PL		
			14									
				14.50	SPT 14.50-14.95 m 8,12,16 N=28				Grey brown mottled orange brown, white and black; tending to silty clayey sand.			
				14.95								
			15						Hole Terminated at 14.95 m Target depth Backfilled			
			16									

REPORT OF BOREHOLE: BH4

core consultants pty ltd

Client	Projex Partners	East	530492.0 m	Sheet	1 OF 3
Project	Vehicle Ferry Terminal	North	6945337.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	30/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	H		0					GP	FILL GRAVEL with sand: medium to coarse grained, poorly graded, sub-angular to angular, grey; sand fine to coarse grained, angular.	D	VD	FILL
				0.40				CI	FILL Sandy CLAY: medium plasticity, dark brown; sand fine to medium grained, poorly graded.	w < PL	St	
				0.60				GW	FILL Sandy GRAVEL: fine to coarse grained, well graded, sub-angular to angular, brown to orange brown; sand fine to medium grained, poorly graded.	D - M		
			1	1.00	SPT 1.00-1.45 m 7,9,10 N=19			GC	FILL Clayey GRAVEL with sand: fine to coarse grained, well graded, sub-angular to angular, orange brown and pale grey; clay medium plasticity; sand fine to medium grained.	M	MD	
				1.60				CH	FILL Sandy CLAY trace gravel: high plasticity, mottled pale blue grey, green grey and orange brown; sand fine to coarse grained, well graded, sub-angular; gravel fine to medium grained, sub-angular.			
			2									
				2.50	SPT 2.50-2.95 m 2,4,7 N=11			CH	Possibly FILL CLAY with gravel trace sand: high plasticity, red brown mottled pale grey and orange brown; gravel fine to coarse grained, sub-angular to angular; sand fine to medium grained.		St	
			3									
				4.00	SPT 4.00-4.45 m 5,6,6 N=12			CI-CH	Silty CLAY (RESIDUAL SOIL) with sand trace gravel: medium to high plasticity, mottled pale brown, pale blue grey, green grey, white and orange brown; sand fine to medium grained; gravel fine to medium grained, sub-angular.	w ≈ PL		
WB	F	Groundwater seepage encountered at 1.6 m depth Not observed due to the introduction of drilling fluids below 2.5 m depth	4									
			5									
				5.50	SPT 5.50-5.95 m 2,3,5 N=8			MH	Clayey SILT (RESIDUAL SOIL) trace sand trace gravel: high plasticity, mottled pale green grey, white, pale brown and orange brown; sand fine grained; gravel medium grained, sub-rounded.		F - St	
			6									
			7		U50 7.00-7.35 m PP =300 kPa						St	
			8									

REPORT OF BOREHOLE: BH4

core consultants pty ltd

Client	Projex Partners	East	530492.0 m	Sheet	2 OF 3
Project	Vehicle Ferry Terminal	North	6945337.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	30/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	8	8.50	SPT 8.50-8.95 m 1,2,3 N=5			MH	Clayey SILT (RESIDUAL SOIL) trace sand trace gravel: high plasticity, mottled pale green grey, white, pale brown and orange brown; sand fine grained; gravel medium grained, sub-rounded.		St	
			9						Orange brown mottled red brown and pale blue grey.		F	
			10	10.00	SPT 10.00-10.45 m 3,5,7 N=12				Dark red brown mottled white; decrease in silt and sand content.		St	
			11	11.50	SPT 11.50-11.95 m 1,2,3 N=5				Dark red brown mottled white and green; interbedded lenses of sandy silt.	w ≈ PL		
			12									
			13	13.00	SPT 13.00-13.45 m 1,3,3 N=6				Trace gravel: brown to dark red brown mottled orange brown, white and pale green grey; gravel fine to medium grained, sub-angular.		F	
			14		SPT 14.50-14.95 m 1,3,3 N=6							
			15									
			16	16.00								

REPORT OF BOREHOLE: BH4

core consultants pty ltd

Client	Projex Partners	East	530492.0 m	Sheet	3 OF 3
Project	Vehicle Ferry Terminal	North	6945337.0 m MGA94 Zone 56	Logged:	MC
Location	Weinam Street, Redland Bay	Contractor	Redlands Drilling	Logged Date:	30/09/20
Job No.	J001183	Drill Rig	RD2 Mobile B40L	Checked:	WM
		Inclination	-90°	Checked Date:	28/10/20

Drilling					Sampling		Field Material Description					
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
WB	L	Not observed due to the introduction of drilling fluids below 2.5 m depth	16		SPT 16.00-16.45 m 1,3,4 N=7			MH	Clayey SILT (RESIDUAL SOIL) trace sand trace gravel: high plasticity, mottled pale green grey, white, pale brown and orange brown; sand fine grained; gravel medium grained, sub-rounded. Orange brown mottled white and dark red brown.	w < PL	F	
			17		U50 17.50-17.99 m PP =240 kPa							
			18									
			19	19.00	SPT 19.00-19.45 m 3,6,10 N=16				Grey brown mottled white, orange brown and pale green grey.		VSt	
			20									
	M		21	20.50	SPT 20.50-20.95 m 8,23,26 N=49			SM	Silty SAND (RESIDUAL SOIL): fine grained, uniformly graded, dark red brown mottled white and orange brown.	D - M	D	
	H		22	21.50					BASALT: fine to medium grained, dark red brown mottled white and orange brown, very low strength, highly weathered.	D		
				22.09	SPT 22.00-22.09 m 30/90mm HB				Hole Terminated at 22.09 m Target depth Backfilled			
			23									
			24									

This report must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

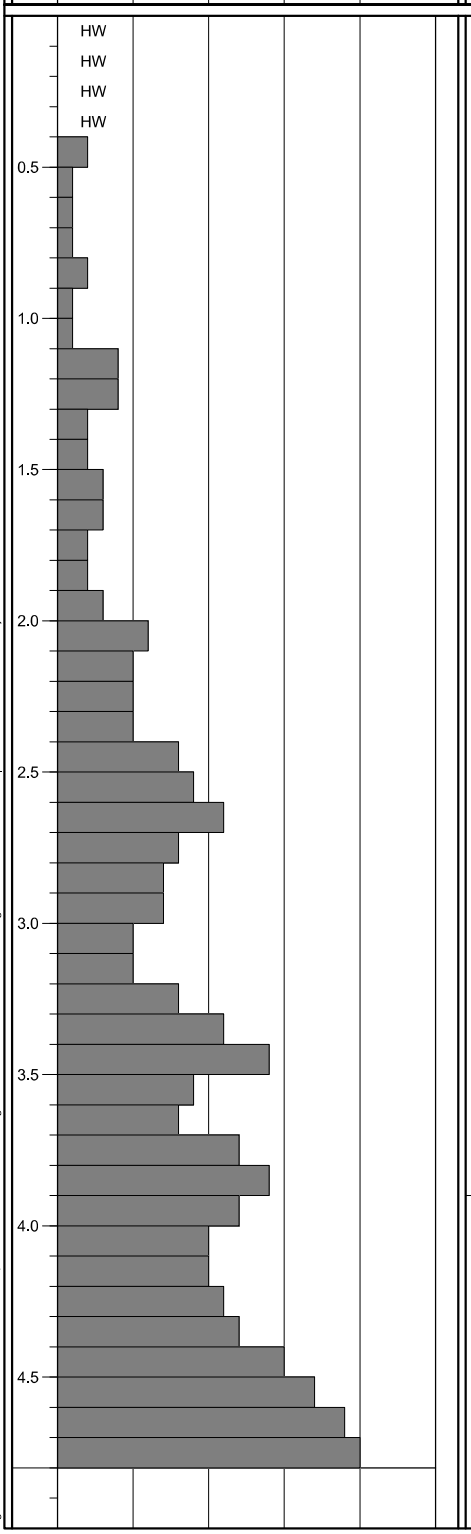
core
consultants pty ltd

CLIENT : Projex Partners CONTRACTOR : Core Consultants PROJECT : Vehicle Ferry Terminal LOCATION : Weinam Street, Redland Bay PROJECT No. : J001183		SHEET : 1 OF 2

TEST: DCP1

LOGGED: MC 29/9/2020
EASTING: 530495.0 m NORTHING: 6945366.0 m
MGA94 Zone 56

Blows per 100 mm (AS 1289.6.3.2-1997)

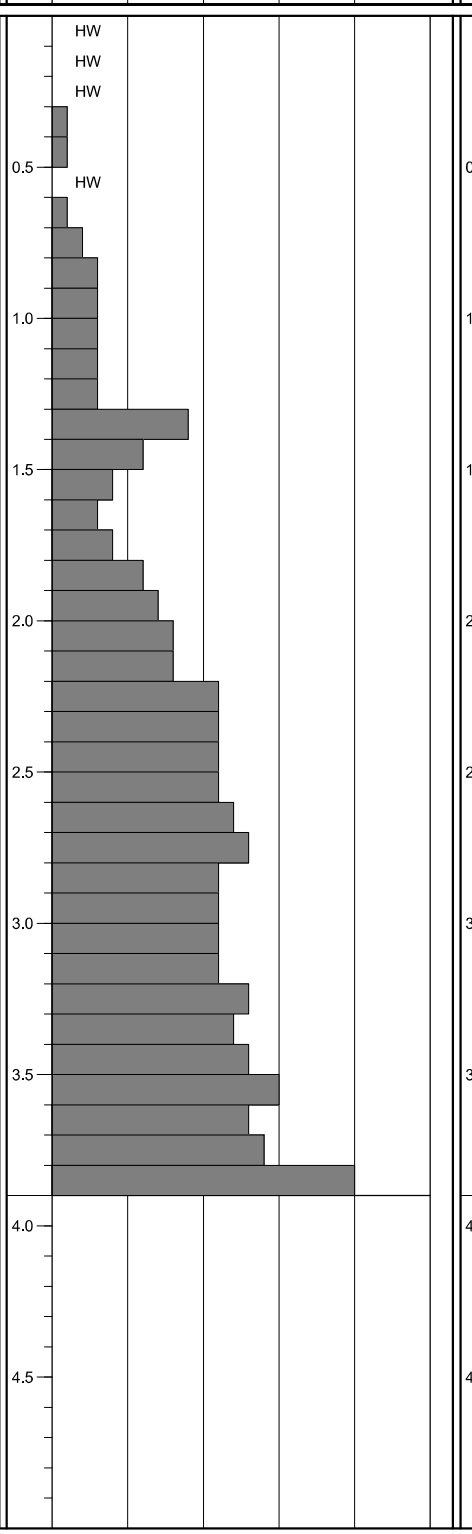


Comments

TEST: DCP2

LOGGED: MC 29/9/2020
EASTING: 530546.0 m NORTHING: 6945399.0 m
MGA94 Zone 56

Blows per 100 mm (AS 1289.6.3.2-1997)

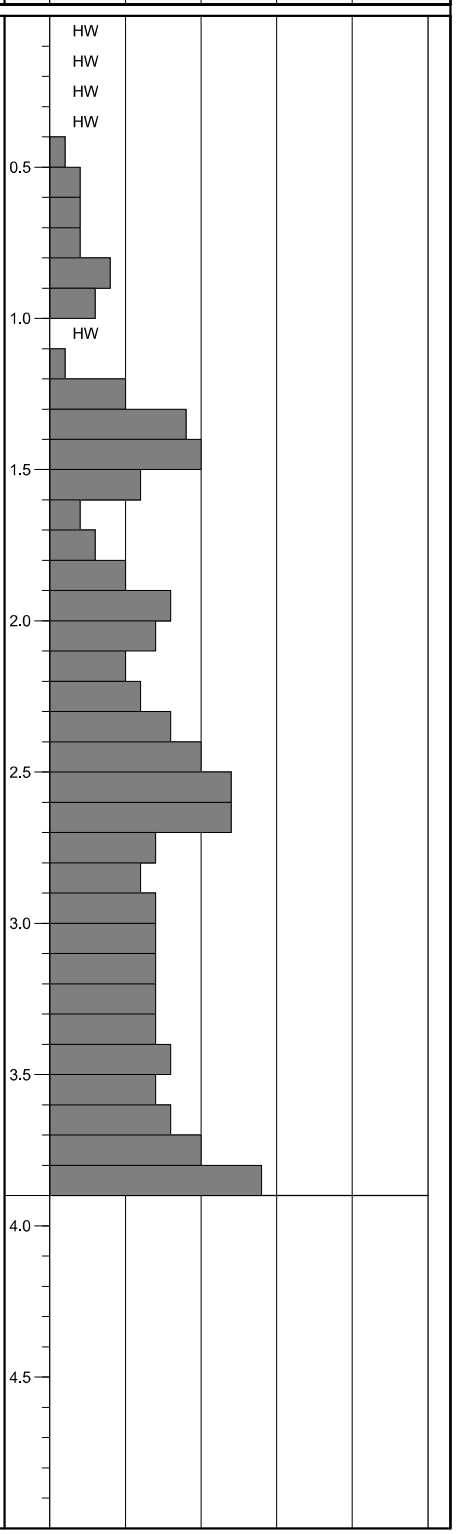


Comments

TEST: DCP3

LOGGED: MC 29/9/2020
EASTING: 530510.0 m NORTHING: 6945380.0 m
MGA94 Zone 56

Blows per 100 mm (AS 1289.6.3.2-1997)



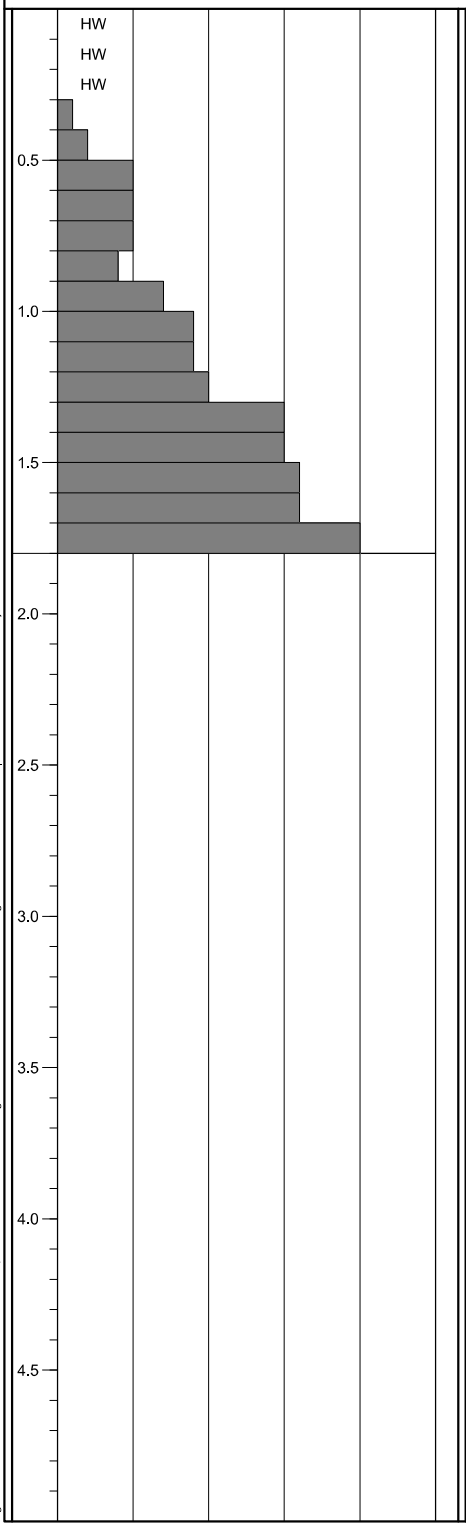
Comments

CLIENT : Projex Partners CONTRACTOR : Core Consultants PROJECT : Vehicle Ferry Terminal LOCATION : Weinam Street, Redland Bay PROJECT No. : J001183		SHEET : 2 OF 2

TEST: DCP4

LOGGED: MC 29/9/2020
EASTING: 530550.0 m NORTHING: 6945353.0 m
MGA94 Zone 56

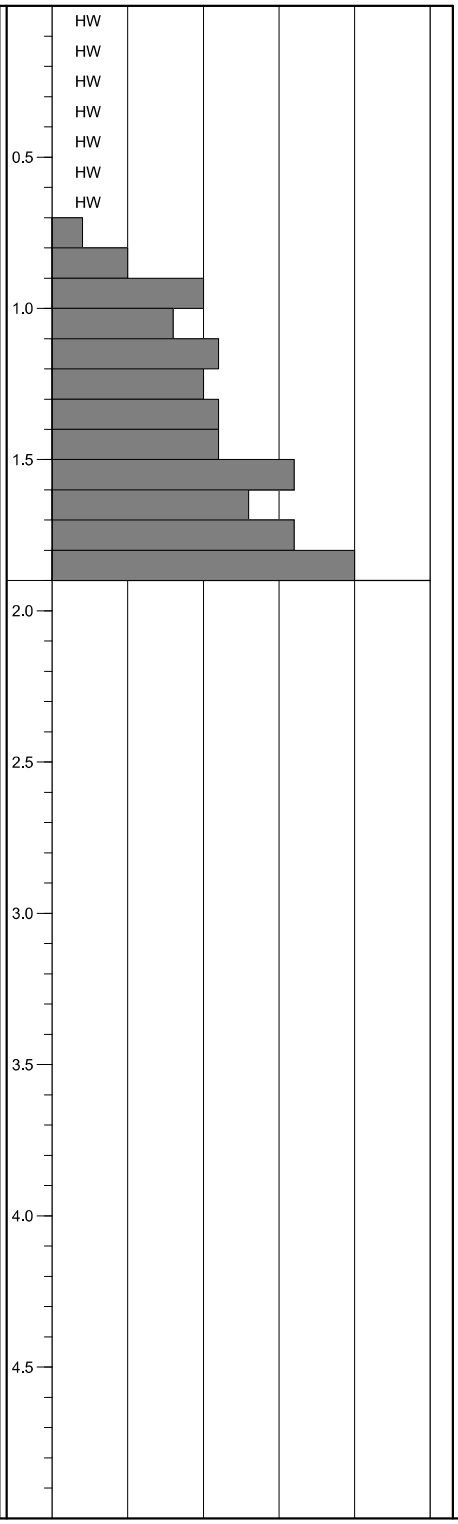
Blows per 100 mm (AS 1289.6.3.2-1997)



TEST: DCP5

LOGGED: MC 29/9/2020
EASTING: 530520.0 m NORTHING: 6945343.0 m
MGA94 Zone 56

Blows per 100 mm (AS 1289.6.3.2-1997)



Comments	Comments	

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS	Auger Screwing	RD	Rotary blade or drag bit	NQ	Diamond Core - 47 mm
AD	Auger Drilling	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
*V	V - Bit	RAB	Rotary Air Blast	HQ	Diamond Core - 63 mm
T	TC - Bit, e.g. ADT	RC	Reverse Circulation	HMLC	Diamond Core – 63mm
HA	Hand Auger	PT	Push Tube	BH	Tractor Mounted Backhoe
ADH	Hollow Auger	CT	Cable Tool Rig	EX	Tracked Hydraulic Excavator
DTC	Diatubre Coring	JET	Jetting	EE	Existing Excavation
WB	Washbore or Bailer	NDD	Non-destructive digging	HAND	Excavated by Hand Methods

PENETRATION/EXCAVATION RESISTANCE

L **Low resistance .** Rapid penetration possible with little effort from the equipment used

M **Medium resistance.** Excavation possible at an acceptable rate with moderate effort from equipment used

H **High resistance to penetration/excavation.** Further penetration is possible at a slow rate

R **Refusal or Practical Refusal.** No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

▽	Water level shown at date	◁	Partial water loss
▷	Water inflow	◀	Complete water loss

GROUNDWATER NOT OBSERVED	The observation of groundwater whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.
GROUND WATER NOT ENCOUNTERED	The borehole/test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed Sample
BDS	Bulk disturbed sample
G	Gas Sample
W	Water sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as uncorrected shear strength (sv = peak value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test expressed as instrument reading in kPa
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres
WPT	Water pressure tests
DCP	Dynamic cone penetration test
CPT	Dynamic cone penetration test
CPTu	Static cone penetration test with pore pressure (u) measurement

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)

$$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

SCR = Solid Core Recovery (%)

$$= \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100$$

RQD = Rock Quantity Designation (%)

$$= \frac{\sum \text{Axial lengths of core} > 100\text{ mm}}{\text{Length of core run}} \times 100$$

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS

	FILL		CLAY (CL,CI, or CH)
	GRAVEL (GP or SW)		ORGANIC SOILS (OL or OH or Pt)
	SAND (SP or SW)		COBBLES or BOULDERS
	SILT (ML or MH)		

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

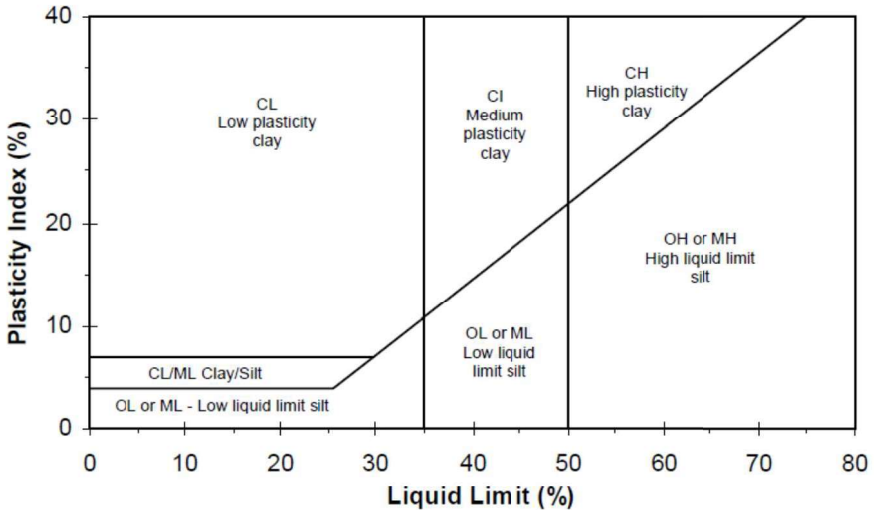
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS 1726 - 2017. The material properties are assessed in the field by visual/tactile methods.

PARTICLE SIZE

Major Division	Sub Division	Particle Size
Boulders		>200 mm
Cobbles		63 - 200 mm
Gravel	Coarse	20 - 63 mm
Gravel	Medium	6.7 - 20 mm
Gravel	Fine	2.36 - 6.7 mm
Sand	Coarse	0.6 - 2.36 mm
Sand	Medium	0.21 - 0.6 mm
Sand	Fine	0.075 - 0.21 mm
Silt		0.002 - 0.075 mm
Clay		<0.002 mm

PLASTIC PROPERTIES



MOISTURE CONDITION FOR COARSE GRAINED SOIL — AS 1726 - 2017

Symbol	Term	Description
D	Dry	Non-cohesive and free running
M	Moist	Soil feels cool, darkened in colour, tends to stick together
W	Wet	Soil feels cool, darkened in colour, soil sticks together, free water forms when handling

MOISTURE CONDITION FOR FINE GRAINED SOIL — AS1726 - 2017

Symbol	Term	Description
W<PL	Moist dry of liquid limit	Hard and friable or powdery
W = PL	Moist near plastic limit	Soils can be molded at a moisture condition approximately equal to the plastic limit
W >PL	Moist, wet of plastic limit	Soils usually weakened and free water forms on hands when handling
W = LL	Wet near plastic limit	
W > LL	Wet, wet of liquid limit	

CONSISTENCY TERMS FOR COHESIVE SOILS — AS1726—2017

Symbol	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa
H	Hard	Above 200 kPa

RELATIVE DENSITY OF COARSE GRAINED SOILS — AS1726—2017

Symbol	Term	Density Index %	SPT 'N' #
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

core consultants pty ltd

TERMS FOR ROCK MATERIAL STRENGTH & WEATHERING AND ABBREVIATIONS FOR DEFECT DESCRIPTIONS

ROCK MATERIAL STRENGTH CLASSIFICATION			AS1726—2017	
Symbol	**Term**	**Uniaxial Compressive Strength (MPa)**	**Point Load Strength $I_{s\ (50)}$ (MPa)**	**Field Guide**
VL	Very Low Strength	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick. Pieces up to 30 mm thick can be broken with finger pressure.
L	Low Strength	2 to 6	0.1 to 0.3	Easily scored with knife. Indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point. A piece of core 150 mm by 50 mm may be broken by hand. Sharp edges of core are friable and break during handling.
M	Medium Strength	6 to 20	0.3 to 1	Readily scored with a knife. A piece of core 150 mm by 50 mm can be broken by hand with difficulty.
H	High Strength	20 to 60	1 to 3	A piece of core 150 mm by 50 mm cannot be broken by hand but can be broken by a pick with a single firm blow. Rock rings under hammer.
VH	Very High Strength	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow. Rock rings under hammer.
EH	Extremely High Strength	Above 200	Above 10	Specimen requires many blows with geological pick to break through intact material. Rock rings under hammer.

● = Diametral Point Load Test ▼ = Axial Point Load Test

CLASSIFICATION OF MATERIAL WEATHERING		AS1726—2017
Symbol	**Term**	**Field Guide**
RS	Residual Soil *(Note 1)*	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible but the soil has not been significantly transported.
XW	Extremely Weathered *(Note 1)*	Material is weathered to such an extent that is has soil properties. Mass structure and material texture and fabric of original rock are still visible.
HW	Highly Weathered *(Note 2)*	The whole rock mass is discoloured, usually by iron staining or beaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
MH	Moderately Weathered *(Note 2)*	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change in strength from fresh rock.
SW	Slightly Weathered	Pock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
FR	Fresh	Rock shows no signs of decomposition of individual minerals or colour change.
Note 1	The term 'Extremely Weathered rock' is misleading as the material has soil properties. The word 'rock' should be replaced with the name of the original rock of the word 'material', eg. Extremely Weathered granite or Extremely Weathered material.	
Note 2	Where it is not possible to distinguish between 'Highly Weathered' and 'Moderately Weathered' rock the term 'Distinctly Weathered' may be used.	

DEFECT TYPE/DESCRIPTION			
B	Bedding Parting	V	Vein
J	Joint	HB/DB	Handling/Drilling Break
EW	Extremely Weathered Seam	C	Contact
FZ	Fracture Zone	L	Cleavage
CZ/S	Crushed Zone/Seam	X	Foliation
IS	Infilled Seam	S	Schistocity
SZ/S	Sheared Zone/Seam		

DEFECT PROFILE	
Symbol	**Description**
PL	Planar
St	Stepped
Un	Undulating

DEFECT INFILL DESCRIPTION	
Symbol	**Description**
Cn	Clean: No visible coating
Sn	Stain: Coated 1 to 3 mm
Vr	Veneer: < 1 mm
Ct	Coating: 1 to 3 mm

DEFECT ROUGHNESS DESCRIPTION	
Symbol	**Description**
Sl	Slickenside
Sm	Smooth
Ro	Rough

Vertical Boreholes - The dip (inclination from horizontal) for the defect is given.

Inclined Boreholes - The inclination is measured as the acute angle to the core axis.

Appendix B
Laboratory Test Results

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03082-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

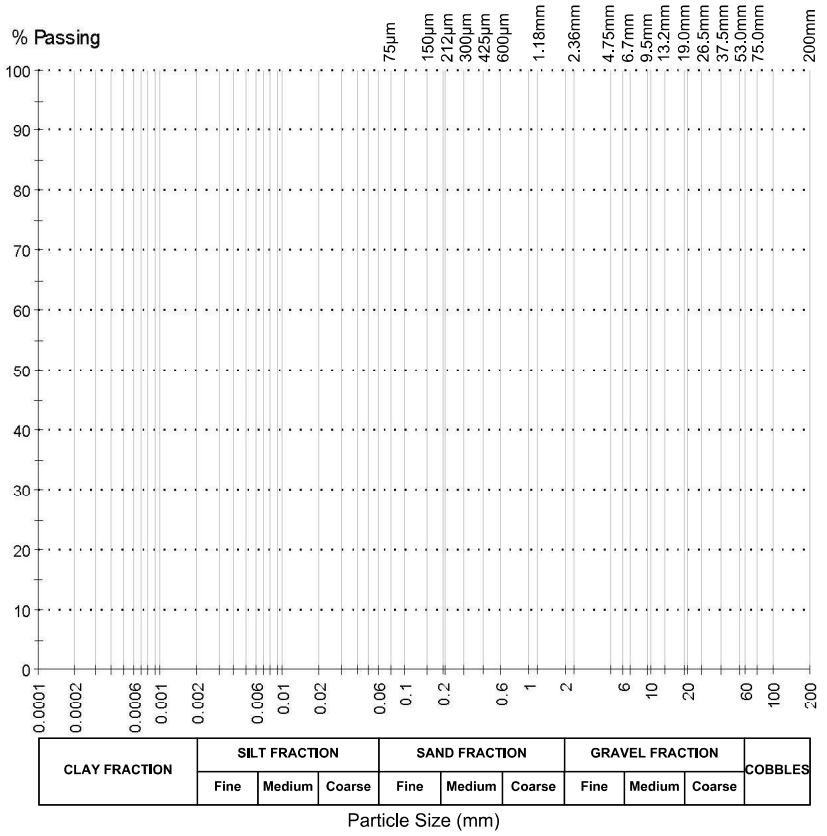
Sample ID: BRIS20S-03082
Client Sample:
Date Sampled: 29/09/2020
Source: On site
Material: In Situ
Specification: AS Grading
Sampling Method: Submitted by client
Project Location: Weinam Street, Redland Bay
Sample Location: BH1 - SPT (10.0-10.45m)

Sample Description:

Atterberg Limit:

Liquid Limit: 75
Plastic Limit: 34
Plasticity Index: 41
Linear Shrinkage (%): 18.0

Particle Size Distribution



Grading: AS 1289.3.6.1

Drying by: Oven
Date Tested: 13/10/2020

Note: Sample Washed

Sieve Size	% Passing	Limits
75µm	70	

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03082-1
Issue No: 1

Material Test Report

Client:	Core Consultants Pty Ltd 52 Second Avenue Maroochydore QLD 4558
Principal:	
Project No.:	TESTBRIS00119AA
Project Name:	J001183 - Vehicle Ferry Terminal
Lot No.:	**TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID:	BRIS20S-03082
Client Sample:	
Date Sampled:	29/09/2020
Source:	On site
Material:	In Situ
Specification:	AS Grading
Sampling Method:	Submitted by client
Project Location:	Weinam Street, Redland Bay
Sample Location:	BH1 - SPT (10.0-10.45m)

Other Test Results

Description	Method	Limits	Result
Moisture Content (%)	AS 1289.2.1.1		65.0
Date Tested			8/10/2020
Sample History	AS 1289.1.1		Oven-dried
Preparation	AS 1289.1.1		Dry Sieved
Linear Shrinkage (%)	AS 1289.3.4.1		18.0
Mould Length (mm)			150.3
Crumbling			No
Curling			Yes
Cracking			Yes
Liquid Limit (%)	AS 1289.3.1.2		75
Plastic Limit (%)	AS 1289.3.2.1		34
Plasticity Index (%)	AS 1289.3.3.1		41
Date Tested			14/10/2020

Comments

N/A

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03083-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

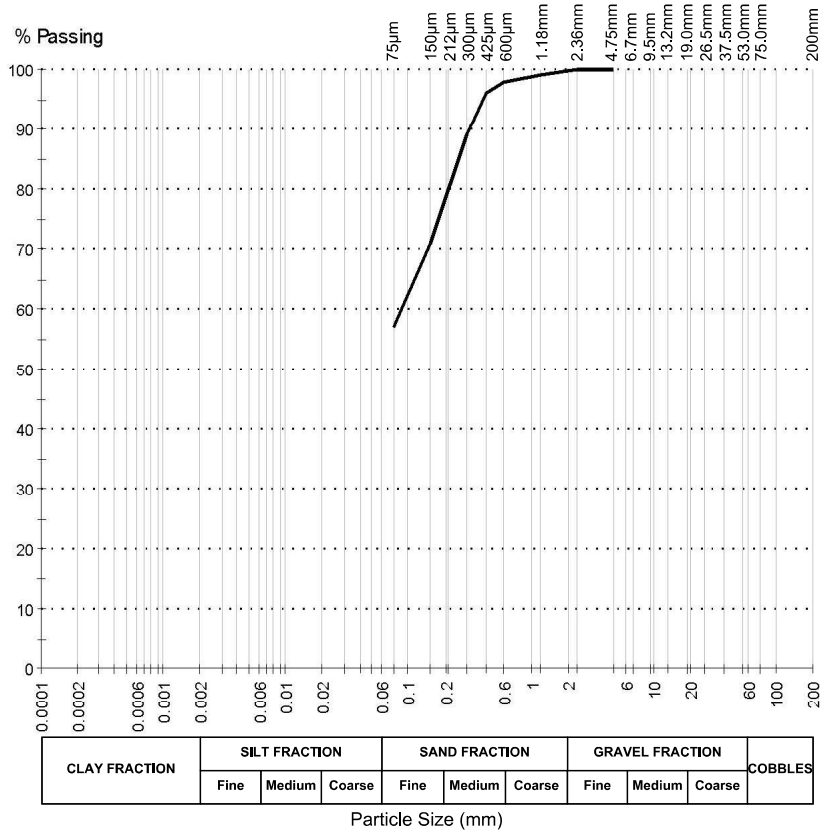
Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID:	BRIS20S-03083
Client Sample:	
Date Sampled:	29/09/2020
Source:	On site
Material:	In Situ
Specification:	AS Grading
Sampling Method:	Submitted by client
Project Location:	Weinam Street, Redland Bay
Sample Location:	BH2 - SPT (17.5-17.95m)

Sample Description:

Particle Size Distribution



Grading: AS 1289.3.6.1

Drying by: Oven
Date Tested: 13/10/2020

Note: Sample Washed

Sieve Size	% Passing	Limits
4.75mm	100	
2.36mm	100	
1.18mm	99	
600µm	98	
425µm	96	
300µm	89	
150µm	71	
75µm	57	

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03083-1
Issue No: 1

Material Test Report

Client:	Core Consultants Pty Ltd 52 Second Avenue Maroochydore QLD 4558
Principal:	
Project No.:	TESTBRIS00119AA
Project Name:	J001183 - Vehicle Ferry Terminal
Lot No.:	**TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID:	BRIS20S-03083
Client Sample:	
Date Sampled:	29/09/2020
Source:	On site
Material:	In Situ
Specification:	AS Grading
Sampling Method:	Submitted by client
Project Location:	Weinam Street, Redland Bay
Sample Location:	BH2 - SPT (17.5-17.95m)

Other Test Results

Description	Method	Limits	Result
Moisture Content (%)	AS 1289.2.1.1		64.0
Date Tested			8/10/2020

Comments

N/A

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03084-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID:	BRIS20S-03084
Client Sample:	
Date Sampled:	30/09/2020
Source:	On site
Material:	In Situ
Specification:	AS Grading
Sampling Method:	Submitted by client
Project Location:	Weinam Street, Redland Bay
Sample Location:	BH3 - SPT (8.5-8.95m)

Sample Description:

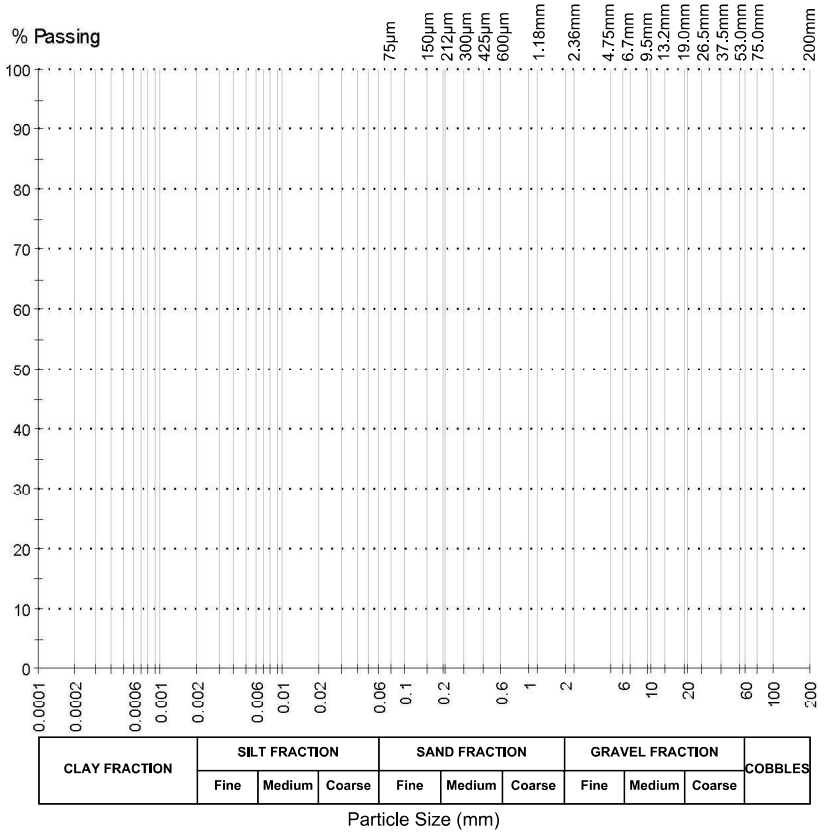
Grading: AS 1289.3.6.1

Drying by: Oven
Date Tested: 13/10/2020

Note: Sample Washed

Sieve Size	% Passing	Limits
75µm	87	

Particle Size Distribution



Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03084-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID: BRIS20S-03084
Client Sample:
Date Sampled: 30/09/2020
Source: On site
Material: In Situ
Specification: AS Grading
Sampling Method: Submitted by client
Project Location: Weinam Street, Redland Bay
Sample Location: BH3 - SPT (8.5-8.95m)

Other Test Results

Description	Method	Limits	Result
Moisture Content (%)	AS 1289.2.1.1		63.0
Date Tested			8/10/2020
Sample History	AS 1289.1.1		Oven-dried
Preparation	AS 1289.1.1		Dry Sieved
Linear Shrinkage (%)	AS 1289.3.4.1		22.5
Mould Length (mm)			249.8
Crumbling			No
Curling			Yes
Cracking			Yes
Liquid Limit (%)	AS 1289.3.1.2		98
Plastic Limit (%)	AS 1289.3.2.1		34
Plasticity Index (%)	AS 1289.3.3.1		64
Date Tested			14/10/2020

Comments

N/A

Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03085-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID:	BRIS20S-03085
Client Sample:	
Date Sampled:	30/09/2020
Source:	On site
Material:	In Situ
Specification:	AS Grading
Sampling Method:	Submitted by client
Project Location:	Weinam Street, Redland Bay
Sample Location:	BH4 - SPT (5.5-5.95m)

Sample Description:

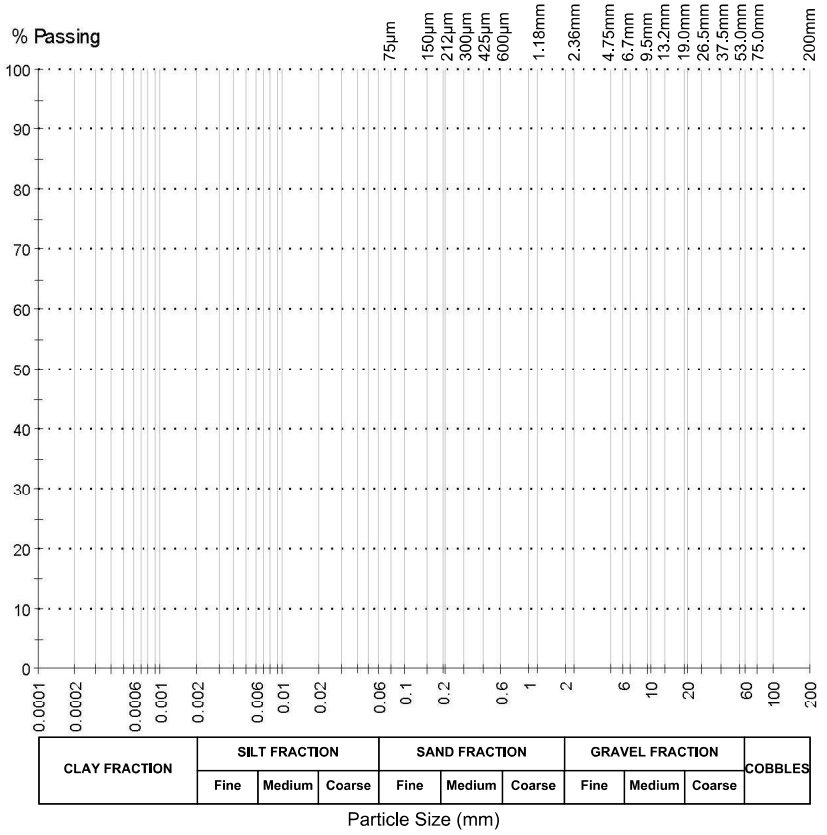
Grading: AS 1289.3.6.1

Drying by: Oven
Date Tested: 13/10/2020

Note: Sample Washed

Sieve Size	% Passing	Limits
75µm	93	

Particle Size Distribution



Brisbane Laboratory

Coffey Testing Pty Ltd
ABN 92 114 364 046
86A Yarraman Place
Virginia QLD 4014

Phone: +61 7 3569 8920

Report No: BRIS20S-03085-1
Issue No: 1

Material Test Report

Client: Core Consultants Pty Ltd
52 Second Avenue
Maroochydore QLD 4558

Principal:
Project No.: TESTBRIS00119AA
Project Name: J001183 - Vehicle Ferry Terminal
Lot No.: **TRN:**

Accredited for compliance with ISO/IEC 17025 - Testing.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Approved Signatory: Royce Smith
(Project Laboratory Manager)
NATA Accredited Laboratory Number:431
Date of Issue: 20/10/2020

Sample Details

Sample ID: BRIS20S-03085
Client Sample:
Date Sampled: 30/09/2020
Source: On site
Material: In Situ
Specification: AS Grading
Sampling Method: Submitted by client
Project Location: Weinam Street, Redland Bay
Sample Location: BH4 - SPT (5.5-5.95m)

Other Test Results

Description	Method	Limits	Result
Moisture Content (%)	AS 1289.2.1.1		59.5
Date Tested			8/10/2020
Sample History	AS 1289.1.1		Oven-dried
Preparation	AS 1289.1.1		Dry Sieved
Linear Shrinkage (%)	AS 1289.3.4.1		25.0
Mould Length (mm)			249.9
Crumbling			No
Curling			Yes
Cracking			Yes
Liquid Limit (%)	AS 1289.3.1.2		132
Plastic Limit (%)	AS 1289.3.2.1		31
Plasticity Index (%)	AS 1289.3.3.1		101
Date Tested			14/10/2020

Comments

N/A

Appendix C
Limitations

LIMITATIONS

This Document has been provided by Core Consultants Pty Ltd ("Core") subject to the following limitations:

This Document has been prepared for the particular purpose outlined in Core's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

The scope and the period of Core's Services are as described in Core's proposal, and are subject to restrictions and limitations. Core did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Core in regards to it.

Conditions may exist which were undetectable given the limited nature of the enquiry Core was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Core's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Core to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.

Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by Core for incomplete or inaccurate data supplied by others.

Core may have retained subconsultants affiliated with Core to provide Services for the benefit of Core. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any direct legal recourse to, and waives any claim, demand, or cause of action against, Core's affiliated companies, and their employees, officers and directors.

This Document is provided for sole use by the Client and is confidential to it and its professional advisers. No responsibility whatsoever for the contents of this Document will be accepted to any person other than the Client. Any use which a third party makes of this Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Core accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Document.

core
consultants pty ltd

Head Office | **Sunshine Coast**
52 Second Avenue
Maroochydore Qld 4558

T 07 5475 5900

Brisbane
Suite 3.16, 433 Logan Road,
Stones Corner QLD 4120

T 07 3394 8331

E info@coreconsultants.com.au

www.coreconsultants.com.au