

53A Warriewood Road, Warriewood NSW proposed subdivision geotechnical investigation

Prepared for PVD No.21 Pty Ltd c/o Craig and Rhodes Pty Ltd

15 June 2021





Document Information	
Prepared for	PVD No.21 Pty Ltd c/o Craig and Rhodes Pty Ltd
Proposal Name	Proposed Subdivision – geotechnical investigation
File Reference	10791E/P/453-A
Job Reference	10791E/P/453
Quote Reference	10848/P/180
Date	15 June 2021
Version Number	A

Contact Information

Construction Sciences	ABN 74 128 806 735
Phone	+61 2 4254 4458
Email	George.Sourenian@constructionsciences.net
Address	2/4 Kellogg Rd, Glendenning 2761

 \leq

George Sourenian Geotechnical Engineer Effective date: 15/06/2021 Vipul de Silva Principal Geotechnical Engineer Date approved: 15/06/2021

DOCUMENT HISTORY

A 15/06/2021 DK/GS VdS Andrew Morelli	Version	Effective Date R	Revision	Author	Reviewer	Recipient
	А	15/06/2021		DK/GS	VdS	Andrew Morelli

© Construction Sciences. Copyright in the whole and every part of this document belongs to Construction Sciences and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Construction Sciences.

This document is produced by Construction Sciences solely for the benefit and use by the client in accordance with the terms of the engagement. Construction Sciences does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.



Contents

1.	Intro	duction		1			
2.	Site D	Description	on and Geology	1			
3.	Inves	tigation	Work	2			
	3.1	Fieldwo	vrk	2			
	3.2	Interpre	eted In-Situ CBR	3			
	3.3 Laboratory Testing						
4.	Discu	ssion an	d Recommendations	6			
	4.1	Geotecl	hnical Model	6			
	4.2	Earthwo	orks	6			
	4.3 Foundation Design Recommendations						
	4.4 Interim AS2870 Classifications.						
	4.5	Excavat	ion	8			
		4.5.1	Batter Slopes	8			
	4.6	Subgra	de Design CBR	8			
	4.7	Paveme	ent Design	9			
		4.7.1	Additional Recommendations	9			
	4.8 Durability						
	4.9	Acid Su	Iphate Soils	10			
5.	Closu	ire		10			
6.	Refer	ences		10			
Impo	rtant l	nformati	ion about this Geotechnical Report	11			

Appendices

Appendix A Important Information and General Notes

Appendix B Site Plan and Borehole Logs

Appendix C Laboratory Test Results

Figures



Tables

Table 1	Summary of Subsurface Profile	. 2
Table 2	Inferred CBR Values from In-situ DCP testing	. 3
Table 3	Summary of Moisture Content and Atterberg Limit Test Results	. 4
Table 4	Summary of California Bearing Ratio (CBR) Tests	. 5
Table 5	Summary of pH Screening Tests	. 5
Table 6	Summary of Aggressivity Tests	. 6
Table 7	Allowable Bearing Capacity of Subsurface Material	. 7
Table 8	Recommended maximum dry batter slopes	. 8
Table 9	Flexible Pavement Design	. 9

1. Introduction

Construction Sciences (CS) was commissioned by PVD No.21 Pty Ltd c/o Craig and Rhodes to carry out a geotechnical investigation at 53A Warriewood Rd (Lot 2 DP 1115877), Warriewood NSW 2102 (the site) in order to provide recommendations and commentary on the pavement thickness design, identify geotechnical constraints and assess the severity of acid sulphate soils for the proposed subdivision. The investigation has been carried out in accordance with CS proposal 10791E-Q 537 dated 18 March 2021.

2. Site Description and Geology

The site is an open lot with an existing occupied residential property and has residential properties on both sides. The site has various banks to avoid flooding in the south western direction, heading towards the rear of the property that reaches the Narrabeen Creek. Vegetation at the lot comprised grass ground cover and small to medium sized trees and bushes on the western and southern boundary fences at the time of investigation.

Reference to MINVIEW online surface geology mapping indicates that the site is underlain by Middle Triassic aged Ashfield Shale formation comprising of black to light grey shale and laminite.

The Sydney – 1:100 000 Geological Maps indicates that the north eastern part of the site is underlain by Interbedded laminite, shale and quartz to lithic-quartz sandstone. The balance is underlain by quaternaty alluvium comprising sand silt, peat and swamp deposits.

An overview of the site is shown in Figure 1 below.



3. Investigation Work

3.1 Fieldwork

Fieldwork was carried out on the 13th and 14th of May 2021 and comprised 9 bore holes spread around the key areas of the proposed subdivision access road. The boreholes were drilled to a maximum depth of 4.0m using a ute mounted drill rig with 220mm diameter auger attachment.

The fieldwork was carried out by a Geotechnical Engineer from CS, who selected test locations, carried out sampling and in-situ testing and compiled engineering logs of the profiles encountered.

Dynamic Cone Penetrometer (DCP) tests were carried out adjacent to the boreholes and samples were taken for laboratory testing to aid assessment of subsurface soil strength.

The approximate borehole locations are shown on the site plan ref: 10791E/P/453-1 presented in Appendix B.

Subsurface soil profiles encountered in the boreholes are generalised in Table 1 below. Reference should be made to the attached borehole logs for a more detailed description of soils encountered at a particular location.

Table 1	Summary of Subsurface Profile	
Layer/Descri	ption	Depth to Base of Layer (m)
TOPSOIL:		
Clayey Sandy	/ SILT: low plasticity, dark grey and brown	0.0 to 0.8
FILL (BH04 a	and BH06 only):	
Silty Sandy G	RAVEL: fine to medium grained, poorly graded	
Silty Sandy C	LAY: medium plasticity, brown, with gravel	
Sandy CLAY:	medium plasticity, pale grey and grey-brown	>1.0 to 2.2
ALLUVIUM:		
Silty CLAY: m	nedium to high plasticity, grey, trace sand, hard	
Silty CLAY: lo	w to medium plasticity, pale grey and grey, firm to stiff	
CLAY: high p	lasticity, pale grey, trace sand, very stiff to hard	
Clayey SAND dense): fine to medium, pale grey, low plasticity, loose to medium	3.5 to >4.0
RESIDUAL :		
CLAY: low to to hard	medium plasticity, red-brown, orange red and pale-grey, firm	
CLAY: mediu rootlets, soft	m to high plasticity, orange-brown and grey-brown, trace	
Sandy CLAY:	medium plasticity, orange-brown	>1.5 to >4.0

-
_

Layer/Description

Depth to Base of Layer (m)

Clayey SAND: fine to medium, pale grey and grey, medium plasticity

Groundwater was encountered during our investigation; this is assumed to be due to the creek that runs behind the property. The groundwater was identified on the rear side of the property, where the land is at its lowest point at 2.7m at BH6 and 0.5m at BH7.

3.2 Interpreted In-Situ CBR

Interpreted California Bearing Ratio (CBR) inferred from in-situ DCP tests with reference to Austroads 2017 – Guide to Pavement Technology Part 2 - Pavement Structural Design (AGPTP2-2017) are given in Table 2 below. DCP results are included in the borehole logs.

Depth below	Inferred In-Situ CBR Value from DCP Test							
Surface – Level (m)	BH01	BH02	BH03	BH04	BH05	BH06	BH07	BH08
0.0 – 0.1	6	0	11	15	0	6	2	0
0.1 – 0.2	6	2	25	45	0	11	0	0
0.2 – 0.3	15	4	20	25	11	11	4	2
0.3 – 0.4	15	4	35	50	15	13	4	2
0.4 – 0.5	18	2	45	65	15	65	0	2
0.5 – 0.6	15	4	25		15		4	2
0.6 – 0.7	20	8	20		13		6	4
0.7 – 0.8	25	18	6		11		8	6
0.8 – 0.9	29	15	6		6		11	8
0.9 – 1.0	18	25	8		8		13	8
1.0 – 1.1	25	20	6		13		15	13
1.1 – 1.2	18	25	8		13		25	18
1.2 – 1.3	15	31	13		15	15	23	23
1.3 – 1.4	25	35	25		25	18	50	25
1.4 – 1.5	25	35	25		35	15	50	35
1.5 – 1.6	25	18	30		35	15	50	45
1.6 – 1.7	25	25	35		40	11	55	
1.7 – 1.8	30	40	45			6		
1.8 – 1.9		37				6		
1.9 – 2.0		45				11		

 Table 2
 Inferred CBR Values from In-situ DCP testing



$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
2.2 - 2.3 35 2.3 - 2.4 35 2.4 - 2.5 35 2.5 - 2.6 25 2.6 - 2.7 45 2.7 - 2.8 45
2.3 - 2.4 35 2.4 - 2.5 35 2.5 - 2.6 25 2.6 - 2.7 45 2.7 - 2.8 45
2.4 - 2.5 35 2.5 - 2.6 25 2.6 - 2.7 45 2.7 - 2.8 45
2.5 - 2.6 25 2.6 - 2.7 45 2.7 - 2.8 45
2.6 - 2.7 45 2.7 - 2.8 45
2.7 – 2.8 45
28.20 25
2.0 - 2.5 55
2.9 – 3.0 55
3.0 – 3.1 55

3.3 Laboratory Testing

Laboratory testing comprising thirteen (12) Field Moisture Content (FMC) tests, two (2) Atterberg Limit tests, and two (2) California Bearing Ratio (CBR) tests was carried out to aid assessment of subsurface parameters. Laboratory test results are summarised in Table 3. A copy of the laboratory test certificates can be found in Appendix C.

BH IDDepth (mBH010.85) FMC (%) 24.7 18.7	LL (%)	PL(%)	PI(%)	LS(%)
	18.7				
BH01 1.3		-	-	-	-
BH02 0.65	-	41	19	22	10.0
BH02 1.3	15.2	-	-	-	-
BH03 0.9	19.5	-	-	-	-
BH04 1.0	8.6	-	-	-	-
BH05 1.3	18.5	-	-	-	-
BH06 1.0	12.0	-	-	-	-
BH06 2.2	19.5	-	-	-	-
BH06 2.9	21.1	-	-	-	-
BH07 0.45	28.0	-	-	-	-
BH08 1.5	17.4	-	-	-	-
BH09 1.0	-	31	16	15	8.0
BH09 1.5	18.7	-	-	-	-

 Table 3
 Summary of Moisture Content and Atterberg Limit Test Results



BH ID	Depth (m)	Soil Description	FMC ^[1] (%)	OMC ^[2] (%)	MDD ^[3] (t/m ³)	CBR ^[4] (%)
BH 01 CBR01	0.6-1.0	Brown Clay	20.5	19.0	1.74	8
BH05 CBR02	0.7-1.1	Brown Silty Clay	18.4	15.0	1.83	7
BH08 CBR03	0.4-0.9	Grey Brown Clay	19.5	13.0	1.88	9

 Table 4
 Summary of California Bearing Ratio (CBR) Tests

Notes: ^[1] Field Moisture Content ^[2] Optimum Moisture Content

^[3] Maximum Dry Density

^[4] California Bearing Ratio

CBR values more than 20% have been rounded to the nearest 5%.

Aggressivity and pH screening tests were also conducted, with the results summarised in Tables 5 and 6 below.

BHID	Depth (m)	рНF	pHFox	CRS %	Net Acidity CRS based Mole/T	Liming rate Kg/T
BH01	1.8	5.4	4.7	-	-	-
BH02	1.4	5.2	4.5	-	-	-
BH05	1.0	5.2	4.5	< 0.005	25	1.9
BH06	3.3	7.5	5.7	-	-	-
BH07	0.5	5.6	4.2	-	-	-
BH07	1.2	5.1	3.9	-	-	-
BH07	2.5	4.9	3.8	< 0.005	16	1.2
BH08	0.5	7.1	5.4	-	-	-
BH08	1.0	7.0	5.6	-	-	-
BH08	1.5	5.0	4.3	<0.005	86	6.4
BH09	2.0	5.2	4.3	-	-	-

Table 5Summary of pH Screening Tests



, abte e		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
BHID	Depth	Chloride (mg/kg)	Conductivity (μS/cm)	рН	Sulphate (as SO4, mg/kg)	Moisture (%)
BH07	1.2	38	42	5.3	43	20
BH02	1.2	<10	27	5.6	50	15

4. Discussion and Recommendations

4.1 Geotechnical Model

Summary of Agaressivity Tests

Table 6

Based on the borehole logs and review of geological maps the site subsurface lithology may be considered in two profiles.

- The area north east of borehole BH08 is underlain by residual clay profile to termination depth (BH1, 2, 3, 5, 8 and 9).
- The area south west of BH08 underlain by fill and alluvial soils.

Based on the DCP test results all soils including alluvial soils are assessed to be firm to very stiff.

No evidence of a weak alluvial layer was encountered in the boreholes.

It is noted that some areas in Warriewood valley contained peat and soft clay underlain by water charged alluvial loose sand. Presence of such layers may be detected during earthworks when proof roll inspections are carried out.

4.2 Earthworks

It is likely that earthworks would be required to bring some parts of the site above flood level and also to facilitate drainage. Site regrading plans were not available at the time of this commission. CS recommends that the earthworks plans to be reviewed by a geotechnical consultant prior to construction.

In general, the following recommendations are made:

- Topsoil and uncontrolled fill found on site should be removed and sorted for later use where appropriate. It is noted that topsoil depth to be up to 0.8m. CS recommends that vegetative layer of topsoil and fill be stripped and disposed offsite or use for later landscaping if required.
- Topsoil with less than about 0.5% vegetable matter may be blended at a ratio of 3: t general fill : topsoil for incorporating in earthworks.
- Stripped surface should be proof rolled and soft or deflecting areas should be excavated and back filled with suitable fill.
- There may be a requirement for a bridging layer consisting of granular fill or ballast including geogrids and geofabrics at some places depending upon the in-situ moisture condition at the time.



- Slightly or moderately reactive fill materials such as ripped sandstone should be used for filling to reduce the risk of adverse site classification.
- Earthworks should be carried out in accordance with AS3798 Guidelines for Earthworks in Commercial and Residential Development with testing carried out under Level 1.

4.3 Foundation Design Recommendations

Pad / strip / stiffened raft footings founded on stiff or better residual clay may be considered. Load bearing elements may be proportioned for a maximum allowable bearing pressure (ABP) of 100 kPa on stiff or better residual soils expected below 0.8m. Alternatively, high level footings may be placed in controlled fill placed under level 1 testing as described above. Settlements for pad footings on clay are anticipated to be up to about 15mm where loading does not exceed the maximum allowable values.

All footings should be founded on material with similar end bearing capacity to limit differential movement across the building footprint. Individual pad footings should not span the interface between different foundation materials.

	Allowable Vertical Bearing Capacity		
Foundation material	Shallow Footing (kPa) ¹	Bored Piles (kPa) ²	
Topsoil/Uncontrolled Fill ³	N/A	N/A	
Stiff Sandy Clay (expected below 0.8m)/ Controlled fill	100	N/A	
Very Stiff Clay (expected below 1.3m)	170	300	

 Table 7
 Allowable Bearing Capacity of Subsurface Material

Notes:

- 1. Allowable bearing pressure for shallow footings assuming a geotechnical strength reduction factor of 0.5 and a serviceability factor of 0.5.
- 2. Allowable end bearing pressure for piles assuming a geotechnical strength reduction factor of 0.5 and a serviceability factor of 0.5. Base of piles to be inspected by a geotechnical engineer to confirm expected materials are encountered and bearing capacity is met. The depth to pile toe should be at least 5 times the diameter.
- 3. Fill materials are assumed to have been placed under uncontrolled condition and are not suitable as support for the proposed building.

The above design parameters are based on the assumptions that the base of excavation is free of loose or soft soils and water prior to placement of concrete, and an embedment of at least 1.0 m or two to three pile diameter, whichever is greatest, in the material unit.

All footings should be inspected by a Geotechnical Engineer or Principal Certifying Authority (PCA) and constructed with minimal delay following excavation. The Geotechnical Engineer is to confirm encountered conditions satisfy design assumptions. Water that has ponded in the base of excavations and any resultant softened material is to be removed prior to footing construction. If a delay in construction is anticipated, we recommend that a concrete blinding layer of at least 50 mm thickness is placed to protect the foundation material.



4.4 Interim AS2870 Classifications.

Natural site within residual soil area can be given an interim site classification in accordance with AS2870-2011 of Class M (Moderately Reactive). Any cut fill earthworks more than 300mm depth would alter the site classification and the modified site classification should be reviewed by a geotechnical; consultant following earthworks.

Placement of reactive fill would increase the severity of site classification.

The classifications provided here assumes that the site maintenance is carried out based on the recommendations of CSR BTF -18 Foundation Maintenance and Footing performance included in Appendix A and the performance expectations are in accordance with those in Appendix B of AS2870-2011.

4.5 Excavation

No major excavation is expected as part of the proposed development. However, excavations for the purpose of shallow footings and buried services are expected to encounter fill and residual clay soils, which can be readily excavated using conventional earthmoving equipment.

All excavation work should be completed with reference to the Code of Practice 'Excavation Work', by Safe Work Australia. Excavation method statements will need to be prepared by the excavation contractor prior to the issue of CC.

4.5.1 Batter Slopes

Recommended maximum slopes for permanent and temporary batters less than 2m height are presented in Table 8. All deeper excavations or fill embankments should be subjected to geotechnical design.

 Table 8
 Recommended maximum dry batter slopes

Unit

	Permanent	Temporary
Residual Clay & Alluvial Clay	2.5:1	1:1
Medium Dense Sand (or denser)	3:1	2:1

4.6 Subgrade Design CBR

Table 4 above summarises the results of laboratory CBR tests carried out on the three subgrade samples. CBR values ranged between 7% and 9% and were up to 6.5% wet of standard optimum moisture content.

Inferred in-situ CBR from DCP test results are presented in Table 2 above. CBR interpreted in this way is at insitu FMC condition, compared to a 4-day soaked condition for the laboratory CBR values, and as such is useful for helping define weak subgrade conditions associated with wetter and or poorly drained in-situ subgrade.



4.7 Pavement Design

Based on Northern Beaches Council guidelines and Austroads 2017 – Guide to Pavement Technology Part 2 - Pavement Structural Design, the pavement design for the proposed subdivision is given in Table 9 below.

The pavement layer thickness has been assessed based off the Northern Beaches Council guidelines for minor and local residential roads.

If a different road description classification is to be assigned, please contact CS and the design can be revised.

Table 9	Flexible Pavement Design				
DESA	CBR (%)	Base Course (mm)	Intermediate Course (mm)	Wearing Course (mm)	Total (mm)
2x10⁵	5	200	120	40	360

Notes: The above pavement thickness is for good subgrade conditions. Where the existing subgrade condition is poor, a select subgrade course must be provided.

Subgrade is to be thoroughly trimmed and compacted by applying a roller of no less than 8 tonnes until it conforms to the required profile and exhibits some degree of compacion. Any unstable or soft patches shall be removed and replaced.

4.7.1 Additional Recommendations

Subsoil drains should be installed to a minimum depth no less than 600mm below finished subgrade level along both sides of all roads or as directed by Council Engineers.

During construction, it is recommended that a Senior Geotechnician, Geotechnical Engineer or other experienced consultant inspect the subgrade following preliminary boxing in order to verify subgrade conditions and the recommended CBR design value. If any adverse moisture conditions are encountered, provisions should be made for potential replacement of subgrade material.

For any sections of road requiring fill placement, the placed fill material must have a CBR value equal to or greater than 15%. The fill, subgrade and pavement layers should also be compacted to the following minimum dry density ratios (AS 1289 5.4.1) during construction.

Basecourse	98% Modified
Subbase	98% Modified
Subgrade/Select fill	100% Standard

4.8 Durability

Two soil samples were tests for durability assessment including chloride, sulphate, pH and Electrical Conductivity. Based on the test results soils were assessed to be non-aggressive to both steel and concrete members in contact with soil.

4.9 Acid Sulphate Soils

Twelve samples from 8 boreholes were subjected to pH screening test.

All samples recorded pH >4.5 in water (pHF).

All samples recorded pHFox >3.0

Based on screening test results and in accordance with NSW Acid Sulphate Soil management manual all samples are assessed to be neither Actual Acid Sulphate (AASS) nor Potential Acid Sulphate (PASS).

Nevertheless, three samples were subjected Chromium Reducible Sulphur suite of tests. The results indicated the soil samples did not contain any unoxidized sulphur. There were minor quantities of existing acidity ranging from 16 Moles/t to 86 moles per tonne of hydrogen with an average of 37moles/ton.

Test results are included in Appendix C.

The soils are assessed to be fine grained soils and therefore if less than 1000t of soil to be disturbed no acid sulphate management is required.

Based on the proposed development where excavation is limited to OSD basin, it is unlikely that more than 1000t of acid sulphate soils would be excavated. Therefore, CS assessed that an Acid Sulphate management Plan is not required.

5. Closure

This report should be read in conjunction with the 'Important Information about this Geotechnical Report' sheet below.

CS trusts this report meets your current requirements. Please do not hesitate to contact George Sourenian 0475 778 595 or <u>george.sourenian@constructionsciences.net</u> if you have any queries.

6. References

AS1726-2017 'Geotechnical site investigations'

Austroads 2017 - Guide to Pavement Technology Part 2 - Pavement Structural Design

Wollondilly Shire Council – Subdivision & Engineering Standard

Appendix A Important Information and General Notes



Important Information about this Geotechnical Report

Scope of Work

The purpose of this report and any associated documentation is expressly stated in the document. This document does not form a complete assessment of the site, and no implicit determinations about Construction Sciences scope can be taken if not specifically referenced. Whilst this report is intended to reduce geotechnical risk, no level of detail or scope of work can entirely eliminate risk.

The nature of geotechnical data typically precludes auxiliary environmental assessment without undertaking specific methods in the investigation. Therefore, unless it is explicitly stated in the scope of work, this report does not provide any contamination or environmental assessment of the site or adjacent sites, nor can it be inferred or implied from any component of the document.

The scope of work, geotechnical information, and assessments made by Construction Sciences may be summarised in the report; however, all aspects of the document, including associated data and limitations should be reviewed in its entirety.

Standard of care

Construction Sciences have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, data that was available or was collected, and previous

experience.

Construction Sciences findings and assessment represent its reasonable judgment, diligence, skill, with sound professional standards, within the time and budget constraints of its commission. No warranty, expressed or implied, is made as to the professional advice included in this report.

Data sources

In preparing this document, or providing any consulting services during the commission, Construction Sciences may have relied on information from third parties including, but not limited to; sub-consultants, published data, and the Client including its employees or representatives. This data may not be verified and Construction Sciences assumes no responsibility for the adequacy, incompleteness, inaccuracies, or reliability of this information.

Construction Sciences does not assume any responsibility for assessments made partly, or entirely based on information provided by third parties.



Variability in conditions and limitations of data

Subsurface conditions are complex and can be highly variable; they cannot be accurately defined by discrete investigations. Geotechnical data is based on investigation locations which are explicitly representative of the specific sample or test points. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and there are unknowns or variations in ground conditions between test locations that cannot be inferred or predicted.

The precision and reliability of interpretive assessment between discrete points is dependent on the uniformity of the subsurface strata, as well as the frequency, detail, and method of sampling or testing.

Subsurface conditions are formed by various natural and anthropogenic processes and therefore are subject to change over time. This is particularly relevant with changes to the site ownership or usage, site boundary or layout, and design or planning modifications. Aspects of the site may also not be able to be determined due to physical or project related constraints and any information provided by Construction Sciences cannot apply following modification to the site, regulations, standards, or the development itself.

It is important to appreciate that no level of detail in investigation, or diligence in assessment, can eliminate uncertainty related to subsurface conditions and thus, geotechnical risk. Construction Sciences cannot and does not provide unqualified warranties nor does it assume any liability for site conditions not observed or accessible during the investigations.

Verification of opinions and recommendations

Geotechnical information, by nature, represents an opinion and is based extensively on judgment of both data and interpretive assessments or observation. This report and its associated documentation are provided explicitly based on Construction Sciences opinion of the site at the time of inspection, and cannot be extended beyond this.

Any recommendations or design are provided as preliminary until verified on site during project implementation or construction. Inspection and verification on site shall be conducted by a suitably qualified geotechnical consultant or engineer, and where subsurface conditions or interpretations differ from those provided in this document or otherwise anticipated, Construction Sciences must be notified and be provided with an opportunity to review the recommendations.

Client and copyright

This document is produced by Construction Sciences solely for the benefit and use by the Client in accordance with the terms of the engagement. Construction Sciences does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Copyright in the whole and every part of this document belongs to Construction Sciences and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person other than by agreement with Construction Sciences.

Appendix B Site Plan and Borehole Logs



Approximate Borehole Locations



Construction Sciences

Unit 2 / 4 Kellogg Road Rooty Hill NSW 2766 Tel: 1300 165 769 Email: info@constructionsciences.net

Drawing No: 10791E/P/453	Sheet: 1 of 1	Site Plan 1	
Drawn By: DK	Location: 53A Warriewood Rd, Warriewood NSW 2102		
Date: 19 th May 2021	Project: 10791E/P/453		
Scale: NTS	Client: PVD No.21 c/o Craig and Rhodes		



Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	Method				
Test Pitting: exc	Test Pitting: excavation/trench				
BH	Backhoe bucket				
EX	Excavator bucket				
R	Ripper				
Н	Hydraulic Hammer				
Х	Existing excavation				
Ν	Natural exposure				
Manual drilling:	hand operated tools				
HA	Hand Auger				
Continuous san	nple drilling				
PT	Push tube				
PS	Percussion sampling				
SON	Sonic drilling				
Hammer drilling					
AH	Air hammer				
AT	Air track				
Spiral flight auger drilling					
AS	Auger screwing				
AD/V	Continuous flight auger: V-bit				
AD/T	Continuous spiral flight auger: TC-Bit				
HFA	Continuous hollow flight auger				
Rotary non-core drilling					
WB	Washbore drilling				
RR	Rock roller				
Rotary core drilling					
PQ	85mm core (wire line core barrel)				
HQ	63.5mm core (wire line core barrel)				
NMLC	51.94mm core (conventional core barrel)				
NQ	47.6mm core (wire line core barrel)				
DT	Diatube (concrete coring)				

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method				
Soil sampling				
В	Bulk disturbed sample			
D	Disturbed sample			
С	Core sample			
ES	Environmental soil sample			
SPT	Standard Penetration Test sample			
U	Thin wall tube 'undisturbed' sample			
Water sampling				
WS	Environmental water sample			

Field testing may be conducted as a means of assessment of the in situ conditions of materials.

|--|

SPT	Standard Penetration Test		
HP/PP	Hand/Po	ocket Penetrometer	
Dynamic F	Dynamic Penetrometers (blows per noted increment)		
	DCP	Dynamic Cone Penetrometer	
	PSP	Perth Sand Penetrometer	
MC	Moisture Content		
VS	Vane Shear		
PBT	Plate Bearing Test		
IMP	Borehole Impression Test		
PID	Photo Ionization Detector		

If encountered, refusal (R), virtual refusal (VR) or hammer bouncing (HB) of penetrometers may be noted.

The quality of the rock can be assessed by the degree of natural defects/fractures and the following.

Rock quality description				
TCR	Total Core Recovery (%)			
	(length of core recovered divided by the length of core run)			
RQD	Rock Quality Designation (%)			
	(sum of axial lengths of core greater than 100mm long divided by the length of core run)			

Notes on groundwater conditions encountered may include.

Groundwater	
Not Encountered	Excavation is dry in the short term
Not Observed	Water level observation not possible
Seepage	Water seeping into hole
Inflow	Water flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions		
Stable	No obvious/gross short term instability noted	
Spalling	Material falling into excavation (minor/major)	
Unstable	Collapse of the majority, or one or more face of the excavation	



Explanatory Notes: General Soil Description

The methods of description and classification of soils used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, a material is described as a soil if it can be remoulded by hand in its field condition or in water. The dominant component is shown in upper case, with secondary components in lower case. In general descriptions cover: soil type, plasticity or particle size/shape, colour, strength or density, moisture and inclusions.

In general, soil types are classified according to the dominant particle on the basis of the following particle sizes.

Soil Classification		Particle Size (mm)
CLAY		< 0.002
SILT		0.002 0.075
SAND	fine	0.075 to 0.21
	medium	0.21 to 0.6
	coarse	0.6 to 2.36
GRAVEL	fine	2.36 to 6.7
	medium	6.7 to 19
	coarse	19 to 63
COBBLES		63 to 200
BOULDERS		> 200

Soil types may be qualified by the presence of minor components on the basis of field examination methods and/or the soil grading.

Terminology	In coarse	In fine soils	
reminology	% fines	% coarse	% coarse
Trace	≤5	≤15	≤15
With	>5, ≤12	>15, ≤30	>15, ≤30

The strength of cohesive soils is classified by engineering assessment or field/lab testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	≤12kPa
Soft	S	12kPa to ≤25kPa
Firm	F	25kPa to ≤50kPa
Stiff	St	50kPa to ≤100kPa
Very Stiff	VSt	100kPa to ≤200kPa
Hard	Н	>200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	<15%
Loose	L	15% to ≤35%
Medium Dense	MD	35% to ≤65%
Dense	D	65% to ≤85%
Very Dense	VD	>85%

The plasticity of cohesive soils is defined by the Liquid Limit (LL) as follows.

Plasticity	Silt LL	Clay LL
Low plasticity	≤ 50%	≤ 35%
Medium plasticity	N/A	> 35% ≤ 50%
High plasticity	> 50%	> 50%

The moisture condition of soil (*w*) is described by appearance and feel and may be described in relation to the Plastic Limit (PL), Liquid Limit (LL) or Optimum Moisture Content (OMC).

moiste	ire condition and description
Dry	Cohesive soils: hard, friable, dry of plastic limit. Granular soils: cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure of soil layers may include: defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin a	Soil origin and description		
Fill	Anthropogenic deposits or disturbed material		
Topsoil	Zone of soil affected by roots and root fibres		
Peat	Significantly organic soils		
Colluvial	Transported down slopes by gravity/water		
Aeolian	Transported and deposited by wind		
Alluvial	Deposited by rivers		
Estuarine	Deposited in coastal estuaries		
Lacustrine	Deposited in freshwater lakes		
Marine	Deposits in marine environments		
Residual soil	Soil formed by in situ weathering of rock, with no structure/fabric of parent rock evident		
Extremely weathered material	Formed by in situ weathering of geological formations, with the structure/fabric of parent rock intact but with soil strength properties		

The origin of the soil generally cannot be deduced solely on the appearance of the material and the inference may be supplemented by further geological evidence or other field observation. Where there is doubt, the terms 'possibly' or 'probably' may be used



Explanatory Notes: General Rock Description

The methods of description and classification of rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, if a material cannot be remoulded by hand in its field condition or in water, it is described as a rock. In general, descriptions cover: rock type, grain size, structure, colour, degree of weathering, strength, minor components or inclusions, and where applicable, the defect types, shape, roughness and coating/infill.

Rock types are generally described according to the predominant grain or crystal size, and in groups for each rock type as follows.

Rock type	Groups
Sedimentary	Deposited, carbonate (porous or non), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate, or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing minerology (iron oxides or hydroxides, silica, calcium carbonate, gypsum)

Reference should be made to AS1726 for details of the rock types and methods of classification.

The classification of rock weathering is described based on definitions in AS1726 and summarised as follows.

Term and symbol		Definition
Residual Soil	RS	Soil developed on rock with the mass structure and substance of the parent rock no longer evident
Extremely weathered	XW	Weathered to such an extent that the rock has 'soil-like' properties. Mass structure and substance still evident
Distinctly weathered	DW	The strength is usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores. May be distinguished into MW (Moderately Weathered) and HW (Highly Weathered).
Slightly weathered	SW	Slightly discoloured; little or no change of strength from fresh rock
Fresh Rock	FR	The rock shows no sign of decomposition or staining

The rock material strength can be defined based on the point load index as follows.

Term and symbol		Point Load Index I₅50 (MPa)
Very Low	VL	0.03 to 0.1
Low	L	0.1 to 0.3
Medium	Μ	0.3 to 1.0
High	Н	1.0 to 3
Very High	VH	3 to 10
Extremely High	EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength which can be significantly weaker due to the effect of defects. A preliminary assessment of rock strength may be made using the field guide detailed in AS1726, and this is conducted in the absence of point load testing.

The defect spacing measured normal to defects of the same set or bedding, is described as follows.

Definition	Defect Spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Terms for describing rock and defects are as follows.

Defect Terms			
Joint	JT	Sheared zone	SZ
Bedding Parting	BP	Seam	SM
Foliation	FL	Vein	VN
Cleavage	CL	Drill Lift	DL
Crushed Seam	CS	Handling Break	HB
Fracture Zone	FZ	Drilling Break	DB

The shape and roughness of defects in the rock mass are described using the following terms.

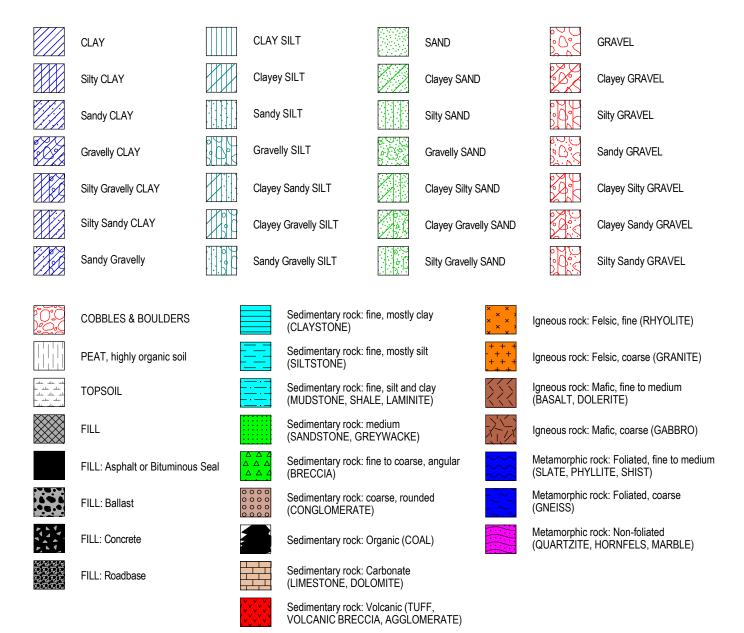
Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulose	UN	Smooth	S
Irregular	IR	Slickensided	SL
Stepped	ST	Polished	POL
Discontinuous	DIS		

The coating or infill associated with defects in the rock mass are described as follows.

Infill and Coating		
Clean	CN	
Stained	SN	
Carbonaceous	Х	
Minerals	MU	Unidentified mineral
	MS	Secondary mineral
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
Veneer	VNR	Thin or patchy coating
Coating	СТ	Infill up to 1mm



Graphic Symbols Index



۱,		ons cien		tion								В	ORE	HOLE LOG SHEET
	ject:			-	Ltd c/o Crai	-	Rhode	s					H	lole No: BH01
	atio		3A W	arriewood	Rd, Warriev	vood				Job No: 10791E/P/453				Sheet: 1 of 1
	ition		<u>. Mo</u>	unted Drill	Pia					Angle from Horizontal: Mounting: Light Vehic			Surface Driller:	e Elevation:
				eter: None	-					Mounting. Light venic		ractor:	Jiller.	
-	-	arted:			Date Con	nplete	d: 21/5	/13		Logged By: DK			Checke	ed By:
	Drillin	g		Samplir	g & Testing						al Description			
Method	Resistance	Casing	Water	Sample Field Te		Depth (m)	Graphic Log	Classification		SOIL TYPE, plasticity or particle char colour, secondary and minor comy ROCK TYPE, grain size and type, fabric & texture, strength, weath	ponents colour,	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
2	Re							Clas		TOPSOIL: Clayey Sandy SILT: low p		20	°	TOPSOIL
					3	-				dark-grey and brown, fine grained sa rootlets	and, with			
					3	-		ML				M (≈PL)		
					7				0.40m					
					7	-0.5				CLAY: red-brown, with fine to mediu gravel, trace fine grained sand	ım grained			RESIDUAL SOIL
			tered	D 0 00 1 00	8	- 0.0								
 -			count	B 0.60 - 1.00 m CBR	7	_								
- AD/T	E	None	Not Encountered		9 10	4								
			⁻	D 0.85 - 0.85 m FMC		+		CL-						
					8	- 1.0		CI				M (<pl)< td=""><td>VSt to H</td><td></td></pl)<>	VSt to H	
					11	+								
					8	+		1						
					7	+]						
				D 1.40 - 1.40 m	10	+			1.50-					
					10				1.50m	TERMINATED AT 1.50 m				
					11	-				Target depth				
					10	-								
					12									
						-2.0								
						2.0								
						_								
						_								
						-2.5								
						ŀ								
						ŀ								
						F								
						F								
						- 3.0								
						F								
						F								
						F								
						f								
						- 3.5								
						Ē								
						[
						L								
				<u> </u>					<u> </u>					
ME EX HA PT SC AH PS AD AD HF	R Pi DN Si I Ai SI SI SI SI SI SI SI SI SI SI SI SI SI	xcavato ipper and aug ush tube onic dril ir hamm ercussio hort spii olid fligh	ger e lling ner on sam ral aug nt auge nt auge	pler er r: V-Bit r: TC-Bit	PENETRATION VE Very Easy (E Easy F Firm H Hard VH Very Hard (WATER Water shown water i	No Resista Refusal) Level on		F C F M F	FIELD 1 SPT - PP - DCP - PSP - PSP - MC - PBT - MP - PID - /S -	ESTS Standard Penetration Test Hand/Pocket Penetrometer Dynamic Cone Penetrometer Perth Sand Penetrometer Moisture Content Plate Bearing Test Borehole Impression Test Photoionisation Detector Vane Shear; P=Peak,	D - Dis ES - En U - Th MOISTURE D - Dr M - Mo W - We PL - Pla	y bist et astic limit	mple al sample	s - Soft F - Firm St - Stiff VSt - Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense
WE RF	3 W R R	ashbor ock rolle	e drillin er		water o					R=Residual (uncorrected kPa)	w - Mc	juid limit bisture con	tent	D - Dense VD - Very Dense
abb	previatio	ins and ba	asis of d	escriptions		CO	N21	τU	CL	ON SCIENCES P	'IY LIL)		

77	Sc	ien	ces							В		HOLE LOG SHEE
Client: Projec	:t:			No.21 Pty Ltd o	-		Rhode	S			н	ole No: BH0
ocatio		53	BA W	arriewood Rd,	Warriew	ood			Job No: 10791E/P/453			Sheet: 1 of
Positic	-	1.1+/	Moi	Inted Drill Rig					Angle from Horizontal: 90° Mounting: Light Vehicle		Surface Driller:	Elevation:
	-			eter: None /						tractor:	Jillei.	
Date S	-				ate Com	pleted	d: 21/5	/13	Logged By: DK		Checke	d By:
Drill	lling			Sampling & T	esting				Material Description	n		-
Method Resistance	Kesisiance	Casing	Water	Sample or Field Test	DCP	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
					1	-		ML	TOPSOIL: Clayey Sandy SILT: low plasticity, dark-grey and brown, fine grained sand, with rootlets	M (« PL)		TOPSOIL
					2 1 2	- 0.5			0.40m CLAY: medium plasticity, orange-red and red-brown, with fine to medium grained gravel, trace sand		s	RESIDUAL SOIL
					4	-					F	
	=	None	Not Encountered		8 7 10 9	- 1.0		СІ		M (<pl)< td=""><td></td><td></td></pl)<>		
					10 13 14	- 1.5					VSt	
					15 8 10 16	-		СІ	1.55m CLAY: medium plasticity, red-brown, with fine to medium grained gravel	M (<pl)< td=""><td></td><td></td></pl)<>		
,		V			15 18 20	- 2.0			2.10m TERMINATED AT 2.10 m		н	
					25				Refusal			
						-						
						- 3.0 -						
						- 						
METHO	OD			PENE	TRATION	-		F	ELD TESTS SAMPLES	6		SOIL CONSISTENCY
R HA PT SON AH PS AD/V AD/V HFA WB	Rip Har Pus Son Air I Per Sho Soli Soli Holl Was	per nd aug ih tube nic drill hamm cussic ort spir d fligh d fligh low flig	ing er n samp al auger t auger t auger ht auge drilling	oler WATI	Very Easy (N Easy Firm Hard Very Hard (R ER Water L water L water inf water ou	^{efusal)} evel on low		F F F F	P - Hand/Pocket Penetrometer D - D CP Dynamic Cone Penetrometer U - T SP - Perth Sand Penetrometer U - T C - Moisture Content MOISTUR D - D ST - Plate Bearing Test D - D - D IP - Photoionisation Detector W - W W Q - Photoionisation Detector W - P Q - - Penetroiter H -	ulk disturbed sa invironment hin wall tub RE Pry loist Vet lastic limit iquid limit loisture con	mple al sample e 'undistur	VS - Very Soft S - Soft F - Firm VSt - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dens D - Dense VD - Very Dense
Refer to	expla	anatory	notes fo	r details of scriptions	(NST	L RU	CTION SCIENCES PTY LTI	D		

Casir Date	ect: tion tion: Type ng/H	: 53 : : Ute lole I rted:	3A W e Moi Diam	No.21 Pty Ltd arriewood Rd, unted Drill Rig eter: None / 13 C Sampling & T Sample or Field Test	Warriewo Date Comp	bod			Job No: 10791E/P/453 Angle from Horizontal: 90 Mounting: Light Vehicle			Iole No: BH03 Sheet: 1 of 7
Posit Rig T Casir Date	tion: Type ng/H Stai	: Ute lole I rted:	e Mor Diamo 21/5/	unted Drill Rig eter: None / 13 C Sampling & T Sample or	Date Comp	pletec	d: 21/5	5/13	Angle from Horizontal: 90			e Elevation:
Casir Date	ng/H Stai rilling	lole I rted:	Diam 21/5/	eter: None / 13 C Sampling & T Sample or	Testing		d: 21/5	5/13	Mounting: Light Vehicle		Drillor	
Date : Dr	Stai rilling	rted:	21/5/	13 C Sampling & T Sample or	Testing		1: 21/5	/13			Jillei.	סוט
Dr	rilling	9		Sampling & T Sample or	Testing		1: 21/5	5/13		Contractor:		
			Water	Sample or		(F			Logged By: DK		Checke	ed By:
Method	Resistance	Casing	Water		<u>е</u>	3			Material De	escription		
		Å			Ď	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle charactel colour, secondary and minor componer ROCK TYPE, grain size and type, color fabric & texture, strength, weathering defects and structure	uts ur, structure	Consistency Relative Density	STRUCTURE & Other Observations
					5 10 9 14 17 10 9	- - - 0.5 -		CL	TOPSOIL: Sandy Silty CLAY: low plastici dark-brown, trace fine to medium grained	ty, I gravel M (<pl)< td=""><td></td><td>TOPSOIL</td></pl)<>		TOPSOIL
			untered	D.0.00 4.00 m	3	-			0.80m CLAY: medium plasticity, mottled orange brown and pale grey-brown, trace fine to			RESIDUAL SOIL
	E	None	Not Encountered	D 0.90 - 1.00 m FMC	3 4 3 4	1.0 - -			grained gravel		St	
					6 10 11 12	- - 1.5 -		СІ		M (≈ PL)		
V		V			14 18	- - - 2.0			2.00m		н	
						2.0 - - - - 2.5 -			TERMINATED AT 2.00 m Target depth			
						- - - 3.0 - -						
						- 3.5 - - -						
METH EX R HA PT SON AH PS AS AD/V AD/T HFA WB RR	Exe Rip Ha Pu: Sol Air Pe Sol Sol Ho Wa	oper ind aug sh tube nic drill hamm rcussic ort spir lid fligh lid fligh llow flig	er er al auger t auger t auger jht aug e drilling	t VE E F H VH VH VH tr SV-Bit Er F	ETRATION Very Easy (No Easy Firm Hard Very Hard (Rei TER Shown water Le shown water influ	^{fusal)} vel on ow		S F C P M P	PT - Standard Penetration Test B P - Hand/Pocket Penetrometer D CP - Dynamic Cone Penetrometer D SP - Perth Sand Penetrometer U C - Moisture Content N BT - Plate Bearing Test D ID - Photoionisation Detector V S - Vane Shear P=Peak	D - Disturbed sa ES - Environmenl J - Thin wall tub MOISTURE - Dry 0 - Dry M - Moist V - Wet PL - Plastic limit L - Liquid limit	mple al sample e 'undistu	S - Soft F - Firm

		Con Scie			tion							E	BORE	EHOLE LOG SHEET
Clie Pro		:	PV	D N	No.21 Pty	Ltd c	/o Craig	g and	Rhode	es			ŀ	lole No: BH04
Loc			53A	W	arriewood	d Rd, V	Varriew	ood			Job No: 10791E/P/453			Sheet: 1 of 1
Pos											Angle from Horizontal: 90°			e Elevation:
-					Inted Dril						Mounting: Light Vehicle	Contractor	Driller:	: DTD
	-	arte			eter: Non		te Com	nleter	d· 21/	5/13	Logged By: DK	Contractor:	Check	ed Bv:
	Drilli					ng & Te				0/10	Material Desci		oncon	
		Ť	n	_			_	Depth (m)	<u>.0</u>	ation	SOIL TYPE, plasticity or particle characteristi		e e	
Method	Resistance	Caeino		Water	Sample Field T		DCP	Dept	Graphic Log	Classification	colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	o, Moisture Condition	Consistency Relative Density	
				p			7			ML	TOPSOIL: Clayey Sandy SILT: low plasticity dark-brown, fine to coarse grained sand, with to medium grained gravel		.)	TOPSOIL
AD/T	E	No	ne	Encountered			10 19	- 0.5			0.40m FILL: Silty Sandy GRAVEL: fine to medium, graded, fine to coarse grained sand	poorly	-	FILL
A				Not			25	-		GP- GM		M to D	i.	
								-			1.00m			
					D 1.00 m FMC			-1.0-			TERMINATED AT 1.00 m Refusal			
								-						
								- 1.5 -						
								-						
								2.0						
								-						
								- 						
								-						
								-						
								- 3.5						
								-						
EX R HA	F	Excava Ripper Hand a	uger	ucket	t	VE E	TRATION Very Easy (N Easy Firm	l o Resista	ince)	F	SPT - Standard Penetration Test B PP - Hand/Pocket Penetrometer D OCP - Dynamic Cone Penetrometer ES	IPLES - Bulk disturb - Disturbed s - Environmer	ample ntal sample	e S - Soft F - Firm
PT SO AH PS AS AD	N S	Push t Sonic (Air har Percus Short s Solid fl	drilling nmer sion s piral a ight a	samp auge uger:	r : V-Bit	н	Hard Very Hard (R		Date	F N F	PSP - Perth Sand Penetrometer U //C - Moisture Content MOI PBT - Plate Bearing Test D MP - Borehole Impression Test M	 Thin wall tul STURE Dry Moist Wet 	be 'undistu	VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose
AD HF WE RR	Ά.Η Β.Ν	Solid fl Hollow Washt Rock r	flight ore d	auge	: TC-Bit er J		 water inf water ou 				/S - Vane Shear; P=Peak, PL LL	 Plastic limit Liquid limit Moisture co 	ntent	L - Loose MD - Medium Dense D - Dense VD - Very Dense
Ref abb	fer to e previati	explana ions an	ory no I basis	tes for of de	r details of scriptions			COI	NST	RU	CTION SCIENCES PTY I	LTD		

Ĩ		ons cier		ction							BORE	EHOLE LOG SHEET
	ject:			No.21 Pty Lt			Rhode	s			ŀ	Hole No: BH05
	atio		3A V	arriewood R	Rd, Warriew	ood			Job No: 10791E/P/453			Sheet: 1 of 1
	ition		- M-)				Angle from Horizontal: 9			e Elevation:
				unted Drill R eter: None /	-				Mounting: Light Vehicle	Contracto	Driller	טוס:
	-	arted:			Date Com	nlete	d 21/5	/13	Logged By: DK	Contracto	Check	ed By:
	Drillin			Sampling					Material D	escription	oncon	ou by.
		-9 		camping		Ē		c				
Method	Resistance	Casing	Water	Sample or Field Test		Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle charact colour, secondary and minor compon ROCK TYPE, grain size and type, col fabric & texture, strength, weatherin defects and structure	lour,	Condition Consistency Relative Density	STRUCTURE & Other Observations
						-		ML	TOPSOIL: Sandy Clayey SILT: low plas brown-yellow, fine to coarse grained san rootlets	sticity, nd, with M (◄	PL)	TOPSOIL
						1			0.30m			
					5				CLAY: low plasticity, orange brown, with grained sand	h fine		RESIDUAL SOIL
					7	0.5		CL-		M (<f< td=""><td>PL) VSt</td><td>-</td></f<>	PL) VSt	-
			tered			+		CI				
			Not Encountered		7	1			0.70m			4
-AD/T	E	None	lot En		6	1			Sandy CLAY: low plasticity, mottled ora and red, trace fine grained gravel	nge-brown		
					5	1						
				D 4 00	3	- 1.0		1				
				D 1.00 m AGG				CL-		M (>F	PL) St to VS	t
					6	_		CI			<i>'</i>	
				D 1.20 m FMC	6	1						
					7							
V		V			11	-1.5-			1.50m			
					14				TERMINATED AT 1.50 m Target depth			
					14				0			
					16							
						-2.0						
						2.0						
						-2.5						
						-						
						ſ						
						Γ.						
						- 3.0						
						F						
						ſ						
						ſ						
						F						
						- 3.5						
						F						
						F						
						F						
						ſ						
	THO				PENETRATION					SAMPLES		SOIL CONSISTENCY
EX R	R	xcavato ipper		et v	/E Very Easy (N E Easy	No Resista	ance)		P - Hand/Pocket Penetrometer	D - Disturbed	rbed sample sample	S - Soft
HA PT	H P	and aug ush tub	e	F	Firm Hard			[CP - Dynamic Cone Penetrometer	ES - Environm U - Thin wall	ental sample	e F - Firm urbed' St - Stiff
SC AH	N S	onic drii ir hamm	lling ner	V	/H Very Hard (F)	Refusal)			SP - Perth Sand Penetrometer	MOISTURE		VSt - Very Stiff H - Hard
PS AS	P S	ercussi hort spi	on sarr ral aug	er	VATER	_evel on	Date		BT - Plate Bearing Test	D - Dry M - Moist		RELATIVE DENSITY
AD AD	/V S /T S	olid fligh olid fligh	nt auge	r: V-Bit r: TC-Bit	shown		- 200	F	D - Photoionisation Detector	M - Moist W - Wet Pl Plastic lim	.i+	VL - Very Loose L - Loose
HF	A H	ollow fli /ashbor	ght aug	ger	 water in water o 			\	B=Bosidual (uncorrected kBa)	PL - Plastic lim	t	MD - Medium Dense D - Dense
RF		ock roll			<u> </u>					w - Moisture	Jonient	VD - Very Dense
Ref	fer to ex	planator	y notes f	or details of		COI	NST	21	CTION SCIENCES PT			
abb	n eviatio	n is an D	ລວເວ OT C	lescriptions		50	1011	.0				

Clie Proj	nt: ect:			No.21 Pty Lt	-		Rhode	s			H	lole No: BH0
.002	ation		3A W	arriewood R	d, Warriew	ood			Job No: 10791E/P/453			Sheet: 1 o
	ition								Angle from Horizontal: 90			e Elevation:
				unted Drill Ri eter: None /	ig				Mounting: Light Vehicle	Contractor:	Driller:	טוט
	-	rted:			Date Com	nleter	1. 21/5	/13	Logged By: DK		Checke	ed Bv:
	Drilling		21/0	Sampling				10	Material De		oncont	cu by.
		,		Gampling		Ē		-	Matchai Be			
Method	Resistance	Casing	Water	Sample or Field Test	DCP	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characte colour, secondary and minor compone ROCK TYPE, grain size and type, colo fabric & texture, strength, weathering defects and structure	ents gitio	Consistency Relative Density	STRUCTURE & Other Observations
A		A				-			FILL: Silty Sandy CLAY: medium plasticit with fine to medium grained gravel	ty, brown,		FILL
					3	Ļ						
					5	ŀ						
					6	F						
					25	-0.5						
						-						
						-						
						-		СІ		M (<pl)< td=""><td>)</td><td></td></pl)<>)	
						$\left \right $		1				
						- 1.0	XX/					
						ŀ					-	
						$\left \right $						
					7	ł						
					8	ŀ						
					8	- 1.5						
					7	ŀ		1	1.60m		-	
					5	ļ			FILL: Sandy CLAY: medium plasticity, pa and grey-brown, fine to coarse grained s			
	Е	None			3	ļ		1	fine grained gravel, sandstone			
					3	ļ		СІ		M (≈ PL)	
					5	-2.0						
					8	ł	(///	1				
				D 2.20 m	7	-		<u> </u>	2.20m Silty CLAY: medium to high plasticity, gre			ALLUVIUM
				FMC	15	ł			fine grained sand	ey, trace	VSt	1
					14	-						
					14	- 2.5		1				
					11	ł						
			<u> </u>		17	╞						
					17	╞		CI-		M (>PL)		
					15	ł	[]]]	СН		IVI (~PL,	′ н	
				D 3.00 m	21	- 3.0						
				AGG	21	ł						
						ł						
				ASS 3.30 m ASS		F]				
				,		F			3.50m			
						-3.5-	1.1.17		TERMINATED AT 3.50 m		1	
						F			Refusal			
						ľ						
						Ē.						
	THOD				ENETRATION					SAMPLES		SOIL CONSISTENCY
EX R	Rip	cavato oper		Ē	Easy	o Resista	nce)	P	P - Hand/Pocket Penetrometer	B - Bulk disturb D - Disturbed sa	ample	S - Soft
HA	Pu	nd aug sh tube	9	F	Hard	- f *				ES - Environmen U - Thin wall tub		ırbed' St - Stiff
SOI AH	Air	nic drill hamm	er		H Very Hard (Ro	erusal)		N	C - Moisture Content	MOISTURE		VSt - Very Stiff H - Hard
PS AS	Sh	rcussic ort spir	al auge	er	Vater L	evel on	Date	P IN		D - Dry M - Moist		
AD/ AD/	T So	lid fligh	t auge	: V-Bit : TC-Bit	shown			P	D - Photoionisation Detector	W - Wet PL - Plastic limit		VL - Very Loose L - Loose MD Modium Door
HF/ WB	Wa	llow flig ashbore	e drillin	er g					B=Basidual (upperrected kDa)	LL - Liquid limit W - Moisture col	ntent	MD - Medium Dens D - Dense VD - Very Dense
RR		ck rolle	r	1								I VI) - Very Dense

etc: SAV Warriewood Rd, Warriewood Rd, Warriewood Rd, John St. 10791E/PI453 Shot: 1 of Top: Unclude Offile: Prove: Prove:		S	cie	nce			<u> </u>	<u> </u>			E		HOLE LOG SHEE
Home Argis from Horizontal: 90* Surface Elevation: Type: Use Novided Prill Rig Type: Use Novided Prill Rig Banded Z19713 Date Completed: 219/13 Logged By: DK Contractor: Samuel 219719 Samuel Privation: Date Completed: 219/13 Logged By: DK Checked By: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Checked By: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Checked By: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Checked By: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Checked By: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Samuel Privation: Date Samuel Privation: Date Completed: 219/13 Logged By: DK Samuel Privation: Date Samuel Privation: Date Completed: 219/13 Date Completed: 219/13 Date Completed: 219/13 Date Samuel Privation: Date Completed: 219/13 Date Completed: 219/13 Date Completed: 219/13 Date Date Date Completed: 219/13 Date Completed: 219/13 Date Completed: 219/13 Date Date Date Completed: 219/13 Date Completed: 219/13 Date Completed: 219/13	Clien Proje	ect:			-		-	Rhode	S			H	lole No: BH0
Type: Use Mounted Driller DD Driller DD Bartel: 21/611 Date Completed: 21/611 Contractor: Bartel: 21/611 Date Completed: 21/611 Logged By: DK Checked By: Dring Sampling Testing				53A	Warriewoo	Rd, Warri	ewood					<u> </u>	
Imported Duranter: Contractor: Section: 21/16/13 Det completed: 21/8/13 Logged By: DK Checked By: Dating Sampling & Testing Material Description: 1 Material Description: 5				to M	ounted Dril	Dia				•			
Stanticity Date Completed: 21/8/13 Logged By: DK Checked By: Drillion Sampling & Tealing Sampling & Tealing Material Description Material Description Sign gill gill gill gill gill gill gill g												-	טוט
Dating of the starting		-					ompleted	d: 21/5	5/13	Logged By: DK			ed By:
Big of the construction of the construling of the construction of the construction of the construction				<u> </u>									, - - , -
B C -			, 						c				
E None Permittation Pe	Method	Resistance	Casing	Water	Sample Field T	e or Co est C	Depth (r	Graphic Log	Classificatio	colour, secondary and minor comp ROCK TYPE, grain size and type, fabric & texture, strength, weath	racteristic, ponents bigger colour, signer ering, WO	Consistency Relative Density	STRUCTURE & Other Observations
E Note Peter Taylor Pe						1			ML	TOPSOIL: Clayey SILT: low plasticit with fine grained sand, with rootlets)	TOPSOIL
E None Pass 20 m Performance Performance<							_			0.30m			
E Nore F ASS 0.0 m F M (PQ) F 4 5 1.0 0.5 1.0 0.4 M (PQ) 5.6 VSI 5 5.3 0.0 m 70 1.0 0.4 1.0 M (PQ) 1.0 6 1.0 1.0 0.4 1.0 M (PQ) 1.0 M (PQ) 1.0 1.0 0.4 1.0 0.4 1.0 M (PQ) 1.0 M (PQ) 1.0 1.0 0.4 1.0 0.4 1.0 M (PQ) 1.0 M (PQ) 1.0 1.0 0.4 0.0 0.4 0.0											pale-grey		ALLUVIUM
E None Pass 30.0 m Pass 40 2 - 3 4 - 4 5 - 1.0 CL Cr CL Cr M (PR) M (PR) 4					AGG	2						F	
E None ASS 4 5 4 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7				-	FMC								
E None ASS 120 m Image: Solution of the solution of					ASS			W			M (SPI)		
E Nore ASS 2.50 m CLAY high plasticity, pale-grey, ince fire grained and pale-grey, ince fire grain									CI			ή]	
E Nore ASS 120 m B CLAY high plasticity, pale-grey, trace fine grained ASS 120 m ASS 2.20 m THO TH													
E None ASS 120 m							1.0					St to VSt	
E None ASS 120 m To										1.10m			
E None ASS 10 m 10 -0 -0 -0 -0 20 15 0 -0 -0 -0 -0 -0 20 20 -0 -0 -0 -0 -0 20 20 -0 -0 -0 -0 -0 20 -2.0 -0 -0 -0 -0 -0 20 -2.0 -0 -0 -0 -0 -0 4 -2.0 -2.0 -0 -0 -0 -0 -2.0 -2.0 -0 -0 -0 -0 -0 -2.0 -2.0 -2.0 -0 -0 -0 -0 -2.0 -2.0 -2.0 -0 -0 -0 -0 -2.0 -2.5 -2.5 -0 -0 -0 -0 -3.0 -2.5 -0 -0 -0 -0 -0 -3.0 -0 -0 -0 -0 -0 -0 -3.0 -0 -0 -0 -0 -0 -0 -3.0 -0 -0 -0 -0 -0 -0 -0 -0 -0 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>e fine grained</td><td></td><td></td></td<>											e fine grained		
E None 15 CH M (PR) H 22 20 2.10n Clayey SAND. fine to medium grained, pale-grey, iow plasticity clay H 4 -2.0 -2.10n Clayey SAND. fine to medium grained, pale-grey, iow plasticity clay H 4 -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5					ASS 1.20 m ASS								
E None 20 1.5 CH M (PL) H 210 210 Clayey SAND. fine to medium grained, pale-grey. H H ASS 250 m -2.5 Clayey SAND. fine to medium grained, pale-grey. H H ASS 250 m -2.5 Clayey SAND. fine to medium grained, pale-grey. H H -3.0 CL -2.5 H H H -3.0 CL H H H -3.5 -3.5 CL H H -3.5 -2.5 H H H -3.5 -2.5 -2.5 H H -3.6 -2.5 -2.5 H H -3.7 -2.5 -2.5 H H -3.7 -2.5 -2.5 H H -3.7 -2.5 H H H -3.6 -2.5 H H H -3.7 -3.5 H H <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>													
E None ASS 2.50 m CH M (PL) H ASS 2.50 m -2.5 Clayey SAND: fine to medium grained, pale-grey. H -3.0 Clayey SAND: fine to medium grained, pale-grey. H -3.0 CLayey SAND: fine to medium grained, pale-grey. H -3.0 CL M (PL) Lio MD -3.5 -1 -1 -1 -3.5 -1 -1 -1 -3.5 -1 -1 -1 -3.5 -1 -1 -1 -3.6 -1 -1 -1 -3.7 -1 -1 -1 -3.6 -1 -1 -1 -3.7 -1 -1 -1 -3.7 -1 -1 -1 -3.7 -1 -1 -1 -3.7 -1 -1 -1 -3.7 -1 -1							1 5		1				
E None 22 210m Clayey SAND: fine to medium grained, pale-grey, low plasticity clay ASS 250 m -2.0 210m Clayey SAND: fine to medium grained, pale-grey, low plasticity clay M (>PL) ASS 250 m -2.5 -2.5 -2.5 -2.5 -2.5 -2.5 -3.0 CL -3.0 CL M (>PL) Lto MD M (>PL) Lto MD Excavorable blocket Reper -3.5 -2.5 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td>,</td><td></td><td>Сн</td><td></td><td>M (>PL</td><td></td><td></td></t<>							,		Сн		M (>PL		
E None 2.0m 2.0m Ass 2.0m Clayey SAND: fire to medium grained, pale-grey, low plasticity clay													
THOD PENETRATION Clayey SAND: fire to medium grained, pale-grey, low plasticity clay Image: Clayey SAND: fire to medium grained, pale-grey, low plasticity clay THOD -2.5 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.0 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 -3.5 -2.5 -2.5 -2.5 -2.5 <td< td=""><td></td><td></td><td></td><td></td><td></td><td>22</td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>						22	2						
THOO PENETRATION Clayery SMD. fine to medium grained, pale-gray, low plasticity clay M (-PL) L to MD -3.0 CL -3.0 CL M (-PL) L to MD -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 PENETRATION VE Very Easy (No Resistance) E Employment And Pooter Penetrometer DCP - Dynamic Cone Penetrometer DCP - Dynamic Conten Penetrometer DCP - Dynamic Conten PEN - Penetrometer DCP - Dynamic Conten Penetromete													
THOO PENETRATION Clayery SMD. fire to medium grained, pale-grey, low plasticity clay -3.0 -2.5 -3.0 -2.5 -3.0 -2.6 -3.5 -3.5 -3.5 -2.5 -5 -2.5 -7 -2.5 -7	AD/T -	E	Non				20						
How plasticity clay Iow plasticity clay ASS 2.50 m -2.5 -3.0 -2.5 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.0 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.5 -3.6 -3.6 -3.6 -3.7 -3.6 -3.8 -3.6 -3.9 -3.6 -3.6 -3.6 -3.7 -3.6 -3.8 -3.6 -5 -5 -6 -6 -7	A	L					2.0			2.10m			
THOD PENETRATION Excavator bucket Pinetration Ripper -3.5 Hand auger VE Public Field TETRY/INATED AT 4.00 m Strandbacket SAMPLES B Buik disturbed sample VE Very Easy (No Resistance) Finammer Pinetration PSP - Perth Sand Penetrometer D DS Sonic diffing Ari hammer WATER WATER VE										Clayey SAND: fine to medium graine low plasticity clay	ed, pale-grey,		
THOD PENETRATION Excavator bucket Pinetration Ripper -3.5 Hand auger VE Public Field TETRY/INATED AT 4.00 m Strandbacket SAMPLES B Buik disturbed sample VE Very Easy (No Resistance) Finammer Pinetration PSP - Perth Sand Penetrometer D DS Sonic diffing Ari hammer WATER WATER VE													
THOD PENETRATION Excavator bucket Pinetration Ripper -3.5 Hand auger VE Public Field TETRY/INATED AT 4.00 m Strandbacket SAMPLES B Buik disturbed sample VE Very Easy (No Resistance) Finammer Pinetration PSP - Perth Sand Penetrometer D DS Sonic diffing Ari hammer WATER WATER VE													
THOD PENETRATION -3.0 CL M (>PL) L to MD -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 -3.5 THOD Excavator bucket PENETRATION FIELD TESTS/INVATED AT 4.00 m SAMPLES SAMPLES Excavator bucket VE Very Easy (No Resistance) FIELD TESTS/INVATED AT 4.00 m SAMPLES B B Buik disturbed sample D Excavator bucket VE Very Easy (No Resistance) FT StatRd aff Penetration Test B - Buik disturbed sample VS S Soft CONSISTENCY No Sonic diffling Ari hammer WH Very Hadr (Refusal) PP Hand/Pocket Penetrometer PSP B - Buik disturbed sample ES S S oft S S oft S WATER WATER WATER Moisture Content PF D D D D D PH + Hard							-25						
THOD PENETRATION -3.5 -3.5 -3.5 -4.00m THOD -3.5 -4.00m -3.5 -3.5 -3.5 Excavator bucket VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Hand (Refusal) SPT - Stand dight of the netration Test PC Do Disturbed sample VS - Soft N Sonic drilling VH Hand Very Hand (Refusal) VC Moisture Content B - Bulk disturbed sample VS VS - Very Soft N Ar hammer PSP Penth Sand Penetrometer D Disturbed sample VS VS Very Stiff N thammer Very Hard (Refusal) WATER PB Penetrometer D Div MOISTURE MOISTURE Noter Comparing PB Path Bearing Test D D Drov PEI Attract PENSTY							2.5						
THOD PENETRATION -3.5 -3.5 -3.5 -4.00m THOD PENETRATION PENETRATION -4.00m -3.5 -3.5 -3.5 Excavator bucket VE Very Easy (No Resistance) PIELID TESTISMINATED AT 4.00 m SAMPLES B - Bulk disturbed sample SOIL CONSISTENCY VE Very Easy (No Resistance) FIELID TESTISMINATED AT 4.00 m SAMPLES B - Bulk disturbed sample VS - Soft Push tube VE Very Hand (Refusal) PP - Hand/Pocket Penetrometer B - Bulk disturbed sample VS - Soft N Sonic drilling VH Hand Very Hard (Refusal) PSP - Pents Sand Penetrometer B - Disturbed sample St St - Stiff N Ar hammer Very Hard (Refusal) WATER PB - Path Bearing Test D - Dry Pentatore Penetrometer MOISTURE MOISTURE PE Hard PENSTITY													
THOD PENETRATION -3.5 -3.5 -3.5 -4.00m THOD -3.5 -4.00m -3.5 -3.5 -3.5 Excavator bucket VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Hand (Refusal) SPT - Stand dight of the netration Test PC Do Disturbed sample VS - Soft N Sonic drilling VH Hand Very Hand (Refusal) VC Moisture Content B - Bulk disturbed sample VS VS - Very Soft N Ar hammer PSP Penth Sand Penetrometer D Disturbed sample VS VS Very Stiff N thammer Very Hard (Refusal) WATER PB Penetrometer D Div MOISTURE MOISTURE Noter Comparing PB Path Bearing Test D D Drov PEI Attract PENSTY													
THOD PENETRATION -3.5 -5.5 -5.5 -5.5 <td></td>													
THOD PENETRATION -3.5 -3.5 -3.5 -4.00m THOD -3.5 -4.00m -3.5 -3.5 -3.5 Excavator bucket VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Easy (No Resistance) FIELD TESTISM/INATED AT 4.00 m SAMPLES B - Bulk disturbed sample Push tube VE Very Hand (Refusal) SPT - Stand dight of the netration Test PC Do Disturbed sample VS - Soft N Sonic drilling VH Hand Very Hand (Refusal) VC Moisture Content B - Bulk disturbed sample VS VS - Very Soft N Ar hammer PSP Penth Sand Penetrometer D Disturbed sample VS VS Very Stiff N thammer Very Hard (Refusal) WATER PB Penetrometer D Div MOISTURE MOISTURE Noter Comparing PB Path Bearing Test D D Drov PEI Attract PENSTY													
THOD PENETRATION 4.00m Excavator bucket Ripper Hand auger Push tube PENETRATION FIELD TESRS/MINATED AT 4.00 m SPT - Standard depth enetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content B - Bulk disturbed sample D - Disturbed sample D - Disturbed sample D - Thin wall tube 'undisturbed' SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm VS - Very Soft S - Soft F - Firm VH Very Hard (Refusal) WATER WATER PBT - Plate Bearing Test D - Dry BELATIVE DENSITY							- 3.0		CL		M (>PL)) L to MD	
THOD PENETRATION 4.00m Excavator bucket Ripper Hand auger Push tube PENETRATION FIELD TESRS/MINATED AT 4.00 m SPT - Standard depth enetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content B - Bulk disturbed sample D - Disturbed sample D - Disturbed sample D - Thin wall tube 'undisturbed' SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm VS - Very Soft S - Soft F - Firm VH Very Hard (Refusal) WATER WATER PBT - Plate Bearing Test D - Dry BELATIVE DENSITY									1				
THOD PENETRATION 4.00m Excavator bucket Ripper Hand auger Push tube PENETRATION FIELD TESRS/MINATED AT 4.00 m SPT - Standard depth enetration Test PP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content B - Bulk disturbed sample D - Disturbed sample D - Disturbed sample D - Thin wall tube 'undisturbed' SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm VS - Very Soft S - Soft F - Firm VH Very Hard (Refusal) WATER WATER PBT - Plate Bearing Test D - Dry BELATIVE DENSITY													
THOD PENETRATION 4.00m Excavator bucket Ripper Hand auger Push tube PENETRATION FIELD TESRS/MINATED AT 4.00 m SPT - Standard define SAMPLES B Bulk disturbed sample D SOIL CONSISTENCY VE Very Easy (No Resistance) E Easy Hand auger Push tube FIELD TESRS/MINATED AT 4.00 m SPT - Standard define SAMPLES B - Bulk disturbed sample D VS - Very Soft S Soil CONSISTENCY N Sonic drilling Air hammer Percussion sampler WATER Pert Sand Penetrometer MC Pert Mand/Pocket Penetrometer PSP - Perth Sand Penetrometer MC B Bulk disturbed sample D VS - Very Soft S Soil - Soft F WATER PBT - Plate Bearing Test D - Dry Rel ATIVE DENSITY							[
THOD PENETRATION 4.00m Excavator bucket Ripper Hand auger Push tube PENETRATION FIELD TESRS/MINATED AT 4.00 m SPT - Standard define SAMPLES B Bulk disturbed sample D SOIL CONSISTENCY VE Very Easy (No Resistance) E Easy Hand auger Push tube FIELD TESRS/MINATED AT 4.00 m SPT - Standard define SAMPLES B - Bulk disturbed sample D VS - Very Soft S Soil CONSISTENCY N Sonic drilling Air hammer Percussion sampler WATER Pert Sand Penetrometer MC Pert Mand/Pocket Penetrometer PSP - Perth Sand Penetrometer MC B Bulk disturbed sample D VS - Very Soft S Soil - Soft F WATER PBT - Plate Bearing Test D - Dry Rel ATIVE DENSITY							_ <u>,</u> _						
THOD PENETRATION FIELD TEGRISMINATED AT 4.00 m SAMPLES SOIL CONSISTENCY Excavator bucket VE Very Easy (No Resistance) SPT - Staffadd Penetration Test B - Bulk disturbed sample VS - Very Soft Ripper E Easy PP - Hand/Pocket Penetrometer D Disturbed sample VS - Very Soft Push tube H Hard DCP Dynamic Cone Penetrometer DCP - Disturbed sample S S S till N Sonic drilling VH Very Hard (Refusal) MC MOISTURE MOISTURE MOISTURE St Stiff Percussion sampler WATER PBT Plate Bearing Test D - Dry Rel ATIVE DENSITY							- 3.5						
THOD PENETRATION FIELD TEGREMINATED AT 4.00 m SAMPLES SOIL CONSISTENCY Excavator bucket VE Very Easy (No Resistance) SPT - Staffaddrementation Test B - Bulk disturbed sample VS - Very Soft Ripper E Easy Firm DCP Dynamic Cone Penetrometer D - Disturbed sample S S - Soft Push tube H Hard DCP Dynamic Cone Penetrometer DCP - Disturbed sample S S S - Soft N Sonic drilling VH Very Hard (Refusal) MC - Moisture Content MOISTURE MOISTURE H ard Percussion sampler WATER PBT P late Bearing Test D - Dry RELATIVE DENSITY							[1				
THOD PENETRATION FIELD TEGREMINATED AT 4.00 m SAMPLES SOIL CONSISTENCY Excavator bucket VE Very Easy (No Resistance) SPT - Staffaddrementation Test B - Bulk disturbed sample VS - Very Soft Ripper E Easy Firm DCP Dynamic Cone Penetrometer D - Disturbed sample S S - Soft Push tube H Hard DCP Dynamic Cone Penetrometer DCP - Disturbed sample S S S - Soft N Sonic drilling VH Very Hard (Refusal) MC - Moisture Content MOISTURE MOISTURE H ard Percussion sampler WATER PBT P late Bearing Test D - Dry RELATIVE DENSITY							L						
THOD PENETRATION FIELD TEGRISMINATED AT 4.00 m SAMPLES SOIL CONSISTENCY Excavator bucket VE Very Easy (No Resistance) SPT - Standard Penetration Test B - Bulk disturbed sample VS - Very Soft Ripper E Easy Firm DCP - Dynamic Cone Penetrometer D - Disturbed sample S S oft Push tube H Hard DCP Dynamic Cone Penetrometer DCP - Disturbed sample S S tiff N Sonic drilling VH Very Hard (Refusal) MC Moisture Content MOISTURE MOISTURE H H ard Percussion sampler WATER PBT Plate Bearing Test D - Dry RELATIVE DENSITY							L						
Excavator bucket Ripper Hand auger Push tube VE Very Easy (No Resistance) E SPT - Standarder Standarder PP B - Bulk disturbed sample VS - Very Soft Hand auger Push tube F Firm DCP Dynamic Cone Penetrometer D D Disturbed sample S S oft N Sonic drilling Air hammer Percussion sampler VH Very Hard (Refusal) PSP Perth Sand Penetrometer MC Moisture Content MOISTURE WOISTURE N Set Attive Density													
Ripper VL Very Easy (No Resistance) PP Hand/Pocket Penetrometer D D Disturbed sample S S oft Hand auger F Firm DCP Dynamic Cone Penetrometer D - Disturbed sample S - Soft Push tube H Hard DCP Dynamic Cone Penetrometer D - Disturbed sample F - Firm N Sonic drilling VH Very Hard (Refusal) PSP Perth Sand Penetrometer MOISTURE MOISTURE VSt - Very Stiff Percussion sampler WATER PBT Plate Bearing Test D - Dry REL ATIVE DENSITY	MET EX		cavat	or buc	ket							ed sample	
Push tube H Hard DCF - Dynamic Cone Penetorneen U - Thin wall tube 'undisturbed' St - Stiff N Sonic drilling Air hammer VH Very Hard (Refusal) PSP - Perth Sand Penetrometer U - Thin wall tube 'undisturbed' St - Stiff Percussion sampler WATER PBT - Plate Bearing Test MOISTURE H - Hard	R HA	Rip	oper			E Easy	əy (INO Kesista	nice)	F	 Hand/Pocket Penetrometer 	D - Disturbed sa	ample	S - Soft
Air hammer MC - Moisture Content MOISTURE H - Hard Percussion sampler WATER PBT - Plate Bearing Test D - Dry RELATIVE DENSITY	PT SON	Pu	sh tul	be		H Hard	rd (Refusal)			5	U - Thin wall tub		rbed' St - Stiff
PDI - Plate Dealing rest D - Dry RELATIVE DENSITY	AH PS	Air	ham	ner	mpler		(H - Hard
Short spiral auger Water Level on Date IMP - Borehole Impression Test M - Moist VL - Very Loose VL - Very Loose	AS AD/V	Sh	ort sp	iral au	iger	Vat	ter Level on wn	Date	1	P - Borehole Impression Test			
/T Solid flight auger: TC-Bit → water inflow VS - Vane Shear; P=Peak, PL - Plastic limit MD - Medium Dens	AD/T HFA	So Ho	lid flig llow f	ht aug ight a	jer: TC-Bit uger	► wate	er inflow				PL - Plastic limit		L - Loose MD - Medium Dens
B Washbore drilling — water outflow R=Residual (uncorrected kPa) LL - Liquid limit D - Dense	WB RR	Wa	ashbo	re dril	ling	wate	er outflow				w - Liquid limit w - Moisture co	ntent	D - Dense
er to explanatory notes for details of reviations and basis of descriptions CONSTRUCTION SCIENCES PTY LTD													,

		ciei		ction 5									В	ORE	HOLE LOG SHEET
Clie Proj Loc	ect:			-	/ Ltd c/o Cra d Rd, Warrie	-	Rhode	S		lok No. 40	045/0/450			F	lole No: BH08
Pos			J JA V	annewoo	u nu, warne	woou				Job No: 107 Angle from				Surfac	Sheet: 1 of 1 e Elevation:
			te Mo	unted Dril	l Ria					Mounting: 1				Driller:	
_				eter: Non	-					incurring.	ight forme		actor:		
	-	arted			Date Co	mplete	d: 21/5	/14		Logged By:	DK		(Checke	ed By:
	Drillir	ng		Sampl	ing & Testing						Materia	al Description			-
Method	Resistance	Casing	Water	Sample Field T		Depth (m)	Graphic Log	Classification		DIL TYPE, plasticity colour, secondary a ROCK TYPE, grain fabric & texture, s defects a	nd minor comp size and type,	ponents , colour,	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
					1	-		ML	۱ I	TOPSOIL: Clayey SI with fine to medium g grained gravel, rootle	rained sand, w	ty, dark-brown, vith fine	M (>PL)		TOPSOIL
			Not Encountered	B 0.40 - 0.90 r CBR D 0.45 m AGG ASS 0.45 m ASS		0.5		CI- CH		CLAY: medium to hig and grey-brown, trac		ange-brown	M (≈PL)	s	RESIDUAL SOIL
AD/T	E	None	Not Enc	D 1.00 m	2 3 4 4	1.0			0	CLAY: mottled pale-o grained sand	rey and red-gro	ey, trace fine		F to St	-
				AGG	6 8 10			СІ					M (≈ PL)	VSt to H	_
<u> </u>				ASS 1.50 m ASS D 1.50 m FMC	15	1.5-				TERMINATED AT 1.4 Target depth	50 m				
						- 2.0 -									
						- - - 2.5 -									
						- - 3.0									
						- - - 3.5									
						-									
ME EX R HA PT SO AH PS AD AD HF R R	RHPSAPSSSH NVTAS	Excavate Ripper land au Push tub Sonic dr Sonic dr Percuss Short sp Solid flig	iger be illing mer ion san iral aug ht auge ht auge ight aug ight aug	ipler er r: V-Bit r: TC-Bit ger	E Easy F Firm H Hard VH Very Hard WATER	r (No Resista (Refusal) r Level on n inflow		S F C P M P	P - H CP - D SP - F IC - M BT - F MP - E ID - F S - N	STS Standard Penetratio Hand/Pocket Penetr Jynamic Cone Pene Perth Sand Penetrou Voisture Content Plate Bearing Test Jorehole Impression Photoionisation Dete /ane Shear; P=Pea R=Residual (uncorre	ometer trometer neter Test ector	D - Dis ES - En U - Thi MOISTURE D - Dry M - Mo W - We PL - Pla LL - Liq	/ ist	mple al sample e 'undistu	S - Soft F - Firm
Ref	er to e:	xplanator	ry notes t	or details of lescriptions		CO	NSTI	L RU	CTIC	ON SCIEN	ICES P	TY LTD)		

Clie	S	on cie	ene	ces		Ltd c/o Crai	g and	Rhode	s		D		HOLE LOG SHEET ole No: BH09
Proj Loca		ו:				d Rd, Warriew				Job No: 10791E/P/453		11	Sheet: 1 of 1
Posi										Angle from Horizontal: 9	90°	Surface	Elevation:
			Jte	Мо	unted Dril	l Rig				Mounting: Light Vehicle		Driller:	
_					eter: Non	-					Contractor:		
Date	Sta	rte	d: 2	21/5	/14	Date Con	npleted	d: 21/5	6/14	Logged By: DK		Checke	d By:
0	Drillin	g			Sampli	ng & Testing				Material D	Description		
Method	Resistance	Casing	D 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Water		ample or eld Test	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle charac colour, secondary and minor compor ROCK TYPE, grain size and type, co fabric & texture, strength, weatherin defects and structure	nents ents	Consistency Relative Density	STRUCTURE & Other Observations
							-		ML	TOPSOIL: Sandy Clayey SILT: low plas dark-brown, fine grained sand, with roo			TOPSOIL
							†		1	0.30m			
					D 0.50 m AGG ASS 0.60 m ASS		- - 0.5 - - -			Sandy CLAY: medium plasticity, orange	a-brown		RESIDUAL SOIL
					D 1.00 m ATT D 1.50 m		- 1.0 - - - - - 1.5		CI		M (>PL)		
AD/T	E	No	ne	Not Encountered	ASS 2.00 m		- - - -2.0			1.80m CLAY: medium plasticity, orange and g fien to medium grained sand	rey, with		
							- - - 2.5 -		CI		M (>PL)		
					ASS 3.50 m ASS		- - 3.0 - - - - 3.5 - -		sc	2.80m Clayey SAND: fine to medium grained, plasticity, pale-grey and grey	M		
ME EX R HA PT SOT AH PS AD/ AD/ HFA WB R	Ri Ha Pu N So Ai Pe Sh Sh Sh Sh Sh W W	cava pper and a ush t onic o r har ercus onic fi olid fi olid fi oliow	uge drillir sior pira ight ight fligh	ng r I sam auge auge auge nt aug drillin	pler er r: V-Bit r: TC-Bit jer	PENETRATION VE Very Easy (f E Easy F Firm VH Very Hard (f WATER WATER Water I water or	Refusal) _evel on nflow		S F F F F I I F	4.00m IELD TESTS MINATED AT 4.00 m PT - Standard Penetration Test P - Hand/Pocket Penetrometer CP - Dynamic Cone Penetrometer SP - Perth Sand Penetrometer IC - Moisture Content BT - Plate Bearing Test MP - Borehole Impression Test ID - Photoionisation Detector S - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - D - Disturbed sa ES - ENvironment U - Thin wall tub MOISTURE D - D - P - PL - PL - LL - Liquid limit w -	mple al sample e 'undistur	bed' SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm VSt - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense

Appendix C Laboratory Test Results



Construction Sciences Pty Ltd ABN: 74 128 806 735

Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

Laboratory: Glendenning Laboratory 02 9854 1700 Phone: Fax: 02 4577 9055 Email: Sydney@constructionsciences.net

MOISTURE CONTENT REPORT

Client:	Construction Sciences - Professional Services	Report Number:	12385/R/249571-1	
Client Address:	31 Anvil Road, Seven Hills	Project Number:	12385/P/1528	
Project:	53A Warriewood RD	Lot Number:		
Location:	Warriewood	Internal Test Request:	12385/T/111542	
Component:	Borehole Sampling	Client Reference/s:	53A Warriewood RD	
Area Description:	Warriewood	Report Date / Page:	2/06/2021	Page 1 of 2

Test Procedures:	AS1289.2.1.1			
Sample Number	12385/S/898468	12385/S/898469	12385/S/898471	12385/S/898472
ID / Client ID	-	-		-
Lot Number	-	-	-	-
Date / Time Sampled	24/05/2021	24/05/2021	24/05/2021	24/05/2021
Sampling Method	AS1289.1.2.1 CI 6.4b	AS1289.1.2.1 CI 6.4b	AS1289.1.2.1 CI 6.4b	AS1289.1.2.1 Cl 6.4b
Sampled By	Daniel Duffy	Daniel Duffy	Daniel Duffy	Daniel Duffy
Tested By	Christopher McDonald	Christopher McDonald	Christopher McDonald	Christopher McDonald
Date Tested	25/05/2021	25/05/2021	25/05/2021	25/05/2021
Material Source	Existing	Existing	Existing	Existing
Material Type	In-Situ	In-Situ	In-Situ	In-Situ
Borehole	BH01	BH01	BH02	BH03
Depth	0.85 -> 0.85	1.3 -> 1.3	1.3 -> 1.3	0.9 -> 0.9
Moisture Content (%)	24.7	18.7	15.2	19.5

| -
24/05/2021
AS1289.1.2.1 Cl 6.4b
Daniel Duffy
Christopher McDonald |
|---|---|---|---|
| AS1289.1.2.1 Cl 6.4b
Daniel Duffy
Christopher McDonald | AS1289.1.2.1 Cl 6.4b
Daniel Duffy
Christopher McDonald | AS1289.1.2.1 Cl 6.4b
Daniel Duffy | AS1289.1.2.1 Cl 6.4b
Daniel Duffy |
| AS1289.1.2.1 Cl 6.4b
Daniel Duffy
Christopher McDonald | AS1289.1.2.1 Cl 6.4b
Daniel Duffy
Christopher McDonald | AS1289.1.2.1 Cl 6.4b
Daniel Duffy | AS1289.1.2.1 Cl 6.4b
Daniel Duffy |
| Daniel Duffy
Christopher McDonald | Daniel Duffy
Christopher McDonald | Daniel Duffy | Daniel Duffy |
| Christopher McDonald | Christopher McDonald | , | , |
| | | Christopher McDonald | Christenber McDaneld |
| 05/05/0001 | | | Christopher McDonald |
| 25/05/2021 | 25/05/2021 | 25/05/2021 | 25/05/2021 |
| Existing | Existing | Existing | Existing |
| In-Situ | In-Situ | In-Situ | In-Situ |
| BH04 | BH05 | BH06 | BH06 |
| 1.0 -> 1.0 | 1.3 -> 1.3 | 1.0 -> 1.0 | 2.2 -> 2.2 |
| | 49.5 | 12.0 | 19.5 |
| | | | 1.0 -> 1.0 1.3 -> 1.3 1.0 -> 1.0 8.6 18.5 12.0 |

Remarks

Accredited for compliance with ISO/IEC 17025 - Testing



Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W20Rep Rev 3



Construction Sciences Pty Ltd ABN: 74 128 806 735

Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

 Laboratory
 Glendenning Laboratory

 Phone:
 02 9854 1700

 Fax:
 02 4577 9055

 Email:
 Sydney@constructionsciences.net

MOISTURE CONTENT REPORT

Client:	Construction	Sciences - Professional Services		Report Number:	12385/R/249571-1	
Client Address: 31 Anvil Ro		oad, Seven Hills		Project Number:	12385/P/1528	
Project:	53A Warrie	ewood RD		Lot Number:		
Location: Warriewo		d		Internal Test Request:	12385/T/111542	
Component:	Borehole S	Borehole Sampling		Client Reference/s:	53A Warriewood RD	
Area Description:	Warriewoo	d		Report Date / Page:	2/06/2021	Page 2 of 2

Test Procedures:	AS1289.2.1.1			
Sample Number	12385/S/898477	12385/S/898478	12385/S/898479	12385/S/898481
ID / Client ID	-	-	-	-
Lot Number	-	-	-	-
Date / Time Sampled	24/05/2021	24/05/2021	24/05/2021	24/05/2021
Sampling Method	AS1289.1.2.1 Cl 6.4b	AS1289.1.2.1 CI 6.4b	AS1289.1.2.1 CI 6.4b	AS1289.1.2.1 CI 6.4b
Sampled By	Daniel Duffy	Daniel Duffy	Daniel Duffy	Daniel Duffy
Tested By	Christopher McDonald	Christopher McDonald	Christopher McDonald	Christopher McDonald
Date Tested	25/05/2021	25/05/2021	25/05/2021	25/05/2021
Material Source	Existing	Existing	Existing	Existing
Material Type	In-Situ	In-Situ	In-Situ	In-Situ
Borehole	BH06	BH07	BH08	BH09
Depth	2.9 -> 2.9	0.45 -> 0.45	1.5 -> 1.5	1.5 -> 1.5
Moisture Content (%)	21.1	28.0	17.4	18.7

Sample Number			
ID / Client ID			
Lot Number			
Date / Time Sampled			
Sampling Method			
Sampled By			
Tested By			
Date Tested			
Material Source			
Material Type			
Borehole			
Depth (m)		
Moisture Content (%)			

Remarks

Accredited for compliance with ISO/IEC 17025 - Testing



Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W20Rep Rev 3



Construction Sciences Pty Ltd ABN: 74 128 806 735

Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

 Laboratory
 Glendenning Laboratory

 Phone:
 02 9854 1700

 Fax:
 02 4577 9055

 Email:
 Sydney@constructionsciences.net

ATTERBERG LIMITS REPORT

Client:	Construction Sciences - F	Professional Services		Report Number:	12385/R/249572-1		
Client Address:	31 Anvil Road, Seve	en Hills		Project Number:	12385/P/1528		
Project:	53A Warriewood RD)		Lot Number:			
Location:	Warriewood			Internal Test Request:	12385/T/111542		
Component:	Borehole Sampling			Client Reference/s:	53A Warriewood RD		
Area Description:	Warriewood			Report Date / Page:	2/06/2021	Page 1 of 2	
Test Procedures: AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1							
Sample Number	12385/S/898470			Sampl	e Location		
Sampling Method	AS1289.1.2.1 CI 6.4	b	Borehole		BH02		
Date Sampled	24/05/2021		Depth	(m)	0.65 -> 0.65		
Sampled By	Daniel Duffy						
Date Tested	28/05/2021						
Att. Drying Method	Oven Dried		Material So	ource Existing			
Atterberg Preparation	Dry Sieved		Material Ty	/pe In-Situ			
Material Description	-						
		Atterberg L	imits Result	S			
Atterberg Limit		Specification Minimum		Test Result	Specificatior	n Maximum	
Liquid Limit (%)				41			
Plastic Limit (%)				19			
Plasticity Index (%)				22			
Linear Shrinkage (%)				10.0			
Linear Shrinkage Mou	ld Length / Defects:	Mould Length: 250.1mm / No	one				

Remarks

ΝΔ

Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W11bRep Rev 1



Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

 Laboratory
 Glendenning Laboratory

 Phone:
 02 9854 1700

 Fax:
 02 4577 9055

 Email:
 Sydney@constructionsciences.net

ATTERBERG LIMITS REPORT

Test Procedures: AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1 Sample Number 12385/S/898480 Sampling Method AS1289.1.2.1 Cl 6.4b Date Sampled 24/05/2021 Date Sampled 24/05/2021 Date Tested 28/05/2021 Att. Drying Method Oven Dried Atterberg Preparation Dry Sieved Material Description - Atterberg Limits Results Atterberg Limit Specification Minimum Liquid Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0 <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>										
Project: 53A Warriewood RD Lot Number: Location: Warriewood Internal Test Request: 12385/T/111542 Component: Borehole Sampling Report Date / Page: 2/06/2021 Page Area Description: Warriewood Report Date / Page: 2/06/2021 Page Test Procedures: AS1289.3.1.1, AS 1289.3.2.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1 Sample Location Sample Number 12385/S/898480 Sample Location Sampled AS1289.1.2.1 Cl 6.4b Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Depth Instrial Source Existing Atterberg Preparation Dry Sieved Material Source Existing Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 15 Infe Plasticity Index (%) 8.0 8.0 8.0 10	Client:	Construction Sciences - F	Professional Services		Report Number:	12385/R/24	19572-1			
Location: Warriewood Internal Test Request: 12385/T/111542 Component: Borehole Sampling Client Reference/s: 53A Warriewood RD Area Description: Warriewood Report Date / Page: 2/06/2021 Page Test Procedures: AS1289.3.1.1, AS 1289.3.2.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.3.4.1	Client Address:	31 Anvil Road, Seve	en Hills		Project Number:	12385/P/15	528			
Component: Borehole Sampling Client Reference/s: 53A Warriewood RD Area Description: Warriewood Report Date / Page: 2/06/2021 Page Test Procedures: AS1289.3.1.1, AS 1289.3.2.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1 Sample Location Sample Number 12385/S/898480 Sample Location Sample Number 12385/S/898480 Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sample By Daniel Duffy Date Tested 28/05/2021 Atterial Source Existing Att. Drying Method Oven Dried Material Source Existing Material Description Material Description Test Result Specification Maximum Material Description - - - - - - Material Description - <td>Project:</td> <td>53A Warriewood RE</td> <td>)</td> <td></td> <td>Lot Number:</td> <td></td> <td></td>	Project:	53A Warriewood RE)		Lot Number:					
Area Description: Warriewood Report Date / Page: 2/06/2021 Page Test Procedures: AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.2.1, AS1289.2.1.1 Sample Number 12385/S/898480 Sample Location Sample Number 12385/S/898480 Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Depth (m) 1.0 -> 1.0 Sampled Construction Sampled Construction Sampled Construction Sampled Construction Atter Description Depth (m) 1.0 -> 1.0 Sampled Construction Material Description Dry Sieved Material Source Existing Atterberg Limits Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 If 6 If 6 If 6 Plasticity Index (%) 15 8.0 8.0 If 6	Location:	Warriewood			Internal Test Request:	1542				
Test Procedures: AS1289.3.1.1, AS 1289.3.3.1, AS1289.3.2.1, AS1289.3.4.1, AS1289.2.1.1 Sample Number 12385/S/898480 Sample Location Sampling Method AS1289.1.2.1 Cl 6.4b Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Material Source Existing Atterberg Preparation Dry Sieved Material Source Existing Material Description - - Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 15 15 15 Linear Shrinkage (%) 8.0 8.0 8.0	Component:	Borehole Sampling			wood RD					
Sample Number 12385/S/898480 Sample Location Sampling Method AS1289.1.2.1 Cl 6.4b Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Date Tested 28/05/2021 Atterial Source Existing Att. Drying Method Oven Dried Material Source Existing Atterberg Preparation Dry Sieved Material Type In-Situ Material Description - - - Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 115 116 Plasticity Index (%) 8.0 8.0 116	Area Description:	Warriewood			Report Date / Page:	2/06/2021	Page 2 of			
Sampling Method AS1289.1.2.1 Cl 6.4b Borehole BH09 Date Sampled 24/05/2021 Depth (m) 1.0 -> 1.0 Sampled By Daniel Duffy Depth (m) 1.0 -> 1.0 Date Tested 28/05/2021 Material Source Existing Material Source Existing Att. Drying Method Oven Dried Material Source Existing Material Type In-Situ Material Description - - - - Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 116 115 Plastici Limit (%) 115 8.0 8.0	Test Procedures:	AS1289.3.1.1, AS 1	289.3.3.1, AS1289.3.2.1, AS12	289.3.4.1, A	S1289.2.1.1					
Date Sampled 24/05/2021 Sampled By Daniel Duffy Date Tested 28/05/2021 Att. Drying Method Oven Dried Atterberg Preparation Dry Sieved Material Description - Atterberg Limit Specification Minimum Liquid Limit (%) 16 Plastic Limit (%) 15 Plasticity Index (%) 8.0	Sample Number	12385/S/898480			Sample	e Location				
Sampled By Daniel Duffy Date Tested 28/05/2021 Att. Drying Method Oven Dried Atterberg Preparation Dry Sieved Material Description - Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 Plastic Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Sampling Method	AS1289.1.2.1 CI 6.4	b	Borehole	brehole BH09					
Date Tested 28/05/2021 Att. Drying Method Oven Dried Atterberg Preparation Dry Sieved Material Description - Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Date Sampled	24/05/2021		Depth	(m)	1.0 -> 1.0				
Att. Drying Method Oven Dried Material Source Existing Atterberg Preparation Dry Sieved Material Type Material Description - Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Sampled By	Daniel Duffy								
Atterberg Preparation Dry Sieved Material Type In-Situ Material Description - Atterberg Limits Results Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 Plastic Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Date Tested	28/05/2021								
Material Description - Atterberg Limits Results Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 16 16 Plasticity Index (%) 15 15 15 Linear Shrinkage (%) 8.0 10 10	Att. Drying Method	Oven Dried		Material Source Existing						
Atterberg Limits Results Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 16 16 Plastic Limit (%) 15 15 15 Linear Shrinkage (%) 8.0 10 10	Atterberg Preparation	Dry Sieved		Material Type In-Situ						
Atterberg Limit Specification Minimum Test Result Specification Maximum Liquid Limit (%) 31 Plastic Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Material Description	-								
Liquid Limit (%) 31 Plastic Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0			Atterberg L	imits Result	S					
Plastic Limit (%) 16 Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Atterberg Limit		Specification Minimum		Test Result	Sp	ecification Maximum			
Plasticity Index (%) 15 Linear Shrinkage (%) 8.0	Liquid Limit (%)				31					
Linear Shrinkage (%) 8.0	Plastic Limit (%)			16						
	Plasticity Index (%)			15						
Linear Shrinkara Defeate	Linear Shrinkage (%)				8.0					
	Linear Shrinkage Defe	ects:	None							

Remarks

ΝΔ

Accredited for compliance with ISO/IEC 17025 - Testing

Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W11bRep Rev 1



Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

Laboratory:Glendenning LaboratoryPhone:02 9854 1700Fax:02 4577 9055Email:Sydney@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

Client:	Construction Scier	nces - Professional Servio	ces		Rep	ort N	umbe	er:	12385/R/	250052-1	
Client Address:	31 Anvil Road,	Seven Hills			Proj	ect N	lumbe	er:	12385/P/ ⁻	1528	
Project:	53A Warriewoo	od RD			Lot I	Num	ber:				
Location:	Warriewood				Inter	rnal T	Fest R	Request	: 12385/T/ [.]	111542	
Component:	Borehole Sam	olina			Clie	nt Re	feren	ce/s:	53A Warr	iewood RD	
Area Description:	Warriewood				_			Page:	8/06/202		Page 1 of 3
					Кер		ale / I	raye.	8/00/202		T dgc T of 0
Test Procedures		AS1289.5.1.1, AS12	289.2.1.1								
Sample Number	12385/S/89848	32						Sam	ple Location		
Sampling Method	AS1289.1.2.1	CI 6.4b		Borehole					CBR01		
Date Sampled	24/05/2021			Depth			(m)	0.6 -> 1.0		
Sampled By	Daniel Duffy										
Date Tested	1/06/2021										
Material Source	Existing			Material Li	mit St	art			-		
Material Type	In-Situ			Material Li	mit Er	nd			-		
Client Reference	-			Compactiv	e Effc	ort			Standard		
Material Description	CLAY - Brown										
Maximum Dry Density	(t/m³):	1.74			CE	BR P	ENET	RATI	ON PLOT		
Optimum Moisture Cor	ntent (%):	19.0									
Field Moisture Content	: (%):	20.5	2000								
Sample Percent Overs	ize (%)	1.0	1800								
Oversize Included / Ex	cluded	Excluded									
Target Density Ratio (%	%):	100	1600								
Target Moisture Ratio	(%):	100	1400								
Placement Dry Density	/ (t/m³):	1.75	1100								
Placement Dry Density	/ Ratio (%):	100.0	1200								
Placement Moisture Co	ontent (%):	19.1	2 1000								
Placement Moisture Ra	atio (%):	99.5	(N) 1000								
Test Condition / Soakir	ng Period:	Soaked / 4 Days	800			_					
CBR Surcharge (kg)		9.0	coo 1								
Dry Density After Soak	: (t/m³):	1.73	600								
Total Curing Time (hrs))	44	400								
Liquid Limit Method		Estimation	1								
Moisture (top 30mm) A	fter Soak (%)	22.8	200								
Moisture (remainder) A	After Soak (%)	20.5	0 ±								
CBR Swell (%):		0.5			ώώ	44	່ທ່າ	100	F	10.0	12.5
Minimum CBR Specific	. ,	-	0		0 01	00				ö	ίπ
CBR Value @ 2.5mm	(%):	8					Pe	enetrati	ion (mm)		

Remarks

Accredited for compliance with ISO/IEC 17025 - Testing



Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W2ASRep Rev2



Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

Laboratory:Glendenning LaboratoryPhone:02 9854 1700Fax:02 4577 9055Email:Sydney@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

Client:	Construction Scien	nces - Professional Servi	ces		Report Number:		12385/R/250	0052-1	
Client Address:	31 Anvil Road,	Seven Hills			Project Number:		12385/P/152	28	
Project:	53A Warriewoo	od RD			Lot Number:				
Location:	Warriewood				Internal Test Re	quest:	12385/T/111	1542	
Component:	Borehole Sam	oling			Client Reference	e/s:	53A Warriev	vood RD	
Area Description:	Warriewood	-			Report Date / Pa	age:	8/06/2021		Page 2 of 3
Test Procedures	1200611	AS1289.5.1.1, AS1	200 2 1 1		'	0			-
Sample Number	12385/S/89848		209.2.1.1			Sample	Location		
Sampling Method	AS1289.1.2.1 (Borehole		•	CBR02		
		51 0.40			()				
Date Sampled	24/05/2021			Depth	(m)	(0.7 -> 1.1		
Sampled By	Daniel Duffy								
Date Tested	7/06/2021								
Material Source	Existing			Material Li			-		
Material Type	In-Situ			Material Li			-		
Client Reference	-			Compactiv	e Effort		Standard		
Material Description	Brown Silty Cl	ay	1						
Maximum Dry Density	, ,	1.83			CBR PENETR	ATION	I PLOT		
Optimum Moisture Con		15.0	1						
Field Moisture Content	. ,	18.4	2400						
Sample Percent Oversi		0.0	-					/	
Oversize Included / Exe		Excluded	2100						
Target Density Ratio (%		100	-						
Target Moisture Ratio (100	1800						
Placement Dry Density		1.84	-						
Placement Dry Density		100.0	□ □ 1500						
Placement Moisture Co	. ,	14.8	(N) pe 1200						
Placement Moisture Ra	. ,	99.5	9 1200						
Test Condition / Soakin	ng Period:	Unsoaked	900						
CBR Surcharge (kg)		9.0							
Dry Density After Soak	()	1.84	600						
Total Curing Time (hrs))	44							
Liquid Limit Method		Estimation	300						
Moisture (top 30mm) A		16.0	1						
Moisture (remainder) A	fter Soak (%)	14.9	0 1						
CBR Swell (%):		0.0	C iu		00044000 0000000	0.00	N S	10.0	12.5
Minimum CBR Specific	. ,	-	-					0	U.
CBR Value @ 5.0mm	(%):	7			Pen	etration	r (mm)		

Remarks

Accredited for compliance with ISO/IEC 17025 - Testing



Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W2ASRep Rev2



Address: Unit 2, 4 Kellogg Road,

Glendenning NSW 2761

Laboratory:Glendenning LaboratoryPhone:02 9854 1700Fax:02 4577 9055Email:Sydney@constructionsciences.net

CALIFORNIA BEARING RATIO REPORT

Client: Co	Instruction Scien	ices - Professional Servic	ces		Repor	t Num	nber:		12385/R/2	250052-1	
Client Address: 31	l Anvil Road,	Seven Hills			Projec	t Nun	nber:		12385/P/1	528	
Project: 53	BA Warriewoo	od RD			Lot Nu	umber	:				
-	arriewood				Interna	al Tes	st Requ	uest:	12385/T/1	11542	
Component: Bo	orehole Samp	olina					rence/:			ewood RD	
	arriewood	Sing			Repor				8/06/2021		Page 3 of 3
Area Description.	amewood				керо	t Date	e / Pag	je.	0/00/2021		Fage 5 01 5
		AS1289.5.1.1, AS12	289.2.1.1								
Sample Number 12	2385/S/89848	34					S	ample	e Location		
Sampling Method AS	51289.1.2.1 (CI 6.4b		Borehole					CBR03		
Date Sampled 24	1/05/2021			Depth			(m)		0.4 -> 0.9		
Sampled By Da	aniel Duffy										
Date Tested 7/0	06/2021										
Material Source Ex	kisting			Material Lin	mit Star	t			-		
Material Type In-	-Situ			Material Li	mit End				-		
Client Reference -				Compactiv	e Effort				Standard		
Material Description Gr	rey Brown Cla	ау									
Maximum Dry Density (t/n	n³):	1.88			CBR		IETRA	TIO	N PLOT		
Optimum Moisture Conter	nt (%):	13.0									
Field Moisture Content (%	ó):	19.5	3000								
Sample Percent Oversize	(%)	0.0	2700								
Oversize Included / Exclue	ded	Excluded									
Target Density Ratio (%):		100	2400								
Target Moisture Ratio (%)):	100	2100								
Placement Dry Density (t/	′m³):	1.89									
Placement Dry Density Ra	atio (%):	100.5	1800								
Placement Moisture Conte	ent (%):	12.8	(N) 1500								
Placement Moisture Ratio	o (%):	97.0	Loa								
Test Condition / Soaking F	Period:	Soaked / 4 Days	1200								
CBR Surcharge (kg)		9.0	900								
Dry Density After Soak (t/	m³):	1.89	500 -								
Total Curing Time (hrs)		46	600								
Liquid Limit Method		Estimation	200								
Moisture (top 30mm) After		14.5	300								
Moisture (remainder) After	r Soak (%)	13.6	0 1								
CBR Swell (%):		0.0	C is		4ωω 5 τö ci	v 4 v o n c	000	50	7.5	10.0	12.5
Minimum CBR Specification		-	-							0	U.
CBR Value @ 5.0mm (%)):	9					Pene	ratio	n (mm)		

Remarks

Accredited for compliance with ISO/IEC 17025 - Testing



Accreditation Number: Corporate Site Number: 1986 12385

Pal Dear

Approved Signatory: Patrick Deasy Form ID: W2ASRep Rev2



Certificate of Analysis

Environment Testing

Construction Sciences P/L (Glendenning) 2/4 Kellogg Rd Glendenning **NSW 2761**





NATA Accredited Accreditation Number 1261 Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Attention:	Vipul DeSilva
Report	795819-S
Project name	

Project ID

Received Date

795819-S WARRIEWOOD

May 14, 2021

Client Sample ID Sample Matrix			BH07 - 1.2 Soil	BH07 - 0.4 Soil	BH07 - 0.5 (JAR) Soil	BH07 - 2.5 Soil
Eurofins Sample No.			S21-My32322	S21-My32323	S21-My32324	S21-My32325
Date Sampled			May 14, 2021	May 14, 2021	May 14, 2021	May 14, 2021
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	38	-	-	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	42	-	-	-
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	5.3	-	-	-
Sulphate (as SO4)	10	mg/kg	43	-	-	-
% Moisture	1	%	20	21	-	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.1	-	5.6	4.9
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	3.9	-	4.2	3.8
Reaction Ratings* ^{S05}	-	comment	1.0	-	1.0	1.0

Client Sample ID			BH08 - 1.5	BH08 - 0.45	BH08 - 1.0	BH08 - 0.5 (A)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-My32327	S21-My32328	S21-My32329	S21-My32330
Date Sampled			May 14, 2021	May 14, 2021	May 14, 2021	May 14, 2021
Test/Reference	LOR	Unit				
% Moisture	1	%	-	18	-	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.0	-	7.0	7.1
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.3	-	5.6	5.4
Reaction Ratings*505	-	comment	1.0	-	1.0	1.0



Client Sample ID			0462740212 Soil	BH01 - 1.8 Soil	BH02 - 1.2 Soil	BH04 - 1.0 Soil
Sample Matrix						
Eurofins Sample No.			S21-My32331	S21-My32332	S21-My32333	S21-My32336
Date Sampled			May 14, 2021	May 14, 2021	May 14, 2021	May 14, 2021
Test/Reference	LOR	Unit				
Chloride	10	mg/kg	-	-	< 10	-
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	-	-	27	-
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	-	-	5.6	-
Sulphate (as SO4)	10	mg/kg	-	-	50	-
% Moisture	1	%	-	-	15	15
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.0	5.4	-	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.1	4.7	-	-
Reaction Ratings* ⁵⁰⁵	-	comment	1.0	1.0	-	-

Client Sample ID			BH02 - 1.4	BH05 - 1.0 (BAG)	BH05 - 1.0 (JAR)	BH06 - 3.3 (JAR)
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S21-My32337	S21-My32338	S21-My32339	S21-My32340
Date Sampled			May 14, 2021	May 14, 2021	May 14, 2021	May 14, 2021
Test/Reference	LOR	Unit				
% Moisture	1	%	-	-	15	-
Acid Sulfate Soils Field pH Test						
pH-F (Field pH test)*	0.1	pH Units	5.2	5.2	-	7.5
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	4.5	4.5	-	5.7
Reaction Ratings* ^{S05}	-	comment	1.0	1.0	-	1.0

Client Sample ID Sample Matrix Eurofins Sample No. Date Sampled			BH06 - 3.0 Soil S21-My32341 May 14, 2021	BH09 - 2.0 (JAR) Soil S21-My32342 May 14, 2021
Test/Reference	LOR	Unit		
% Moisture	1	%	20	-
Acid Sulfate Soils Field pH Test				
pH-F (Field pH test)*	0.1	pH Units	-	5.2
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	-	4.3
Reaction Ratings*505	-	comment	-	1.0



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description Chloride	Testing Site Sydney	Extracted May 19, 2021	Holding Time 28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser		N. 40.0004	
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Sydney	May 19, 2021	7 Days
pH (1:5 Aqueous extract at 25°C as rec.)	Sydney	May 19, 2021	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Sulphate (as SO4) - Method: E045 Anions by Ion Chromatography	Sydney	May 19, 2021	28 Days
Acid Sulfate Soils Field pH Test	Sydney	May 19, 2021	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
% Moisture	Sydney	May 19, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

	eurofi	nc				Australia											New Zealand	
	50 005 085 521 web:			ronment email: EnviroSale		Melbourne 6 Monterey Road Dandenong South VIC 3 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254 & 14271	U 175 1 0 L P	6 Mars ane Co hone : -		NSW 2 00 840	1/ M 066 PI 0 N	urarrie hone : +	allwood QLD 41 +61 7 39		Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone: - 664 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 767 Phone: 0800 856 450 IANZ # 1290
	ompany Name: Idress:	2/4 Ke	ellogg F denning		. (Glendennin	g)		R P	rder N eport hone: ax:		7	P/453 79581)2 985		0		Received: Due: Priority: Contact Name:	May 18, 2021 8:19 May 20, 2021 2 Day Vipul DeSilva	AM
	oject Name: oject ID:	WARF	RIEWO	OD												Eurofins Analytical	Services Manager : l	Jrsula Long
			CANCELLED	Chloride	Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set								
/lelk	oourne Laborato	ory - NAT	A Site	# 1254 & 142	271													
Sydı	ney Laboratory	- NATA S	Site # 1	8217			Х	X	Х	Х	Х	Х	Х	Х				
Bris	bane Laborator	y - NATA	Site #	20794														
Pert	h Laboratory - N	NATA Site	e # 237	36														
	field Laboratory		Site # 2	25079														
	rnal Laboratory	·	-															
No	Sample ID	Sample	Date	Sampling Time	Matrix	LAB ID												
	BH07 - 1.2	May 14,	2021		Soil	S21-My32322		Х	Х		Х	х	Х	Х				
2	BH07 - 0.4	May 14,	2021		Soil	S21-My32323								Х				
5	BH07 - 0.5 (JAR)	May 14,	2021		Soil	S21-My32324							х					
1	BH07 - 2.5	May 14,	2021		Soil	S21-My32325							х					
5	BH07 -0.5 (BAG)	May 14,			Soil	S21-My32326	х											
5	BH08 - 1.5	May 14,			Soil	S21-My32327							Х					
7	BH08 - 0.45	May 14,	2021		Soil	S21-My32328		ļ						х				
8	BH08 - 1.0	May 14,	2021		Soil	S21-My32329	1	1	1	1	1	1	X					

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com		Australia											New Zealand		
		Melbourne 6 Monterey Road Dandenong South VIC 31 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254 & 14271	U 75 16 La Pl	6 Mars F ane Cov hone : +		NSW 20 00 8400	1/2 Mu 066 Ph 0 NA		allwood F QLD 41 +61 7 39		Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone: +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 767 Phone : 0800 856 450 IANZ # 1290	
Company Name: Address:	Construction 2/4 Kellogg R Glendenning NSW 2761	Sciences P/L (Glendennin td	g)		Re Ph	der N port i none: ix:	#:	7	P/453 795819)2 985	9	0		Received: Due: Priority: Contact Name:	May 18, 2021 8:19 May 20, 2021 2 Day Vipul DeSilva	АМ
Project Name: Project ID:	WARRIEWO	OD											Eurofins Analytical	Services Manager : I	Jrsula Long
	Sa	mple Detail		CANCELLED	Chloride	Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set				
Melbourne Laborator	•				V	×	~				~				
Sydney Laboratory - Brisbane Laboratory				Х	X	Х	Х	X	X	X	X				
Perth Laboratory - N										<u> </u>					
Mayfield Laboratory										<u> </u>					
External Laboratory															
9 BH08 - 0.5 (A)	May 14, 2021	Soil	S21-My32330							x					
	May 14, 2021	Soil	S21-My32331							х					
	May 14, 2021	Soil	S21-My32332							Х					
	May 14, 2021	Soil	S21-My32333		x	х		х	х	<u> </u>	х				
	May 14, 2021	Soil	S21-My32334				Х	└──	ļ'	<u> </u>					
	May 14, 2021	Soil	S21-My32335				Х	└──	ļ!	<u> </u>					
	May 14, 2021	Soil	S21-My32336					↓	<u> </u>		Х				
	May 14, 2021	Soil	S21-My32337					└──	ļ!	X					
	May 14, 2021	Soil	S21-My32338							x					
(BAG)	May 14, 2021							+	-	<u> </u>					

🛟 eurofir	nc I		Australia											New Zealand	
	Envi	ronment Testing	Phone : +61 3 8564 500 NATA # 1261	175 1 0 L F	6 Mars ane Co Phone :		NSW 2	1, N 2066 P 10 N	lurarrie hone : ·	allwood QLD 41 +61 7 39		Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 9251 9600 4 NATA # 1261 Site # 23736	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448 NATA # 1261 Site # 25079	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
Company Name: Address:	Construction 2/4 Kellogg F Glendenning NSW 2761		ning)		R P	order N eport hone: ax:	#:	7	P/453 79581)2 98		0		Received: Due: Priority: Contact Name:	May 18, 2021 8:19 May 20, 2021 2 Day Vipul DeSilva	АМ
Project Name: Project ID:	WARRIEWO	OD											Eurofins Analytical	Services Manager : L	Jrsula Long
	Sa	mple Detail		CANCELLED	Chloride	Conductivity (1:5 aqueous extract at 25°C as rec.)	HOLD	pH (1:5 Aqueous extract at 25°C as rec.)	Sulphate (as SO4)	Acid Sulfate Soils Field pH Test	Moisture Set				
Melbourne Laborator															
Sydney Laboratory -				X	X	X	X	X	Х	X	Х				
Brisbane Laboratory				-											
Perth Laboratory - NA										-					
Mayfield Laboratory	- NATA Site # 2	25079													
External Laboratory					+	+				+					
(JAR) 19 BH06 - 3.3 I (JAR)	May 14, 2021	Soil	S21-My32340							x					
	May 14, 2021	Soil	S21-My32341			1	1		1	1	х				
21 BH09 - 2.0	May 14, 2021	Soil	S21-My32342							x					
(JAR)		Call	S21-My32343				х								
/	May 14, 2021	Soil	32 T-IVI 932343												
` /		Soil	S21-My32343				х								



Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site 1. Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- 2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- 3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- 5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds
- 6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- 7. Samples were analysed on an 'as received' basis.
- 8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
- This report replaces any interim results previously issued. 9.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days. **NOTE: pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Limit of Reporting.
Addition of the analyte to the sample and reported as percentage recovery.
Relative Percent Difference between two Duplicate pieces of analysis.
Laboratory Control Sample - reported as percent recovery.
Certified Reference Material - reported as percent recovery.
In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
The addition of a like compound to the analyte target and reported as percentage recovery.
A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
United States Environmental Protection Agency
American Public Health Association
Toxicity Characteristic Leaching Procedure
Chain of Custody
Sample Receipt Advice
US Department of Defense Quality Systems Manual Version 5.3
Client Parent - QC was performed on samples pertaining to this report
Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

- 1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- 2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 3. Organochlorine Pesticide analysis where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
- 4. Organochlorine Pesticide analysis where reporting Spike data, Toxaphene is not added to the Spike.
- Total Recoverable Hydrocarbons where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported 5. in the C10-C14 cell of the Report.
- 6. pH and Free Chlorine analysed in the laboratory Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- 7. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
- 8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
- 9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
- 10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.



Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code		
Method Blank									
Chloride			mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at	25°C as rec.)		uS/cm	< 10			10	Pass	
Sulphate (as SO4)			mg/kg	< 10			10	Pass	
LCS - % Recovery								-	
Chloride			%	101			70-130	Pass	
Conductivity (1:5 aqueous extract at	25°C as rec.)		%	82			70-130	Pass	
Sulphate (as SO4)			%	99			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S21-My37108	NCP	%	102			70-130	Pass	
Sulphate (as SO4)	S21-My37108	NCP	%	98			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S21-My37108	NCP	mg/kg	20	19	8.0	30%	Pass	
Conductivity (1:5 aqueous extract at 25°C as rec.)	S21-My32322	СР	uS/cm	42	45	6.9	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	S21-My32322	СР	pH Units	5.3	5.4	<1	30%	Pass	
Sulphate (as SO4)	S21-My37108	NCP	mg/kg	25	24	6.0	30%	Pass	
% Moisture	S21-My32322	CP	%	20	19	4.0	30%	Pass	



Comments

Sample Integrity	
Custody Seals Intact (if used) N	√A/
Attempt to Chill was evident Y	/es
Sample correctly preserved Y	/es
Appropriate sample containers have been used Y	/es
Sample containers for volatile analysis received with minimal headspace Y	/es
Samples received within HoldingTime Y	/es
Some samples have been subcontracted N	No

Qualifier Codes/Comments

Code

Description

Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction. S05

Authorised by:

John Nguyen Charl Du Preez

Analytical Services Manager Senior Analyst-Inorganic (NSW)

Glenn Jackson General Manager

Final Report - this report replaces any previously issued Report

- Indicates Not Requested
- * Indicates NATA accreditation does not cover the performance of this service
- Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.



Certificate of Analysis

Environment Testing

Construction Sciences P/L (Glendenning) 2/4 Kellogg Rd Glendenning NSW 2761





NATA Accredited Accreditation Number 1261 Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Vipul DeSilva

Report Project name Project ID Received Date **797643-S** ADDITIONAL WARRIEWOOD May 24, 2021

Client Sample ID			BH05 1.0	BH07 2.5	BH08 1.5
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			S21-My47085	S21-My47086	S21-My47087
Date Sampled			May 14, 2021	May 14, 2021	May 14, 2021
Test/Reference	LOR	Unit			
Chromium Suite					
pH-KCL	0.1	pH Units	4.7	4.8	4.3
Acid trail - Titratable Actual Acidity	2	mol H+/t	25	16	78
sulfidic - TAA equiv. S% pyrite	0.003	% pyrite S	0.040	0.030	0.12
Chromium Reducible Sulfur ^{S04}	0.005	% S	< 0.005	< 0.005	< 0.005
Chromium Reducible Sulfur -acidity units	3	mol H+/t	< 3	< 3	< 3
Sulfur - KCI Extractable	0.02	% S	N/A	N/A	< 0.02
HCI Extractable Sulfur Correction Factor	1	factor	2.0	2.0	2.0
HCI Extractable Sulfur	0.02	% S	N/A	N/A	< 0.02
Net Acid soluble sulfur	0.02	% S	N/A	N/A	< 0.02
Net Acid soluble sulfur - acidity units	10	mol H+/t	N/A	N/A	< 10
Net Acid soluble sulfur - equivalent S% pyrite ^{S02}	0.02	% S	N/A	N/A	< 0.02
Acid Neutralising Capacity (ANCbt)	0.01	% CaCO3	N/A	N/A	N/A
Acid Neutralising Capacity - acidity (a-ANCbt)	2	mol H+/t	N/A	N/A	N/A
Acid Neutralising Capacity - equivalent S% pyrite (s-ANCbt) ^{S03}	0.02	% S	N/A	N/A	N/A
ANC Fineness Factor		factor	1.5	1.5	1.5
CRS Suite - Net Acidity (Sulfur Units)	0.02	% S	0.04	0.03	0.14
CRS Suite - Net Acidity (Acidity Units)	10	mol H+/t	25	16	86
CRS Suite - Liming Rate ^{S01}	1	kg CaCO3/t	1.9	1.2	6.4
Extraneous Material					
<2mm Fraction	0.005	g	73	79	140
>2mm Fraction	0.005	g	< 0.005	< 0.005	< 0.005
Analysed Material	0.1	%	100	100	100
Extraneous Material	0.1	%	< 0.1	< 0.1	< 0.1
% Moisture	1	%	15	21	14



Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	May 26, 2021	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	May 26, 2021	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Sydney	May 25, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

	eurofi	nc			Australia							New Zealand	
••	Curon		ironment	Testing	Melbourne 6 Monterey Road Dandenong South VIC 3 Phone: +61 3 8564 5000 NATA # 1261	U 175 1 D L	6 Mars I ane Cov		Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794	Perth 46-48 Banksia Road Welshpool WA 6106 Phone : +61 8 9251 9600 NATA # 1261	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448	Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 76 Phone : 0800 856 450 IANZ # 1290
BN: 50	0 005 085 521 web: v	www.eurofins.com.au	ı email: EnviroSale	es@eurofins.com	Site # 1254 & 14271	N	IATA # 1	1261 Site # 18217		Site # 23736	NATA # 1261 Site # 25079		
	mpany Name: dress:	Construction 2/4 Kellogg F Glendenning NSW 2761	٦d	_ (Glendenning)		Re Pl	rder No.: eport #: hone: ax:	797643 02 9854 1700		Received: Due: Priority: Contact Name:	May 24, 2021 11:0 May 31, 2021 5 Day Vipul DeSilva	8 AM
	oject Name: oject ID:	ADDITIONA WARRIEWC									Eurofins Analytical	Services Manager : l	Jrsula Long
		Sa	mple Detail			Chromium Reducible Sulfur Suite	Moisture Set						
	ourne Laborato			271				-					
	ney Laboratory					x	X	-					
	h Laboratory - N					^	1	-					
	ield Laboratory												
	rnal Laboratory		1										
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	BH05 1.0	May 14, 2021		Soil	S21-My47085	Х	X						
		May 14, 2021		Soil	S21-My47086	Х	Х						
3	BH08 1.5	May 14, 2021		Soil	S21-My47087	Х	X						
4	Counts					3	3						



Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site 1. Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- 2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- 3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- 5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds
- 6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
- 7. Samples were analysed on an 'as received' basis.
- 8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
- This report replaces any interim results previously issued. 9.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days. **NOTE: pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Limit of Reporting.
Addition of the analyte to the sample and reported as percentage recovery.
Relative Percent Difference between two Duplicate pieces of analysis.
Laboratory Control Sample - reported as percent recovery.
Certified Reference Material - reported as percent recovery.
In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
The addition of a like compound to the analyte target and reported as percentage recovery.
A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
United States Environmental Protection Agency
American Public Health Association
Toxicity Characteristic Leaching Procedure
Chain of Custody
Sample Receipt Advice
US Department of Defense Quality Systems Manual Version 5.3
Client Parent - QC was performed on samples pertaining to this report
Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

- 1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- 2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 3. Organochlorine Pesticide analysis where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
- 4. Organochlorine Pesticide analysis where reporting Spike data, Toxaphene is not added to the Spike.
- Total Recoverable Hydrocarbons where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported 5. in the C10-C14 cell of the Report.
- 6. pH and Free Chlorine analysed in the laboratory Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
- 7. Recovery Data (Spikes & Surrogates) where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
- 8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
- 9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
- 10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.



Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery			•						
Chromium Suite									
pH-KCL			%	98			80-120	Pass	
Acid trail - Titratable Actual Acidity			%	101			80-120	Pass	
Chromium Reducible Sulfur			%	101			80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Chromium Suite				Result 1	Result 2	RPD			
pH-KCL	S21-My47085	CP	pH Units	4.7	4.7	<1	30%	Pass	
Acid trail - Titratable Actual Acidity	S21-My47085	CP	mol H+/t	25	24	2.0	30%	Pass	
sulfidic - TAA equiv. S% pyrite	S21-My47085	CP	% pyrite S	0.040	0.040	2.0	30%	Pass	
Chromium Reducible Sulfur	S21-My47085	CP	% S	< 0.005	< 0.005	<1	30%	Pass	
Chromium Reducible Sulfur -acidity units	S21-My47085	СР	mol H+/t	< 3	< 3	<1	30%	Pass	
ANC Fineness Factor	S21-My47085	CP	factor	1.5	1.5	<1	30%	Pass	
CRS Suite - Net Acidity (Sulfur Units)	S21-My47085	СР	% S	0.04	0.04	2.0	30%	Pass	
CRS Suite - Net Acidity (Acidity Units)	S21-My47085	СР	mol H+/t	25	24	2.0	30%	Pass	
CRS Suite - Liming Rate	S21-My47085	CP	kg CaCO3/t	1.9	1.8	2.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-My47315	NCP	%	11	14	22	30%	Pass	



Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code Description

S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period

Authorised by:

John Nguyen Myles Clark Analytical Services Manager Senior Analyst-SPOCAS (QLD)

Glenn Jackson General Manager

Final Report - this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

Located across Australia and New Zealand

QLD

Airlie Beenleigh Brisbane (Acacia Ridge) Brisbane (Beenleigh) Brisbane (Brendale) Brisbane (Petrie) Cairns Emerald Gladstone Gold Coast Mackay Moranbah Rockhampton Petrie Sunshine Coast Toowoomba Townsville

NSW

Ballina Coffs Harbour Grafton Lynwood Newcastle Sydney (Glendenning) Sydney (Seven Hills) Sydney (St Peters) Taree Wollongong

VIC

Ararat Bendigo Echuca Melbourne (Chadstone) Melbourne (Keysborough) Melbourne (Pakenham) Melbourne (Oaklands Junction) Melbourne (Sunshine West) Traralgon

WA

Bunbury Kalgoorlie Newman Perth Port Hedland

SA

Adelaide Port Augusta

NT Darwin

ACT Canberra

NZ Wellington

> Construction Sciences

Ph 1300 165 769 E info@constructionsciences.net W constructionsciences.net