Port of Gladstone
Gatcombe and Golding Cutting Channel Duplication Project

Environmental Impact Statement

Gladstone Ports Corporation
Growth. Prosperity. Community.

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Appendix E3
Geotechnical Investigation Factual Report Channel Duplication (Dredger Access Channel and Transfer Location)

REPORT

GEOTECHNICAL INVESTIGATION FACTUAL REPORT

Gatcombe and Golding Cutting Channel Duplication Project (Dredger Access Channel and Transfer Location)

Submitted to:

Gladstone Ports Corporation Limited
QLD 4680 Australia

Submitted by:

Golder

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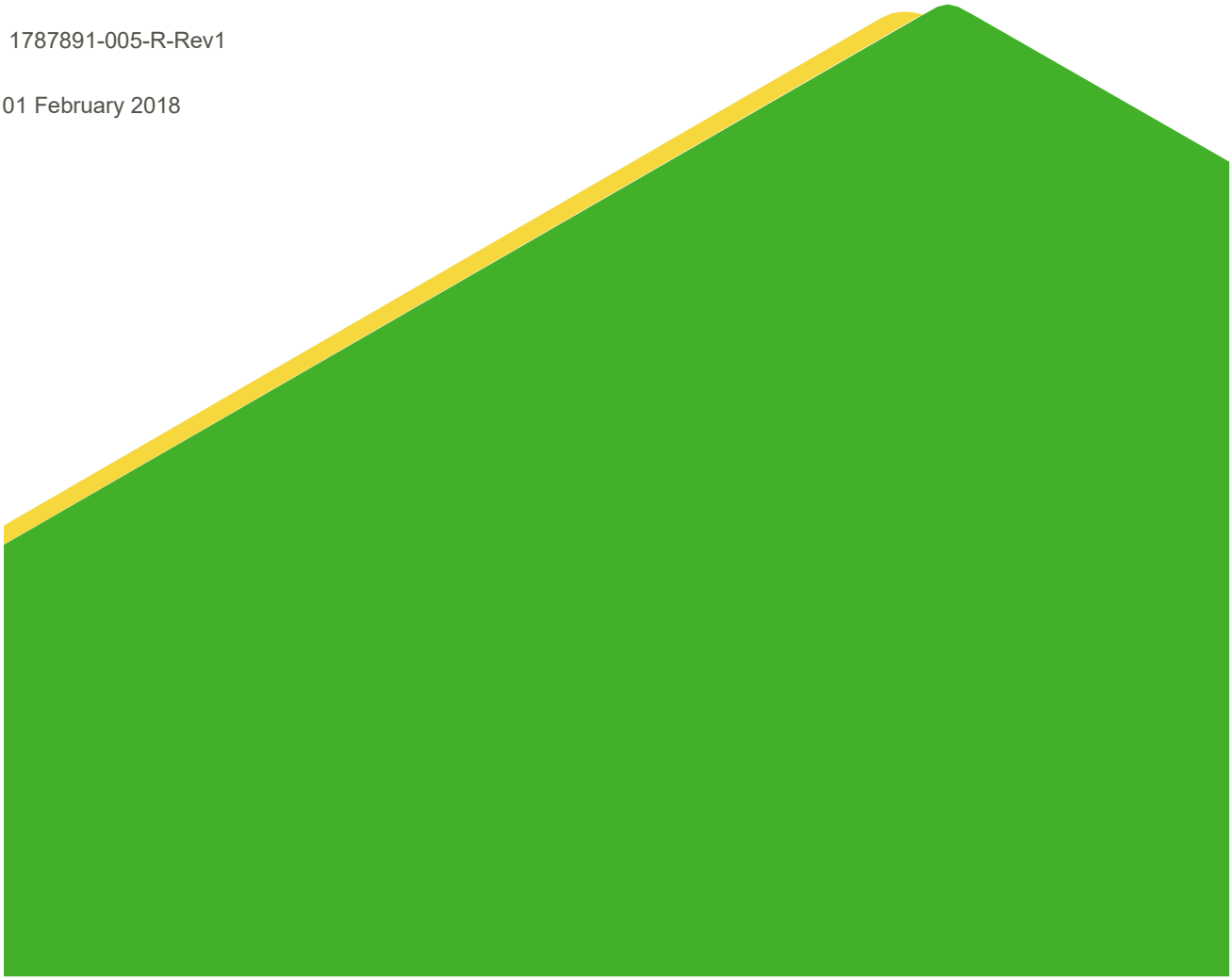
1787891-005-R-Rev1

01 February 2018



EXPLANATORY NOTE

March 2019

This Geotechnical Investigation Factual Report was finalised in February 2018 to support the Port of Gladstone Gatcombe and Golding Cutting Channel Duplication Project Environmental Impact Statement (EIS).

This geotechnical investigation and report presents the Project dredging methodology that was relevant and in effect at that time.

Between July 2018 and December 2018, the Project dredging methodology was amended to comply with the Sustainable Ports Development Act 2015 (Qld), however the geotechnical boreholes contained in this report are located in close proximity to the proposed barge access channel (which forms part of the Project description included in the EIS).

In this regard, this report has been provided in the Gatcombe and Golding Cutting Channel Duplication Project EIS as an indication of the sediment characteristics of the material to be dredged for proposed barge access channel.

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APPENDICES

1.0 INTRODUCTION

Golder Associates Pty Ltd (Golder) was commissioned by Gladstone Ports Corporation Limited (GPC) to carry out a geotechnical investigation for the Gatcombe and Golding Cutting Channel Duplication Project in Gladstone. The primary purpose of the investigation was to provide advice on the characteristics of the type of material to be dredged in the dredger access channel and the transfer location. The geotechnical investigation was carried out in accordance with the Golder Proposal P1787891-001-Rev0 dated 26 September 2017. Findings of the geotechnical investigation are presented in this report.

Note that, in this report, reduced levels refer to Lowest Astronomical Tide (LAT) and coordinates relate to Map Grid of Australia 1994 (MGA94) Zone 55.

Figure 1 shows the location of the boreholes carried out.

2.0 GEOLOGY

The geology of the site is described in the "Geology of the Rockhampton and Port Clinton 1:250 000 Sheet Areas" (Kirkegaard et al., 1989) and the more recent "Gladstone Special 1:100 000 Sheet" (Donchak and Holmes, 2006). The map indicates that the site is underlain by the Early Carboniferous Wandilla Formation of the Curtis Island Group.

Depending on the level of dredging that has already occurred in the past, a varying thickness of very soft fine grained material or very loose coarse grained material can be expected to be encountered. These loosely compacted material would overlie older stiffer alluvium and residual soil in places which in turn would overlie the rock of the Wandilla Formation at depth.

Regionally, the Wandilla formation consists of mudstone, arenite (sandstone), and subordinate chert and minor limestone. The rocks were formed on the continental slope and are interpreted to be part of an accretionary wedge which resulted during a subduction of the oceanic crust beneath the Australian shield. During its formation, deposition of muds and silica rich organisms (which form cherts) were interrupted by periodic turbidity flows depositing arenaceous material.

Structurally, the Wandilla Formation is characterised by steeply dipping, north-west to north trending (geographic) fracture to slaty cleavage, which is mostly parallel to bedding. There are more localised bedding parallel disruption fabrics due to shearing forces. Tight chaotic folding is present within the chert rich units which are thought to have formed by localised slumping. Stratal disruptions by north-west faults are common within the Wandilla Formation. The faults are interpreted to be thrust related imbricated slices dipping to the east.

3.0 CURRENT (2017) OVERWATER INVESTIGATION

The current geotechnical investigation comprised four overwater boreholes at the nominated locations by GPC. The boreholes HP1, HP2, AC1 and AC2 are located in Fisherman's Landing area to the south-west of Curtis Island as shown in Figure 1.

The fieldwork was carried out from 13 to 15 December 2017.

3.1 Geotechnical Boreholes

The borehole drilling was undertaken using a Hydrapower Scout drill rig operated by Schneider Drilling welded on the Shine jack-up barge mobilised by a tug boat provided by MIPEC. The drill rig was equipped for rotary drilling, rock coring, SPT (Standard Penetration Test), undisturbed sampling (U_{50}) and field Vane Shear testing. The boreholes were drilled to either the proposed target depth or at least 2 m into rock material with inferred strength ranging from very low to low strength. All boreholes were terminated with the approval of GPC.

Boreholes locations are shown in **Figure 1** borehole logs are presented in APPENDIX A. The coordinates and as-drilled depths are summarised in Table 1.

Table 1: Summary of Completed Boreholes

Borehole ID	Coordinates		Seabed Elevation (RL m LAT)	Termination Depth (m)	Termination Elevation (RL m LAT)
	Easting (m)	**Northing (m)**			
AC1	313894.565	7368869.273	-6.371	7.450	-13.821
AC2	313712.308	7369298.616	-6.614	6.950	-13.564
HP1	313600.183	7369713.919	-8.049	12.500	-20.549
HP2	313436.803	7369807.628	-8.092	12.400	-20.492

3.2 Geotechnical Laboratory Testing

Laboratory testing was specified by Golder and approved by GPC on selected soil and rock samples from the SPTs, U_{50} tube samples and rock core and included the following:

- Moisture Content to AS1289.2.1.1
- Atterberg Limits to AS1289.3.1.2, AS1289.3.2.1, AS1289.3.3.1 and AS1289.3.4.1
- Partial Size Distribution including hydrometer to AS1289.3.6.3

The results of the completed laboratory testing are summarised in Table 2 and testing reports are included in APPENDIX B.

Table 2: Laboratory Test Results – Geotechnical Soil Properties

BH ID	Depth of Sampling [m bgl]	Material Description	Symbol in accordance with AS1726	Particle Size Distribution (PSD)				Atterberg Limits				
				Clay *<2 µm*	**Silt** *2 µm to 75 µm*	**Sand** *<75 µm to 2.36 mm*	**Gravel** *2.36 mm to 63 mm*	**LL**	**PL**	**PI**	**LS**	**MC**
				[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]	[%]
AC1	4	Silty CLAY	CI	39	55	6	0	48	17	31	13.5	39.5
	5.5	Sandy CLAY	CH	38		59	3	-	-	-	-	-
AC2	4	Silty CLAY	CH	51	46	3	0	84	23	61	20	72.6
HP1	2.5	Silty CLAY	CH	51	44	5	0	74	21	53	18.5	80.9
	7	Silty CLAY	CH	42	31	24	3	63	16	47	16.0	58.1
	8.5	Clayey SAND	SC	21		65	14	-	-	-	-	-
HP2	2.5	Silty CLAY	CH	52	47	1	0	66	23	43	17.5	26.5
	7	Sandy CLAY	CI	44		56	0	35	13	22	10.5	17.4
	10	Sandy CLAY	CL-CI	50		46	3	37	16	21	11	17.6
	11.5	Clayey Gravelly SAND	SC	25		40	35	-	-	-	-	-

Notes: LL=Liquid Limit; PL=Plastic Limit; PI=Plasticity Index; LS=Linear Shrinkage; MC=Moisture Content

4.0 INVESTIGATION FINDINGS

4.1 Ground Conditions

Subsurface conditions encountered at shallow depth in the offshore boreholes comprised layers of very soft to soft silty clays interlayered in places with very loose to loose sands. Stiff to hard clays and medium dense to dense sands/gravels were then encountered, some of them being residual soil. Rock was not encountered in any of the four boreholes.

Subsurface conditions encountered in the boreholes at each of the sites are summarised in Table 3.

Table 3: Summary of Ground Conditions

Investigation ID	Unit Thickness (m)		
	Alluvium Deposit	Residual Soil	Bed Rock
AC1	6.60	0.85	n/e[1]
AC2	>6.95	n/e[1]	n/e[1]
HP1	>12.50	n/e[1]	n/e[1]
HP2	>12.40	n/e[1]	n/e[1]

Notes: 1. Material either not observed or not encountered in the field are noted as 'n/e' in the table above.

5.0 REFERENCES

Donchak, P.J.T., and Holmes, K.H. (2006). *Gladstone Special: Sheet 9150 & Part 9151*, Department of Resource Industries, Queensland.

Kirkegaard, A.G., Shaw, R.D., and Murray, C.G. (1989). *Geology of the Rockhampton and Port Clinton 1:250,000 Sheet Areas,* Queensland Department of Mines, Brisbane.

6.0 IMPORTANT INFORMATION

Your attention is drawn to the document – "Important Information Relating to This Report", which is included in APPENDIX C of this document. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be, and to present you with recommendations on how to minimise the risks associated with the services provided for this project. The document is not intended to reduce the level of responsibility accepted by Golder Associates, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Signature Page

Golder Associates Pty Ltd

Florian Hittinger
Senior Geotechnical Engineer

Jay Ameratunga
Principal Geotechnical Engineer

FHH/JA/fhh/fz

\\golder.gds\gap\brisbane\jobs\geo\2017\1787891 - gpc_cvip investigation_gladstone\correspondence out\005\1787891-005-r-rev1-gpc- access channel and handling area factual report.docx

FIGURES

Figure 1: Site Plan and Geotechnical Investigation Locations

LEGEND

Geotechnical Borehole

BoreholeID	Easting	Northing
AC1	313894.565	7368869.273
AC2	313712.308	7369298.616
HP1	313600.183	7369713.919
HP2	313436.803	7369807.628

0 2 4 6 8

1:100,000 Kilometers

NOTE(S)

1. Projection: GDA 1994 MGA Zone 56

REFERENCE(S)

Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

CLIENT
GLADSTONE PORTS CORPORATION LTD.

PROJECT
GATCOMBE AND GOLDING CUTTING CHANNEL DUPLICATION PROJECT (DREDGER ACCESS CHANNEL AND TRANSFER LOCATION)

TITLE
SITE PLAN AND GEOTECHNICAL INVESTIGATION LOCATIONS

CONSULTANT

GOLDER

DATE	2018-01-31
DESIGNED	MB
PREPARED	MB
REVIEWED	FH
APPROVED	FH

PROJECT NO.	CONTROL	REV.	FIGURE
1787891	005	0	1

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APPENDIX A

A1 - Borehole Reports
A2 - Explanation of Notes, Abbreviations & Terms Used On Borehole and Test Pit Reports

REPORT OF BOREHOLE: AC1

SHEET: 1 OF 1

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FZ DATE: 15-12-17
CHECKED: FHH DATE: 15-11-18

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	drilled over water	0	-6.37				CH	Silty CLAY (ALLUVIUM) high plasticity, grey, trace fine grained sand, with shell fragments	M	VS	
			1		SPT 1.00-1.45 m RW/450mm							
			2									
					SPT 2.50-2.95 m RW/450mm							
			3									
				3.80								
			4	-10.17	SPT 4.00-4.45 m 2, 3, 5 N=8			CI	Silty CLAY medium plasticity, pale yellow brown and pale grey			
				5.00								
	L-M		5	-11.37				CH	Sandy CLAY high plasticity, yellow brown, fine to coarse grained sand, trace fine grained gravel, grading to clayey sand in places		F - St	
			6		SPT 5.50-5.95 m 3, 5, 7 N=12							
				6.60								
				-12.97				CH	Sandy Silty CLAY (RESIDUAL SOIL) high plasticity, pale grey/pale orange brown/pale yellow brown, fine grained, yellow brown sand		St - VSt	
			7		SPT 7.00-7.45 m 5, 5, 10 N=15							
				-13.82					END OF BOREHOLE @ 7.45 m TARGET DEPTH DRILLED OVER WATER			
			8									
			9									
			10									

This report of borehole 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.

GAP gINT FN. F01a RL3

REPORT OF BOREHOLE: AC2

SHEET: 1 OF 1

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FHH DATE: 13-12-17
CHECKED: MM DATE: 15-11-18

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
RD	L	drilled over water	0	-6.61				CH	Silty CLAY (ALLUVIUM) high plasticity, grey	W	VS	
			1		SPT 1.00-1.90 m RW/450mm PP=TNP							
			2		SPT 2.50-3.40 m RW/450mm PP=TNP							
			3									
			4		SPT 4.00-4.90 m RW/450mm PP=TNP							
			5									
			6		SPT 5.50-6.40 m RW/450mm PP=TNP							
			7	-13.56	SPT 6.50-7.40 m RW/450mm PP=TNP				END OF BOREHOLE @ 6.95 m TARGET DEPTH DRILLED OVER WATER			
			8									
			9									
			10									

REPORT OF BOREHOLE: HP1

SHEET: 1 OF 2

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FZ DATE: 15-12-17
CHECKED: FHH DATE: 15-11-18

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	drilled over water	0	-8.05				CH	Silty CLAY (ALLUVIUM) high plasticity, dark grey			
			1		SPT 1.00-1.45 m RW/450mm							
			2		SPT 2.50-2.95 m RW/450mm							
			3									
			4		SPT 4.00-4.45 m RW/450mm						VS	
			5	*5.00* -13.05				CH	Silty CLAY high plasticity, dark grey, trace fine to coarse grained sand	M		
			6		SPT 5.50-5.95 m RW/450mm							
				6.60 -14.65				CH	Silty CLAY high plasticity, pale grey to dark grey, with fine to coarse grained sand			
			7		SPT 7.00-7.45 m RW/450mm							
			8	*8.30* -16.35				SC	Clayey SAND fine to coarse grained, yellow brown and pale grey, high plasticity clay, trace fine to medium grained, sub-angular to sub-rounded gravel		D - VD	
			9		SPT 8.50-8.78 m 15, 30/125mm							
	M			*9.80* -17.85				SW				
			10									

This report of borehole 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: HP1

SHEET: 2 OF 2

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FZ DATE: 15-12-17
CHECKED: FHH DATE: 15-11-18

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	M		10		SPT 10.00-10.10 m 30/100mm HB			SW	Gravelly SAND fine to coarse grained, yellow brown, fine to medium grained, sub-angular to sub-rounded gravel	M	D - VD	
			11		SPT 11.50-11.64 m 30/140mm HB							
			12	-20.55					END OF BOREHOLE @ 12.50 m TARGET DEPTH DRILLED OVER WATER			
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

REPORT OF BOREHOLE: HP2

SHEET: 1 OF 2

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FHH DATE: 14-12-17
CHECKED: FHH DATE: 15-11-18

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
RD	L	drilled over water	0	-8.09				CH	Silty CLAY (ALLUVIUM) high plasticity, grey to dark grey	W	VS	
				0.50								
				-8.59				CH	Silty CLAY high plasticity, grey and pale orange brown			
			1		SPT 1.00-1.45 m 3, 7, 10 N=17 PP=250-450 kPa							
			2									
					SPT 2.50-2.95 m 3, 6, 9 N=15 PP=250-350 kPa							
			3									
			4		SPT 4.00-4.45 m 4, 7, 9 N=16							
			5	5.10								
				-13.19				CI	Sandy CLAY medium plasticity, grey and pale orange brown, fine to coarse grained sand, varying sand content	M	VSt	
					SPT 5.50-5.95 m 10, 7, 7 N=14							
			6									
			7	7.00								
				-15.09	SPT 7.00-7.45 m 4, 6, 10 N=16				interbeded in places with medium to coarse grained sand up to 100 mm thick			
				7.90								
			8	-15.99				CH	Gravelly CLAY high plasticity, grey, fine grained, subangular to angular (some gravels are quartz) pale grey to dark grey gravel, grading in places to clayey gravel			
RT					SPT 8.50-8.95 m 10, 9, 11 N=20							
			9									
				9.70								
				-17.79				CL-CI			H	
			10									

REPORT OF BOREHOLE: HP2

SHEET: 2 OF 2

CLIENT: GPC
PROJECT: Gatcombe and Golding Cutting Channel Duplication Project
LOCATION: Fisherman Landing
JOB NO: 1787891

COORDS: 313894.6 m 7368869.3 m 55
SURFACE RL: -6.37 m DATUM: LAT
INCLINATION: -90°
HOLE DEPTH: 7.45 m

DRILL RIG: Hydrapower Scout
CONTRACTOR: Schneider Drilling
LOGGED: FHH DATE: 14-12-17
CHECKED: FHH DATE: 15-11-18

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
RT	L		10		SPT 10.00-10.45 m 9, 15, 15 N=30			CL-CI	Sandy CLAY low to medium plasticity, grey and dark orange brown, fine to coarse grained, subrounded to rounded, white sand	M	H	
			11	*11.30* -19.39	SPT 11.50-11.73 m 29, 30/80mm			SC	Clayey Gravelly SAND fine to coarse grained, grey and orange brown, fine to medium grained subrounded gravel, low plasticity clay		D - VD	
			12	-20.49					END OF BOREHOLE @ 12.40 m TARGET DEPTH DRILLED OVER WATER			
			13									
			14									
			15									
			16									
			17									
			18									
			19									
			20									

GOLDER

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS

SYMBOLS


FILL


GRAVEL (GW, GP, GM or GC)


SAND (SW, SP, SM or SC)


SILT (ML or MH)


CLAY (CL, CI or CH)


ORGANIC SOILS (OL, OH or Pt)


COBBLES or BOULDERS

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

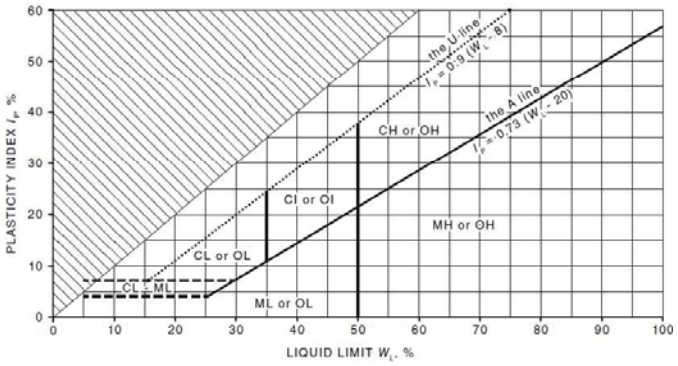
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726-2017. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Soil Group	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		63 to 200 mm
GRAVEL	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
SAND	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
SILT		0.002 to 0.075 mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays and silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in dry condition and may feel cool. Sands and gravels tend to cohere.
W	Wet	Soils exude free water. Sand and gravels tend to cohere.

Moisture condition for fine grained soils is described relative to the plastic limit or liquid limit as specified in AS1726-2017.

CONSISTENCY AND DENSITY

Fine Grained Soils

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
Fr	Friable	-

Coarse Grained Soils

Symbol	Term	Density Index (%)	SPN "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.

* SPT correlations are not stated in AS1726-2017, and may be subject to corrections for overburden pressure and equipment type.

CEMENTATION

Weakly Cemented	The soil may be easily disaggregated by hand in air or water.
Moderately Cemented	Effort is required to disaggregate the soil by hand in air or water.

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

DRILLING/EXCAVATION METHOD

ADH	Hollow auger drilling	EX	Excavator	PQ3	Diamond core - 83 mm
ADT	Auger drilling with tc-bit	HA	Hand auger	PT	Push tube sampling
ADV	Auger drilling with v-bit	HAND	Excavated by hand methods	RAB	Rotary air blast
AIRCORE	Aircore	HMLC	Diamond core - 63 mm	RC	Reverse circulation
AT	Air track	HQ3	Diamond core - 61 mm	RT	Rock roller
BH	Backhoe bucket	JET	Jetting	SONIC	Sonic drilling
CT	Cable tool rig	MZ	Mazier tube sampling	SPT	Standard penetration testing
DTC	Diatube coring	NDD	Non-destructive digging	U	Undisturbed tube sampling
EE	Existing excavation	NMLC	Diamond core - 52 mm	WB	Washbore drilling
EPT	Extruded push tube	NQ3	Diamond core - 45 mm		

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 the equipment used.

H **High resistance** to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.

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 at date shown		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.
GROUNDWATER 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
30/80 mm	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, sr = residual 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 test
DCP	Dynamic cone penetration test
CPT	Cone penetration test
CPTu	Cone penetration test with pore pressure (u) measurement

RANKING OF VISUALLY OBSERVABLE CONTAMINATION AND ODOUR (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

TCR = Total Core Recovery (%)	RQD = Rock Quality Designation (%)	SCR = Solid Core Recovery (%)	F = Fracture Frequency
$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$	$= \frac{\sum \text{Axial lengths of core} > 100\text{ mm}}{\text{Length of core run}} \times 100$	$= \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100$	$= \frac{\text{No. of defects}}{\text{Length of zone (m)}}$

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

STRENGTH

Symbol	Term	UCS (MPa)	Field Guide
VL	Very Low	0.6 to 2	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	2 to 6	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	6 to 20	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	20 to 60	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	60 to 200	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>200	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

Material with strength less than 'Very Low' shall be described using soil characteristics. The presence of an original rock structure, fabric or texture should be noted, if relevant.

ROCK MATERIAL WEATHERING

Symbol		Term	Field Guide
RS		Residual Soil	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	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
DW	HW	Highly Weathered	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. 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.
	MW	Moderately Weathered	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 of strength from fresh rock.
SW		Slightly Weathered	Rock 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 sign of decomposition of individual minerals or colour changes.

ABBREVIATIONS FOR DEFECT TYPES AND DESCRIPTIONS

Defect Type	
P	Parting
X	Foliation
L	Cleavage
C	Contact
J	Joint
SSu	Sheared Surface
SS	Sheared Seam
SZ	Sheared Zone
CS	Crushed Seam
IS	Infilled Seam
EWS	Extremely Weathered Seam
V	Vein

Coating or Infilling	
Cn	Clean
Sn	Stain
Ve	Veneer
Ct	Coating
In	Infill

Planarity	
Pl	Planar
Cv	Curved
Un	Undulating
St	Stepped
Ir	Irregular

Roughness	
VRo	Very Rough
Ro	Rough
Sm	Smooth
Po	Polished
Sl	Slickensided

Vertical Boreholes – The dip (inclination from horizontal) of the defect is given.

Inclined Boreholes – The inclination is measured as the acute angle between the core axis and the vertical direction.

APPENDIX B

Laboratory Testing Reports

Trilab
Soil Rock Calibration

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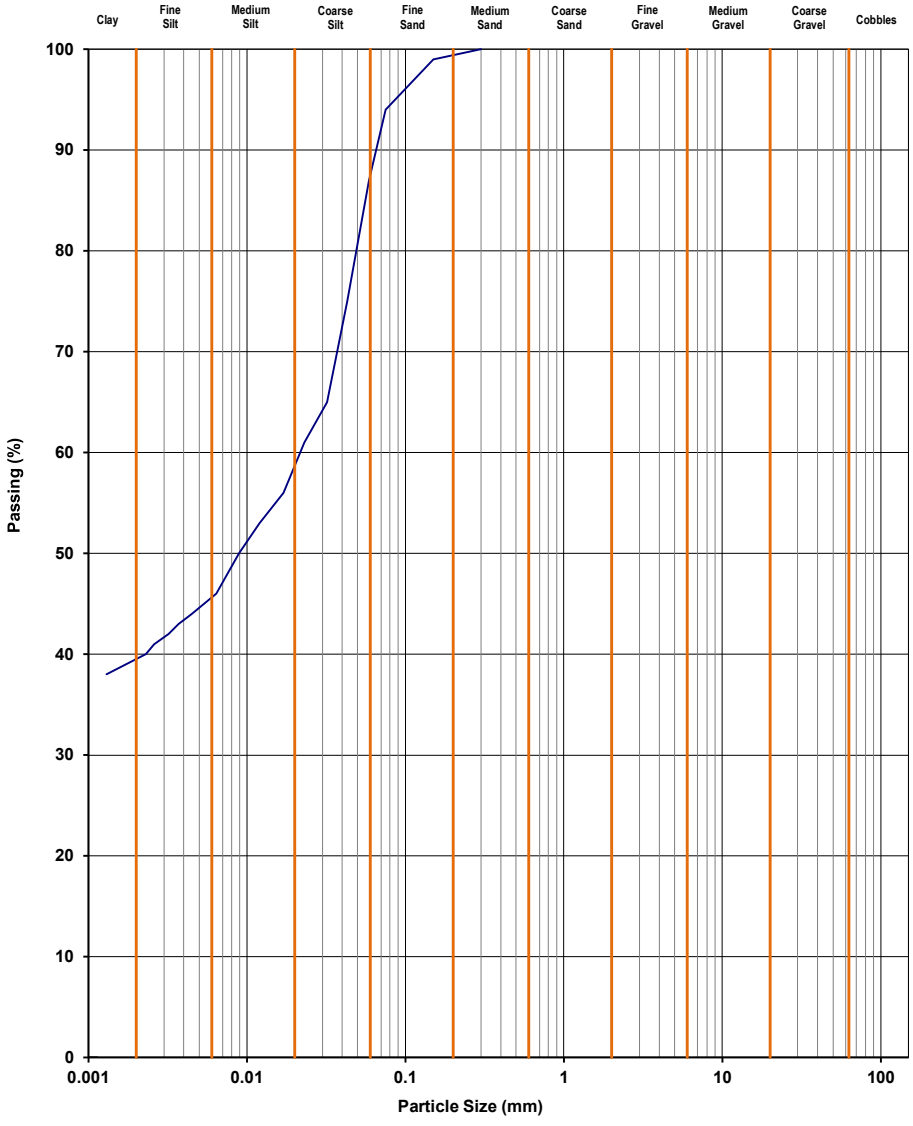
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100271-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	AC1	**Depth From (m)** 4	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	
0.600	
0.425	
0.300	100
0.150	99
0.075	94
0.059	87
0.043	75
0.032	65
0.023	61
0.017	56
0.012	53
0.0089	50
0.0064	46
0.0045	44
0.0037	43
0.0032	42
0.0026	41
0.0023	40
0.0013	38



NOTES/REMARKS: -

Moisture Content 39.5%

-2.36mm Soil Particle Density(t/m^3) 2.67

Sample/s supplied by the client

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.

Tested at Trilab Brisbane Laboratory.

Authorised Signatory

C. Channon

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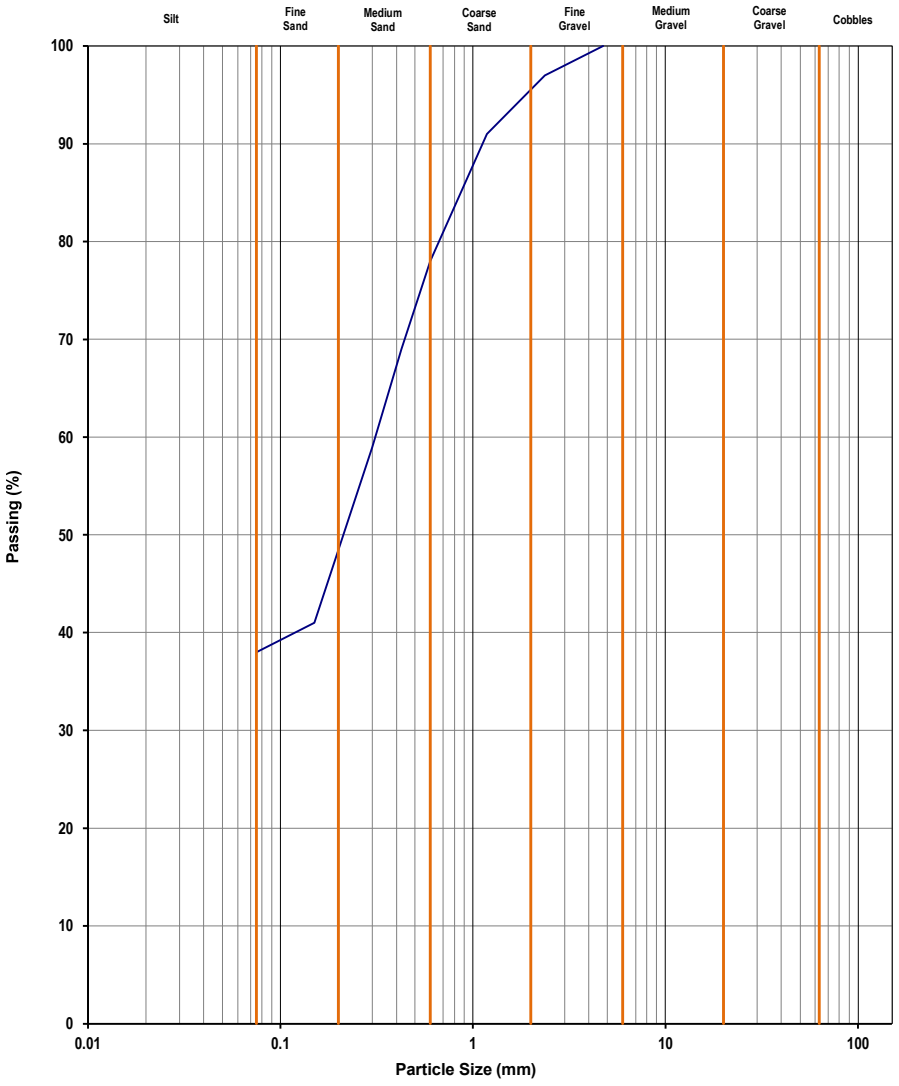
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1 , 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100272-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	17/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	AC1	**Depth From (m)** 5.5	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	100
2.36	97
1.18	91
0.600	78
0.425	69
0.300	59
0.150	41
0.075	38



NOTES/REMARKS: -

Moisture Content 38%

Sample/s supplied by the client

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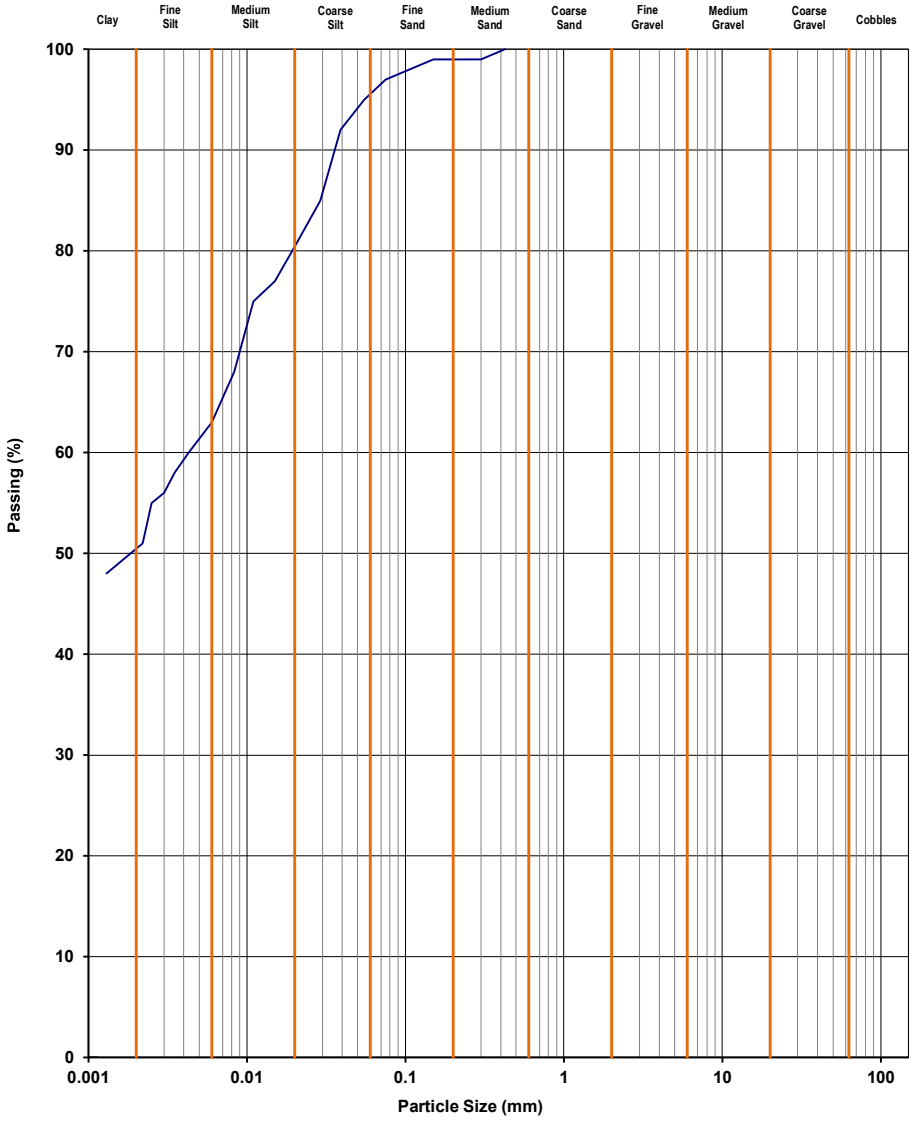
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100243-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	AC2	**Depth From (m)** 4	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	
0.600	
0.425	100
0.300	99
0.150	99
0.075	97
0.055	95
0.039	92
0.029	85
0.021	81
0.015	77
0.011	75
0.0083	68
0.006	63
0.0043	60
0.0035	58
0.003	56
0.0025	55
0.0022	51
0.0013	48



NOTES/REMARKS: -

Moisture Content 72.6%

-2.36mm Soil Particle Density(t/m^3) 2.60

Sample/s supplied by the client

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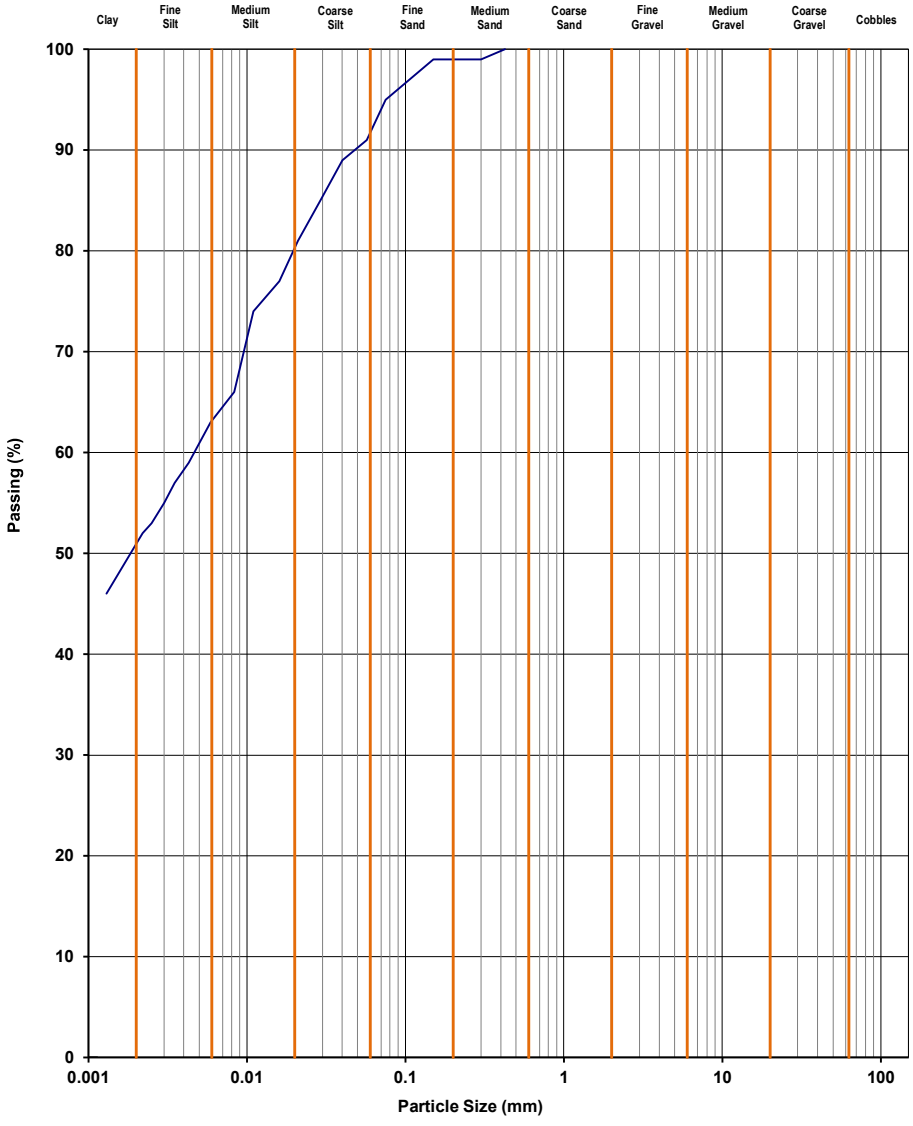
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100273-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP1	**Depth From (m)** 2.5	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	
0.600	
0.425	100
0.300	99
0.150	99
0.075	95
0.057	91
0.04	89
0.029	85
0.021	81
0.016	77
0.011	74
0.0083	66
0.0059	63
0.0043	59
0.0035	57
0.003	55
0.0025	53
0.0022	52
0.0013	46



NOTES/REMARKS: -

Moisture Content 80.9%

-2.36mm Soil Particle Density(t/m^3) 2.63

Sample/s supplied by the client

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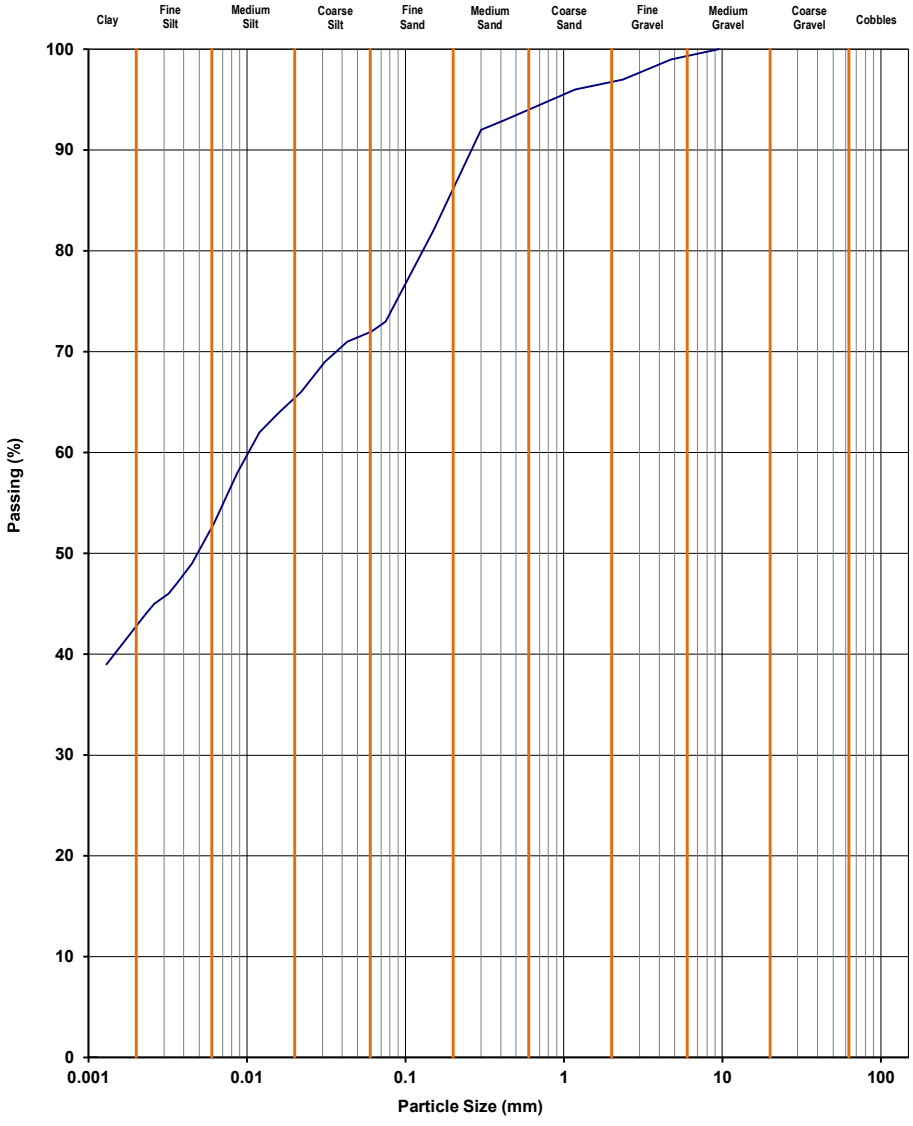
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100274-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP1	**Depth From (m)** 7	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	100
6.7	99
4.75	99
2.36	97
1.18	96
0.600	94
0.425	93
0.300	92
0.150	82
0.075	73
0.061	72
0.043	71
0.031	69
0.022	66
0.016	64
0.012	62
0.0087	58
0.0062	53
0.0045	49
0.0036	47
0.0032	46
0.0026	45
0.0023	44
0.0013	39



NOTES/REMARKS: -

Moisture Content 58.1%

-2.36mm Soil Particle Density(t/m^3) 2.62

Sample/s supplied by the client

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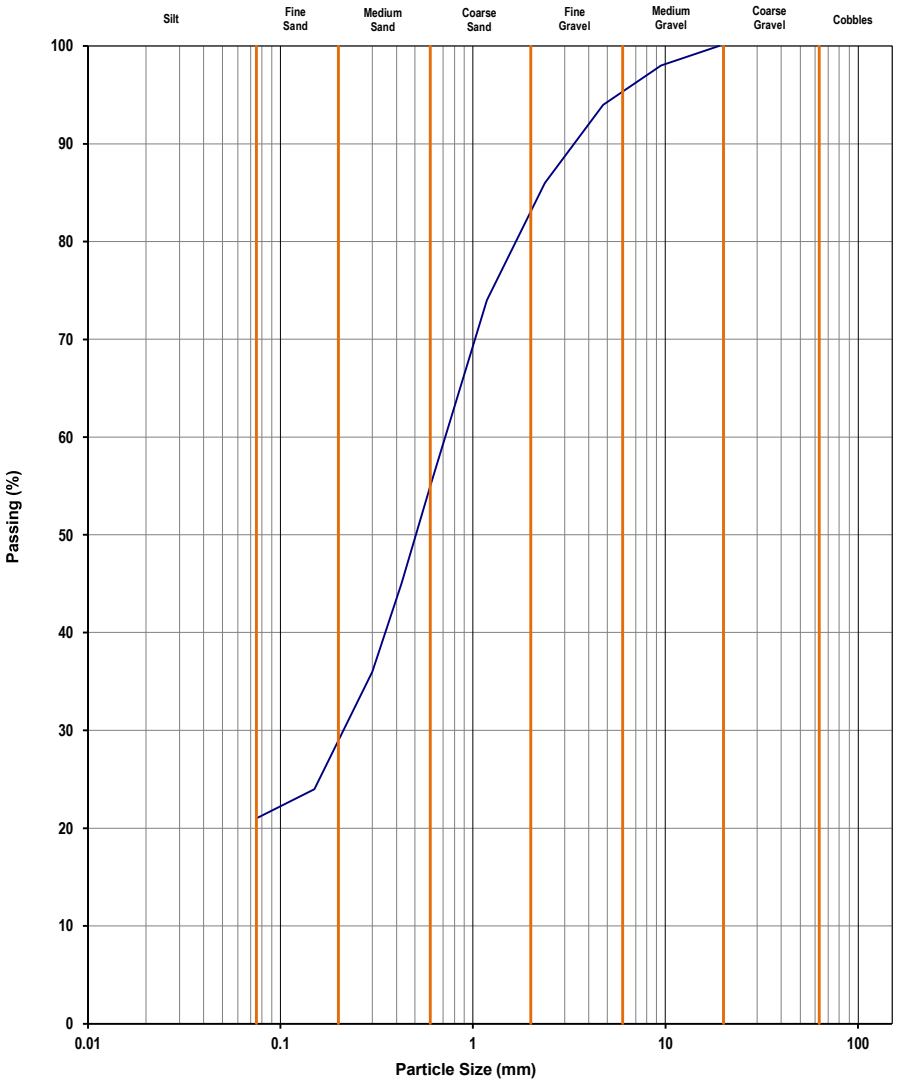
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1 , 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100275-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	19/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP1	**Depth From (m)** 8.5	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	100
9.5	98
6.7	96
4.75	94
2.36	86
1.18	74
0.600	55
0.425	45
0.300	36
0.150	24
0.075	21



NOTES/REMARKS: -

Moisture Content 20%

Sample/s supplied by the client

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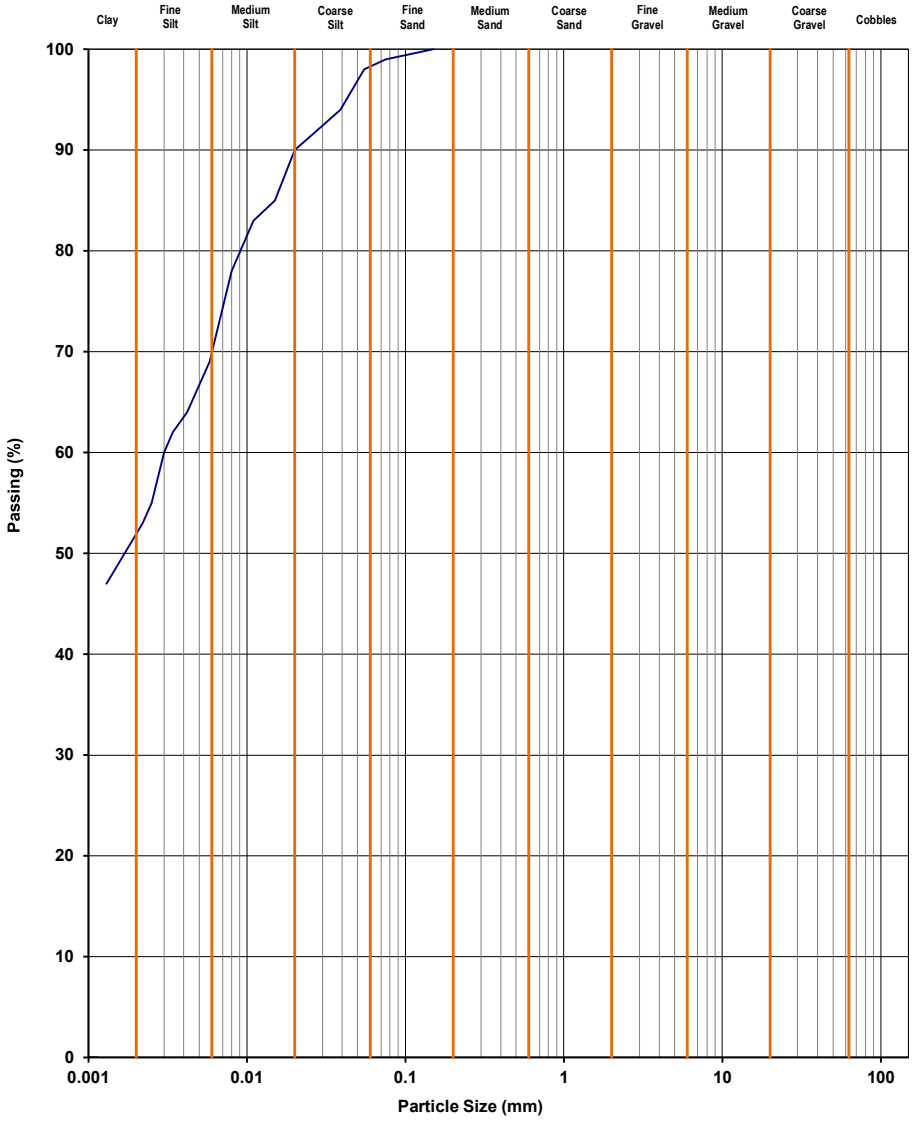
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.3, 3.5.1 & 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100276-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP2	**Depth From (m)** 2.5	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	
1.18	
0.600	
0.425	
0.300	
0.150	100
0.075	99
0.055	98
0.039	94
0.028	92
0.02	90
0.015	85
0.011	83
0.008	78
0.0058	69
0.0042	64
0.0034	62
0.003	60
0.0025	55
0.0022	53
0.0013	47



NOTES/REMARKS: -

Moisture Content 26.5%

-2.36mm Soil Particle Density(t/m^3) 2.64

Sample/s supplied by the client

Accredited for compliance with ISO/IEC 17025 - Testing.
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Tested at Trilab Brisbane Laboratory.

Authorised Signatory

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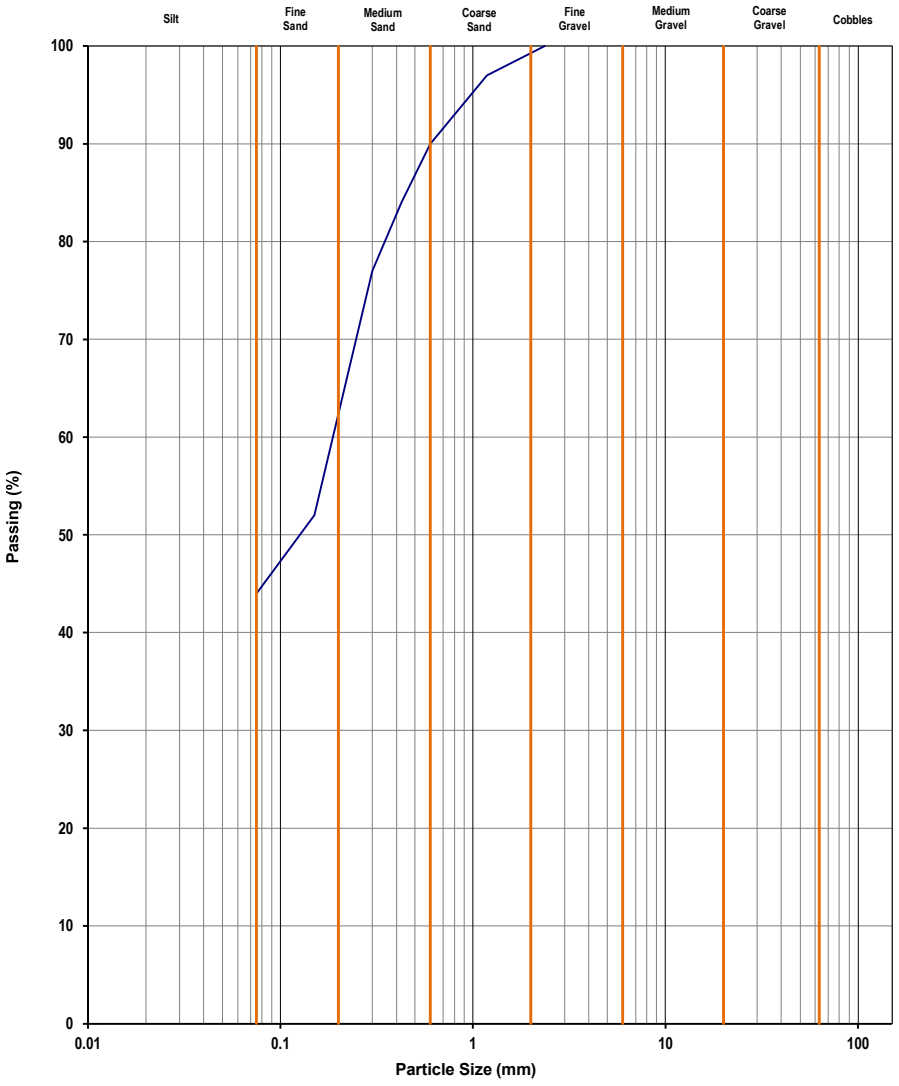
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1 , 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100277-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP2	**Depth From (m)** 7	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	
4.75	
2.36	100
1.18	97
0.600	90
0.425	84
0.300	77
0.150	52
0.075	44



NOTES/REMARKS: -

Moisture Content 17.7%

Sample/s supplied by the client

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.

Tested at Trilab Brisbane Laboratory.

Authorised Signatory

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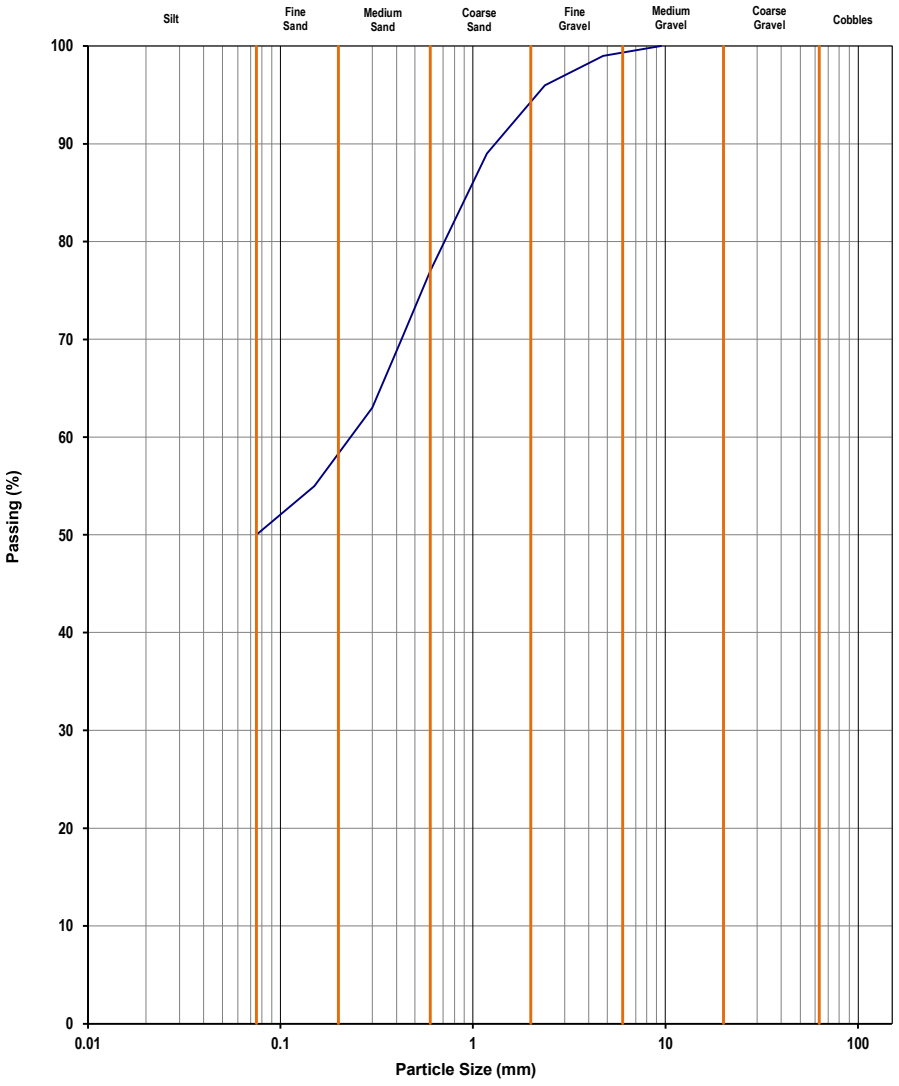
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1 , 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100278-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	17/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP2	**Depth From (m)** 10	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	
13.2	
9.5	
6.7	100
4.75	99
2.36	96
1.18	89
0.600	77
0.425	70
0.300	63
0.150	55
0.075	50



NOTES/REMARKS: -

Moisture Content 17.6%

Sample/s supplied by the client

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.

Tested at Trilab Brisbane Laboratory.

Authorised Signatory

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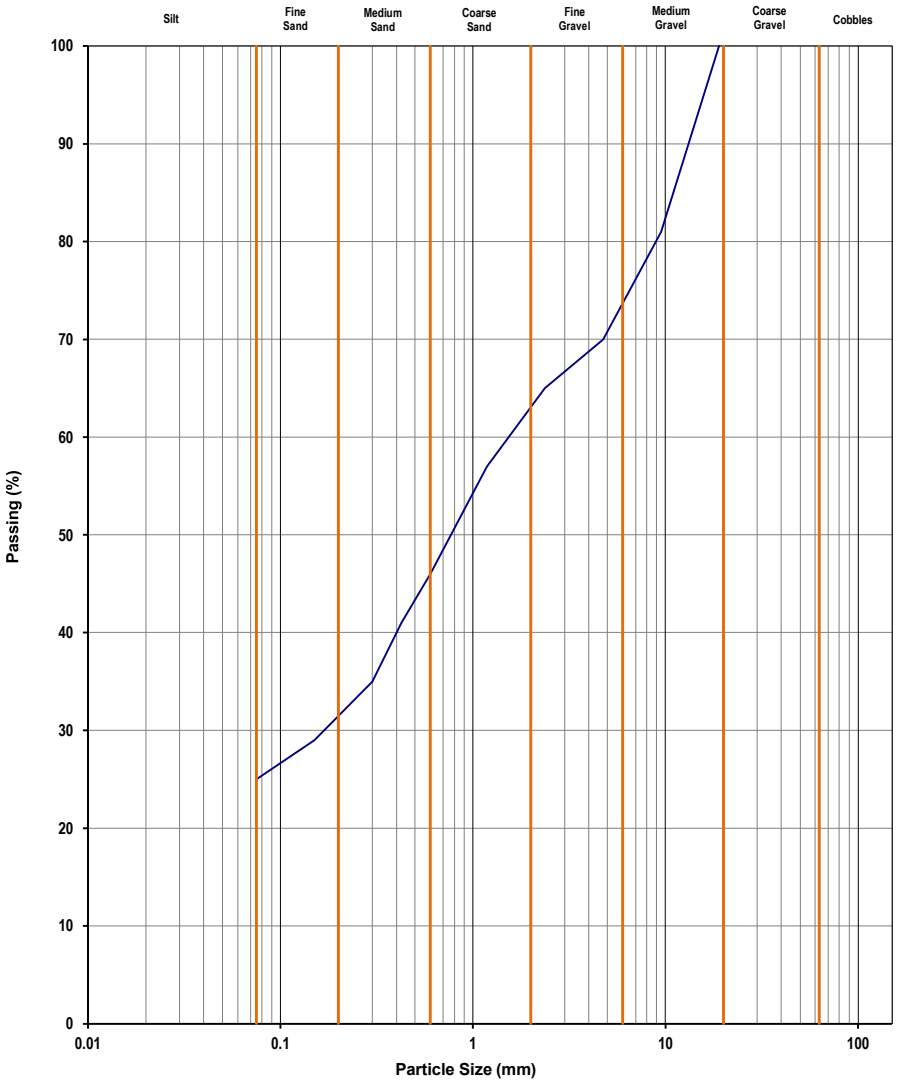
PARTICLE SIZE DISTRIBUTION TEST REPORT

Test Method: AS 1289 3.6.1 , 2.1.1

Client	Golder Associates Pty Limited	**Report No.**	GA100279-G
		Request No	20122017
Address	PO Box 1734 MILTON BC QLD 4064	**Test Date**	18/1/2018
		Report Date	24/1/2018
Project	GPC_CVIP Investigation_Gladstone		
Project No	1787891	**Client Sample No**	-
Bore Hole	HP2	**Depth From (m)** 11.5	**Depth To (m)**
Description	DS		

Sieve Size (mm)	Passing %
150.0	
75.0	
63.0	
53.0	
37.5	
26.5	
19.0	100
13.2	86
9.5	81
6.7	77
4.75	70
2.36	65
1.18	57
0.600	46
0.425	41
0.300	35
0.150	29
0.075	25



NOTES/REMARKS: -

Moisture Content 16.5%

Sample/s supplied by the client

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Tested at Trilab Brisbane Laboratory.

Authorised Signatory

C. Channon

NATA ACCREDITED FOR TECHNICAL COMPETENCE

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ATTERBERG LIMITS TEST REPORT

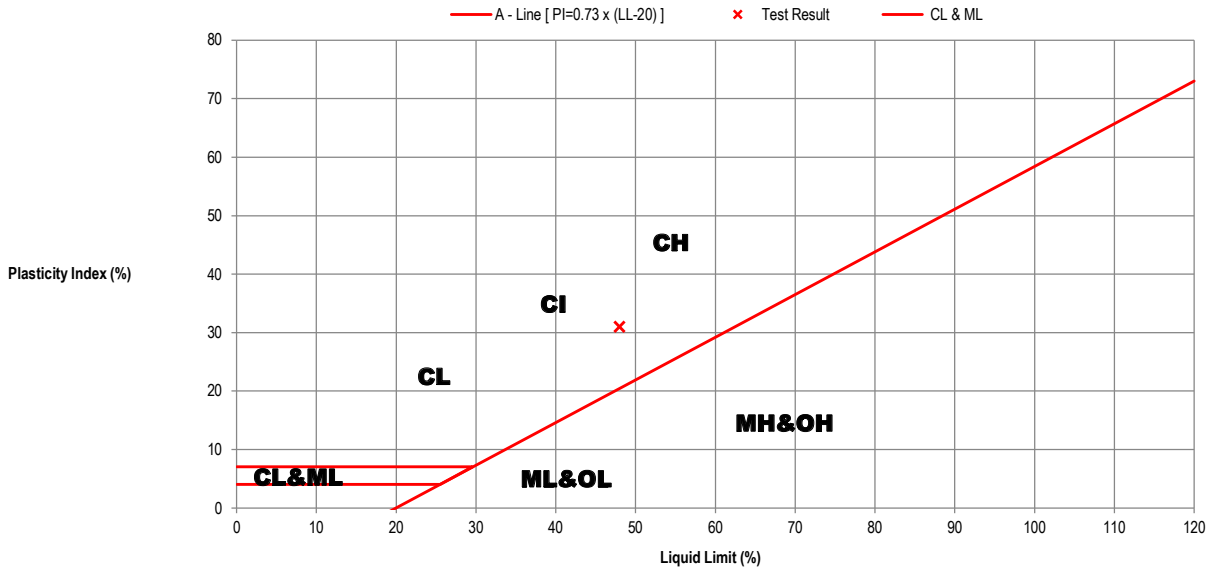
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100271-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	AC1	**Depth From (m)** 4	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**48**	
Plastic Limit (%)	**17**	
Plasticity Index (%)	**31**	
Linear Shrinkage (%)	**13.5**	**Curling Ocurred**
Moisture Content (%)	**39.5**	
Preparation Method	**Wet Sieved and Natural**	

Plasticity Chart



Remarks:

Sample/s supplied by client | Tested as received | **Page: 1 of 1** | REP00102

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ATTERBERG LIMITS TEST REPORT

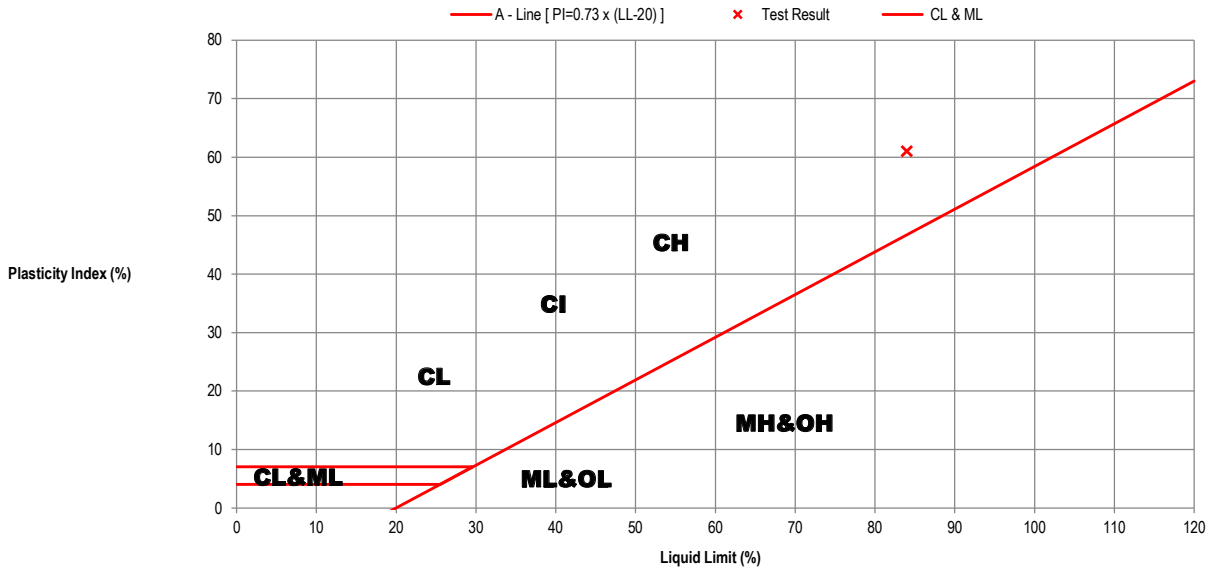
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100243-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	AC2	**Depth From (m)** 4	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**84**	
Plastic Limit (%)	**23**	
Plasticity Index (%)	**61**	
Linear Shrinkage (%)	**20.0**	**Curling Ocurred**
Moisture Content (%)	**72.6**	
Preparation Method	**Wet Sieved and Natural**	

Plasticity Chart



Remarks:

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ATTERBERG LIMITS TEST REPORT

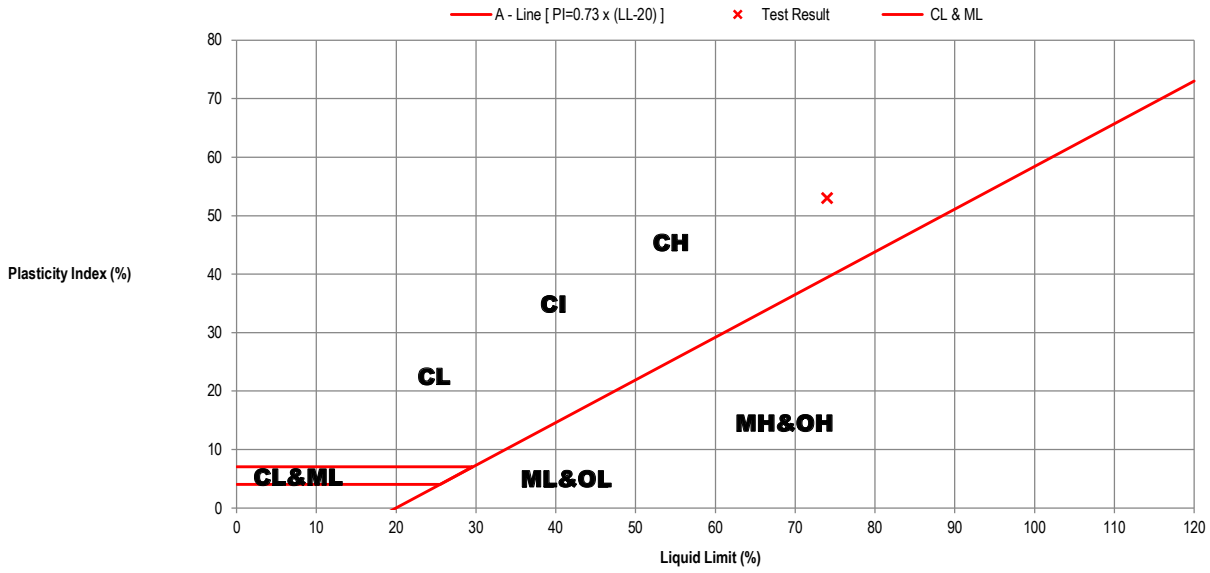
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100273-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	HP1	**Depth From (m)** 2.5	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**74**	
Plastic Limit (%)	**21**	
Plasticity Index (%)	**53**	
Linear Shrinkage (%)	**18.5**	**Curling Ocurred**
Moisture Content (%)	**80.9**	
Preparation Method	**Wet Sieved and Natural**	

Plasticity Chart



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ATTERBERG LIMITS TEST REPORT

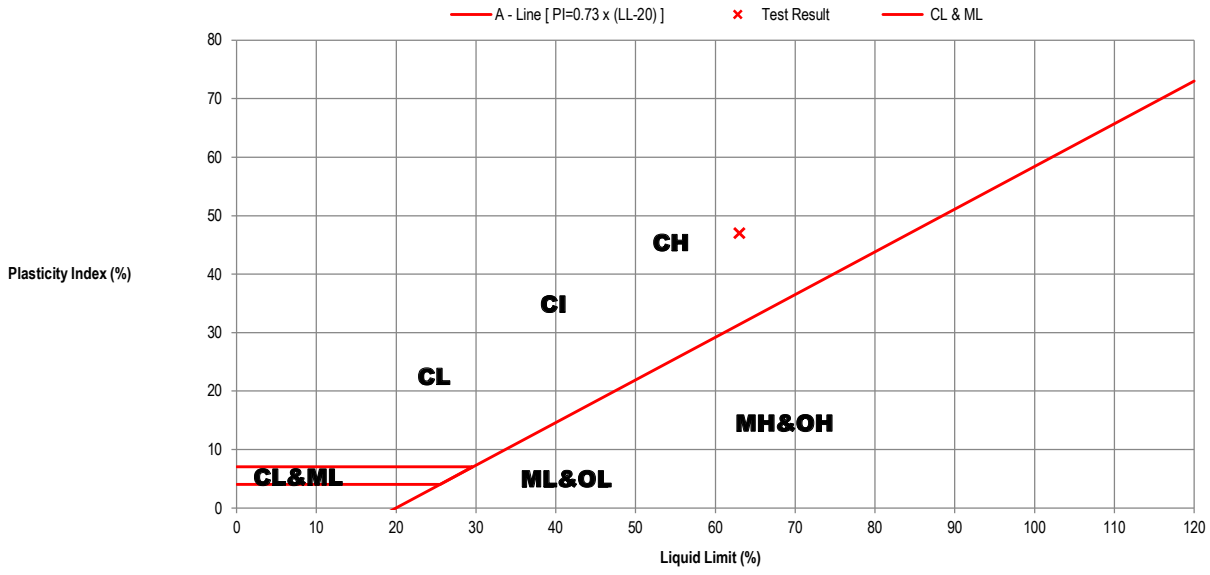
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100274-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	HP1	**Depth From (m)** 7	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**63**	
Plastic Limit (%)	**16**	
Plasticity Index (%)	**47**	
Linear Shrinkage (%)	**16.0**	**Curling Ocurred**
Moisture Content (%)	**58.1**	
Preparation Method	**Wet Sieved and Natural**	

Plasticity Chart



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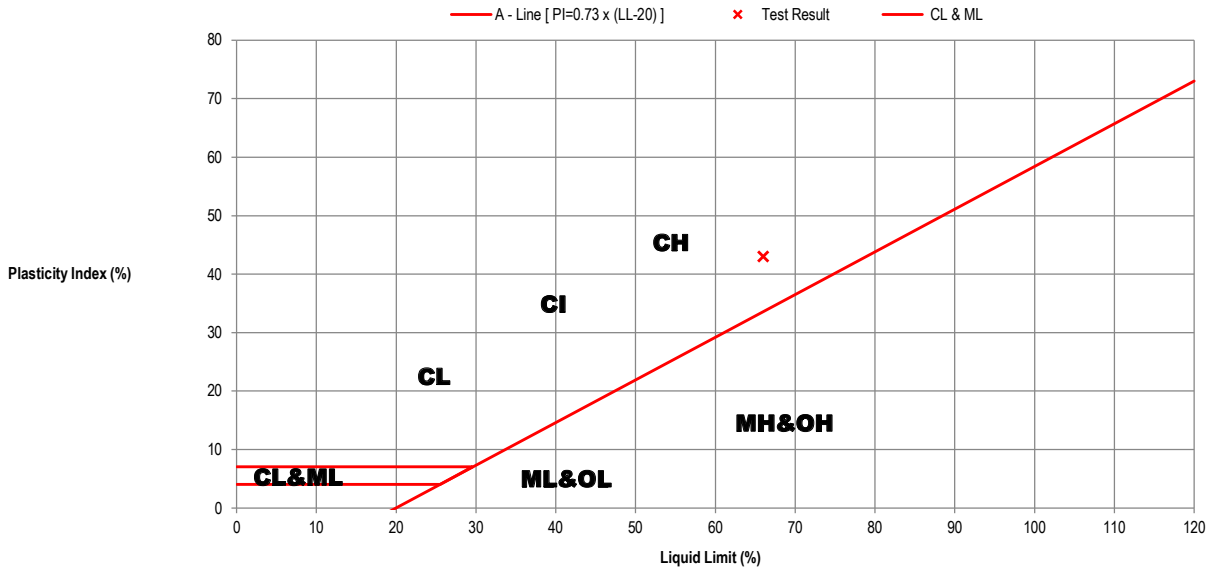
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100276-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	HP2	**Depth From (m)** 2.5	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**66**	
Plastic Limit (%)	**23**	
Plasticity Index (%)	**43**	
Linear Shrinkage (%)	**17.5**	**Curling Ocurred**
Moisture Content (%)	**26.5**	
Preparation Method	**Dry Sieved and Oven Dried**	

Plasticity Chart



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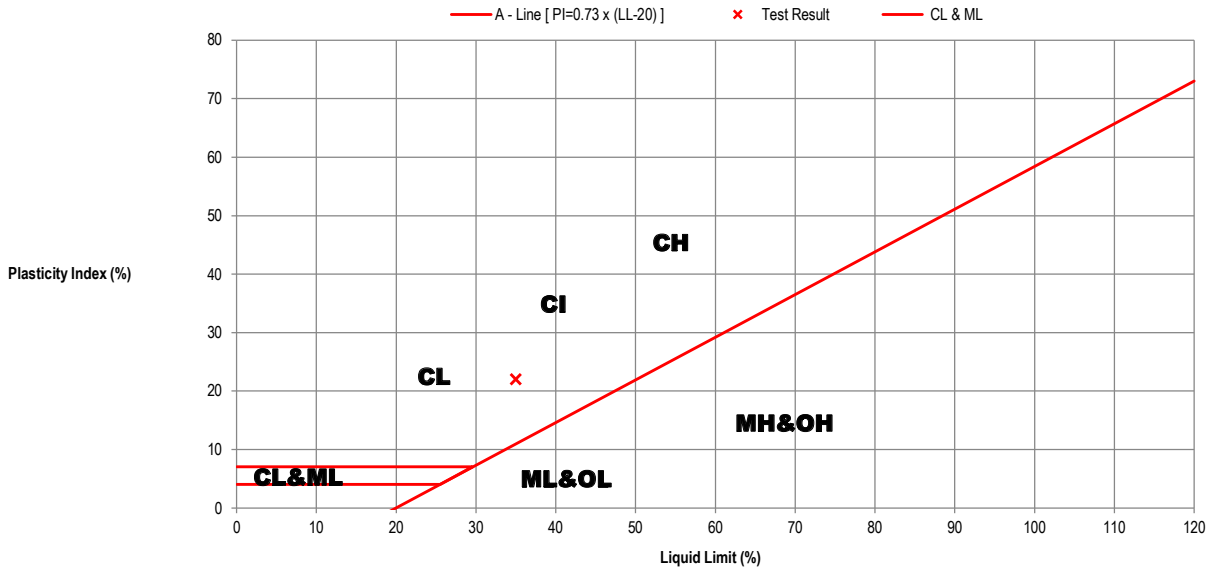
Test Method: AS 1289 2.1.1, 3.1.2, 3.2.1, 3.3.1, 3.4.1

Client	Golder Associates Pty Limited	**Report No.**	GA100277-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	HP2	**Depth From (m)** 7	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**35**	
Plastic Limit (%)	**13**	
Plasticity Index (%)	**22**	
Linear Shrinkage (%)	**10.5**	**Curling Ocurred**
Moisture Content (%)	**17.4**	
Preparation Method	**Dry Sieved and Oven Dried**	

Plasticity Chart



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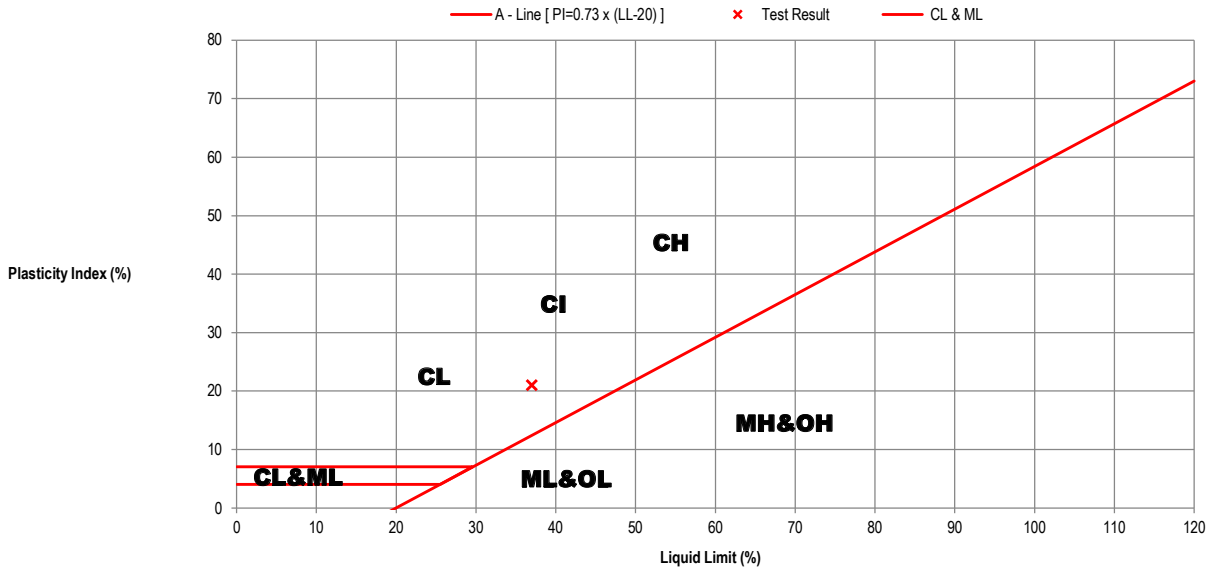
Client	Golder Associates Pty Limited	**Report No.**	GA100278-AL
Address	PO Box 1734 MILTON BC QLD 4064	**Request No.**	20122017
		Test Date	19/01/2018
Project	GPC_CVIP Investigation_Gladstone	**Report Date**	23/01/2018
Project No.	1787891	**Client Sample No.**	-
Bore Hole	HP2	**Depth From (m)** 10	**Depth To (m)**
Description	DS		

RESULTS OF TESTING

Liquid Limit (%)	**37**	
Plastic Limit (%)	**16**	
Plasticity Index (%)	**21**	
Linear Shrinkage (%)	**11.0**	**Curling Ocurred**
Moisture Content (%)	**17.6**	
Preparation Method	**Dry Sieved and Oven Dried**	

Plasticity Chart



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APPENDIX C

Important Information Relating to this Report

IMPORTANT INFORMATION RELATING TO THIS REPORT

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder's Client and persons acting on the Client's behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

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Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

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