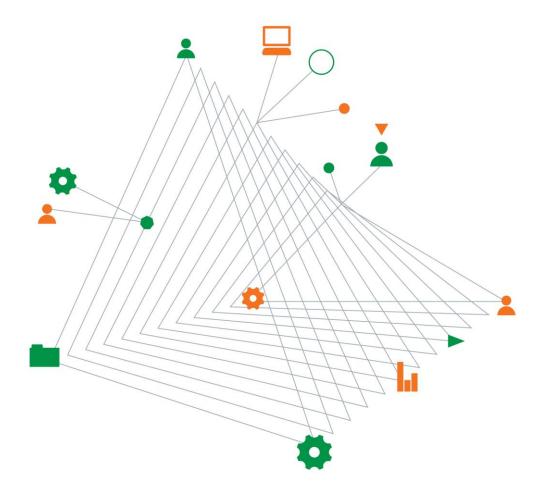


SH Gosford Residential Pty Ltd

Central Coast Quarter, 26 Mann Street Gosford

Geotechnical Interpretative Report





Experience comes to life when it is powered by expertise This page has been left intentionally blank

Central Coast Quarter, 26 Mann Street Gosford

Prepared for SH Gosford Residential Pty Ltd Level 9, 333 Ann Street, Brisbane QLD 4000

Prepared by Coffey Services Australia Pty Ltd Level 19, Tower B, 799 Pacific Highway Chatswood NSW 2067 Australia t: +61 9406 1000 f: +61 294 151 678 ABN: 55 139 460 521

Document authorisation

Our ref: SYDGE214942 Rev 3

For and on behalf of Coffey

Latatur illi

Ali Mohiti Senior Geotechnical Engineer/ Geotechnical Team Leader

Quality information

Revision history

Revision	Description	Date	Author	Reviewer	Signatory
0	Initial Issue for Review	03/04/2018	Alex Condor	Patrick Wong	Ali Mohiti
1	Issue for DA Submission	12/08/2019 Ali Mohiti		Pawan Sethi	Ali Mohiti
2	Amend client name and Dwg references	16/08/2019	Alex Condor	Ali Mohiti	Ali Mohiti
3	Include About This Report	20/08/2019	Alex Condor	Ali Mohiti	Ali Mohiti

Distribution

Report Status	No. of copies	Format	Distributed to	Date
0	1	PDF	Joseph Risitano	03/04/2018
1	1	PDF	Frank Katsanevas	12/08/2019
2	1	PDF	Frank Katsanevas	16/08/2019
3	1	PDF	Frank Katsanevas	20/08/2019

Table of contents

Abc	out This	s Report1	1
1.	Introc	luction2	2
	1.1.	Overview	2
	1.2.	Supplied Data2	2
	1.3.	Proposed Development	3
	1.4.	Objectives	3
2.	Site D	Description	1
	2.1.	General Site Description	1
3.	Publi	shed Data and Background Information	5
	3.1.	Soil Landscape Maps	5
	3.2.	Geological & Quaternary Maps	5
	3.3.	Acid Sulfate Soil Risk Maps	5
	3.4.	Local Groundwater Maps	5
	3.5.	Previous Geotechnical Reports	3
		3.5.1. Cardno	3
		3.5.2. Douglas Partners	7
4.	Inves	tigation Methodology	3
	4.1.	Site Investigation	3
	4.2.	Laboratory Testing	9
5.	Geote	echnical Characteristics and Model10)
	5.1.	Geotechnical Soil and Rock Units10)
	5.2.	Groundwater11	1
6.	Labo	ratory Test Results	3
	6.1.	Material Quality Test Results13	3
	6.2.	Soil Aggressivity Test Results13	3
	6.3.	Point Load Test Results14	1
	6.4.	Uniaxial Compressive Strength Test Results14	1
7.	Earth	works15	5
	7.1.	Excavations15	5
	7.2.	Site Preparation Measures15	5
	7.3.	Cutting and Batters15	5
	7.4.	Dewatering16	3
	7.5.	Suitability of Cut Materials for Reuse or Disposal17	7
		7.5.1. Requirements for Waste Classification	7
		7.5.2. Requirements for Reuse in Reconstruction	7

8.	Found	dation Conditions and Footing Design Recommendations	.18
	8.1.	Aggressivity	.18
	8.2.	Foundation Design	.18
		8.2.1. Design Criteria	.18
		8.2.2. Foundation Conditions	.19
		8.2.3. Foundation Parameters	22
9.	Retai	ning Structures	.24
	9.1.	Design Criteria	.24
	9.2.	Temporary Excavation Shoring	24
	9.3.	Retaining Wall Design Parameters	25
	9.4.	Construction Recommendations	26
10.	Refer	ences	27

Important information about your Coffey Report

Tables

Table 3-1 Summary of Local Groundwater Monitoring Wells
Table 5-1 Generalised Geotechnical Units
Table 5-2 Summary of Depth to Base of Geological Units
Table 6-1 Summary of Material Quality Test Results
Table 6-2 Summary of Soil Aggressivity Test Results
Table 6-3 Summary of Uniaxial Compressive Strength Test Results
Table 7-1 Maximum Allowable Batter Slopes

- Table 8-1 Geotechnical Design Parameters for Pile Foundations
- Table 9-1 Retaining Wall Design Parameters

Figures

- Figure 8-1 Comparison of SPT "N" Values vs Elevation
- Figure 8-2 Comparison of $I_{s(50)}$ Values vs Elevation

Appendices

- Appendix A Investigation Drawings
- Appendix B Explanatory Notes, Borehole Logs & Core Box Photographs
- Appendix C Laboratory Report Sheets
- Appendix D Point Load Test Results

About This Report

This geotechnical and groundwater assessment report has been prepared to satisfy the item 18 of the Secretary's Environmental Assessment Requirements (SEARs). It is understood that this report will be submitted for Concept State Significant Development Application (SSDA) for the Central Coast Quarter development located at 26 Mann St, Gosford. It should be noted this concept SSDA does not cover construction activities and no construction work is currently proposed. Construction related works will be separately addressed at detailed Development Application (DA) stage as appropriate.

This geotechnical Interpretative Report has been prepared to assist in the design and construction of the proposed commercial and residential structures and as such the recommendations of this report should be considered at relevant DA stage.

Based on the results of our geotechnical assessment and subject to the adoption of the geotechnical recommendations of this report, the site could be made suitable for the proposed mixed use residential and commercial development.

1. Introduction

1.1. Overview

This report documents the results of the geotechnical investigation conducted by Coffey for the proposed mixed use commercial and residential structures at 26 Mann St, Gosford.

The geotechnical investigation has been conducted in accordance with Coffey's proposal (Ref No. SYDGE214942-AA, dated 31/01/2018) and was commissioned by Joseph Cummings of SH Gosford Residential Pty Ltd (St Hilliers) on 8 February 2018.

The current revision of the report has been prepared considering the latest architectural drawings as part of the Development Application (DA) submission to the Department of Planning and Environment NSW.

This geotechnical interpretative report has been prepared to assist in the design and construction of the proposed commercial and residential structures. A Detailed (contamination) Site Investigation (DSI) is also being prepared by Coffey for the proposed development and will be issued as a separate report (Ref No SYDGE214942-AC).

1.2. Supplied Data

A site survey plan (SP) has been prepared by Veris Limited (Job No. 173672, Issue C, dated 12/2/218) and provided by St Hilliers to assist with the geotechnical investigation.

Cardno Pty Ltd have previously conducted a preliminary geotechnical investigation (Ref No. 851686, Rev 1, dated 23 December 2015) of the previous Gosford High School site to assist with the Development Application.

In addition, Douglas partners have conducted a geotechnical investigation (Ref No. 83186.00, dated June 2017) for an adjacent structure located to the north-east of the proposed site. These reports have been provided by St Hilliers to assist with the Coffey's current assessment and are summarised in Section 3.5 of this report.

Architectural drawings prepared by DKO, dated 13/08/2019 have also been prepared, which outline the general floor layout and basement finish levels.

1.3. Proposed Development

A review of the Architectural Plans (AP) prepared by DKO Architecture (dated 13 August 2019) indicates that the development is to comprise the following:

- Construction of a basement carpark with a finished floor level of 1.6 AHD covering the entire site. The basement level includes a number of retail stores fronting Baker Street to the south west and residential units to the north west; and
- Three multi-storey residential/commercial structures situated above the basement with building heights of between 21 and 27 stories.

Excavations for the proposed basement carpark are expected to extend to depths of up to 8.5m below existing ground levels (BGL) along the south-eastern boundary adjacent to Mann St and reducing to grade or less than 1.5m for a large portion of the site.

1.4. Objectives

This geotechnical report outlines the investigation findings, provides comments on the implications of the geotechnical conditions as well as design and construction implications comprising:

- Recommendations for earthwork procedures and guidelines;
- Information regarding foundation conditions and design strategy requirements including deep foundation design parameters;
- Aggressively assessment to buried structural steel and concrete elements; and
- Advice on the excavation requirements and design parameters for retaining structures.

2. Site Description

2.1. General Site Description

The site is legally identified as Lot 1 in DP 1235203 and Lots 2-7 on DP 14671. The site is located at 32 Mann St, Gosford and is irregular in shape with an approximate area of 8,700m² which is bounded by Mann St to the east, the unformed extension of Baker St and Gosford City Park to the West, Georgina Terrace and the newly constructed Australian Taxation Office (ATO) building to the north, and Vaughan Ave to the south. This area forms the current developmental of the previous Gosford High School Site which now includes the ATO building to the north and mixed-use commercial structure situated to the north and north-east.

Reference to the SP, site elevations across the site ranges from 2.57m AHD within the south-western portion of the site, to 9.33m AHD within the eastern boundary of the site adjacent to Mann St.

The following features were observed at the time of investigation:

- The site is currently used as construction storage area, carparking and site offices for the construction of the mixed use commercial structure.
- Topographically, the eastern portion of the site is situated on the foot slopes of a hill to the east with the remaining portion of the site situated within the generally flat alluvial floodplains and reclaimed lands of Brisbane Waters to the west.
- Site surfacing typically comprise gravel hardstand within the majority of the site.
- A concrete crib retaining wall is situated along the eastern boundary of Lots 3, 2 and 1 with an approximate height of 2.0 m. No indication of instability was observed along the retaining wall.
- Site surfaces are generally flat with slopes of between 1 and 2° within the central and western portion of the site. Site slopes increase up to 7° towards the base of the crib wall within the eastern portion of the site and steepen to between 18-20° from top of wall to the site boundary with Mann St.
- Large mature trees were observed within the eastern portion of the site between the crib wall and Mann St.

3. Published Data and Background Information

3.1. Soil Landscape Maps

A review of the Office and Environment and Heritage, Electronic Soil Profiling Maps (eSPADE) V2.0 [1] indicates that the majority of the site is situated within Disturbed Terrain (9131xx) and is known to comprise land reclamation activities of the Brisbane Waters Bay to the west. The eastern portion of the site is situated within the Erina soil landscape (9131er) which typically comprises undulating to rolling rises and low hills on the Terrigal Formation. The soil profile is expected to comprise brownish-black fine sandy loam topsoil overlying brown sandy clay loam and yellowish-brown sandy clay situated over Terrigal Formation sandstones. These soils are known to be slightly to moderately acidic with pH values of between 4.5-6.0 and include small angular to sub-angular sandstone rock fragments.

3.2. Geological & Quaternary Maps

Reference to the 1:100,000 Central Coast Coastal Quaternary Geological Map [2] indicates that the eastern portion of the site is generally underlain by Terrigal Formation (Rnt) comprising residual clays overlaying interbedded siltstone, shale and fine to coarse grained quartz-lithic sandstone with minor claystone lenses.

3.3. Acid Sulfate Soil Risk Maps

A review of the Department of Land and Water Conservation, Acid Sulfate Soil Risk Map [3] indicates that the site is situated within disturbed terrain to depths of typically between 1.0-2.0m BGL which is resultant from reclamation of the low-lying swamps of the Brisbane Water foreshore for urban development.

Further review of the Gosford City Council (now Central Coast Council) Local Environmental plan (LEP), Acid Sulfate Soils Risk Map [4] indicates that the site is situated within Class 2 Terrain. Class 2 terrain indicates that development consent is required where works are expected to occur below the natural ground surface, or by which the water table is likely to be lowered.

3.4. Local Groundwater Maps

Data obtained from the NSW Department of Primary Industries, Office of Water, Groundwater map [5] indicates that there are two groundwater bores situated within 500m of the proposed development. The following summarises the information derived from the Work Summary report sheets.

Bore ID	Location	Date of drilling	Total Depth (m)	Subsurface Profile	Standing Water Level (m)
GW21893	100m North	8/8/2004	78	Sandy CLAY and CLAY with minor SANDSTONE bands to 20m underlain by interbedded SANDSTONE and SHALE to depth of hole.	Not Recorded
GW21679	125m North	2/9/2004	102	SAND and CLAY to 25m underlain by interbedded SANDSTONE and SHALE to depth of hole.	Not Recorded

Table 3-1 Summary of Local Groundwater Monitoring Wells

3.5. Previous Geotechnical Reports

3.5.1. Cardno

A preliminary geotechnical investigation of the site has previously been conducted by Cardno to support the Development Application of the previous Gosford High School site for submission for the site to Gosford City Council (now Central Coast Council). This report provided a preliminary assessment of the entire site bounded by Georgina Terrace, Mann St, Vaughan Ave and Baker Street.

The geotechnical investigation comprised a review of available published information as well as an investigation which included drilling of six boreholes (BH001-BH006) across the site using a drill rig with spiral flight auger and V-bit techniques. Two 50mm standpipe piezometers were installed in two boreholes (BH003 and BH006) to allow for groundwater level monitoring and sampling of the groundwater. Laboratory testing comprised Atterberg Limit and Particle Size Distribution tests for material classification, aggressively tests for steel and concrete element durability as well as a limited testing for Acid Sulfate Soils.

The following summarises the key findings of the preliminary geotechnical investigation:

- The subsurface profile typically comprised up to 1.6m of fill comprising sands with some gravel and clays within the central and western portion of the site, reducing in depth towards the east. This was underlain by alluvial profiles comprising interbedded clayey sand, sandy clay and silty clay to depths of 2.7m BGL. This material was typically soft to firm (clays) or very loose to medium dense (sands) in consistency. These profiles were generally underlain by residual clay and sandy clays varying from stiff to hard in consistency underlain by extremely weathered, extremely low strength sandstone bedrock.
- Standing Water Levels encountered within the groundwater wells varied between 1.25-1.72m AHD within the central and western portion of the site.
- Soils encountered were typically non-aggressive towards structural steel elements, and mildly aggressive towards buried concrete elements.
- A Slope Risk Assessment in accordance with Council and Australian Geomechanics Society guidelines [6] was conducted and indicated a low to very low risk to property where appropriate engineering controls were implemented.

3.5.2. Douglas Partners

A geotechnical investigation and report has previously been conducted by Douglas Partners to support the design and construction of the proposed multi-storey commercial structure located to the north-east of the current development site.

The geotechnical investigation and report comprised a review of available published information as well as drilling of six boreholes (Bores A-F) within the building envelope of the proposed structure. Drilling comprised spiral flight auger and V-Bit techniques as well as NMLC rock coring to depth of between 10-20m BGL. Laboratory testing comprised point load testing on selected sections of rock core to assess bedrock strength.

The following summarises the key finding of the geotechnical investigation.

- The subsurface profile encountered within the building envelope of the proposed structure typically comprised silt, sand and clay fill up to 0.7m BGL underlain by firm to stiff clays to depths of up to 7.8m BGL. These layers are, in turn, underlain by extremely weathered and extremely to very low strength sandstone and siltstone to depths of up to 11.1m BGL, and by moderate weathered to fresh sandstone, siltstone and conglomerates of low to high strength to the depth of investigation at 20m BGL.
- Groundwater levels encountered during drilling varied between -0.6m to 4.8m AHD.

Ultimate and serviceability end bearing pressures, together with recommendations on safe batter slopes and geotechnical parameters for retaining structures were provided in the Douglas Partners Report for high level and piled footings.

Douglas Partners have also previously conducted a Preliminary Site Investigation (PSI) for the entire site as well as a Detailed Site Investigation (DSI) and Acid Sulfate Soil Management Plan (ASSMP) for the adjacent mixed-use development which are summarised in Coffey's DSI report for this site.

4. Investigation Methodology

4.1. Site Investigation

Prior to the investigation, the intrusive test locations were cleared of underground services. Test locations were then adjusted if required to minimise the risk of damage to underground assets.

Coffey's site investigation was conducted between the dates of 22 February and 6 March 2018 and comprised the following:

- A site walkover and visual inspection by a geotechnical engineer from Coffey including site mapping and logging of significant site features.
- Drilling of nine boreholes across the site using a track mounted drill rig utilising a combination of push tube, spiral flight auger and NMLC rock coring techniques comprising:
 - BH1 drilled within the central portion of the site. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to the depth of investigation at 8.7m BGL (-6.2m AHD).
 - BH2 drilled within the central portion of the site. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to the depth of investigation at 15.06m BGL (-12.56m AHD).
 - BH3 drilled within the south-eastern portion of the site at the toe of the crib wall and adjacent to Mann St and Vaughen Ave. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 5.5m BGL.
 Washboring was then conducted to a depth of 6.7m BGL and followed by NMLC rock coring techniques to the depth of investigation at 15.1m BGL (-11.1m AHD).
 - BH4 drilled within the north-western corner of the site adjacent to Baker St. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 5.95m BGL. Washboring was then conducted to a depth of 13.2m BGL and followed by NMLC rock coring techniques to the depth of investigation at 15.0m BGL (-12.2m AHD).
 - BH5 drilled within the central portion of the site. Push tube sampling was conducted to a depth of 2.5m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 5.5m BGL. Washboring was then conducted to a depth of 9.4m BGL and followed by NMLC rock coring techniques to the depth of investigation at 15.0m BGL (-12.3m AHD).
 - BH6 drilled within the eastern portion of the site at the toe of the crib wall and adjacent to Mann St. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 5.6m BGL. Washboring was then conducted to a depth of 6.9m BGL and followed by NMLC rock coring techniques to the depth of investigation at 16.0m BGL (-12.0m AHD).
 - BH7 drilled within the southern portion of the site adjacent to Vaughan Ave. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 8.6m BGL. This was followed by NMLC rock coring techniques to the depth of investigation at 15.2m BGL (-12.7m AHD).
 - BH8 drilled within the central portion of the site. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 8.57m BGL (-6.07m AHD) where refusal on rock was encountered.
 - BH9 drilled within the northern portion of the site. Push tube sampling was conducted to a depth of 3.0m BGL and then advanced using AD/TC bit with spiral flight auger to a depth of 14.5m BGL (-11.9m AHD) where refusal was encountered.
- All rock core samples were stored in designated core boxes for further assessment and laboratory testing.

- Eight additional push tubes tests were conducted across the site to a depth of 3.0m BGL to aid in the DSI investigation and sampling requirements.
- Standard penetration Tests (SPT) were conducted at regular intervals within the boreholes to assess soil strength and consistency until V-bit refusal was encountered.
- Disturbed and bulk samples of soil were taken for further laboratory assessment and future reference.

A geotechnical engineer from Coffey carried out all fieldwork including logging of subsurface profiles, collection of samples and construction of piezometer wells. Approximate test locations are shown in Figure 1, attached in Appendix A. Subsurface conditions are summarised in Section 5.1 and detailed in the borehole and push tube logs attached in Appendix B together with the explanatory notes and rock core photographs.

A recent site visit was undertaken by a senior geotechnical engineer from Coffey on 6 August 2019 to record the current groundwater levels and observe changes to the site's geotechnical conditions for the current revision of the report.

4.2. Laboratory Testing

Laboratory testing on selected samples recovered during the geotechnical investigation comprised the following:

- Five sets of Atterberg Limits and Particle Size Distribution (PSD) tests to aid in material classification.
- Five soil aggressivity tests including pH, Electrical Conductivity (EC), Sulphate and Chloride to aid in assessment of aggressivity to buried structural elements.
- Four Uniaxial Compressive Strength (UCS) tests on selected sections of rock core; and
- Point load testing on selected sections of rock core.

The results of the laboratory tests are detailed in the report sheets attached in Appendix C and summarised in Section 9.

Geotechnical Characteristics and Model 5.

Geotechnical Soil and Rock Units 5.1.

For the purpose of geotechnical characterisation of the subsurface conditions, the soil and rock profiles encountered during the investigation have been characterised into the following geotechnical units and shown below in Table 5-1.

Origin	Unit ⁽¹⁾	Description (USC Group)	Consistency Range / Rock Strength ⁽¹⁾	Moisture Condition / Rock Weathering
FILL	F1	SP-SC ⁽²⁾ Gravelly SAND, Gravelly Clayey SAND, Gravelly Silty SAND, Clayey SAND and SAND of fine to coarse grained and low to medium plasticity clay	-	Dry-Moist
TOPSOIL / COLLUVIUM	C1	SM-ML ⁽²⁾ Silty CLAY and Silty SAND with trace of organics, fine to medium grained, low to medium plasticity	Firm clays and loose sands	Dry-Moist
ALLUVIAL	A1	CL-CH & SM-SC ⁽²⁾ Sandy CLAY and Silty CLAY of low to high plasticity interbedded with, fine to medium grained Silty SAND, Clayey SAND and SAND	Generally firm to stiff clays interbedded with very loose to loose sands. Increasing to Very Stiff in BH2 Very soft to soft clay in BH5 and BH7	Moist clays with interbedded moist to wet sands
	R1	CL ⁽²⁾ CLAY and Sandy CLAY of medium to high plasticity	Firm to Stiff	Moist-Wet
RESIDUAL	R2	CL ⁽²⁾ CLAY, Sandy CLAY, Clayey SAND and extremely weathered Class V SANDSTONE bedrock ⁽³⁾	Very Stiff to Hard Very low strength bedrock	Moist-wet Extremely weathered
BEDROCK	T1	Fine grained SANDSTONE with interbedded SILTSTONE Inferred Rock Class: Class IV Sandstone ⁽³⁾	Medium strength bedrock	Extremely to slightly weathered
(Terrigal Formation)	T2	Fine to medium grained SANDSTONE with interbedded SILTSTONE Inferred Rock Class: Class III Sandstone ⁽³⁾	Medium to high strength	Distinctly to slightly weathered

Table 5-1 Generalised Geotechnical Units

Notes to table:

(1) Inferred from Standard Penetration Tests (SPT)

(2)

Refer to AS 1726-2017 [7], Table A1 for group symbols. The rock classification is based on the requirements presented in P.J.N Pells et al [8], Foundations on Sandstone and (3) Shale in the Sydney Region

Table 5-2 below provides a summary of the depth to base of each unit encountered within the borehole and push tube test locations.

	Surface		Depth to Base of Unit (m) BGL						Groundwater Level (m) BGL		
Hole ID	level (m) AHD	Unit F1	Unit C1	Unit A1	Unit R1	Unit R2	Unit T1	Unit T2	At time of drilling	Following well installation	6 August 2019
BH1	2.5	1.3	-	2.0	5.3	> 8.7	-	-	5.2	-	-
BH2	2.7	1.2	-	5.0	-	>15.06	-	-	4.0	-	-
BH3	4.0	-	1.0	1.9	5.5	8.0	-	>15.1	-	-	-
BH4	2.8	1.6	-	5.0	10.0	14.51	-	>15.0	4.0	2.03	Covered under the newly constructed concrete driveway
BH5	2.7	0.5	-	4.0	5.5	9.4	>15.0	-	2.5	-	
BH6	4.0	-	0.3	2.7	-	8.0	-	>16.0	-	1.7	Could not be located due to vegetation overgrowth, potentially destroyed during construction
BH7	2.5	1.0	-	2.0	4.8	8.6	11.41	>15.2	2.45	2.0	2.1
BH8	2.5	0.3	-	2.5	4.0	>8.57	-	-	2.8	-	-
BH9	2.6	0.5	-	2.8	4.0	>14.5	-	-	2.2	-	-
P1	2.9	0.1	-	>3.0	-	-	-	-	-	-	-
P2	2.6	0.7	-	1.9	>3.0	-	-	-	-	-	-
P 3	2.7	0.2	-	1.1	>3.0	-	-	-	-	-	-
P4	2.7	0.5	-	2.0	>3.0	-	-	-	-	-	-
P5	2.7	0.7	-	2.5	>3.0	-	-	-	-	-	-
P6	2.7	0.2	-	1.0	>3.0	-	-	-	-	-	-
P 7	2.5	0.5	-	1.8	>3.0	-	-	-	-	-	-
P 8	2.6	0.6	-	>3.0	-	-	-	-	-	-	-

Table 5-2 Summary of Depth to Base of Geological Units

Notes to table:

BGL: Below Ground Level

AHD: Australian Height Datum

"-": Not Encountered

5.2. Groundwater

Groundwater levels encountered during drilling varied between 0.2m to -2.7m AHD across the site apart from BH3 and BH6 where groundwater was not observed at the time of investigation. In addition, no groundwater levels were identified within the push tube holes.

Following drilling, groundwater wells were installed and developed in BH4, BH6 and BH7 for groundwater monitoring as well as to aid in additional groundwater sampling for the purpose of contamination investigation. Further groundwater sampling was undertaken on 19 March 2018 and

groundwater levels were measured at depths between 1.7-2.03m BGL which corresponds to elevations of between 0.8-2.3m AHD across the site.

On 6 August 2019, the groundwater level in the existing standpipe piezometers in BH7 was measured at 2.1m BGL, as summarised in **Table 5-2**. This result indicates minor change in groundwater levels recorded previously at the time of investigation.

It should be noted that groundwater levels are likely to fluctuate with site and climatic conditions.

6. Laboratory Test Results

6.1. Material Quality Test Results

The results of the Atterberg Limit and Particle Size Distribution test results are summarised in **Table 6-1** below with the laboratory report sheets attached in Appendix C.

Hole ID	Depth (m)	Passing 2.36mm (%)	Passing 0.75µm (%)	LL (%)	PL (%)	PI (%)	Material Classification
BH1	2.0 - 2.45	100 50 24 11 13 Sandy C		Sandy CLAY, low plasticity (CL)			
BH3	1.0 - 1.45	1.45 100 35		22	16	6	Clayey SAND, fine to medium grained, low plasticity, (CL)
BH4	3 - 3.45	100 44 27 13 14 Sandy CLAY, low plas		Sandy CLAY, low plasticity (CL)			
BH6	5.5 - 5.95	- 5.95 100 85 37 18 19 Silty CLAY, low plasticity, tr		Silty CLAY, low plasticity, trace of sand (CI)			
BH7	5.5 - 5.95	88	44	29	17	12	Sandy CLAY, low plasticity, trace of fine gravel (CL)

Table 6-1 Summary of Material Quality Test Results

Notes to table: LL: Liquid Limit

PL: Plastic Limit

PI: Plasticity Index

6.2. Soil Aggressivity Test Results

The results of the soil aggressivity test results are summarised below in **Table 6-2** with the laboratory report sheets attached in Appendix C.

Hole ID	Depth (m)	Soil Type and (Groundwater Condition)	pH (1:2) ⁽¹⁾ for concrete pile	EC (µS/cm)	Resistivity (Ωcm) ⁽²⁾	Sulphate (mg/kg), Classification for concrete piles	Chloride (mg/kg), Classification for concrete piles
BH1	3.0-3.45	Sandy CLAY (B)	7.8	52	960	43	16
BH1	5.5-5.95	Sandy CLAY (B)	7.3	42	1200	29	24
BH1	7.0-7.34	SANDSTONE (B)	7.2	35	1400	20	26
BH2	8.5-8.61	Sandy CLAY (B)	7.2	39	1300	<10	19
BH4	5.5-5.95	Sandy CLAY (B)	6.4	82	610	120	22

Table 6-2 Summary of Soil Aggressivity Test Results

Notes to table:

(1) Exposure classification for concrete piles based on pH, the exposure classification for steel piles are slightly different based on pH values and has been discussed in the respective section of this report

(2) Aggressivity classification for Steel Piles based on resistivity

Scale of aggressivity obtained from AS2159 - 2009 [9] for concrete piles in soil

Non Aggressive

Mildly Aggressive	
Moderately Aggressive	

Severely Aggressive

ery Severely Aggressive

6.3. Point Load Test Results

The results of the axial and diametric point load testing conducted on selected sections of rock core samples obtained from the boreholes are presented in Appendix D.

The results of the point load tests indicated that the sandstone and siltstone formations varied from medium to high strength, with lenses of very high strength rock.

6.4. Uniaxial Compressive Strength Test Results

The Uniaxial Compressive Strength (UCS) tests conducted on representative samples of rock core are summarised below in **Table 6-3** and detailed in the laboratory report sheets attached in Appendix C.

Hole ID	Depth (m)	Unit	Rock Type and Structure	Density (t/m³)	Uniaxial Compressive Strength (MPa)
BH3	11.0 – 11.16	T2	Sandstone, pale grey-grey	2.4	28.2
BH5	10.49 - 10.64	T2	Sandstone, red	2.3	19.1
BH6	9.0 - 9.18	T2	Sandstone, grey	2.4	25.9
BH7	12.42 - 12.55	T2	Sandstone, pale grey	2.3	34.1

Table 6-3 Summary of Uniaxial Compressive Strength Test Results

7. Earthworks

A review of the design levels presented in the AP indicates that the proposed multi-storey structures basement finished floor level is situated at approximately 1.6m AHD and as such, excavations are required with excavation depths ranging from 1.0m within the western portion of the site, and up to 8.5m along the eastern boundary adjacent to Mann St.

Subsurface material present within the depth of excavation is expected to comprise:

- Silty sand and silty clay topsoil/colluvium present within the eastern slopes of the site adjacent to Mann St. (Unit C1)
- Gravelly, silty and clayey sand filling generally encountered across the entire site (Unit F1)
- Firm to stiff alluvial silty and sandy clays interbedded with loose silty and clayey sands generally encountered across the entire site (Unit A1)
- Firm to stiff residual clay and sandy clays (Unit R1) within the eastern portion of the site with some very stiff to hard residual clay and sandy clays (Unit R2) expected at depths close to the basement excavation along the eastern boundary.

7.1. Excavations

Based on the subsurface profile encountered, excavations to basement levels are expected to be readily conducted using conventional earthmoving equipment. Considering the site's surficial soil profile, tracked machinery would be required to conduct the bulk earthworks.

A construction platform should be designed by a qualified geotechnical engineer considering the construction equipment types and track pressures following the preparation of a construction strategy by the principal contractor.

Loss of strength in alluvial sands and clays are expected following repetitive trafficking of heavy construction machinery. Trafficking of machinery over the excavated sections or areas with elevated moisture conditions present must be minimised. Construction of a temporary construction platform will be required if this cannot be avoided as well as to assist with heavy equipment loading.

It is recommended that contractors for the piling and detailed footing excavations should undertake an assessment of the rock core samples summarised in this report to make their own assessment on excavatability/drillability with regards to the type of equipment they propose to use.

7.2. Site Preparation Measures

The following site preparation measures are recommended during the earthworks:

- Construct a working platform where required to minimise softening of foundation material and improve trafficability.
- It is recommended to grade the floor of the bulk excavations to the west to allow surface drainage to be collected and pumped into sedimentation tanks/ponds prior to discharge.

Earthworks construction procedures should be in accordance with AS3798-2007 Guidelines for Earthworks for Commercial and Residential Developments [10].

7.3. Cutting and Batters

It is expected that the underlying clay soils will not remain stable when cut vertically without support and could result in slope failure which would impact neighbouring properties such as Mann St. Therefore, it is necessary that excavations be battered to a safe batter slope or supported by an engineer designed retaining structure or shoring system.

Recommendations for retaining structures and shoring systems designs are provided in Section 9.2. The below recommendations should be adopted for all remaining excavations when not subject to construction loading and less than 3.0m in height.

Table 7-1 below provides a summary of the maximum batter slopes for each geotechnical unit expected within the depth of excavation for the proposed structures. All long-term batters to be protected by vegetation or similar to withstand erosion. Where batters steeper than those are required, these should be designed by an engineered retaining structure.

Table 7-1 Maximum Allowable Batter Slopes

Unit	Brief Description	Maximum short term batter slope	Maximum long term batter slope	
F1	Gravelly, silty and clayey sand filling of fine to coarse grained	2H:1V	3H:1V	
C1	Firm silty clay and loose silty sand topsoil/colluvium	2H:1V	3H:1V	
A1	Firm to stiff alluvial silty and sandy clays with interbedded loose silty and clayey sands	2H:1V	3H:1V	
R1	Firm to stiff residual sandy clays of medium to high plasticity	1H:1V	2H:1V	
R2	Very Stiff to hard residual clays and extremely weathered sandstone bedrock	0.75H:1V ⁽¹⁾	1.5H:1V ⁽¹⁾	

Notes to table:

(1) Subject to geotechnical inspection and assessment as bedrock stability depends on defect spacing and dip and as such, angle may need to be reduced

The above batter slopes assume that no groundwater seepage occurs along the battered face. Where water seepage occurs in layers with sandy material such as Unit C1 and A1 or where adverse weather conditions extend for a period of time, advice should be obtained from a geotechnical consultant and batter slopes may need to be revised or retained by retaining structures. It is recommended to install diversion drains above the crests of all batters to direct upslope runoff away from the batter face to limit erosion.

It is recommended to prepare an earthworks management plan to consider the stability of the batter and excavated faces during the piling and temporary works.

7.4. Dewatering

Groundwater levels encountered within the boreholes generally varied between 0.4 to -2.7m AHD across the site and as such, are situated below within the depth of excavation in some areas across the site. However, higher groundwater levels may be expected along the eastern boundary of the site adjacent to Mann St following an extended period of rainfall.

It is expected that the majority of the groundwater inflows would be captured by strip drains installed behind any shoring system or retaining walls and diverted into the stormwater system. Where additional inflows are encountered, pump-and-sump methods could be adopted to dewater the excavation for the minor inflow.

Considering our experience with the 32 Mann St site's development, long-term dewatering treatment and discharge system for a drained basement should be considered.

The groundwater should be directed and stored in sedimentation tank/basins, analysed and potentially treated prior to release into the Council stormwater or sewerage system, depending on consultation with Council. Water quality testing should be undertaken in accordance with The Liquid

Trade Waste Quality Standards to Gosford City Council Sewerage System [11] requirements prior to the discharge into Council assets.

7.5. Suitability of Cut Materials for Reuse or Disposal

7.5.1. Requirements for Waste Classification

Classification of the site in-situ material in accordance with EPA Guidelines "Waste Classification Guidelines, Part 1: Classifying Waste [12]" will be required prior to removal off site. In addition, his should consider the results of acid sulfate soils assessment conducted by Coffey as part of the DSI. Reference to Coffey's DSI report SYDGE214942-AC must be made regarding the requirements of transporting material off the site.

7.5.2. Requirements for Reuse in Reconstruction

All excavation material with the exception of Unit C1, topsoil and colluvium material could be used as controlled filling on site following appropriate moisture reconditioning and compaction control.

8. Foundation Conditions and Footing Design Recommendations

Based on a review of the borehole logs and expected geotechnical conditions at the foundation levels, pile foundations are expected to be required to ensure embedment into strata of similar stiffness to limit differential settlements.

General design parameters and recommendations are presented in the following sections and should be used as guidance for the design. The detailed design of the foundations should consider the structural loads against serviceability and ultimate limit state criteria.

8.1. Aggressivity

Based on the summary of analytical results presented in **Table 6-2** and on the bases of Chlorides, pH and resistivity, it was found that the sandy clay and weathered sandstone soil encountered within the boreholes were non-aggressive towards buried concrete piles, and mildly to moderately aggressive towards buried steel elements.

8.2. Foundation Design

8.2.1. Design Criteria

Design of the proposed structure foundations should be undertaken in accordance with the requirements of the following:

- > AS 2159 (2009) Piling Design & Instillation [9]
- > AS 5100 (2007) Bridge Design Set (Parts) [13]
- > Other relevant Australian and international standards
- > Engineering principles

For the pile foundations, AS 2159-2009 [9] requires that the ultimate design geotechnical strength $(R_{d,g})$ is not less than the design action effect (E_d) . The design geotechnical strength is calculated as the ultimate geotechnical strength $(R_{d,ug})$ multiplied by a geotechnical strength reduction factor (ϕ_g) .

The value of the geotechnical strength reduction factor is influenced by the following factors:

- ϕ_{gb} Basic geotechnical strength reduction factor, which is influenced by an assessment of the various risk factors relating to the site, design methodology and the method of pile instillation.
- $> \phi_{tf} Intrinsic testing factor based on the type of pile testing to be undertaken; and$
- > K Testing benefit factor dependant on the percentage of piles to be tested.

The assessment of individual risk ratings for risk factors as set out in Table 4.3.2 (A) of AS 2159-2009 [9] will need to be undertaken by the designer of the foundations. However, to assist in the design of foundations, an assessment of the average risk rating has been undertaken based on the following factors and assumptions:

- > A level and quality of the geotechnical investigation that has been undertaken to date which includes in-situ and laboratory testing on the weathered rock profile;
- > A low-redundancy foundation system (i.e. isolated piles set out at large spacing's);
- > No pile testing will be undertaken;

- > Similar experience with the design of foundations into residual soils and weathered bedrock; and
- > A competent and experienced piling contractor to install the piles.

Based on the assessment of the above factors and assumptions, an Average Risk Rating (ARR) for the design of the foundations into the weathered bedrock of 3.14 could be adopted.

Based on Table 4.3.2 (C) of AS 2159-2009 [9], an ARR of 3.14 is defined as low to moderate risk. The basic geotechnical strength reduction factor (ϕ_{gb}) for single isolated piles founded into the residual soil and weathered bedrock profile within the site is assessed to be 0.48.

An increase in the geotechnical strength reduction factor could be adopted by adopting the following procedures:

- > Inspection of the foundation conditions by a geotechnical engineer
- > Pile testing regime depending on the type and extent of the testing.

For all piles where the basic geotechnical strength reduction factor is greater than 0.4, AS2159-2009 [9] requires the integrity of the pile shaft to be assessed by testing and inspection.

Ultimate and serviceability limit state of the piles or pile groups should be undertaken during the detailed design phase of the proposed development.

8.2.2. Foundation Conditions

Figure 8-1 below provides a comparison between SPT "N" values with respect to elevation for the SPT test undertaken on site on a log plot. Trendlines have also been added to indicate the general trend of the SPT data.

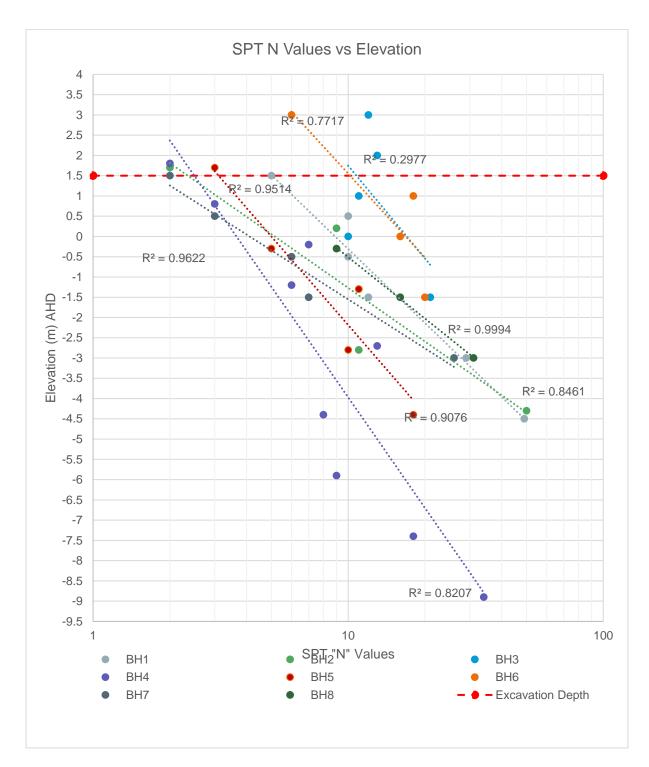


Figure 8-1 Comparison of SPT "N" Values vs Elevation

The results of the SPT tests indicate that the soil consistency generally improves with depth across the site until bedrock is encountered. Based on a basement finished floor level of 1.6m AHD, SPT N values of between 2-10 are expected at the base of the excavation, indicating soft to stiff clays along with loose sands.

Figure 8-2 below provides a comparison of point load testings axial Is₍₅₀₎ values with respect to elevations for the rock core samples recovered from BH3, BH5, BH6 and BH7.

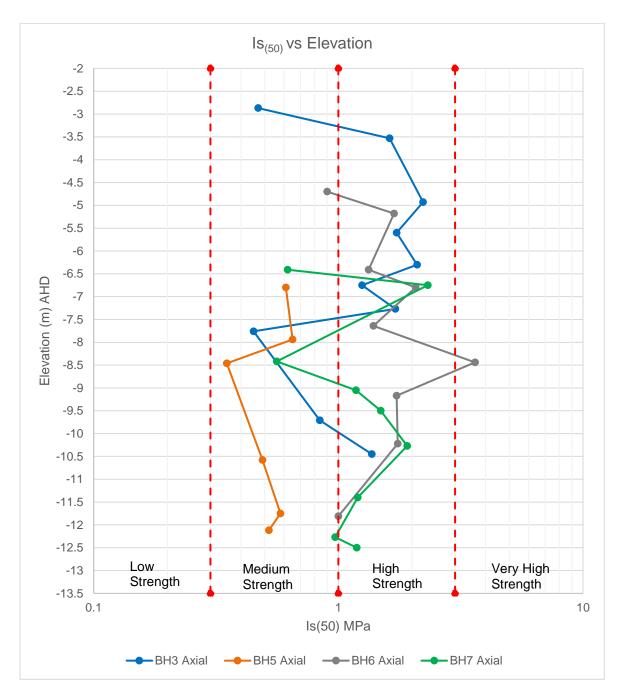


Figure 8-2 Comparison of $I_{s(50)}$ Values vs Elevation

The above assessment indicates that there is no direct relation between $I_{S(50)}$ values and elevation across the site. $I_{s(50)}$ values for the sandstone and siltstone typically range between 0.35-2.2 MPa to the depth of investigation with the exception of some minor very high strength bands.

Based on previous experience with greater Sydney basin sandstone and siltstone/shales , and reference to *Substance and Mass Properties of Engineering Structures in Hawksbury Sandstone* by Pells (P.J.N Pells) [14], Unconfined Compressive Strength (UCS) of Sydney basin sandstone is generally between 15 to 35 times the point load $I_{S(50)}$ values. Although this correlation has been suggested based on the laboratory testing of Hawksbury Sandstone, it has been widely used for correlation of UCS and point load testing results of sandstones and siltstone/shale of other geological formations.

Considering UCS values of between 19-34 MPa for the sandstone with $I_{S(50)}$ values generally in the range of 0.65-1.49 MPa respectively, a point load $I_{S(50)}$ to UCS correlation factor of 30 could be adopted for the site sandstone.

Based on this correlation, a representative UCS value for the Unit T1 and T2 sandstone of 18 and 25 MPa respectively could be adopted. Note that this value is recommended for foundation design only. Higher UCS values may need to be used for assessment of rock socket drillability.

Considering the basement floor finished design level of 1.6m AHD, the following materials are expected to be present at levels below the basement level.

- Unit A2 & R1: Firm to stiff alluvial and residual clays are expected at basement level across the site. These materials were assessed to be unsuitable to support any significant loads and as such, foundations should extend beyond these materials.
- Unit R2: Very stiff to hard residual clay and extremely weathered Class V sandstone is expected to encounter at depths close to excavation level within the eastern portion of the site adjacent to Mann St and is expected at depths generally below -1.5m to -3.0m AHD across the remaining portion of the site, increasing towards the west. Deep residual R1 profiles were encountered in BH4 to a depth of -7.2m AHD.
- Unit T1: Class IV sandstone bedrock was encountered at depths below -6.6m AHD within the western portion of the site and between -8.9m to -6.1m AHD within the south-western portion of the site. This layer was underlain by Unit T2 profiles.
- Unit T2: Class III sandstone bedrock was encountered at depths from approximately -4.0m AHD within the eastern portion of the site adjacent to Mann St and increasing in depth to between -8.9m to -12.3mAHD within the western portions of the site. Based on a review of the borehole logs from the previous report by DP, it is expected that this unit is encountered at depths below approximately -6.0m AHD along the boundary with the mixed-use development situated to the north-east of the proposed site.

8.2.3. Foundation Parameters

Considering the subsurface conditions summarised in Section 5 of this report and due to the potential differential ground movement risk that could result from settlement and seasonal moisture variations, it is recommended to place all the foundations in material of similar strata. This will require foundations to comprise pile foundations extending to Unit R2 and embedded into Unit T1 and T2 profile.

Design values presented in Table 8-1 assumes that:

- > Pile foundations comprise centrally loaded piles suitably embedded into Class III Sandstone or Siltstone (Unit T1) bedrock constructed using appropriate construction practice considering socket roughness and cleaning of pile base.
- > Serviceability limit state design is undertaken for the foundation to consider the settlement of the various foundation types and structural tolerances.

General design parameters are presented in the following sections and should be used as guidance for the design.

Isolated piles required to support the structure could be designed using the parameters presented in **Table 8-1** below. Reference to AS 2159-2009 *Piling Design and Installation* [9] a basic geotechnical reduction factor (ϕ_{gb}) of 0.48 is recommended for the below geotechnical ultimate values. The reduction factor has been estimated utilising the procedure outlines in AS 2159-2009 Table 4.3.2 (A) with Individual Risk Rating (IRR) nominated based on the site conditions, design procedure and assumed construction control monitoring procedures as outlined in Section 8.2.1.

Unit	Description	Inferred Rock Class ⁽¹⁾ / Soil Consistency	Average UCS ⁽²⁾ (MPa)	Serviceability End Bearing Pressure ⁽³⁾ (MPa)	Ultimate End Bearing Pressure ⁽⁴⁾ (MPa)	Ultimate Shaft Adhesion ⁽⁵⁾ (Compression ⁶) within layer (MPa)	Elastic Modulus (MPa)
R2	Very stiff to hard residual clays and extremely weathered sandstone bedrock	Very Stiff- Hard Class V Sandstone	-	-	-	0.06	30
T1	Medium strength sandstone with interbedded siltstone	Class IV Sandstone	15	3.5	10	0.6	600
T2	Medium to high strength sandstone with interbedded siltstone	Class III Sandstone	25	6	30	1.2	1000

Table 8-1 Geotechnical Design Parameters for Pile Foundations

Notes:

1- The inferred rock classifications are based on P.J.N Pells et al [8].

2- Average UCS values are based on interpretation of $I_{s(50)}$ values and representative rock samples UCS values based on an assumed correlation factor of 30.

3- Serviceability bearing pressure is expected to cause settlement of <1% of footing dimension for foundations embedded in weathered rock. Serviceability end bearing pressure may be increased subject to specific foundation settlement analyses and assessment of tolerable settlement and differential settlement.

4- At ultimate bearing pressure large settlements greater than 5% of the minimum foundation dimensions are expected.

5- The shaft adhesion value is based on clean socket roughness of R2 [8] or better which must comprise grooves of depth 1-4mm, width greater than 2mm at spacing 50mm to 200mm

6- For uplift loads, reduce the ultimate shaft adhesion values by 30% subject to confirmation of shaft roughness and cleanness by geotechnical engineer during the construction. Pile uplift design should also take into consideration the cone pull-out failure assuming a cone angle of 90° in rock utilising submerged unit weight for long-term. This should also consider the pile group affect and reduced cone volume.

The above preliminary design parameters are subject to inspection of the foundation conditions by experienced geotechnical engineer to confirm the founding conditions. All foundation excavations should be kept free of fall-ins and water ponding.

An estimation of the required pile sockets and expected settlement estimation should be undertaken as part of the detail design of the piles.

9. Retaining Structures

9.1. Design Criteria

This section outlines design criteria and parameters for the purpose of retaining structures design. Based on the AP, excavations of up to 7.9m would be required within the eastern portion of the site adjacent to Mann St and as such, appropriate shoring system should be constructed prior to the excavations.

The following design criteria should be adopted for the design of the retaining structures:

- AS 4678 (2002) Earth Retaining Structures [9];
- AS 5100 (2007) Bridge Design Set (Parts) [13];
- AS 3798 (2007) Guideline on Earthworks for Commercial and Residential Developments [10]; and
- An accepted industry practice for global stability factors of safety (FOS) for slopes of 1.5 for longterm conditions and 1.3 for short term construction conditions.

For a simplified or preliminary design, flexible walls such as cantilever or gravity walls may adopt a triangular earth-pressure distribution. During detailed design, the designer should select earth pressure coefficients based on the specific geotechnical and geometrical situation under consideration. The retaining walls design should comprise assessment of foundation bearing capacity, sliding, overturning and global stability checks.

9.2. Temporary Excavation Shoring

Soil profiles expected to be retained along the eastern boundary would comprise surficial topsoil (Unit C1) overlying firm to hard (Unit R1 & R2) residual sandy clay and clayey sand profiles. The remaining portion of the site's basement level retaining structures within the central and western portion of the site are expected to retain surficial fill (Unit F1) overlying soft to firm alluvial sands and clays (Unit A1) to the depth of excavation.

Considering subsurface profile, soldier piles laterally restrained by temporary anchors with shotcrete panel could be utilised for the shoring system.

Based on previous experience with design and construction of similar shoring walls, the geotechnical design and stability of the retaining structure is critical and would require in-depth understanding of the geotechnical strength and material failure modes. The retaining wall design parameters in the following section should be used for preliminary checks only and as such should not be justified for over-simplification of the design problem. As a minimum, the following procedure should be followed for the shoring wall design:

- Geotechnical model to be adjusted for various wall sections as a simplified model could result in over or under designing different wall sections. This should also consider variations in groundwater levels across the site as well as seasonal variations in short and long term.
- The design should also incorporate surcharge loading from the road and neighbouring structures.
- Considering the risks associated with potential shoring wall failure to the construction workers and neighbouring structures residence and road users, design should be undertaken using an appropriate 2D/3D finite element analysis package capable of estimating the deflections along the pile and ground surface behind the wall. This will enable the design to be checked for the serviceability criteria considering the expected deflection tolerances of the neighbouring structures.

- Design of the temporary and permanent anchors should consider anchor bond material and apply the appropriate reduction factors as per as AS4678 2002 [15] (or similar codes such as BS8081, 1989: British Standard Code of Practice for Ground Anchorage [16]. Understanding of the potential geotechnical failure mode/plane of the retaining structure would be required to determine the appropriate anchor free and bond length.
- The design should consider both serviceability design criteria such as wall and surface deflections as well as ultimate limit state. This should include analysis of the wall global stability using finite element strength reduction or limit equilibrium analysis.
- The shoring wall embedment depths below the finish excavation levels should consider the location of the future foundation/trenches excavations. The embedment depth should be selected to minimise the balance the anchor requirements by providing sufficient length to transfer a portion of the lateral loads to the foundations.
- The design should develop required construction procedures such as excavation, anchoring and shotcreting sequences.
- Shotcrete design loads should consider the soil arching effect and hydrostatic pressure as well as the rock defects spacing and orientations.
- Where temporary anchors are utilised, long term stability of the structure should consider redistribution of the anchor loads to floor slabs as well as the long term hydrostatic loads.
- The design should be accompanied with a monitoring and instrumentation procedure as well as a safety in design register to qualify the potential construction and long-term risks to be considered by the contractor/future users.

9.3. Retaining Wall Design Parameters

The subsurface profile to be retained by the shoring structure along the eastern boundary is generally expected to comprise:

- Unit C1 to depths up to 1.0 m BGL overlying,
- Unit R1 residual soils to depths up to 6.0m BGL over,
- Unit R2 residual soils to a depth of 8.0m BGL.

Retaining structures required to support the partially embedded basement levels across the remainder of the site are expected to retain up to 1.0m of filling (Unit F1) overlying soft to stiff alluvial sands and clays to a depth of between 2-5m BGL across the site, increasing in depth towards the west. This is expected to be underlain by Unit R1 and Unit R2 residual clays.

It should be noted that the above conditions are inferred from the discrete borehole locations and variation of the subsurface conditions should be considered in the design.

It is recommended to calculate the lateral earth coefficient values based on the wall geometry, type and backfill slopes using the values provided in the following table. The earth coefficients presented in the following table have been calculated for level backfill/ground surface and vertical wall arrangements. The designer should reference to the requirements of AS 4678 (2002) – Earth Retaining Structures [9] for the selection of appropriate groundwater level for the design purpose, however, groundwater was encountered at elevations of between 0.4 to -2.7m AHD (on average) at the time of investigation.

Recommended design parameters for retaining walls are presented below in Table 9-1

Unit	Description	Density (t/m³)	Effective Friction Angle [¢] ' (Degrees)	Effective Cohesion C' (kPa)	Effective Elastic Modulus E' (MPa)	Active Earth Pressure Coefficient $K_A^{(1)}$	Passive Earth Pressure Coefficient $K_P^{(1)}$	At Rest Earth Pressure Coefficient K _o ⁽²⁾
C1	Firm silty clays and clayey sand topsoil/colluvium	18	24	0	4	0.42	2.3	0.5
F1	Gravelly, silty and clayey sands	18	28	0	10	0.36	2.7	0.5
A1	Firm to stiff alluvial silty and sandy clays with interbedded loose clayey sands	18	26	0	10	0.39	2.5	0.5
R1	Firm to stiff residual clay and sandy clay	18	25	4	6	0.4	2.4	0.5
R2	Very stiff to hard residual clays and extremely weathered sandstone	21	28	10	15	0.36	2.7	0.5
T1	Medium strength Class IV Sandstone	23	40	120	800	0.21	4.6	1.0 ⁽³⁾
Т2	Medium to high strength Class III Sandstone	23	50	200	1000	0.13	7.5	1.0 ⁽³⁾

Table 9-1 Retaining Wall Design Parameters

Notes to table:

(1) Coefficients stated above to be used with effective stress calculation

(2) K_o of 0.5 assumes minor wall movement will occur

(3) In-situ K_o value for sandstone may be significantly higher due to platonic locked-in horizontal stresses. The use of lower value in this case is not critical as the bulk excavation level is above the sandstone bedrock level.

9.4. Construction Recommendations

- Retaining wall backfill should comprise granular free-draining material with appropriate separation geofabric placed between the wall and granular backfill;
- All foundations should be founded on similar strata to limit the effects of differential settlement;
- Subsurface drainage lines should be placed behind the permanent and temporary (depending on the type) retaining wall, to direct seepage to appropriate points of discharge. Subsurface lines should be installed with consideration of maintenance and flush-out points; and
- Retaining wall foundations as well as anchor bond material should be inspected by experienced geotechnical and engineer.

10. References

- [1] NSW Office of Environment and Heritage, "eSPADE V2.0," NSW Office of Environment and Heritage, December 2016. [Online]. Available: http://www.environment.nsw.gov.au/eSpade2Webapp.
- [2] A. L. Troedson, *Central Coast Area 1:100,000 and 1:25,000, Coastal Quaternary Geology Map Series,* Maitland: Geological Survey of New South Wales, 2016.
- [3] Department of Land And Water Conservation, "Acid Sulfate Soil Risk Map (Edition 2)," NSW Department of Natural Resources, 1997.
- [4] Gosford City Council, "Local Environmental Plan (LEP) Acid Sulfate Soil Risk map".
- [5] NSW Department of Primary Industries, Office of Water, "Groundwater Map," Office of Water, [Online]. Available: http://allwaterdata.water.nsw.gov.au/water.stm.
- [6] Austraslian Geomechanics Society, "Practice Note Guidelines for Landslide Risk Management (c)," *Journal and News of hte Australian Geomechanics Society*, vol. 42, no. 1, pp. 63-158, 2007.
- [7] Australian Standards AS1726-2017, "Geotechnical Site Investigations," Standards Australia, 2017.
- [8] P. J. Pells, G. Mostyn and B. F. Walker, "Foundations on Sandstone and Shale in the Sydney Region," Australian Geomechanics, Dec 1998.
- [9] Australian Standard AS2159-2009, "Piling Design & Installation," Standards Australia, 2009.
- [10] Australian Standard AS3798-2007, "Guidelines on Earthworks for Commercial and Residential Structures," Standards Australia, 2007.
- [11] Gosford City Council, "Discharge of Liquid Trade Waste and Septic Waste to the Gosford City Council Sewerage System," Gosford City Council, 28 July 2015.
- [12] NSW Department of Environment and Climate Change (DECC), "Waste Classification Guidelines, Part 1 - Classifying Waste," Department of Environment and Climate Change NSW, December 2009.
- [13] Australian Standard AS5100-2007, "Bridge Design Set," Standards Australia, 2007.
- [14] P. Pells, "Substance and Mass Properties of Engineering Structures in the Hawksbury Sandstone," Australian Geomechanics Journal Vol 39 No 3, 2004.
- [15] Australian Standard AS4678-2002, "Earth Retaining Structures," Standards Australia, 2002.
- [16] British Standards BS8081-1989, "Ground Anchorages," British Standards Institution, 1989.
- [17] G. H. McNally, Soil and Rock Construction Materials, London: E. & F. N. Spon, 1998.

Important information about your Coffey Report

As a client of Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, owners should retain the services of Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other project design professionals who are affected by the report. Have Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

Data should not be separated from the report*

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples.

These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Coffey for information relating to geoenvironmental issues.

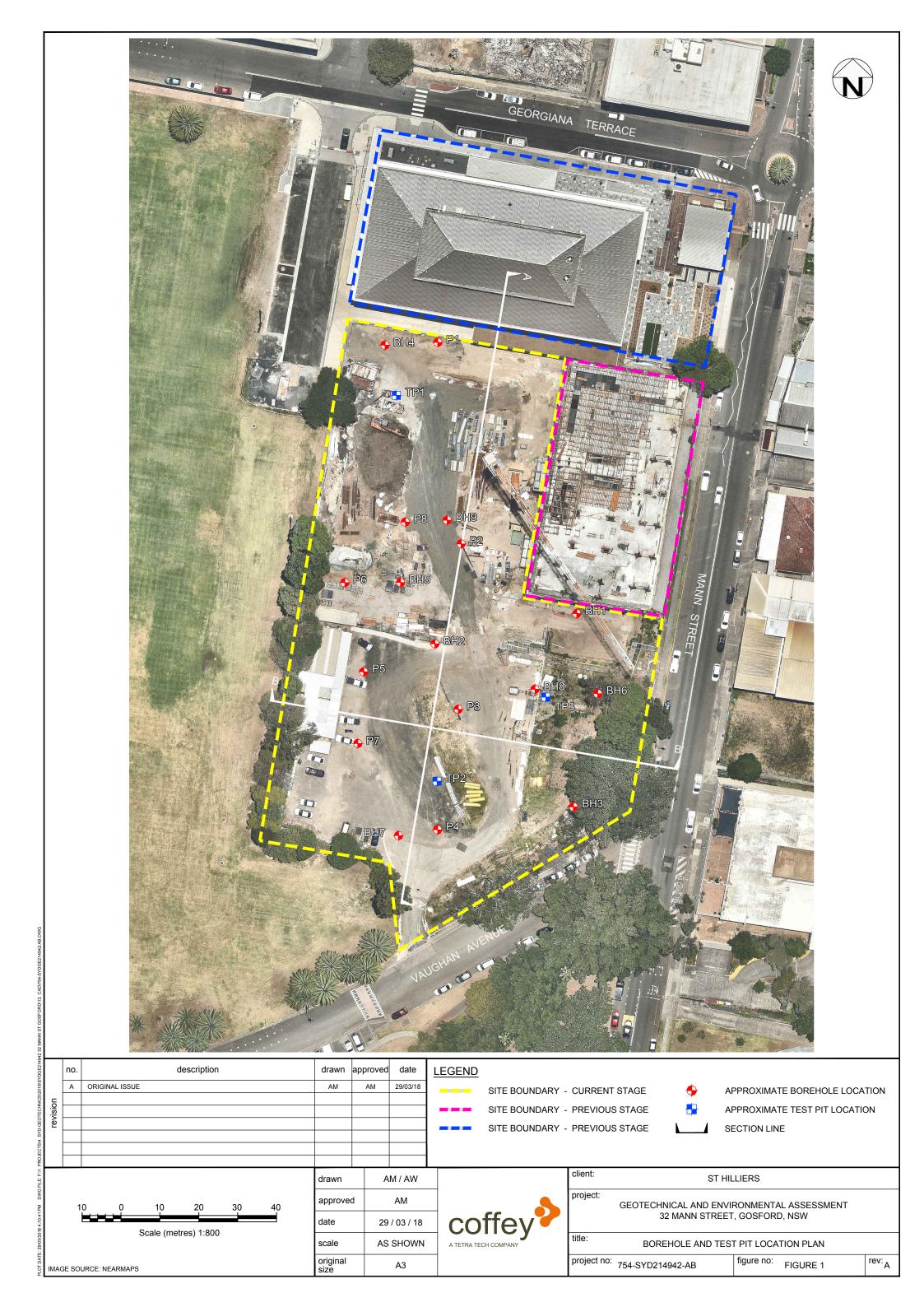
Rely on Coffey for additional assistance

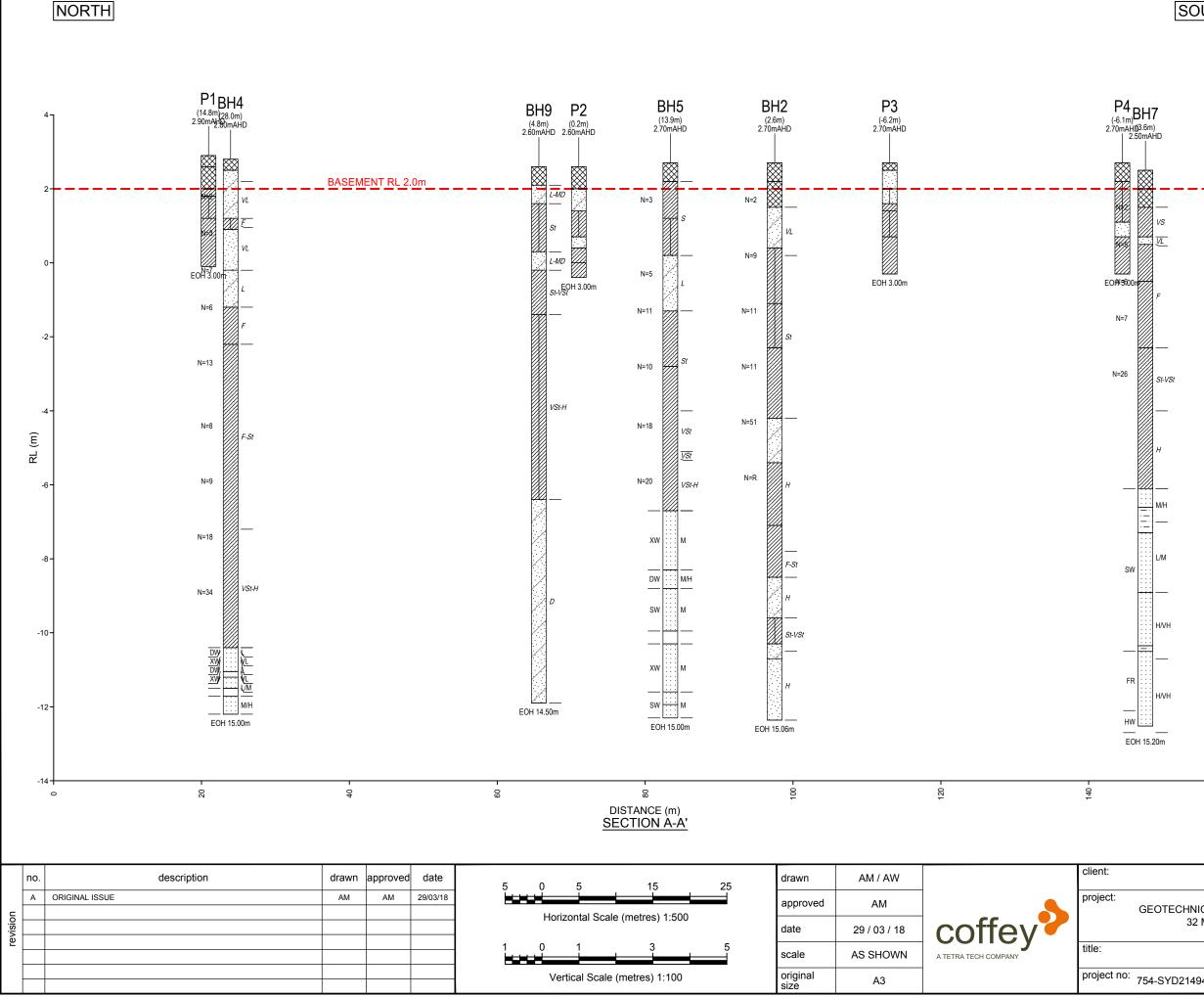
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

* For further information on this aspect reference should be made to "Guidelines for the Provision of Geotechnical information in Construction Contracts" published by the Institution of Engineers Australia, National headquarters, Canberra, 1987. **Appendix A - Investigation Drawings**







<u>LEGEND</u>



FILL

CLAYEY SAND

SANDY CLAY

CLAY

SILTY CLAY

SAND

TOPSOIL

SANDSTONE

CLAYSTONE

SILTSTONE

NO CORE

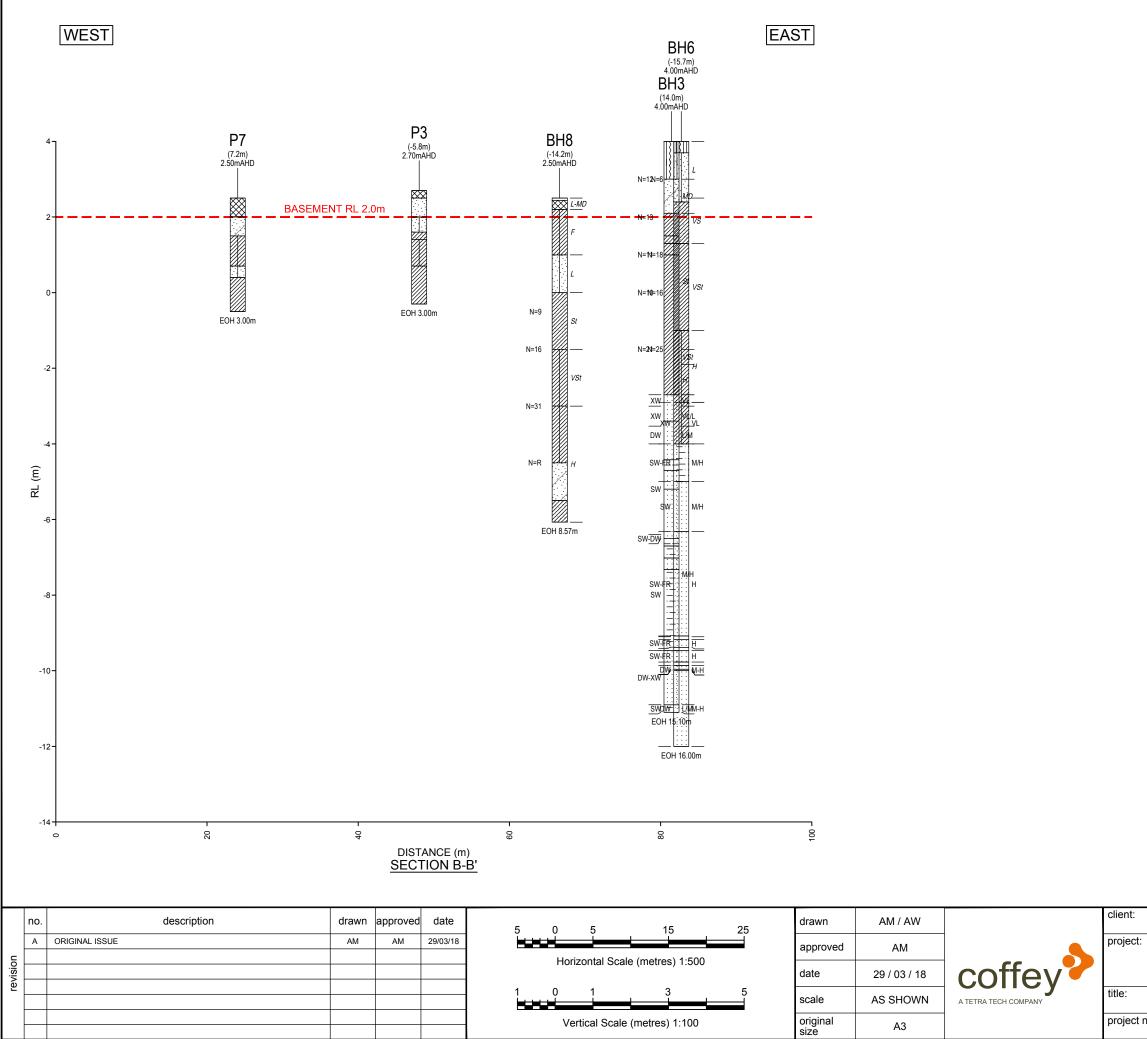
SILTY SAND

ASPHALT

SANDY SILTY CLAY

160 J

ST HIL	ST HILLIERS				
GEOTECHNICAL AND ENVIRONMENTAL ASSESSMENT 32 MANN STREET, GOSFORD, NSW					
SECTION A-A'					
^{10:} 754-SYD214942-AB figure no: FIGURE 2 rev					



LEGEND

\bigotimes
/
: : : : : : : : : :

FILL

CLAYEY SAND

SANDY CLAY

CLAY

SILTY CLAY

SAND

TOPSOIL

SANDSTONE

CLAYSTONE

SILTSTONE

NO CORE

SILTY SAND

ASPHALT

SANDY SILTY CLAY

ST HILLIERS

GEOTECHNICAL AND ENVIRONMENTAL ASSESSMENT 32 MANN STREET, GOSFORD, NSW

^{no:} 754-SYD214942-AB	figure no:	FIGURE 3	^{rev:} A

This page has been left intentionally blank

Appendix B - Explanatory Notes, Borehole Logs & Core Box Photographs



Soil Description Explanation Sheet (1 of 2)

DEFINITION:

In engineering terms soil includes every type of uncemented or partially cemented inorganic or organic material found in the ground. In practice, if the material can be remoulded or disintegrated by hand in its field condition or in water it is described as a soil. Other materials are described using rock description terms.

CLASSIFICATION SYMBOL & SOIL NAME

Soils are described in accordance with the Unified Soil Classification (UCS) as shown in the table on Sheet 2.

PARTICLE SIZE DESCRIPTIVE TERMS

NAME SUBDIVISION		SIZE	
Boulders		>200 mm	
Cobbles		63 mm to 200 mm	
Gravel coarse		20 mm to 63 mm	
medium		6 mm to 20 mm	
	fine	2.36 mm to 6 mm	
Sand coarse		600 μm to 2.36 mm	
	medium	200 μm to 600 μm	
	fine	75 μm to 200 μm	

MOISTURE CONDITION

- Dry Looks and feels dry. Cohesive and cemented soils are hard, friable or powdery. Uncemented granular soils run freely through hands.
- Moist Soil feels cool and darkened in colour. Cohesive soils can be moulded. Granular soils tend to cohere.
- Wet As for moist but with free water forming on hands when handled.

CONSISTENCY OF COHESIVE SOILS

TERM	UNDRAINED STRENGTH S _U (kPa)	FIELD GUIDE			
Very Soft	<12	A finger can be pushed well into the soil with little effort.			
Soft	12 - 25	A finger can be pushed into the soil to about 25mm depth.			
Firm	25 - 50	The soil can be indented about 5mm with the thumb, but not penetrated.			
Stiff	50 - 100	The surface of the soil can be indented with the thumb, but not penetrated.			
Very Stiff	100 - 200	The surface of the soil can be marked, but not indented with thumb pressure.			
Hard	>200	The surface of the soil can be marked only with the thumbnail.			
Friable	_	Crumbles or powders when scraped by thumbnail.			

DENSITY OF GRANULAR SOILS

TERM	DENSITY INDEX (%)
Very loose	Less than 15
Loose	15 - 35
Medium Dense	35 - 65
Dense	65 - 85
Very Dense	Greater than 85

MINOR COMPONENTS

TERM	ASSESSMENT GUIDE	PROPORTION OF MINOR COMPONENT IN:		
Trace of	Presence just detectable by feel or eye, but soil properties little or no different to general properties of primary component.	Coarse grained soils: <5% Fine grained soils: <15%		
With some	Presence easily detected by feel or eye, soil properties little different to general properties of primary component.	Coarse grained soils: 5 - 12% Fine grained soils: 15 - 30%		

SOIL STRUCTURE

	ZONING	CE	MENTING
Layers	Continuous across exposure or sample.	Weakly cemented	Easily broken up by hand in air or water.
Lenses	Discontinuous layers of lenticular shape.	Moderately cemented	Effort is required to break up the soil by hand in air or water.
Pockets	Irregular inclusions of different material.		

GEOLOGICAL ORIGIN WEATHERED IN PLACE SOILS Extremely Structure and fabric of parent rock visible. weathered material					
Residual soil	Structure and fabric of parent rock not visible.				
TRANSPORTS					
TRANSPORTE	DSOILS				
Aeolian soil	Deposited by wind.				
Alluvial soil	Deposited by streams and rivers.				
Colluvial soil	Deposited on slopes (transported downslope by gravity).				
Fill	Man made deposit. Fill may be significantly more variable between tested locations than naturally occurring soils.				
Lacustrine soil	Deposited by lakes.				
Marine soil	Deposited in ocean basins, bays, beaches and estuaries.				

coffey **>**

Soil Description Explanation Sheet (2 of 2)

(Exclu	Iding				ON PROCEDURE and basing fractions		USC	PRIMARY NAME				
~		arse 36 mm	arse 36 mm	arse 36 mm	arse 36 mm	arse 36 mm	CLEAN GRAVELS (Little or no fines)		range in grain size a ints of all intermediat		GW	GRAVEL
3 mm i		/ELS If of cc than 2.	CLE GRA (Lit or fin		ominantly one size or more intermediate siz		GP	GRAVEL				
SOILS than 6 m	eye)	GRAVELS More than half of coarse ction is larger than 2.36 m	/ELS FINES ciable unt nes)		Non-plastic fines (for identification procedures see ML below)		GM	SILTY GRAVEL				
XAIINED ials less 0.075 m	e naked	GRAVELS More than half of coarse fraction is larger than 2.36 mm	GRAVELS WITH FINES (Appreciable amount of fines)		ic fines (for identificat CL below)	tion procedures	GC	CLAYEY GRAVEL				
COARSE GRAIINED SOILS More than 50% of materials less than 63 mm is larger than 0.075 mm llest particle visible to the naked eye)	particle is about the smallest particle visible to the		AN IDS or s)	Wide amou	range in grain sizes a ints of all intermediat	and substantial e sizes	SW	SAND				
an 50% larç	icle visi	IDS If of cos than 2.5	CLEAN SANDS (Little or no fines)	Predo with s	ominantly one size or some intermediate siz	a range of sizes zes missing.	SP	SAND				
Nore tha	lest part	SANDS More than half of coarse fraction is smaller than 2.36 mm	SANDS WITH FINES (Appreciable amount of fines)	Non- proce	plastic fines (for iden edures see ML below	tification).	SM	SILTY SAND				
	the smal	More fraction is	SAI WITH (Appre amo		ic fines (for identificat CL below).	tion procedures	SC	CLAYEY SAND				
	out		IDENTIFICAT	ION PI	ROCEDURES ON FR	ACTIONS <0.2 mm.						
nan	s ab	(0	DRY STREN	GTH	DILATANCY	TOUGHNESS						
NLS less th 75 mr	rticle i	CLAYS limit an 50	None to Low	,	Quick to slow	None	ML	SILT				
ED SC aterial ian 0.0	nm pa	SILTS & CLAY Liquid limit less than 50	Medium to H	ligh	None	Medium	CL	CLAY				
aRAIN of ma aller th	(A 0.075 mm	SIL SIL	SIL	SIL	Low to medi	um	Slow to very slow	Low	OL	ORGANIC SILT		
FINE GRAINED SOILS More than 50% of material less than 63 mm is smaller than 0.075 mm		& CLAYS id limit r than 50	Low to medi	w to medium Slow to very slo		Low to medium	МН	SILT				
		SILTS & CLAYS Liquid limit greater than 50	High		None	High	СН	CLAY				
Mc 6		SILTS Liqui greater	Medium to H	ligh	None	Low to medium	ОН	ORGANIC CLAY				
HIGHL' SOILS	Y OF	RGANIC	Readily ident frequently by		y colour, odour, spon Is texture.	gy feel and	Pt	PEAT				

SOIL CLASSIFICATION INCLUDING IDENTIFICATION AND DESCRIPTION

• Low plasticity – Liquid Limit $w_{\rm L}$ less than 35%. • Medium plasticity – $w_{\rm L}$ between 35% and 50%. • High plasticity – $w_{\rm L}$ greater than 50%.

COMMON DEFECTS IN SOIL

TERM	DEFINITION	DIAGRAM	TERM	DEFINITION	DIAGRAM
PARTING	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.		SOFTENED ZONE	A zone in clayey soil, usually adjacent to a defect in which the soil has a higher moisture content than elsewhere.	ALCONTRACTION OF
JOINT	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed. The term 'fissure' may be used for irregular joints <0.2 m in length.		TUBE	Tubular cavity. May occur singly or as one of a large number of separate or inter-connected tubes. Walls often coated with clay or strengthened by denser packing of grains. May contain organic matter	
SHEARED ZONE	Zone in clayey soil with roughly parallel near planar, curved or undulating boundaries containing closely spaced, smooth or slickensided, curved intersecting joints which divide the mass into lenticular or wedge shaped blocks.		TUBE CAST	Roughly cylindrical elongated body of soil different from the soil mass in which it occurs. In some cases the soil which makes up the tube cast is cemented.	
SHEARED SURFACE	A near planar curved or undulating, smooth, polished or slickensided surface in clayey soil. The polished or slickensided surface indicates that movement (in many cases very little) has occurred along the defect.		INFILLED SEAM	Sheet or wall like body of soil substance or mass with roughly planar to irregular near parallel boundaries which cuts through a soil mass. Formed by infilling of open joints.	



Rock Description Explanation Sheet (1 of 2)

DEFINITIONS	Ro	ck substance, defect and mass are defined as follows	:			
	ce In e dis	engineering terms rock substance is any naturally occur integrated or remoulded by hand in air or water. Other nogenous material, may be isotropic or anisotropic.	rring aggregate o			
Defect Mass	Dis An	continuity or break in the continuity of a substance or / body of material which is not effectively homogeneous. re substances with one or more defects.		two or m	ore substances	without defects, or one or
SUBSTANCE		CRIPTIVE TERMS:	ROCK	UBST	ANCE STRE	NGTH TERMS
ROCK NAME	Cir	and real names are used rether then preside	Town	A h h wave	Point Load	Field Guide
		nple rock names are used rather than precise ological classification.	Term	iation	Index, I _{s(50)} (MPa)	Field Guide
PARTICLE SIZE		ain size terms for sandstone are:				
Coarse graine		inly 0.6mm to 2mm	Very Low	VI	Less than 0.1	Material crumbles under firm
0		inly 0.2mm to 0.6mm	Very LOW	۷L	Less than 0.1	blows with sharp end of pic
Fine grained		inly 0.06mm (just visible) to 0.2mm				can be peeled with a knife; pieces up to 30mm thick ca
ABRIC		ms for layering of penetrative fabric (eg. bedding, avage etc.) are:				be broken by finger pressure
Massive	No	layering or penetrative fabric.				
Indistinct	Lay	ering or fabric just visible. Little effect on properties.	Low	L	0.1 to 0.3	Easily scored with a knife; indentations 1mm to 3mm show with firm bows of a
Distinct		rering or fabric is easily visible. Rock breaks more sily parallel to layering of fabric.				pick point; has a dull sound under hammer. Pieces of core 150mm long by 50mm
Term Abb	reviat					diameter may be broken by hand. Sharp edges of core may be friable and break
Residual Soil	RS	Soil derived from the weathering of rock; the mass structure and substance fabric are no				during handling.
		longer evident; there is a large change in volume but the soil has not been significantly transported.	Medium	м	0.3 to 1.0	Readily scored with a knife; piece of core 150mm long b 50mm diameter can be
Extremely Weathered Material	xw	Material is weathered to such an extent that it has soil properties, ie, it either disintegrates or can be remoulded in water. Original rock fabric				broken by hand with difficult
Wateria		still visible.	High	н	1 to 3	A piece of core 150mm lon by 50mm can not be broke
Highly Weathered Rock	HW	Rock strength is changed by weathering. The whole of the rock substance is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Some minerals are decomposed to clay minerals. Porosity may be increased by				by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
		leaching or may be decreased due to the deposition of minerals in pores.	Very High	n VH	3 to 10	Hand specimen breaks after more than one blow of a pick; rock rings under
Moderately Weathered	MW	The whole of the rock substance is discoloured, usually by iron staining or bleaching, to the				hammer.
Rock		extent that the colour of the fresh rock is no longer recognisable.	Extremel High	y EH	More than 10	Specimen requires many blows with geological pick t
Slightly Weathered Rock	SW	Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance (usually by limonite) has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the			ubstance Stre	•
		fresh rock substance.				o strength applies to the strengt n strength anisotropic rocks ma
Fresh Rock	FR	Rock substance unaffected by weathering.	break rea	dily parall	el to the planar ar	nisotropy.
	ts the t	erm "Distinctly Weathered" (DW) to cover the range of	term. Whi makes it o	le the terr clear that	n is used in AS17	d as a rock substance strength 26-1993, the field guide thereir strength range are soils in
not practical to advantage in ma given in AS1726	delinea aking si 3.	conditions between XW and SW. For projects where it is te between HW and MW or it is judged that there is no uch a distinction. DW may be used with the definition emical changes were caused by hot gasses and liquids	anisotrop 10 to 25 t	nfined con ic rocks w imes the p	hich fall across the point load index l	th for isotropic rocks (and he planar anisotropy) is typically s(50). The ratio may vary for rocks often have lower ratios
associated with	igneou	s rocks, the term "altered" may be substituted for e abbreviations XA, HA, MA, SA and DA.	than high			NONO OTTOT HAVE IDWEL TALIUS



Rock Description Explanation Sheet (2 of 2)

ROCK MA		Diagram		aphic Log Note 1)	DEFECT SHAPE Planar	TERMS The defect does not vary i orientation
Term	Definition				.	
Parting	A surface or crack across which the rock has little or no tensile strength. Parallel or sub parallel to layering		20 Bedding		Curved	The defect has a gradual change in orientation
	(eg bedding) or a planar anisotropy in the rock substance (eg, cleavage).		20 Cleavage	(Note 2)	Undulating	The defect has a wavy surface
	May be open or closed.			(NOLE 2)	Stepped	The defect has one or mo well defined steps
Joint	A surface or crack across which the rock has little or no tensile strength. but which is not parallel or sub				Irregular	The defect has many shar changes of orientation
	parallel to layering or planar anisotropy in the rock substance.		60	(Note 2)		ment of defect shape is partly by the scale of the observation
	May be open or closed.			(14016 2)	ROUGHNESS Slickensided	FERMS Grooved or striated surfac usually polished
Sheared Zone	Zone of rock substance with roughly parallel near planar, curved or				Polished	Shiny smooth surface
(Note 3)	undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of		35		Smooth	Smooth to touch. Few or r surface irregularities
	the defects are usually curved and intersect to divide the mass into lenticular or wedge shaped blocks.	·/· · · ·		~	Rough	Many small surface irregulariti (amplitude generally less tha 1mm). Feels like fine to coars sand paper.
Sheared Surface (Note 3)	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.		40	していた。	Very Rough	Many large surface irregularities (amplitude generally more than 1mm Feels like, or coarser than ve coarse sand paper.
Crushed Seam	Seam with roughly parallel almost planar boundaries, composed of				COATING TER	MS No visible coating
(Note 3)	disoriented, usually angular fragments of the host rock substance which may be more			2000 1000 1000 1000	Stained	No visible coating but surfaces are discoloured
	weathered than the host rock. The seam has soil properties.			17 1	Veneer	A visible coating of soil or mineral, too thin to measur may be patchy
Infilled Seam	Seam of soil substance usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1mm thick may be described as veneer or coating on joint surface.				Coating	A visible coating up to 1mi thick. Thicker soil material usually described using appropriate defect terms (e infilled seam). Thicker roc strength material is usuall described as a vein.
					BLOCK SHAPE Blocky	Approximately
Extremely Weathered Seam	Seam of soil substance, often with gradational boundaries. Formad by weathering of the rock substance in		32 TITTTT	511	Tabular	equidimensional Thickness much less than length or width
	place.	Seam	-y-	No la	Columnar	Height much greate than cross section

2. Partings and joints are not usually shown on the graphic log unless considered significant.

^{3.} Sheared zones, sheared surfaces and crushed seams are faults in geological terms.



A TE	ETRA	TECH	COMP	ANY								nole ID.	BH1
E	En	gi	ne	erin	g l	_00	q -	Во	rehole		sheet		1 of 2
—	ent:	<u> </u>		Gosfo	<u> </u>	-	_				proje	started:	<u>SYDGE214942</u> 22 Feb 2018
			511	603101	un	esiu	entia	i i ty	Liu				
	inci		_									complete	
pr	ojec	et:							ental Assessment		logge	d by:	LP
lo	catio	on:	32	Mann S	Stree	et, G	osfoi	rd, N	ŚW		check	ked by:	АМ
· ·				56.31; N: 6 be 7822D ⁻				4)	surface elevation: 2.50 m (AHD) drilling fluid: Water	0		orizontal: r : 100 mr	
		g info			1, 11d		-	erial sub		TIOLE	lamete	1. 100 111	11
		tion		samples &			bol	_	material description		y / nsity	hand	structure and
method &	support	1 2 penetration 3	water	field tests	RL (m)	depth (m)	graphic lc	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	penetro- meter (kPa)	additional observations
				E	2	-			FILL: Gravelly SAND: fine to medium grained, pale brown, with fine sub-angular gravels, trace of low plasticity clay.	D	_		FILL PID: 2.5ppm
				SPT 5, /50mm N*=R		1.0-			FILL: CLAY: medium to high plasticity, dark grey-black, trace of organics.	М			
Tq					-1	- - 2.0-		SC	CLAYEY SAND: fine grained, dark brown mottled dark grey, with low to medium plasticity clay, trace of fine gravel.				
019 09:25				SPT 2, 4, 6 N*=10	-0	-		CL	Sandy CLAY: medium to high plasticity, dark brown mottled dark grey, with fine grained sand, trace of fine gravel.		St		RESIDUAL SOIL PID: 3.4ppm
				SPT 4, 5, 5 N*=10	-	- 3.0 — -							
DGE214942.GPJ < <drawingfile>> 16/08/2019 09:25</drawingfile>				SPT	1 	- - 4.0—		СН	CLAY : medium to high plasticity, pale grey, trace of fine grained sand, trace of fine to medium sub-rounded gravel.				
				2, 4, 8 N*=12	2	-							
NON CORE			22/02/181		-	5.0-			$_{ m 7}$ 5.2 m: harder ground conditions, red shade of soil $_{ m 7}$	- w -	VSt		-
BOREHOLE: —— AD/T			22/02	SPT 6, 13, 16 N*=29	3	-		CL	Sandy CLAY: medium to high plasticity, pale grey mottled orange, red, with very fine grained sand.				
U Log CUF					+	6.0-							
KAKY.GLB rev.A					4	- - 7.0-			6.5 m: harder ground conditions encountered				
CUP_0_9_0/_LIBKARY.GLB FØV.AU LOG CUP BUREHOLE: NUN CUREU 784-5Y				SPT 6, 19, 30 N*=49	5	-		CL	Sandy CLAY: medium plasticity, pale grey, spotted red, with fine grained sand, trace of extremely weathered rock.				
Ĩ						-	V////						
n A H W P	S A /	d auger o auger s hand a washbo push tu	crewir uger ore		M n C c pen	etration	ı	nil istance g to	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT)	soil de ased on a sture con dry moist	up symbo escriptio AS 1726: ndition	n	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* B T V	.g.	bit shov AD/T blank b TC bit V bit		suffix	wate	■ 10- lev wat	Oct-12 wa el on date ter inflow ter outflov	shown	N* SPT - sample recovered W Nc SPT with solid cone Wp VS vane shear; peak/remouded (kPa) WI R refusal HB hammer bouncing	wet plastic li liquid lin			VL very loose L loose MD medium dense D dense VD very dense



ATETI	RA TECH	COMF	PANY										Borel	nole ID.		BH1		
Engineering Log - Borehole sheet project SH Gosford Residential Pty Ltd date of principal: date of date of project: Geotechnical and Environmental Assessment logge					t:		2 of 2											
	ngi			-		-			e				proje	ct no.		SYDO	GE214942	
clie	nt:	SH	Gosfo	rd R	esid	lentia	al Pty	Ltd					date	started:		22 Fe	b 2018	
prin	oject: Geotechnical and Environmental Assessment												date	complet	ted:	22 Fe	b 2018	
proj	ect:	Ge	otechn	ical	and	Envi	ronm	ental As	sessment	t			logge	ed by:		LP		
loca	ation:	32	Mann S	Stree	et, G	osfo	rd, N	SW					chec	ked by:		АМ		
posit									levation: 2.50	m (AHD)		angle	from h	orizontal:	90°			
				T, Tra	ck mou	_	wiel eur		id: Water			hole	diamete	r : 100 m	m			
un	ling info	mat					erial sub	stance	material d	escription			/ sity	hand		str	ucture and	
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol		NAME: plasticity c	r particle characteristic d minor components	.,	moisture condition	consistency / relative density	penetro- meter (kPa) $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$ $\stackrel{0}{\scriptscriptstyle \sim}$			nal observations	i
	- 0 0	>		LL.	-		CL	spotted red	, with fine grain	asticity, pale grey, ed sand, trace of		W	H			IDUAL SO	DIL	-
— AD/T			SPT	6	-			extremely v	veathered rock	(continued)								-
*		8	20, 30/50mm	/	-			Borehole B	H1 terminated	at 8.70 m								-
			\ <u>N*=R</u>	-	9.0-	1												-
]												-
				7	-	-												-
					- 10.0	1												-
						-												-
09:25				8	-	1												-
38/2019					-	-												-
>> 16/				-	11.0-	1												-
vingFile					-													-
< <draw< td=""><td></td><td></td><td></td><td>9</td><td>-</td><td>1</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></draw<>				9	-	1												-
2.GPJ				_	12.0 –	1												-
E2 1494					-	-												-
-SYDG	i i i			10		1												-
ED 754					-	-												-
N CORE				-	13.0-													-
NO I				11	-													-
DREHO					-	1												-
CDF_0_9_07_LIBRARY.GLB rev.AU Log COF BOREHOLE: NON CORED 754-SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:25</drawingfile>				Ļ	- 14.0]												- -
l Log					-	1												-
B rev:Al				12		1												-
RY.GLI					-	{												-
LIBRA					15.0	1												-
20 6 0	111			13	.	-								<u>iiii</u>				-
CDF				-13	-	1												-
															<u> </u>			-
	method support samples & field tests AD auger drilling* M mud N nil B bulk disturbed sam AS auger screwing* C casing D disturbed sample										soil d	up symb	n	c V S	S	 / relative densit very soft soft 	у	
HA W	hand a washb	auger ore	5		etratior	n		E SS	environmental split spoon san	sample	sa	aseu on	AS 1726	.2017	F S		firm stiff	
PT	push t	ube				no res rangir	sistance ng to	U## HP	undisturbed sa hand penetrom	mple ##mm diameter eter (kPa)	D	dry	ndition		V H	St	very stiff hard	
*	bit sho	wn by	suffix	wat	T 10-	-Oct-12 w	ater	N N* Nc	standard penel SPT - sample r SPT with solid		W	moist wet plastic li	imit		F V L	L	friable very loose loose	
e.g. B	AD/T blank l	oit			- lev wai	el on date ter inflow		VS R		cone ak/remouded (kPa)		liquid lin				ID	noose medium dens dense	e
T V	TC bit V bit			-	- d wa	ter outflow	N	HB	hammer bound	ing					V		very dense	



A TETRA	A TECH (COMP	ANY							Boreh	nole ID.		BH2	
Er	nai	20	orin	а I	~	n _	R۸	rehole		sheet	:		1 of 2	
	iyii					-		rehole		proje	ct no.		SYDGE214942	
client	t:	SH	Gosfor	rd R	esid	entia	l Pty	Ltd		date	started:		22 Feb 2018	
princ	ipal:									date o	complet	ed:	23 Feb 2018	
proje	ct:	Ge	otechni	ical	and	Envi	ronm	nental Assessment		logge	d by:		LP	
locati	ion:	32	Mann S	Stree	et, G	osfoi	rd, NS	SW		check	ed by:		АМ	
positio	on: E:3	845,7	19.85; N: 6	,299,8	09.19	(MGA94	4)	surface elevation: 2.70 m (AHD)	angle	from ho	orizontal:	90°		
		· ·	be 7822D	T, Tra	ck mou	-		drilling fluid: Water	hole d	liametei	r : 100 mi	m		
drilli	ng info	rmati	on			mate	erial sub	ostance		≿	h a se d			
& p t	penetration		samples & field tests	_	(E	ic log	dno lo	material description SOIL NAME: plasticity or particle characteristic,	ion	tency / e densi	hand penetro- meter		structure and additional observations	
method & support	pene	water		RL (m)	depth (m)	graphic log	soil group symbol	colour, secondary and minor components	moisture condition	consistency / relative density	(kPa)			
1	- 0.0	-	E		-			FILL: Gravely SAND: fine to medium grained,	M		- 0.64	FILL	2 7000	-
			E	_	-			dark brown-black, with fine to medium angular gravel, trace of low to medium plasticity clay.					3.7ppm	-
				-2	-			FILL: SAND: fine to medium grained, brown-dark brown, trace of silt and fine gravel.				PID: \	3.8ppm	-
			E,		1.0-							PID.	6.5ppm	-
			SPT 3, 1, 1	-	-	\bigotimes		CLAYEY SAND: fine grained, grey, medium	M - W			L		
			N*=2	_	-		30	plasticity clay, organic odour, trace of organics and root fibres.	101 - 00	VL		ALLU		_
				-1	-	$\langle \rangle$								-
			E	-	2.0-							PID: 4	4.9ppm	-
				-	-									-
9 09.60			SPT	-	-		СН	Silty CLAY: medium to high plasticity, pale grey-dark grey, trace of root fibres and fine white gravel.	М	St				-
07000			3, 5, 4 N*=9	-0	-									-
			<u> </u>	1	3.0-									-
5					-									-
				1	-									-
LD.Z	i.				- 4.0-		СН	Silty CLAY: medium to high plasticity, grey mottled orange-red, trace of fine grained sand, root fibres			liii			-
			SPT 2, 4, 7	-				and fine pale gravel.						-
			N*=11	-	-									-
5				2	-									-
					5.0 —		CL	Sandy CLAY: medium to high plasticity, pale grey,				RESI		·
	i.			-	-		0L	white sotted orange, with fine grained sand, trace of root fibres and silt.						
			SPT		-	\mathbb{V}/\mathbb{V}					1111			-
			2, 4, 7 N*=11	3	-									-
D) R					6.0-									-
					-									-
				4	-									-
					7.0-	<u>KIII</u>	sc	SAND: fine grained, pale grey, streaked red,		— <u>—</u> —				-
			SPT 18, 21, 30	-	-			medium plasticity clay.						-
			N*=51	-	-									-
				5	-									-
	<u></u>				port			samples & field tests	soil grou	in sumh	. i i i i		nsistanay / valative days the	
AD AS	auger o auger s			Mi		Ν	nil	B bulk disturbed sample		scriptio	n	VS S	nsistency / relative density very soft soft	
HA W	hand a washbo	uger ore	-		etration	ı		E environmental sample	aseu on A	-1720:	2017	F St	firm stiff	
PT	push tu	be			- N M	no res rangin rangin	istance g to	U## undisturbed sample ##mm diameter moi HP hand penetrometer (kPa) D	sture cor dry	ndition		VS H	it very stiff hard	
*	bit show	vn bv	suffix	wate		Oct-12 wa		N standard penetration test (SPT) M N* SPT - sample recovered W	moist wet	mit		Fb VL	very loose	
e.g. B	AD/T blank b				- lev	el on date ter inflow	shown	VS vane shear; peak/remouded (kPa) WI	plastic lii liquid lim					
T V	TC bit V bit			-		ter outflov	v	R refusal HB hammer bouncing				D VD	dense very dense	

CDF_0_9_07_LIBRARY.GLB rev.AU_Log_COF BOREHOLE: NON CORED_754-SYDGE214942.GPJ_<CDrawingFile>> 16/08/2019_09:25



		J Y									
TETRA TECH									Boreł	nole ID.	BH2
Enai	00	orin	~ I	~	~	Do	rahala		sheet	:	2 of 2
Engi	ne	enn	<u>y ı</u>	-0(<u>J -</u>	DU	rehole		proje	ct no.	SYDGE214942
lient:	SH	Gosfor	rd R	esid	entia	al Pty	Ltd		date	started:	22 Feb 2018
orincipal:									date	completed	23 Feb 2018
oroject:	Ge	otechni	cal	and	Envi	ronm	ental Assessment		logge	d by:	LP
ocation:	32	Mann S	tree	et, Go	osfo	rd, N	SW		checł	ked by:	АМ
osition: E:	345,7	19.85; N: 6,	299,8	09.19 ((MGA9	4)	surface elevation: 2.70 m (AHD)	angle	e from ho	orizontal: 90)°
ill model: (Geopr	be 7822D1	r, Tra	ck mou	unted		drilling fluid: Water	hole	diamete	r : 100 mm	
drilling inf	ormati	on	1	1	mate	erial sul	ostance				
support support 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetro- meter (kPa)	structure and additional observations
		SPT 20, 30 N*=R				CH CH SC SC	Sandy CLAY: medium to high plasticity, orange-brown mottled red, pale grey, fine to medium grained sand. CLAY: high plasticity, pale grey, spotted brown, trace of fine to coarse gravel. 10.5 to 11.2 m: very soft spot encountered CLAYEY SAND: fine to coarse grained, pale brown-orange mottled pale grey, with medium plasticity clay. 11.9 m: hard material encountered Silty CLAY: medium to high plasticity, pale grey mottled pale brown, with silt, trace of fine sub-rounded grey gravel, medium strength. CLAYEY SAND: fine to coarse grained, pale brown-orange filt of the sub-rounded grey gravel, medium strength. Silty CLAY: medium to high plasticity, pale grey mottled pale brown, with silt, trace of fine sub-rounded grey gravel, medium strength. SLAYEY SAND: fine to medium grained, pale grey, with medium plasticity clay, trace of sandstone. 13.05 to 13.4 m: soft material SAND: fine to coarse grained, pale brown-orange, trace of sandstone.	M	H F - St - H St - VSI - H		RESIDUAL SOIL

6/08/2010 00-25 ç CDF_0_9_07_LIBRARY.GLB rev.AU Log COF BOREHOLE: NON COF

		12 15.0			
CDF_0_9_01_LIE		13	Borehole BH2 terminated at 15.06 m		
meth AD AS HA W PT	hod auger drilling* auger screwing* hand auger washbore push tube	support M mud N nil C casing penetration	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter	soil group symbol & soil description based on AS 1726:2017 moisture condition	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff
* e.g. B T V	bit shown by suffix AD/T blank bit TC bit V bit	water 10-Oct-12 water level on date show water inflow water outflow	HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Na SPT - with oping	D dry M moist W wet Wp plastic limit WI liquid limit	H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



ATE	TRA	TECH	H COMF	PANY							Borel	hole ID.	BH3	
	'n	ai	inc	orin	~ I	~	~	Po	rahala		sheet	t:	1 of 3	
_		<u>iy</u>	me	enn	y I	-0(<u>y -</u>	DU	rehole		proje	ct no.	SYDGE214942	_
clie	ent	:	SH	Gosfo	rd R	esid	entia	al Pty	Ltd		date	started:	23 Feb 2018	
pri	nci	pal:									date	complet	ted: 23 Feb 2018	
pro	ojec	ct:	Ge	otechn	ical	and	Env	ironm	ental Assessment		logge	ed by:	LP	
loc	atio	on:	32	Mann S	Stree	et. G	osfo	rd, N	SW		checl	ked by:	АМ	
pos	sitio	n: E		'55.46; N: 6		,			surface elevation: 4.00 m (AHD)	angle		orizontal:		-
drill	l mc	odel:	Geopr	obe 7822D	T, Tra	ck mou	unted		drilling fluid: Water	hole o	diamete	r : 100 mi	m	
dr	illin	ng inf	format	ion			mat	erial sul	stance					_
ø		ration		samples &		Ê	bol	e B		9 5	ncy / density	hand penetro-	structure and additional observations	
method &	support	penetration	water	field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	meter (kPa)		
<u>⊢</u>	S	- 0 0	Î		4	q		ML	TOPSOIL: Silty CLAY: low to medium plasticity,	D-M	52	100 100 100 100 100 100	TOPSOIL	-
			·				1		brown, pale brown, trace of organics and root fibres.					
			· .	E	-	-								-
		11	i			-			0.8 m: grading to brown-dark brown			liii		
			· .	SPT	-3	1.0-		sc	CLAYEY SAND: fine to medium grained, dark		MD			-
			· .	4, 5, 7 N*=12					brown, trace of fine grained sand.					
		ii Ti	i		-	-						<u>liii</u>		
		11	i	E	-2	2.0-		сн	CLAY: medium to high plasticity, dark brown	- <u>-</u> -	St		 RESIDUAL SOIL	_
				SPT 4, 6, 7		2.0	V///		mottled red-dark grey.		01			
				N*=13 E	-	-								
PT		ii II		E	_	-		CL CH	Sandy CLAY: medium to high plasticity, dark brown, grading to brown, pale brown, fine to	/		<u>liii</u>		
		$\left \cdot \right $			-1	3.0-	V//	1	\medium grained sand, trace of silt	<i>r</i>				_
			Encountered	SPT 3, 5, 6		-	$\langle / / /$	СН	trace of sllt, sand and root fibres.	´				
20			티	N*=11	-	-	V///		trace of tree root fibres.					_
		11	i 📃				V///		3.2 m: colour changes to pale grey spotted red					
			i	SPT	-0	4.0-	$\langle / / /$							_
			· .	2, 4, 6 N*=10		-	V///		4.1 m: colour changes to pale, more tree root fibres present					
5					-		V///							_
5						-	$\langle / / /$							
					1	5.0-	V///							_
			· .				V///							
		ii II	i	SPT	-	-	$\langle / / /$				VSt			-
				5, 8, 13 N*=21		-	$\langle / / /$				L			
AD/T-					2	6.0-			5.9 m: grading red-orange		н			-
						-	$\langle / / /$							
<u> </u>			· .			-	<i>\///</i>							_
		$\left \cdot \right $	i 📃		3	7.0-	1		Borehole BH3 continued as cored hole					-
						-								
			·		_	-	1							_
3		ii II	· · · · · · · · · · · · · · · · · · ·				1							
		ii										liii		_
AE AS		auge	r drilling r screwi		Mi	port mud	١	l nil	samples & field tests B bulk disturbed sample		escriptio	n	Consistency / relative density	
HA W	4		auger			casing etratior	n		E environmental sample	based on	AS 1726	:2017	S soft F firm St stiff	
PT		push				3 5	1 − no re	sistance		dry	ndition		VSt stiff H hard	
					wat		rangi refus		N stand penetrofineter (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W	dry moist wet			Fb friable VL very loose	
* e.g	g	AD/T		suffix	-	- lev	Oct-12 w el on dat	e shown	Nc SPT with solid cone Wp VS vane shear; peak/remouded (kPa) WI	plastic l			L loose MD medium dense	
B T V		blank TC bi V bit			_		ter inflow ter outflo		R refusal HB hammer bouncing				D dense VD very dense	

CDF_0_9_07_LIBRARY.GLB rev:AU Log COF BOREHOLE: NON CORED 754-SYDGE214942.GPJ <<DrawingFile>> 16/05



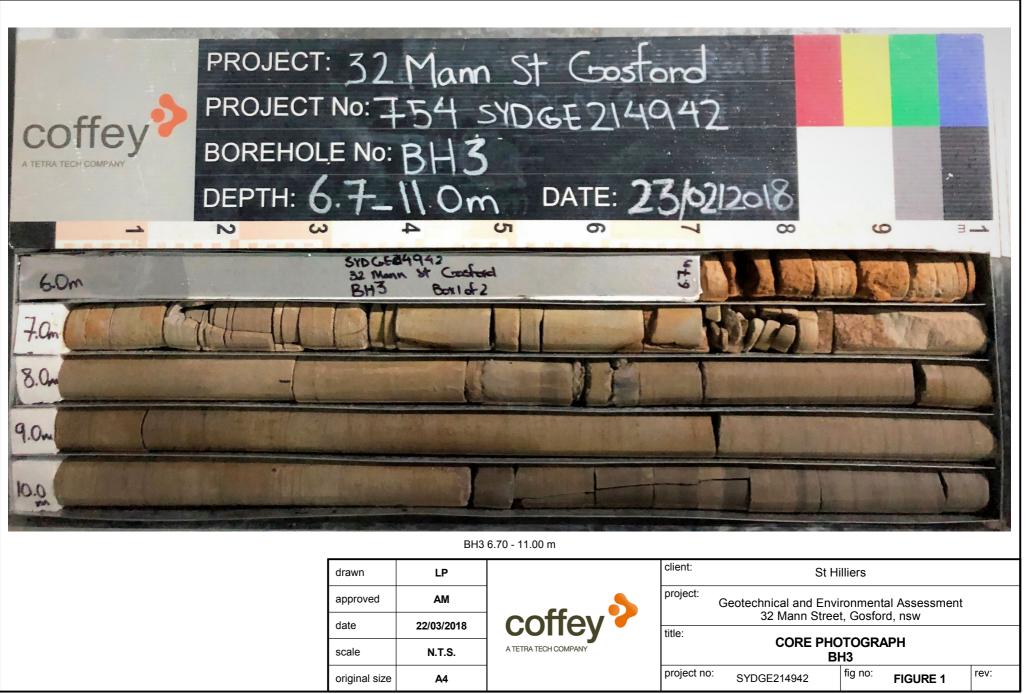
A TETRA TECH	COMPANY	Borehole ID.	BH3
Enai	nearing Lag Cared Parabala	sheet:	2 of 3
Engi	neering Log - Cored Borehole	project no.	SYDGE214942
client:	SH Gosford Residential Pty Ltd	date started:	23 Feb 2018
principal:		date completed:	23 Feb 2018
project:	Geotechnical and Environmental Assessment	logged by:	LP
location:	32 Mann Street, Gosford, NSW	checked by:	AM

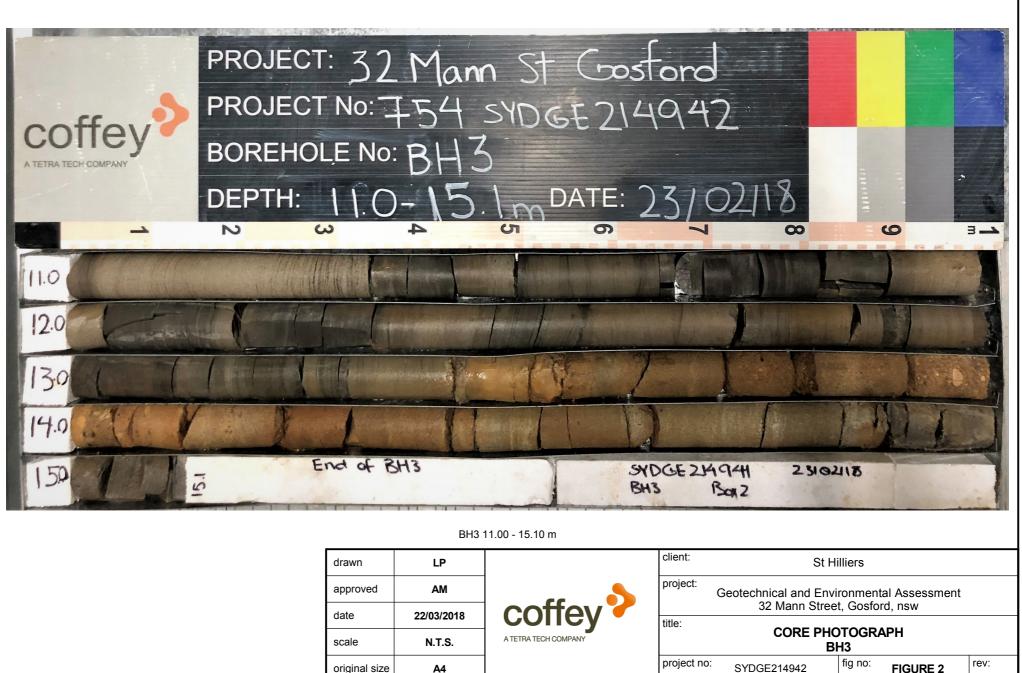
						rface elevation: 4.	00 m (A	HD)		-	e from horiz		
		aei: Geo g inform	-			lling fluid: Water					diameter : 1		
method &			depth (m)	graphic log	rial substance material descriptio ROCK TYPE: grain charac colour, structure, minor con	cterisics,	weathering & alteration	estimated strength & Is50 X = axial; O = diametral	samples, field tests & Is(50) (MPa) a = axial; d = diametral	& RQD	defect spacing (mm)	additional observations ar defect descriptions (type, inclination, planarity, roughne thickness, other) particular	
CDF_0_9_07_LIBRARY.GLB rev.AU_Log_COF_BOREHOLE: CORED_754-SYDGE214942.GPJ_< <drawingfile>> 16/08/2019_09:29</drawingfile>	20 No. 10 No.	* <u>c</u> 		5					d = diametral	8		particular	general
	ared	2 	6.0 — - - - - - - - - - - - - - - - - - - -	· · · · · · · · · · · · · · · · · · ·	started coring at 6.70m SANDSTONE: fine grained, oran brown-grey, laminated, iron stain	ing present.	XW		a=0.47			=— JT, 45°, PL, RO, CO — SM, PL, SO, CO, 30 mm	- - - - - - - - - - -
CDF_0_9_07_LIBF	Not Encountered		-		7.00 m: colour changes to pale g iron stains SANDSTONE: fine grained, pale bedded, trace of iron stains.		XW DW		a=0.47 d=0.05 a=1.62 d=1.56	13% 84%	┉╦╢╢╫┽┠╴╴╴╴ ╴╴╴╴╴╴╴╴╴╴	— JT, 85°, IR, RO, CO - Fe	-
A C V R N N	S D B / R MLC Q Q Q	d & supp auger sc auger dri claw or b washbor rock rolle NMLC ac wireline o wireline o wireline o bush tube	rewing lling lade bit e ore (51.9 core (51.9 core (47.0 core (63.0 core (85.0	mm) 6mm) 5mm)	support C casing M mud N none water ↓ 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss partial drilling fluid loss partial drilling fluid loss	core run & RQD	covered nbols indicate recovere rithdrawn	material) d	MW moder	al soil nely wea weather ately we v weather whith A for a w n gh	athered red sathered ared ilteration	defect type planarity PT parting PL plar JT joint CU cun SS shear surface UN und ZS shear zone ST step CO contact IR irreg CS crushed seam SM seam roughness coating VR very rough SN stai SO smooth VN ven POL polished CO coa SL slickensided SL	iar red ulating iped jular n ned eer



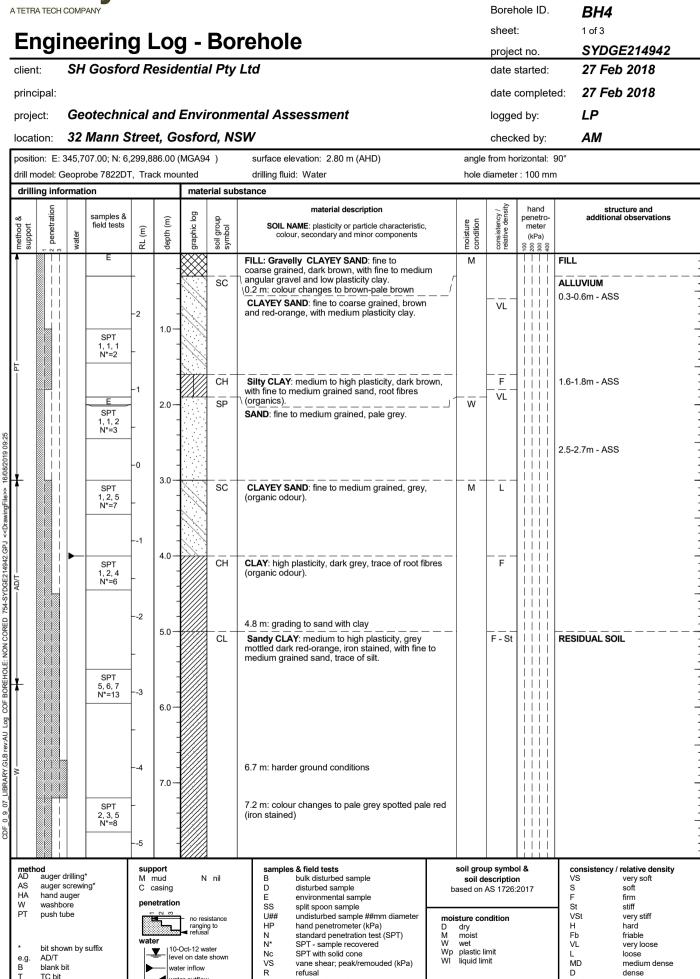
A TETRA TECH	COMPANY	Borehole ID.	BH3
Engi	nearing Lag Cared Parabala	sheet:	3 of 3
Engi	neering Log - Cored Borehole	project no.	SYDGE214942
client:	SH Gosford Residential Pty Ltd	date started:	23 Feb 2018
principal:		date completed:	23 Feb 2018
project:	Geotechnical and Environmental Assessment	logged by:	LP
location:	32 Mann Street, Gosford, NSW	checked by:	АМ

pos	sitio	n:				5,299,767.29 (MGA94) su	face elevation: 4.	00 m (A	(HD)		and	e from horiz	-	
T				,	,	, , , ,	ling fluid: Water		,			diameter : 1		
dr	illin	g ir	nform	ation	mate	erial substance					rock	mass defe	cts	
method &	support	water	•RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain charac colour, structure, minor com	terisics,	weathering & alteration	estimated strength & Is50 × = axial; o = diametral ⇒	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm)	additional obse defect des (type, inclination, planari thickness particular	criptions ty, roughness, coating,
			-4	-	· · · · ·	SANDSTONE: fine grained, pale bedded, trace of iron stains. <i>(con</i>		SW						
			_	-		CLAYSTONE: grey, laminated, w sandstone.	ith interbeds of						← PT, UN, RO, CN ← SM, PL, SO, CO ← SM, PL, SO, CO	
			5	9.0 —		SANDSTONE: fine grained, pale interlaminated with grey siltstone.			 	a=2.22 d=1.86			— PT, UN, SO, CN — PT, UN, SO, CN	-
			_	-		SANDSTONE: fine grained, grey,	bedded.			u 1.00	84%			
				-	· · · · ·					a=1.73 d=2.05			-	
			6	10.0										-
9:29			_	-		\10.44 to 10.49 m: claystone, dark		SW - DW SW		a=2.10 d=1.50				0
COF BOREHOLE: CORED 754-SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:29 </drawingfile>		be	7	- 11.0 —		∖siltstone. ∖SILTSTONE: grey, interlaminated ∖claystone.	/			a=1.24 d=0.77		U _1 P _1 U _1	- -	0 - 5°, PL, RO - SO, CN - CO otherwise described
gFile>> 16 W		Encountered	-	-		SANDSTONE: fine grained, pale bedded.	/			a=1.71 d=1.40			-	PL, RO vise desc
< <drawing< td=""><td></td><td>Not</td><td>_</td><td>-</td><td> · ·</td><td>SILTSTONE: grey-dark grey, inte with claystone.</td><td>rlaminated</td><td></td><td>ା ୧</td><td>a=0.45 d=0.06</td><td></td><td></td><td>-</td><td>T, 0 - 5°, ss otherv</td></drawing<>		Not	_	-	· ·	SILTSTONE: grey-dark grey, inte with claystone.	rlaminated		ା ୧	a=0.45 d=0.06			-	T, 0 - 5°, ss otherv
1942.GPJ			8	12.0 —	· · · ·					u=0.00	80%		PT, UN, SO, CN	Defects are: PT, unless
SYDGE214			-	-									-	Defec
RED 754-5			9	13.0 —	 								PT, IR, SO, CN	-
HOLE: CU			_	-	 	SANDSTONE: fine to medium gra	ained, grey	DW -					PT, UN, SO, CN PT, UN, SO, CO SM, SO, CO PT, UN, RO, CO	
OF BORE			10	- 14.0 —		stained red-orange, bedded, trac	e of gravel.	XW		a=0.84 d=0.50			- PT, CU, SO, CN - PT, CU, SO, CN - PT, 0°, UN, SO - RO,	CN
				-	· · · · ·						52%		= - PT, CU, SO - RO, CN PT, UN, SO - RO, CN	
Y.GLB rev			-	-						a=1.37 d=0.94				
BRAH			11	15.0 —		SILTSTONE: grey, thinly bedded.		SW				5 	-	
CDF_0_9_07_LIBRARY.GLB rev.AU Log			_			Borehole BH3 terminated at 15.1	0 m							
A A C W R N N	S D B / R MLC	aug cla va roc NN win	ger dri w or b shbor k rolle /ILC co eline o	rewing Iling lade bit e r ore (51.9 core (47.	6mm)	support C casing M mud N none water 10/10/12, water level on date shown water inflow complete drilling fluid loss	graphic log / con core rec (graphic syn no core core run & RQD	overed abols indicate	e material)	HW highly MW model SW slightly FR fresh *W replaced w strength	al soil nely wea weathe rately we weathe weathe ith A for a	athered red eathered ered	defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam	planarity PL planar CU curved UN undulating ST stepped IR Irregular
H P P	Q	wir		core (63 core (85		water pressure test result (lugeons) for depth interval shown	RQD = Rock Qu			VL very lov L low M mediur H high VH very hig EH extrem	n gh		roughness VR very rough RO rough SO smooth POL polished SL slickensided	coating CN clean SN stained VN veneer CO coating









very dense

VD

water outflow

Vbi

HB

hammer bouncing



ATETR	RA TECH	COM	PANY							Во	reh	ole ID.		BH4	
F	nai	n	orin			a -	R۸	rehole		she	eet	-		2 of 3	
	iyi			-		-				pro	ojec	ct no.		SYDGE214942	2
clier	nt:	Sł	l Gosfo	ord R	Resid	entia	al Pty	Ltd		dat	te s	started:		27 Feb 2018	
prin	cipal:									dat	te c	complet	ed:	27 Feb 2018	
proj	ect:	Ge	eotechn	nical	and	Envi	ronm	ental Assessment		log	ge	d by:		LP	
loca	ition:	32	Mann	Stre	et, G	osfo	rd, N	SW		che	eck	ed by:		АМ	
posit	ion: E:	345,	707.00; N: 6	6,299,8	386.00	(MGA9	4)	surface elevation: 2.80 m (AHD)	а	ngle from	ו ho	rizontal:	90°		
		· ·	robe 7822D)T, Tra	ack mo	-		drilling fluid: Water	h	ole diame	eter	: 100 mi	m		
dril	ling inf	orma	tion			mate	erial sul				≥	h a sa d			
method & support	penetration	water	samples 8 field tests		depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture	condition consistency /	relative densi	hand penetro- meter (kPa) § § § §		structure and additional observations	S
	0 0 0						CL	Sandy CLAY: medium to high plasticity, grey mottled dark red-orange, iron stained, with fine to		M F-			RES	SIDUAL SOIL	
				-				motiled dark red-orange, iron stained, with line to medium grained sand, trace of silt. (continued)	.0						
			SPT 3, 3, 6	6	9.0-			8.7 m: colour changes to pale grey mottled red-orange							
			N*=9	-	0.0										
	7 7 10.0 7 10.0 7 10.0														
									VSt						
									VSt	- 1 1					
 ∧															
				8											
					11.0-										
				-				11.2 m: ground gets harder							
			SPT 11, 14, 20	9											
			N*=34		12.0-										
				-		V///									
				10	13.0-										
•						<i>¥////</i>		Borehole BH4 continued as cored hole							
M								blendie brie continued as cored note							
				11		1						İİİİ			
	111				14.0-	-									
				F		1									
						1									
				12		-									
					15.0 -	1									
						1									
						-									
	13 -					1									
meti AD AS HA W PT	auger auger			n	l nil sistance ng to al	nil B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter to HP hand penetrometer (kPa) D d			soil group symbol & soil description based on AS 1726:2017 moisture condition D dry			consistency / relative densi VS Very soft S soft F firm St stiff VSt very stiff H hard Fb friable	ty		
*	bit sho AD/T	own by	/ suffix	wa	▼ 10	-Oct-12 w		N* SPT - sample recovered Nc SPT with solid cone	W we Wp pla	t stic limit				VL very loose L loose	
e.g. B T	blank TC bit			level on date shown VS vane shear; peak/remouded (kPa) Wi liquid lin water inflow R refusal						ud limit				MD medium dens D dense	se
v	V bit			-	- wa	ter outflow	N	HB hammer bouncing					\ \	VD very dense	



A TETRA TECH	ICOMPANY	Borehole ID.	BH4
Engi	nearing Log Cared Parabala	sheet:	3 of 3
Engi	neering Log - Cored Borehole	project no.	SYDGE214942
client:	SH Gosford Residential Pty Ltd	date started:	27 Feb 2018
principal:		date completed:	27 Feb 2018
project:	Geotechnical and Environmental Assessment	logged by:	LP
location:	32 Mann Street, Gosford, NSW	checked by:	AM

							rface elevation: 2.8	80 m (A	HD)		angl	e from horiz	ontal: 90°		
- H					_		lling fluid: Water					diameter : 1			
┢	drilli	ng ir	nform	ation	mate	rial substance	-				rock	mass defe		t	
	support &	water	RL (m)	depth (m)	graphic log	material descriptio ROCK TYPE: grain charac colour, structure, minor con	cterisics,	weathering & alteration	estimated strength & Is50 X = axial; O = diametral	samples, field tests & Is(50) (MPa) a = axial:	core run & RQD	defect spacing (mm)	defect d (type, inclination, plana thickne	servations and escriptions arity, roughness, c ss, other)	coating,
┢	e ns	wa	RL	de	gra			alte	╡┘ᅙェ⋛册	a = axial; d = diametral	8 ∞	300 3 4 9 3 3 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 3 4 9 4 9	particular		general
			6	- - 9.0 - -											-
			7	- - 10.0 — -											-
e>> 16/08/2019 09:29			8	- - 11.0 — -											-
CDF_0_9_07_LIBRARY.GLB rev.AU_Log_COF BOREHOLE: CORED_754-SYDGE214942.GPJ_< <drawingfile>>_16/08/2019_09:29</drawingfile>			9	- - 12.0 — -											-
DRED 754-SYDG			10	- 13.0 —		started coring at 13.20m							JT, 85°, PL, CN		-
F BOREHOLE: C(11	-		SANDSTONE: fine grained, pale stained, interbedded with extrem sandstone. NO CORE: 0.15 m		DW XW DW XW							otherwise described States of the second states of
3 rev:AU Log CO	NMLC.		_	14.0 — - -		SANDSTONE: fine grained, pale stained, interbedded with extrem sandstone. NO CORE: 0.21 m	grey, iron ely weathered				21%		+ PT, 0°, PL, SO - RC PT, 0°, PL, SO - RC PT, 0°, PL, SO - RC	, CN	■ Defects are: PT, 0 - 5 unless otherwise
07_LIBRARY.GL	•		12 -	- 15.0 -	· · · · · · · · · · · · · · ·	SANDSTONE: fine grained, pale stained, orange, bedded. Borehole BH4 terminated at 15.0				a=1.57 d=0.81			- PT, 0 - 5°, PL, SO -	RO, CN - SN	
CDF_0_9_			13								0		defeation -	n Januari da s	-
	AS AD CB W RR	aug cla wa roc CNN wir	shbore k rolle /ILC co eline c	rewing lling lade bit e	6mm)	support C casing M mud N none water 10/10/12, water level on date shown water inflow complete drilling fluid loss	n id loss core run & ROD id loss					athered red eathered ered	defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam	planarity PL planar CU curved UN undulatir ST stepped IR Irregular	Ť
	PQ PT	wir	reline c	ore (85.	0mm)	water pressure test result (lugeons) for depth interval shown	a loss core run & RQD VL very low bass barrel withdrawn L low barrel withdrawn M medium				n gh		roughness VR very rough RO rough SO smooth POL polished SL slickensided	coating CN clean SN stained VN veneer CO coating	



BH4 13.20 - 15.00 m

drawn	LP		client:	St H	illiers			
approved	AM		project:	Geotechnical and Envi 32 Mann Stree				
date	22/03/2018	coffey 7	title:	2				
scale	N.T.S.	A TETRA TECH COMPANY		CORE PHC BI	DTOGRA H4	NPH		
original size	A4		project no:	SYDGE214942	fig no:	FIGURE 1	rev:	



A٦	TETR.	A TECH	COMP	ANY							Boreł	nole	ID.		BH5		
	=r	hai	no	orin	~ I	~	2	B A	rabala		sheet	:			1 of 3		
_		iyi			-		-		rehole		proje	ct n	0.		SYDG	E214942	
С	lien	t:	SH	Gosfor	rd R	esid	entia	l Pty	Ltd		date	star	ted:		28 Fel	b 2018	
р	rinc	ipal:									date o	com	plete	ed:	28 Fel	b 2018	
р	oroje	ect:	Ge	otechni	ical	and	Envi	ronm	ental Assessment		logge	d b	y:		LP		
lo	ocat	tion:	32	Mann S	tree	et, G	osfo	rd, N	SW		check	ked	by:		АМ		
р	ositio	on: E:	345,7	11.00; N: 6,	,299,8	25.00	(MGA9	4)	surface elevation: 2.70 m (AHD)	angle	from ho	orizo	ntal:	90°			
				be 7822D1	r, Tra	ck mou	-		drilling fluid: Water	hole d	liametei	r:1(00 mr	n			
H	drilli	ing info	ormati	on			mate	erial sub			≿		1				
م ت	8 フ モ	penetration		samples & field tests	_	(L	c log	dno _c	material description SOIL NAME: plasticity or particle characteristic,	ion	ency / densit	per	and netro- leter			cture and al observations	
method	support	pene	water		RL (m)	depth (m)	graphic log	soil group symbol	colour, secondary and minor components	moisture condition	consistency / relative density	(ŀ	kPa) ₹ 8 8 8				
Ī		3 5 7			_				FILL: Gravelly SILTY SAND: fine to coarse grained, brown-red, trace ceramics	M	02		10.4	FILL	0.6ppm		-
						-			fragments.					FID.	0.0ppm		-
					-2	-		CL	Sandy CLAY: medium to high plasticity, grey-brown, trace of organics with fine to coarse		s			ALLU	JVIUM		
					_	1.0-			grained sand.					PID:	2.0ppm		-
				SPT 3, 2, 1	_	-											
μ				N*=3	-	-						İ					-
								СН	Silty CLAY : medium to high plasticity, dark brown-black, trace of root fibres.			l i i		PID:	0.8ppm		-
																	-
																	-
8 0 a. z							<u>KNU</u>	sc	CLAYEY SAND: fine to coarse grained, pale grey,		– <u>–</u> –				1.0		-
/02/20/	CASING			SPT	-0	-			medium to high plasticity clay.			İ		PID:	1.3ppm		-
	-			SPT 1, 2, 3		3.0-						l i i					-
VINGFIIE				N*=5		-											-
<					1	-											-
C - D - J		İ				4.0-								L			
AD/T —		4.0					$\langle / / /$	CL	Sandy CLAY: medium to high plasticity, grey mottled orange.	St	i		RESI	DUAL SO	IL	-	
				N*=11	_	-										_	
t i					2	-										-	
COKE						5.0-	$\langle / / /$										-
					-	-											-
	¥.			SPT		-			5.4 m: colour change to red mottled orange-grey			İ					-
F BUR				3, 3, 7 N*=10	3	-	$\langle / / /$		spotted orange, trace of silt and fine grained sand.								-
ר ק					L	6.0-	¥////										
						-	$\mathbb{V}//\mathbb{V}$										-
M					4	-	V///				VSt						-
KARY.						7.0-	V///				vst						-
				SPT 6, 8, 10	-	-	$\mathbb{V}//\mathbb{V}$										-
				N*=18		-											-
3					5	-	$\mathbb{V}///$										-
H	meth	iod		 	sun	port	<u> </u>	1	samples & field tests	soil grou	VSt				nsistency /	relative density	
Ľ	AD AS	auger auger	screwi		Mi		N	nil	B bulk disturbed sample	soil de	escriptio	n	7	VS S		very soft	
1	HA W	hand a washb	ore			etration	ı	E environmental sample SS split spoon sample						F St		firm stiff	
	PT	push t	ude	ranging to HP hand penetrometer (kPa) D dry						dry	ndition			VS H		very stiff hard	
	*	bit sho	wn by	suffix	wate	10-	- Oct-12 w	ater	N standard penetration test (SPT) M moist N* SPT - sample recovered W wet					bist Fb friable t VL very loose		very loose	
	e.g. B	AD/T blank l				- lev	el on date ter inflow	e shown	NC SPT with solid cone VVP plastic minit VS vane shear; peak/remouded (kPa) VI liquid limit					L MI D	D	loose medium dense dense	
	T V	TC bit V bit			-	wat	ter outflov	v	R refusal HB hammer bouncing					VE)	very dense	



ATE	ETRA	TECH (OMF	ANY							Boreh	nole ID.		BH5	
-		~:-			~		-			sheet	:		2 of 3		
	n	gii	ne	erin	g I	LΟį	g -	B 0	rehole		projec	ct no.		SYDGE214942	
cli	ent:		SH	Gosfo	rd R	esid	lentia	al Pty	Ltd		date s	started:		28 Feb 2018	
pr	incip	oal:									date o	complet	ted:	28 Feb 2018	
pr	ojec	t:	Ge	otechn	ical	and	Envi	ronn	nental Assessment		logge	d by:		LP	
	, catio			Mann S								, xed by:		AM	
				11.00; N: 6					surface elevation: 2.70 m (AHD)	angle		orizontal:			
dri	ll mo	del: G	eopro	obe 7822D	T, Tra	ick moi	unted	,	drilling fluid: Water	-		: 100 m			
d	rillin	g info	rmati	ion			mate	erial sul	bstance				-		
8	Ŧ	penetration		samples & field tests		Ê	log :	<u>a</u> _	material description	2 5	ancy / density	hand penetro-		structure and additional observations	
method &	uppor	penet	water		RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	meter (kPa)			
	s	9.6 -	\$		œ	p		CH	CLAY : medium to high plasticity, grey-pale grey,	W	o ≝ VSt - H	200	-	DUAL SOIL	
					F		V///		spotted orange, trace of silt and fine grained sand. (continued)						-
≥				SPT	6		$\mathbb{V}//\mathbb{V}$								-
Í				6, 7, 13 N*=20			<i>\///</i>								•
					1	9.0-	$\mathbb{V}//\mathbb{V}$								
Ł							<i>\////</i>		9.3 m: started getting really hard	/					
					7				Borehole BH5 continued as cored hole						•
						10.0-	4								_
					F		1								
9 09:25							1								-
08/2019					8		-								•
~ 16/						11.0-	1								-
ingFile					Γ										
< <draw< td=""><td></td><td></td><td></td><td></td><td>9</td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></draw<>					9		-								-
GPJ						12.0-									
214942					-		-								
SYDGE							1								
0 754-9					10		1								•
COREL						13.0-	-								-
NON					F		1								
EHOLE															-
F BORE					11		-								
og CO						14.0-									-
CDF_0_9_07_LIBRARY.GLB revAU_Log_COF BOREHOLE: NON CORED_754-SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:25</drawingfile>						.	-								
GLB rev					12		1								
RAY.C						15.0-	1					İİİİ			_
07_LIBI					-		-								-
6 0							1								_
CDF					13										
	netho	i i i			eur	port			samples & field tests	soil area	up symbo			nsistency / relative density	
A A	Da Sa	auger d auger s	crewi		Μ	mud casing	N	l nil	B bulk disturbed sample D disturbed sample		escription	n	VS S		
H. W	/ \	hand au washbo	re			etration	n		E environmental sample SS split spoon sample		20.		F St	firm stiff	
P.	1	oush tu	be				no res rangir	sistance ng to	HP hand penetrometer (kPa) D		ndition		VS H	hard	
*		oit shov	vn by	suffix	wat	V 110-	– -Oct-12 w	ater	N standard penetration test (SPT) M N* SPT - sample recovered W No SPT with colid conc	V wet	limit		Fb VL	very loose	
e. B	.g. /	AD/T blank bi				- lev	vel on date	e shown		Vp plastic limit L loose VI liquid limit MD medium dense D dense					
T V		TC bit √ bit			-	- 🗸 wa	ter outflow	N	HB hammer bouncing						



A TETRA TECH	I COMPANY	Borehole ID.	BH5
Enai	incoring Log Cored Perchala	sheet:	3 of 3
Eng	neering Log - Cored Borehole	project no.	SYDGE214942
client:	SH Gosford Residential Pty Ltd	date started:	28 Feb 2018
principal:		date completed:	28 Feb 2018
project:	Geotechnical and Environmental Assessment	logged by:	LP
location:	32 Mann Street, Gosford, NSW	checked by:	АМ
position E	345.711.00: N: 6.299.825.00 (MGA94) surface elevation: 2.70 m (AHD)	angle from horizontal: 90°	

posi	tion:	E: 34	5,711.0	00; N: 6	,299,825.00 (MGA94) su	rface elevation: 2.	70 m (A	HD)		angl	e from horiz	ontal: 90°		
drill	mode	el: Geo	probe	7822D	T, Track mounted dr	illing fluid: Water		hole	diameter : ´	100 mm				
dril	ling i	nform	ation	mate	erial substance					rock	mass defe	cts		
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain chara colour, structure, minor con	cterisics,	weathering & alteration	estimated strength & Is50 X = axial; O = diametral	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm)	defect de (type, inclination, plana	ss, other)	ing, neral
	-	6	9.0											-
2		7			started coring at 9.40m SANDSTONE: fine to coarse gra stained, bedded, trace of fine gra		XW		a=0.61 d=0.61	84%		- → PT, 0°, PL, RO, CN → JT, 20°, UN, RO, CN → SM, 0°, PL, SO, CO, → SM, 0°, PL, SO, CO, → PT, 0°, UN, RO, CN	, 100 mm	- - - -
File>> 16/08/2019 09:2		8	- - 11.0 -		SANDSTONE: fine to medium gr grey, laminated orange-red.		DW		a=0.65 d=0.95 a=0.35 d=0.07			E CS, 0°, PL, RO, CO CS, 0°, UN, RO, CN PT, 0°, CU, SO, CN PT, 0°, CU, SO, CN FT, 0°, CU, SO, CN F PT, 0°, UN, SO, CN	ź	
ev.AU Log COF BORFHOLE: CORED 754-SYDGE214942.GPJ < <drammgfile>> 16/08/2019 09:29 NMLC</drammgfile>		9	- - 12.0 — -		SANDSTONE: fine to medium gr bedded.	ained, grey,	SW			51%		→ SM, 0°, PL, SO, CO, → SM, 5°, PL, SO, CO, → T, 2°, IR, SO, CN ↓ JT, 70°, IR, SO, CN	, 30 mm	s otherwise described
UKEU /94-SYDG		10	- - 13.0 — -		NO CORE: 0.35 m SANDSTONE: fine to medium gr red-orange.	ained,	XW		_			SM, 5°, PL, SO, CO, SZ, IR, CN, 70 mm PT, 3°, UN, SO, SN		- niess
OF BOREHOLE: C		11	- - 14.0 —						a=0.49 d=0.38]— JT, 60°, PL, RO, CN -]— JT, 75°, UN, RO, CN ₽— Fractured zone	RO	cribed I
		- 12	-		SANDSTONE: fine grained, grey		SW		a=0.58 d=0.10	12%	{; 	 Fractured 2016 TJT, 75°, PL, SO, SN, SN, 0°, PL, SO, CO, PT, 0 - 5°, UN - IR, F SM, 0°, PL, SO, CO, 	60 mm ਜੋ RO, CN مُنْ	nerwise
		- 13	- - -	· · · · ·	sandstone. Borehole BH5 terminated at 15.0				a=0.52 d=0.43			- >— SM, 0°, PL, SO, CO,	20 mm C L 30 mm S S S Q Q Q	- India
AS AD CB W RR	au au cla wa cla wa wa MLCNN (LCNN (LCNN) (L	ashbore ck rolle MLC co reline c reline c	rewing lling lade bit r re (51.9 ore (51.9 ore (47. ore (63. ore (85.	6mm) 5mm)	Support C casing M mud N none water 10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss partial drilling fluid loss	core run & RQD	covered nbols indicate recovere rithdrawn	ry material)		al soil nely wea weathe rately we y weathe ith A for a w n gh	athered red sathered sethered ered	defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam roughness VR very rough RO rough SO smooth POL polished SL slickensided	planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stained VN veneer CO coating	



original size

A4

project no:

SYDGE214942

rev:

FIGURE 1



drawn	LP		client:	St H	illiers		
approved	AM		project:	Geotechnical and Envi			
date	22/03/2018	coffey V	title:	32 Mann Stree	,	,	
scale	N.T.S.	A TETRA TECH COMPANY		CORE PHC BI)TOGRA H5	APH	
original size	A4		project no:	SYDGE214942	fig no:	FIGURE 2	rev:



A	TETR	A TECH C	COMP	ANY							Boreł	nole ID.		BH6	
	Fr	nai	no	orin	a I	0	a _	R۸	orehole		sheet	:		1 of 3	
_					<u> </u>						proje	ct no.		SYDGE2149	
(clien	it:	SH	Gosfor	rd R	esid	entia	al Pty	/ Ltd		date s	started:		01 Mar 2018	3
ł	orinc	cipal:									date o	complet	ed:	01 Mar 2018	3
I	oroje	ect:	Ge	otechni	ical a	and	Envi	ironm	nental Assessment		logge	d by:		LP	
I	ocat	tion:	32	Mann S	Stree	et, G	osfo	rd, N	ISW		check	ked by:		AM	
F	oositi	on: E:3	45,7	61.69; N: 6,	,299,7	96.39	(MGA9	4)	surface elevation: 4.00 m (AHD)	angle	from ho	orizontal:	90°		
H				be 7822D1	r, Tra	ck mou	i		drilling fluid: Water	hole o	diameter	r : 100 mr	n		
ł	ariiii	ing info	rmati	on				erial sur	material description		ţî,	hand		structure and	1
	a to	penetration		samples & field tests	Ē	(E	graphic log	dn or	SOIL NAME: plasticity or particle characteristic,	ure tion	tency a	penetro- meter		additional observa	
1	method & support	3 ben	water		RL (m)	depth (m)	graph	soil group symbol	colour, secondary and minor components	moisture condition	consistency / relative density	(kPa) 00 80 80 00 00 80 00			
ľ				E	4	-	$ \rangle$		TOPSOIL: SILTY SAND: fine to medium grained, brown-pale brown, trace of organics (root fibres).	М	L		TOPS	SOIL 0.0ppm	
						-		SP	SILTY SAND: fine to medium grained, dark					JVIUM	
						-			brown-black, trace of low plasticity clay and root fibres.						
				E	-3	1.0-							PID:	1.3ppm	-
				SPT 3, 3, 3		-									
ł	<u>-</u>			N*=6	-	-									
									Sandy CLAY: medium to high plasticity, grey-brown, with fine grained sand, trace of silt.	v5		PID:	1.0ppm		
									g j ,	$ -\overline{w} $	-				- -
8 08.Z													PID: 2	2.2ppm	
102/00	CASING					-	V///	СН	2.6 m: clay to sand ratio increases /	-	VSt		RESI	DUAL SOIL	
	ΤĬ			SPT	-1	3.0-			trace of tree root fibres.	- <u>m</u> -	-				
				5, 8, 10 N*=18		-	\mathbb{V}/\mathbb{V}								
NDISK					-	-									-
						- 4.0-									
14942				SPT 5, 7, 9	0	4.0	$\mathbb{V}//\mathbb{V}$								
				N*=16		-									
25						-									
					1	5.0-					- <u>-</u> -				-
NON						-			Silty CLAY : medium plasticity, pale grey-white mottled red-orange, trace of sand (iron stained).		п	1111			
	╞			SPT	+	-	VX//								- -
				5, 10, 15 N*=25		-									-
					2	6.0-									-
	\$														
LD EV.															-
9. FAK									Borehole BH6 continued as cored hole						
									Borenole BHo continued as cored note						-
							-								
5															
	meth AD AS	auger d auger s			Min		N	l nil	samples & field tests B bulk disturbed sample	soil de	up symbo escriptio	n	VS		
	AS HA W	hand au washbo	lger	ษ		casing etratior	ı		D disturbed sample b E environmental sample SS split spoon sample	based on a	AS 1726:	2017	S F St	soft firm stiff	
	PT	push tu				- <u>0</u> 0	no res	sistance ng to		i sture co i dry	ndition				
	*	hit ob -	un her	suffix	wate		rangir refusa		N standard penetration test (SPT) M N* SPT - sample recovered W	moist wet			Fb VL	friable	se
	e.g. B	bit shov AD/T blank bi		SUIIIX		- lev		el on date shown VS vane shear, peak/remouded (kPa) WI liquid limit L loo					loose D medium		
	T V	TC bit V bit			-		ter outflow		R refusal HB hammer bouncing				D VD	dense) very den	se



A TETRA TECH	I COMPANY	Borehole ID.	BH6
Enai	incoring Log Cored Porcholo	sheet:	2 of 4
Eng	neering Log - Cored Borehole	project no.	SYDGE214942
client:	SH Gosford Residential Pty Ltd	date started:	01 Mar 2018
principal:		date completed:	01 Mar 2018
project:	Geotechnical and Environmental Assessment	logged by:	LP
location:	32 Mann Street, Gosford, NSW	checked by:	AM

I	posit	ion:	E: 34	5,761.6	89; N: 6	,299,796.39 (MGA94) su) surface elevation: 4.00 m (AHD)								angle from horizontal: 90°				
	drill n	node	el: Geo	probe	7822D	T, Track mounted dri	illing fluid: Water						hole	diameter : ⁻	100 mm				
I	drilli	ing i	nform	ation	mate	rial substance							rock	mass defe	cts				
	method & support	water	RL (m)	depth (m)	graphic log	material descriptio ROCK TYPE: grain charac colour, structure, minor con	cterisics,	weathering & alteration	st 8	timateo rength ls50 = axial; diametra		samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	defect de (type, inclination, planar	ervations and scriptions rity, roughness, coating, s, other)			
L	an sul	wa	Ч Ч	deb	gre			alte	r K	Σ I ≯	Ш	a = axial; d = diametral	ö∞	30 300 3000 3000	particular	general			
I				_															
I				-															
I				-															
I				-												-			
I			-3	1.0-					¦		i			11111		-			
I				_															
I			-	-					ļį	İİ	i			11111					
I				-												-			
I			-2	2.0							!					-			
I				_					i	ii									
8																			
19 09.									ļį		i								
			-1	3.0							i					-			
				_												-			
II IAI II			-	-					ļį	İİ	i								
				-					1 :		: I -								
			-0	4.0 —												-			
404C				_					i	ii	i								
			-	-															
25				-												-			
			1	5.0 —					1 :	i i	i					-			
5				_															
			-	-															
				-					li		i					-			
2 R			2	6.0 —												-			
				_															
			F	-												-			
P.				-	11/1	started coring at 6.90m	-41-14	×14/		 - -									
			3	7.0		Silty CLAY: medium to high plas grey-white, with orange-red band		XW								Ī			
5	NMLC			_		sandstone/siltstone). 7.00 to 7.10 m: ironstone, fine to	medium grained				i		6%			-			
	N N		sand, red-dark red-black									0%							
								İİİ				<u> </u>		-					
ſ		nethod & support Support Crasing Minud Nigone				graphic log / core	e recove	ry		F	veathering RS residua	al soil		PT parting	planarity PL planar				
I	AD CB	CB claw or blade bit water			water	core rec				- H	W extrem	weathe	red	JT joint SS shear surface	CU curved UN undulating				
	W RR	wa roo	shbore ck rolle	e r		L 10/10/12, water level on date shown	(graphic sym	nbols indicate		.,	S F	WW moder SW slightly R fresh	weathe	ered	SZ shear zone CO contact CS crushed seam	ST stepped IR Irregular			
	NQ	wi	reline c	ore (51.9 ore (47.	6mm)	water inflow complete drilling fluid loss		recovere	Ju		ŝ	W replaced wi strength	th A for a	Iteration	SM seam				
	hq Pq	wii wii	eiine c reline c	ore (63. ore (85.	omm) 0mm)	partial drilling fluid loss	core run & RQD	ithdrawn			L	/L very lov low M medium			roughness VR very rough	coating CN clean			
	PT	pu	sh tube			water pressure test result (lugeons) for depth	RQD = Rock Qu			ion (%	۱ŀ	H high H very hig			RO rough SO smooth	SN stained VN veneer			
1						 interval shown 		-	-		Ē	EH extreme	ely high		POL polished	CO coating			



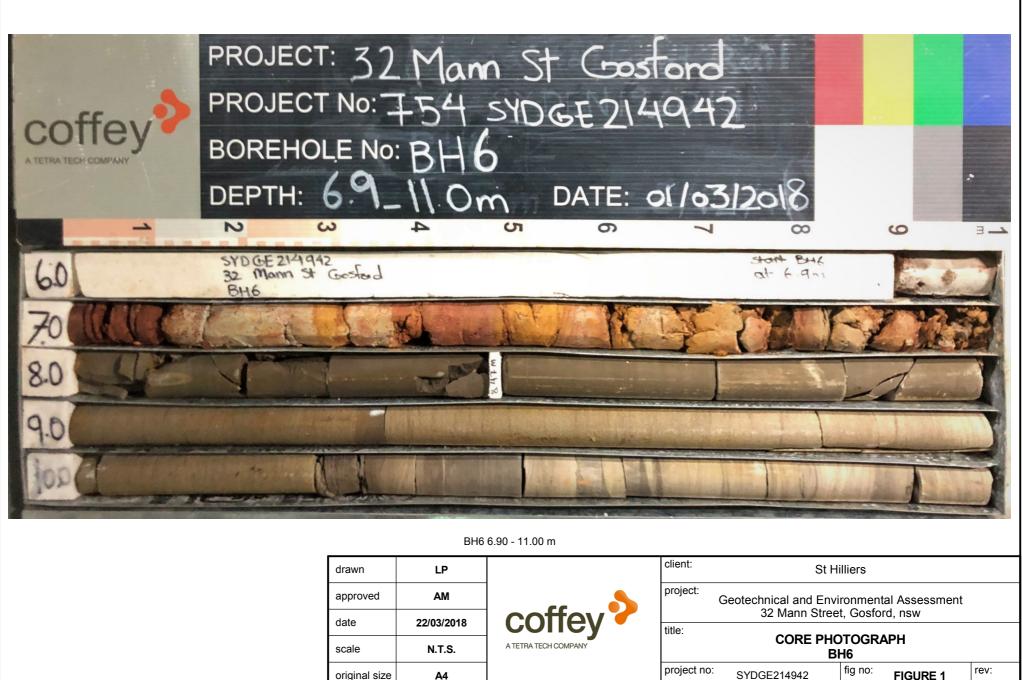
A TETRA TECH	COMPANY	Borehole ID.	BH6	
Enai	sheet:3 of 4project no.SYDGGosford Residential Pty Ltddate started:01 Max		3 of 4	
Engi	neering Log - Cored Borenole	project no.	SYDGE214942	
client:	SH Gosford Residential Pty Ltd	date started:	01 Mar 2018	
principal:		date completed:	01 Mar 2018	
project:	Geotechnical and Environmental Assessment	logged by:	LP	
location:	32 Mann Street, Gosford, NSW	checked by:	AM	
nasitian. E.	245 764 60: Nr 6 200 706 20 (MCA04.)	angle from berimentaly 00°		

positi	ion:	E: 34	5,761.6	89; N: 6	,299,796.39 (MGA94) su	rface elevation: 4.	HD)	angle from horizontal: 90°									
drill m	node	el: Geo	probe	7822D	T, Track mounted dri		hole diameter : 100 mm										
drilli	ng i	inform	ation	mate	rial substance			rock	mass defe	cts							
method & support	water	RL (m)	depth (m)	graphic log	material descriptio ROCK TYPE: grain charac colour, structure, minor con	cterisics,	weathering & alteration	estimated strength & Is50 × = axial; o = diametral	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm)	additional obs defect des (type, inclination, planar thickness particular	scriptions rity, roughness, coat	-			
	1	5	- - - 9.0		SILTSTONE: dark grey, thinly be SANDSTONE: fine to medium gr bedded.		SW - FR		a=0.90 d=0.48	6%		JT. 80°, IR, RO, CN, 9 PT, 0°, PL, SO, CO - JT, UN, SO, CN, 100 JT, IR, RO, CN, 100 JT, IR, RO, CN, 70 m PT, 0°, PL, SL, CN PT, 0°, PL, SL, CN JT, 75°, IR, SO, CN, 5 PT, 0°, PL, SL, CN	90 mm Clay, 5 mm mm mm mm				
		7 11	- - - 10.0 - -		SANDSTONE: grey-dark grey, in of fine grained, grey sandstone, siltstone?.		SW - FR		a=1.69 d=1.47 a=1.33 d=0.13	83%		PT, 0 - 3°, PL - IR, R(SM, 0°, PL, SO, CO - = =	D, CN Clay, 5 mm	CN ay, 5 mm			
0			- - - -						a=2.07 d=2.25 a=1.39 d=0.92			- PT, 0°, PL, SO - SL, (OO - NO OS Id	e described			
NMLC		8 - 9	12.0 — - - 13.0 —						a=3.62 d=0.85	41%		T, 85°, PL, SO - SL,	are: F				
		10	- - - 14.0 —		NO CORE: 0.09 m SANDSTONE: fine to coarse gra stained orange. NO CORE: 0.09 m SANDSTONE: fine to coarse gra stained orange. NO CORE: 0.09 m SANDSTONE: fine to medium gr	ined, grey,	SW - FR SW - FR DW DW		a=1.73 d=1.29			PT, 0°, CU, SO, CN PT, 0 - 2°, PL, RO, Cl JT, 90°, UN, RO, CN PT, 0°, PL, RO, CO SM, 0°, PL, CO SM, 0°, PL, CO	N				
		11	- - - 15.0 — - -		NO CORE: 0.04 m SANDSTONE: fine to medium gr 14.95 to 15.01 m: laminated silts 15.10 to 15.25 m: laminated silts 15.25 to 16.00 m: fine to coarse	ained, grey. tone/sandstone tone/sandstone			a=1.75 d=1.16	92%		- - - - - - - -	50 - RO, CN				
AS AD CB W RR	au cla va ro CNN wii wii wii	ireline c ireline c	ewing ling ade bit r re (51.9 ore (47 ore (63 ore (85	mm) 6mm) 5mm)	Borehole BH6 terminated at 16.00 support C casing M mud N none water I0/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss partial drilling fluid loss water pressure test result (lugeons) for depth interval shown	e recove covered nbols indicate recovere ithdrawn ality Des	enaterial)	a=1.00 weathering RS residu XW extrem HW highly MW model SW slightly FR fresh W replaced w strength VL very loi EH extrem	ial soil nely wea weathe rately we y weathe with A for a w n gh	athered red aathered ared alteration	☐ defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam roughness VR very rough RO rough SO smooth POL polished SL slickensided	Planarity PL planar CU curved UN undulating ST stepped IR Irregular coating CN clean SN stained VN veneer CO coating					



A TETRA TECH	H COMPANY	Borehole ID.	BH6		
Enai	incoring Log Cored Perebala	sheet:	4 of 4		
Eng	ineering Log - Cored Borehole	project no.	SYDGE214942		
client:	SH Gosford Residential Pty Ltd	date started:	01 Mar 2018		
principal:		date completed:	01 Mar 2018		
project:	Geotechnical and Environmental Assessment	logged by:	LP		
location:	32 Mann Street, Gosford, NSW	checked by:	АМ		

					rface elevation: 4. lling fluid: Water	.00 m (A	AHD)		-	e from horiz diameter : 1		
drill	ing inforn	nation	mate	erial substance	0		rock	mass defe	cts			
method & support	water SRL (m)	depth (m)	graphic log	material descriptio ROCK TYPE: grain charac colour, structure, minor com	terisics,	weathering & alteration	estimated strength & Is50 X = axial; O = diametral ⇒	samples, field tests & Is(50) (MPa) a = axial; d = diametral	core run & RQD	defect spacing (mm)	defect de (type, inclination, plana)	ervations and scriptions rity, roughness, coating s, other) genera
	12 13 14 15 16 16 17 18 18							d=0.28			₩ 5°, UN, SO, CO, SM, 5°, UN, SO, CO,	-
AS AD CB W RR NM NQ HQ	LCNMLC of wireline wireline	rrewing illing blade bit re ore (51.9 core (47.6 core (63.5	5mm)	support C casing M mud N none water 10/10/12, water level on date shown water inflow complete drilling fluid loss		covered mbols indicate	e material)	weathering RS residual XW extrem HW highly MW moder SW slightly FR fresh *W replaced with strength VL very low	al soil nely wea weather ately we weather th A for a	thered ed eathered ered	defect type PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam	planarity PL planar CU curved UN undulating ST stepped IR Irregular
PQ PT	wireline o	core (85.0)mm)	water pressure test result (lugeons) for depth interval shown	barrel w	core run & RQD VL very low Low Low M RQD = Rock Quality Designation (%) VH very hig EH extreme					roughness VR very rough RO rough SO smooth POL polished SL slickensided	coating CN clean SN stained VN veneer CO coating





BH6

SYDGE214942

fig no:

FIGURE 2

rev:

project no:

scale

original size

N.T.S.

A4



TETR	A TECH (ANY							Boreł	nole l	D.	BH7	
┍.	1		!	~	_					sheet	t:		1 of 3	
Er	ngi	ne	erin	<u>g</u> L	-0(g -	BO	rehole		proje	ct no.		SYDGE214942	
clien	Slient: SH Gosford Residential Pty Ltd												02 Mar 2018	
princ	principal:											leted:	02 Mar 2018	
proje	ect:	Ge	otechn	ical a	and	Envi	ronm	ental Assessment		logge	d by:		LP	
locat	tion:	32	Mann S	Stree	et, Go	osfol	rd, N	SW		checł	ked b	y:	АМ	
positi			10.50; N: 6		-		-	surface elevation: 2.50 m (AHD)	angle	from ho	orizont	al: 90°		
drill m	nodel: G	eopro	be 7822D	T, Tra	ck mou	unted		drilling fluid: Water	hole c	diamete	r : 100	mm		
drilli	ing info	rmati	on			mate	erial sul			>.		.		
method & support	penetratio	Solution Samples & field tests Image: Color of the second									2000 km model consistency / consistency / consistency / meter as 200 (kba) (structure and additional observations	
E J	3 2 1	Ŵ	E	R	- de	5	S S	FILL: Gravelly SAND: fine to coarse grained, dark brown, fine to medium angular gravel, trace of clay	M moisture condition	o e	100	FIL	L D: 2.5ppm	
				-2	-			and ceramics. FILL: Gravelly SAND: fine to coarse grained, pale						
					-			brown-orange, medium to coarse angular gravel.						
			SPT 2, 1, 1	Ť	1.0		CL	Sandy CLAY: medium to high plasticity, dark brown, with fine grained sand, trace of silt.		VS		AL		
Ī			2, 1, 1 N*=2 E	-1	-			,,						
					-								D: 1.6ppm	
			SPT	-	2.0 —	////	SC CL	SAND: fine to medium grained, grey, trace of low	$+\overline{w}$ -			i i 🛏 –	RESIDUAL SOIL	
			1, 1, 4 N*=5		-			Sandy CLAY: medium to high plasticity, grey, with fine to medium grained sand, trace of silt, root fibres and organics.						
			E	-0	-			2.5 m: colour change to grey mottled red-orange					D: 2.2ppm	
			E	1	- 3.0 —					-		PIE	D: 1.5ppm	
		2, 3, 3 N*=6		, 3, 3		СН		CLAY: medium to high plasticity, grey, mottled orange, red.	M					
				1	-									
					-									
			SPT 3, 3, 4		4.0									
			N*=7	2	-									
					-									
				-	5.0 —		CL	Sandy CLAY: low plasticity, pale grey-white mottled red-orange, fine to coarse grained sand, trace of extremely weathered incostone gravel		St - VSI				
Ì					-			uace of externely weathered nonstone gravel.	remely weathered ironstone gravel.					
			SPT 9, 10, 16,	3	-									
			N*=26	_	6.0-									
					-									
				4	-					<u> н</u> –				
					-									
				F	7.0	V///								
				5	-									
					-	V////								
mot	und und			sup	nort	V/////		samples & field tests	soil grou	ID event	ii		consistancy / mating density	
meth AD AS	auger o auger s	crewir		Min		N	nil	B bulk disturbed sample D disturbed sample	-	escriptio	n		consistency / relative density VS very soft S soft	
HA W PT	hand a washbo push tu	ore			etration			E environmental sample SS split spoon sample			•	;	F firm St stiff	
	pusiriu					rangir	sistance ig to il	HP hand penetrometer (kPa) D	dry moist	ndition			VSt very stiff H hard Fb friable	
* e.g.	bit shov AD/T	wn by s	suffix	water N* standard penetration test (SPT) M M moi īx 10-Oct-12 water N* SPT - sample recovered W W water N SPT - sample recovered W W W W									VL very loose L loose	
е.g. В Т	blank b	it			wat	er inflow		VS vane shear; peak/remouded (kPa) WI R refusal HB hammer bouncing	liquid lin	TIIT			MD medium dense D dense VD very dense	



ATE	A TETRA TECH COMPANY												ID.		BH7			
-	'	~:.	~ ~	orio	~		~	Da	rahala		sheet	t:		2	2 of 3			
	n	gii	ne	erin	<u>g</u> I	_ O	g -	B 0	orehole		proje	ct no			SYDG	E214942		
clie	ent:		SH	Gosfo	rd R	esid	entia	al Pty	r Ltd		date	starte	ed:	(02 Ma	r 2018		
prii	ncip	oal:									date	comp	olete	ed: (02 Ma	r 2018		
pro	ojec	t:	Ge	otechn	ical	and	Envi	ronm	nental Assessment	tal Assessment						LP		
loc	atic	on:	32	Mann S	Stree	et, G	osfo	rd, N	'SW		checl	ked b	oy:		AM			
pos	sitior	n: E:3	45,7	10.50; N: 6	,299,7	59.90	(MGA9	4)	surface elevation: 2.50 m (AHD)									
drill	mo	del: G	eopro	obe 7822D	T, Tra	ick mou	unted		drilling fluid: Water	hole d	liamete	r : 100) mn	n				
dr	illing	g info	rmati	ion			mate	erial sul	bstance		È	l						
method &	uoddr	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	har pene met	etro- ter Pa)	structure and additional observations			•	
E	S SI	- 7 6	Ś		Ľ	ÿ	Б /////	ଧ ଜ CL	Sandy CLAY: low plasticity, pale grey-white	е 8 М	8 e	100		RESID	UAL SO	NL	-	
- AD/T -					6				mottled red-orange, fine to coarse grained sand, trace of extremely weathered ironstone gravel. (continued)				11					
									Borehole BH7 continued as cored hole									
					-	9.0-	-						ΪÌ.				- -	
						-							ÌÌ.					
					7	-	-					li i	1.1				-	
						- 10.0 —												
						10.0-												
9:25																		
3/2019 (-												
> 16/08					-	11.0-	-						ÌÌ.				-	
gFile>						-						lii.					-	
 Drawir		ΪΪ.			9		-										-	
GPJ <																	-	
214942.						12.0-										-		
YDGE					10	-												
0 754-5																	-	
COREL					-	13.0-	-											
NON						-												
KEHOLE					11		-										-	
DF BOF						-							Ιİ.					
CDF_0_9_07_LIBRARY GLB revAU_Log_COF BOREHOLE: NON CORED_754-SYDGE214942.GPJ_< <drawingfile>>_16/08/2019.09:25</drawingfile>						14.0-	-						Ιİ.					
ev:AU										11	Ϊİ.				-			
Y.GLB r												ii.				-		
IBRAR																-		
9_07_L															-			
DF_0																-		
0													11					
AD AS HA W PT * e.g B	5 a \	auger d auger s hand au washbo bush tu bit shov AD/T blank bi	crewi uger re be wn by	ng*	M C o pen	▼ 10- lev	ı	ater	B bulk disturbed sample base D disturbed sample base E environmental sample base SS split spoon sample undisturbed sample ##mm diameter HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W Nc SPT with solid cone WP	soil grou soil de ased on / ature cor dry moist wet plastic li liquid lim	adition	n		con VS S F St VSt H Fb VL L MD D	sistency /	/ relative densit very soft soft firm stiff very stiff hard friable very loose loose medium dens dense	-	
T V		FC bit / bit				- wa	ter outflow	N	HB hammer bouncing						D dense VD very dense			



-6 started coring at 8.60m SANDSTONE: fine grained, pale gray, iron -7 started coring at 8.60m -8 started coring at 8.60m -9 started coring at 8.60m -10 started coring at 8.		7			C	y															
Engineering Log - Corect Borehole project Sydce214942 client: SH Gosford Residential Pty Lid date started: 02 Mar 2018 principal: codechnical and Environmental Assessment Logad by: LP tractacion: 32 Main Street, Gosford, NSW checked by: AM predict: 543/10/6/14/2 (2017) sufficient elvestion: 2.0 m (HD) angle from hotocostil: 90" tilling information metrini stated elserginin Image from hotocostil: 90" ball care elvestion: 2.0 m (HD) tilling information metrini stated elserginin Image from tocostil: 90" ball care elvestion: 90" in angle from tocostil: 90" ball care elvestion: comment of the tocostil: 90" tilling information metrini stated elserginin Image from tocostil: 90" ball care elvestion: sufficient downood on an general stated elserginin Image from tocostil: 90" ball care elvestion: sufficient downood on an general stated elserginin Image from tocostil: 90" ball care elvestion: sufficient downood on an general stated elserginin Image from tocostil: 90" sufficient downood on an general stated elserginin Image from tocostil: 90" sufficient downood on an general state elserginin Image from tocosti: 90" Image from tocostil: 90" </th <th>ATE</th> <th>ETR/</th> <th>A TEC</th> <th>CH CO</th> <th>MPANY</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>Boreho</th> <th>le ID.</th> <th>BH7</th> <th></th>	ATE	ETR/	A TEC	CH CO	MPANY								Boreho	le ID.	BH7						
client: SH Gosford Residential Pty Ltd date standard: 02 Mar 2018 principal: date standard: 02 Mar 2018 principal: date standard: 02 Mar 2018 principal: date completed: 02 Mar 2018 principal: date completed: 02 Mar 2018 principal: LP principal: LP principal: and to standard	F	: F	n	in	۵۵	rin	a Loa - Core	d Rorah	امر	۵			sheet:		3 of 3						
ministriction data control 20000 data control 20000 data	_	_!	iy										project	no.		2					
project: Besterning and Environmental Assessment tester 20 Ann Street, Gosford, NSW medice: Eds371050; N.6.289,75950 MCMAB project: Eds371050; N.6.289,75950 MCMAB medice: Eds371050; N.6.289,75950 MCMAB	cli	en	t:	S	ΗG	osfo	rd Residential Pty Ltd						date sta	arted:	02 Mar 2018						
Lichtom: 24 Mann Street, Gosford, NSW Indice Keyster Add preter: List 36,710,50, N. 8,209,759,80 (McA4k) indice Keyster indice Key	pr	inc	ipal	:									date co	mpleted:	02 Mar 2018						
pediton: E: 945,710.50, N. 6,289,759.30 (MSA94) surface etervation: 2.50 m (MHD) angle from horizontal: 30" diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Track mounted diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 10 mm diffing informatic Response 782/07, Fr. 10, 80, 70, 70, 70, 70, 70, 70, 70, 70, 70, 7	pr	oje	ct:	G	Geote	echn	ical and Environmenta	al Assessme	ent				logged	by:	LP						
drill model: Copyreptive 782201. Travis mounted drilling fuld: Hode diameter: 100 mm drilling information material subtance rock mass defects additional subtance gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gring gri	lo	cat	ion:	3	2 Ма	ann S	Street, Gosford, NSW						checke	d by:	АМ						
defiling information material substance rock mass sheets g	ро	sitio	on: E	E: 34	5,710.5	50; N: 6	,299,759.90 (MGA94) su	rface elevation: 2.	50 m (A	AHD)		angl	e from horiz	zontal: 90°							
Image: Section of the section of t								lling fluid: Water													
-6 started coring at 8.60m SANDSTONE: free grained, pale gray, iron SW -7 10.0 -7 10.0 -8 11.0 -7 10.0 -8 11.0 -9 10.0 SANDSTONE: free grained, pale gray, iron started with datk gray sandstorie. -7 10.0 -8 11.0 -9 5ANDSTONE: free grained, pale gray, iron started doubled. 90.0 -8 11.0 -9 10.0 SANDSTONE: free grained, pale gray, iron started anathering & sandstorie. -9 10.0 -9 10.0 -10 5ANDSTONE: free grained, pale gray, iron -11 -10 -12.0 -11.0 -11 -11.0 -12.0 -11.0 -11 -11.0 -12.0 -11.0 -11 -11.0 -12.0 -11.0 -13.0 -11.0 -14.0 -11.0 -11.0			ng in	form	ation			n			госк	defect									
SANDSTONE fine granded, pale grey, kon SW SW Image: second	method &	support	water	RL (m)	depth (m)	graphic log			weathering alteration	& Is50 X = axial; O = diametral	& ls(50) (MPa)	core run & RQD	(mm)		ation, planarity, roughness	s, coating, general					
SANDSTONE: fine to coarse grained, pale grey, iron SW Image: second se					-																
SANDSTONE: fine grained, pale grey, iron SW SW Image: Sind sector in the dock with dark grey station. -7 <				6	-		started coring at 8.60m														
9.0		'							SW					PT, 0°, IF	R, RO, CN, 10 mm	1					
Sult Store: and grey, for stained, not add grey sandstore. add grey, for stained, not add grey sandstore. add grey, for stained, not add grey sandstore. add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, for stained, not add grey, not add grey, for stained at 15.20 m add grey, for stained, not add grey, for stained, not add grey, for stained at 15.20 m method & support Not more add grey, fight for stained at 15.20 m free for stained, not prove stained, not add grey, for stained, add grey, not prove stained, not add grey, for stained at 15.20 m free for stained, not prove stained, not add grey, not prove stained, not add grey, not prove stained, not add grey, not prove stained, not add grey, not prove stained, not add grey, not prove stained, not prove			-	-	9.0 —	· · · · · · · · ·			_							-					
0					-		SILTSTONE: dark grey, iron stain interbedded with dark grey sand	ned, stone.			a=2.32										
3ANDSTONE: fine to coarse grained, pale grey, iron a=0.56 a=0.57 a=0.57 p=0.57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00 p=7.0-57 p=1.00<			-	7	-	· ·					d=1.66			JT, 87 - 9	90°, PL, SO, CN ° PL - UN SO - RO CN						
8 8 9 SANDSTONE: fine to coarse grained, pale gray, iron stained, massive, trace of gravel. 9 9 SANDSTONE: fine to coarse grained, pale gray, iron stained, massive, trace of gravel. 9 10					-			grey, iron	-												
10 9 SANDSTONE: fine to coarse grained, pale grey, intertaminated with fine grey, intertaminated with fine grey, intertaminated with fine grey fine standstone. 9 9 10 9 10 9 10				-	- 10.0		stained, bedded.					69%		F A							
9 - 11.0				8	-									Ħ							
9 -9 -9 SANDSTONE: fine to coarse grained, pale grey, iron stained, massive, trace of gravel. 0					-									PT, 0 - 5	°, PL - UN, SO - SL, CN						
-9 -9 -9 SANDSTONE: fine to coarse grained, pale grey, iron stained, massive, trace of gravel. 11 <td></td> <td></td> <td>-</td> <td>-</td> <td>11.0</td> <td>· · · · ·</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>li <u>b</u>iii</td> <td></td> <td></td> <td></td>			-	-	11.0	· · · · ·							li <u>b</u> iii								
method & support Support Support Support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery Weathering & alteration* Method & support r 1100 Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Method & support Support Support r 1000/11/2, water Image: support Core recovery Methore recovered Method & support Support r 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovered Methore r					-						d=0.59			PT, 0 - 5	°, PL - UN, SO, CN ° PL - UN, SO, CN	ed CN					
method & support Support Support Support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery Weathering & alteration* Method & support r 1100 Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Method & support Support Support r 1000/11/2, water Image: support Core recovery Methore recovered Method & support Support r 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovered Methore r	,		-	9	-									-	, 1 L - ON, 00, ON	PL, S escrib					
method & support Support Support Support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery weathering & alteration* Method & support r-13 Borehole BH7 terminated at 15.20 m Image: support graphic log / core recovery Weathering & alteration* Method & support r 1100 Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Weathering & alteration* Method & support r 1000/11/2, water Image: support Core recovery Method & support Support Support r 1000/11/2, water Image: support Core recovery Methore recovered Method & support Support r 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovery Methore recovered Methore recovered W 10/10/12, water Image: support Core recovered Methore r					-	· · · · ·	g j,	· g · - · ·						₽— SM, 0°, F	PL, SO, CO	0 - 5°, vise d					
method & support Support Support graphic log / core recovery weathering & alteration Jiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii				-	12.0 —	· · · · ·								-		e: PT, other					
method & support Support Support Core recovery method & support Gefect type planarity As auger drilling H </td <td></td> <td></td> <td></td> <td>10</td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>u=1.55</td> <td></td> <td></td> <td></td> <td></td> <td></td>				10	-						u=1.55										
method & support Support Casing M mud None graphic log / core recovery weathering & alteration* R H				10	-	· · · · ·										Defe					
ANDSTONE: fine to coarse grained, pale grey, highly iron stained bedded. And the pale grey, highly bedded bedded. And the pa			-	-	- 13.0 -	- 13.0 — -			nated with fine								-				
Image: support AS auger screwing AD auger screwing AD auger screwing AD auger screwing R rock roller Support C casing M mud N none water graphic log / core recovered (graphic symbolis indicate material) weathering & alteration* RS residual soil XW extremely weathered SW silghtly weathered defect type PL planarity P							-	-	-	13.0	13.0	13.0	· · · · ·	SANDSTONE: fine to coarse gra					83%	╎╎╙┥╵	JT, 75°, I
12 12 12 13 13 13 13 13 13 13 13 13 13 13 11			-	11	-		grey, nigniy iron stained bedded.														
12 12 12 13 13 13 13 13 13 13 13 13 13 13 11					-	· · · · ·															
method & support As auger screwing Borehole BH7 terminated at 15.20 m HW HW HW HW HW HV	,		-	-	14.0 —											-					
method & support As auger screwing Borehole BH7 terminated at 15.20 m HW HW HW HW HW HV				- 10	-																
method & support Support Borehole BH7 terminated at 15.20 m Image: support in the image: support in				-12	-	· · · · ·			нw	-				PT, 0 - 7	°, IR, SO - RO, CN						
Image: Second State Support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller Support C casing M mud N none water graphic log / core recovery (graphic symbols indicate material) weathering & alteration* RS residual soil XW extremely weathered (graphic symbols indicate material) defect type V = 10/10/12, water level on date shown planarity PL planar				-	- 15.0 —	· · · · · · · · · ·			-			100%		-		_					
method & support AS auger screwing AS auger screwing Casing M mud N none Datager drilling Casing M mud N none CB claw or blade bit Water 10/10/12, water 10/10/12, water Imethod & support 10/10/12, water Imethod & support Support Casing M mud N none Imethod & support Water Imethod & support Imethod & support Casing M mud N none Water Imethod & support Imethod & support Sc asing M mud N none Water Imethod & support Imethod & support Core recovered Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imethod & support Sc asing M mud N none Imetor Nonderately weathered Sc asing N mud N none </td <td> *</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Borehole BH7 terminated at 15.2</td> <td>20 m</td> <td></td> <td></td> <td>a=1.19</td> <td></td> <td></td> <td></td> <td></td> <td></td>	 *						Borehole BH7 terminated at 15.2	20 m			a=1.19										
method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller support C casing M mud N none water graphic log / core recovery (graphic symbols indicate material) weathering & alteration* RS residual soil XW extremely weathered SS shear zone defect type PT parting PT parting SS shear zone planarity PT parting SS shear zone Image: Model of the symbols indicate material Image: Model of the symbols indicaterial Image: Model of the symbols indicaterial			-	13	-																
Mentod & support Support Support Support Graphic by Constructively RS residual soil PT parting PL planar AS auger screwing C casing M mud N none Image: screwing XW extremely weathered JT joint CU curved AD auger drilling C casing M mud N none Image: screwing Core recovered KW extremely weathered JT joint CU curved W washbore Image: screwing Image: screwing Image: screwing MW moderately weathered SS shear surface UN undulating RR rock roller Image: screwing Image: screwing Image: screwing SS shear surface UN Ndulating RR rock roller Image: screwing Image: screwing SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surface SS shear surfa					-																
AD auger drilling CB claw or blade bit W washbore RR rock roller → 10/10/12, water level on date shown NU externely weathered (graphic symbols indicate material) NV externely weathered SS shear surface SS shear surfac						1		graphic log / cor	e recove	ery	RS residu	ial soil		PT parting	g PL plana						
W washbore RR rock roller U101012, water level on date shown U201012, water U20102, water U20102, water U20102, water U20102, water U20102,	A	D B	aug clav	jer dril N or bl	ling ade bit		water			e material)	HW highly	weathe	red	SS shear	surface UN undu	lating					
W replaced with A for alteration SM poor	F	RR	roc	k rolle	r	mm)	level on date shown				SW slightl FR fresh	y weathe	ered	CO contac CS crushe	ct IR Irregu ed seam						
NQ wireline core (47.5mm) — complete drilling fluid loss core run & RQD VL very low	N H	IQ IQ	wire wire	eline c eline c	ore`(47. ore (63.	6mḿ) 5mm)	complete drilling fluid loss				VL very lo		literation	SM seam							
PQ wireline core (85.0mm)			wire	eline c	ore (85.			barrel w	ithdrawn		L low M mediur			VR very	rough CN clean						
water pressure test result (lugeons) for depth interval shown RQD = Rock Quality Designation (%) H	ĺ						ਤੋ (lugeons) for depth	RQD = Rock Qu	ality Des	ignation (%)	VH very hi			SO smoo POL polis	hed VN vene CO coatin	er					

b

200





BH7 13.00 - 15.20 m

drawn	LP		client:	St Hilli	iers		
approved	AM		project:	Geotechnical and Enviro 32 Mann Street,			
date	22/03/2018	coffey V	title:	32 Marin Street,	Gosioi	u, nsw	
scale	N.T.S.	A TETRA TECH COMPANY		CORE PHOT BH		PH	
original size	A4		project no:	SYDGE214942	ig no:	FIGURE 2	rev:



		TEOU									Parel	ole ID.	DUC
AI	EIRA	TECH	JOIVIP	ANY									BH8
E	Ξn	gi	ne	erin	q l	_00	ק -	Bo	rehole		sheet		1 of 2
—	lient	-		Gosfor	<u> </u>						projec	started:	<u>SYDGE214942</u> 06 Mar 2018
			311	603101	un	esiu	entia	urty	Ltu				
р	rinci		_								date d	complete	
р	rojeo								ental Assessment		logge	d by:	LP
lo	ocati	on:	32	Mann S	Stree	et, Go	osfo	rd, N	SW		check	ed by:	AM
				45.57; N: 6				4)	surface elevation: 2.50 m (AHD)	-		rizontal: 9	
		ng info		obe 7822D	I, Ira	ck mou	-	erial sub	drilling fluid: Water	hole c	liameter	: 100 mm	
		-							material description		sity	hand	structure and
method &	support	1 2 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	penetro- meter (kPa) 00 00 00 00 00 00 00 00 00	additional observations
ION CORED 754-SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:25</drawingfile>	_			SPT 2, 2, 7 N*=9 SPT 4, 7, 9 N*=16	-2 -1 -0 1 2			CH SP CL	ASPHALT. FILL: Gravelly SAND: fine to coarse grained, dark brown, with fine to medium gravel, trace of ceramics. Silty CLAY: medium to high plasticity, dark brown, trace of sand and organics (root fibres). SILTY SAND: fine to coarse grained, grey, low to medium plasticity clay, trace of organics (root fibres). Sandy CLAY: medium to high plasticity, grey mottled dark red-orange, with fine to coarse grained sand, trace ironstone. Silty CLAY: medium plasticity, pale grey-white, trace of fine sun-rounded gravel.	—	L - MD F		FILL PID: 1.5ppm PID: 0.3ppm PID: 0.6ppm PID: 0.6ppm PID: 1.3ppm P
CDF_0_9_07_LIBRARY.GLB rev.AU Log COF BOREHOLE: NON CORED 754-SY - AD/T - AD/T				SPT 10, 16, 15 N*=31 SPT 30, 30, N*=R				CL SC	Silty CLAY: medium to high plasticity, brown-orange, with fine sand. 6.4 to 6.5 m: ground gets soft CLAYEY SAND: fine to medium grained, brown-orange, with low to medium plasticity clay, trace of weathered sandstone.		H		
/ 	AS HA W PT e.g. B T	od auger d auger s hand au washbc push tu bit shov AD/T blank b TC bit V bit	crewii uger re be wn by	ng*	M I C o pen	etration	I	ater e shown	B bulk disturbed sample ba D disturbed sample ba E environmental sample ba SS split spoon sample mois U## undisturbed sample ##mm diameter mois HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W V SPT with solid cone	soil de	mit	n	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



client: SH Gosford Residential Pty Ltd date started: 06 principal: date completed: 06 project: Geotechnical and Environmental Assessment logged by: LF location: 32 Mann Street, Gosford, NSW checked by: Al position: E: 345,745.57; N: 6,299,797.53 (MGA94) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drilling information material substance material description in the project is amples & (i) if is boot is in the project is and prove is and prov	H8
client: SH Gosford Residential Pty Ltd date started: 06 principal: date completed: 06 project: Geotechnical and Environmental Assessment logged by: LH location: 32 Mann Street, Gosford, NSW checked by: Al position: E: 345,745.57; N: 6,299,797.53 (MGA94.) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drilling information material substance material description instrume instrume with tests instrume instrume instrume instrume instrume instrume instrume with tests instrume <	f 2
principal: date completed: 06 project: Geotechnical and Environmental Assessment logged by: Lf location: 32 Mann Street, Gosford, NSW checked by: Al position: E: 345,745.57; N: 6,299,797.53 (MGA94) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drilling information material substance hole diameter : 100 mm meterial substance void and reading readin	YDGE214942
project: Geotechnical and Environmental Assessment location: 32 Mann Street, Gosford, NSW checked by: All position: E: 345,745.57; N: 6,299,797.53 (MGA94) drill model: Geoprobe 7822DT, Track mounted drilling fluid: Water hole diameter : 100 mm drilling information material substance <u>drilling information</u> <u>material substance</u> <u>drilling fluid: water</u> <u>note fried tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt to data tests</u> <u>u opt</u>	6 Mar 2018
Iocation: 32 Mann Street, Gosford, NSW checked by: Al position: E: 345,745.57; N: 6,299,797.53 (MGA94.) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drill model: Geoprobe 7822DT, Track mounted drilling fluid: Water hole diameter : 100 mm drilling information material substance with the samples & field tests (i) ii) iii) SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components iii) iiii) iiii) iii) iiii) </td <td>6 Mar 2018</td>	6 Mar 2018
position: E: 345,745.57; N: 6,299,797.53 (MGA94) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drill model: Geoprobe 7822DT, Track mounted drilling fluid: Water hole diameter : 100 mm drilling information material substance v u<	D
position: E: 345,745.57; N: 6,299,797.53 (MGA94) surface elevation: 2.50 m (AHD) angle from horizontal: 90° drill model: Geoprobe 7822DT, Track mounted drilling fluid: Water hole diameter : 100 mm drilling information material substance v u<	M
drilling information material substance which is a constrained by the set of the set	
Solution Samples & field tests (iii) Do of tests Do	
CL Sandy CLAY: medium to high plasticity, grey. M H	
CL Sandy CLAY: medium to high plasticity, grey. M H	structure and Iditional observations
CL Sandy CLAY: medium to high plasticity, grey. M H	
	AL SOIL
	- -
	_
	-
	-
	-
	- -
	-
요 -	-
	-
	-
AD auger drilling* M mud N nil B bulk disturbed sample soil description VS	_
AS auger screwing* C casing D disturbed sample based on AS 1726:2017 S HA hand auger E environmental sample F	tency / relative density very soft
PT push tube	very soft soft firm
* bit shown by suffix * bit shown by suffix	very soft soft firm stiff very stiff
* bit shown by suffix e.g. AD/T -Oct-12 water level on date shown VC VL SPT + Sall ple recovered VV Nc SPT with solid cone VV plastic limit L	very soft soft firm stiff very stiff hard friable
B blank bit water inflow volume shear, pearlier housed (kr a) inflow with bit T TC bit water outflow R refusal D V V bit HB hammer bouncing VD	very soft soft firm stiff very stiff hard



	A TECH		ANY								nole ID.	BH9
Er	ngi	ne	erin	g l	Lo	g -	Bo	rehole		sheet projec		^{1 of 2} SYDGE214942
clien	t:	SH	Gosfo	rd R	esid	entia	l Pty	Ltd			started:	06 Mar 2018
princ	ipal:						-			date o	complete	ed: 06 Mar 2018
oroje	ect:	Gee	otechn	ical	and	Envi	ronm	ental Assessment		logge	d by:	LP
ocat		32	Mann S	Stree	et, G	osfoi	d, N	SW			ked by:	АМ
ositi	on: E:		23.00; N: 6		-		-	surface elevation: 2.60 m (AHD)	angle	e from ho	prizontal:	
			be 7822D	T, Tra	ck mo	-		drilling fluid: Water	hole	diameter	r : 100 mn	n
drilli	ng info ⊊	ormati	on			mate	rial sul	material description		_≩	hand	structure and
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	penetro- meter (kPa)	additional observations
				-				FILL: Gravely SAND: fine to coarse grained, dark grey-brown, with fine angular gravel, trace of ceramics and concrete.	М			FILL PID: 2.0ppm
				-2			sc	CLAYEY SAND: fine to coarse grained, pale brown-orange, with low to medium plasticity clay, trace of root fibres.		L - MD		
				-	1.0-		CL	Silty CLAY: medium plasticity, dark brown-black, high organic content (root fibres).		St		PID: 0.7ppm
				-1								PID: 0.7ppm
				-	2.0-			CLAYEY SAND: fine to coarse grained, grey, pale		L - MD		
				-0				grey, with medium to high plasticity clay. Sandy CLAY: medium to high plasticity, grey		 St - VSt		PID: 0.1ppm RESIDUAL SOIL
•				-	3.0-			mottled red-orange, with fine to coarse grained sand.				
				1								
				-	4.0-		CL	Silty CLAY: medium to high plasticity, pale grey-white, trace of fine grained gravel.	M	VSt - H		
				2	5.0-							
				-	5.0-							
				3	6.0-							
				-								
				4	7.0-							
				5								1
neth D S IA V	auger			M C (port mud casing etration		nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample		up symbo escription AS 1726:	n	consistency / relative density VS very soft S soft F firm St stiff
Υ	push t		suffix	wat		no res rangin refusa	I	U## undisturbed sample ##mm diameter mm HP hand penetrometer (kPa) D N standard penetration test (SPT) M N* SPT - sample recovered W	dry moist wet			VSt very stiff H hard Fb friable VL very loose
e.g. 3 - /	AD/T blank I TC bit V bit	oit			▲ lev wa	el on date ter inflow ter outflow	shown	Nc SPT with solid cone Wi VS vane shear, peak/remouded (kPa) Wi R refusal HB HB hammer bouncing HB				L loose MD medium dense D dense VD very dense



A TETR/	A TECH (COMP	ANY							Boreh	ole ID.	BH9
Er	ai	n 0	orin	~ I	~	~	Po	rahala		sheet	:	2 of 2
	igii	ne	enn	y L	-0(<u>J -</u>	DU	rehole		projec	ct no.	SYDGE214942
client	t:	SH	Gosfor	d R	esid	entia	l Pty	Ltd		date s	started:	06 Mar 2018
princ	ipal:									date o	complete	ed: 06 Mar 2018
proje	ct:	Ge	otechni	cal a	and	Envi	ronm	ental Assessment		logge	d by:	LP
locat	ion:	32	Mann S	tree	et, G	osfo	rd, NS	SW		check	ed by:	АМ
positio	on: E:3	345,7	23.00; N: 6,	299,84	41.00 ((MGA9	4)	surface elevation: 2.60 m (AHD)	angle	from ho	rizontal: 9	90°
drill m	odel: G	eopro	be 7822DT	, Tra	ck mou	unted		drilling fluid: Water	hole	diameter	: 100 mm	1
drilli	ng info	rmati	on			mate	erial sub	stance		_		
method & support	1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetro- meter (kPa) 02 08 08 04	structure and additional observations
				6	-		CL	Silty CLAY: medium to high plasticity, pale grey-white, trace of fine grained gravel. (continued)	M	VSt - H		RESIDUAL SOIL

CDF_0_9_07_LIBRARY.GLB_rev:AU_Log_COF_BOREHOLE: NON CORED_754-SYDGE214942.GPJ_<<DrawingFile>>_16/08/2019_09:25

	drilliı	ng infor	mati	on			mate	rial sub	stance				
	support &	1 2 penetration 3	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	hand penetro- meter (kPa) ତୁ ରୁ ରୁ ତ୍ୱ	structure and additional observations
		2 2 2	1		- 6	-		CL	Silty CLAY : medium to high plasticity, pale grey-white, trace of fine grained gravel. <i>(continued)</i>	М	VSt - H		RESIDUAL SOIL
					7	9.0— - - -		SC	CLAYEY SAND: fine to coarse grained, brown-orange, with low to medium plasticity clay, trace weathered sandstone.		D		
19 09:25					8	10.0 — - -			10.5 m: ground gets hard				
< <pre><<drawingfile>> 16/08/2019 09:25</drawingfile></pre>					-	- 11.0— -							
154-51 UGEZ 14842.GPJ < <u< td=""><td></td><td></td><td></td><td></td><td>9</td><td>- 12.0 — -</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></u<>					9	- 12.0 — -							
BUREHULE: NUN CURED 194-9					10	- - 13.0 — -							
LOG CUF BUKEHULE					11	- - 14.0—							
LB rev:AU	,				12	-			Borehole BH9 terminated at 14.5 m Refusal				
					-	- 15.0 — -			, wasai				
5					13	_							
	metho AD AS HA W PT	od auger dr auger so hand au washbor push tub	crewir ger e		M n C c pen	port mud casing etration	► no res	nil istance g to		soil	bup symbol description AS 1726: ondition	n	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard
		bit show AD/T blank bit TC bit V bit		suffix	wate	Leve wat	rangin refusa Oct-12 wa el on date er inflow er outflow	ater shown	N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone	M moist W wet Wp plastic Wl liquid I	limit imit		Fb friable VL very loose L loose MD medium dense D dense VD very dense



A TETR	A TECH	COM	PANY											Borel	hole	ID.		P1		
۲	hai	nc	orin	а I			Ro	roh	ماد	•				shee	t:			1 of 1		
	iyi		erin		-	-				;				proje	ct no	Э.		SYDG	GE214942	?
clien	it:	SH	Gosfo	rd R	esid	entia	al Pty	' Ltd						date	start	ted:		28 Fe	b 2018	
princ	cipal:													date	com	plet	ed:	28 Fe	b 2018	
proje	ect:	Ge	otechn	ical	and	Envi	ronn	nental	Ass	essment				logge	ed by	y:		LP		
locat	tion:	32	Mann S	Stree	et, G	osfol	rd, N	SW						checl	ked	by:		АМ		
positi	on: E:	345,7	20.57; N: 6	,299,8	86.73	(MGA9	4)	surfa	ce elev	vation: 2.90 m	(AHD)		angle	from h	orizor	ntal:	90°			
drill m	nodel:	Geopr	obe 7822D	T, Tra	ick mou	unted		drillin	g fluid:	Water			hole	diamete	er : 10)0 mr	m			
drilli	ing inf	ormat	ion	1		mate	erial su	bstance						<u> </u>						
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	s			cription particle characterist minor components		moisture condition	consistency / relative density	pen me (k	and ietro- eter Pa)		str addition	ucture and al observation:	S
Σ σ A	- 0 0	, >		œ	σ		້ທີ່ທີ່	FILL: G	Fravell	y CLAYEY SA	ND: fine to		M	5 E			FILL			
			E		-			coarse ∖clay, ar	graine 1d fine	d, grey to dark to medium an	grey, with low pl gular gravel.	lasticity						3m - ASS .4ppm	S	
					-						to coarse grained asticity clay, trace									-
				-2	-			angular						-		ÌÌ				
			E		1.0-		CH CL		l red.		icity, dark brown 	-grey, ́	W		lii		ALLU PID: 3	.4ppm		-
PT				+	-			Silty C brown-l	black,	medium to higl high organic c	n plasticity, dark ontent.							1m - ASS organic c	S ontent, smell	of -
Ĩ			E	-	-			Sandy		· medium to h	 gh plasticity, pale						organ			
				-1	2.0-	V///		grey-gr	ey, wit	h fine grained	sand.	5					1.7-2.	.zppm 0m - AS	S	-
	; ; ;				-								<u>— м</u> –	-	1 i i	ÌÌ				
97:60				F	-															-
				-0	3.0			Boreho	le P1 !	terminated at 3	.0 m									
- Guile					-	1														
ารามสพทเญาแลวร						-									lii					-
ř L				1	-															
-51 DGEZ 14942. GPJ					4.0-	1														-
DGEZ				-		-														
	; ; ;				-	1									lii					-
, YED				2	5.0-															-
5					-	-														
				-	-															-
BONEL																				
5				3	6.0-	-									l i i	11				-
						1										11				
					.	-														-
19.14				4	•	1														
ייי_בומאארו טבום ואיאט בטן טער מטאבחטבב: אטא טטאבט א					7.0-	1														-
				F	-	-									1 i	11				_
100					-	1										11				-
				5	-	1		<u> </u>				_					<u> </u>			
Meth AD	auger	drilling		M	port mud	N	l nil	В	ł	& field tests bulk disturbed sa				up symb escriptic			VS	sistency	/ relative densi very soft	ty
AS HA W		screw auger	ing^		casing etratior	ı		DE	e	disturbed sample environmental sa	imple	b	ased on	AS 1726	:2017		S F		soft firm	
PT	push				- 0 0	no res	sistance	SS U# HP	# ι	split spoon samp undisturbed sam hand penetrome	ple ##mm diameter		sture co	ndition			St VSt H		stiff very stiff hard	
	L			wat		rangir refusa	al	N N	5	nand penetrome standard penetra SPT - sample red	tion test (SPT)	D M W	dry moist wet				Fb VL		naro friable very loose	
* e.g. B	bit sh AD/T blank	own by	SUTIX		lev	Oct-12 wa el on date ter inflow	e shown	Nc VS	; ;	SPT with solid co		Wp WI	plastic I liquid lir				L MD		loose medium dens	se
Б Т V	TC bit					ter inflow ter outflow		R HE		refusal hammer bouncin	g						D VD		dense very dense	



ATE	TRA	TECH (COMF	PANY							Boreł	hole	ID.		P 2		
C	In	aiı	20	orin	a I		2	P_	rabala		sheet	t:			1 of 1		
		ncipal: ject: Geotechnical and E ation: 32 Mann Street, Gos ition: E: 345,726.57; N: 6,299,834.92 (M model: Geoprobe 7822DT, Track mount lling information		-				proje	ct no	0.		SYDG	E214942				
cli	ent:		SH	Gosfo	rd R	esid	entia	al Pty	' Ltd		date	start	ted:		27 Fel	b 2018	
pri	incip	oal:									date	com	plet	ed:	27 Fel	b 2018	
pro	ojec	t:	Ge	otechn	ical	and	Envi	ronn	nental Assessment		logge	ed by	y:		LP		
loc	catio	on:	32	Mann S	Stree	et, G	osfo	rd, N	SW		checł	ked	by:		АМ		
po	sitior	n: E:3	45,7	26.57; N: 6	6,299,8	34.92	(MGA9	4)	surface elevation: 2.60 m (AHD)	angle	from ho	orizoi	ntal:	90°			
					T, Tra	ick moi	-		drilling fluid: Water	hole c	diamete	r : 10)0 mr	n			
dı	rillin	-	rmati	ion			mate	erial su	bstance		₹	h	and		-	atura and	
method &	rpport	penetratio	ater			epth (m)	graphic log	soil group symbol	material description SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	pen me (k	netro- eter Pa)		additiona	icture and al observations	
_E ▲	S		3		-	Ď	<u> </u>	ິດັດ	FILL: SAND: fine to coarse grained, dark	E 8 M	2 9	20 <u>10</u>	1 8 9	FILL			
						-			grey-black, with fine to medium angular gravel.).3m - ASS 2.6ppm	5	
					-2		XXX	sc	CLAYEY SAND: fine to coarse grained, dark	$-\overline{w}$	-						
				E	-	-			grey-brown, with medium to high plasticity clay.				ii II				
					-	1.0-						lii			2.8ppm		_
PT								СН	Silty CLAY: medium to high plasticity, dark brown-black.					1.1-1	.2m - ASS	6	_
Ī					-1	-											
		2						sc	CLAYEY SAND: fine to coarse grained, medium								
								CL	to high plasticity, pale grey-grey, trace of fine gravel. Sandy CLAY: medium to high plasticity, grey, with	-					2.8ppm 2.2m - ASS	5	
9 09:26					-0	_	V///		fine grained sand.	- <u>-</u> -	-						-
/08/201						-	$\langle / / /$	СН	CLAY : medium to high plasticity, grey mottled brown-pale brown.	M		1 i					
*e					-	3.0			Borehole P2 terminated at 3.0 m								
wingFil		i i i				-	-					ÌÌ					
< <dra< td=""><td></td><td></td><td></td><td></td><td>1</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></dra<>					1	-											•
SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:26</drawingfile>						4.0-											_
3E2149.						-	-										
					2												-
ED 75/						-	-										
N COR					-	5.0-											-
NO E							-										
REHO					3	-						1					
CDF_0_9_07_LIBRARY/GLB rev:AU_Log_COF BOREHOLE: NON CORED_754						6.0-	1					1 1 1					_
Log						.	-										
s rev:AL					4		1					1 i					-
3Y.GLE						-	-					1 i					
LIBRA					F	7.0-	1					1 i	11				_
- 0 <u>-</u> 01												1 i					
CDF_0					5	-	1										-
						-	1		<u> </u>								
A		auger d			М	port mud	N	l nil	B bulk disturbed sample	soil grou soil de	up symbo escriptio			VS		relative density very soft	
AS H/ W	A I	auger s nand au vashbo	uger	ng		casing ietratior	ı		E environmental sample	based on <i>l</i>	AS 1726:	:2017	,	S F St		soft firm stiff	
P		oush tu			· ,		no res	sistance ng to		i sture cor dry	ndition					sun very stiff hard	
*	,	oit shov	vn bv	suffix	wat	. 40	Oct-12 w	al	N standard penetration test (SPT) M N* SPT - sample recovered W	moist wet				Fb VL		friable very loose	
e. B	g. /	AD/T blank bi				lev	el on date		Nc SPT with solid cone Wp VS vane shear; peak/remouded (kPa) WI	plastic li liquid lim					D	loose medium dense	
T V	-	FC bit / bit			-		ter outflow	N	R refusal HB hammer bouncing					D VE	0	dense very dense	



ATE	ETRA	TECH C	COMF	PANY							Boreł	nole	D.		P 3	
C	In	aiı	20	orin	~ I		2	B A	rabala		sheet	t:			1 of 1	
		-			_		-		rehole		proje	ct n	0.		SYDG	E214942
cli	ient:		SH	Gosfo	rd R	esid	entia	l Pty	r Ltd		date s	star	ted:		27 Feb	2018
pr	incip	al:									date o	com	nplet	ed:	27 Feb	2018
pr	ojec	t:	Ge	otechn	ical	and	Envi	ronn	nental Assessment		logge	ed b	y:		LP	
lo	catic	n:	32	Mann S	Stree	et, G	osfo	rd, N	SW		check	ked	by:		AM	
ро	sition	: E:3	45,7	25.84; N: 6	,299,7	92.39	(MGA9	4)	surface elevation: 2.70 m (AHD)	angle	from ho	orizo	ntal:	90°		
				obe 7822D	T, Tra	ck mou	-		drilling fluid: Water	hole o	diameter	r : 1(00 mi	n		
	rilling	g info ⊊	rmat	ion			mate	erial su	bstance material description		_ <u>₹</u>	h	and		etru	cture and
nethod &	support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	per m (F	netro- ieter kPa)			observations
Ē		3 / 1	>		LLL LLL	0		v v	FILL: Gravelly CLAY: low to medium plasticity,	M	02			FILL		
				E	T	-		SP	∖ grey, with fine to medium angular gravel			1		1°— -	0.2m - ASS UVIUM	
					-2	-			with angular fine grained.					PID:	2.9ppm	
					-	-		SP	SILTY SAND: fine to coarse grained, dark brown, highly organic.							
					Ļ	1.0-	V////	CL	Sandy CLAY: medium to high plasticity, grey,					RES	IDUAL SOI	
PT				E		-		СН	brown, with fine grained sand.			ļ			2.9ppm 1.3m - ASS	
Ī					-1	-			brown-grey.					1.1-	1.5III - ASS	
						2.0-			CLAY: medium to high plasticity, grey, trace sand.							
					-	-	$\langle / / /$	СП	CLAT. medium to high plasticity, grey, trace sand.							
9 09:26				E		-	$\mathbb{V}//\mathbb{V}$					İ		PID:	2.4ppm 2.6m - ASS	
08/2016					-0	-	$\langle / / / / / / / / / / / / / / / / / / /$					ļ		2.7-2		
× 1						3.0			Borehole P3 terminated at 3.0 m							
/ingFile						-										
< <draw< td=""><td></td><td></td><td></td><td></td><td>1</td><td>-</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></draw<>					1	-	-									
SYDGE214942.GPJ < <drawingfile>> 16/08/2019 09:26</drawingfile>						4.0-						İ				
214942					-		-					ļ				
sybge						-										
					2	-										
COKEL						5.0-	-									
NON					-	-						1				
HOLE												1				
F BOR					3	-	1					i.				
n Bi						6.0-	1									
N.AU L						-	-									
GLB re					4	-										
SRARY.						7.0-						l i				
07 _LIE					-	-	1					i.				
CDF_0_9_07_LIBKARY.GLB rev.AU Log COF BOREHOLE: NON CORED 754.							1					1				
8					5	-	-					I.				
m	nethoo	 			sup	port	I		samples & field tests	soil grou	ıp symbo				onsistency /	relative density
A	Da Sa	luger d luger s	crewi		Μ	mud casing	N	nil	B bulk disturbed sample D disturbed sample ba	soil de	AS 1726:	n	7	V: S	S	very soft soft
H W P	/ v	iand au vashbo oush tu	re			etration			E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter moie		114"			F Si V:	t	firm stiff verv stiff
	• •						no res rangir refusa	sistance ig to il	HP hand penetrometer (kPa) D	dry moist	ndition			H		very stiff hard friable
*		oit shov	vn by	suffix	wat	v 10-	Oct-12 w		N* SPT - sample recovered W Nc SPT with solid cone Wp	wet plastic li				V L	L	very loose loose
B	Ľ	AD/T blank bi TC bit	t			- wat	ter inflow		VS vane shear; peak/remouded (kPa) WI R refusal	liquid lin	nit			M D	ID	medium dense dense
v		/ bit				- wat	ter outflow	v	HB hammer bouncing					V	G	very dense



A TETRA	A TECH	COM	PANY								Boreł	nole	ID.		P4		
Er	nai	t: Geotechnical and Environmental Assessment an: 32 Mann Street, Gosford, NSW : E: 345,720.53; N: 6,299,761.38 (MGA94) surface elevation: 2.70 m del: Geoprobe 7822DT, Track mounted drilling fluid: Water g information material substance to the standard of the standa				robolo			sheet	t:			1 of 1				
	iyi			-		-					proje	ct no	0.		SYDG	E214942	
client	t:	SH	Gosfo	rd R	esid	entia	al Pty	Ltd			dates	star	ted:		27 Feb	2018	
princ	ipal:										date o	com	plete	ed:	27 Feb	2018	
proje	ct:	Ge	otechn	ical	and	Envi	ronn	ental Assessment			logge	d b	y:		LP		
locat	ion:	32	Mann S	Stree	et, G	osfo	rd, N	SW			check	ked	by:		АМ		
1 ·						-	4)	surface elevation: 2.70 m (AHD)		•	from ho						
				T, Tra	ick moi	-	vrial eul	-		hole c	liametei	r:10)0 mn	n			
	-							material description			, sity	ha	and		stru	cture and	
method & support		water			depth (m)	graphic loç	soil group symbol	SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components		moisture condition	consistency / relative density	m (k	netro- eter Pa)		additiona	l observations	
								FILL: Gravelly CLAYEY SAND: fine to		M			10.4	FILL			
			E					plasticity clay, with fine angular gravel.							2.0ppm .5m - ASS		
	111			-2			СН	Silty CLAY: medium to high plasticity, dark brown-black, with fine grained sand.							JVIUM 3.0ppm		
			E		1.0-									0.8-1	.8m - ASS		
				-									1.1				
- PT -																	
			E	-1			SP	SAND: fine to medium grained, pale brown-grey, trace of silt.	',					PID:	2.4ppm		
	E 						сн	CLAY : medium to high plasticity, brown, pale orange, with fine to medium sand.						1.8-2	.0m - ASS IDUAL SOI		
								orange, with line to medium sand.							.0m - ASS	-	
	-0													PID:	2.6ppm		
•					3.0	¥////											
				-		1		Borehole P4 terminated at 3.0 m				1 · ·					
						1											
				1		-											
					4.0-	1											
						-											
	iii			2		1							ii II				
					5.0-]											
	iii			-		1						i i	ΪÌ.				
						1						1 I					
				3		-						1 I					
					6.0-	1											
					.	-						1 2 2					
				4		1											
					7.0-	-						ÌÌ					
				\vdash	.	1							11				
	111					1						İİ	1 i				
				5	.	-											
metho AD AS HA W	od auger auger hand a washb	screw iuger		M C	port mud casing etration		l nil	samples & field tests B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample		soil de	ip symbo escriptio AS 1726:	n	,	CC VS S F St	6	relative density very soft soft firm stiff	y
PT	push t			· ,		no res	sistance ng to	U## undisturbed sample ##mm diameter HP hand penetrometer (kPa)		ure con dry	ndition					very stiff hard	
*	bit sho	wn hy	suffix	wat	10	-Oct-12 w	al	N standard penetration test (SPT) N* SPT - sample recovered	Mr Wv	noist vet				Fb VL		friable very loose	
e.g. B	AD/T blank l		- 2000		- lev	el on date	e shown	Nc SPT with solid cone VS vane shear; peak/remouded (kPa)		plastic li iquid lin				L MI		loose medium dense	9
T V	TC bit V bit					ter outflow		R refusal HB hammer bouncing						D VE		dense very dense	



A TETRA	A TECH	COMP	ANY							Borel	hole	ID.		P5	
۲w	ai	~~	orin	~ I		~	Da	rabala		sheet	t:		1	of 1	
	igi	ne	erin	<u>y I</u>	-0	<u>y -</u>	DU	rehole		proje	ct no	0.	9	SYDGE21494	12
client	t:	SH	Gosfo	rd R	esid	entia	l Pty	Ltd		date	start	ted:	2	28 Feb 2018	
princ	ipal:									date	com	plete	ed:	28 Feb 2018	
proje	ct:	Ge	otechn	ical	and	Envi	ronm	ental Assessment		logge	ed by	v:	L	LP	
locati		32	Mann S	Stree	of G	osfo	rd NS	SW		checl	-			A <i>M</i>	
			01.52; N: 6		-		-	surface elevation: 2.70 m (AHD)	angle	from ho					
1.			obe 7822D			•	.,	drilling fluid: Water	•	diamete					
drilli	ng info	ormati	on			mate	erial sub	ostance							
∞	ation		samples &		Ē	bo	d.	material description		icy / ensity		and netro-		structure and additional observation	ons
method support	1 2 penetration	water	field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	(k	eter Pa)			
				-				FILL: Gravelly CLAYEY SAND: dark grey, fine to coarse grained sand, low to medium plasticity clay, fine to coarse gravel.	M				FILL 0.2-0.3 PID: 2.	im - ASS 2ppm	-
			E	+2 	1.0-		SP	SAND: fine to coarse grained, pale grey.					ALLUV	/IUM	
— РТ —			E	-1	. .		CL	Sandy CLAY: medium to high plasticity, dark brown, with fine to medium plasticity sand.					PID: 1. 1.6-1.8	5ppm Im - ASS	-
2				-	2.0-		sc	CLAYEY SAND: fine to medium grained, dark brown, with medium to high plasticity clay.					PID: 4. 2.0-2.2	0ppm Im - ASS	-
				-0			СН	CLAY : medium to high plasticity, grey mottled orange, trace of fine grained sand and silt.					RESID	UAL SOIL	
				_	3.0-			Borehole P5 terminated at 3.0 m			1				
D						-									_
				1											
					4.0-										_
				-								İİ			
															-
				2	.										
					5.0-										-
				-											
												ΪÌ.			-
	iii			3							l i i	Ϊİ.			
2 2 2					6.0-										-
					.	-									
				4	.	1						Ϊİ.			-
	İİİ				7.0-	1					l i i	Ϊİ.			_
				-											
															-
				5											
metho	iii		<u> </u>		port			complex & field tests	soil grou	ID OV			 	historia (minthe at	oitu
AD AS	auger of aug			Mi	mud casing	N	nil	samples & field tests B bulk disturbed sample D disturbed sample		escriptio	n	,	VS S	sistency / relative der very soft soft	isity
HA W	hand a washb	iuger ore			etration	ı		E environmental sample SS split spoon sample	Jaseu UII.		.2017		F St	firm stiff	
PT	push ti	ube			3 5	no res rangir	sistance ig to	U## undisturbed sample ##mm diameter mo HP hand penetrometer (kPa) D	isture co dry	ndition			VSt H	very stiff hard	
*	bit sho	wn.bv	suffix	wat		Oct-12 w		N standard penetration test (SPT) M N* SPT - sample recovered W	moist wet	ine it			Fb VL	friable very loose	
e.g. B	AD/T blank b				lev	el on date ter inflow		Nc SPT with solid cone Wp VS vane shear; peak/remouded (kPa) WI					L MD	loose medium de	ense
T V	TC bit V bit					ter outflow	v	R refusal HB hammer bouncing					D VD	dense very dense	•

CDF 0 9 07 LIBRARY.GLB rev:AU Log COF BOREHOLE: NON CORED 754-SYDGE214942.GPJ <<DrawingFile>> 16/08/2019 09:26



	A TECH									Bore	hole ID.	P 6	
– .	! .		!	-			D -			shee	t:	1 of 1	
Er	ngi	ne	erin	g I	_O (J -	BO	rehole		proje	ect no.	SYDGE2149) 42
clien	it:	SH	Gosfo	rd R	esid	entia	l Pty	Ltd		date	started:	28 Feb 2018	}
prind	cipal:									date	complete	ed: 28 Feb 2018	}
proje		Ge	otechn	ical	and	Fnvi	ironm	ental Assessment			ed by:	LP	
locat			Mann S								ked by:	 AM	
			96.69; N: 6					surface elevation: 2.75 m (AHD)	200		orizontal:		
1° -			obe 7822D			•	+)	drilling fluid: Water	0		er : 100 mr		
drill	ing info	ormati	ion			mate	erial sub	ostance			_		. <u> </u>
~	ation		samples &		-	Бõ	_ م	material description		cy / ensity	hand penetro-	structure and additional observa	
method & support	1 2 penetration 3	water	field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	' meter (kPa) € % % % %		
Î			E		-	XXX		FILL: Gravelly SAND: fine to coarse grained, red-brown, with fine angular gravel, trace ceramics,	M			FILL 0.1-0.2m - ASS	
					-		SP	concrete, low to medium plasticity clay.	Ĺ			ALLUVIUM	
	111		E	-2	-		sc	∖ red, with silt and fine gravel.	1			PID: 2.2ppm PID: 2.6ppm	
			E		1.0-		СН	CLAYEY SAND: fine to medium grained, grey, with medium plasticity clay.	_ /-			0.6-0.9m - ASS	_
				F	-			Sandy Silty CLAY: medium to high plasticity, pale brown-orange-grey, with fine to coarse grained				PID: 2.3ppm 1.0-1.3m - ASS	
- PT -					-			sand, trace of root fibres and organics.					-
				-1	-								
					2.0-								_
				-	-								
					-								-
				-0	-								
					3.0-			Borehole P6 terminated at 3.0 m					
0					-								-
				1									
					4.0-								-
				-	-								
					-								-
	111			2	-						liii		
					5.0-								-
				F	-								
				3	-								-
				3	6.0-								_
				L	-								
					-								-
				4	-								
					7.0-	-							-
1				+	-								
1	111			1									-
1				5	-								
meth	od				port	<u> </u>	1	samples & field tests		oup symb		consistency / relative d	
AD AS HA	auger o auger s hand a	screwi			mud casing	N	l nil	B bulk disturbed sample D disturbed sample		description n AS 1726		VS very soft S soft	
W	nand a washbo			pen	etration	1		E environmental sample SS split spoon sample				F firm St stiff	

S F St VSt

H Fb VL

L MD

D VD

 moisture condition

 D
 dry

 M
 moist

 W
 wet

 Wp
 plastic limit

 WI
 liquid limit

very stiff hard friable

very loose

dense very dense

medium dense

loose

no resistance ranging to

10-Oct-12 water level on date shown

water inflow

water outflow

с

T

Þ

а. water

D E SS U##

HP N N* Nc VS

R HB

refusal hammer bouncing

environmental sample split spoon sample undisturbed sample ##mm diameter hand penetrometer (kPa) standard penetration test (SPT) SPT - sample recovered SPT with solid cone vane shear; peak/remouded (kPa) refued

AD AS HA W PT

*

e.g. B T

push tube

AD/T blank bit

TC bit V bit

bit shown by suffix



A	TETRA	TECH	COMF	PANY						-	Boreh	nole	e ID.		P 7	
	En	ai	20	orin	~ I	~	2	Po	robolo		sheet	t:			1 of 1	
_		gi			<u> </u>		-		rehole		projec	ct n	0.		SYDGE214942	2
	client	:	SH	Gosfor	rd R	esid	entia	l Pty	Ltd		date s	star	ted:		28 Feb 2018	
	princi	pal:									date o	con	nplet	ed:	28 Feb 2018	
	proje	ct:	Ge	otechni	ical	and	Envi	ronm	ental Assessment		logge	ed b	y:		LP	
	locati	on:	32	Mann S	Stree	et, G	osfoi	rd, N	SW		check	ked	by:		АМ	
ſ	positio	n: E: 3	845,7	00.01; N: 6	,299,7	83.58 ((MGA94	4)	surface elevation: 2.50 m (AHD)	angle	from ho	orizc	ontal:	90°		
┟		odel: G Ig info	· ·	obe 7822D	T, Tra	ck mou	-	wiel eur	drilling fluid: Water ostance	hole d	liameter	r : 1	00 m	m		
ł	uriili	-	mat						material description		/ sity	h	and		structure and	
	method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME : plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	n (netro- neter kPa) 8 8 8		additional observations	5
ŀ		3 5 7	>			-		00	FILL: Gravelly Sandy CLAY: low to medium plasticity, pale brown-brown, with fine to coarse grained sand, fine angular gravel.	M	02		 	FILI 0.1-	L 0.3m - ASS : 3.2ppm	-
					-2	-		sc	CLAYEY SAND: fine to coarse grained, brown-dark brown, with medium plasticty clay.							
				E	-	1.0-		СН	Silty CLAY: medium to high plasticity, grey-dark							
	- PT -			E	1	-		- - - - -	grey-brown-black, highly organic with organics.					PID: 1.3-	: 2.0ppm 1.5m - ASS	-
				E	-	2.0-		SP	SILTY SAND: fine to coarse grained, grey, with medium to high plasticity clay.					RES	SIDUAL SOIL	
9:26					-0	-		СН	CLAY : medium to high plasticity, grey mottled dark grey, with fine to coarse grained sand.						: 1.9ppm 2.3m - ASS	-
/08/2019 0						-						İ				
e>> 16	•					3.0			Borehole P7 terminated at 3.0 m			- ·				-
DrawingFi					1	-										-
142.GPJ <<					_	- 4.0 <i>—</i>										-
YDGE2149					2	-										
ED 754-S						-						1				-
NON COF					-	5.0-										
OREHOLE:					3	-										
CDF_0_9_07_LIBRARY.GLB rev.AU_Log_COF BOREHOLE: NON CORED_754-SYDGE214942.GPJ_< <drawingfile>>_16/08/2019_09:26</drawingfile>					_	6.0-										-
B rev:AU 1					4	-						i				-
IBRARY.GI					_	- 7.0 <i>-</i>						- ·				-
9_07_LI						-						· ·				-
CDF_0					5	-	-									-
Ĭ						-										-
	AS HA W	d auger o auger s hand a washbo push tu	screwi uger ore		M C pen	port mud casing etratior	no res rangin	nil istance g to	B bulk disturbed sample D disturbed sample E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter	soil de	p symbo scription AS 1726: ndition	n	7	V S F S	firm St stiff /St very stiff	ty
	*	bit show	wn by	suffix	wat		Oct-12 wa	ıl	N standard penetration test (SPT) M N* SPT - sample recovered W	moist wet	mit			F	b friable /L very loose	
	в	AD/T blank b				lev	el on date ter inflow			plastic lir liquid lim					ID medium dens	e
	T V	TC bit V bit			-	- wat	ter outflov	v	HB hammer bouncing						/D very dense	



ŀ	TETRA	TECH	COMF	PANY							Boreł	hole	D.		P8	
	۲n	ai	2	orin	~		~	D۵	robolo		sheet	t:			1 of 1	
		gi			<u> </u>		-		rehole		proje	ct n	0.		SYDGE214942	
	client		SH	Gosfo	rd R	esid	lentia	l Pty	Ltd		date	star	ted:		28 Feb 2018	
	princi	pal:									date o	com	plet	ed:	28 Feb 2018	
	proje	ct:	Ge	otechn	ical	and	Envi	ronm	iental Assessment		logge	d b	y:		LP	
	locati	on:	32	Mann S	Stree	et, G	osfoi	rd, N	SW		check	ked	by:		АМ	
ſ	positio	n: E::	345,7	12.24; N: 6	,299,8	40.53	(MGA94	4)	surface elevation: 2.60 m (AHD)	angle	from ho	orizo	ntal:	90°		
┟				obe 7822D	T, Tra	ck mou	-		drilling fluid: Water	hole d	liametei	r : 1(00 mr	n		
ł	ariiiir	ig info	rmat					eriai sui	material description		ity	h	and		structure and	
	method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	per m (H	netro- leter (Pa)		additional observations	
ľ	A	<u>3 0 7</u>			-	-		0, 0,	FILL: Gravelly SAND: fine to coarse grained, brown, with fine angular gravel, and low to medium plasticity clay.	M	012		 	FILL		-
				E	-2	- 1.0-		сн	Silty CLAY: medium to high plasticity, dark brown-black, high organic matter, trace of brown sand.					<u>\</u> 0.5-0	2.0ppm 0.6m - ASS JVIUM	- - - -
					-	-		SC	CLAYEY SAND: fine to coarse grained, pale grey-grey, with medium to high plasticity sand.					PID: 1.2-1	2.5ppm .5m - ASS	-
				E	-1	-		SC	SAND: fine to coarse grained, pale grey-grey mottled brown, with medium to high plasticity clay.							-
					-	2.0-			2.0 m: colour changes to grey mottled red					PID: 2.0-2	2.0ppm 2.3m - ASS	-
CDF_0_9_07_LIBRARY.GLB rev:AU_Log_COF BOREHOLE: NON CORED_754-SYDGE214942.GPJ_< <drawingfile>>_16/08/2019_09:26</drawingfile>				E	-0			CL	Sandy CLAY: medium to high plasticity, grey mottled red-orange, with fine grained sand.							-
>> 16/0	*				-	3.0			Borehole P8 terminated at 3.0 m							-
vingFile						-										-
< <drav< td=""><td></td><td></td><td></td><td></td><td>1</td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td></drav<>					1	-										-
42.GPJ						4.0-										_
SE21494					-	-	-									-
4-SYDC					2											-
RED 75						-										-
ON COF					-	5.0-]									-
OLE: N						-										_
BOREH					3	-										-
D COF					_	6.0-	-					1 I				-
AU Loç							1					i i				-
LB rev:					4	-						İ				
RARY.G						7.0-	1					1				_
07_LIB					-		-					1				-
F_0_9					5	-	1					ii				-
8							-									-
	AS HA W PT * e.g.	d auger of auger s hand a washbo push tu bit shor AD/T blank b TC bit	screwi uger bre be wn by	ng*	M C pen	■	n no res rangin refusa -Oct-12 wa rel on date ter inflow	il ater shown	E environmental sample SS split spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) N* SPT - sample recovered Wc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal	based on <i>i</i> bisture cor dry moist wet plastic li	AS 1726:	n	7	VS S F VS H Fb VL L MI D	soft firm stiff b st o friable very loose loose D medium dense dense	
l		V bit				- wai	ter outflov	v	HB hammer bouncing					VE	o very dense	

This page has been left intentionally blank

Appendix C - Laboratory Report Sheets



Coffey Services Australia Pty Ltd ABN 55 139 460 521 31 Hope Street Melrose Park NSW 2114

Phone: +61 (2) 8876 0500

TETRA TECH COMP		nort				Report No: SYD	N18S-02100- Issue No:
	Test Re	•					
Client:	Coffey Services A Level 19, 799 Pac Chatswood NSW	cific Highway	(Chatswood)			Accredited for compliance wi Testing. The results of the tests, calib measurements included in th to Australian/national standa	rations and/or is document are tracea
Principal: Project No.: Project Name: Lot No.: -	754-SYDN001814 754-SYDGE21494			RD		Approved Signatory: Renni C (GeoTechnician) NATA Accredited Laboratory Date of Issue: 26/03/2018	
Sample Det	aile				Particlo Si	ize Distributior	
Sample ID: Client Sample: Date Sampled: Source: Material: Specification: Sampling Meth Project Locatio Sample Locatio	SYDN18 - 12/02/20 Ex. Site Clay No Speci od: Submitte on: 32 Mann	ification ed by client St Gosford			Method: Drying by: Date Tested: Note: Sieve Size 2.36mm 1.18mm 600µm 425µm 300µm	AS 1289.3.6.1 Oven	Limits
Other Test I Description Sample History Preparation Linear Shrinkag Mould Length (r Liquid Limit (%) Method Plastic Limit (%) Plastic Limit (%)	e (%) nm)	Method AS 1289.1.1 AS 1289.1.1 AS 1289.3.4. AS 1289.3.1. AS 1289.3.2. AS 1289.3.3.	Dry Sieved 1 5.5 127 1 24 Four Point 1 11	Limits	150μm 75μm 	66 50	
					Chart %Passing		_

Form No: 18909, Report No: SYDN18S-02100-1



Material Test Report

Client: Coffey Services Australia Pty Ltd (Chatswood) Level 19, 799 Pacific Highway Chatswood NSW 2067

Principal: Project No.: 754-SYDN00181AA 754-SYDGE214942 - 754-32 MANN ST GOSFORD Project Name: Lot No.: -TRN: -

SYDN18S-02101

Sample Details

Sample ID: Client Sample: Date Sampled: Source: Material: Specification: Sampling Method: **Project Location:** Sample Location:

12/02/2018 Ex. Site Clayey Sand No Specification Submitted by client 32 Mann St Gosford BH3 1.00 - 1.45

Other Test Results

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Oven-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	5.0	
Mould Length (mm)		125	
Liquid Limit (%)	AS 1289.3.1.1	22	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	16	
Plasticity Index (%)	AS 1289.3.3.1	6	

Sydney Laboratory

Coffey Services Australia Pty Ltd ABN 55 139 460 521 31 Hope Street Melrose Park NSW 2114

Phone: +61 (2) 8876 0500

Report No: SYDN18S-02101-1

Issue No: 1

Accredited for compliance with ISO/IEC 17025 - Testing.



The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

KMature

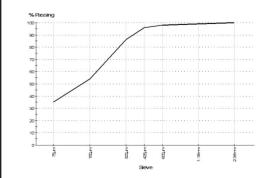
Approved Signatory: Renni Cetinich (GeoTechnician) NATA Accredited Laboratory Number:431 Date of Issue: 26/03/2018

Particle Size Distribution Method: AS 1289.3.6.1 Drying by: Oven Date Tested: 19/03/2018

Note: Sample Washed

Sieve Size	% Passing	Limits
2.36mm	100	
1.18mm	99	
600µm	98	
425µm	96	
300µm	86	
150µm	54	
75µm	35	

Chart



Comments



Coffey Services Australia Pty Ltd ABN 55 139 460 521 31 Hope Street Melrose Park NSW 2114

Phone: +61 (2) 8876 0500

Particle 11 PSE Kepport Binet: Coffey Services Australia PY Ltd (Chatswood) Chatswood NSW 2067 'incipal: Tropet No:: 754-SYDN00181AA ropet No:: 754-SYDBCE214942-754-32 MANN ST GOSFORD Incit Manual State 11 the State	TETRA TECH COMPANY					Report No: SYDN18S-02102-
Heritic Control 10, 50, 50, 50, 50, 50, 50, 50, 50, 50, 5	Material Tes	t Report				Issue No:
rincipal: roject Nam: 754-SYD000181AA roject Nam: 754-SYDGE214942 - 754-32 MANN ST GOSFORD of No.: -''''''''''''''''''''''''''''''''''''	Level 19	9, 799 Pacific Highway	Chatswood)			Testing. The results of the tests, calibrations and/or measurements included in this document are traceal
roject No:: 754-SYDN00181AA roject Name: 754-SYDN00181AA No:: TRX:- TRX:	Principal:				NAIA	2
rojet Landin (mm) AS 1289.3.1.1 Oven-dried reparation AS 1289.3.3.1 14 Tethor (%) AS 1289.3.3.1 14 Particle Size Distribution Motivation Particle Size Distribution Motivation As 1289.3.1.1 As 1289.3.3.1 Motivation Motivation Motivation Motivation Motivation Motivation Motivation Motivation Motivation Motivation As 1289.3.1.1 As 1289.3.3.1 Motivation Moti						
ample ID: SYDN18S-02102 lient Sample: - ate Sampled: 12/02/2018 ource: EX. Site laterial: Clay pocification: No Specification ample Location: 32 Mann St Gosford ample Location: BH4 3.00 - 3.45 Sieve Size % Passing Limits 18mm % 100 3.00 - 3.45 Sieve Size % Passing Limits 18mm % 100 3.00 - 3.45 Sieve Size % Passing Limits ample History AS 1289.3.1 reparation Method AS 1289.3.1 27 inar Shrinkage (%) AS 1289.3.1 AS 1289.3.3.1 127 quid Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.4 lastic Limit (%) <td>Project Name: 754-SY[Lot No.: -</td> <td></td> <td></td> <td>RD</td> <td></td> <td>(GeoTechnician) NATA Accredited Laboratory Number:431</td>	Project Name: 754-SY[Lot No.: -			RD		(GeoTechnician) NATA Accredited Laboratory Number:431
ample ID: SYDN18S-02102 lient Sample: - ate Sampled: 12/02/2018 ource: EX. Site laterial: Clay pocification: No Specification ample Location: 32 Mann St Gosford ample Location: BH4 3.00 - 3.45 Sieve Size % Passing Limits 18mm % 100 3.00 - 3.45 Sieve Size % Passing Limits 18mm % 100 3.00 - 3.45 Sieve Size % Passing Limits ample History AS 1289.3.1 reparation Method AS 1289.3.1 27 inar Shrinkage (%) AS 1289.3.1 AS 1289.3.3.1 127 quid Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.3.1 lastic Limit (%) AS 1289.3.4 lastic Limit (%) <td>Sample Details</td> <td></td> <td></td> <td></td> <td>Particle Si</td> <td>ze Distribution</td>	Sample Details				Particle Si	ze Distribution
laterial: Clay models of the second	Sample ID: Client Sample: Date Sampled:	- 12/02/2018			Drying by:	Oven
roject Location: 32 Mann St Gosford ample Location: BH4 3.00 - 3.45 ther Test Results escription Method Result Limits ample History AS 1289.1.1 Oven-dried reparation AS 1289.3.1.1 4.5 toud Length (mm) 127 telthod Four Point tastic Limit (%) AS 1289.3.2.1 13 laasticity Index (%) AS 1289.3.3.1 14 Escription AS 1289.3.3.1 14 Escription AS 1289.3.3.1 14 Escription AS 1289.3.3.1 14 Escription AS 1289.3.2.1 13 laasticity Index (%) AS 1289.3.3.1 14 Based Component AS 1289.3.3.1 14 Escription AS 1289.3.3.1 14 Method AS 1289.3.3.1 14 Escription AS 12	Source: Material: Specification:	Clay			Note:	Sample Washed
Chart Chart Inter Test Results escription Method Result Limits ample History AS 1289.1.1 Oven-dried reparation AS 1289.3.1.1 Dry Sieved inear Shrinkage (%) AS 1289.3.1.1 27 iguid Limit (%) AS 1289.3.1.1 27 iguid Limit (%) AS 1289.3.2.1 13 Iastric Limit (%) AS 1289.3.3.1 14	Sampling Method: Project Location: Sample Location:	Submitted by client 32 Mann St Gosford BH4			1.18mm 600µm 425µm 300µm 150µm	100 99 98 91 68
ample History AS 1289.1.1 Oven-dried reparation AS 1289.1.1 Dy Sleved inear Shrinkage (%) AS 1289.3.4.1 4.5 fould Length (mm) 127 iquid Limit (%) AS 1289.3.1.1 27 lethod Four Point lastic Limit (%) AS 1289.3.2.1 13 lasticity Index (%) AS 1289.3.3.1 14	Other Test Results	S			75µm	44
X Resing	Description Sample History Preparation Linear Shrinkage (%) Mould Length (mm) Liquid Limit (%) Method Plastic Limit (%) Plasticity Index (%)	AS 1289.1.1 AS 1289.1.1 AS 1289.3.4. AS 1289.3.1.1 AS 1289.3.1.1 AS 1289.3.2.1	Oven-dried Dry Sieved 4.5 127 27 Four Point 13	Limits	_	
					Chart	
ommonts						e 00 4 0 -
	omments					



Coffey Services Australia Pty Ltd ABN 55 139 460 521 31 Hope Street Melrose Park NSW 2114

Phone: +61 (2) 8876 0500

TETRATECH COMP		Report No: SYDN18S-02103- Issue No:
	Test Report	
Client:	Coffey Services Australia Pty Ltd (Chatswood) Level 19, 799 Pacific Highway Chatswood NSW 2067	Accredited for compliance with ISO/IEC 17025 - Testing. The results of the tests, calibrations and/or measurements included in this document are tracea
Principal: Project No.:	754-SYDN00181AA	to Australian/national standards.
Project Name: ot No.: -	754-SYDGE214942 - 754-32 MANN ST GOSFORD TRN: -	WORLD RECOGNISED (GeoTechnician) ACCREDITATION NATA Accredited Laboratory Number:431 Date of Issue: 26/03/2018
ample Det	ails	Particle Size Distribution
Sample ID: Client Sample: Date Sampled: Source:		Method: AS 1289.3.6.1 Drying by: Oven Date Tested: 19/03/2018
Aaterial: Specification:	Clay No Specification	Note: Sample Washed
Sampling Meth Project Locatio Sample Locatio	on: 32 Mann St Gosford	Sieve Size % Passing Limits 1.18mm 100 600μm 99 425μm 99 300μm 99 150μm 92
)ther Test F	Results	75µm 85
Sample History Preparation Linear Shrinkagu Aould Length (n Liquid Limit (%) Aethod Plastic Limit (%) Plasticity Index (nm) 125 AS 1289.3.1.1 37 Four Point) AS 1289.3.2.1 18	
		Chart
		96 Resing



Coffey Services Australia Pty Ltd ABN 55 139 460 521 31 Hope Street Melrose Park NSW 2114

Phone: +61 (2) 8876 0500

TETRA TECH COMP.					Report No: SYD	N18S-02104- Issue No:
Material	Test Report					Issue No:
Client:	Coffey Services Australia Pty Ltd Level 19, 799 Pacific Highway Chatswood NSW 2067	(Chatswood)			Accredited for compliance wi Testing. The results of the tests, calib measurements included in th to Australian/national standard	rations and/or iis document are tracea
Principal: Project No.: Project Name: Lot No.: -	754-SYDN00181AA 754-SYDGE214942 - 754-32 MA TRN		RD	WORLD RECOGNISED ACCREDITATION	Approved Signatory: Renni C (GeoTechnician) NATA Accredited Laboratory Date of Issue: 26/03/2018	
Sample Deta	ails			Particle Si	ze Distribution	1
Sample ID: Client Sample: Date Sampled: Source: Material:	SYDN18S-02104 - 12/02/2018 Ex. Site Clay			Method: Drying by: Date Tested: Note:	AS 1289.3.6.1 Oven	
Specification: Sampling Meth Project Locatio Sample Locatic	n: 32 Mann St Gosford			Sieve Size 19.0mm 13.2mm 9.5mm 6.7mm 4.75mm	% Passing 100 98 98 94 91	Limits
)ther Test F	Results			2.36mm 1.18mm	88 86	
Description Sample History Preparation Linear Shrinkage Aould Length (n Liquid Limit (%) Aethod Plastic Limit (%) Plasticity Index (AS 1289.3.1 AS 1289.3.2	Dry Sieved .1 6.5 .1 27 .1 29 Four Point .1 17	Limits	_ 600μm 425μm 300μm 150μm 75μm	84 83 81 72 44	
				Chart		
				%6 Ressing	Let up the second secon	4.73m 4.7mm 1.83mm 1.83mm 1.83mm 1.81mm
omments						



lient:	COFFEY SEI	RVICES AUSTR	ALIA PTY LTI	D		job no: 754-S	(DS00113AA
Principal:	ST HILL					laboratory: Sydney	
oroject:		REET, GOSFOI	RD NSW			report date: 29 March	
ocation:	32 MANN ST	GOSFORD				borehole: BH3	
	test procedure:	AS 4133.1.	1.1 and 41	33.4.2.1		date received:	
	test apparatus:	Avery with	200 kN CA	S load cell	4222		page 1 of
The sampl	le was cut short to	o remove existin	g damaged se	ections			
QESTLA	B work order ID		height	uniaxial compressive	wet density	sample description	comments
	depth	date tested	average diameter		moisture	bedding/foliation	
QESTL	_ab sample ID	test duration	height/dia ratio	MPa	content	boadingronation	failure mechanism
SYDS	S18W00047		119 mm		2.4 t/m³	Sandstone	Tested in 'as received"
	.00 to 11.16 m	23 Mar 18	51.9 mm	28.2	4.9 %	Bedding planes are at an angle	moisture condition
SYDS	S18S-00232	7.53 min	2.29:1			of 80° to the axis of loading	Shear
			BH3 to 11.16 n pre testing	n	1	BH3 1.00 to 11.16 m after testing	

Technology Manager

standards.



lient:	COFFEY SEI	RVICES AUST	RALIA PTY LTI)				DS00113AA
rincipal:	ST HILL					laboratory:	Sydney	,
roject:	32 MANN ST	REET, GOSFC	ORD NSW			report date: 2		
cation:	32 MANN ST	REET, GOSFC	ORD NSW			borehole:	BH5	
	test procedure:					date received:		
	test apparatus:	Avery with	200 kN CA	S load cell	4222			page 1 or
	B work order ID	1	i bolaht i	uniaxial	i wat dapaitu	sample descriptio	<u> </u>	
			height	compressive	wet density	sample descriptio		comments
	depth	4	average diameter	strength	moisture content	bedding/foliation	·	
	ab sample ID	test duration	height/dia ratio	MPa		O an da tan a		failure mechanism
	\$18W00047	00 14 40	136 mm	40.4	2.3 t/m ³	Sandstone	l	Tested in 'as received" moisture condition
	49 to 10.64 m S18S00233	22 Mar 18 8.72 min	51.8 mm 2.62:1	19.1		Bedding planes are at an of 80° to the axis of loa		Shear
		100		-	100			
			BH 5 49 to 10.64 efore testing			BH 5 4.49 to 10.64 m after testing		
	F:2. TECHNICAL	be	49 to 10.64 efore testing	3		.49 to 10.64 m	je 1	
NATA		be	49 to 10.64 efore testing	3	RockTests\Temp 0	.49 to 10.64 m after testing	je 1 Date:	22 Mar 2018

included in this document are traceable to Australian/national standards.

TECHNICAL COMPETENCE

Alan Cocks Technology Manager



	ERVICES AUST	RALIA PTY LTI	D			54-SYDS00113AA
ncipal: ST HILL					laboratory: Sj	
	STREET, GOSFC				report date: 22	
	STREET, GOSFC				borehole: B	H6
	e: AS 4133.1			1000	date received:	
test apparatu	s: Avery with	200 KN CA	S load cell	4222		page 1 of
QESTLAB work order ID		height	uniaxial compressive	wet density	sample description	comments
depth	date tested	average diameter		moisture	bedding/foliation	
QESTLab sample ID	test duration	height/dia ratio	MPa	content		failure mechanism
SYDS18W00047		145 mm		2.4 t/m ³	Sandstone	Tested in 'as received"
BH6 9.00 to 9.18 m	22 Mar 18	51.9 mm	25.9		Bedding planes are at an al	
SYDS18S00234	9.08 min	2.80:1			of 80° to the axis of loadin	ng Shear
	(erbe				- 2-18	
		BH 6 0 to 9.18 m ore testing			BH 6 9.00 to 9.18 m after testing	



Accredited for compliance with ISO/IEC 17025 - Testing The results of the tests, calibrations, and/or measurements included in this document are traceable to Australian/national standards. NATA Accredited Laboratory No. 431 Authorised Signature: *Alan Cocks Technology Manager*



ient:		RVICES AUSTI	RALIA PTY LTI	0				YDS00113AA
rincipal:	ST HILL					laboratory:		
oject:		REET, GOSFO				report date:		h 2018
cation:		REET, GOSFO				borehole:	BH7	
	test procedure:					date received:		
	test apparatus:	Avery with	200 kN CA	S load cell	4222			page 1 of
••••••	work order ID	date tested	height average diameter	uniaxial compressive strength	wet density moisture	sample descript		comments
QESTLat	o sample ID	test duration	height/dia ratio	MPa	content	bedding/foliation	n .	failure mechanism
	8W00047		148 mm	ini u	2.3 t/m ³	Sandstone	İ	Tested in 'as received"
BH7 12.42	2 to 12.55 m	22 Mar 18	51.8 mm	34.1		Bedding planes are at a	an angle	moisture condition
SYDS1	I8S00235	4.65 min	2.86:1	-		of 85° to the axis of lo		Shear
		12.42	BH 7 to 12.55 m			BH 7 12.42 to 12.55 m		
		befc	ore testing			after testing		

included in this document are traceable to Australian/national standards.

Authorised Signature: Alan Cocks Technology Manager



See Strain Strai

Certificate of Analysis

Coffey Environments Pty Ltd NSW Level 20, Tower B, Citadel Tower 799 Pacific Highway Chatswood NSW 2067





NATA Accredited Accreditation Number 1261 Site Number 18217

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

Attention:

Renni Cetinich

Report
Project name
Project ID
Received Date

590507-S 32 MANN ST GOSFORD 214942 Mar 22, 2018

mgt

Client Sample ID Sample Matrix Eurofins mgt Sample No. Date Sampled Test/Reference	LOR	Unit	BH1 (3-3.45M) Soil S18-Ma25413 Not Provided	BH1 (5.5- 5.95M) Soil S18-Ma25414 Not Provided	BH1 (7-7.34M) Soil S18-Ma25415 Not Provided	BH2 (8.5- 8.61M) Soil S18-Ma25416 Not Provided
Chloride	10	mg/kg	16	24	26	19
Conductivity (1:5 aqueous extract at 25°C as rec.)	5	uS/cm	52	42	35	39
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.8	7.3	7.2	7.2
Resistivity*	0.5	ohm.m	960	1200	1400	1300
Sulphate (as SO4)	10	mg/kg	43	29	20	< 10
% Moisture	1	%	11	15	14	12

Client Sample ID Sample Matrix Eurofins mgt Sample No.			BH4 (5.5- 5.95M) Soil S18-Ma25417
Date Sampled			Not Provided
Test/Reference	LOR	Unit	
Chloride	10	mg/kg	22
Conductivity (1:5 aqueous extract at 25°C as rec.)	5	uS/cm	82
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	6.4
Resistivity*	0.5	ohm.m	610
Sulphate (as SO4)	10	mg/kg	120
% Moisture	1	%	15



Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported. A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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.

mgt

Description Chloride	Testing Site Sydney	Extracted Mar 22, 2018	Holding Time 28 Day
- Method: E045 /E047 Chloride			
Conductivity (1:5 aqueous extract at 25°C as rec.)	Sydney	Mar 22, 2018	7 Day
- Method: LTM-INO-4030 Conductivity pH (1:5 Aqueous extract at 25°C as rec.)	Sydney	Mar 22. 2018	7 Day
- Method: LTM-GEN-7090 pH in soil by ISE	Sydney	Wai 22, 2010	T Day
Sulphate (as SO4)	Sydney	Mar 22, 2018	28 Day
- Method: E045 Anions by Ion Chromatography			
% Moisture	Sydney	Mar 22, 2018	14 Day
- Method: LTM-GEN-7080 Moisture			

	🔅 eur	ofins	mgt		ABN– 50 005 0 e.mail : Enviro web : www.eur	Sales@	eurofins	Melbourne 2-5 Kingston Town Close Oakleigh VIC 3166 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254 & 14271	Sydney Unit F3, Building F 16 Mars Road Lane Cove West NSW 2066 Phone : +61 2 9900 8400 NATA # 1261 Site # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 2079	Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 4 NATA # 1261 Site # 23736
Ad Pre	Company Name: Coffey Environments Pty Ltd NSW Address: Level 20, Tower B, Citadel Tower 799 Pacific Highway Chatswood NSW 2067 Project Name: 32 MANN ST GOSFORD Project ID: 214942						Or Re Ph Fa			Received: Due: Priority: Contact Name:	Mar 22, 2018 10:33 AM Mar 23, 2018 1 Day Renni Cetinich
		Sa	mple Detail			Aggressivity Soil Set	Moisture Set		Euron	ns mgt Analytical Se	vices Manager : Nibha Vaidya
Melk	ourne Laborato	ory - NATA Site	# 1254 & 142	271							
	ney Laboratory					Х	х				
	bane Laborator										
Pert	h Laboratory - N	NATA Site # 237	36								
Exte No	rnal Laboratory Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	BH1 (3-3.45M)	Not Provided		Soil	S18-Ma25413	х	x				
2	BH1 (5.5-	Not Provided		Soil	S18-Ma25414	x	x				
3	5.95M) BH1 (7-7.34M)	Not Provided		Soil	S18-Ma25415	x	x				
4	BH2 (8.5- 8.61M)	Not Provided		Soil	S18-Ma25416	x	x				
5	BH4 (5.5- 5.95M)	Not Provided		Soil	S18-Ma25417	x	x				
					•	5	5				



mgt

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.

- 2. All soil results are reported on a dry basis, unless otherwise stated.
- 3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- 4. 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. This report replaces any interim results previously issued.

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

mg/L: milligrams per litre

NTU: Nephelometric Turbidity Units

ppm: Parts per million

%: Percentage

Units

mg/kg: milligrams per kilogram ug/L: micrograms per litre ppb: Parts per billion org/100mL: Organisms per 100 millilitres MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Termo	
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	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.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	Quality Systems Manual ver 5.1 US Department of Defense
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	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.
TEQ	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 50-150%-Phenols & PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.1 where no positive PFAS results have been reported have been reviewed and no data was affected.

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.
- 5. 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 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.



mgt

Quality Control Results

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank									
Conductivity (1:5 aqueous extract at	25°C as rec.)		uS/cm	< 5			5	Pass	
LCS - % Recovery								-	
Chloride			%	104			70-130	Pass	
Conductivity (1:5 aqueous extract at	25°C as rec.)		%	96			70-130	Pass	
Resistivity*			%	96			70-130	Pass	
Sulphate (as SO4)			%	120			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	S18-Ma25413	СР	uS/cm	52	53	2.0	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	S18-Ma25413	СР	pH Units	7.8	7.7	pass	30%	Pass	
Resistivity*	S18-Ma25413	CP	ohm.m	960	940	2.0	30%	Pass	
% Moisture	S18-Ma25413	CP	%	11	11	1.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S18-Ma25415	CP	mg/kg	26	25	1.0	30%	Pass	
Sulphate (as SO4)	S18-Ma25415	CP	mg/kg	20	20	3.0	30%	Pass	



mgt

Comments

Sample Integrity	
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
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

Authorised By

Nibha Vaidya

Analytical Services Manager

Glenn Jackson National Operations 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 | mgt 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 | mgt 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.

This page has been left intentionally blank

Appendix D - Point Load Test Results



		ANAGING THE													Project No	754-SYD0	GE214941
Point Lo	oad Stre	ngth Ir	ndex Test	Res	ults										Sheet 1	of 2	
Client	St Hilliers														Office	Chatswo	od
Principal															Date	8-3-2018	
Project	32 Mann St	Gosford													Ву	LP	
Location	32 Mann St	Gosford													Checked		
est Method est Machine Calibration Date	AS 4133.4.1 - 2007 Methods of Testing Rocks for Engineering Purposes, Determination of Point Load Strength Index GSA (bench-mounted)						ng	Sampling Technique Storage History Moisture Condition Loading Rate	NMLC Coffey Natura	Chats	wood				Sampling Date Testing Date Tested By		
	-	Locatio	Depth				netral Tests							gular Lu	ump Tests		Streng
	к Туре	n	(m)	D (mm)	L (mm)	P (kN)	I _{s(50)} (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	I _s (MPa)	I _{s(50)} (MPa)	Failu	re Mode	Classific on
Claystone Sandstone Sandstone Sandstone Siltstone Sandstone Ironstone Ironstone Ironstone Sandstone Sandstone Sandstone Sandstone Sandstone Sandstone Sandstone		BH3 BH3 BH3 BH3 BH3 BH3 BH3 BH3 BH3 BH5 BH5 BH5 BH5 BH5 BH5	6.87 - 6.99 7.53 - 7.62 8.93 - 9.0 9.6 -9.71 10.3 -10.37 10.75 - 10.82 11.27 - 11.34 11.76 - 11.83 13.71 -13.79 14.45 - 14.51 14.78 - 14.86 9.5 - 9.63 10.64 - 10.73 11.16 - 11.26 13.28 - 13.35 14.45 - 14.56 14.82 - 14.90	50 50 50 50 50 50 50 50 50 50 50 50 50 5	60 45 35 35 35 35 35 35 40 40 45 35 540	0.12 3.91 4.65 5.12 3.76 1.92 3.5 1.26 2.35 2.03 1.53 2.37 0.17 0.94 0.26 1.08	0.05 1.56 1.86 2.05 1.5 0.77 1.4 0.06 0.5 0.94 0.81 0.61 0.95 0.07 0.37 0.1 0.43		50 50 50 50 50 50 50 50 50 50 50 50 50 5	30 46 31 32 34 26 30 40 29 25 35 33 47 36 38 34		0.96 4.59 4.62 3.69 4.69 2.26 3.47 0.92 2.12 2.7 2.76 1.39 1.42 1.01 1.15 1.42 1.17	0.5 1.57 2.34 1.81 2.16 1.37 1.82 0.48 0.83 1.46 1.74 0.62 0.67 0.34 0.5 0.59 0.54	0.47 1.62 2.22 1.73 2.1 1.25 1.71 0.45 0.84 1.37 1.57 0.61 0.65 0.35 0.49 0.52			VL/N H H M/H M/H M/H M/H M/H M VL/N M L/M



Sandstone

BH7

15.0 - 15.09

50

45

3.89

Point Load Strength In	Index Test Results
------------------------	--------------------

J	SPECIALISTS MANAGING THE EARTH													Project No	754-SYE	DGE214941	
Point Lo	oint Load Strength Index Test Results															of 2	
Client	St Hilliers															Office Chatswood	
Principal															Date	8-3-2018	3
Project	32 Mann St Gosford														Ву	LP	
Location	32 Mann St Gosford														Checked		
Test Method Test Machine Calibration Date	AS 4133.4.1 - 2007 Methods of Testing Rocks for Engineering Sampling Technique NMLC core Purposes, Determination of Point Load Strength Index Storage History Coffey Chatswood GSA (bench-mounted) Moisture Condition Natural e 21-11-2011 Loading Rate												Sampling Dal <i>8-3-2018</i> Testing Date <i>#REF!</i> Tested By <i>LP</i>				
	_		Depth	Diametral Test				-	Axial, Block, and Irregular Lu				mp Tests	Strength			
Rock Type		Location	(m)	D (mm)	L (mm)	P (kN)	І _{s(50)} (MPa)	Failure Mode	W (mm)	D (mm)	L (mm)	P (kN)	l _s (MPa)	І _{s(50)} (MPa)	Failur	e Mode	Classificat
Mudstone		BH6	8.7 - 8.84	50	70	1.2	0.48		50	37	-	2.15	0.91	0.9			М
Sandstone		BH6	9.18 - 9.35	50	85	3.67	1.47		50	30	-	3.43	1.8	1.69			н
Siltstone		BH6	10.41 - 10.50	50	45	0.33	0.13		50	39	-	3.3	1.33	1.33			L/H
Siltstone		BH6	10.80 - 10.92	50	60	5.62	2.25		50	30	-	4.21	2.2	2.07			н
Siltstone		BH6	11.64 - 11.75		55	2.29	0.92		50	37	-	3.31	1.41	1.39			M/H
Siltstone		_	12.44 - 12.51		35	2.12	0.85		50	40	-	9.17	3.6	3.62			M / VH
Sandstone			13.17 - 13.32		75	3.23	1.29		50	46	-	4.89	1.67	1.73			н
Sandstone		BH6	14.22 - 14.35		65	2.91	1.16		50	35	-	4	1.79	1.75			н
Sandstone		BH6	15.81 - 15.89	50	40	0.69	0.28		50	39	-	2.49	1	1			L/H
Sandstone		BH7	8.91 - 9.0	50	45	1.52	0.61		50	35	-	1.43	0.64	0.62			М
Siltstone		BH7	9.25 - 9.34	50	45	4.15	1.66		50	33	-	5.07	2.42	2.32			н
Siltstone		BH7	10.92 - 11.0	50	40	1.48	0.59		50	33	-	1.22	0.58	0.56			М
Sandstone		BH7	11.55 - 11.70		75	3.95	1.58		50	40	-	2.98	1.17	1.18			Н
Sandstone		BH7	12.0 - 12.08		40	3.83	1.53		50	40	-	3.78	1.48	1.49			Н
Siltstone		BH7	12.77 - 12.88	50	55	3.31	1.32		50	39	-	4.76	1.92	1.91			Н
Sandstone		BH7	13.9 - 14.0	50	50	4.6	1.84		50	27	-	2.24	1.31	1.2			Н
Sandstone		BH7	14.77 - 14.90	50	65	2.47	0.99		50	23	-	1.61	1.1	0.97			М

50

25

-

2.09

1.32

1.19

Н

\\tts779fs1.tt.local\Data\1. PROJECTS\4. SYD-GEOTECHNICS\2018\SYDGE214942 32 Mann St Gosford\[POint Load Testing Excel Spreadhseet.xls]Result Sheet (1 of 3)

1.56

This page has been left intentionally blank