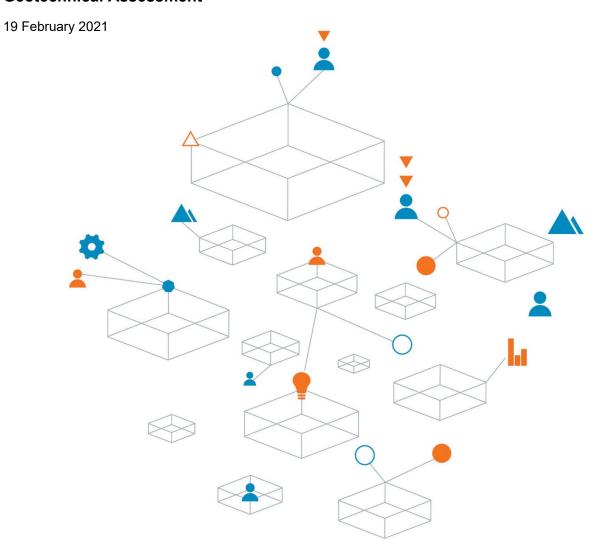


#### Newcastle Grammar School Proposed Stage 1 Additions - Newcastle Grammar School- Park Campus

754-NTLGE282007-AD

#### **Geotechnical Assessment**



Trust is the cornerstone of all our projects

This page has been left intentionally blank

# Proposed Stage 1 Additions - Newcastle Grammar School - Park Campus - Geotechnical Assessment

Prepared for Newcastle Grammar School

Prepared by
Coffey Services Australia Pty Ltd
16 Callistemon Close
Warabrook
NSW 2304 Australia
t: +61 2 4028 9700
ABN 55 139 460 521

19 February 2021

754-NTLGE282007-AD

#### **Quality information**

#### **Revision history**

Revision	Description	Date	Originator	Reviewer	Approver
Version 0	Geotechnical Report	19/02/2021	Simon Baker	Sri Chakrabarti, Jules Darras	Simon Baker

#### Distribution

Report Status	No. of copies	Format	Distributed to	Date	
Initial Issue	1	PDF	Brendan Fisher	19/02/2021	

#### **Table of contents**

1.	Intro	duction		1
	1.1.	Object	ives	1
	1.2.	Scope	of work	1
2.	Field	work sui	mmary	2
3.	Site (	Conditio	ns	2
	3.1.	Surfac	e Conditions	2
	3.2.	Regior	nal geology	2
	3.3.	Subsu	rface Conditions	3
	3.4.	Ground	dwater	4
4.	Labo	ratory T	esting	5
	4.1.	Mecha	nical Testing	5
	4.2.	Chemi	cal Testing	6
5.	Discu	ussion		7
	5.1.	Genera	al	7
	5.2.	Found	ations	7
		5.2.1.	Deep Foundations	7
		5.2.2.	Shallow Foundations	9
	5.3.	Constr	ruction Issues	10
		5.3.1.	Uncontrolled Fill	10
		5.3.2.	Shallow Water Table	10
		5.3.3.	Very Soft Clays	10
	5.4.	Tempo	orary and Permanent Excavations	11
	5.5.	Pavem	nent Design for Driveway	11
		5.5.1.	Rigid Pavement Composition	11
		5.5.2.	Flexible Pavement Options	12
		5.5.3.	Subgrade Preparation	13
6.	Closi	ng rema	arks	14

#### **Tables**

- Table 1: Summary of geotechnical units
- Table 2: Summary of distribution of units in deep boreholes
- Table 3: Summary of distribution of inferred units in CPT locations
- Table 4: CBR and Standard Maximum Dry Density Test Results
- Table 5: Summary of PSD testing
- Table 6: Atterberg Limit Testing
- Table 7: Summary of Aggressivity Testing

Table 8: Summary of pile design parameters

Table 9 Rigid pavement composition

Table 10: Suggested Flexible Option

#### **Figures**

Figure 1: Summary of point load testing

#### **Appendices**

Drawings

Appendix A – Borehole Logs

Appendix B - Laboratory Testing

Appendix C – Cone Penetration Testing Interpretation

#### 1. Introduction

Erica Thomas, Head of School for Newcastle Grammar School, commissioned Coffey Services Australia Pty Ltd (Coffey) to carry out a geotechnical investigation for the proposed Stage 1 additions for the Newcastle Grammar School - Park Campus located at 127 Union Street, Cooks Hill.

This report addresses the scope outlined in Section 3.4.2 and 3.4.4 Coffey proposal 754-NTLGE282007-AA.Rev1 dated 10 December 2020.

It is proposed to demolish several buildings on the site and to construct two large buildings between two to three storeys in height. The geotechnical investigation is required to assist in the planning phase to assess potential options for foundations of the developments proposed for the site.

#### 1.1. Objectives

This objective of this report is to summarise the factual results of our investigation and to provide information on the following:

- Provide a site classification in accordance with AS2870
- Description of soil conditions to a depth as necessary below natural surface level for the design of the structure's foundations
- Review of the details and descriptions of the existing strata including laboratory test results for various soil characteristics at various depths as appropriate from the boreholes advised
- Groundwater conditions encountered and comment on how groundwater may affect construction
- Comment on suitable foundation options as appropriate and provide geotechnical design parameters – footings / bored piers / pre-cast piles / tension piles, including domestic framed structures
- Pavement design parameters and pavement design for new driveway
- If soil aggressivity is reported within soils analysed, concrete and steel required for the construction of below ground basement level and supports would be as per Australian Standard AS2159-2009 Piling-Design and Installation requirements.
- Advise on excavation conditions
- · Advise on temporary and permanent batter slopes
- Comment on construction issues anticipated

#### 1.2. Scope of work

The scope of work under the purview of this report includes:

- Preparation of safety documentation and liaison with DBYD
- Organising an underground services locator to confirm test sites were clear of underground facilities
- Drilling of four boreholes to rock including coring 8m into rock
- Drilling of ten shallow boreholes for environmental sampling
- Four cone penetration tests with pore pressure (CPTu) tests
- Laboratory testing
- Analysis and preparation of this report

### 2. Fieldwork summary

Fieldwork for this geotechnical investigation comprised of the following:

- Organising an underground service locator to confirm absence of underground services in the test locations
- Push tube drilling of seven environmental locations BH01 to BH07 to depths ranging from 0.6m to 4.2m
- Hand auger drilling of three environmental locations BH08 to BH10 at inaccessible areas to depths ranging from 0.6m to 0.8m on 18 January 2021
- Setting out borehole and CPTu locations based on dial before you dig plans and site access in generally the two main building footprints
- Drilling of four deep boreholes GBH01 to GBH04 to depths of 36.0m, 36.15m, 31.54m, and 32.07m respectively, targeting diagonal corners at each proposed building footprint between 18 January and 25 January 2021.
- Pushing of six cone penetration tests with pore pressure (CPTu), CPT01 to CPT06 to depths of 27.7m, 26.63m, 26.6m, 23.69m, 24.05m and 22.82m respectively between 20 and 21 January 2021.

The locations of above field testing are shown on Drawing 2. Geotechnical field work was carried out in the full-time presence of Coffey geotechnical engineers who produced field logs and nominated sampling of the deep boreholes.

Environmental field work was carried out in the full-time presence of Coffey environmental scientists who produced field logs and nominated sampling of the environmental boreholes.

#### 3. Site Conditions

#### 3.1. Surface Conditions

The site is located at 102 DP 861562, 127 Union Street, Cooks Hill as shown on Drawing 2. The site is bounded by Union Street to the north east, Parkway Avenue to the south west, and Corlette Street to the south east.

Topographically the site is located within a former estuarine floodplain in the historical location of Cottage Creek. Historical maps (including Plan of Port of Newcastle 1887, Map of the Newcastle District showing the Colliery Holdings 1932) have the area as a "swamp". Since the 1900s, the area has been raised with fill creating a near-level plain, with Cottage Creek realigned to Parkway Avenue south of the site. Newcastle Harbour is located 1km to the north.

The site falls to the north at approximately 1V:70H, with site elevations (RLs) ranged from 2.02m AHD at the northern corner and up to 3.02m AHD at the southern corner. Test locations were generally completed within school playground areas with grass covering.

The surrounding area generally consists of residential developments and parkland. The main water course in the area is a concrete lined channel within Park Avenue, 15m south west of the site.

### 3.2. Regional geology

Based on the 1:100,000 scale Newcastle Coalfield Geology map, the site is underlain by Quaternary deposits comprising gravel, sand, silt and clay. Underling this unit is the late Permian aged Lambton

Subgroup of the Newcastle Coal Measures comprising interbedded and interlaminated siltstone, sandstone and coal.

The mined Borehole Seam forms the floor of the Lambton Subgroup, which also contains the Yard Seam which is not present at the site. (The Yard Seam was mined beneath The Hill, approximately 500m to the east of the site.) Details of mining within the Borehole Seam can be found in the Mine Subsidence Assessment Report 754-NTLGE282007-AB dated 2 February 2021.

#### 3.3. Subsurface Conditions

The geotechnical testing confirmed the area was once a low lying depression with periodic flooding and thick vegetation.

Drawing 2 provides a plan borehole and CPTu locations. All borehole logs from the site investigation are provided in Appendix A. The interpreted geotechnical units encountered at the site are shown in Table 1 with the distribution of the above units shown in Table 2.

Table 1: Summary of geotechnical units

Unit	Material / Origin	Description
1a	Topsoil	Gravelly SAND to Sandy GRAVEL: fine to medium grained, brown to pale brown in colour, fine to medium sixed subangular gravels trace to some rootlets
1b	Fill (Variable)	Highly variable unit includes the following  SAND to Silty SAND and Clayey SAND: fine to coarse grained, pale brown/ grey brown dark brown and black, trace to with some gravel including coal reject material, trace rootlets, bricks  Sandy CLAY: medium plasticity, orange mottled red and white, with fine to medium sand  CLAY: high plasticity yellow and mottled grey  SAND: fine to medium grained, pale brown/ pale yellow/ grey, some fine to
2a	Swamp deposits	medium grained subangular gravels  PEAT: dark grey to black, trace of fine to medium sand and rootlets, very soft to soft consistency
2b	Estuarine Soil	Clayey SILT: low plasticity, dark grey to black, trace of fine to medium sand and marine/shell fragments, very soft to soft consistency
2c	Estuarine Soil	SAND: fine to medium grained, grey, loose to medium density, some clay beds within units generally firm or better
2d	Estuarine Soil/ Alluvial soil	Silty CLAY to CLAY: high plasticity dark grey becoming sandy with depth, generally firm or better consistency.
3a	Residual Soil grading into extremely weathered material with depth	Sandy CLAY to Clayey SAND: low to medium plasticity, grey to pale brown and orange, fine to medium grained sand, stiff to very stiff with loose to medium dense sand layers
4a	Highly weathered to distinctly weathered material	Interbedded and interlaminated siltstone and sandstone: Sandstone generally fine grained and grey, siltstone generally dark grey, units generally laminated with carbonaceous laminations prone to breakages. Significant staining on joints
4b	Moderately weathered to Slightly weathered	Interbedded and interlaminated siltstone and sandstone: Sandstone generally fine grained and grey, siltstone generally dark grey, units generally laminated with carbonaceous laminations prone to breakages

Table 2: Summary of distribution of units in deep boreholes

Unit	Material / Origin		Depth to base of unit (m)				
Unit	Material / Origin	GBH01	GBH02	GBH03	GBH04		
1a	Topsoil	0.1	0.3	1.0	1.5		
1b	Fill (Variable)	4	3.8	4.5	4		
2a	Swamp deposits	7	8	7.5	5		
2b	Estuarine Soil	10.3	10	10.5	11		
2c	Estuarine Soil	14	15	12	11.7		
2d	Estuarine Soil/ Alluvial soil	16.6	22	16.5	16		
3a	Residual Soil grading into extremely weathered material with depth	28.4	27.7	23.45	24		
4a	Highly weathered to distinctly weathered material	NE	28.65	29.4	28.8		
4b	Moderately weathered to Slightly weathered	>36.0	>36.15	>31.54	>32.07		
Notoo:							

Notes:

> : Limit of investigation

Table 3: Summary of distribution of inferred units in CPT locations

Unit			Depth to bas			
Onit	CPT01	CPT02	CPT03	CPT04	CPT05	CPT06
1a	0.1	0.1	0.1	0.05	0.05	0.05
1b	3.8	4.2	4.5	3.6	3.3	3.2
2a	6.4	5.4	5.6	5.9	4.8	6
2b	10.0	9.6	9.6	NE	6.4	9.3
2c	14.7	14.1	14.1	11.6	11.2	12.05
2d	17.2	19.6	16.4	14.2	15.0	15.2
3a	27.7	26.63	26.50	23.69	24.05	22.82
4a	>27.7	>26.63	>26.50	>23.69	>24.05	>22.82

#### 3.4. Groundwater

Groundwater was measured after CPTu testing at depths ranging from 1.2m up to 2.0m. Similar depths were observed within borehole locations with values ranging from 1.4m to 1.8m. Depths of water observations are shown on the attached borehole and CPTu logs.

## 4. Laboratory Testing

### 4.1. Mechanical Testing

Samples obtained during the investigation were returned to Coffey's Newcastle laboratory for temporary storage and NATA accredited testing. Laboratory testing comprised:

- 2 Nos. Four-day soaked California Bearing Ratio (CBR).
- 2 Nos. particle size distribution (PSD)
- 2 Nos. Atterberg Limit Tests

The results are presented in Appendix B and summarised in Table 4 to Table 6 and Figure 1.

Table 4: CBR and Standard Maximum Dry Density Test Results

Hole ID	Depth (m)	Field Moisture Content (%)	Optimum Moisture Content (%)	SMDD (t/m³)	CBR <sup>(1)</sup>	Swell (%)
BH07	0.3 - 0.6	10.3	14	1.72	40	0.0
GBH03	0.5 - 1.0	21.7	13.0	1.76	7	0.5

Notes:

(1): 4 day soak and 4.5kg surcharge

Table 5: Summary of PSD testing

Hole ID	Depth (m)	Sieve size (mm)	Percent passing (%)
		0.075	10
		0.15	13
BH07	0.3 – 0.6	0.6	72
		2.36	78
		19	89
		0.075	19
		0.15	22
GMH04	0.5 – 1.0	0.6	90
		2.36	92
		19	100

Table 6: Atterberg Limit Testing

Hole ID	Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
GBH01	4.5 – 4.95	21	17	4
GBH02	4.0 – 4.45	43	29	14
GBH03	0.5 - 1.0	33	15	18

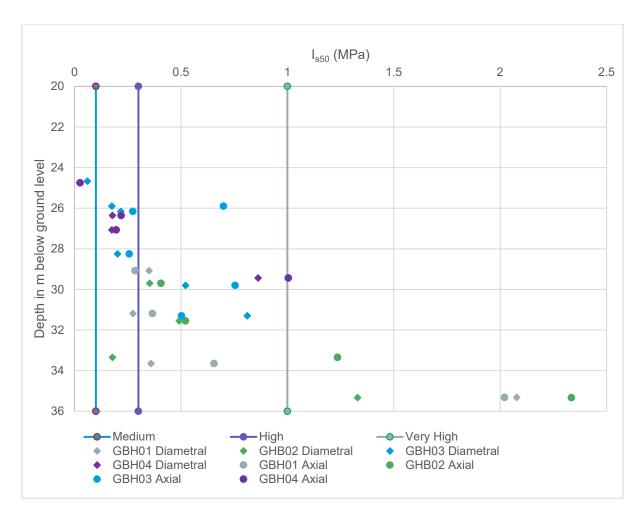


Figure 1: Summary of point load testing

## 4.2. Chemical Testing

The results of the aggressivity results are presented in Table 7.

Table 7: Summary of Aggressivity Testing

Borehole	Depth (m) BGL	Soil Condition	рН	Sulfate (SO4) (ppm)	Chloride (ppm)	Electrical Resistivity (ohm.cm)	Exposure classification for concrete structures	Exposure classification for steel structures
GBH02	4.0	В	7.0	70	80	10200	Non-Aggressive	Non-Aggressive
GBH02	8.5	В	8.6	210	170	4300	Non-Aggressive	Non-Aggressive
GBH02	11.5	Α	7.6	60	40	30300	Mild	Non-Aggressive
GBH02	16	В	8.4	500	180	4460	Non-Aggressive	Non-Aggressive
GBH03	4.5	В	6.4	90	610	3320	Non-Aggressive	Non-Aggressive
GBH03	7.5	В	9.0	60	190	5350	Non-Aggressive	Non-Aggressive
GBH03	12.0	В	7.8	10	90	7580	Non-Aggressive	Non-Aggressive
GBH03	16.5	В	7.2	20	150	9090	Non-Aggressive	Non-Aggressive

#### 5. Discussion

#### 5.1. General

The area is characterised by:

- Approximately 4m of variable fill over
- Very soft to soft peat and clay to approximately 10m (swamp and estuarine deposits). A chart of interpreted consistency is included in Appendix C.
- Very loose to medium dense sands to 11m to 15m (swamp and estuarine deposits)
- Firm clay to 14m to 19.2m (alluvial deposits)
- Interbedded medium dense to dense sands and stiff to very stiff clays (residual soils)

#### 5.1.1. Site Classification

Although it is noted this code is not strictly for this type of development, in accordance with AS2870 2011, due to the presence of up to over 4m of uncontrolled fill/ fill without records of placement and underlying soft soils, the site is classified as Class P. Shrink swell testing indicates that ground reactivity due to moisture variation  $(y_s)$  is estimated to be in the order of 20mm at GBH03, and less than 20mm at GBH02 and GBH04 where the fill generally comprises more granular materials.

#### 5.1.2. Footing Options

Due to the presence of deep compressible clay units, buildings founded at the current surface level on strip or pad footings are likely to undergo significant settlement and will need careful design consideration.

However, founding with deep footing elements (piles) attracts another issue: There is potential for significant movements for the site in the current state, should the mine workings beneath the site fail. Settlements as a result of mine subsidence were estimated in Coffey Report 754-NTLGE282007-AB dated 2 February 2021, and summarised as follows:

- The surface subsidence of 350mm to 650mm allowing for 600mm to 1000mm of crush at mine level.
- The maximum tilt for the building is expected to be in the range of 10mm/m to 20mm/m.
- The maximum tensile strains are assessed to be in the range of 2.5mm/m to 5mm/m with a radius of curvature of 4km to 2km.
- The maximum compressive strains are assessed to be in the range of 3.5mm/m to 6.5mm/m with a radius of curvature of 2.5km to 1.5km.

Where buildings are founded on piles at a depth of 30m (in Units 4a and 4b), the tilts and curvature at the base of piles may be significantly higher than estimated for the ground surface causing significant differential movement between the toe of the piles and the building base. It is noted that this condition can be partially mitigated through remediation of the mine voids as outlined in our Mine Subsidence Report (754-NTLGE282007-AB dated 2 February 2021.

#### 5.2. Foundations

#### 5.2.1. Deep Foundations

Ignoring mine subsidence constraints, due to the variable ground conditions, the appropriate foundation types include continuous flight auger (CFA) piles taken to rock level or driven precast piles (provided approval for the significant vibrations can be obtained). Bored piles are unlikely to be

suitable without casing down to the residual soils due to the presence if sands which will collapse into the pile holes.

Should deep piles be considered for the development, the preliminary design parameters are provided in Table 8.

Table 8: Summary of pile design parameters

			Preliminary Pile Design Parameters							
Unit	Material / Origin	Su (kPa) (clay units)	UCS (MPa) (Rock units)	Ultimate End Bearing <sup>(1)</sup> (MPa)	Serviceability End Bearing <sup>(2)</sup> (MPa)	Ultimate Shaft Adhesion (4) (kN/m²)	E <sub>v</sub> (MPa)	E <sub>h</sub> (MPa)		
1b	Fill (Variable) (3)	25	-	-	-	0	10	7.5		
2a	Swamp deposits <sup>(3)</sup>	10	-	-	-	0	2	1.5		
2b	Estuarine Soil	20	-	-	-	16	4	3		
2c	Estuarine Soil	NA	-	-	-	30	15	11.25		
2d	Estuarine Soil/ Alluvial soil	25	-	-	-	20	5	3.75		
3a	Residual Soil grading into extremely weathered material with depth	50	-	0.45	0.4	30	24	18		
4a	Highly weathered to distinctly weathered material	NA	4	9	2	400	300	225		
4b	Moderately weathered to Slightly weathered	NA	10	15	5	600	1200	900		

#### Notes:

- 1. Ultimate values occur at large settlements (>5% of minimum footing dimensions).
- 2. Serviceability values occur at large settlements (<1% of minimum footing dimensions).
- 3. It is noted piles should ignore any support from the swamp deposits (Unit 2a) or above due to the compressible nature of this unit.
- 4. Tensile loading from piles and or anchors may adopt 0.6x the ultimate compressive skin friction

The above parameters may be modified based on site specific pile testing during construction.

Based on Table 4.3.2(A) of AS2159-2009, Coffey calculated an Individual Risk Rating (IRR) of 2.79, which is low to moderate. Based on this IRR, the following basic geotechnical strength reduction factors,  $\Phi_{gb}$ , are recommended:

- 0.52 for piles with a low level of redundancy, such as piles supporting individual columns
- 0.60 for piles with a high level of redundancy, such as piles in groups or supporting stiff pile caps or stiffened rafts.

As per Section 4.2, piles should be designed for a mild aggressivity classification for concrete piles and non-aggressive for steel piles. It is noted this does not take into account any change in groundwater chemistry that may develop as a result from dewatering the area. Also, experience in the area has shown that bacterial in the soil in the area may be aggressive to steel elements after dewatering. Therefore, any steel elements to be in contact with soil should be isolated from contact with the soil or should be designed with measures to counteract potential degradation caused by bacterial attack.

#### 5.2.2. Previous Pile Driving Results

Results of previous nearby pile driving is included in Table 9.

Table 9: Results of previous nearby pile driving.

Unit	Depth Range (m)	Driving Resistance		
1 - Fill	0 to 4.2	Pre-augured, fell under own weight		
2a/2b (Organics) & C (Clay)	4.2 to approx. 12	2 blows / 0.5m with a 1 to 1.4m drop		
2c – Silty Sand	Approx. 12 to 14	Increasing up to 14 blows / 0.5m with 1.2 to 1.4m drop		
Not Encountered – Sand Approx. 14 to 15		Up to 21 blows / 0.5m with 1.2 to 1.4m drop		
2d – Sandy Clay	Approx. 15 to 19.5	8 to 14 blows / 0.5m with 1.2 to 1.4m drop		
	Approx. 19.5 to 20	48 blows / 0.5m with 1.4 to 2.0m drop		
3a – Sandy Clay, Clayey	Approx. 20 to 23.5	9 to 13 blows / 0.5m with 2.0m drop		
Gravel	Approx. 23.5 to 26.5	Increasing to 21 to 25 blows / 0.5m with 1.5 to 2.0m		
	Approx. 26.5 to 28.75	Increasing to 31 to >50 blows / 0.5m with 1.5m drop		

#### 5.2.3. Shallow Foundations

The capacity of shallow foundations will depend on the fill cover over the very soft clays and settlement constraints of the development/s.

Small isolated structures may be proportioned for an allowable bearing capacity of 100kPa for footings less than 0.6m width) assuming the following construction work is completed

- Verification of the density of sand fill at footing location is medium dense or better
- Minimum 700mm of cover over the very soft alluvial soils

For the main buildings raft foundations, based on the CPTu results, the main structure is likely to undergo significant consolidation as the building moves into primary consolidation with the over consolidation ratio (OCR) dropping below 1.

Preliminary estimate of the elastic settlement for a raft foundation for the main structure is estimated to be between 1.7mm (south) to 2.4mm (north) per kPa of loading averaged across the building (i.e. differential movements are likely to increase towards the north). Additional consolidation may occur on top of these numbers, with the magnitude to be estimated by additional lab testing.

It is noted where raft foundation is proposed, additional analysis will be required as well as lab testing of the upper compressible soil units (note additional samples have been collected for this purpose).

#### 5.3. Construction Issues

#### 5.3.1. Uncontrolled Fill

On site, up to 4.2m of variable fill was encountered in varies states including sands, gravels, clays and silts. The sources of material appear to be variable with some coal reject material, dredged sand material as well as clays from unknown sources. This material is understood to be supporting existing 1 and 2 storey buildings onsite and provides significant cover for the very soft to soft underlying peats and clays. As a minimum the following improvement of the uncontrolled fill should be included:

- Excavate 1m of uncontrolled fill below the building footprint.
- The density of the underlying 1m should be assessed with dynamic cone penetration testing at close centres (5m).
- Proof roll subgrade.
- Construct a 1m thick platform using excavated material. Earthworks should be completed under level 1 supervision in accordance with AS3798-2007 'Guidelines for Earthworks for Commercial and Residential Developments' recompacted to minimum 98% standard maximum dry density (SMDD) at 60% to 90% optimum moisture content (OMC)

However, with the water table at only 1.2m to 2.0m below the ground surface, compaction of the first layer may be very difficult and may need a geogrid and fabric to assist in the construction.

Dynamic compaction of this unit is unlikely to be suitable due to the proximity of surrounding buildings and the site being a workings school.

#### 5.3.2. Shallow Water Table

The water table was encountered at only 1.2m to 2.0m below the ground surface. As the predominate component of the fill was sand, significant inflow into excavations greater than 1.2m should be expected. The water inflows may be reduced by sheet piling into low permeability layers (Unit 2b) to allow for dewatering of the area, if requited.

Dewatering of the surrounding area, if required, may cause settlement on adjacent properties. If dewatering is required, a detailed groundwater extraction plan should be commissioned to assess the potential for causing settlement on adjacent properties and for managing disposal of water. A detailed groundwater / dewatering assessment is beyond the scope of this investigation.

Although testing only showed generally non-aggressive to mild aggressivity, experience in the area has seen a sheet pile wall disintegrate within 1 year due to naturally occurring bacteria after dewatering due to a partially failed sheet pile wall. Similar issues which may cause significant issues for surrounding developments founded on deep foundations.

#### 5.3.3. Very Soft Clays

The very soft to soft clays (10kPa to 25kPa) are likely to cause significant construction issues including:

- Large settlements due to the highly compressible nature
- Additional settlement due to primary consolidation
- Secondary settlement over the life of the project
- Untrafficable areas where excavations below 3m are completed.

These very soft soils may be improved using ground improvement methods such as deep soil mixing of the clays beneath the proposed building.

Other mitigation methods considered unlikely to be suitable include:

Proposed Stage 1 Additions - Newcastle Grammar School – Park Campus 127 Union Street Cooks Hill – Geotechnical Assessment

- Dynamic compaction Vibration of nearby developments and not effective in clay
- Pre loading and variants of this method insufficient time to complete
- Piled embankment will reduce the overburdens ability to reduce severity of the mine subsidence impacts (i.e. will cause transfer of subsidence values at rock level to the surface level.

#### 5.4. Temporary and Permanent Excavations

Excavations into the fill is likely achievable with standard construction equipment. Due to the predominately granular nature of the fill, the batter slopes should be limited to 1V:2H for excavations up to 1.2m depth. Excavations greater than 1.2m will likely require dewatering of the excavation footprint area and shoring to prevent water inflow and dewatering of the area.

Permanent batters within the fill materials should be limited to 1V:3H or flatter.

#### 5.5. Pavement Design for Driveway

Along the northern boundary of the site a "kiss and drop" pavement is proposed. For this driveway Coffey has provided four options:

- Rigid pavement allowing for minimal heavy vehicles (i.e. cars only)
- Rigid pavement allowing for 20 busses a day
- Flexible pavement allowing for minimal heavy vehicles (i.e. cars only)
- Flexible pavement allowing for 20 busses a day

For the first options (i.e. cars only) a traffic loading of 1 x 10<sup>5</sup> N<sub>HVAG</sub> is suggested with an ESA/N<sub>HVAG</sub> of 0.654 allowing for one heavy vehicle per day only, (i.e. maintenance vehicles, garbage trucks etc).

For the second option (i.e. with buses) a traffic 2 x 10<sup>6</sup> N<sub>HVAG</sub> is suggested

This pavement thickness design for the car park has been performed in accordance with the empirical procedure detailed in Austroads AGPT02-17 Guide to Pavement Technology.

The pavement thickness designs for the proposed driveway is provided, reflecting conventional design for a 40 year design life. If the assumptions above are changed then the pavement designs will need to be revised.

#### 5.5.1. Rigid Pavement Composition

With reference to Table 9.2, a project design reliability of 90% resulting in a Load Safety Factor (LsF) of 1.1 has been adopted for straight sections assuming dowelled joints.

The rigid pavement composition is provided in Table 10. The rigid pavement joint layout design should be based on RMS standard drawings or Cement Concrete & Aggregates Australia (CCAA) (2009) "Guide to Industrial Floors and Pavements". It is understood that the rigid pavement layouts will be designed by others.

Table 10 Rigid pavement composition

Layer	Rigid without shoulder no buses	Rigid without shoulder with buses
Concrete Base (mm)	190 <sup>(2)</sup> (160mm if 40MPa is utilised <sup>(3)</sup> )	180 <sup>(3)</sup>
Subbase (mm) <sup>(4)</sup>	150 <sup>(5)</sup>	150 <sup>(5)</sup>
Reengineered Subgrade (mm)	300	300
Design Subgrade CBR(%)	10	10
HVAG	1 x 10 <sup>5</sup>	2 x 10 <sup>6</sup>

#### Notes

- 1. A structural shoulder is a tied shoulder that is keyed by corrugating the joint and has a minimum width of 1.5 m, or is a 600 mm integral widening outside of the traffic lane (this may include integral channel or kerb/channel). This is not anticipated for the site.
- 2. The above assumes a minimum 28 day concrete flexural strength of 3.5MPa and a minimum 28 day concrete compressive strength of 32 MPa. A minimum SL92 Steel Reinforcement Mesh will be required with a minimum cover of 50mm. Note if the 40MPa concrete is adopted the pavement may be reduced to 160mm.
- 3. The above assumes a minimum 28 day concrete flexural strength of 4.5MPa and a minimum 28 day concrete compressive strength of 40 MPa. A minimum SL92 Steel Reinforcement Mesh will be required with a minimum cover of 50mm in accordance with Section 9.3.3. of AGPT2 17 for the higher traffic loading.
- Subbase is to comprise DGS20 complying with RMS Specification 3051 modified with minimum 5% cement in accordance with Section 9.2.2 AGPT2 17 for traffic loading between 1 x 10<sup>6</sup> and 5 x 10<sup>6</sup> NHVAG.
- 5. A thick subbase for the rigid pavement is proposed to help bridge the fill nature of the subgrade
- 6. A debonding treatment will be required between the subbase and concrete base. Debonding treatment may be bitumen emulsion or flat thick polythene sheets.
- 7. A minimum 300mm working platform should be ripped/blended and recompacted to 100% standard.
- 8. If clay subgrade is encountered during excavation, the clay should be over excavated and replaced with sand material to correspond with other areas.
- 9. The above thickness is a minimum and does not include construction tolerance.

#### 5.5.2. Flexible Pavement Options

Flexible pavement designs for the pathway has been undertaken in accordance with procedures detailed in Austroads Guide 2017 (AGPT2). With reference to Table 2.1 AGPT2 and Table 3 RMS 11.050 dated 2018, a 90% confidence level design has been included.

For the flexible design a speed of 10km/hr was adopted for the heavy vehicles. The recommended pavement composition is provided in Table 11.

Table 11: Suggested Flexible Option

Pavement Components	Layer Thickness No Buses	Layer Thickness With Buses	Comments
Wearing Course (mm)	40	40	AC14 with AE15 binder installed on a 7mm seal <sup>(1)</sup>
Base (mm)	100 <sup>(1)</sup>	120	DGB20 conforming to RMS QA Specification 3051 compacted to 98% Modified
Subbase(mm)	100 <sup>(1)</sup>	150	DGS20 conforming to RMS QA Specification 3051 compacted to 95% Modified
Reengineered Subgrade (mm)	300	300	Locally sourced sand material
Total Thickness (mm)	540mm	610mm	
Subgrade	CBR min 10%	CBR min 10%	
NDT	1.0x10 <sup>5</sup>	2.0x10 <sup>6</sup>	

#### Notes:

AC14 with A15E binder with 5% to 6% by mass. Note this layer is to be replaced after 10 to 15 years due to oxidisation hence the design life of asphalt is assessed by a lower 0.7x10<sup>6</sup> NDT. The polymer modified asphalt is recommended to decrease the modulus over an unbound base.

RMS 3051 material specified due to moderate traffic count proposed for the road above 1 x 10<sup>6</sup> ESA's. Material to have a minimum modulus of 300MPa.

(1) It is noted without buses option may adopt NGB conforming to City of Newcastle requirements.

#### 5.5.3. Subgrade Preparation

All earthworks should be carried out in accordance with the recommendations outlined in AS3798-2007 'Guidelines for Earthworks for Commercial and Residential Developments' and City of Newcastle Council Guidelines where applicable.

The upper minimum 300mm below invert level of pavement/s should be ripped and recompacted to create a homogenous material. Compaction is to be to 100% standard compaction at 60% to 90% optimum moisture content. Where variable materials are observed a 300mm select layer should be sourced (minimum CBR 10%).

## 6. Closing remarks

The Newcastle Grammar School site at 127 Union Street Cooks Hill is positioned over in the order of 4m of fill overlying very soft to soft compressible clays and peats. These units are likely to cause significant settlement and consolidation.

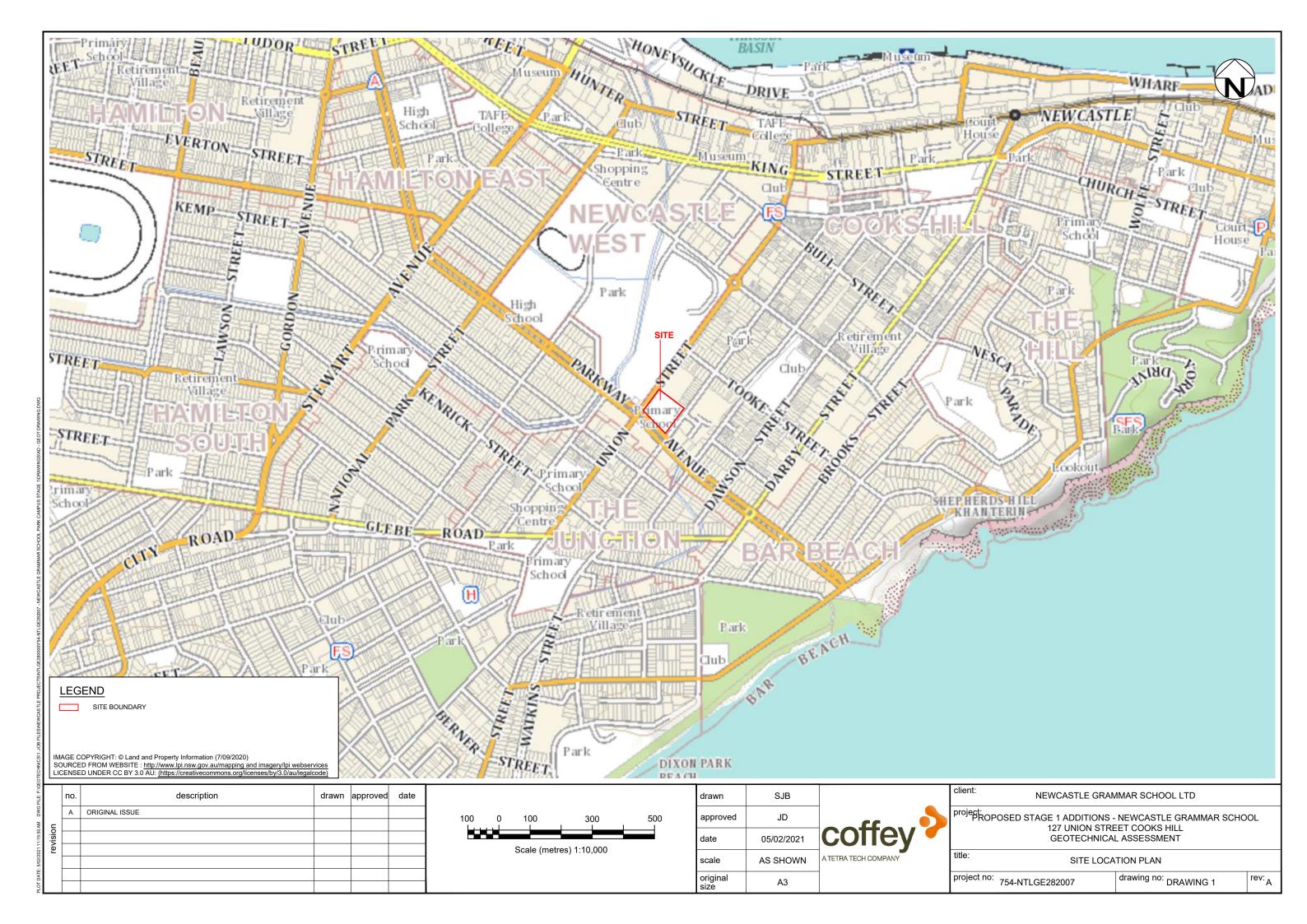
The project structural engineer should review the above ground conditions is conjunction with the mine subsidence assessment 754-NTLGE282007-AB dated 2 February 2021.

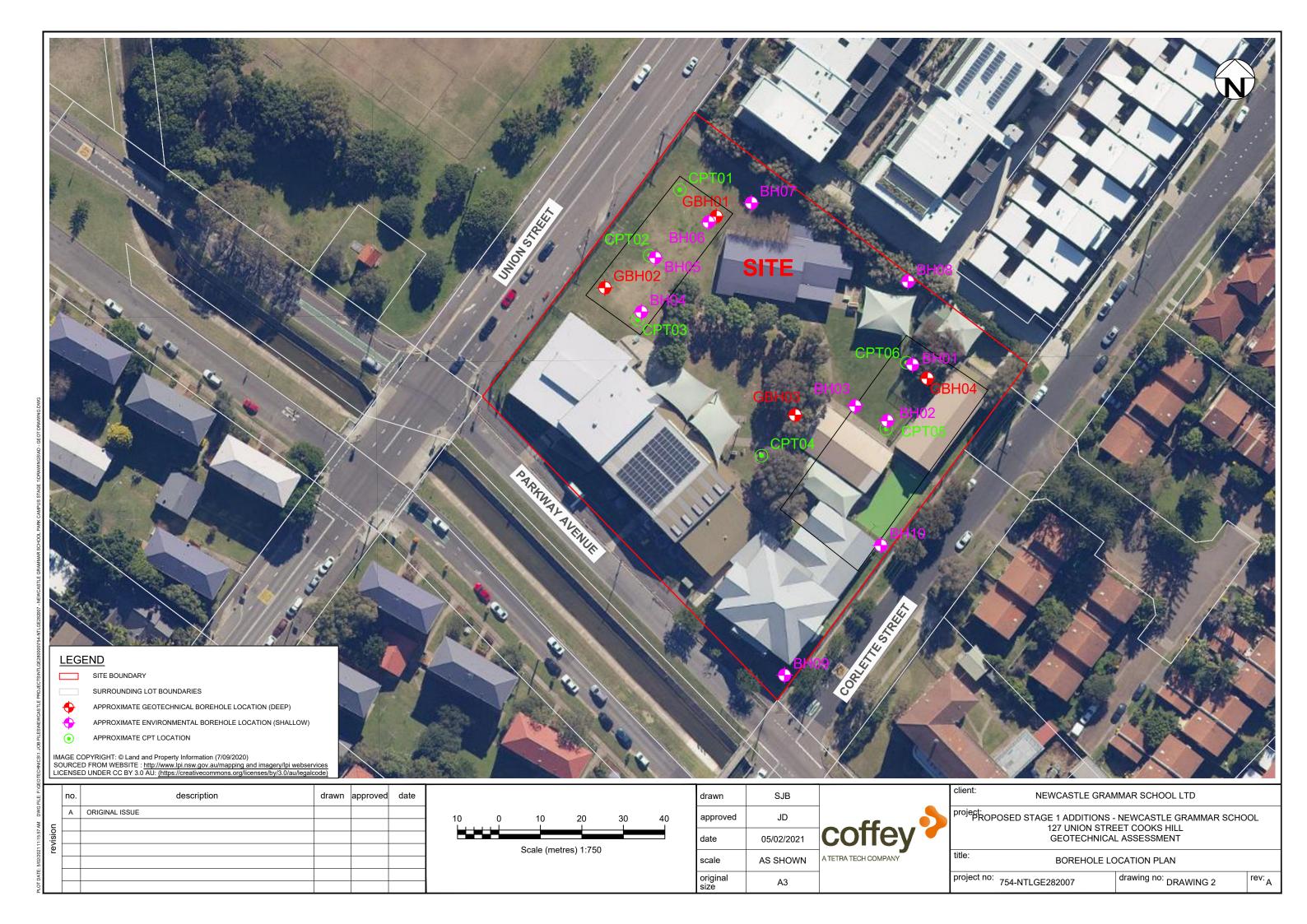
Further advice on the uses and limitations of this report is presented in the attached document, 'Important Information about your Coffey Report'.

Signature:	Short
Full name:	Simon Baker
Title:	Senior Geotechnical Engineer
Date:	19 February 2021

Drawings

This page has been left intentionally blank





Appendix A – Borehole Logs

This page has been left intentionally blank



## **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Borehole ID. BH01 sheet: 1 of 2

SB

754-NTLGE282007 project no. Newcastle Grammar School date started: 15 Jan 2021

date completed: 15 Jan 2021 principal:

project: logged by: 127 Union Stroot Cooks Hill 2200 ahaakad bi C ID

100	cati	on:	127	Union	Stre	eet, (	Cook	s Hil	I, 2300		checl	ked by:	SJB
ро	sitic	n: E:3	34,36	3; N: 6,355	5,233	(MGA9	4 )		surface elevation: 2.8 m (AHD)	angle	from h	orizontal: 9	0°
dri	ll m	odel: Ge	opro	be, Trackı	mount	ted			drilling fluid: None	hole d	iamete	r : 50 mm	
d	rillir	ng infor	mati	on			mate	rial sub	stance				
method &	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) % 8 8 8	structure and additional observations
CDF_0_9_07_LIBRARY GLB rev.AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawingfile>&gt; 16/02/2021 11:40  PT</drawingfile>			Encountered	E		1.5—		SP SP CL-CI SP	FILL: Gravelly SAND: fine to medium grained, brown to pale brown, fine to medium grained, sub-angular gravels, with grass rootlets.  FILL: SAND: fine to medium grained, white to grey.  FILL: Sandy CLAY: low to medium plasticity, orange and mottled red, fine to medium grained sand with fine to medium grained gravels.  FILL: SAND: fine to medium grained gravels.  FILL: SAND: fine to medium grained gravels.  1.5m: gravels become finer grained  2.5m: becomes no gravels				FILL (TOPSOIL)  FILL (GENERAL)  PID: 0.1 ppm  FILL (COAL REJECT)  PID: 0.1 ppm  PID: 0.1 ppm  FILL (SOAL REJECT)  PID: 0.1 ppm
$\mu$	S A / A T	od auger di auger sc hand au washboi hand au push tub bit show AD/T blank bit	rewinger e ger ger e	g*	pend wate	etration		j to ter	E environmental sample SS split spoon sample	isture cor dry moist wet	escription AS 1726 Indition	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



blank bit

TC bit

## **Engineering Log - Borehole**

2 of 2 sheet:

Borehole ID.

754-NTLGE282007 project no. Newcastle Grammar School

date started: 15 Jan 2021

MD

medium dense

dense

very dense

**BH01** 

15 Jan 2021 principal: date completed:

Newcastle Grammar School - Park Campus SB project: logged by:

127 Union Street, Cooks Hill, 2300 SJB location: checked by: position: E: 384,363; N: 6,355,233 (MGA94 ) surface elevation: 2.8 m (AHD) angle from horizontal: 90° drill model: Geoprobe, Track mounted drilling fluid: None hole diameter : 50 mm drilling information material substance material description hand structure and penetration penetro meter samples & soil group symbol  $\widehat{\Xi}$ method & support moisture condition SOIL NAME: plasticity or particle characteristic, graphic Ξ depth ( water colour, secondary and minor components (kPa) 씸 9 2 8 4 PEAT: dark grey to black, with petrified roots. SWAMP DEPOSITS Borehole BH01 terminated at 4.2 m +++Target depth 4.5  $| \cdot |$ -2 5.0  $\perp$ I I I I II I I II + I + I5.5 I I I I-3 6.0  $\perp$ I I I I I111 $\perp$  $\Box$ 6.5 -4 7.0 +111 $\Box$ 7.5 I I I I I-5 method AD auger drilling\* support samples & field tests soil group symbol & consistency / relative density bulk disturbed sample soil description very soft auger screwing C casing D E disturbed sample based on AS 1726:2017 S F soft HA W hand auger environmental sample firm penetration St VSt washbore SS split spoon sample stiff HA PT hand auge undisturbed sample ##mm diameter very stiff no resistance ranging to
 refusal U## moisture condition ΗP hand penetrometer (kPa) dry moist wet plastic limit liquid limit D M W standard penetration test (SPT) Fb Ν friable SPT - sample recovered very loose bit shown by suffix 10-Oct-12 water level on date shown SPT with solid cone Nc loose e.g. B AD/T

vane shear; peak/remouded (kPa)

VS

R

НВ

refusal

water inflow

water outflow



principal: project:

## **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **BH02** 

sheet: 1 of 1

logged by:

754-NTLGE282007 project no.

SB

date started: 15 Jan 2021

date completed: 15 Jan 2021

127 Union Street, Cooks Hill, 2300 SIR checked by

loca	atio	on:	127	Union	Str	eet, (	Cook	s Hil	l, 2300		checl	ked by:	SJB
pos	sitior	n: E:3	34,3	57; N: 6,35	5,220	(MGA9	4)		surface elevation: 3.1 m (AHD)	angle	from h	orizontal: 9	90°
drill	l mo	del: Ge	opro	be, Track	moun	ted			drilling fluid: None	hole d	liamete	r : 50 mm	
dri	illin	g infor	mati	on			mate	rial sub	stance		ı		
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) 8 8 8	structure and additional observations
Log COF BOKEHOLE: NON CORED / 54-NILGEZ8200/ GFU <	dns		Encountered	E		1.5 —	elb Company of the Co	SP SC SP CL CI	FILL: Gravelly SAND: fine to medium grained, brown, fine to medium grained, sub-angular gravels, with grass rootlets.  FILL: CLAYEY SAND: fine to medium grained.  FILL: SAND.  FILL: Sandy CLAY.  FILL: Sandy CLAY: medium plasticity, brown to black to grey, fine to medium grained sand.  CLAY: medium plasticity, grey.  Borehole BH02 terminated at 3.2 m	ou	uoo	000	FILL PID: 13.3 ppm  FILL (COAL REJECT) PID: 1.6 ppm  FILL  PID: 0.1 ppm  ALLUVIAL SOIL
AD AS	6 8	auger d auger s	rewir		sup M r C c		N	nil	Target depth  samples & field tests  B bulk disturbed sample D disturbed sample	soil grou soil de based on A	escriptio		consistency / relative density VS very soft S soft
HA W HA PT * e.g B T V	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	hand auwashbo hand au push tul bit show AD/T blank bit TC bit V bit	ger pe n by s	suffix	wate	10-0 leve		iter 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 NC SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing		mit		F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



principal:

## **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **BH03** 

1 of 1 sheet:

754-NTLGE282007 project no.

date started: 15 Jan 2021

date completed: 15 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: SB

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

location: 12	., 0111011	0170	.c., \	COOK	3 1111	I, 2300		check	ieu by.	SJB
position: E: 384,		-		4)		surface elevation: 2.9 m (AHD)	-		orizontal:	90°
drill model: Geop	robe, Track	mounte	ed			drilling fluid: None	hole d	liamete	: 50 mm	
drilling informa	tion			mate	rial sub	ostance				ı
support  support  pure 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
PT	E	-2 -1 -0		TII	SP SP CL	FILL: GRAVEL: fine grained.  FILL: Gravelly SAND: fine to medium grained, brown, fine to medium grained, sub-angular gravels.  FILL: SAND.  FILL: Sandy CLAY: low plasticity, mottled red and grey.  FILL: CLAY: high plasticity, yellow and mottled grey.  FILL: CLAYEY SAND: fine to medium grained, pale brown, with fine to coarse grained sub-angular gravels.  PEAT: dark grey to black.  Borehole BH03 terminated at 3.2 m Target depth	m H	20 20 20 20 20 20 20 20 20 20 20 20 20 2	100	FILL (TOPSOIL) PID: 9.1 ppm  FILL (COAL REJECT)  PID: 8.1 ppm  FILL  PID: 0.2 ppm  SWAMP DEPOSITS
method AD auger drillin AS auger screw HA hand auger HA hand auger PT push tube  * bit shown by e.g. AD/T B blank bit	ving*	supp M m C ca pene wate	etration		l ater	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 W	soil grou soil de pased on A isture cor dry moist wet plastic lin liquid lim	escriptio AS 1726: Indition	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



principal: project:

## **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **BH04** sheet: 1 of 1

754-NTLGE282007 project no.

date started: 15 Jan 2021

date completed: 15 Jan 2021

logged by: SB

127 Union Street, Cooks Hill, 2300 SIR checked by

location	i: <b>1</b> 2	27 Ur	nion	Stre	eet, (	Cook	s Hil	l, 2300			check	ked by:	SJB
position:	E: 384	,298; N	: 6,355	,246 (	(MGA9	4 )		surface elevation: 2.4 m (AHD)		angle	from ho	orizontal: 9	90°
drill mode	el: Geop	orobe,	Track r	nount	ted			drilling fluid: None		hole o	liamete	r : 50 mm	
drilling i	inform	ation				mate	rial sub	stance					
	2 penetration	field	ples & I 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
-PPT				-2	0.5—	5	GP  CL SC CL SP	Sandy GRAVEL: fine to medium grained, sub-angular, brown, fine to medium grained san with grass rootlets.  Sandy CLAY: low plasticity, brown to black, fine medium grained sand, fine to medium grained sub-angular gravels.  CLAYEY SAND: fine to medium grained, brown with fine to coarse sub-angular gravels.  Sandy CLAY: medium plasticity, mottled orangered and white, with fine to medium grained sand.  SAND: fine to medium grained, pale brown, som fine to medium grained, sub-angular gravels.  1.4m: becomes without gravels, and pale yellow.	e to	E 0	0.5		FILL (GENERAL)  FILL (COAL REJECT)  FILL (GENERAL)
			,	-01	2.5			Borehole BH04 terminated at 2.2 m Target depth					
method AD aug AS aug HA har W was HA har PT pus  * bit e.g. AD B bla	ger drillii ger scre nd auge sshbore nd auge sh tube shown b O/T ank bit	wing* r		pene wate	etration  or of the control of the c		l ater shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	mois D M W	soil grou soil de ased on a sture cor dry moist wet plastic li liquid lin	escription AS 1726 Indition	ol & 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



principal: project:

## **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **BH05** sheet: 1 of 1

project no. **754-NTLGE282007** 

SB

date started: **15 Jan 2021** 

date completed: 15 Jan 2021

logged by:

location: 127 Union Street, Cooks Hill, 2300 checked by: SJB

_	iocati			Union				3 1111				kea by:	SJB
- 1				01; N: 6,355 bbe, Track		•	4 )		surface elevation: 2.2 m (AHD) drilling fluid: None	•		orizontal: 9 r : 50 mm	90°
Ī	drillir	ng infor	mati	on			mate	rial sub	stance				
	method & 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
CDF_0_9_07_LIBRARY.GLB rev.AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawningfile>&gt; 16/02/2021 11:40</drawningfile>	- bi		Encountered	E	-2 1	1.0—		용   C   S	FILL: Gravelly SAND: fine grained, brown, with fine grained sub-angular gravels, with grass rootlets.  0.2m: becomes black  FILL: CLAY: medium plasticity, brown to grey.  FILL: Sandy CLAY: brown to grey, with fine to medium grained sand.  FILL: Sandy CLAY: brown to grey, with fine to medium grained sand.  FILL: Sandy CLAY: brown to grey, with fine to medium grained sand.  FILL: SAND: fine to medium grained, brown to grey.  FILL: GRAVEL: fine grained, black, carbonaceous gravels.  FILL: CLAY: medium plasticity, grey to black.  Borehole BH05 terminated at 2.2 m  Target depth				FILL (GENERAL) PID: 9.3 ppm  FILL (COAL REJECT) PID: 6.6 ppm  FILL (GENERAL)
	method AD AS HA W HA PT * e.g. B T	auger d auger si hand au washboi hand au push tul bit show AD/T blank bit TC bit V bit	crewir ger e ger e n by s	ng*	pend wate	etration  output  outp		g to iter shown	E environmental sample SS split spoon sample	isture cor dry moist wet	escriptio AS 1726: addition	ol & 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



principal: project:

## **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **BH06** 1 of 1 sheet:

754-NTLGE282007 project no.

date started: 15 Jan 2021

date completed: 15 Jan 2021

logged by: SB

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

locat							3 mi	1, 2300			checl	ке	u b	y:	SJB
			14; N: 6,35			)4 )		surface elevation: 2.1 m (AHD)		•	from ho				
		_	be, Track	moun	ted	ì		drilling fluid: None		hole d	liamete	r:	50 r	mm	
drilli	ing info	rmati	on			mate	rial sub	stance				_			T
method & 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	ľ	han ene met (kPa	tro- er a)	structure and additional observations
			E	-2	-		SP	FILL: Gravelly SAND: fine to coarse grained, brown, fine grained sub-angular gravels.				     		         	FILL (TOPSOIL) PID: 6.4 ppm
			E	1	-	$\bowtie$	CI -	FILL: CLAY: medium plasticity, brown to grey.							FILL (GENERAL)
1					0.5	$\bowtie$	SP -	FILL: SAND: fine to medium grained, brown.							PID: 4.4 ppm
—PT—————		Encountered		-1	1.0—		CL-CI	FILL: Sandy CLAY: low to medium plasticity, mottled red and brown to grey, fine grained sub-angular gravels, some red brick fragments				j		 	·
			E		- - 1.5—		 SP	FILL: SAND: fine to medium grained, brown to grey.							
					-		CH	FILL: CLAY: high plasticity, grey to black, trace					i H	ΪÌ	PID: 4.1 ppm
					2.0-			ceramic fragments 1.8 - 1.9m.							
					-			Borehole BH06 terminated at 2.1 m Target depth							
				_	2.5—										
				1	3.0 —							j			
				_	3.5—										
meth	         		1	Sim	port -			samples & field tests		soil grou	ıp svmh	j	         &	ΪÌ	consistency / relative density
AD AS HA W HA PT	auger d auger s hand au washbo hand au push tu	crewii iger re iger		M r C c	mud casing 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)	moi: D M	soil de ased on A sture cor dry moist	AS 1726	on			VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable
* e.g. B T V	* bit shown by suffix e.g. AD/T B blank bit T TC bit				10-leve	Oct-12 wa el on date er inflow er outflow	shown	N* SPT - sample recovered  Nc SPT with solid cone  VS vane shear; peak/remouded (kPa)  R refusal  HB hammer bouncing	W Wp Wi	wet plastic lii liquid lim					VL very loose L loose MD medium dense D dense VD very dense



## **Engineering Log - Hand Auger**

sheet: 1 of 1

Borehole ID.

754-NTLGE282007 project no. Newcastle Grammar School date started:

15 Jan 2021

**BH07** 

date completed: 15 Jan 2021 principal: project: Newcastle Grammar School - Park Campus logged by: SB

127 Union Stroot Cooks Hill 2200 ahaakad bi C ID

le	ocati	on:	127	' Union	Stre	eet, (	Cook	s Hil	I, 2300		check	ed by:	SJB
р	ositio	n: E:3	34,32	25; N: 6,355	5,272	(MGA9	4 )		surface elevation: 2.1 m (AHD)	angle	from ho	orizontal: 9	0°
d	Irill m	odel: Ha	nd A	uger					drilling fluid: None	hole d	iamete	: 50 mm	
L	drilliı	ng infor	nati	on			mate	rial sub	stance				
0 10 0	metnod & 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) 8 8 8 8	structure and additional observations
Ld	-			E B	-2	0.5—		SP	FILL: SAND: fine to medium grained, brown and yellow, fine grained sub-angular gravels, with grass rootlets.				FILL (GENERAL) PID: 6.2 ppm
21 11:41					-1	1.0 —	× V V		Hand Auger BH07 terminated at 0.6 m Target depth				PID: 2.1 ppm
o) < <drawingfile>&gt; 16/02/2021 11:41</drawingfile>					_	1.5— - - -							- - - - -
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ					-0	2.0—							- - - - - -
CDF_0_9_07_LIBRARY.GLB rev:AU Log COF BOREHOLE: I					<b>−</b> -1	3.0							- - - - - - -
	metho AD AS HA W HA PT * e.g. B	od auger dr auger sc hand au washbor hand au push tub bit show AD/T blank bit TC bit	rewinger e ger e	g*	pend wate	etration		j to ter	E environmental sample SS split spoon sample	based on A  Disture con dry moist wet plastic lir	scriptio AS 1726: adition	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



## **Engineering Log - Hand Auger**

sheet: 1 of 1

**BH08** 

Borehole ID.

client: Newcastle Grammar School Project no. 754-NTLGE282007

principal: date completed: 18 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: SB

loca	ation:	12	7 Union	Stre	eet, (	Cook	s Hil	l, 2300		check	ked by:	SJB
posi	ition: E	: 384,3	362; N: 6,35	5,253	(MGA9	4 )		surface elevation: 2.4 m (AHD)	angle t	from ho	orizontal: 9	0°
-	model:							drilling fluid: None	hole di	iamete	r : 70 mm	
dri	lling in		tion			mate	rial sub	stance				
method &	2 penetration		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) % 8 8 8	structure and additional observations
НА — — — — — — — — — — — — — — — — — — —			E		1 1		SP	FILL: SAND: fine to medium grained, brown, fine ot medium grained sub-angular gravels.	D - M			FILL (TOPSOIL)  PID: 8.2 ppm  -
		· 1	E	-2	0.5—			0.3m: becomes dark brown				FILL (GENERAL)  - PID: 2 ppm
2007.GPJ < <drawingfile>&gt; 16\02/2021 11:41</drawingfile>					1.0—			Hand Auger BH08 terminated at 0.6 m Target depth				- - -
U LOG COF BORRFHOLE: NON CORED 754-NILGEZ8Z007.GFJ <-UrawingFile>> 16/02/2021 11:41				-1	- - - 1.5—							- - - -
AD AS	auge	er drilling		supi M r C c		N	nil	samples & field tests B bulk disturbed sample D disturbed sample	soil grou soil de based on A	scriptio	n	consistency / relative density VS very soft S soft
HA W HA PT * e.g. B T V	hand wash hand push	d auger hbore d auger n tube hown by f k bit		pend wate	etration	no resiranging refusal  Oct-12 was el on date er inflow er outflow	to ter shown	E environmental sample SS spilt spoon sample U## undisturbed sample ##mm diameter HP hand penetrometer (kPa) N standard penetration test (SPT) SPT - sample recovered Nc SPT with solid cone	moisture con D dry M moist W wet Wp plastic lin WI liquid lim	<b>dition</b>	2017	S SOIT F F firm St stiff VSt very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



principal: project:

## **Engineering Log - Hand Auger**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

**BH09** sheet: 1 of 1

Borehole ID.

754-NTLGE282007 project no.

date started: 18 Jan 2021

date completed: 18 Jan 2021

logged by: SB

127 Union Street. Cooks Hill. 2300 S.IB location. checked by:

loc	atic	n:	127	7 Union	Stre	eet, (	Cook	s Hil	1, 2300			check	ked by:	SJB
pos	sition	n: E:3	34,3	33; N: 6,35	5,158 (	(MGA9	4)		surface elevation: 3.0 m (AHD)		angle	from ho	orizontal: 9	90°
_		del: Ha							drilling fluid: None		hole d	iamete	r : 70 mm	
dr	illin	g infor	mati	on			mate	rial sub	estance					
method &	support	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
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ <-DrawingFile>> 16/02/2021 11:41  HA  HA	ddns		Wate	E	L C C C C C C C C C C C C C C C C C C C	0.5— 1.0— 1.5—	daub)	S IDS P IC	FILL: SAND: fine to medium grained, pale browfine grained, sub-angular to sun-rounded gravel  0.2m: becomes dark brown  FILL: CLAYEY SAND: fine to medium grained, brown.  0.7m: becomes brown and mottled black  Hand Auger BH09 terminated at 0.8 m  Target depth		Cond	Consi		FILL (TOPSOIL)  PID: 10.1 ppm  FILL (GENERAL)  PID: 4.1 ppm  PID: 0.6 ppm
CDF_0_9_07_LIBRARY.GLB rev.AU Log	ethoo ) a 3 a 4 d 1		crewir ger e ger e n by	ng*	pene	etration  or of the control of the c		g to l later shown	samples & field tests  B	moist D 0	oil grou soil de sed on A ture con dry moist wet plastic lir liquid lim	scriptio AS 1726: dition		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



project:

## **Engineering Log - Hand Auger**

Newcastle Grammar School - Park Campus

754-NTLGE282007 project no.

logged by:

sheet:

Borehole ID.

**BH10** 

1 of 1

SB

Newcastle Grammar School client: date started: 18 Jan 2021

date completed: 18 Jan 2021 principal:

location: 127 Union Street, Cooks Hill, 2300										check	ked by:	SJB		
position: E: 384,356; N: 6,355,190 (MGA94 ) surface elevation: 3.2 m (AHD)										angle	from ho	orizontal: 9	90°	
drill model: Hand Auger drilling fluid: None										hole diameter : 70 mm				
drilli	ng info	mati	on			mate	rial sub	stance				1		
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) 8 8 8 8	structure and additional observations	
•			Е	-3	-		SP	FILL: SAND: fine grained, dark brown, with fine grained sub-angular gravels and grass rootlets		D - M			FILL (TOPSOIL) PID: 6.4 ppm	
— HA					-			0.3m: becomes pale brown					FILL (GENERAL)	
			E		0.5		SC	FILL: CLAYEY SAND: fine to medium grained pale brown.					PID: 3.8 ppm	
•				_	-			0.5m: red brick fragments  Hand Auger BH10 terminated at 0.6 m  Target depth					***************************************	
				-2	1.0-									
				_	- 1.5 — - -									
metho AD AS HA W HA PT * e.g. B T	AS auger screwing* hand auger W washbore HA hand auger push tube  * bit shown by suffix e.g. AD/T B blank bit T TC bit				— leve	ı	ater shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	D dry M moist W wet Wp plastic limit			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		



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **GBH01** 

sheet: 1 of 6

project no. **754-NTLGE282007** 

date started: 18 Jan 2021

date completed: 20 Jan 2021

logged by: **HL** 

_	locat	tion:	127	7 Union	Stre	eet, (	Cook	s Hil	, 2300	checked by: <b>SJB</b>	
I	positi	tion: E: 384,316; N: 6,355,20 model: Hanjin D&B, Track m lling information				(MGA9	4 )		surface elevation: 2.1 m (AHD)	angle from horizontal: 90°	
Į	drill m	nodel: Ha	njin	D&B, Trac	k mou	nted			drilling fluid: Guar Gum	hole diameter : 150 mm	
ļ	drilli	ing info	mati	on			mate	rial sub	stance		
	method & 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	more than the condition of the condition	
	AD		18/01/21		-2 - -1 -	1.0		GP CL-CI	FILL: SILTY SAND: fine grained, brown to dark brown, loamy, trace of sub-angular gravels with grass rootlets.  FILL: Sandy GRAVEL: fine grained, sub-angular to angular, dark brown to dark grey, with fine to coarse grained sand, carbonaceous material with some clay.  FILL: Gravelly CLAY: low to medium plasticity, dark brown to black and pale brown, fine to mediun grained sub-rounded to sub-angular coal gravels with silt and coal chitter.		
32007.GPJ < <drawingfile>&gt; 16/02/2021 11:41</drawingfile>	* *		Encountered	SPT 2, 2, 3 N=5	1 2	3.0 —	TIT	<u></u>	PEAT: black, trace of fine to medium grained sand and roots / rootlets.		
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ	- M			SPT 1, 1, 1 N=2	3	5.0			and roots / rootiets.		
CDF_0_9_07_LIBRARY.GLB rev:AU Log COF				SPT 0, 0, 0 N=0	4 - 5	6.0 — 7.0 —		MH	Clayey SILT: dark grey, traces of shell fragments.	- >Wp VS	.
	method AD auger drilli AS auger scre HA hand auge W washbore HA hand auge push tube  bit shown l e.g. AD/T B blank bit T TC bit			ng*	pene	etration  or company  etration  etration  or company  etration  et		I ater shown	HP hand penetrometer (kPa)  N standard penetration test (SPT)  N* SPT - sample recovered  Nc SPT with solid cone	soil group symbol & consistency / relative density   soil description	



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **GBH01** 

sheet: 2 of 6

project no. **754-NTLGE282007** 

date started: 18 Jan 2021

date completed: 20 Jan 2021

logged by: HL

	locati	ion:	127	' Union	Str	eet, (	Cool	ks Hil	I, 2300		chec	ked by:	SJB
	positio	n: E: 3	34,3	16; N: 6,35	5,269	(MGA9	4)		surface elevation: 2.1 m (AHD)	ang	e from h	orizontal: 9	90°
				D&B, Trac	k mou	nted			drilling fluid: Guar Gum	hole	diamete	r : 150 mm	
	drillir	ng infor	mati	on			mate	erial sul	estance				
	method & 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
CDF_0_9_07_LIBRARY.GLB rev/AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawingfile>&gt; 16/02/2021 11:41</drawingfile>			Encountered	SPT 0, 0, 0 N=0  SPT 0, 3, 1 N=4  SPT 3, 1, 2 N=3  SPT 5, 2, 1 N=3	6 7 8 10 11	9.0 —		SM	Clayey SILT: dark grey, traces of shell fragments (continued)  8.5m: becoming sandy, fine grained  SILTY SAND: fine to medium grained, grey.  11.5m: strong odour  Silty CLAY: high plasticity, dark grey, trace of fine grained sand.	e >Wp	VS		ALLUVIAL SOIL
	method AD auger drill AS auger scr HA hand aug W washbore HA hand aug PT push tube  bit shown e.g. AD/T B blank bit T TC bit V V bit		crewir ger e ger e n by s	ng*	pen wate	etration  or company  etration  etration  or company  etration  et		al ater e shown	samples & field tests 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) N* SPT - sample recovered SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	soil	limit	n	consistency / relative density VS Very soft S S Soft F F firm St stiff VSt Very stiff H hard Fb friable VL very loose L loose MD medium dense D dense VD very dense



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **GBH01** 

sheet: 3 of 6

project no. **754-NTLGE282007** 

date started: 18 Jan 2021

date completed: 20 Jan 2021

logged by: **HL** 

	locatio	on:	127	' Union	Str	eet,	Cook	s Hil	l, 2300		check	ked by:	SJB
ſ	position	n: E: 38	34,31	16; N: 6,355	5,269	(MGA9	)4 )		surface elevation: 2.1 m (AHD)	angle	from ho	orizontal: 9	0°
			_	D&B, Tracl	k mou	nted			drilling fluid: Guar Gum	hole d	liamete	: 150 mm	
ŀ	drillin	g infor	matio	on		ı	mate	rial sub					
	method & support	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)	structure and additional observations
			_	SPT 0, 0, 3 N=3	14 	-		CH	Silty CLAY: high plasticity, dark grey, trace of fine grained sand. (continued)	>Wp	VS		ALLUVIAL SOIL -
				14-5	15 -	- 17.0 — - -		CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	>Wp	F		RESIDUAL SOIL -
16/02/2021 11:41				SPT 2, 2, 4 N=6	16 -	- 18.0 — - - -							- - - - - - - - - - - - - - - - -
			-	SPT	17	19.0 — -			CLAYEY SAND: fine to medium grained, grey.		MD		-
J < <drawingfile>&gt;</drawingfile>			Encountered	6, 7, 7 N=14	-	-							- - - -
754-NTLGE282007.GPJ	- W — — — — —		Enco		18 -	20.0							
COF BOREHOLE: NON CORED					19 -	21.0 — - - - - 22.0 —							
Log			•	SPT 4, 4, 18 N=22	20	-			Sandy CLAY: low plasticity, mottled grey and pale	- JA/n			-
CDF_0_9_07_LIBRARY.GLB rev:AU					21 -	- 23.0 — - - -		OL.	brown to orange, fine grained sand.	<wp< td=""><td>JI.</td><td></td><td></td></wp<>	JI.		
	AS A	d auger dr auger sc hand au washbor hand au push tub bit show AD/T blank bit TC bit V bit	rewin ger e ger e	g*	pen wat	etration  or N P  er  10-  leve wat	ı	l ater shown	E environmental sample SS split spoon sample	based on A  bisture cor  dry  moist  wet  plastic lii	escriptio AS 1726: andition	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



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **GBH01** 

sheet: 4 of 6

logged by:

project no. **754-NTLGE282007** 

HL

date started: 18 Jan 2021

date completed: 20 Jan 2021

loca	ation:	127	Union	Str	eet, (	Cook	s Hil	I, 2300			check	ed by:	SJB
posi	tion: E:3	84,3	16; N: 6,35	5,269	(MGA9	4 )		surface elevation: 2.1 m (AHD)	á	angle	from ho	rizontal: 9	0°
drill ı	model: Ha	anjin	D&B, Trac	k mou	nted			drilling fluid: Guar Gum	ŀ	hole d	iameter	: 150 mm	
dril	lling info	mati	on			mate	rial 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	o di di	moisture condition	consistency / relative density	hand penetro- meter (kPa) (kPa)	structure and additional observations
				22 - 23	- - - - 25.0—		CL	Sandy CLAY: low plasticity, mottled grey and pal brown to orange, fine grained sand. (continued)	lle <	Wp	St		RESIDUAL SOIL
		sred	SPT 4, 6, 8 N=14	-23	-								
M H		Encountered		24 -	26.0— - - -								
	A		SPT	25 -	27.0 — - - -			∖ 27.55m: 50mm ironstone band		<u></u>			EXTREMELY WEATHERED
			13, 10, 7 N=17	26	- 28.0 -			CLAYEY SAND: fine to medium grained, grey, with thin ironstone bands.  Borehole GBH01 continued as cored hole					MATIERAL
				27	- 29.0— - -								
				28	30.0— - -								
				29 -	- 31.0 — - - -								
met AD AS HA W HA PT * e.g.	thod auger d auger s hand au washbo hand au push tul bit show AD/T blank bi TC bit	crewir iger re iger be	ng*	M D	etration  orange  etration  orange  er  location leve water		ater shown	samples & field tests 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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	moistu D dr M me W we Wp pla	ed on A	nit	ol & n	consistency / relative density VS Very soft S 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



principal: project:

# **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH01

5 of 6 sheet:

754-NTLGE282007 project no.

date started: 18 Jan 2021

date completed: 20 Jan 2021

logged by: HL

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

oositi	ion:	E: 38	4,316; 1	N: 6,35	5,269 (MGA94 ) surface elevation:	2.1 m (AF	ID)		angl	e from horiz	ontal: 90°	
drill n	node	el: Har	ijin D&E	3, Trac	ck mounted drilling fluid: Guar 0	Gum			hole	diameter : 1	50 mm	
drilli	ing i	nform	ation	mate	rial substance				rock	mass defe	cts	
support	water	RL (m)	depth (m)	graphic log	material description  ROCK TYPE: grain characterisics, colour, structure, minor components	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)	additional obs defect des (type, inclination, planar thickness particular	scriptions ity, roughness, coati
		22 - 23 - 24 -	25.0 — 25.0 — 26.0 — 27.0 —									NO.
	P	26 27	- - 28.0 — - - - 29.0 — -		started coring at 28.00m  Sandy CLAY (CL): low plasticity, orange to brown, fine to medium grained sand with some ironstone fragments.  INTERLAMINATED SILTSTONE (30%) & SANDSTONE (70%): grey, fine grained sandstone with traces of carbonaceous laminations.	XW SW		a=0.28 d=0.35	90%			Defects are: PT, 0 - 21, PL, RO, 9
	Encountered	28 - 29	30.0 —		SILTSTONE: grey to dark grey.  INTERLAMINATED SILTSTONE (60%) & SANDSTONE (40%): fine grained sandstone with traces of carbonaceous laminations.	SW -		a=0.37 d=0.27	79%		Drilling Break  Compared to the compared to th	
AS AD CB W RR	AD auger drilling Claw or blade bit W washbore rock roller WMLC NMLC core (51.9 mm) AQ wireline core (47.6mm) wireline core (83.5mm) wireline core (85.0mm) HA hand auger			6mm) 5mm)	10/10/12, water level on date shown water inflow complete drilling fluid loss partial drilling fluid loss	ecovered symbols indicate re recovered withdrawn	material)	HW highly MW moder	al soil nely wea weathe rately w / weathe ith A for a w	athered red eathered 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



principal:

project:

### **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH01

6 of 6 sheet:

754-NTLGE282007 project no. date started: 18 Jan 2021

date completed: 20 Jan 2021

HL logged by:

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

position: E: 384,316; N: 6,355,269 (MGA94 ) surface elevation: 2.1 m (AHD) angle from horizontal: 90° drill model: Hanjin D&B, Track mounted drilling fluid: Guar Gum hole diameter: 150 mm drilling information material substance rock mass defects material description estimated defect additional observations and weathering 8 alteration field tests & Is(50) defect descriptions tion, planarity, roughness, coating, ROCK TYPE: grain characterisics,  $\widehat{\Xi}$ (type, inclina core run & RQD method a graphic. colour, structure, minor components Ξ depth ( (MPa) thickness, other) water 30 300 300 3000 చ \_ ≥ I ∃ H particular -30 SILTSTONE: grey. (continued) SW MW ─ CS, 10 mm
─ JT, 85°, PL, RO, CN 79% 33 O -31 SANDSTONE: fine to medium grained, grey, SW some carbonaceous laminations. JT, 45°, PL, RO, CN Encountered a=0.66 d = 0.3634.0 -32 JT, 90°, PL, RO, SN INTERLAMINATED SILTSTONE (20%) & SW MW JT, 40°, PL, RO, CN 53% SANDSTONE (80%): fine grained sandstone JT. 40°, PL. RO, CN with traces of carbonaceous laminations. 35.0 -33 SM. 20 mm SANDSTONE: fine grained, pale grey. FR a=2.51 d=2.08 JT, 35°, PL, RO, CN SILTSTONE: grey to dark grey. SW Drilling Break JT, 60°, PL, RO, CN **Drilling Break** -34 Borehole GBH01 terminated at 36.00 m  $\mathbf{I}$ Target depth 1111137.0 -35 11111IIIIII $\mathbf{I}$  $\perp$ I I I I I I38 N I I I I I I-36 39.0 -37 IIIIIIweathering & alteration defect type planarity method & support graphic log / core recovery support PL planar CU curved UN undulating ST stepped parting joint shear surface residual soil auger screwing auger drilling claw or blade bit M mud N none extremely weathered highly weathered moderately weathered HW MW SW SS SZ core recovered water 10/10/12, water level on date shown stepped Irregular shear zone washbore SW slightly weathered
FR fresh
\*W replaced with A for alteration
strength CO contact RR rock roller NMLCNMLC core (51.9 mm) crushed seam seam no core recovered water inflow SM wireline core (47.6mm) wireline core (63.5mm) wireline core (85.0mm) NQ complete drilling fluid loss very low low medium HQ PQ core run & RQD VL partial drilling fluid loss coating CN clean SN stained VN veneer roughness very rough rough smooth barrel withdrawn hand auger push tube high RQD = Rock Quality Designation (%) VH very high EH extremely high (lugeons) for depth POL polished SL slickenside CO coating interval shown





drawn	SJB		client:	NEWCASTLE GRAMI	MAR SCHOOL LTD
approved	JD	a off a v	project:	NEWCASTEL GRAMMAR S STAG	
date	19/02/2021	coffey		127 UNON STREE	T COOKS HILL
scale	N/A	A TETRA TECH COMPANY	title:	CORE PHOT	OGRAPH
original size	A4		project no:	754-NTLGE282007	borehole no: GBH01
\\ -4700f-1\C70	0/CEOTECHNICC/4 I			ITI CE000007 Nameda Carana Cal	and Dark Compus Ctage 1\Correspondent

\\ess782fs1\S798\GEOTECHNICS\1. JOB FILES\NEWCASTLE PROJECTS\NTLGE280000\754-NTLGE282007 - Newcastle Grammar School Park Campus Stage 1\Correspondent



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH02

1 of 6 sheet:

754-NTLGE282007 project no.

date started: 21 Jan 2021

date completed: 22 Jan 2021

logged by: HL

lo	cati	ion:	127	' Union	Stre	eet, (	Cook	s Hil	l, 2300		checke	ed by:	SJB
- 1				39; N: 6,35			4 )		surface elevation: 2.3 m (AHD)	•		rizontal: 9	
_				D&B, Trac	k mou	nted			drilling fluid: Guar Gum	hole o	diameter	: 150 mm	
۲	riiii	ng info	mati	on			mate	rial sub			≥	hand	aturisti us and
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	consistency / relative density	hand penetro- meter (kPa)	structure and additional observations
	1					_		SM	FILL: SILTY SAND: fine to medium grained, da brown to grey, trace of fine grained sub-angular	nrk M	VL		FILL (TOPSOIL)
					-2 -	- - 1.0—		SM	\ gravels.  FILL: SILTY SAND: fine to medium grained, brown, with silts and clays.	<del>M</del> _	VL - L		FILL (GENERAL)
——AD	     			SPT 2, 3, 1 N=4	-1	-							- - -
			21/01/21		_	2.0—							- - -
11:41	<b>X</b>			SPT	-0	-							- - - -
>> 16/02/202				1, 4, 4 N=8	_	3.0—		SP	SAND: fine to medium grained, grey.	M	L	iiii	ESTUARINE SOIL (POTENTIAL - FILL)
oj < <drawingfile:< td=""><td></td><td></td><td>Encountered</td><td></td><td>1 -</td><td>-</td><td></td><td>– – – Pt</td><td>PEAT: dark grey to black, with tree rootlets /</td><td> <del>-</del></td><td>vs</td><td></td><td>SWAMP DEPOSITS</td></drawingfile:<>			Encountered		1 -	-		– – – Pt	PEAT: dark grey to black, with tree rootlets /	<del>-</del>	vs		SWAMP DEPOSITS
-NTL GE282007.G			Enco	SPT 1, 1, 1 N=2	2	4.0-			petrified roots, strong odour.  4.2m: becomes less vegetated with roots / rootl		VO		
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawingfile>&gt; 16/02/2021 11:14 </drawingfile>	- W				3	5.0—							- - - - - - - -
S S					4	6.0—							
CDF_0_9_07_LIBRARY.GLB rev:AU				SPT 0, 0, 0 N=0	<b>5</b>	7.0-						           	
CDF_0_{						- -							
A H W H P	IA T	auger d auger s hand au washbo hand au push tu bit show AD/T blank b TC bit V bit	crewir uger re uger be	ng*	pend wate	etration  S S  er  10-0 leve		to ter shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing		ndition	ı	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



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **GBH02** 

sheet: 2 of 6

project no. **754-NTLGE282007** 

date started: 21 Jan 2021

date completed: 22 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: HL

,	locat					_		S HII	1, 2300		cnec	ked by:	SJB
-				39; N: 6,35		•	)4 )		surface elevation: 2.3 m (AHD)	_		orizontal: 9	0°
ŀ				D&B, Trac	k mou	nted			drilling fluid: Guar Gum	hole	diamete	r : 150 mm	
ŀ	drilli	ing infor	mati	on	I	ı	mate	rial sub					
	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) 8 8 8 8 hand	structure and additional observations
< <drawingfile>&gt; 16/02/2021 11:41</drawingfile>	dns em	2 p		SPT 0, 0, 0 N=0  SPT 3, 4, 2 N=6	군 6 7 8	9.0 —	e.b	lios H   P   P   P   P   P   P   P   P   P	Clayey SILT: dark grey to black, traces of man matter and shell fragments.  SAND: fine to medium grained, grey.		_	100	ESTUARINE SOIL
754-NTLGE282007.GPJ			Encountered	1, 2, 5 N=7	- 10	- 12.0 — - - -							- - - - - - - - - - - - - - - - - - -
COF BOREHOLE: NON CORED				SPT 5, 7, 11 N=18	11 	13.0 — - - - 14.0 —							
07_LIBRARY.GLB rev:AU Log (				SPT 2, 2, 2 N=4	12 -	- - -							
CDF_0_9_07_LIBRA					13 -	15.0 — - - -		CH	Silty CLAY: high plasticity, dark grey.	>Wp	VS		
	meth AD AS HA W HA PT * e.g. B T	auger dr auger sc hand au washbor hand au push tub bit show AD/T blank bit TC bit V bit	crewir ger e ger e n by s	ng*	pend	etration  etration  er  er  10-leve wat	ı	ater shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	soil	limit	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



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. **GBH02** 

sheet: 3 of 6

project no. **754-NTLGE282007** 

date started: 21 Jan 2021

date completed: 22 Jan 2021

logged by: HL

lo	cation:	127	' Union	Str	eet, (	Cook	s Hil	l, 2300		check	ed by:	SJB
po	osition: E: 3	84,28	39; N: 6,35	5,252	(MGA9	94 )		surface elevation: 2.3 m (AHD)	angle	from ho	orizontal: 9	0°
$\vdash$	rill model: Ha			k mou	nted			drilling fluid: Guar Gum	hole	diamete	: 150 mm	
F	drilling infor	mati	on		I	mate	rial sub					
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)	structure and additional observations
0_9_07_LIBRARY.GLB rev.AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawingfile>&gt; 16/02/2021 11:41 </drawingfile>	- НО	Encountered	SPT 0, 0, 0 N=0  SPT 0, 0, 0 N=0  SPT 0, 0, 0 N=0  SPT 0, 0, 0 N=0	14 15 16 17 18 20	17.0 —		CH   SC	19.0m: becoming sandy, fine grained  CLAYEY SAND: fine to coarse grained, grey an mottled orange to brown.		VS MD		RESIDUAL SOIL
A H V H F	e.g. AD/T B blank bi	crewir iger re iger be	ng*	M r C c pen	etration	ı	ater shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing		<b>ndition</b>	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



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

GBH02 4 of 6 sheet:

Borehole ID.

754-NTLGE282007 project no.

date started: 21 Jan 2021

date completed: 22 Jan 2021

logged by: HL

project: Newcastle Grammar School - Park Campus

127 Union Street, Cooks Hill, 2300 SJB location: checked by: position: E: 384,289; N: 6,355,252 (MGA94 ) surface elevation: 2.3 m (AHD) angle from horizontal: 90°

		9; N: 6,35			)4 )		surface elevation: 2.3 m (AHD)	_		orizontal: 9	
drill model: H		-	k mou	nted			drilling fluid: Guar Gum	hole	diamete	r : 150 mm	1
drilling info	rmatio	n		1	mate	rial sub					
method & support	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
			22	-		SC	<b>CLAYEY SAND</b> : fine to coarse grained, grey a mottled orange to brown. <i>(continued)</i>		MD		RESIDUAL SOIL
	Encountered	SPT 5, 9, 9 N=18	23 	25.0 — - - -							
- M	Encon		24	- 26.0 — - -							
			25	- 27.0 — - -							
* * * * * * * * * * * * * * * * * * *		SPT 8/60mm HB N=R	- - 26	28.0 — -			Borehole GBH02 continued as cored hole				
			- 27	29.0 — - - -							
111			- 28	30.0 —							
			_ 29	- 31.0 — - -							
method AD auger of AS auger s HA hand at W washbo HA hand at PT push tu  * bit show e.g. AD/T B blank b	crewing uger ore uger be vn by si		M r C c pend	etration	1	ater e shown	samples & field tests  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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal		<b>ndition</b>	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



project:

# **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Borehole ID. **GBH02** 

HL

754-NTLGE282007

sheet: 5 of 6

project no.

logged by:

client: Newcastle Grammar School date started: 21 Jan 2021

principal: date completed: 22 Jan 2021

loca					Street, Cooks Hill, 23								d by: <b>SJB</b>	
ı						rface elevation: 2.	-	ID)		·			contal: 90°	
-						lling fluid: Guar G	um			_			150 mm	
ariii	ıng	inform	Idtion	mate	rial substance material descriptio	n	∞	estimated	samples,	rock	mass defe		additional observations and	_
method & support	water	RL (m)	depth (m)	graphic log	ROCK TYPE: grain charac colour, structure, minor con	cterisics,	weathering & alteration	strength & Is50 X = axial; O = diametral	field tests & Is(50) (MPa)	core run & RQD	spac (mr	ing n)	defect descriptions (type, inclination, planarity, roughness, coati thickness, other)	ing,
m ns	*	₹	<del>g</del>	g			a ±	ຊ ¬ ≥ τ ≩ g	d = diametral	8 ∞	8 6 8	5 8	particular ger	nera
		22 - 23 - 24 -	25.0 — 26.0 — 27.0 —		started coring at 27.70m  SILTSTONE: with some orange t	to brown iron	HW						-2; PL RO, CN.	se described
		26	- 28.0 — - -		SILTSTONE: with some orange t staining.	to brown iron							No.   PL, RO, CN   No.   No.	unless otherwise
	pe	27	29.0 — -		INTERBEDDED SILTSTONE (60 SANDSTONE (40%): grey, fine g sandstone.		SW			72%			PT, 0°, PL, RO, SN - Coal, 10 mm   Drilling Break Drilling Break	
	Encountered	28	30.0				SW - FR		a=0.41 d=0.35				— Drilling Break	
		29	31.0 —						a=0.52	100%		Ιİ	- Drilling Break	
		-							d=0.49			 	— DT 0° CH PO CM	
AS AD CB W RR NM NQ HQ	ai cl w rc LCN w w	ashbor ock rolle IMLC co ireline o ireline o	rewing illing lade bit e er ore (51.9 core (47.6 core (63.5	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		covered mbols indicate recovere	material)	HW highly MW mode SW slight! FR fresh *W replaced w strength VL very love	al soil nely wea weathe rately w y weath	athered red eathered ered	<u>1                                    </u>	defect type planarity PT parting JT joint CU curved SS shear surface SZ shear zone CO contact CS crushed seam SM seam	
PQ HA PT	ha	ireline on and augush tube		Umm)	water pressure test result (lugeons) for depth interval shown	barrel w	ithdrawn uality Desi	gnation (%)	L low M mediur H high VH very hi EH extrem	gh	ı		roughness         coating           VR         very rough         CN Clean           RO         rough         SN stained           SO         smooth         VN veneer           POL         polished         CO coating           SL         slickensided	



principal: project:

# **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH02

sheet: 6 of 6

754-NTLGE282007 project no.

date started: 21 Jan 2021

date completed: 22 Jan 2021

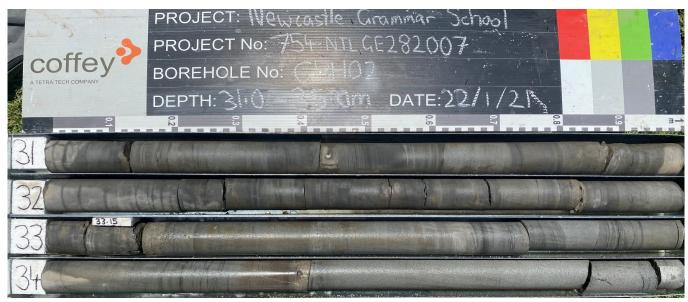
HL

logged by:

127 Union Stroot Cooks Hill 2200 ahaakad bi C ID

loca	atio	n: <b>1</b>	27 U	nion	Street, Cooks Hill, 23	00					check	ed	by: <b>SJB</b>	
posit	tion:	: E: 38	4,289;	N: 6,35	5,252 (MGA94 ) sui	rface elevation: 2.	3 m (AF	HD)		angl	e from ho	rizo	ntal: 90°	
drill r	nod	del: Har	njin D&l	3, Trad	k mounted dri	lling fluid: Guar Gu	ım			hole	diameter	: 15	50 mm	
drill	ing	inform	ation	mate	rial substance					rock	mass de	efec	ts	
method & support	water	RL (m)	depth (m)	graphic log	material descriptio ROCK TYPE: grain charac colour, structure, minor con	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)	3	additional observati defect descripti (type, inclination, planarity, ro thickness, othe particular	ons ughness, coating,
		30 - 31	- - - 33.0 — -		INTERBEDDED SILTSTONE (60 SANDSTONE (40%): grey, fine g sandstone. (continued)	%) AND rained	SW - FR		a=1.24 d=0.18	100%			─ Drilling Break ─ Drilling Break	-
S-Cuawiigriess 15002.2021 10.47	Encountered	32 33	34.0 — - - - 35.0 — -		SANDSTONE: fine to medium gragrey to grey.	ained, pale	SW- FR		a=2.33 d=1.33	90%			— JT, 5°, PL, RO, VN - Coal — PT, 5°, PL, RO, CN — JT, 90°, PL, RO, CN	-
OUT 0.3 0.7 EIBNART GEBTRAND UIG COF BORRENCE: CORED 734-NI GERZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ		34 - 35 - 36	36.0 —		Borehole GBH02 terminated at 3 Target depth	6.15 m								-
AS AD CB W RR	a c w rd ILCN w w w	d & suppauger scauger drictaw or b washborrock roller NMLC cowireline owireline owirel	rewing Illing Iade bit er ore (51.9 core (47. core (63. core (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  water pressure test result (lugeons) for depth interval shown	no core	covered nbols indicate recovered ithdrawn	e material)	weathering RS residu XW extrer HW highly MW mode SW slight! FR fresh *W replaced w strength VL very lov L low M mediur H high VH very hie EH extrem	al soil nely wea weathe rately we y weathe ith A for a w	athered red eathered ered		PT parting	planarity planar j curved undulating stepped Irregular  ating I clean I stained I veneer o coating





SJB		client:	NEWCASTLE GRAM	MAR SCHOOL LTD					
JD	a off a v	project:	NEWCASTEL GRAMMAR SO STAG						
19/02/2021			127 UNON STREET COOKS HILL						
N/A	A TETRA TECH COMPANY	title:	CORE PHOT	OGRAPH					
A4		project no:	754-NTLGE282007	borehole no: GBH02 PT1					
	JD 19/02/2021 N/A A4	JD 19/02/2021 N/A A4	JD 19/02/2021 N/A A4  Project:  title: project no:	JD  19/02/2021  N/A  A4  NEWCASTEL GRAMMAR SO STAG  127 UNON STREE  title: CORE PHOTO  project no: 754-NTLGE282007					

\\ess782fs1\S798\GEOTECHNICS\1. JOB FILES\NEWCASTLE PROJECTS\NTLGE280000\754-NTLGE282007 - Newcastle Grammar School Park Campus Stage 1\Correspondent



drawn	SJB	
approved	JD	a off a v
date	19/02/2021	сопеу
scale	N/A	A TETRA TECH COMPANY
original	Δ4	

client:	NEWCASTLE GRAM	MAR SCHOOL LTD
project:	NEWCASTEL GRAMMAR SO STAG 127 UNON STREE	E 1
title:	CORE PHOT	OGRAPH
project no:	754-NTLGE282007	borehole no: GBH02 PT2

size | Newcastle Grammar School Park Campus Stage 1\Correspondence | Newcastle Grammar School Park Campus Stage 1\Correspond



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **GBH03** 

sheet: 1 of 5

project no. **754-NTLGE282007** 

date started: 21 Jan 2021

date completed: 22 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: SR/SJB

Г	position: E: 384,335; N: 6,355,221 (MGA94 )									angle from horizontal: 90°			
- 1						•	•		surface elevation: 2.8 m (AHD)	_		orizontal:  9 · : 150 mm	
ŀ		ng info		chio GEO	ມບວ, I	iack m	_	rial sub	drilling fluid: Guar Gum	noie d	ameter	. IOU MM	1
ŀ	uriii		mau	Ж			mate	riai Sub			.≥.		
	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)	structure and additional observations
	<b>A A</b>				-2	-		SM	FILL: SILTY SAND: brown to dark brown, trace of sub-rounded angular gravels with grass rootlets an woodchips on surface.				FILL (TOPSOIL)
	AD - N				_	1.0 -		CL	<b>FILL: Sandy CLAY</b> : low plasticity, brown, traces of fine grained angular gravels.	f D-M	VL - L		FILL (GENERAL)
			21/01/21	SPT 1, 0, 0 N=0	-1	2.0—		CL	FILL: Gravelly CLAY: brown to dark brown, fine to medium angular to sub-angular gravels.	5 M	VS		
V02/2021 11:41	<del>   </del>				-0	-							-
< <drawingfile>&gt; 16</drawingfile>			p	SPT 1, 0, 1 N=1	]  - 	3.0-		SP	<b>FILL: SAND:</b> fine to coarse grained, brown, trace fine grained sub-rounded gravels.	M	VL		FILL (COAL REJECT)
754-NTLGE282007.GPJ <<			Encountered		1 -	4.0-		GC	FILL: CLAYEY GRAVEL: fine to medium grained, black, coal reject gravels.	м — <u>М</u>			
				SPT 0, 1, 1 N=2	2	5.0—		Pt	PEAT: brown to dark brown.	>Wp	VS		SWAMP DEPOSITS
COF BOREHOLE: NON CORED	- M - H			CDT	3 	6.0—							
B rev:AU Log				SPT 0, 0, 0 N=0	-	- - -							- - -
0_9_07_LIBRARY.GLB rev					4 -	7.0-							
CDF_0				SPT 0, 0, 0 N=0	5	-		CL-CI	Sandy CLAY: low to medium plasticity, grey, fine to medium grained sand, with traces of shells.	>Wp	VS - S		ESTUARINE SOIL -
	method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit				auger drilling* auger screwing* hand auger washbore hand auger push tube  bit shown by suffix AD/T blank bit TC bit  auger drilling* C casing  penetration  water  10-0  water  10-0  water  10-0  water  wat			shown	HP hand penetrometer (kPa) [ N standard penetration test (SPT) N* SPT - sample recovered Nc SPT with solid cone	soil grou soil de based on A moisture con D dry M moist W wet Wp plastic lin Wi liquid lim	escription AS 1726: adition	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



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **GBH03** 

sheet: 2 of 5

project no. **754-NTLGE282007** 

date started: 21 Jan 2021

date completed: 22 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: SR/SJB

ſ	nociti	on. E. o	<b>8</b> ⁄1 23	35; N: 6,35	5 221	(MCAO	.94 ) surface elevation: 2.8 m (AHD) angle from h						from horizontal: 90°			
	•			chio GEO 3		•	•	ı	drilling fluid: Guar Gum			er : 150 mm				
ŀ		ing infor			, 1			rial sub		110						
İ	method & support	Б Б	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			
CDF_0_9_07_LIBRARY.GLB.rev.AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ < <drawningfile>&gt; 16/02/2021 11:41</drawningfile>			Encountered	SPT 5, 7, 6 N=13  SPT 3, 0, 1 N=1  SPT 0, 0, 0 N=0		9.0 —		SP CH	Sandy CLAY: low to medium plasticity, grey, fine to medium grained sand, with traces of shells. (continued)  SAND: fine to medium grained, grey, slightly silty.  Silty CLAY: high plasticity, grey, trace of sand and shells.	M	MD		ALLUVIAL SOIL			
	method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube  * bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit		pend wate	etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  or company  etration  etration  or company  etration  et	ı	i ater shown	HP hand penetrometer (kPa)  N standard penetration test (SPT)  N* SPT - sample recovered  Nc SPT with solid cone	moisture D dry M mois W wet	t ic limit	ion 6:2017	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					



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School

GBH03

3 of 5 sheet:

Borehole ID.

754-NTLGE282007 project no.

date started: 21 Jan 2021

date completed: 22 Jan 2021

Newcastle Grammar School - Park Campus logged by: SR/SJB

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

nos	ition.	F: 3	34 33	5; N: 6,35	5.221	(MGA9	94 ) surface elevation: 2.8 m (AHD) an						angle from horizontal: 90°				
Ι'				chio GEO		•					hole diameter : 150 mm						
-		infor			,			rial sub									
method &		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) 82,00,00,00	structure and additional observations			
		Ĭ				-		CH	<b>Silty CLAY</b> : high plasticity, grey, trace of sand a shells. <i>(continued)</i>	-	>Wp	VS		ALLUVIAL SOIL			
		i		SPT 2, 10, 9 N=19	14	-		CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	ih >	 >Wp	 St - VSt		RESIDUAL SOIL			
					_	17.0 <i></i>  -  -			17.0m: becoming more sandy								
					15	- - 18.0—											
				SPT 3, 3, 4 N=7	-	-			18.0m: traces of organic material								
- M -					16	19.0											
- M -	Ž.		Encountered	SPT 3, 7, 8	17	-			19.5m: traces of iron stained gravels								
			"	N=15	[-1/ -	20.0—											
					18	-											
				SPT 8, 13, 13 N=26	[ -	21.0 —											
					19	- 22.0—											
					_	- -											
					20	23.0 —											
<u> </u>		             			21	-	<i>(////</i> /		Borehole GBH03 continued as cored hole								
AD AS HA W	AD auger drilling* AS auger screwing* C HA hand auger W washbore HA hand auger					port mud casing etration	1		samples & field tests  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)	base moistu D dr	soil de ed on /	p symbol escription AS 1726: adition	1	consistency / relative density VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable			
* bit shown by suffix e.g. AD/T B blank bit T TC bit V V bit				wate	10-leve	Oct-12 wa el on date ter inflow ter outflow	shown	N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	W we		mit nit		VL very loose L loose MD medium dense D dense VD very dense				



principal:

### **Engineering Log - Cored Borehole**

Newcastle Grammar School

Borehole ID. GBH03

4 of 5 sheet:

754-NTLGE282007 project no.

date started: 21 Jan 2021

22 Jan 2021 date completed:

logged by: SR / SJB

Newcastle Grammar School - Park Campus project: 127 Union Street, Cooks Hill, 2300 SJB location: checked by: position: E: 384,335; N: 6,355,221 (MGA94 ) surface elevation: 2.8 m (AHD) angle from horizontal: 90° drill model: Comacchio GEO 305, Track mounted drilling fluid: Guar Gum hole diameter: 150 mm drilling information material substance rock mass defects material description estimated defect additional observations and field tests & Is(50) defect descriptions tion, planarity, roughness, coating, spacing (mm) ROCK TYPE: grain characterisics, core run & RQD method graphic colour, structure, minor components Ξ X = axial; O = diametra (MPa) depth ( thickness, other) water 30 300 300 3000 చ particular בֿבַּב  $\perp$ 11111 11111 -14 17 0 11111 11111-15 11111 18.0  $\perp$ +1111-16 19.0 1111111111 IIIIII11111 -17 1111 20.0  $\perp$ I I I I I I-18 21.0  $\mathbf{I}$ I I I I I I-19 22 N I I I I I I, RO, X VN, cribed , PL, F -20 PT, 0 - 5°, otherwise 23.0 11111started coring at 23.45m DW SANDSTONE: fine grained, grey and brown, JT, 70 - 80°, UN, RO, SN 0% -21 JT, 70 - 80°, UN, RO, SN weathering & alteration defect type planarity method & support graphic log / core recovery support PL planar CU curved UN undulating ST stepped parting joint shear surface residual soil auger screwir auger drilling M mud N none extremely weathered highly weathered moderately weathered SS SZ core recovered water claw or blade bit 10/10/12, water level on date shown shear zone washbore SW slightly weathered FR fresh \*W replaced with A for alteration strength Irregular CO contact ΙR RR rock roller NMLCNMLC core (51.9 mm) no core recovered water inflow SM seam NQ HQ PQ wireline core (47.6mm) wireline core (63.5mm) wireline core (85.0mm) complete drilling fluid loss very low low medium core run & RQD VL partial drilling fluid loss coating CN clean SN stained VN veneer roughness very rough rough smooth barrel withdrawn hand auger push tube high RQD = Rock Quality Designation (%) VH very high EH extremely high (lugeons) for depth POL polished SL slickenside CO coating interval shown



principal:

project:

### **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

GBH03

5 of 5 sheet:

Borehole ID.

754-NTLGE282007 project no.

date started: 21 Jan 2021

date completed: 22 Jan 2021

SR / SJB logged by:

127 Union Street. Cooks Hill. 2300 SJB location: checked by: position: E: 384,335; N: 6,355,221 (MGA94 ) surface elevation: 2.8 m (AHD) angle from horizontal: 90° drill model: Comacchio GEO 305, Track mounted drilling fluid: Guar Gum hole diameter: 150 mm drilling information material substance rock mass defects material description estimated defect additional observations and weathering 8 alteration defect descriptions (type, inclination, planarity, roughness, coating, field tests ROCK TYPE: grain characterisics, core run & RQD method graphic. colour, structure, minor components Ξ (MPa) X = axial; O = diametra thickness, other) water depth 30 300 300 3000 చ genera JZIZI DW 0% TT, 60°, PL, RO, Fe SN JT, 60°, PL, RO, Fe SN SILTSTONE: brown, laminated 0% JT, 60°, PL, RO, Fe healed  $| \cdot |$ Drilling Break JT, 70 - 90°, UN, healed JT, 60°, PL, RO, Fe VN 111INTERLAMINATED SILTSTONE (60%) & d=0.06 -22 SANDSTONE (40%): grey and dark grey, with iron staining. 25.0 SANDSTONE: fine grained, brown. 20% CS, Coal, 5 mm HW XW CS, Coal, 5 mm JT, 60 - 70°, PL, RO, Fe VN CS, Coal, 5 mm JT, 60 - 70°, PL, RO, Fe VN -23 ol۶ a=0.70 d=0.17 26.0 a=0.27 d=0.22 JT, 60 - 70°, CU, healed 80% T, 60 - 70°, CU, healed JT, 60 - 70°, UN, healed -24 JT, 60 - 70°, UN, healed JT, 70°, PL, healed SW -**INTERLAMINATED SILTSTONE (50%) &** SANDSTONE (50%): fine to medium grained, grey and dark grey, with carbonaceous Encountered laminations -25 28.0 Drilling Break, on PT, X 63% Drilling Break, on PT, X a=0.26 d=0.20 Drilling Break, on PT, X Drilling Break, on PT, X NO CORE: 0.65 m 11111IIIIII-26 29.0 CS, Coal, 10 mm CS, Coal, 40 mm CS, Coal, 5 mm SILTSTONE: dark grey, some coal seams. SW SANDY SILTSTONE: fine grained, dark grey, CS, Coal, 5 mm SW Drilling Break, on PT, X -27 a=0.75 d=0.52 30 O Drilling Break, on PT, X 77% -28 Drilling Break 31.0 CS, Coal, 5 mm JT, 80°, PL, VN CS, Coal, 5 mm a=0.50 d=0.23 JT, 60 - 70°, UN, CN Borehole GBH03 terminated at 31.54 m -29 Target depth weathering & alteration defect type planarity graphic log / core recovery method & support support PL planar CU curved UN undulating ST stepped parting joint shear surface residual soil auger screwing auger drilling claw or blade bit M mud N none extremely weathered highly weathered moderately weathered core recovered water stepped Irregular 10/10/12, water level on date shown shear zone washbore SW slightly weathered
FR fresh
\*W replaced with A for alteration
strength CO contact IR RR rock roller NMLCNMLC core (51.9 mm) crushed seam seam no core recovered water inflow SM wireline core (47.6mm) wireline core (63.5mm) wireline core (85.0mm) NO complete drilling fluid loss very low low medium HQ PQ core run & RQD VL partial drilling fluid loss coating CN clean SN stained VN veneer roughness very rough rough smooth barrel withdrawn hand auger push tube high VH very high EH extremely high RQD = Rock Quality Designation (%) (lugeons) for depth POL polished SL slickenside CO coating interval shown





drawn	SJB		client:	NEWCASTLE GRAMI	MAR SCHOOL LTD					
approved	JD	a off a v	project:	NEWCASTEL GRAMMAR SO STAG						
date	19/02/2021	coffey		127 UNON STREET COOKS HILL  CORE PHOTOGRAPH						
scale	N/A	A TETRA TECH COMPANY	title:							
original size	A4		project no:	754-NTLGE282007	borehole no: GBH03 PT1					



drawn	SJB	
approved	JD	a off over
date	19/02/2021	сопеу
scale	N/A	A TETRA TECH COMPANY
original	Δ4	

client:	NEWCASTLE GRAM	MAR SCHOOL LTD
project:	NEWCASTEL GRAMMAR SO STAG 127 UNON STREE	E 1
title:	CORE PHOT	OGRAPH
project no:	754-NTLGE282007	borehole no: GBH03 PT2

size | M4 | GBH03 F 12 | Wetss782fs1\S798\GEOTECHNICS\1. JOB FILES\NEWCASTLE PROJECTS\NTLGE280000\754-NTLGE282007 - Newcastle Grammar School Park Campus Stage 1\Correspondence of the control of the con



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **GBH04** 

sheet: 1 of 6

project no. **754-NTLGE282007** 

date started: 23 Jan 2021

date completed: 25 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: HL / KF

Ľ	neiti	ion: F·2		67; N: 6,35			94 ) surface elevation: 2.9 m (AHD) an						angle from horizontal: 90°			
- 1				D&B, Trac		•	<del>-</del> )		drilling fluid: Guar Gum		hole diameter : 150 mm					
Ŀ	drill	ling info	mati	on		material substance										
method 8	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) % 88 % 98 % 98 % 98 % 98 % 98 % 98 % 98	structure and additional observations		
				SPT 3, 3, 2	-2	- - - 1.0—		SP	FILL: SAND: fine to medium grained, brown, sor silt, with grass rootlets.	me M	Л	VL - L		FILL (TOPSOIL)		
T:41	! z		23/01/21	N=5	-1	2.0-		SM	FILL: SILTY SAND: fine to medium grained, brown.		<u> </u>			FILL		
P. S. Diawingrije S. 10/02/2021 11.4	<b>X</b>		Encountered	SPT 2, 6, 4 N=10	0	3.0 —										
——————————————————————————————————————			Enc		2	4.0 — - - - 5.0 —		Pt SM	PEAT: dark grey to black, with petrified organic matter.  SILTY SAND: fine to medium grained, dark grey to brown, with clays, traces of shell fragments.					SWAMP DEPOSITS  ESTUARINE SOIL		
	: H			SPT 0, 0, 0 N=0	3	6.0 —			5.7m: oyster in SPT return							
	meth	hod	rillina*		- 5 <b>sup</b>	7.0—			samples & field tests			p symbo		consistency / relative density		
1	AD AS HA W HA PT * e.g. B T	auger d auger s hand au washbo hand au push tul bit show AD/T blank bi TC bit V bit	crewir iger re iger be	ng*	pend	etration  or of the control of the c	ı	iter shown	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) N* SPT - sample recovered Nc SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	moisture D dry M moi W wet Wp plas	on A	nit		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		



principal:

# **Engineering Log - Borehole**

Newcastle Grammar School

Borehole ID. **GBH04** 

sheet: 2 of 6

project no. **754-NTLGE282007** 

date started: 23 Jan 2021

date completed: 25 Jan 2021

project: Newcastle Grammar School - Park Campus logged by: HL / KF

_									, 2300			ea by:	SJB
- 1				67; N: 6,35			)4 )		surface elevation: 2.9 m (AHD)	•		rizontal: 9	
ŀ				D&B, Trac	k mou	ntea	mate	rial sub	drilling fluid: Guar Gum	noie d	liametei	: 150 mm	1
ŀ								riai Sul			≥	b and	-tt
	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)	structure and additional observations
					-	-		SM	<b>SILTY SAND</b> : fine to medium grained, dark grey to brown, with clays, traces of shell fragments. <i>(continued)</i>	W	VL		ESTUARINE SOIL
				SPT 2, 2, 2 N=4	6 	9.0—		CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	- KWp	S		
21 11:41					7 -	- 10.0 — - -							- - - - - - - - - -
< <drawingfile>&gt; 16/02/2021 11:41</drawingfile>					8 -	- 11.0 — -		sc	CLAYEY SAND: fine to medium grained, grey.	<u>M</u> _	VL		
GE282007.GPJ < <dra< td=""><td> M H</td><td></td><td>Encountered</td><td>SPT 0, 0, 0 N=0</td><td>9</td><td>12.0—</td><td></td><td>CH</td><td>Silty CLAY: high plasticity, dark grey to brown.</td><td>&gt;Wp</td><td>VS - S</td><td></td><td><u>-</u></td></dra<>	 M H		Encountered	SPT 0, 0, 0 N=0	9	12.0—		CH	Silty CLAY: high plasticity, dark grey to brown.	>Wp	VS - S		<u>-</u>
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ					10 -	- 13.0 — - -							- - - - - -
.U Log					11 -	- 14.0 — -							- - - :
CDF_0_9_07_LIBRARY.GLB rev:A				SPT 0, 0, 3 N=3	12 	- 15.0— -			14.5m: becomes grey				- - - - - - - -
CDF_0	meth	nod			13 Sun	- port			samples & field tests	soil grou	in sumb	1	consistency / relative density
	AD AS HA W HA PT	auger d auger s hand au washbo hand au push tul	crewir iger re iger be	ng*	M r C c pen	mud casing etration	ー no res rangin ◄ refusa	I	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) N* SPT - sample recovered		AS 1726:	1	VS very soft S soft F firm St stiff VSt very stiff H hard Fb friable VL very loose
	* e.g. B T V	bit show AD/T blank bi TC bit V bit	•	suttix	- <u>-</u>	leve	Oct-12 wa el on date er inflow er outflow	shown	NC SPT with solid cone VS vane shear; peak/remouded (kPa) R refusal HB hammer bouncing	Wp plastic li Wl liquid lin			L loose MD medium dense D dense VD very dense



principal: project:

# **Engineering Log - Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH04

sheet: 3 of 6

754-NTLGE282007 project no.

date started: 23 Jan 2021

date completed: 25 Jan 2021

logged by: HL / KF

le	location: 127 Union Street, Cooks Hill, 2300  position: E: 384,367; N: 6,355,230 (MGA94 ) surface elevation: 2.9 m (AHD)									checked by: SJB					
p	ositio	on: E: 3	34,36	67; N: 6,35	5,230	(MGA9	4 )		surface elevation: 2.9 m (AHD)		_		orizontal: 9		
-			_	D&B, Trac	k mou	nted			drilling fluid: Guar Gum		hole	diameter	: 150 mm	ı	
ŀ	drilli	ng infor	mati	on		I	mate	rial sub							
0 7	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)		acture and al observations
< <drawingfile>&gt; 16/02/2021 11:41</drawingfile>			Encountered	SPT 5, 7, 8 N=15	14 15 16	17.0—	eub (	ooi C C Soli	Sandy CLAY: low to medium plasticity, grey w some iron staining, fine to medium grained sand 17.5m: iron stained, low plastic, friable band of XWM 200mm	nd.	_	St - VSI	0 5 0 4 30 0 4 40 0 0	RESIDUAL SO	IL
COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ				SPT 7, 9, 11 N=20	- 18	21.0 —									<u>-</u>
0_9_07_LIBRARY.GLB rev:AU Log COF BOREHC					19 - 20	22.0 — - - - - 23.0 —			21.50m: increased drilling resistance  22.5m: becomes orange to brown / orange to 23.0m: increased drilling resistance	grey					-
CDF	meth AD AS HA W HA PT	auger di auger so hand au washboi hand au push tuk	rewir ger e ger e	ng*		mud casing etration	ı	nil	Borehole GBH04 continued as cored hole  samples & field tests  B	mois D M	soil d	up symbo escriptio AS 1726: ndition	n	VS S F St VSt H Fb	relative density very soft soft firm stiff very stiff hard friable
	* e.g. B T V	bit show AD/T blank bit TC bit V bit	•	suffix		10-leve	Oct-12 wa el on date er inflow er outflow	shown	N* SPT - sample recovered  Nc SPT with solid cone  VS vane shear; peak/remouded (kPa)  R refusal  HB hammer bouncing		wet plastic I liquid lir			VL L MD D VD	very loose loose medium dense dense very dense



principal: project:

# **Engineering Log - Cored Borehole**

Newcastle Grammar School - Park Campus

Newcastle Grammar School

Borehole ID. GBH04

4 of 6 sheet:

754-NTLGE282007 project no.

date started: 23 Jan 2021

date completed: 25 Jan 2021

logged by: HL / KF

127 Union Street, Cooks Hill, 2300 SJB location: checked by:

posit	itior				5,230 (MGA94 ) surface elevation: 2.9 m (AHD)				angle from horizontal: 90°				
		odel: Hanjin D&B, Track mounted drilling fluid: Guar Gum					hole diameter : 150 mm						
drill	ling	g information material substance			samples,	rock	ervations and						
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 X = axial; O = diametral	field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	defect de (type, inclination, planar	scriptions
me sup	- dow	물	ф	gra			alte	ຊ ¬ ≅ ≖ ≩ ∰	a = axial; d = diametral	00 8 I	8 1000 3000 3000	particular	gener
mei	tthe	14151617182021 d & sup	17.0 —  18.0 —  19.0 —  20.0 —  21.0 —  22.0 —  23.0 —  23.0 —		started coring at 23.98m	graphic log / cor	e recovei		weathering		ation*	defect type	planarity
AS AD CB W RR	AS auger screwing AD auger drilling BB claw or blade bit V washbore RR rock roller IMLC NMLC core (51.9 mm) AQ wireline core (47.6mm) CO wireline core (47.5mm)			6mm) 5mm)	C casing M mud N none water	core rec (graphic syn no core	covered mbols indicate recovere	material)	HW highly MW moder SW slightly FR fresh *W replaced wistrength VL very low L low	nely wea weather ately we weather th A for a	red eathered ered	PT parting JT joint SS shear surface SZ shear zone CO contact CS crushed seam SM seam roughness	PL planar CU curved UN undulating ST stepped IR Irregular
	HA hand auger				water pressure test result (lugeons) for depth interval shown	barrel w	ithdrawn ıality Desi	ignation (%)	M medium H high VH very hig EH extreme	jh		VR very rough RO rough SO smooth POL polished SL slickensided	CN clean SN stained VN veneer CO coating



principal:

### **Engineering Log - Cored Borehole**

Newcastle Grammar School

Borehole ID. GBH04

sheet: 5 of 6

754-NTLGE282007 project no.

date started: 23 Jan 2021

date completed: 25 Jan 2021

HL / KF logged by:

Newcastle Grammar School - Park Campus project: 127 Union Street, Cooks Hill, 2300 SJB location: checked by: position: E: 384,367; N: 6,355,230 (MGA94) surface elevation: 2.9 m (AHD) angle from horizontal: 90° drill model: Hanjin D&B, Track mounted drilling fluid: Guar Gum hole diameter: 150 mm drilling information material substance rock mass defects material description estimated defect additional observations and defect descriptions tion, planarity, roughness, coating, field tests spacing (mm) ROCK TYPE: grain characterisics, core run & RQD method graphic. colour, structure, minor components Ξ (MPa) thickness, other) water depth 30 300 300 3000 చ \_ ≥ I ∃ H genera **INTERBEDDED SILTSTONE (80%) AND** ⁻ JT, 46°, UN, RO, Fe SN 100% SANDSTONE (20%): orange to brown, fine to medium grained sandstone and dark grey silstone. Massive to indistinctly bedded at 22°, iron stained, soft sediment deformation S - Sand  $\Pi\Pi$ Fe SN -: throughout, with carbonaceous laminations. a=0.03 d=0.02 (continued) -22 24.85m: carbaonaceous lamination, 6mm, 10° 25.0 MW I, RO, descrii SM,  $5^\circ$ , IR, hard clay to siltstone infill JT,  $60^\circ$ , PL, RO, Fe SN SM,  $11^\circ$ , UN, Clay, 8~mm25.20 - 26.18m: weathered zone, decreased XW -T, 5 - 15°, PL - UN, unless otherwise d strength & discoloured brown 25.23m; siderite / ironstone band, 35mm. SM, 26°, UN, Clay, 12 mm interlaminated, reddish brown 97% -23 26.0 F, **INTERLAMINATED SILTSTONE (40%) &** MW are: SANDSTONE (60%): dark grey to grey, fine grained sandstone and dark grey siltstone, distincity laminated at 5° to 10°, with extremely to a=0.22 d=0.18 SW very closely spread carbonaceous laminations. 27.0 JT, 72°, PL, RO, healed **SILTSTONE**: dark grey, distinctly laminated at 5° to 10° with carboaceous laminatons & sandsotne laminaitons. -25 28.0 Š SM, 10°, PL, Clay ķ SM, 15°, IR, Clay UN, RO, 3 SM, 5°, PL, clay and rock fragments 70% **INTERLAMINATED SILTSTONE (40%) &** -26 JT, 48°, PL, RO, CN 29.0 SANDSTONE (60%): dark grey to grey, fine grained sandstone and dark grey siltstone, PL distinctly laminated at 5° to 10°, with extremely to very closely spread carbonaceous laminations. e: PT, 5 - 15°, unless otherw a=1.00 d=0.86 are: -27 SM, 14°, PL, Clay, 10 mm 30 O ects SM, 15°, UN, Clay SM, 15°, UN, clay and rock fragments -28 a = 0.3431.0 d=0.24 30.97m: fossils up to 8mm, marine derived 96% weathering & alteration defect type planarity method & support graphic log / core recovery support parting joint shear surface PL planar CU curved UN undulating ST stepped residual soil auger screwing auger drilling claw or blade bit M mud N none extremely weathered highly weathered core recovered water 10/10/12, water level on date shown moderately weathered shear zone washbore SW slightly weathered FR fresh \*W replaced with A for alteration strength Irregular CO contact ΙR RR NML rock roller CNMLC core (51.9 mm) no core recovered water inflow SM seam wireline core (47.6mm) wireline core (63.5mm) wireline core (85.0mm) NO complete drilling fluid loss very low low medium HQ PQ core run & RQD VL partial drilling fluid loss roughness coating CN clean SN stained very rough rough smooth barrel withdrawn hand auger high RQD = Rock Quality Designation (%) push tube VH very high EH extremely high veneer (lugeons) for depth POL polished SL slickenside CO coating interval shown



principal:

### **Engineering Log - Cored Borehole**

interval shown

Newcastle Grammar School

Borehole ID. GBH04

6 of 6 sheet:

754-NTLGE282007 project no.

date started: 23 Jan 2021

25 Jan 2021 date completed:

HL / KF logged by:

Newcastle Grammar School - Park Campus project: 127 Union Street, Cooks Hill, 2300 SJB location: checked by: position: E: 384,367; N: 6,355,230 (MGA94 ) surface elevation: 2.9 m (AHD) angle from horizontal: 90° drill model: Hanjin D&B, Track mounted drilling fluid: Guar Gum hole diameter: 150 mm drilling information material substance rock mass defects material description estimated defect additional observations and field tests & Is(50) defect descriptions tion, planarity, roughness, coating, spacing (mm) ROCK TYPE: grain characterisics, core run & RQD method support graphic colour, structure, minor components Ξ X = axial; O = diametra depth ( (MPa) thickness, other) water 8 0 0 0 0 30 0 0 0 0 చ particular JZI₹⊞ genera a=0.77Borehole GBH04 terminated at 32.07 m  $\perp$ I I I I I ITarget depth I I I I I I1111111111 -30 33 O 11111 1111111111 11111 -31 34.0  $\perp$ I I I I I I11111 +11111 $\Box$ 35.0 111111111111111 $\perp$ 1111 -33 36.0  $\perp$ I I I I I I11111 111111I + I + I + I++++-34 37.0 111111111111111 $\perp$ I I I I I I-35 38 O  $\perp$ 11111+1111-36 39.0 11111IIIIII+11111I + I + I + I11111 weathering & alteration defect type planarity method & support graphic log / core recovery support PL planar CU curved UN undulating ST stepped residual soil extremely weathered highly weathered moderately weathered parting joint shear surface auger screwing auger drilling claw or blade bit M mud N none HW MW SW SS SZ core recovered water 10/10/12, water level on date shown stepped Irregular shear zone washbore SW slightly weathered
FR fresh
\*W replaced with A for alteration
strength CO contact RR rock roller NMLCNMLC core (51.9 mm) crushed seam seam no core recovered water inflow SM NQ HQ PQ wireline core (47.6mm) wireline core (63.5mm) wireline core (85.0mm) complete drilling fluid loss very low low medium core run & RQD VL partial drilling fluid loss coating CN clean SN stained VN veneer roughness very rough rough smooth barrel withdrawn hand auger push tube high RQD = Rock Quality Designation (%) VH very high EH extremely high (lugeons) for depth POL polished SL slickenside CO coating





drawn	SJB		client:	NEWCASTLE GRAM	MAR SCHOOL LTD	
approved	JD	ooffor §	project:	NEWCASTEL GRAMMAR SCHOOL PARK CAMPUS - STAGE 1		
date	19/02/2021	coffey		127 UNON STREET COOKS HILL		
scale	N/A	A TETRA TECH COMPANY	title:	CORE PHO	rograph .	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH04 PT1	
	8/CEOTECHNICS/1 I	OD EII ES/NEWOASTI E DDO IECTS/NI	TI CE280000\754 N	NTI GE282007 - Newcastle Grammar Sch	ool Park Campus Stago 1\Correspondent	

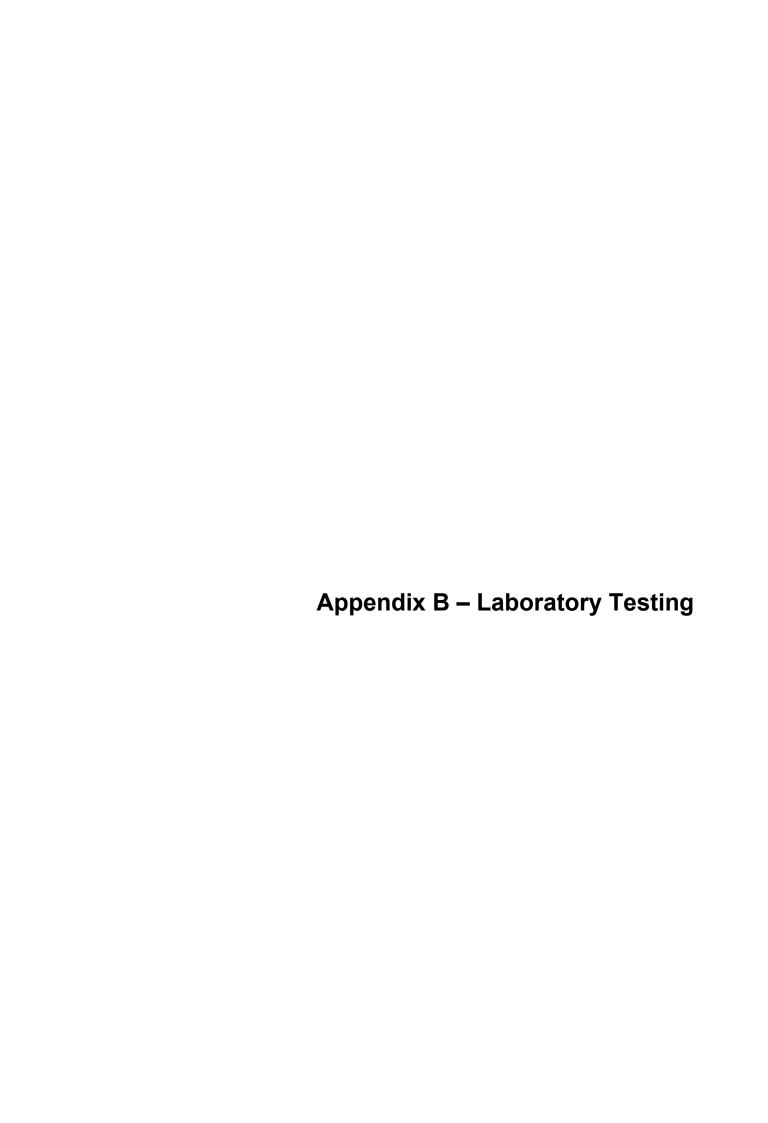
\\etss782fs1\S798\GEOTECHNICS\1. JOB FILES\NEWCASTLE PROJECTS\NTLGE280000\754-NTLGE282007 - Newcastle Grammar School Park Campus Stage 1\Correspondence



drawn	SJB	
approved	JD	a off over
date	19/02/2021	сопеу
scale	N/A	A TETRA TECH COMPANY
original	Δ4	

client:	NEWCASTLE GRAMMAR SCHOOL LTD					
project: NEWCASTEL GRAMMAR SCHOOL PARK CAMPUS STAGE 1 127 UNON STREET COOKS HILL						
title:	CORE PHOTOGRAPH					
project no:	754-NTLGE282007	borehole no: GBH04 PT2				

\\etss782fs1\S798\GEOTECHNICS\1. JOB FILES\NEWCASTLE PROJECTS\NTLGE280000\754-NTLGE282007 - Newcastle Grammar School Park Campus Stage 1\Correspondence



This page has been left intentionally blank



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

### **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: -TRN: 754-NTLGE282007

#### Report No: NEWC21S-00599-1 Issue No: 1



IIaC-MRA

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

Limits



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

### **Sample Details**

Sample ID: NEWC21S-00599 Date Sampled: 25/01/2021 Source: On-Site Material: **Existing Ground** Specification: No Specification

Sampling Method: Submitted by client **Project Location:** Cooks Hill, NSW Sample Location: BH07 @ 0.30-0.60m

### Particle Size Distribution

Method: AS 1289.3.6.1

Drying by: Oven Date Tested: 4/02/2021

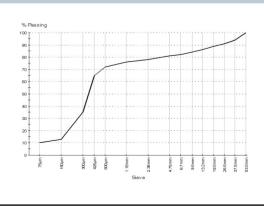
Sample Washed Note:

ı	Sieve Size	% Passing
ı	53.0mm	100
ı	37.5mm	94
ı	26.5mm	91
ı	19.0mm	89
ı	13.2mm	86
	9.5mm	84
	6.7mm	82
ı	4.75mm	81
1	2.36mm	78
ı	1.18mm	76
1	600µm	72
ı	425µm	65
ı	300µm	35
ı	150µm	13
ı	75um	10

#### Other Test Results

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	10.3	
Date Tested		1/02/2021	
Standard MDD (t/m³)	AS 1289.5.1.1	1.72	
Standard OMC (%)		14.0	
Retained Sieve (mm)		19	
Oversize Material (%)		11	
Curing Time (h)		88	
LL Method	Visual / Tactile A	ssessment	
Date Tested		2/02/2021	
CBR at 5.0mm (%)	AS 1289.6.1.1	40	
Dry Density before Soaking (t/m³)		1.72	
Density Ratio before Soaking (%)		100.0	
Moisture Content before Soaking (%)		14.0	
Moisture Ratio before Soaking (%)		99.5	
Dry Density after Soaking (t/m³)		1.72	
Density Ratio after Soaking (%)		100.0	
Swell (%)		0.0	
Moisture Content of Top 30mm (%)		14.8	
Moisture Content of Remaining Depth (%)		14.6	
Compaction Hammer Used		Standard	
Surcharge Mass (kg)		4.50	
Period of Soaking (Days)		4	
Retained on 19 mm Sieve (%)		11	
CBR Moisture Content Method	AS	1289.2.1.1	
Sample Curing Time (h)		53	
Plasticity Method	Visual/Tactile A	ssessment	
Sample Moisture Content	AS	1289.2.1.1	
Date Tested		4/02/2021	

#### Chart



#### Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

### **California Bearing Ratio Test Report**

Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: -TRN: 754-NTLGE282007

### Report No: CBR:NEWC21S-00599



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



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

#### Sample Details

Sample ID: NEWC21S-00599

Client ID:

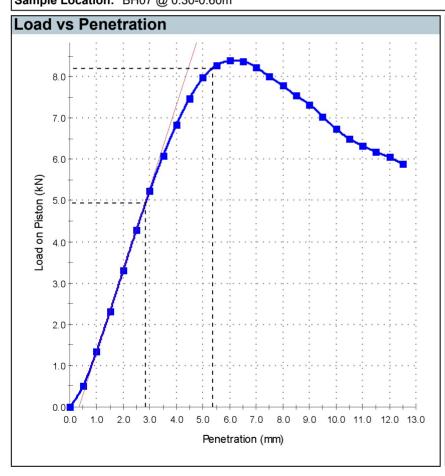
Date Sampled: 25/01/2021

Date Submitted: 27/01/2021 Date Tested: 4/02/2021 Project Location: Cooks Hill, NSW Sample Location: BH07 @ 0.30-0.60m Sampling Method: Submitted by client Material: **Existing Ground** 

Source: On-Site

Specification: No Specification

**Test Results** 



#### CBR at 5.0mm (%): 40 Dry Density before Soaking (t/m³): 1.72 Density Ratio before Soaking (%): 100.0 14.0 Moisture Content before Soaking (%): Moisture Ratio before Soaking (%): 99 5 Dry Density after Soaking (t/m³): 1.72 Density Ratio after Soaking (%): 100.0 Swell (%): 0.0 Moisture Content of Top 30mm (%): 14.8 Moisture Content of Remaining Depth (%): 14.6 Compaction Hammer Used: Standard AS 1289.5.1.1

AS 1289.6.1.1

Surcharge Mass (kg): 4.50 Period of Soaking (Days): Retained on 19 mm Sieve (%): 11

CBR Moisture Content Method: AS 1289.2.1.1

Sample Curing Time (h):

Plasticity Determination Method: Visual/Tactile

#### Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

# **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: TRN: 754-NTLGE282007

#### Report No: NEWC21S-00600-1 Issue No: 1



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



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

### Sample Details

Sample ID: NEWC21S-00600 Date Sampled: 25/01/2021 Source: On-Site Material: **Existing Ground** 

Specification: No Specification Sampling Method: Submitted by client Project Location: Cooks Hill, NSW Sample Location: GBH01 @ 4.50-4.95m

### **Test Results**

Description	Method	Result	Limits
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	0.5	
Mould Length (mm)		125	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	21	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	17	
Plasticity Index (%)	AS 1289.3.3.1	4	
Date Tested		4/02/2021	

#### Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

# **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: TRN: 754-NTLGE282007

#### Report No: NEWC21S-00602-1 Issue No: 1



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



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

### Sample Details

Sample ID: NEWC21S-00602 Date Sampled: 25/01/2021 Source: On-Site Material: **Existing Ground** 

Specification: No Specification Sampling Method: Submitted by client Project Location: Cooks Hill, NSW Sample Location: GBH02 @ 4.00-4.45m

### **Test Results**

December 1	Madhaad	Danul4	1 114
Description	Method	Result	Limits
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	8.0	
Mould Length (mm)		124.9	
Crumbling		No	
Curling		No	
Cracking		No	
Liquid Limit (%)	AS 1289.3.1.1	43	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	29	
Plasticity Index (%)	AS 1289.3.3.1	14	
Date Tested		4/02/2021	

#### Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

## **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

**Project No.:** TESTNEWC00279AA

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: -TRN: 754-NTLGE282007

## Report No: NEWC21S-00603-1 Issue No: 1



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



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

## Sample Details

Sample ID: NEWC21S-00603 Date Sampled: 25/01/2021 Source: On-Site Material: **Existing Ground** Specification: No Specification

Sampling Method: Submitted by client Project Location: Cooks Hill, NSW Sample Location: GBH03 @ 0.50-1.00m

## **Test Results**

Description	Method	Result	Limits
Moisture Content (%)	AS 1289.2.1.1	21.7	
Date Tested		2/02/2021	
Sample History	AS 1289.1.1	Air-dried	
Preparation	AS 1289.1.1	Dry Sieved	
Linear Shrinkage (%)	AS 1289.3.4.1	6.5	
Mould Length (mm)		250	
Crumbling		No	
Curling		No	
Cracking		Yes	
Liquid Limit (%)	AS 1289.3.1.1	33	
Method		Four Point	
Plastic Limit (%)	AS 1289.3.2.1	15	
Plasticity Index (%)	AS 1289.3.3.1	18	
Date Tested		4/02/2021	
Standard MDD (t/m³)	AS 1289.5.1.1	1.76	
Standard OMC (%)		13.0	
Retained Sieve (mm)		19	
Oversize Material (%)		0	
Curing Time (h)		89	
LL Method		Visual / Tactile Assessment	
Date Tested		2/02/2021	
CBR at 5.0mm (%)	AS 1289.6.1.1	7	
Dry Density before Soaking (t/m³)		1.76	
Density Ratio before Soaking (%)		100.0	
Moisture Content before Soaking (%)		13.2	
Moisture Ratio before Soaking (%)		101.5	
Dry Density after Soaking (t/m³)		1.75	
Density Ratio after Soaking (%)		99.5	
Swell (%)		0.5	

## Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

# **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: -TRN: 754-NTLGE282007

## Report No: NEWC21S-00603-1 Issue No: 1



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



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

## Sample Details

Sample ID: NEWC21S-00603 Date Sampled: 25/01/2021 Source: On-Site Material: **Existing Ground** 

Specification: No Specification Sampling Method: Submitted by client Project Location: Cooks Hill, NSW Sample Location: GBH03 @ 0.50-1.00m

## **Test Results**

Description	Method	Result	Limits
Moisture Content of Top 30mm (%)		18.8	
Moisture Content of Remaining Depth (%)		15.6	
Compaction Hammer Used		Standard	
Surcharge Mass (kg)		4.50	
Period of Soaking (Days)		4	
Retained on 19 mm Sieve (%)		0	
CBR Moisture Content Method		AS 1289.2.1.1	
Sample Curing Time (h)		48	
Plasticity Method		Visual/Tactile Assessment	
Sample Moisture Content		AS 1289.2.1.1	
Date Tested		4/02/2021	

## Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

## **California Bearing Ratio Test Report**

Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: -TRN: 754-NTLGE282007

## Report No: CBR:NEWC21S-00603 Issue No: 1



Sampling Method: Submitted by client

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



**Existing Ground** 

No Specification

Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

Sample Details

NEWC21S-00603 Sample ID:

Client ID:

Date Sampled: 25/01/2021

Date Submitted: 27/01/2021 Date Tested: 4/02/2021

Project Location: Cooks Hill, NSW Sample Location: GBH03 @ 0.50-1.00m



Material:

Source:

Specification:

## Load vs Penetration 2.2 2.0 1.8 1.6 .oad on Piston (kN) 12 1.0 0.8 0.6 0.4 0.2 2.0 3.0 4.0 6.0 9.0 10.0 11.0 12.0 13.0 7.0 8.0 Penetration (mm)

### **Test Results**

On-Site

AS 1289.6.1.1 CBR at 5.0mm (%): 7 1.76 Dry Density before Soaking (t/m3): Density Ratio before Soaking (%): 100.0 Moisture Content before Soaking (%): 13.2 Moisture Ratio before Soaking (%): 101.5 Dry Density after Soaking (t/m³): 1.75 Density Ratio after Soaking (%): 99 5 Swell (%): 0.5 Moisture Content of Top 30mm (%): 18.8 Moisture Content of Remaining Depth (%): 15.6

Compaction Hammer Used: Standard AS 1289.5.1.1

Surcharge Mass (kg): 4.50 Period of Soaking (Days): Retained on 19 mm Sieve (%):

CBR Moisture Content Method: AS 1289.2.1.1 Sample Curing Time (h):

Plasticity Determination Method: Visual/Tactile

- AS 1289.2.1.1 -

In Situ (Field) Moisture Content (%): 217

## Comments



Coffey Testing Pty Ltd ABN 92 114 364 046 16 Callistemon Close Warabrook NSW 2304

Phone: +61 2 4016 2300

## **Material Test Report**

Client: Coffey Services Australia Pty Ltd (Newcastle)

16 Callistemon Close Newcastle NSW 2304

Principal:

TESTNEWC00279AA **Project No.:** 

Project Name: 754-NTLGE282007 - Newcastle Grammar School

Lot No.: TRN: 754-NTLGE282007

## Report No: NEWC21S-00604-1 Issue No: 1



IIaC-MRA

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

Limits



Approved Signatory: Chris Blackford

(Geotechnician)
NATA Accredited Laboratory Number:431

Date of Issue: 10/02/2021

## Sample Details

Sample ID: NEWC21S-00604 **Date Sampled:** 25/01/2021 Source: On-Site Material: **Existing Ground** 

Specification: No Specification Sampling Method: Submitted by client **Project Location:** Cooks Hill, NSW Sample Location: GBH04 @ 0.50-1.00m

## Particle Size Distribution

Method: AS 1289.3.6.1

Drying by: Oven Date Tested: 4/02/2021

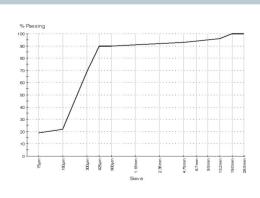
Note: Sample Washed

Sieve Size	% Passing
26.5mm	100
19.0mm	100
13.2mm	96
9.5mm	95
6.7mm	94
4.75mm	93
2.36mm	92
1.18mm	91
600µm	90
425µm	90
300µm	69
150µm	22
ll75um	19

## Other Test Results

**Description** Method Result Limits

### Chart



## Comments

## POINT LOAD STRENGTH INDEX

Australian Standard AS4133.4.1-1993 Method 4.1:Rock Strength Tests - Determination of Point Load Strength Index



Job No. 754-NTLGE282007 Sheet 1 of 2

**CLIENT: APP Coorporation Pty Ltd** 

LOCATION: 127 Union Street, Cooks Hill, 2300

PROJECT: Newcastle Grammar School - Park Campus

Test Machine: Grey / Digital Testing Locality: Newcastle Laboratory

Tested By: HL Test Date: 04-Feb-21

Checked: SJB

Date of Calibration: 15-Jan-21

Calibrated By: PCS Measurement Pty Ltd

Sampled Date: 19-Nov-19 Storage Location: WARABROOK

							Diamo	tral test						Avial or	Irregular	lumn			
	oole No. / Test Depth (m)	Rock Description	Moisture Condition <sup>(1)</sup> (N, D or S)	Length L (2) (mm)	Diameter D (mm)	Load P (Gauge) (kN)	I <sub>s</sub> =(P/D <sup>2</sup> ) x 1000 (MPa)	Size Correction F=(D/50) <sup>A0.45</sup>	I <sub>s(50)</sub> (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D (2) (mm)	D <sub>e</sub> <sup>2</sup>	Load (Gauge) (kN)	I <sub>s</sub> =(P/D <sub>e</sub> <sup>2</sup> ) x 1000 (MPa)	Size Correction $F=(D_e/50)^{\Lambda^{0.45}}$	I <sub>s(50)</sub> (MPa)	Strength Class (Axial)	Comments / Strength Classification
GBH01	29.08	Siltstone		120.0	60.0	1.16	0.32	1.09	0.35	Medium	60.0	40.0	3056	0.83	0.27	1.05	0.28	Low	
	31.19	Sandstone		130.0	60.0	0.91	0.25	1.09	0.3	Low	60.0	41.0	3132	1.09	0.35	1.05	0.4	Medium	
	33.65	Sandstone		170.0	60.0	1.19	0.33	1.09	0.4	Medium	60.0	55.0	4202	2.45	0.58	1.12	0.7	Medium	
	35.32	Sandstone		90.0	60.0	6.89	1.91	1.09	2.1	High	60.0	53.0	4049	7.34	1.81	1.11	2.0	High	
GHB02	35.33	Sandstone		260.0	60.0	4.41	1.23	1.09	1.3	High	60.0	40.0	3056	6.82	2.23	1.05	2.3	High	
	31.55	Interbedded		210.0	60.0	1.63	0.45	1.09	0.5	Medium	60.0	43.0	3285	1.61	0.49	1.06	0.5	Medium	
	33.35	Sanstone		100.0	60.0	0.59	0.16	1.09	0.2	Low	60.0	40.0	3056	3.61	1.18	1.05	1.2	High	
	29.7	Laminate		170.0	60.0	1.17	0.33	1.09	0.4	Medium	60.0	57.0	4354	1.56	0.36	1.13	0.4	Medium	
GBH03	24.67	Siltstone	N	130.0	60.0	0.20	0.06	1.09	0.1	V. Low									
	25.90	Laminate	N	160.0	60.0	0.58	0.16	1.09	0.2	Low	60.0	54.0	4125	2.58	0.63	1.12	0.7	Medium	
	26.16	Siltstone	N	100.0	60.0	0.72	0.20	1.09	0.2	Low	60.0	40.0	3056	0.80	0.26	1.05	0.3	Low	
	28.25	Siltstone	N	250.0	60.0	0.67	0.19	1.09	0.2	Low	60.0	42.0	3209	0.78	0.24	1.06	0.3	Low	
	29.80	Siltstone	N	170.0	60.0	1.73	0.48	1.09	0.5	Medium	60.0	56.0	4278	2.86	0.67	1.13	0.8	Medium	
	31.3	Siltstone	N	110.0	60.0	2.69	0.75	1.09	0.8	Medium	60.0	48.0	3667	1.69	0.46	1.09	0.5	Medium	
GBH04	27.07	Sandstone	N	130.0	60.0	0.58	0.16	1.09	0.2	Low	60.0	51.0	3896	0.69	0.18	1.10	0.2	Low	
	29.44	Sandstone	N	140.0	60.0	2.86	0.79	1.09	0.9	Medium	60.0	46.0	3514	3.27	0.93	1.08	1.0	High	
	24.75	Claystone	N	170.0	60.0	0.08	0.02	1.09	0.0	V. Low	60.0	50.0	3820	0.09	0.02	1.10	0.0	V. Low	
	26.36	Siltstone	N	110.0	60.0	0.59	0.16	1.09	0.2	Low	60.0	40.0	3056	0.64	0.21	1.05	0.2	Low	

**NOTES** 

(2): L > 0.5D, 0.3 < D/W < 1.0

I<sub>s(50)</sub> MPa and Strength Classification (1): N = Natural, D = Dry, S = Saturated < 0.1 Very Low

1 - 3 High 0.1 - 0.3 Low 3 - 10 Very High 0.3 - 1 Medium > 10 Extreamly High

05-02-21 Point Loads1.xlsx



## **CERTIFICATE OF ANALYSIS**

**Work Order** : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD

Contact : MR SIMON BAKER

Address : 16 CALLISTEMON CLOSE

WARABROOK NEWCASTLE 2304

Telephone

**Project** : 754-NTLGE282700 NEWCASTLE GRAMMAR

Order number

C-O-C number

Sampler · HAROLD LEE/SAM RAMSEY

Site

Quote number : EN/222 No. of samples received : 23 No. of samples analysed : 18

Page : 1 of 6

Laboratory : Environmental Division Sydney

Contact : Grace White

Address : 277-289 Woodpark Road Smithfield NSW Australia 2164

Telephone : +61 2 8784 8555

**Date Samples Received** : 29-Jan-2021 14:30 **Date Analysis Commenced** : 02-Feb-2021

Issue Date · 09-Feb-2021 17:56



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with **Quality Review and Sample Receipt Notification.** 

### Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories Accreditation Category

Ben Felgendrejeris Senior Acid Sulfate Soil Chemist Ben Felgendrejeris Senior Acid Sulfate Soil Chemist Kim McCabe Senior Inorganic Chemist

Brisbane Acid Sulphate Soils, Stafford, QLD

Brisbane Inorganics, Stafford, QLD Brisbane Inorganics, Stafford, QLD Page : 2 of 6 Work Order : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD
Project : 754-NTLGE282700 NEWCASTLE GRAMMAR



#### **General Comments**

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key: CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

- ^ = This result is computed from individual analyte detections at or above the level of reporting
- ø = ALS is not NATA accredited for these tests.
- ~ = Indicates an estimated value.
- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 Slight; 2 Moderate; 3 Strong; 4 Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Page : 3 of 6
Work Order : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD
Project : 754-NTLGE282700 NEWCASTLE GRAMMAR



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GBH02 2.5m	GBH02 4.0m	GBH02 8.5m	GHB02 10.0m	GHB02 11.5m
		Sampl	ing date / time	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00
Compound	CAS Number	LOR	Unit	ES2102972-001	ES2102972-002	ES2102972-003	ES2102972-004	ES2102972-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit		7.0	8.6		7.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	μS/cm		98	203		33
EA037: Ass Field Screening Analysi	is							
ø pH (F)		0.1	pH Unit	7.0	7.3	8.7	8.1	7.8
ø pH (Fox)		0.1	pH Unit	2.8	3.3	2.0	1.3	2.1
Ø Reaction Rate		1	-	3	3	4	4	3
EA055: Moisture Content (Dried @ 1	05-110°C)							
Moisture Content		1.0	%		29.6	36.1		18.1
EA080: Resistivity								
Resistivity at 25°C		1	ohm cm		10200	4930		30300
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg		70	210		60
ED045G: Chloride by Discrete Analy	ser							
Chloride	16887-00-6	10	mg/kg		80	170		40

Page : 4 of 6
Work Order : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD
Project : 754-NTLGE282700 NEWCASTLE GRAMMAR



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GHB02 14.5m	GBH02 16.0m	GBH02 17.5m	GBH02 19.0m	GBH03 3.0m
		Sampli	ing date / time	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00
Compound	CAS Number	LOR	Unit	ES2102972-006	ES2102972-007	ES2102972-008	ES2102972-009	ES2102972-010
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit		8.4			
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	μS/cm		224			
EA037: Ass Field Screening Analysi	s							
ø pH (F)		0.1	pH Unit	7.6	8.7	8.6	8.5	6.3
ø pH (Fox)		0.1	pH Unit	2.1	1.6	1.5	2.0	3.6
ø Reaction Rate		1	-	3	4	4	4	3
EA055: Moisture Content (Dried @ 10	05-110°C)							
Moisture Content		1.0	%		41.1			
EA080: Resistivity								
Resistivity at 25°C		1	ohm cm		4460			
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg		500			
ED045G: Chloride by Discrete Analys	ser							
Chloride	16887-00-6	10	mg/kg		180			

Page : 5 of 6
Work Order : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD
Project : 754-NTLGE282700 NEWCASTLE GRAMMAR



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GBH03 4.5m	GBH03 7.5m	GBH03 10.5m	GBH03 12.0m	GBH03 15.0m
		Sampl	ing date / time	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00
Compound	CAS Number	LOR	Unit	ES2102972-011	ES2102972-012	ES2102972-013	ES2102972-014	ES2102972-015
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit	6.4	9.0		7.8	
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	μS/cm	301	187		132	
EA037: Ass Field Screening Analysi	is							
ø pH (F)		0.1	pH Unit	7.0	8.8	8.1	8.0	7.7
ø pH (Fox)		0.1	pH Unit	1.9	2.7	1.3	5.1	1.8
ø Reaction Rate		1	-	4	3	4	4	4
EA055: Moisture Content (Dried @ 1	05-110°C)							
Moisture Content		1.0	%	39.6	21.5		37.7	
EA080: Resistivity								
Resistivity at 25°C		1	ohm cm	3320	5350		7580	
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	90	60		10	
ED045G: Chloride by Discrete Analy	ser							
Chloride	16887-00-6	10	mg/kg	610	190		90	

Page : 6 of 6
Work Order : ES2102972

Client : COFFEY ENVIRONMENTS PTY LTD
Project : 754-NTLGE282700 NEWCASTLE GRAMMAR



## Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	GBH03 16.5m	GBH03 18.0m	GBH03 19.5m	 
		Sampli	ing date / time	21-Jan-2021 00:00	21-Jan-2021 00:00	21-Jan-2021 00:00	 
Compound	CAS Number	LOR	Unit	ES2102972-016	ES2102972-017	ES2102972-018	 
				Result	Result	Result	 
EA002: pH 1:5 (Soils)							
pH Value		0.1	pH Unit	7.2			 
EA010: Conductivity (1:5)							
Electrical Conductivity @ 25°C		1	μS/cm	110			 
EA037: Ass Field Screening Analysis	;						
ø pH (F)		0.1	pH Unit	7.0	7.1	7.9	 
ø pH (Fox)		0.1	pH Unit	2.4	2.0	6.8	 
ø Reaction Rate		1	-	4	3	4	 
EA055: Moisture Content (Dried @ 10	5-110°C)						
Moisture Content		1.0	%	18.3			 
EA080: Resistivity							
Resistivity at 25°C		1	ohm cm	9090			 
ED040S : Soluble Sulfate by ICPAES							
Sulfate as SO4 2-	14808-79-8	10	mg/kg	20			 
ED045G: Chloride by Discrete Analys	er						
Chloride	16887-00-6	10	mg/kg	150			 

## Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA037: Ass Field Screening Analysis

(SOIL) EA055: Moisture Content (Dried @ 105-110°C)

(SOIL) EA002: pH 1:5 (Soils)

(SOIL) ED040S : Soluble Sulfate by ICPAES (SOIL) ED045G: Chloride by Discrete Analyser

(SOIL) EA010: Conductivity (1:5)

(SOIL) EA080: Resistivity

<b>&gt;</b>			Consigning Office:		Warabrook							
coffev		<b>-</b> - 1	Report Results to:		Simon Baker	saker	Mobile:		04	0427 628 117	Email:	simon.baker@coffey.com
LITETRA TECH COMPANY			Invoices to:		Newcastle Accounts	<b>T</b>	Phone:		02	02 4028 9700	Email:	newcastle@coffey.com
Project No:	754-NTLGE282007	Task No:			Lab				!		Analysis Request Section	
Project Name:	Newcastle Grammar	Laboratory:	ALS					nd		-		
Sampler's Name:	Harold Lee / Sam Ramsey	Project Manag	er: Simon Bake	Project Manager: Simon Baker / Craig Schrader	der		iuite	phf a	/A			
Special Instructions:	Keep san	Keep samples for Chromium Reducible Sulphur testing at a later date	n Reducible Su	ilphur testing a	t a later date		vity S	een ( <sub> </sub>	itos P	OLD		
:							ressi		sbes	H		
Lab No.	Sample ID	Sample Date	Time	Matrix (Soiletc)	Container Type & Preservative*	T-A-T (specify)	Agr	ph field	A	··· ,		NOTES
	GBH02 2.5m	21-01-21	1	Soil	2	Std		×				Please store samples for
2	GBH02 4.0m	21-01-21		Soil	2	btS	×	×				further analysis - after this
W	GBH02 8.5m	21-01-21		Soil	Z	Std	×	×		i		lot of testing
V	GBH02 10.0m	21-01-21	•	Soil	Z	Std		×				
S	GBH02 11.5m	21-01-21	•	Soil	Z	Std	×	×			- · · · · · · · · · · · · · · · · · · ·	<u>n</u> .
	GBH02 14.5m	21-01-21	'	Soil	Z	Std		×			Environmental Division	
•	GBH02 16.0m	21-01-21		Soil	Z	Std	×	×			Syaney Work Order Referen	8
8	GBH02 17.5m	21-01-21	-	Soil	Z	Std		×		_	ES0100972	72
حر	GBH02 19.0m	21-01-21		Soil	Z	Std		×			707	
ଟି	GBH03 3.0m	21-01-21	•	Soil	Z	Std		×				
=	GBH03 4.5m	21-01-21		Soil	Z	Std	×	×				
7	GBH03 7.5m	21-01-21	-	Soil	Z	Std	×	×				
	GBH03 10.5m	21-01-21	•	Soil	Z	Std		×				
	GBH03 12.0m	21-01-21		Soil	Z	Std	×	×			<b>新学 新华的地名</b>	
3	GBH03 15.0m	21-01-21	•	Soil	Z	Std		×			Telephone: +61-2-8784 8555	
	GBH03 16.5m	21-01-21		Soil	2	Std	×	×				
<u></u>	GBH03 18.0m	21-01-21		Soil	Z	Std		×				
	GBH03 19.5m	21-01-21		Soil	Z	Std		×				
	RELINQUISHED BY					20	RECEIVED BY				Sample Receipt Advice: (Lab Use Only)	e: (Lab Use Only)
Name: Harold Lee	Date: 2 Time:	Date: 29/01/21 Time:		Name:	, V		Date:	2:30P~ 1:30P~	3/2	_	All Samples Recieved in Good Condition	in Good Condition
Name: MMM	Date:	29/05	12,7	Name:	Showld ?	5	Date:	29 <sub>C</sub>	29012(	07:20	3	
*Container Type & Preservat Sodium Thiosulfate, NP - No P	*Container Type & Preservation Codes: P - Plastic, G- Glass Bottle, J - Glass Jar, V-Vial, Z - Ziplock bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Greenved, B - Siphreid Acid Preserved, I - Ice, ST - sodium Thiosulfate, NP - No Preservative	ss Bottle, J - Glass Ja	ar, V-Vial, Z-Z	Ziplock bag, N -	Nitric Acid Preserve	d, C - Hydrochlo	oric Acid Bre	To the second	sulphuric A	d Preserved,		Ų.
19 (	3BH02-1.C			,			13 20 20					
500	21 GBH02-13-0	6	CXTX	Z		٢						
25	OBHOS II.						LAE	유	)RIGIN:	Z		
23	236 BHCS-60	0					Z	NEWCAST	STLE	111		
Coffey Environments						Version: 6						

Coffey Environments

Version: 6

Issue Date: 22/09/2020

Appendix C – Cone Penetration Testing Interpretation

This page has been left intentionally blank



PointID CPT01 : 1 OF 4 REMARK SHEET

CLIENT : Newcastle Grammar School

ENGINEER : IG

AREA **EASTING** 

: 384307.0 m

RIG : 20T Truck CONE TYPE : PC

APPROVED BY

CHECKED BY CHECKED DATE

STATUS DATE

PROJECT NORTHING : 6355275.0 m CONE ID : C10CFIIP.C19137 : 20/01/2021 : Newcastle Grammar School - Park Campus : 127 Union Street, Cooks Hill COORD. SYS.: MGA94 Zone 56 OPERATOR: NB APPROVED DATE LOCATION PROJECT No.: 754-NTLGE282007 ELEVATION : 2.10 m AHD Corrected Cone Resistance, q<sub>t</sub> (MPa) Friction Ratio, R<sub>f</sub> (%) Relative Density, D<sub>r</sub> (%) Undrained Shear Strength, s<sub>u</sub> (kPa) Overconsolidation Ratio, OCR In Situ Pore Pressure, u<sub>0</sub> (kPa) 30 ——4 Normalised Cone Resistance, Q<sub>t</sub> Normalised Friction Ratio, F<sub>r</sub> (%) Pore Pressure Ratio, B. - 1. s<sub>u</sub> = (q<sub>c</sub> -  $\sigma_{vo}$ )/N<sub>st</sub> or (q<sub>c</sub> -  $\sigma_{vo}$ )/N<sub>k</sub> - 2. s<sub>u</sub> = q/N<sub>st</sub> or a./N<sub>c</sub> 1. Mayne (1995); Demers & Leroueil (2002) 2. Chen & Mayne (1996) 3. Mayne (2005) 4. Robertson (2009) 4.5 - 1. Baldi et al. (1986); Al-Homoud & Wehr (2006 Porewater Pressure, u<sub>2</sub> (kPa) Sleeve Friction Resistance, f<sub>s</sub> (kPa) Inclination (°) 200 300 --- 400 -300 12.5 \_\_\_\_\_ Overconsolidation Ratio Method:
1. Mayne (1995); Demers & Leroueil (2002)
2. Chen & Mayne (1996)
3. Mayne (2005) Relative Density Method:
1. Baldi et al. (1986); Al-Homoud & Wehr (2006) Undrained Shear Strength Method: 1.  $s_u = (q_t - \sigma_{vo})/N_k$ ; or  $(q_c - \sigma_{vo})/N_k$ METHOD: Robertson 1990 5 - SAND mixtures - silty SAND to sandy 9 - Very stiff fine grained 1 - Sensitive, fine grained 2. s<sub>u</sub> = q<sub>i</sub>/N<sub>u;</sub> or q<sub>v</sub>/N<sub>k</sub> 3. Wroth (1984) 4. Trak et al. (1980), Terzaghi et al. (1996) 5. Robertson (2009), s<sub>u</sub> = ▲u/N 3. Kulhawy & Mayne (1990) 2 - Organic soil - PEATS 6 - SANDS - clean SAND to silty SAND 4. Robertson (2009) 3 - CLAYS - CLAY to silty CLAY 7 - Gravelly SAND to SAND 4 - SILT mixtures - clayey SILT to silty CLAY 8 - Very stiff SAND to clayey SAND



CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA

**EASTING** : 384307.0 m

NORTHING : 6355275.0 m COORD. SYS.: MGA94 Zone 56

RIG : 20T Truck CONE TYPE : PC

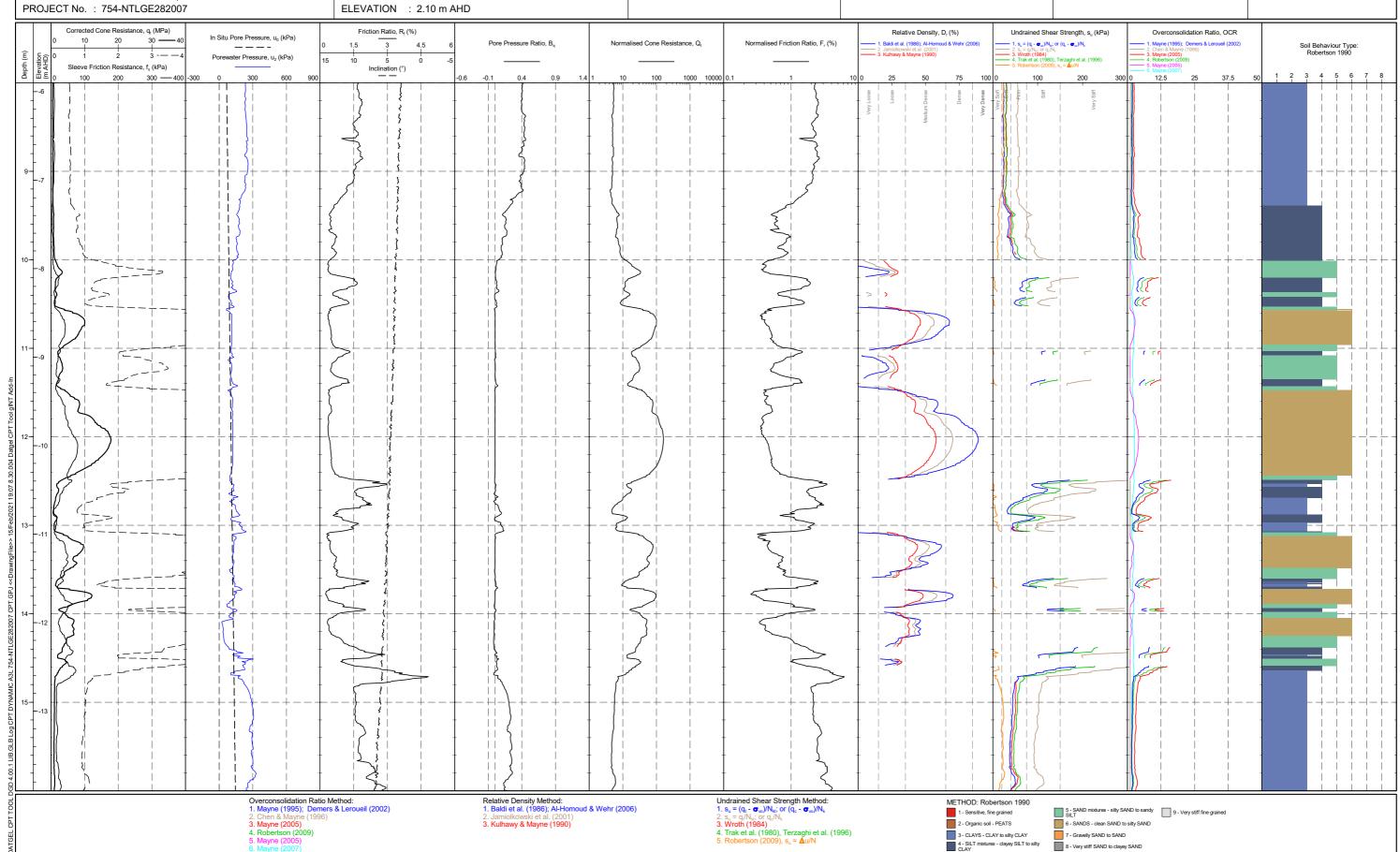
CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE : APPROVED BY APPROVED DATE

REMARK SHEET

: 2 OF 4 STATUS DATE

: 20/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

PROJECT No.: 754-NTLGE282007

AREA

**EASTING** 

COORD. SYS.: MGA94 Zone 56

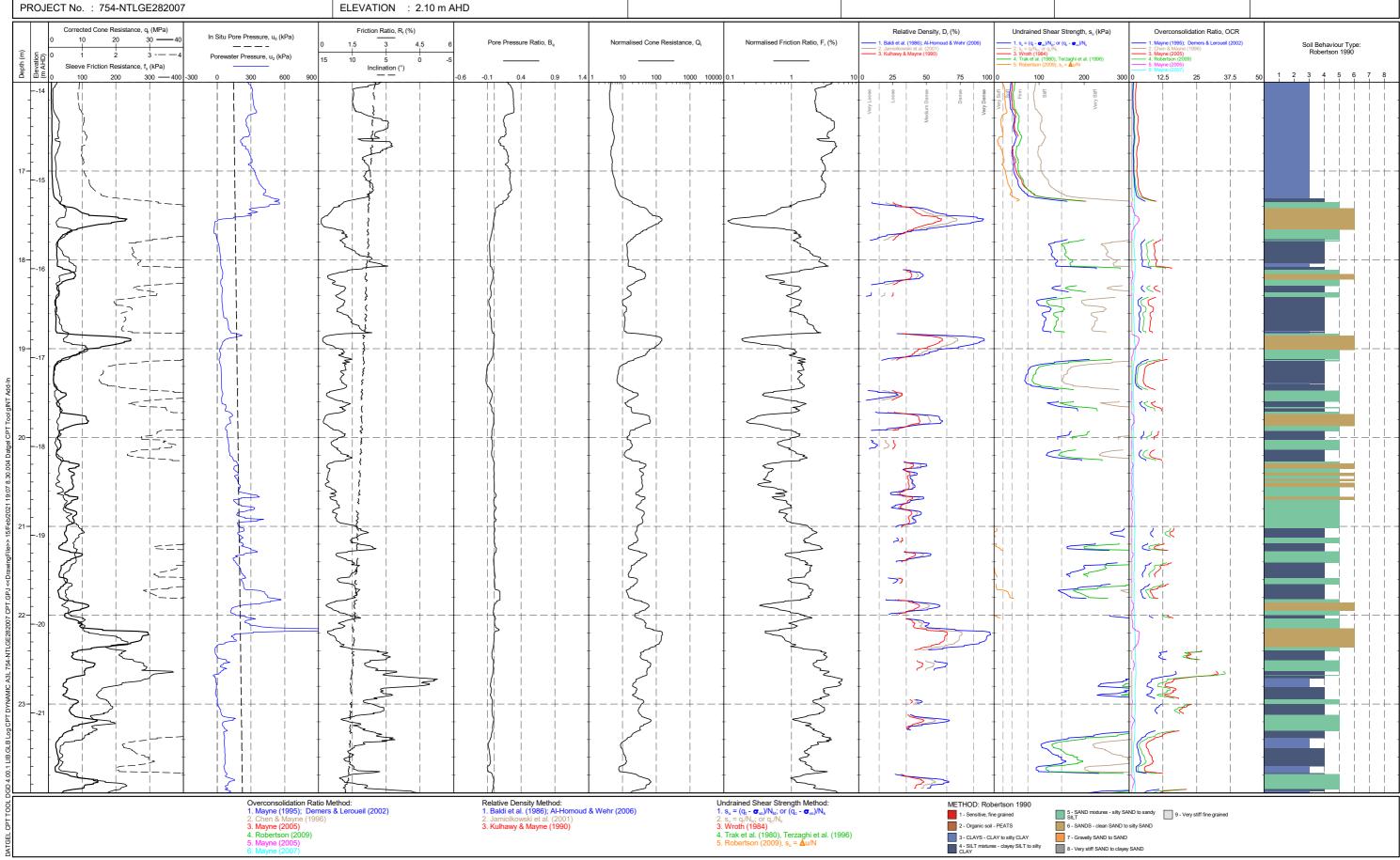
: 384307.0 m NORTHING : 6355275.0 m RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE : REMARK

SHEET : 3 OF 4 STATUS







CLIENT : Newcastle Grammar School

**ENGINEER** : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

PROJECT No.: 754-NTLGE282007

AREA

**EASTING** : 384307.0 m NORTHING : 6355275.0 m

COORD. SYS.: MGA94 Zone 56

RIG

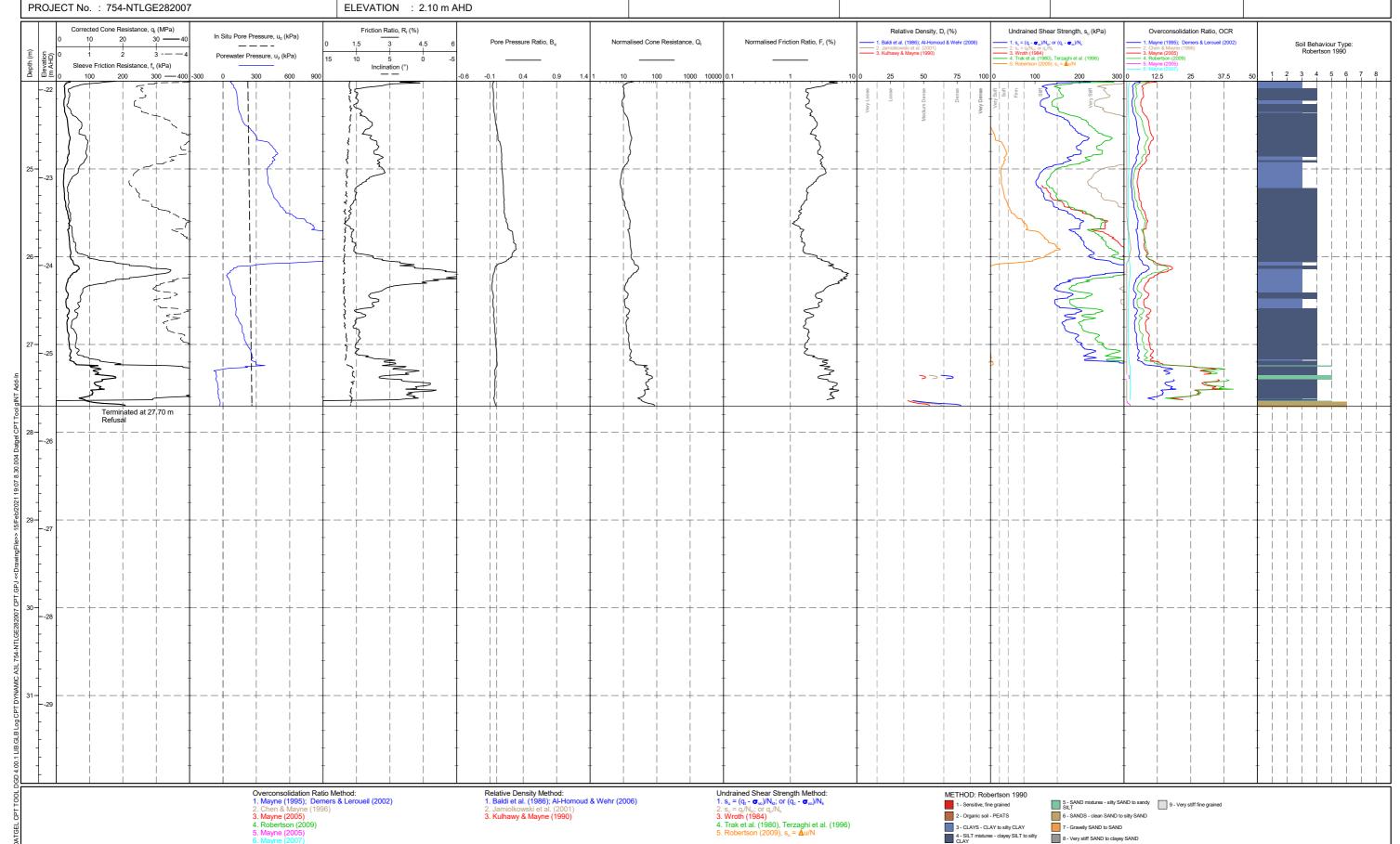
OPERATOR: NB

: 20T Truck CHECKED BY CONE TYPE : PC CHECKED DATE : CONE ID : C10CFIIP.C19137

APPROVED BY APPROVED DATE: REMARK SHEET STATUS

DATE : 20/01/2021

: 4 OF 4





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384300.0 m NORTHING : 6355260.0 m

RIG : 20T Truck CONE TYPE : PC

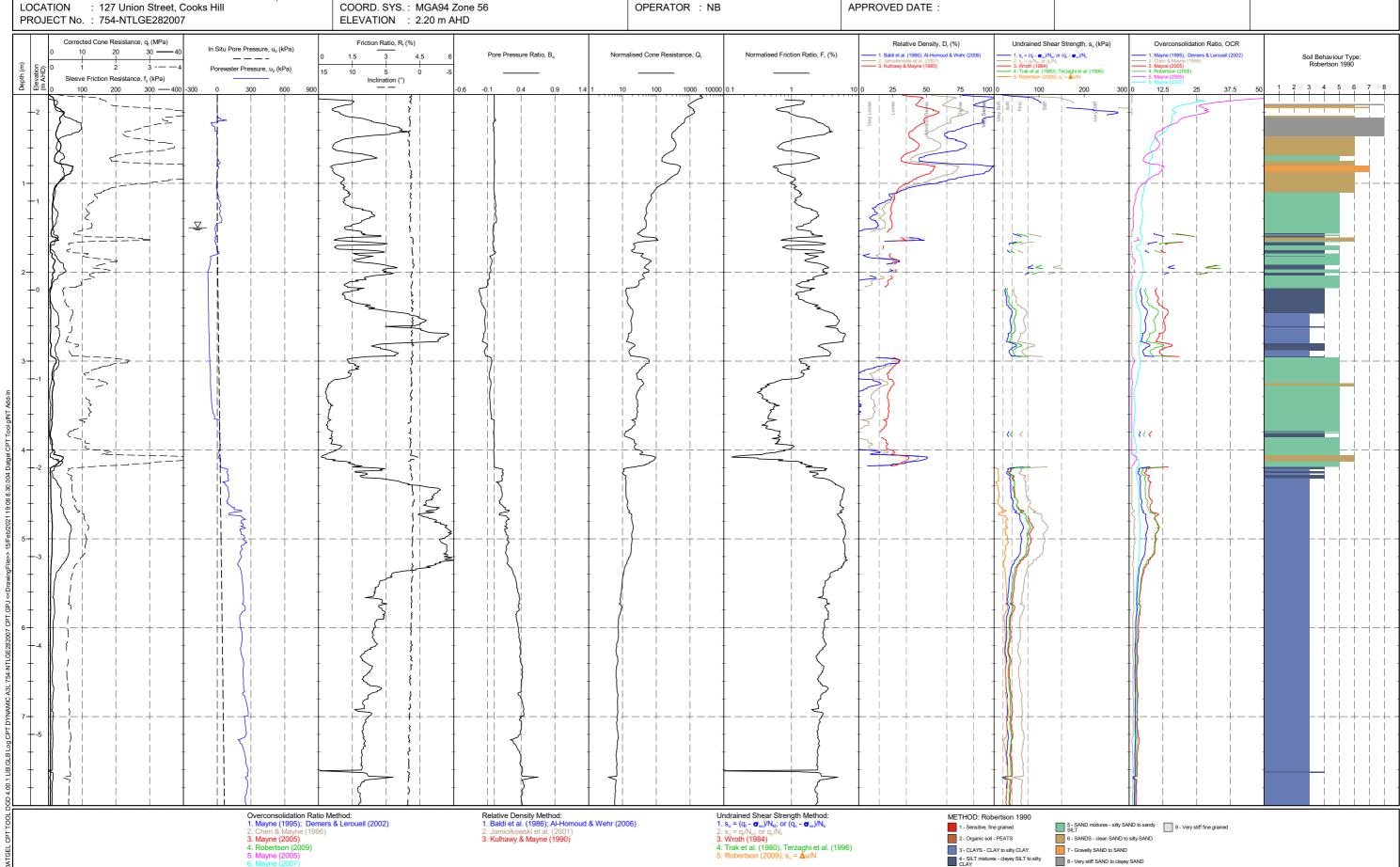
CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE APPROVED BY

REMARK

: 1 OF 4 SHEET STATUS DATE

: 20/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG

AREA

**EASTING** 

: 384300.0 m

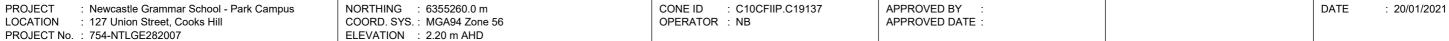
RIG : 20T Truck CONE TYPE : PC

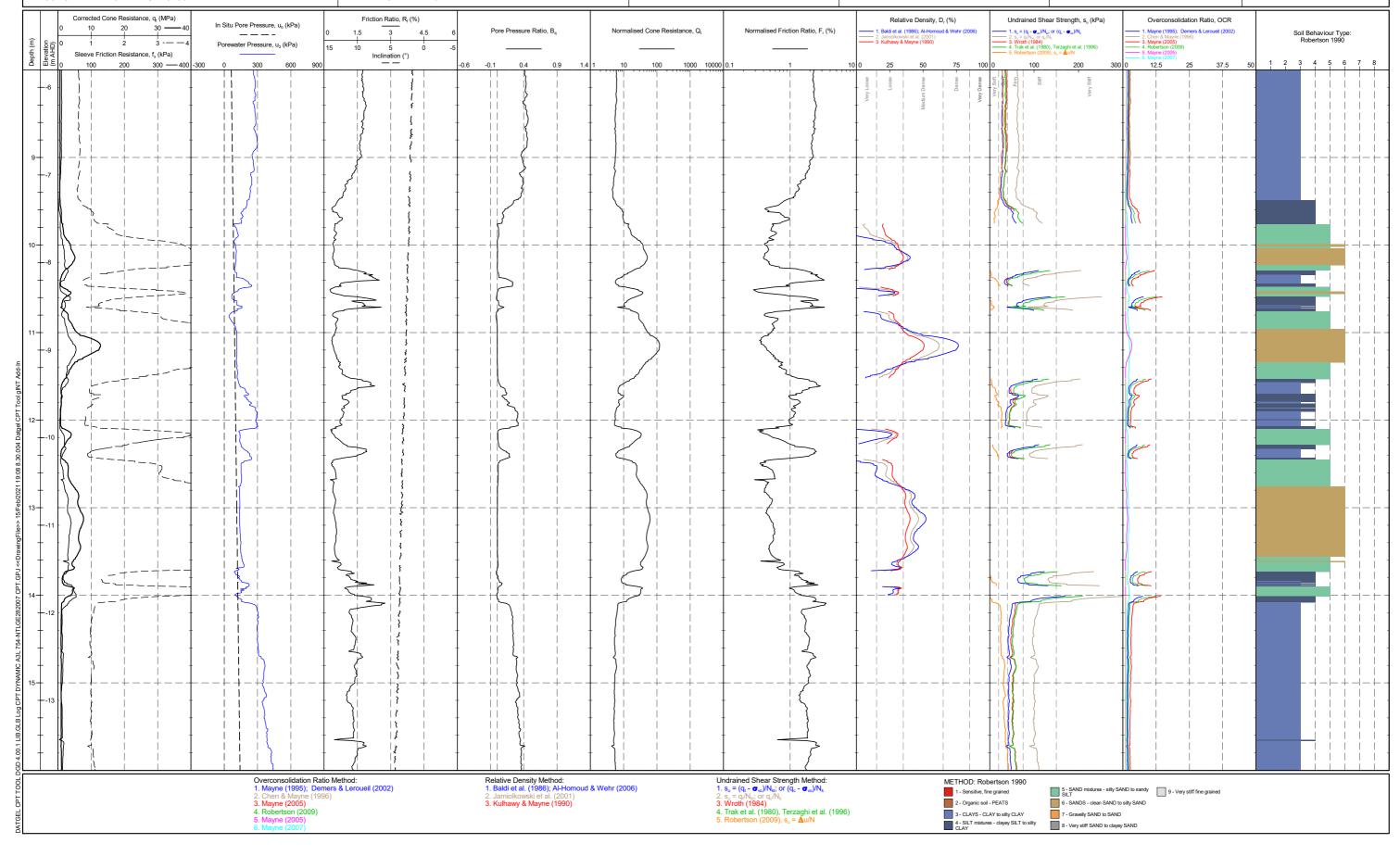
CHECKED BY CHECKED DATE : APPROVED BY

REMARK SHEET

STATUS

: 2 OF 4







CLIENT : Newcastle Grammar School

ENGINEER : IG

PROJECT : Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384300.0 m NORTHING : 6355260.0 m

RIG : 20T Truck CONE TYPE : PC

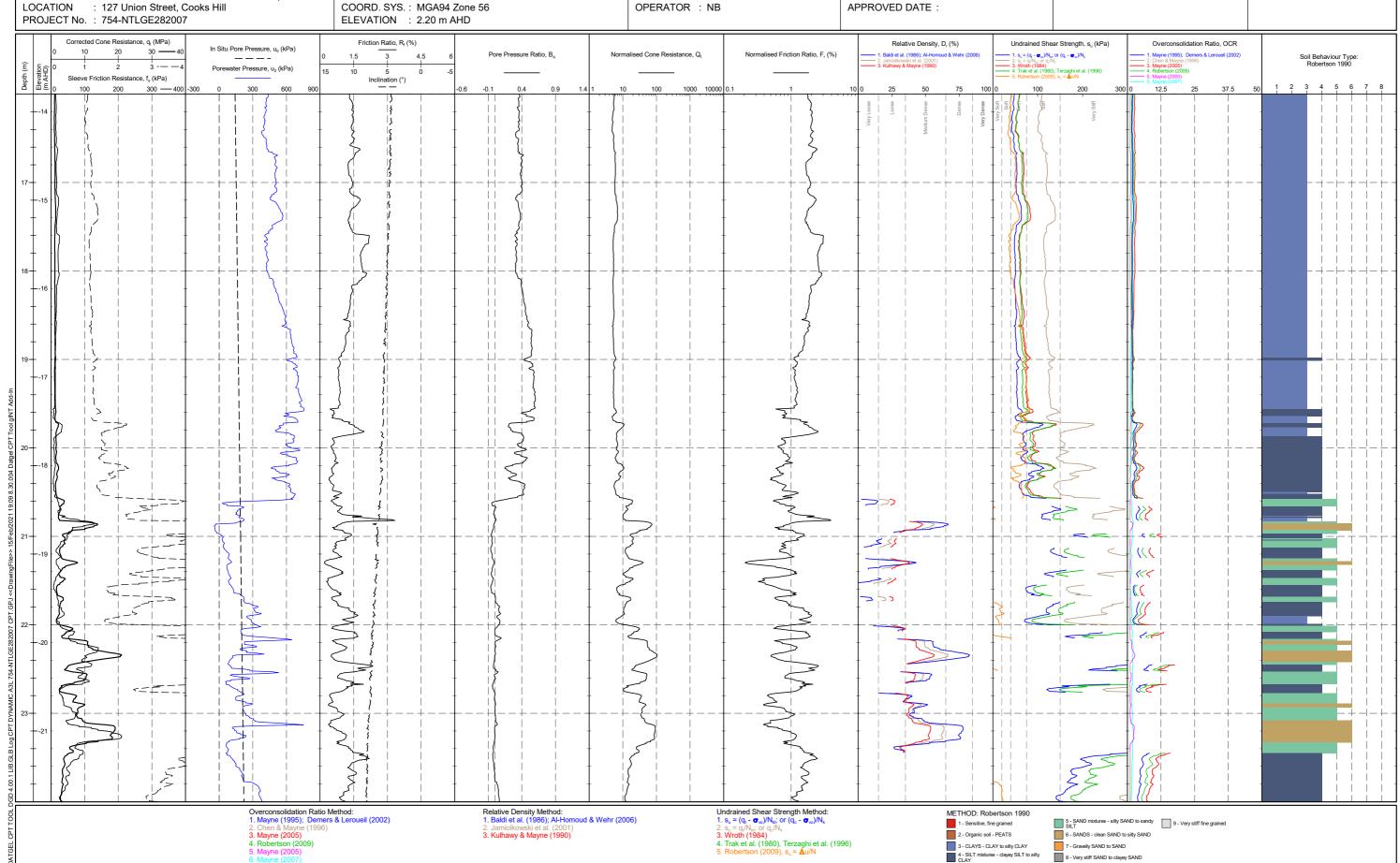
CONE ID : C10CFIIP.C19137

CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET : 3 OF 4 STATUS

DATE : 20/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384300.0 m NORTHING : 6355260.0 m

RIG : 20T Truck CONE TYPE : PC

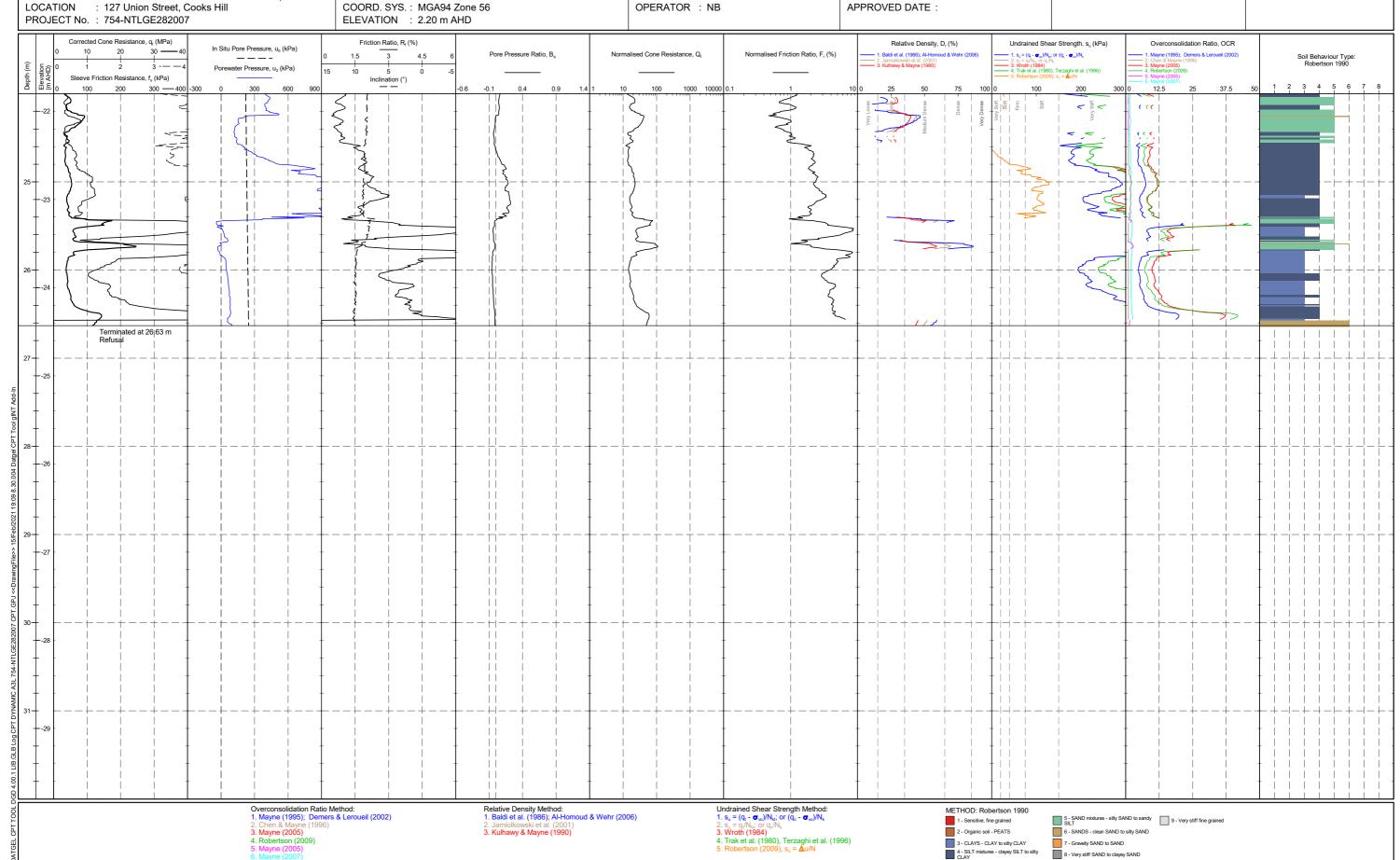
CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE : APPROVED BY

REMARK

SHEET : 4 OF 4 STATUS DATE

: 20/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384297.0 m

NORTHING : 6355244.0 m

RIG : 20T Truck CONE TYPE : PC

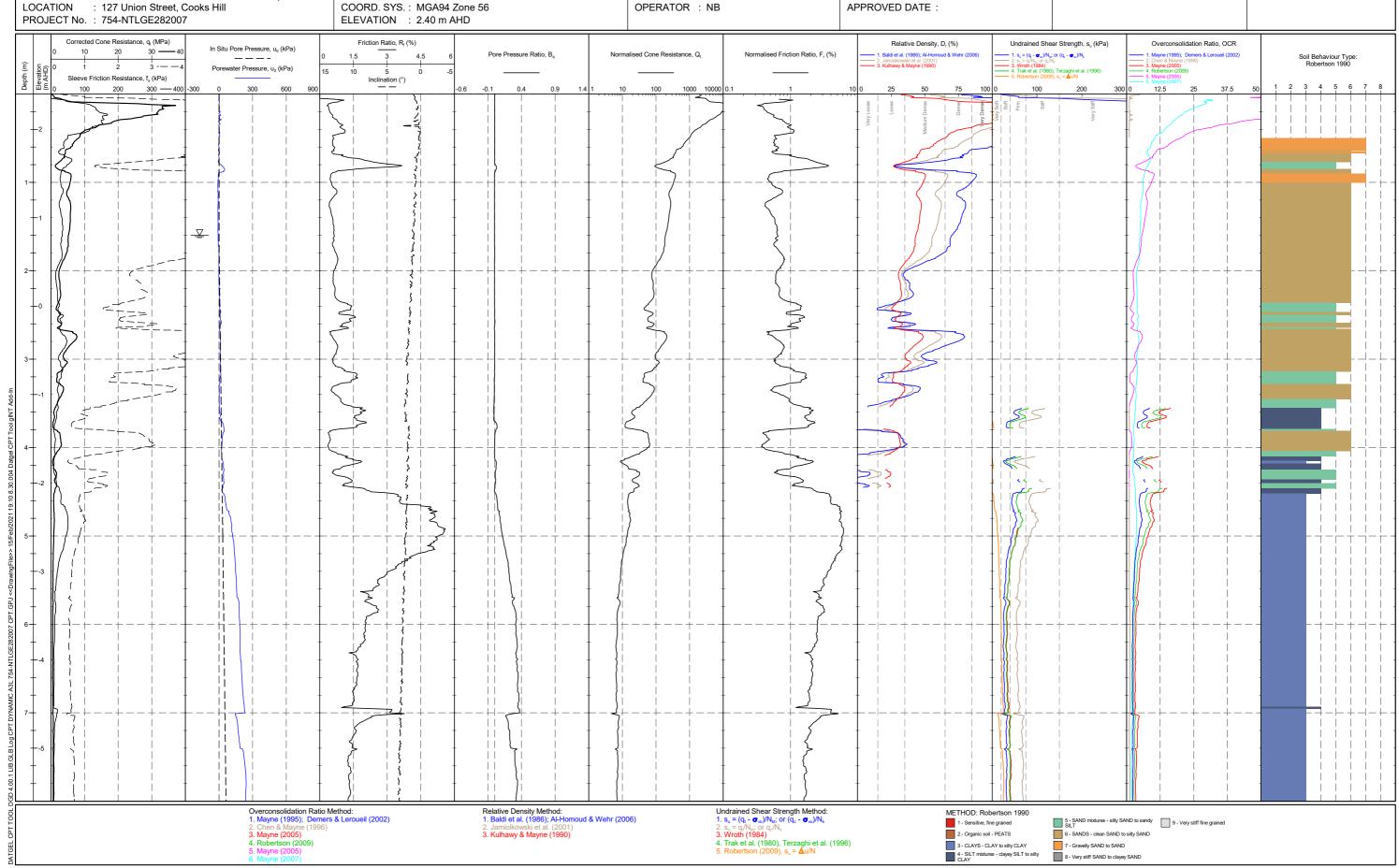
CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE : APPROVED BY

REMARK

: 1 OF 4 SHEET STATUS







CLIENT : Newcastle Grammar School

ENGINEER : IG

LOCATION

AREA

**EASTING** 

: 384297.0 m

CONE TYPE : PC

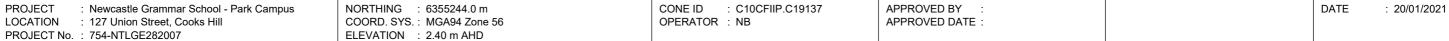
RIG

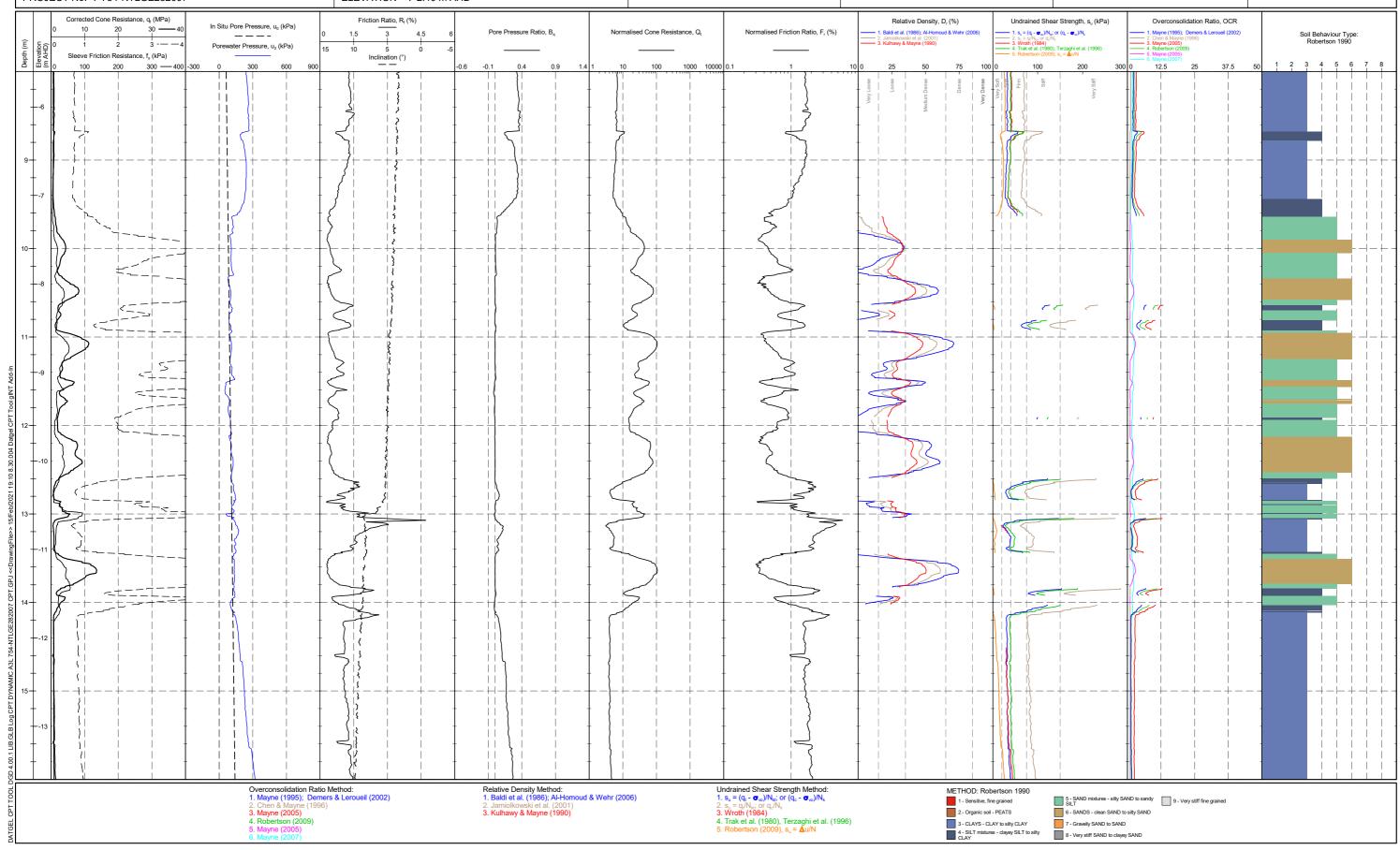
CONE ID : C10CFIIP.C19137

: 20T Truck

CHECKED BY CHECKED DATE : REMARK

SHEET : 2 OF 4 STATUS







CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384297.0 m NORTHING : 6355244.0 m RIG : 20T Truck CONE TYPE : PC

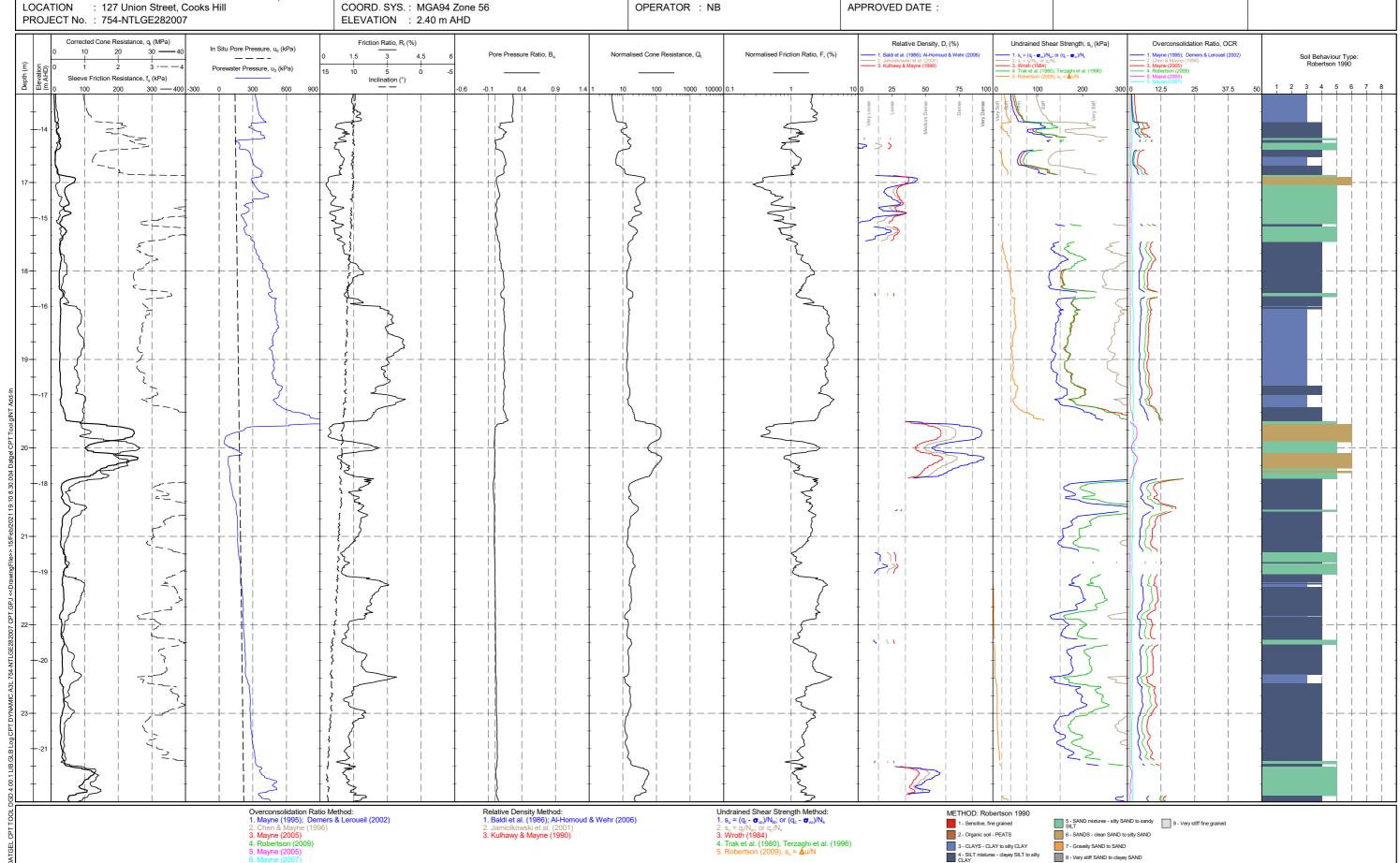
CONE ID : C10CFIIP.C19137

CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET : 3 OF 4 STATUS DATE

: 20/01/2021





CLIENT : Newcastle Grammar School

**ENGINEER** : IG

LOCATION

: Newcastle Grammar School - Park Campus

PROJECT No.: 754-NTLGE282007

AREA **EASTING** 

: 384297.0 m

RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137

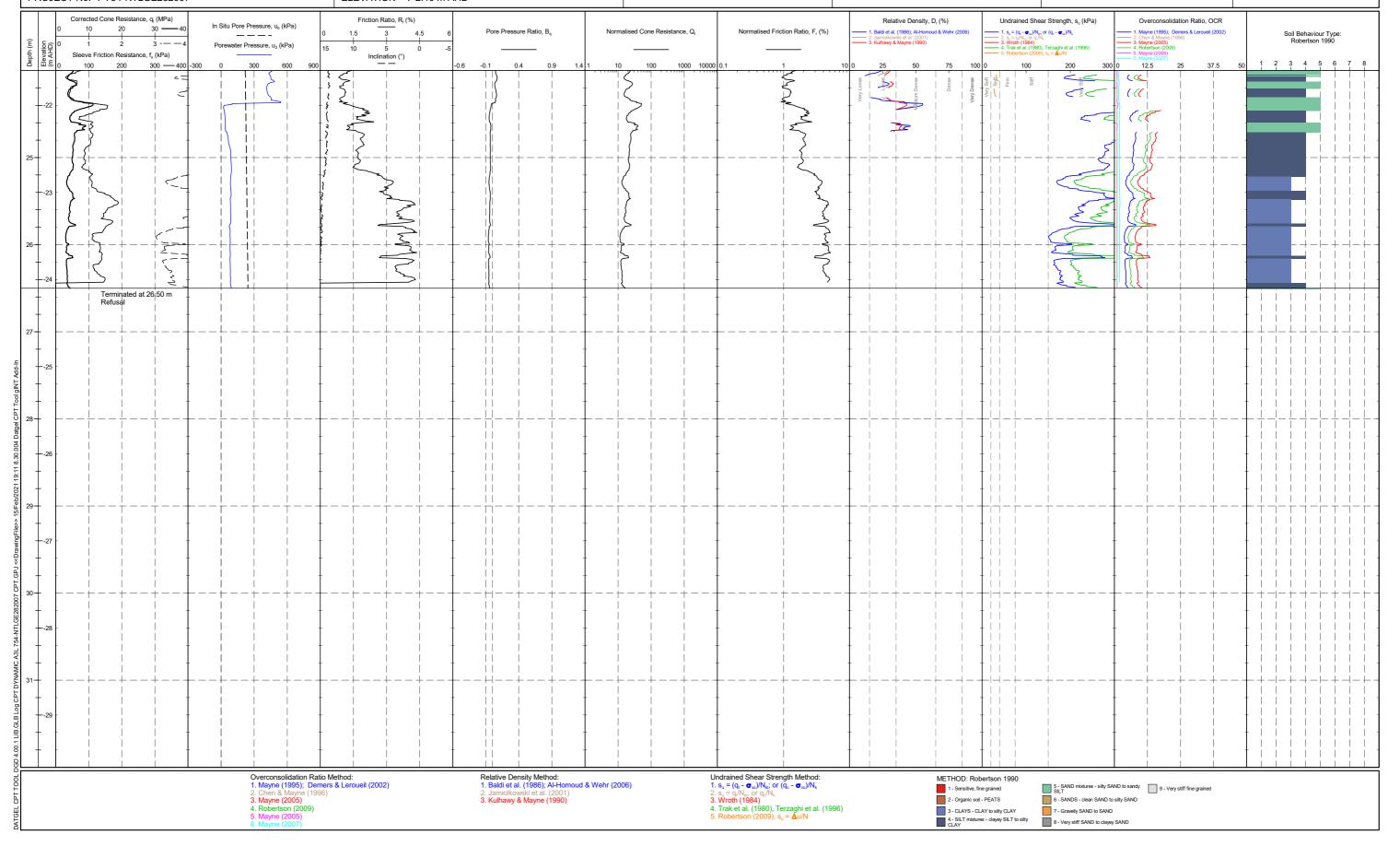
CHECKED BY CHECKED DATE : APPROVED BY

REMARK

SHEET STATUS

: 4 OF 4

PROJECT NORTHING : 6355244.0 m DATE : 20/01/2021 : 127 Union Street, Cooks Hill COORD. SYS.: MGA94 Zone 56 OPERATOR: NB APPROVED DATE: ELEVATION : 2.40 m AHD





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

AREA

**EASTING** 

: 384327.0 m NORTHING : 6355211.0 m RIG : 20T Truck CONE TYPE : PC

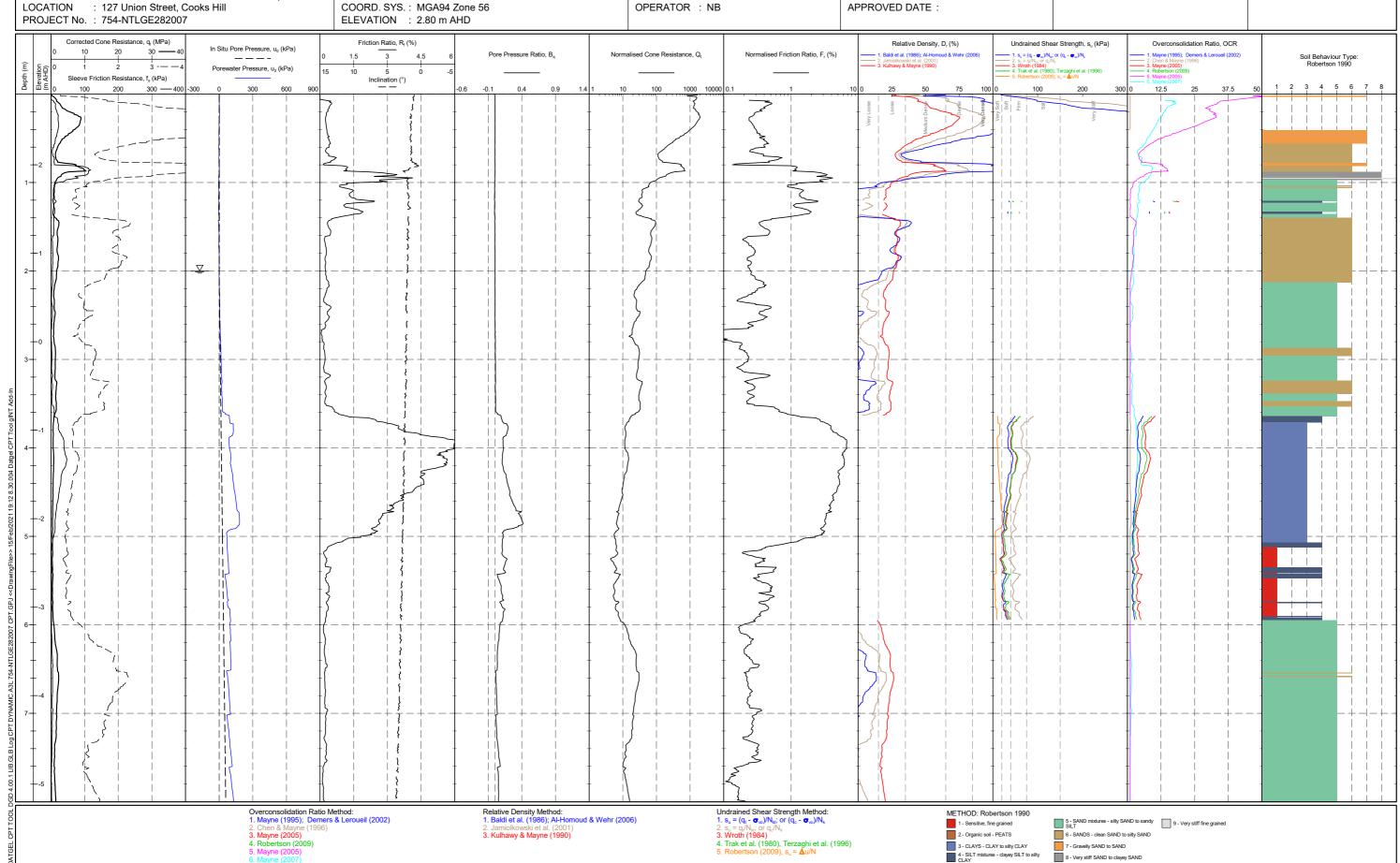
CONE ID : C10CFIIP.C19137

CHECKED BY CHECKED DATE : APPROVED BY

REMARK

: 1 OF 3 SHEET STATUS DATE

: 21/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** : 384327.0 m

NORTHING : 6355211.0 m

CONE TYPE : PC CONE ID : C10CFIIP.C19137

: 20T Truck

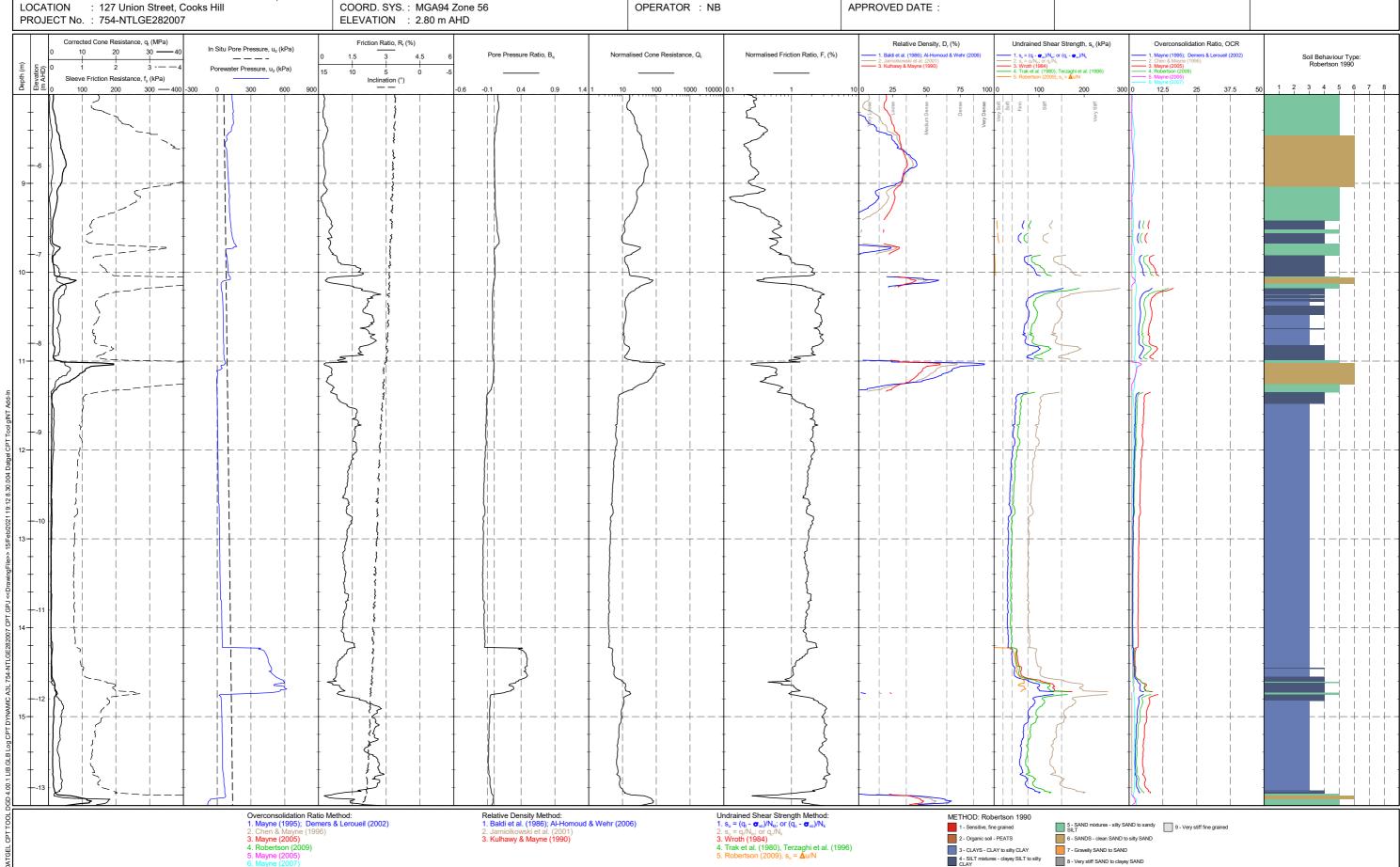
RIG

CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET : 2 OF 3 STATUS

DATE : 21/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

PROJECT No.: 754-NTLGE282007

AREA **EASTING** 

COORD. SYS.: MGA94 Zone 56

: 384327.0 m NORTHING : 6355211.0 m RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137 OPERATOR: NB

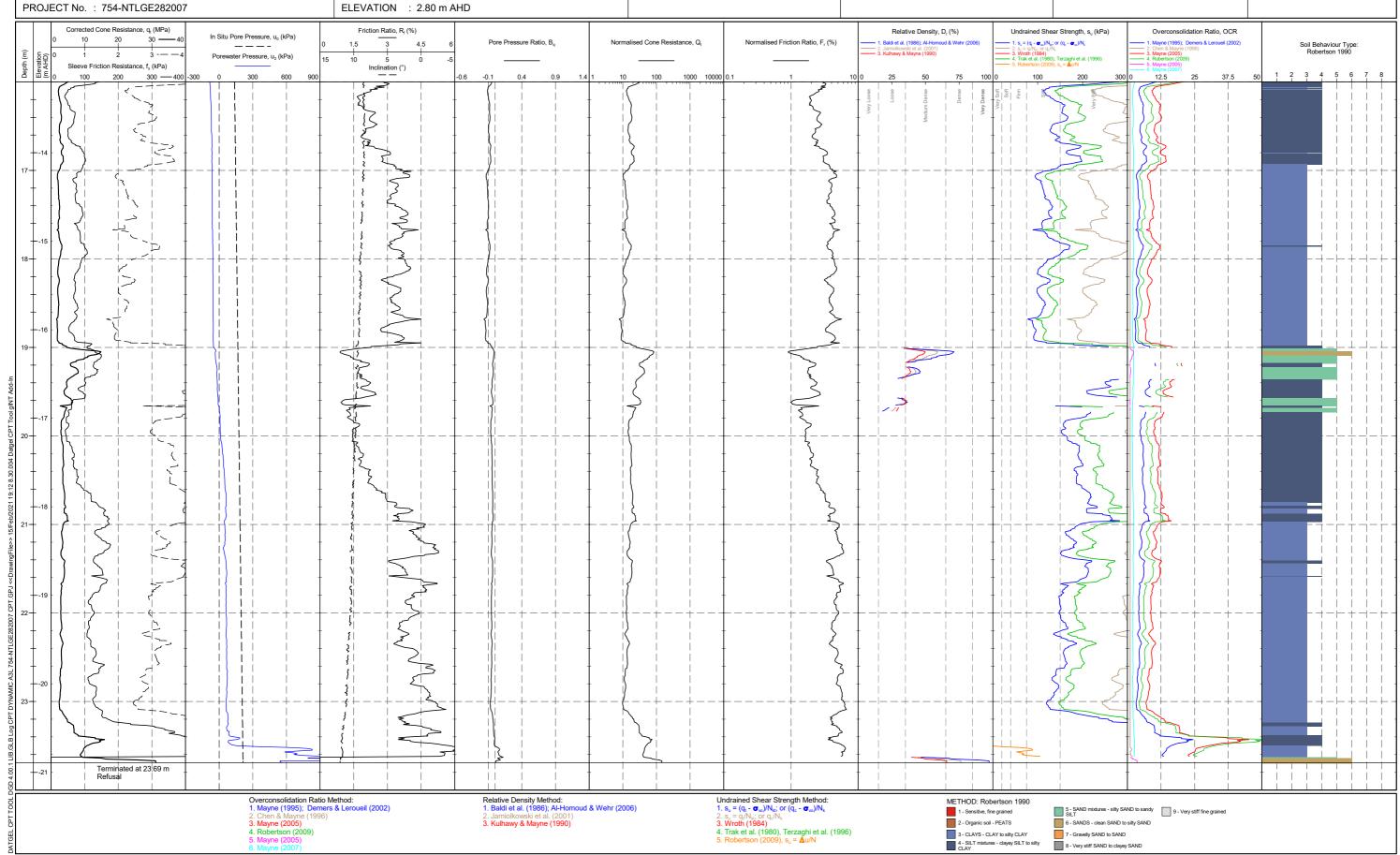
CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET STATUS

: 3 OF 3

DATE : 21/01/2021 APPROVED DATE:





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** : 384357.0 m NORTHING : 6355218.0 m

RIG : 20T Truck CONE TYPE : PC

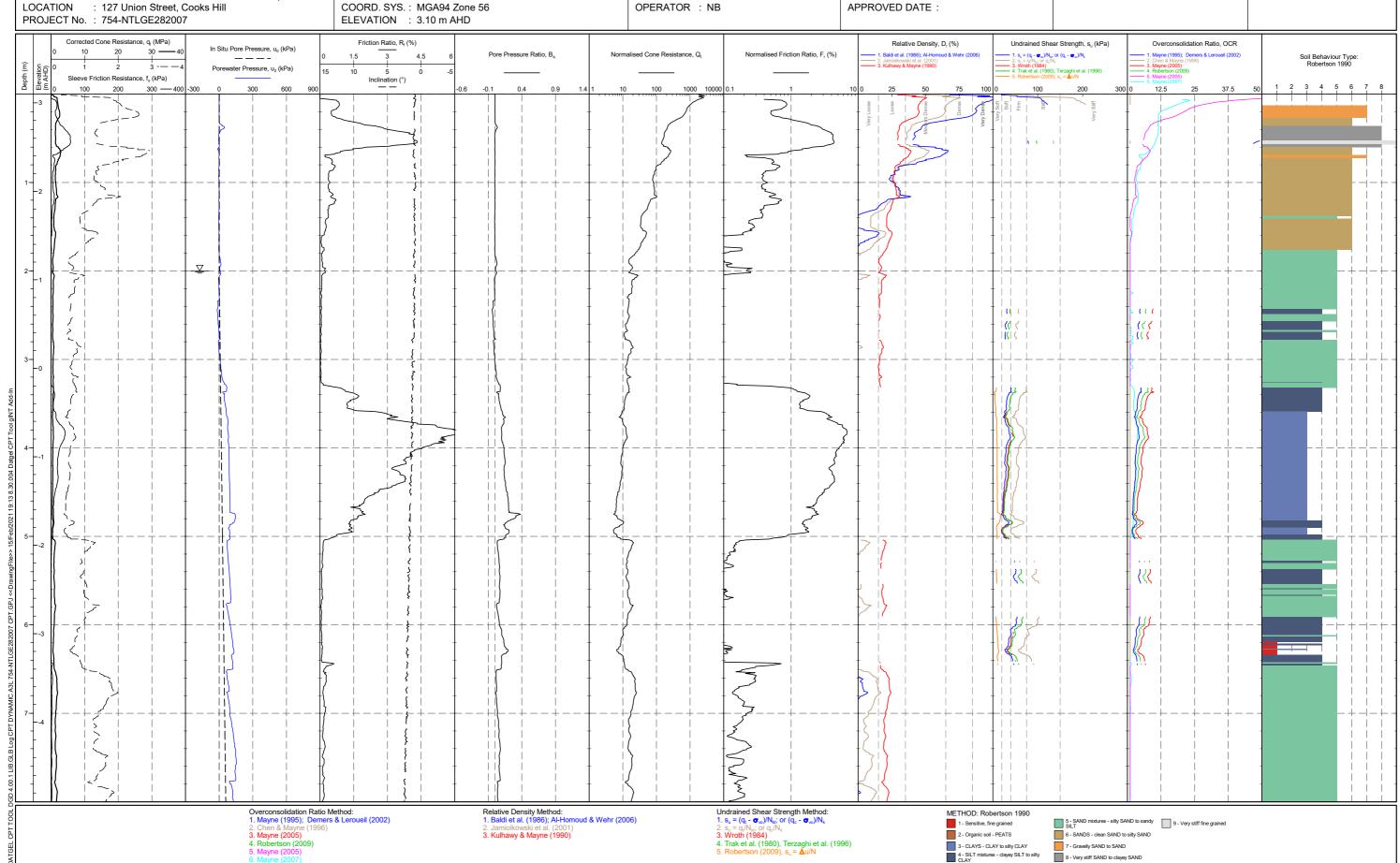
CONE ID : C10CFIIP.C19137

CHECKED BY CHECKED DATE : APPROVED BY

REMARK

: 1 OF 4 SHEET STATUS DATE

: 21/01/2021





CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

: 384357.0 m NORTHING : 6355218.0 m COORD. SYS.: MGA94 Zone 56 RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137 OPERATOR: NB

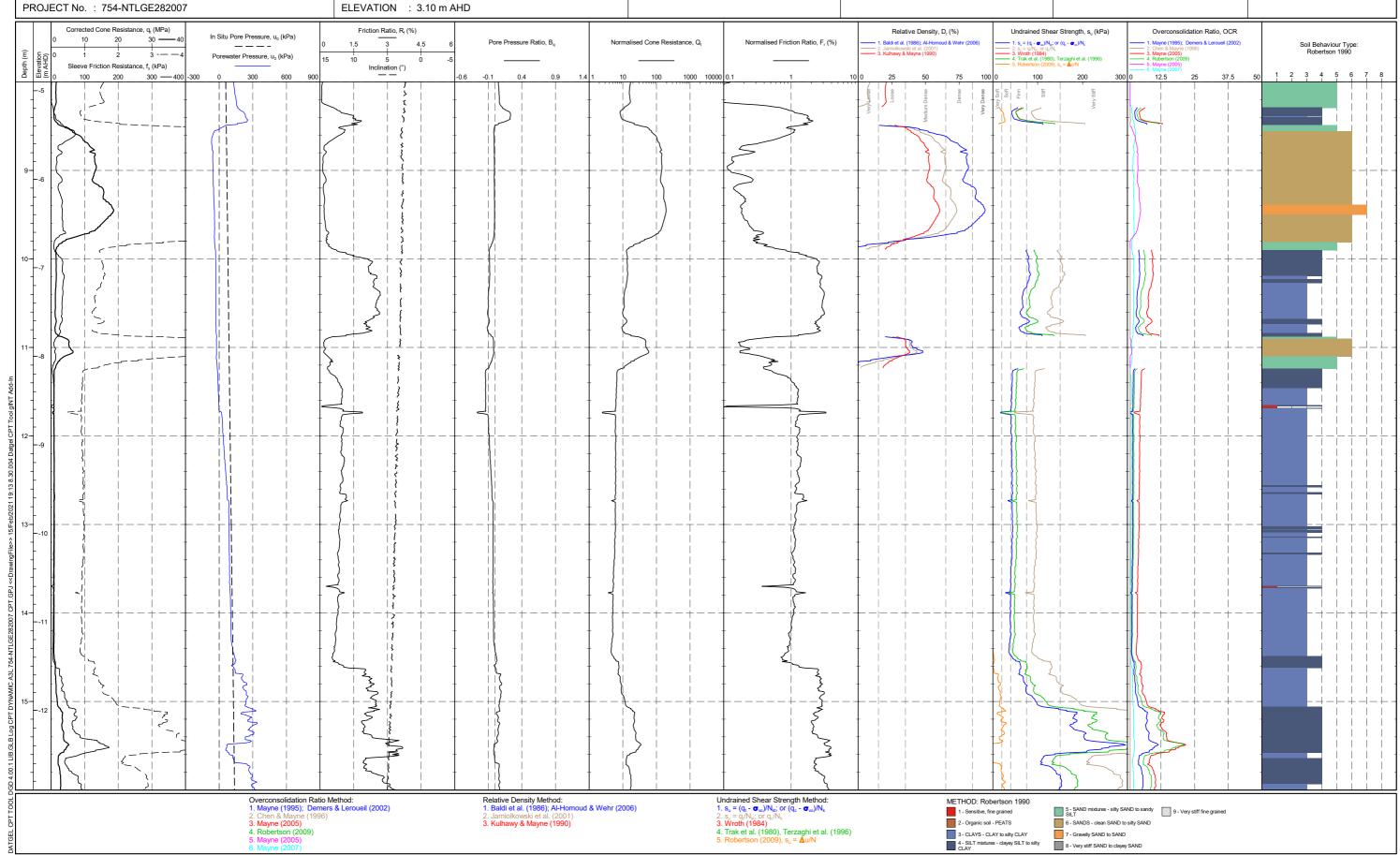
APPROVED BY APPROVED DATE:

CHECKED BY

REMARK

SHEET : 2 OF 4 STATUS

CHECKED DATE DATE : 21/01/2021





PointID

CLIENT : Newcastle Grammar School

ENGINEER : IG

: Newcastle Grammar School - Park Campus

AREA **EASTING** 

: 384357.0 m NORTHING : 6355218.0 m RIG : 20T Truck CONE TYPE : PC

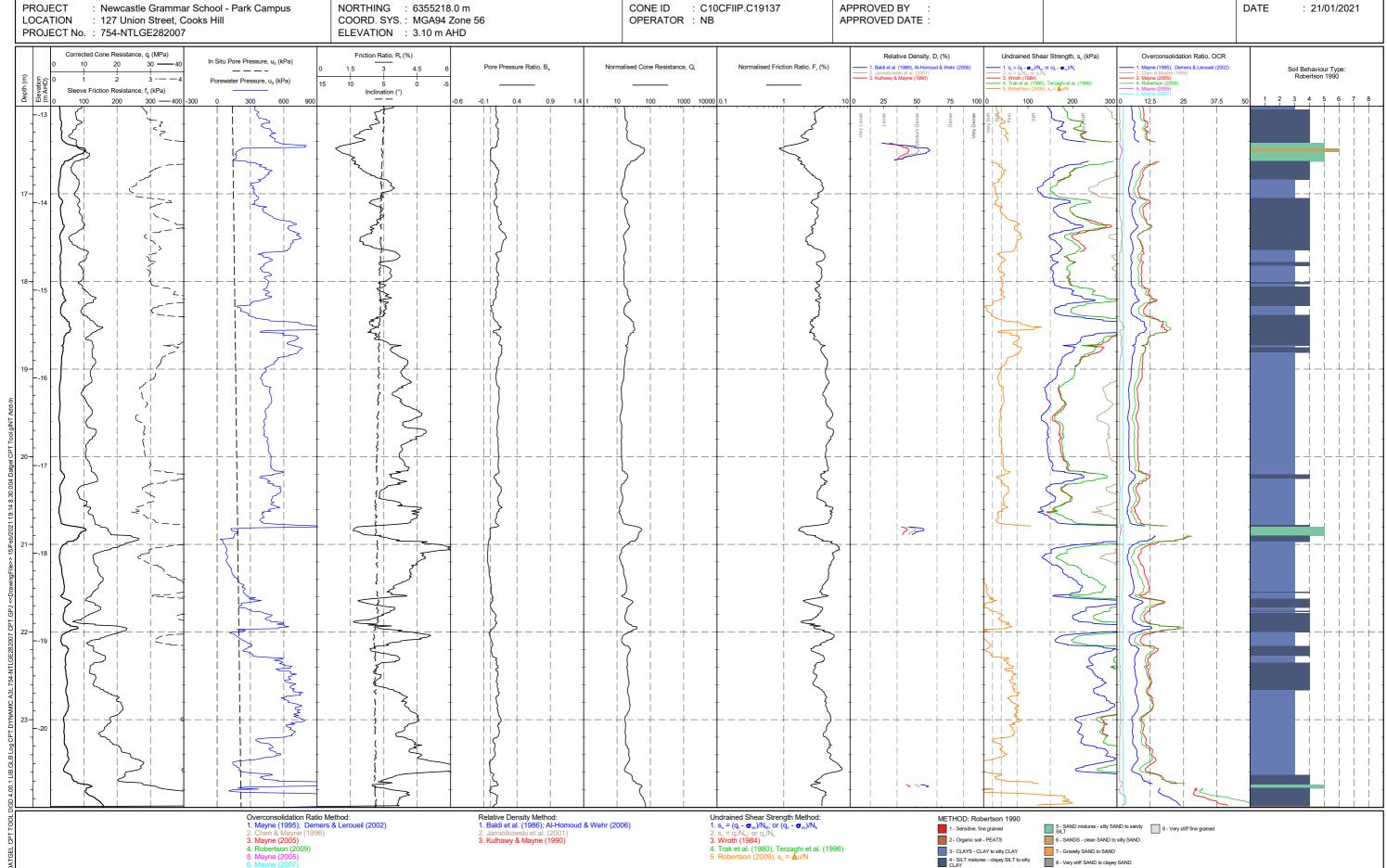
CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET : 3 OF 4 STATUS

CPT05

: 21/01/2021





REMARK

CLIENT ENGINEER : Newcastle Grammar School : IG

PROJECT LOCATION

: Newcastle Grammar School - Park Campus: 127 Union Street, Cooks Hill

RIG : 20T Truck CONE TYPE : PC AREA EASTING : 384357.0 m

NORTHING : 6355218.0 m COORD. SYS. : MGA94 Zone 56

CONE ID : C10CFIIP.C19137 OPERATOR : NB

CHECKED BY : CHECKED DATE : APPROVED DATE :

SHEET STATUS : 4 OF 4

DATE : 21/01/2021

	N : 127 Union Street, C Γ No. : 754-NTLGE282007			COORD. SYS.: MGAS ELEVATION : 3.10 r			OPERATO			APPROVED DA				
vation AHD)	Corrected Cone Resistance, q, (MPa)  10 20 30 — 40  1 2 3 - — 4  Sleeve Friction Resistance, f, (kPa)	In Situ Pore Pre	0	Friction Ratio, R <sub>t</sub> (%)  1.5 3 4.5  15 10 5 0  Inclination (*)	6 Pore Pressure Ratio, B <sub>q</sub>	No	malised Cone Resist	ance, Q <sub>t</sub>	Normalised Friction Ratio, F, (%)		6): Al-Homoud & Wehr (2006)	Undrained Shear Strength, s <sub>u</sub> (kPa)  1. s <sub>i</sub> = (q - • • u)N <sub>u</sub> or (q - • u)N <sub>u</sub> 2. s <sub>i</sub> = o(N <sub>u</sub> ) or o(N <sub>u</sub> ) 3. Wroth (1984) 4. Trak et al. (1990), Terzaghi et al. (1996) 5. Robertson (2009), s <sub>i</sub> = • u)N	Overconsolidation Ratio, OCR  1. Mayne (1995); Demers & Lerouel (2002) 2. Chen & Mayne (1996) 3. Mayne (2005) 4. Robertson (2009) 5. Mayne (2006)	Soil Behaviour Type Robertson 1990
⊕ E 0	100 200 300 — 400	-300 0 30	0 600 900		-0.6 -0.1 0.4 0.	9 1.4 1	10 100	1000 10000	0.1 1	10 0 25	50 75 100 0	100 200 30	0 0 12.5 25 37.5	0 1 2 3 4 5 6
21	Terminated at 24,05 m Refusal -							             		Very Loose	Medium Dentee  Dentee  Overy Dentee			
23								            -+						
.24								            -						†
-								         						
-25								           				i i i		-
-														
7														
.8														
		1 2 3 4	Werconsolidation Ratio Mayne (1995); Deme Chen & Mayne (1996 Mayne (2005) Robertson (2009) Mayne (2005) Mayne (2007)	b Method: ers & Leroueil (2002)	Relative Density Metho 1. Baldi et al. (1986); A 2. Jamiolkowski et al. (2 3. Kulhawy & Mayne (1	d: -Homoud & Wehr (2 0001) 990)	2006)	U 1. 2 3. 4. 5.	ndrained Shear Strength Method: $s_u = (q_t - \sigma_{vo})/N_{et}$ ; or $(q_c - \sigma_{vo})/N_k$ ; $s_v = q_v/N_{et}$ ; or $q_v/N_k$ ; Wroth (1984). Wroth (1980), Terzaghi et al. (19 Robertson (2009), $s_u = \Delta_u/N$	96)	METHOD: Robertso  1 - Sensitive, fine graine  2 - Organic soil - PEAT  3 - CLAYS - CLAY to si  4 - SILT mixtures - clay CLAY	5 - SAND mixtures - sitty S SILT 6 - SANDS - clean SAND to SANI 7 - Gravelly SAND to SANI	D	



CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA **EASTING** 

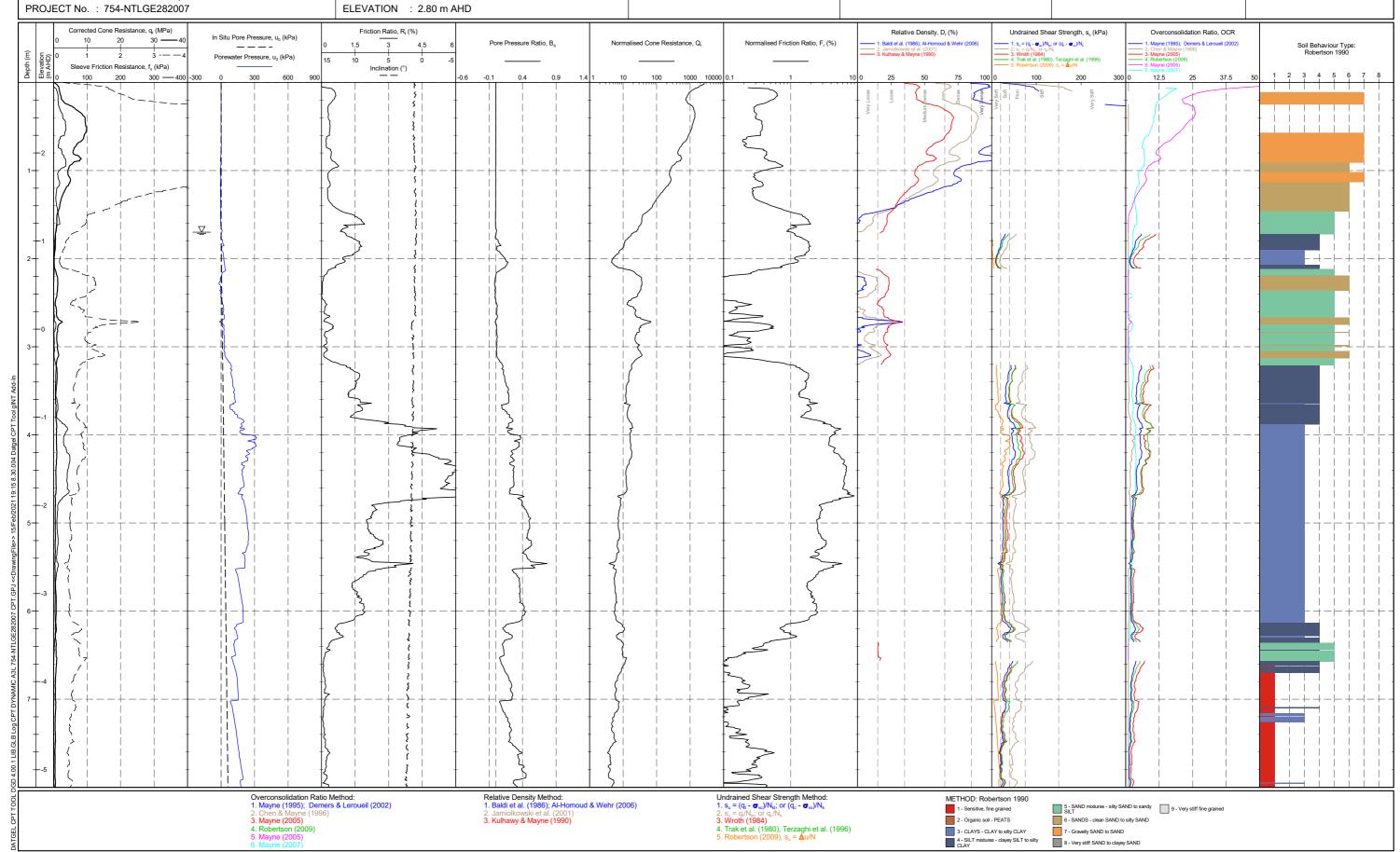
: 384362.0 m NORTHING : 6355234.0 m COORD. SYS.: MGA94 Zone 56 RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137 OPERATOR: NB

CHECKED BY CHECKED DATE APPROVED BY APPROVED DATE REMARK

: 1 OF 3 SHEET STATUS

DATE : 21/01/2021





PointID

CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

AREA RIG : 384362.0 m CONE TYPE : PC

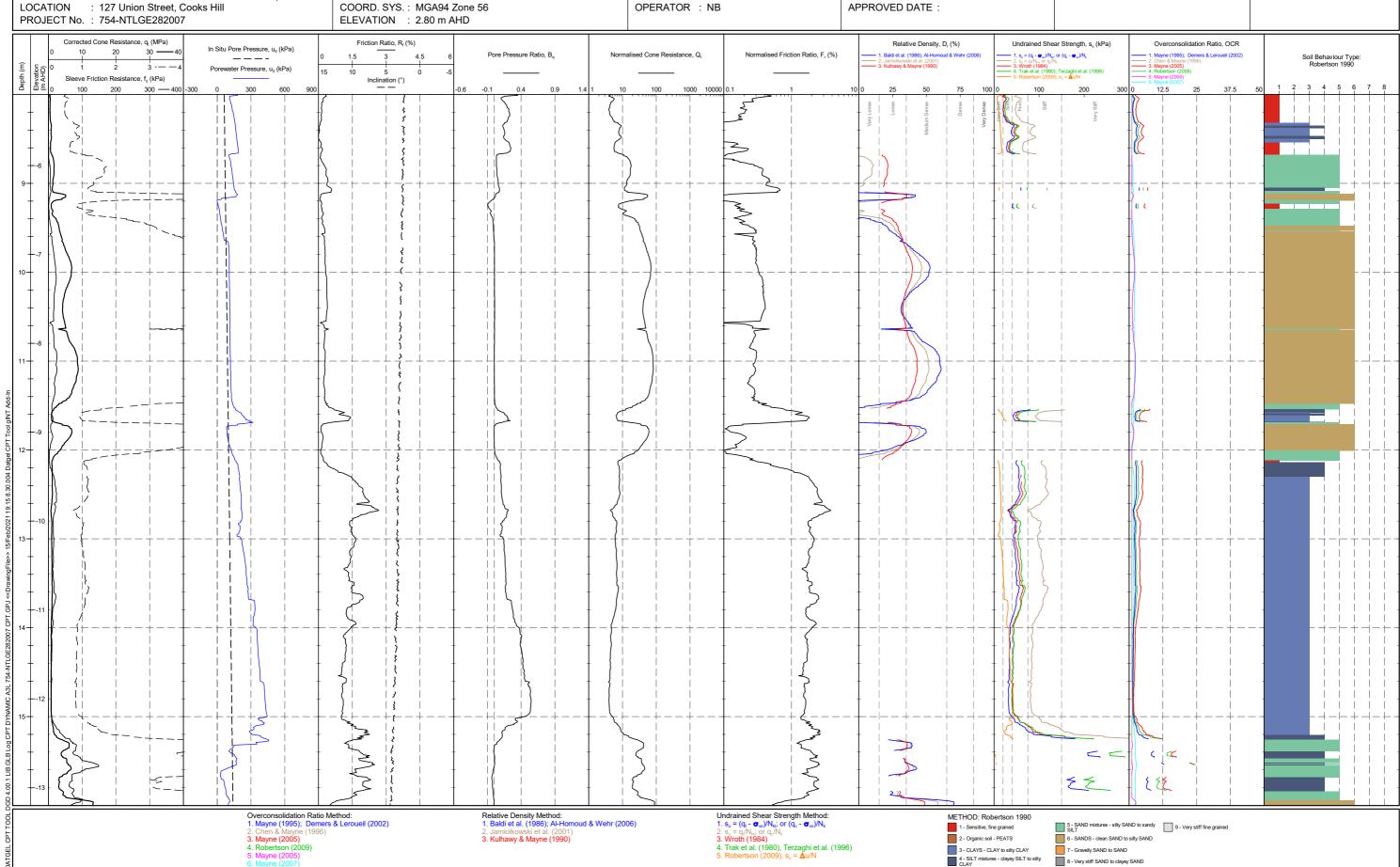
**EASTING** NORTHING : 6355234.0 m CHECKED BY CHECKED DATE APPROVED BY

REMARK

SHEET : 2 OF 3 STATUS DATE

CPT06

: 21/01/2021



: 20T Truck

CONE ID : C10CFIIP.C19137



CLIENT : Newcastle Grammar School

ENGINEER : IG PROJECT

: Newcastle Grammar School - Park Campus

: 127 Union Street, Cooks Hill LOCATION

AREA

**EASTING** 

: 384362.0 m NORTHING : 6355234.0 m

RIG : 20T Truck CONE TYPE : PC

CONE ID : C10CFIIP.C19137

CHECKED BY CHECKED DATE : APPROVED BY

REMARK

SHEET : 3 OF 3 STATUS DATE

: 21/01/2021

