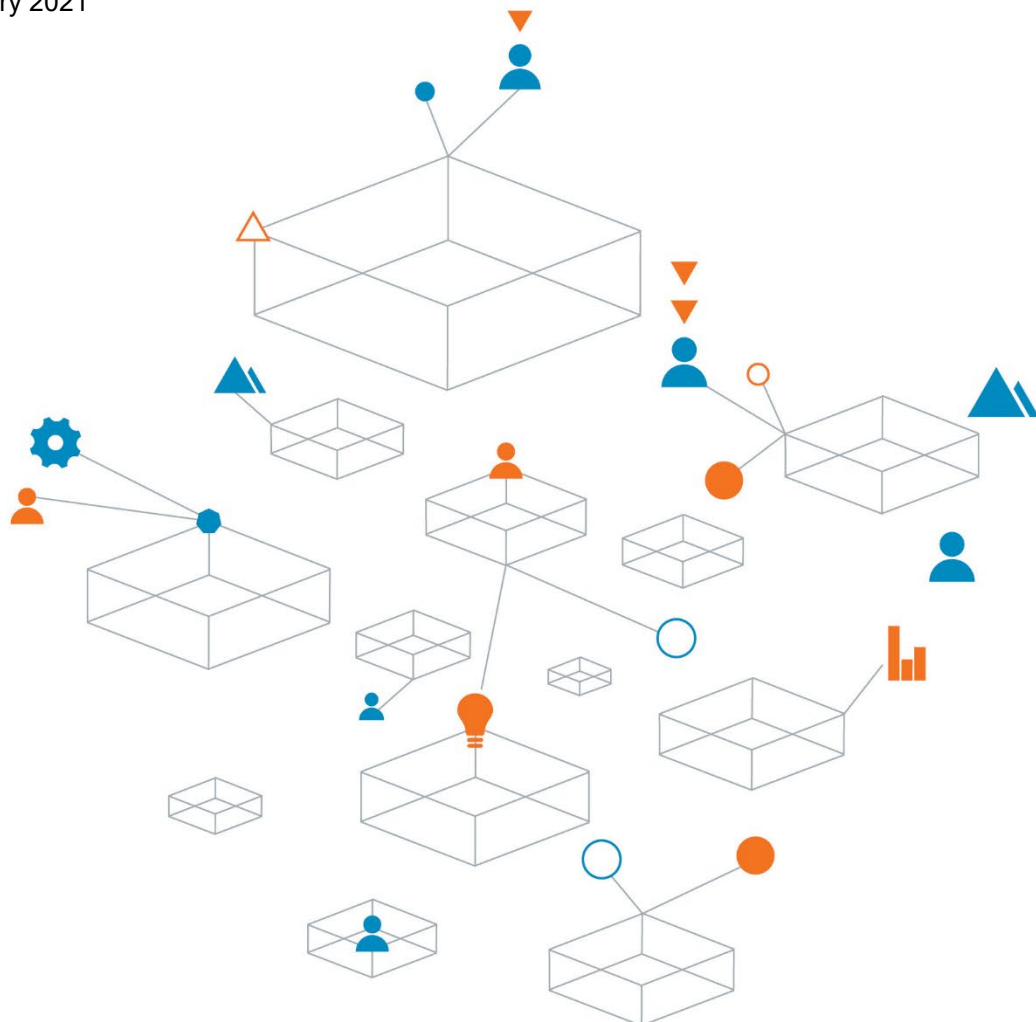


**Newcastle Grammar School
Proposed Stage 1 Additions - Newcastle Grammar School- Park
Campus
754-NTLGE282007-AD
Geotechnical Assessment**

19 February 2021



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cornerstone
of all our
projects

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

Prepared for
Newcastle Grammar School

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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. Underlying 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 sized 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 medium grained subangular gravels
2a	Swamp deposits	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)			
		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
Notes:					
> : Limit of investigation					

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

Unit	Depth to base of unit (m)					
	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/m ³)	CBR ⁽¹⁾	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 (%)
BH07	0.3 – 0.6	0.075	10
		0.15	13
		0.6	72
		2.36	78
		19	89
GMH04	0.5 – 1.0	0.075	19
		0.15	22
		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

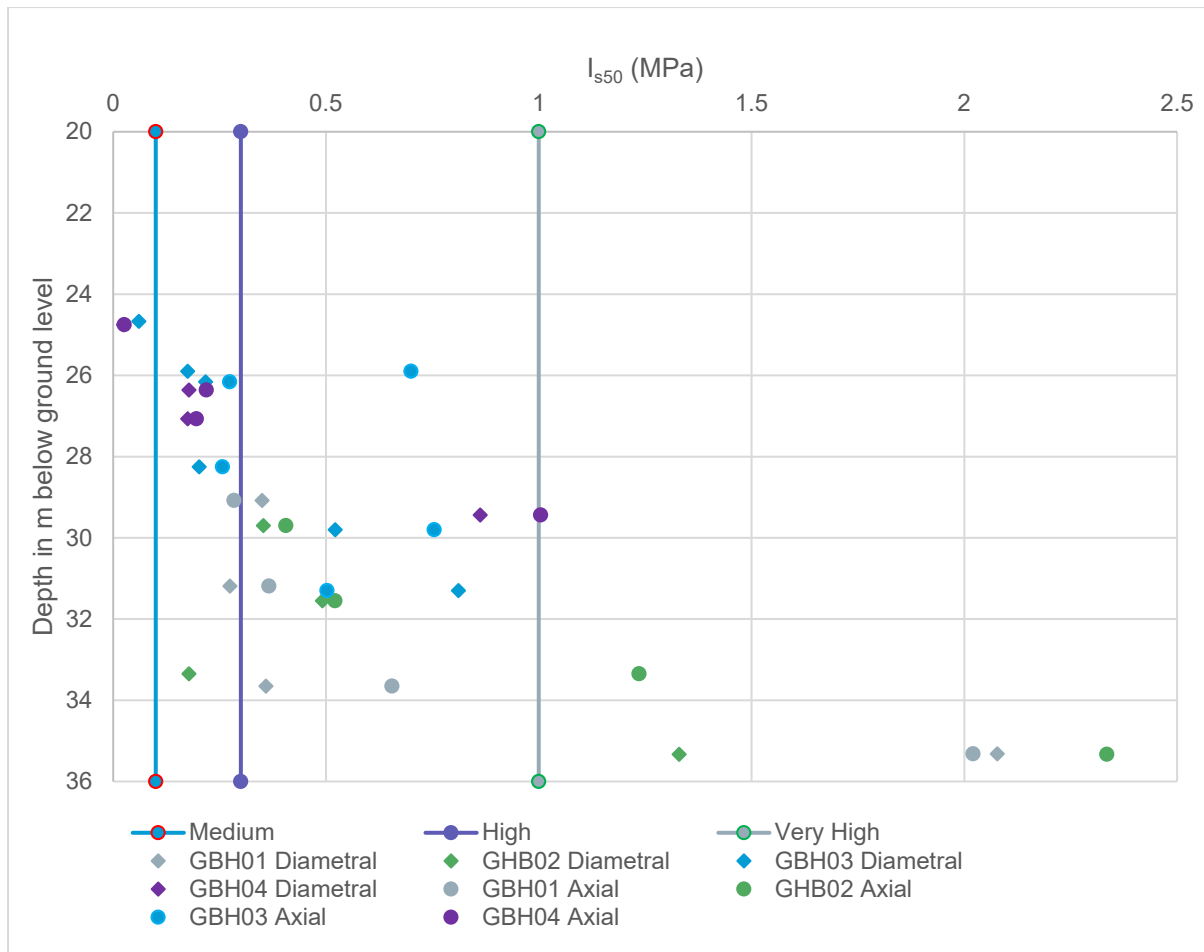


Figure 1: Summary of point load testing

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	pH	Sulfate (SO4) (ppm)	Chloride (ppm)	Electrical Resistivity (ohm.cm)	Exposure classification for concrete structures	Exposure classification for steel structures
GBH02	4.0	B	7.0	70	80	10200	Non-Aggressive	Non-Aggressive
GBH02	8.5	B	8.6	210	170	4300	Non-Aggressive	Non-Aggressive
GBH02	11.5	A	7.6	60	40	30300	Mild	Non-Aggressive
GBH02	16	B	8.4	500	180	4460	Non-Aggressive	Non-Aggressive
GBH03	4.5	B	6.4	90	610	3320	Non-Aggressive	Non-Aggressive
GBH03	7.5	B	9.0	60	190	5350	Non-Aggressive	Non-Aggressive
GBH03	12.0	B	7.8	10	90	7580	Non-Aggressive	Non-Aggressive
GBH03	16.5	B	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 of 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

Unit	Material / Origin	Preliminary Pile Design Parameters						
		Su (kPa) (clay units)	UCS (MPa) (Rock units)	Ultimate End Bearing ⁽¹⁾ (MPa)	Serviceability End Bearing ⁽²⁾ (MPa)	Ultimate Shaft Adhesion ⁽⁴⁾ (kN/m ²)	E _v (MPa)	E _n (MPa)
1b	Fill (Variable) ⁽³⁾	25	-	-	-	0	10	7.5
2a	Swamp deposits ⁽³⁾	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, Φ_{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
3a – Sandy Clay, Clayey Gravel	Approx. 19.5 to 20	48 blows / 0.5m with 1.4 to 2.0m drop
	Approx. 20 to 23.5	9 to 13 blows / 0.5m with 2.0m drop
	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 various 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 working 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 required.

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:

- 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 1×10^5 N_{HVAG} is suggested with an ESA/N_{HVAG} 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 2×10^6 N_{HVAG} 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 (L_{SF}) 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 ⁽²⁾ (160mm if 40MPa is utilised ⁽³⁾)	180 ⁽³⁾
Subbase (mm) ⁽⁴⁾	150 ⁽⁵⁾	150 ⁽⁵⁾
Reengineered Subgrade (mm)	300	300
Design Subgrade CBR(%)	10	10
HVAG	1 x 10 ⁵	2 x 10 ⁶

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.
4. 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 10⁶ and 5 x 10⁶ N_{HVAG}.
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 recompact 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 ⁽¹⁾
Base (mm)	100 ⁽¹⁾	120	DGB20 conforming to RMS QA Specification 3051 compacted to 98% Modified
Subbase(mm)	100 ⁽¹⁾	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 ⁵	2.0x10 ⁶	
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 oxidation hence the design life of asphalt is assessed by a lower 0.7x10⁶ 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 10⁶ 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.

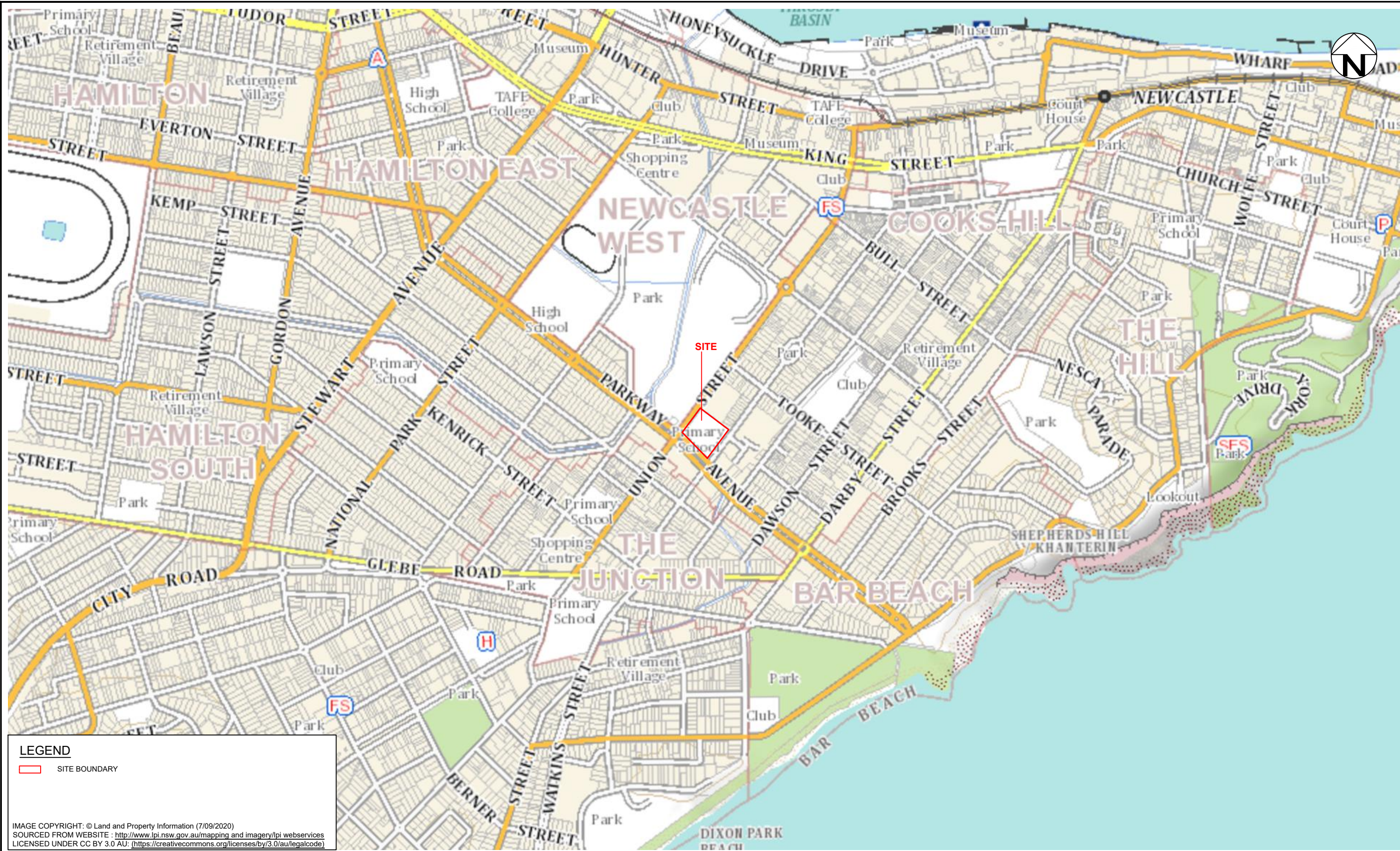
The project structural engineer should review the above ground conditions in conjunction with the mine subsidence assessment 754-NTLGE282007-AB dated 2 February 2021.

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

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

Drawings

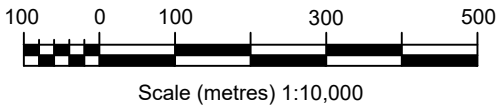
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LEGEND
SITE BOUNDARY

IMAGE COPYRIGHT: © Land and Property Information (7/09/2020)
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revision	no.	description		drawn	approved	date
	A	ORIGINAL ISSUE				



drawn	SJB
approved	JD
date	05/02/2021
scale	AS SHOWN
original size	A3

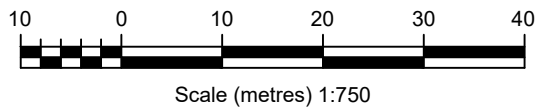


client:	NEWCASTLE GRAMMAR SCHOOL LTD		
project:	PROPOSED STAGE 1 ADDITIONS - NEWCASTLE GRAMMAR SCHOOL 127 UNION STREET COOKS HILL GEOTECHNICAL ASSESSMENT		
title:	SITE LOCATION PLAN		
project no:	754-NTLGE282007	drawing no:	DRAWING 1
		rev:	A

PLOT DATE: 5/02/2021 11:15:57 AM DWG FILE: F:\GEO\NEWCASTLE\PROJECTS\NTLGE28000754\NTLGE28007 - NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS STAGE 1\DRAWINGS\MD - GEOT\DRAWING.DWG



revision	no.	description		drawn	approved	date
	A	ORIGINAL ISSUE				



drawn	SJB
approved	JD
date	05/02/2021
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client:		NEWCASTLE GRAMMAR SCHOOL LTD	
project:		PROPOSED STAGE 1 ADDITIONS - NEWCASTLE GRAMMAR SCHOOL 127 UNION STREET COOKS HILL GEOTECHNICAL ASSESSMENT	
title:		BOREHOLE LOCATION PLAN	
project no:	754-NTLGE282007	drawing no:	DRAWING 2
		rev:	A

Appendix A – Borehole Logs

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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **BH01**

sheet: 1 of 2

project no: **754-NTLGE282007**

date started: **15 Jan 2021**

date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,363; N: 6,355,233 (MGA94)

surface elevation: 2.8 m (AHD)

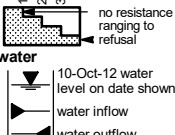
angle from horizontal: 90°

drill model: Geoprobe, Track mounted

drilling fluid: None

hole diameter : 50 mm

drilling information						material substance						
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 penetrometer (kPa)	structure and additional observations
PT	1		E				SP	FILL: Gravelly SAND: fine to medium grained, brown to pale brown, fine to medium grained, sub-angular gravels, with grass rootlets.			100	FILL (TOPSOIL)
	2				0.5		SP	FILL: SAND: fine to medium grained, white to grey.			200	FILL (GENERAL) PID: 0.2 ppm
	3		E				CL-CI	FILL: Sandy CLAY: low to medium plasticity, orange and mottled red, fine to medium grained sand with fine to medium grained gravels.			300	PID: 0.1 ppm
				2	1.0	SP	FILL: SAND: fine to medium grained, grey to black, with fine to medium grained gravels.			400	FILL (COAL REJECT)	
					1.5			1.5m: gravels become finer grained				
					2.0							
					2.5			2.5m: becomes no gravels				
					3.0							
				E		3.5						PID: 0.1 ppm
								Pt	PEAT: dark grey to black, with petrified roots.			

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	support M mud C casing penetration  water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**
principal:
project: **Newcastle Grammar School - Park Campus**
location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH01**
sheet: 2 of 2
project no. **754-NTLGE282007**
date started: **15 Jan 2021**
date completed: **15 Jan 2021**
logged by: **SB**
checked by: **SJB**

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								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1	2	3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			100 200 300 400	
PT ↓									Pt	PEAT: dark grey to black, with petrified roots. (continued)				SWAMP DEPOSITS
							4.5			Borehole BH01 terminated at 4.2 m Target depth				
							5.0							
							5.5							
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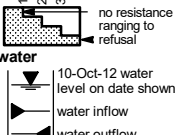
Engineering Log - Borehole

client: **Newcastle Grammar School**
principal:
project: **Newcastle Grammar School - Park Campus**
location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH02**
sheet: 1 of 1
project no. **754-NTLGE282007**
date started: **15 Jan 2021**
date completed: **15 Jan 2021**
logged by: **SB**
checked by: **SJB**

position: E: 384,357; N: 6,355,220 (MGA94) surface elevation: 3.1 m (AHD) angle from horizontal: 90°
drill model: Geoprobe, Track mounted drilling fluid: None hole diameter : 50 mm

drilling information						material substance								
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 penetrometer (kPa)	structure and additional observations
	1	2	3											
PT				E	-3			SP	FILL: Gravelly SAND: fine to medium grained, brown, fine to medium grained, sub-angular gravels, with grass rootlets.					FILL PID: 13.3 ppm
							0.5	SC	FILL: CLAYEY SAND: fine to medium grained.					
								SP	FILL: SAND.					
								CL	FILL: Sandy CLAY.					
				E	-1									
					-2			SP	FILL: SAND: brown to black to grey.					
					1.5			CI	FILL: Sandy CLAY: medium plasticity, brown to black to grey, fine to medium grained sand.					
					2.0									
					2.5									
				E	-0									
					3.0		CI	CLAY: medium plasticity, grey.					PID: 0.1 ppm ALLUVIAL SOIL	
									Borehole BH02 terminated at 3.2 m Target depth					

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing penetration  water	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WI liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH03**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **15 Jan 2021**

date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,350; N: 6,355,223 (MGA94)

surface elevation: 2.9 m (AHD)

angle from horizontal: 90°

drill model: Geoprobe, Track mounted

drilling fluid: None

hole diameter : 50 mm

drilling information						material substance								
method & support	1 penetration	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 penetrometer (kPa)	structure and additional observations
PT				Encountered	E	-2	0.5		GP	FILL: GRAVEL: fine grained.				FILL
									SP	FILL: Gravelly SAND: fine to medium grained, brown, fine to medium grained, sub-angular gravels.				FILL (TOPSOIL) PID: 9.1 ppm
									SP	FILL: SAND.				FILL (COAL REJECT) PID: 8.1 ppm
									CL	FILL: Sandy CLAY: low plasticity, mottled red and grey.				FILL
									CH	FILL: CLAY: high plasticity, yellow and mottled grey.				PID: 0.2 ppm
									SC	FILL: CLAYEY SAND: fine to medium grained, pale brown.				
									SP	FILL: SAND: fine to medium grained, pale brown, with fine to coarse grained sub-angular gravels.				
									Pt	PEAT: dark grey to black.				SWAMP DEPOSITS
										Borehole BH03 terminated at 3.2 m Target depth				

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	support M mud C casing N nil penetration water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **BH04**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **15 Jan 2021**

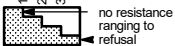
date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,298; N: 6,355,246 (MGA94) surface elevation: 2.4 m (AHD) angle from horizontal: 90°
drill model: Geoprobe, Track mounted drilling fluid: None hole diameter : 50 mm

drilling information						material substance								
method & support	1 penetration	2 penetration	3 penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
PT					E				GP	Sandy GRAVEL: fine to medium grained, sub-angular, brown, fine to medium grained sand, with grass rootlets.			100 200 300 400	FILL (TOPSOIL)
						-2	0.5		CL	Sandy CLAY: low plasticity, brown to black, fine to medium grained sand, fine to medium grained sub-angular gravels.				FILL (GENERAL)
									SC	CLAYEY SAND: fine to medium grained, brown, with fine to coarse sub-angular gravels.				FILL (COAL REJECT)
							1.0		CL	Sandy CLAY: medium plasticity, mottled orange, red and white, with fine to medium grained sand.				FILL (GENERAL)
						-1	1.5		SP	SAND: fine to medium grained, pale brown, some fine to medium grained, sub-angular gravels.				
										1.4m: becomes without gravels, and pale yellow				
										1.6m: becomes brown to grey				
							2.0							
						-0	2.5			Borehole BH04 terminated at 2.2 m Target depth				
							3.0							
						-1	3.5							
										</				

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	support M mud C casing penetration  water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **BH05**

sheet: 1 of 1

project no: **754-NTLGE282007**

date started: **15 Jan 2021**

date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,301; N: 6,355,259 (MGA94) surface elevation: 2.2 m (AHD) angle from horizontal: 90°
drill model: Geoprobe, Track mounted drilling fluid: None hole diameter : 50 mm

drilling information					material substance								
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 penetrometer (kPa)	structure and additional observations
PT	1	2	Encountered	E	2	0.5		SP	FILL: Gravelly SAND: fine grained, brown, with fine grained sub-angular gravels, with grass rootlets. 0.2m: becomes black			100 200 300 400	FILL (TOPSOIL) PID: 11.6 ppm
				E				CI	FILL: CLAY: medium plasticity, brown to grey.				FILL (GENERAL) PID: 9.3 ppm
								SP	FILL: SAND: fine to medium grained, brown.				
								CL	FILL: Sandy CLAY: brown to grey, with fine to medium grained sand.				
								SP	FILL: SAND: fine to medium grained.				
				E				CL	FILL: Sandy CLAY: brown to grey, with fine to medium grained sand.				
								SP	FILL: SAND: fine to medium grained, brown to grey.				FILL (COAL REJECT) PID: 6.6 ppm
								GP	FILL: GRAVEL: fine grained, black, carbonaceous gravels.				
								CI	FILL: CLAY: medium plasticity, grey to black.				FILL (GENERAL)
					0				Borehole BH05 terminated at 2.2 m Target depth				
						2.5							
						3.0							
					-1								
						3.5							

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	support M mud N nil C casing penetration water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WI liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH06**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **15 Jan 2021**

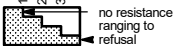
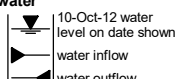
date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,314; N: 6,355,268 (MGA94) surface elevation: 2.1 m (AHD) angle from horizontal: 90°
drill model: Geoprobe, Track mounted drilling fluid: None hole diameter : 50 mm

drilling information					material substance													
method & support	1 penetration	2 penetration	3 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 penetrometer (kPa) 100 200 300 400	structure and additional observations				
PT				Encountered	E	-2			SP	FILL: Gravelly SAND: fine to coarse grained, brown, fine grained sub-angular gravels.				FILL (TOPSOIL) PID: 6.4 ppm				
					E		0.5		CI	FILL: CLAY: medium plasticity, brown to grey.								FILL (GENERAL) PID: 4.4 ppm
									SP	FILL: SAND: fine to medium grained, brown.								
									CL-CI	FILL: Sandy CLAY: low to medium plasticity, mottled red and brown to grey, fine grained sub-angular gravels, some red brick fragments.								
						-1												
									SP	FILL: SAND: fine to medium grained, brown to grey.								
					E		1.5											
									CH	FILL: CLAY: high plasticity, grey to black, trace ceramic fragments 1.8 - 1.9m.				PID: 4.1 ppm				
						0	2.0											
										Borehole BH06 terminated at 2.1 m Target depth								
							2.5											
						-1	3.0											
							3.5											

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	support M mud N nil C casing penetration  water 	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Hand Auger

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH07**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **15 Jan 2021**

date completed: **15 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,325; N: 6,355,272 (MGA94) surface elevation: 2.1 m (AHD) angle from horizontal: 90°
drill model: Hand Auger drilling fluid: None hole diameter : 50 mm

drilling information						material substance								
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
PT	1	2	3		E	-2	0.5		SP	FILL: SAND: fine to medium grained, brown and yellow, fine grained sub-angular gravels, with grass rootlets.			10 20 30 40	FILL (GENERAL) PID: 6.2 ppm
				B										
				E										
										Hand Auger BH07 terminated at 0.6 m Target depth				PID: 2.1 ppm
						-1	1.0							
							1.5							
						0	2.0							
							2.5							
						-1	3.0							
							3.5							

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	support M mud C casing penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Hand Auger

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH08**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **18 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,362; N: 6,355,253 (MGA94) surface elevation: 2.4 m (AHD) angle from horizontal: 90°
drill model: Hand Auger drilling fluid: None hole diameter : 70 mm

drilling information						material substance								
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 penetrometer (kPa)	structure and additional observations
HA	1	2	3		E				SP	FILL: SAND: fine to medium grained, brown, fine ot medium grained sub-angular gravels. 				

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	support M mud N nil C casing penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Hand Auger

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH09**

sheet: 1 of 1

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **18 Jan 2021**

logged by: **SB**

checked by: **SJB**

position: E: 384,333; N: 6,355,158 (MGA94)

surface elevation: 3.0 m (AHD)

angle from horizontal: 90°

drill model: Hand Auger

drilling fluid: None

hole diameter : 70 mm

drilling information					material substance				
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition
HA	1 2 3		E	0			SP	FILL: SAND: fine to medium grained, pale brown, fine grained, sub-angular to sun-rounded gravels.	D - M
								0.2m: becomes dark brown	
			E		0.5		SC	FILL: CLAYEY SAND: fine to medium grained, brown.	
								0.7m: becomes brown and mottled black	
			E						
				-2	1.0			Hand Auger BH09 terminated at 0.8 m Target depth	
					1.5				

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing penetration  no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Hand Auger

client: **Newcastle Grammar School**
principal:
project: **Newcastle Grammar School - Park Campus**
location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **BH10**
sheet: 1 of 1
project no. **754-NTLGE282007**
date started: **18 Jan 2021**
date completed: **18 Jan 2021**
logged by: **SB**
checked by: **SJB**

position: E: 384,356; N: 6,355,190 (MGA94) surface elevation: 3.2 m (AHD) angle from horizontal: 90°
drill model: Hand Auger drilling fluid: None hole diameter : 70 mm

drilling information					material substance				
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	structure and additional observations
HA	1 2 3		E				SP	FILL: SAND: fine grained, dark brown, with fine grained sub-angular gravels and grass rootlets. 0.3m: becomes pale brown	FILL (TOPSOIL) PID: 6.4 ppm
			E		0.5		SC	FILL: CLAYEY SAND: fine to medium grained, pale brown. 0.5m: red brick fragments Hand Auger BH10 terminated at 0.6 m Target depth	FILL (GENERAL) PID: 3.8 ppm
				-2	1.0				
					1.5				

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	support M mud C casing N nil penetration  no resistance ranging to refusal water  10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wl liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH01**

sheet: 1 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

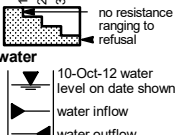
date completed: **20 Jan 2021**

logged by: **HL**

checked by: **SJB**

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							
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 penetrometer (kPa)	structure and additional observations
AD N	1	18/01/21	SPT 2, 2, 3 N=5	-2	1.0		SM	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 medium grained sub-rounded to sub-angular coal gravels with silt and coal chitter.	M	VL - L	100	FILL (TOPSOIL)
	GP			M			L		200	FILL (GENERAL)		
	CL-CI			>Wp			VS - S		300	FILL (COAL REJECT)		
W HC	2	Encountered	SPT 1, 1, 1 N=2	-2	4.0		Pt	PEAT: black, trace of fine to medium grained sand and roots / rootlets.	>Wp	VS - S	400	SWAMP DEPOSITS
SPT 0, 0, 0 N=0	3		SPT 0, 0, 0 N=0	-4	6.0		MH	Clayey SILT: dark grey, traces of shell fragments.	>Wp	VS		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. B blank bit T TC bit V V bit	support M mud C casing N nil penetration 	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH01**

sheet: 2 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **20 Jan 2021**

logged by: **HL**

checked by: **SJB**

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								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
W HQ	1	Encountered		-6			MH	Clayey SILT: dark grey, traces of shell fragments. <i>(continued)</i>	>Wp	VS	100 200 300 400	ESTUARINE SOIL	
	2							8.5m: becoming sandy, fine grained					
	3												
			SPT 0, 0, 0 N=0	-7	9.0								
			SPT 0, 3, 1 N=4	-8	10.0		SM	SILTY SAND: fine to medium grained, grey.	W	VL			
					SPT 3, 1, 2 N=3	-10	12.0			11.5m: strong odour			
			SPT 5, 2, 1 N=3	-11	13.0								
			SPT 1, 1, 1 N=2	-13	15.0		CH	Silty CLAY: high plasticity, dark grey, trace of fine grained sand.	>Wp	VS		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. B blank bit T TC bit V V bit	support M mud C casing penetration water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH01**

sheet: 3 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **20 Jan 2021**

logged by: **HL**

checked by: **SJB**

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							
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
								SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components				
W HQ	1 2 3	Encountered		-14		CH	Silty CLAY: high plasticity, dark grey, trace of fine grained sand. <i>(continued)</i>	>Wp	VS	100 200 300 400	ALLUVIAL SOIL	
			SPT 0, 0, 3 N=3									
				-15		CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	>Wp	F		RESIDUAL SOIL	
				-16								
			SPT 2, 2, 4 N=6									
				-17		SC	CLAYEY SAND: fine to medium grained, grey.	M	MD			
			SPT 6, 7, 7 N=14									
				-18								
	-19											
	-20											
SPT 4, 4, 18 N=22												
	-21		CL	Sandy CLAY: low plasticity, mottled grey and pale brown to orange, fine grained sand.	<Wp	St						

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing penetration water	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH01**

sheet: 4 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **20 Jan 2021**

logged by: **HL**

checked by: **SJB**

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									
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
W HQ	1 2 3	Encountered		-22			CL	Sandy CLAY: low plasticity, mottled grey and pale brown to orange, fine grained sand. <i>(continued)</i>	<Wp	St	100 200 300 400	RESIDUAL SOIL	
	SPT 4, 6, 8 N=14		25.0										
				-24	26.0								
				-25	27.0								
			SPT 13, 10, 7 N=17	-26	28.0		SC	27.55m: 50mm ironstone band CLAYEY SAND: fine to medium grained, grey, with thin ironstone bands.	M	MD		EXTREMELY WEATHERED MATERIAL	
				-27	29.0			Borehole GBH01 continued as cored hole					
				-28	30.0								
				-29	31.0								

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	support M mud C casing penetration water 	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH01**

sheet: 5 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

date completed: **20 Jan 2021**

logged by: **HL**

checked by: **SJB**

position: E: 384,316; N: 6,355,269 (MGA94)

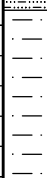
surface elevation: 2.1 m (AHD)

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					
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial; O = diametral a = axial; d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)		
											particular	general	
		-22											
			25.0										
			26.0										
			27.0										
			28.0		started coring at 28.00m								
Encountered		-26			Sandy CLAY (CL): low plasticity, orange to brown, fine to medium grained sand with some ironstone fragments.	XW					SM		
					INTERLAMINATED SILTSTONE (30%) & SANDSTONE (70%): grey, fine grained sandstone with traces of carbonaceous laminations.	SW					JT, 20°, PL, RO, CN		
		-27						a=0.28 d=0.35	90%				
		-28			SILTSTONE: grey to dark grey.	SW					Drilling Break		
		-29						a=0.37 d=0.27	79%		CS		
			31.0		INTERLAMINATED SILTSTONE (60%) & SANDSTONE (40%): fine grained sandstone with traces of carbonaceous laminations.	SW - MW							
					SILTSTONE: grey.	SW - MW							
method & support				support		graphic log / core recovery		weathering & alteration*		defect type		planarity	
AS auger screwing				C casing M mud N none		 core recovered (graphic symbols indicate material)		RS residual soil		PT parting		PL planar	
AD auger drilling						 no core recovered		XW extremely weathered		JT joint		CU curved	
CB claw or blade bit								HW highly weathered		SS shear surface		UN undulating	
W washbore				10/10/12, water level on date shown				MW moderately weathered		SZ shear zone		ST stepped	
RR rock roller				water inflow				SW slightly weathered		CO contact		IR irregular	
NMLC NMLC core (51.9 mm)				complete drilling fluid loss		core run & RQD		FR fresh		CS crushed seam			
NQ wireline core (47.6mm)				partial drilling fluid loss		 barrel withdrawn		*W replaced with A for alteration		SM seam			
HQ wireline core (63.5mm)								strength					
PQ wireline core (85.0mm)								VL very low					
								L low					
								M medium					
								H high					
								VH very high					
								EH extremely high					
HA hand auger				water pressure test result (lugeons) for depth interval shown		RQD = Rock Quality Designation (%)				roughness		coating	
PT push tube										VR very rough		CN clean	
										RO rough		SN stained	
										SO smooth		VN veneer	
										POL polished		CO coating	
										SL slickensided			

Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH01**

sheet: 6 of 6

project no. **754-NTLGE282007**

date started: **18 Jan 2021**

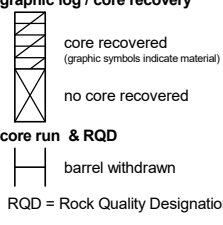
date completed: **20 Jan 2021**

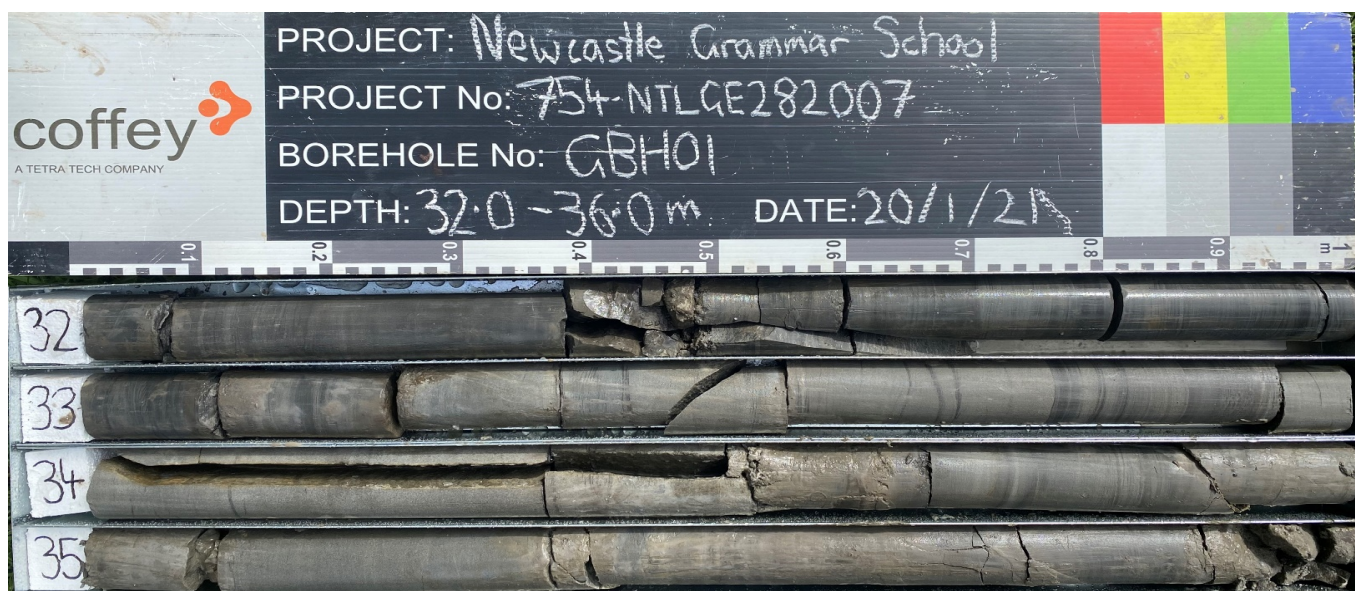
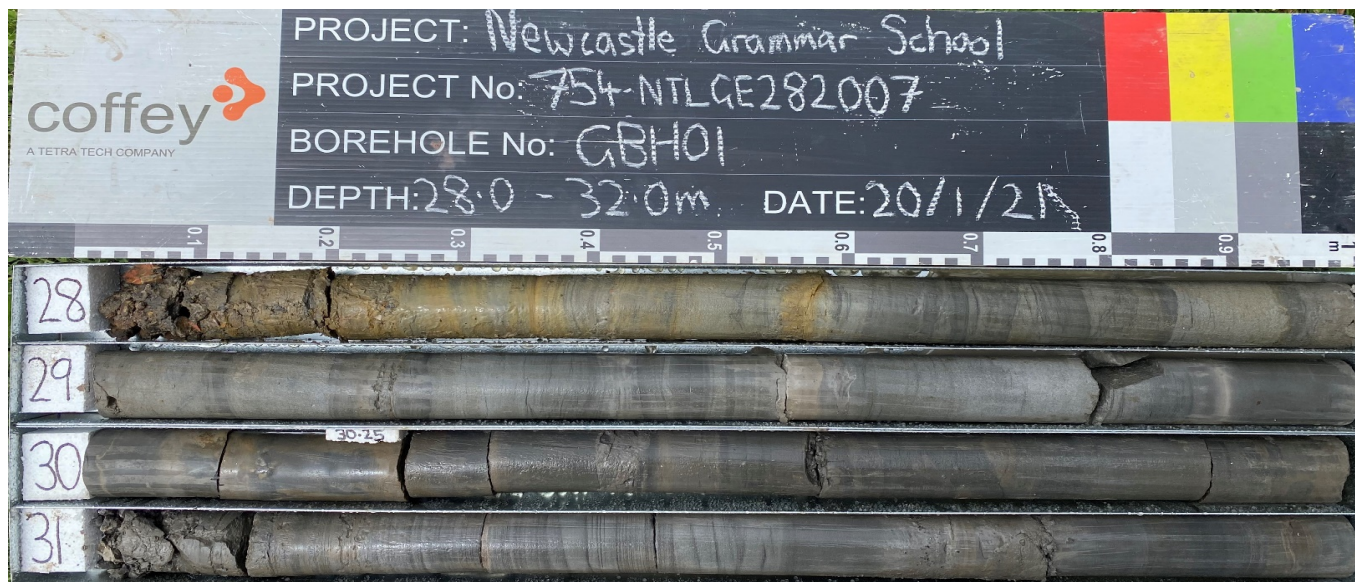
logged by: **HL**

checked by: **SJB**

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			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
		-30			SILTSTONE: grey. (continued)	SW - MW					
		-31	33.0						79%		CS, 10 mm JT, 85°, PL, RO, CN
		-32	34.0		SANDSTONE: fine to medium grained, grey, some carbonaceous laminations.	SW		a=0.66 d=0.36			JT, 45°, PL, RO, CN
		-33	35.0		INTERLAMINATED SILTSTONE (20%) & SANDSTONE (80%): fine grained sandstone with traces of carbonaceous laminations.	SW - MW			53%		JT, 90°, PL, RO, SN JT, 40°, PL, RO, CN JT, 40°, PL, RO, CN SM, 20 mm
		-34	36.0		SANDSTONE: fine grained, pale grey.	FR		a=2.51 d=2.08			JT, 35°, PL, RO, CN Drilling Break
		-35	37.0		SILTSTONE: grey to dark grey.	SW					JT, 60°, PL, RO, CN Drilling Break
		-36	38.0		Borehole GBH01 terminated at 36.00 m Target depth						
		-37	39.0								

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube	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	graphic log / core recovery 	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	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
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drawn	SJB	 A TETRA TECH COMPANY	client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH01

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

Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH02**

sheet: 1 of 6

project no. **754-NTLGE282007**

date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **HL**

checked by: **SJB**

position: E: 384,289; N: 6,355,252 (MGA94)

surface elevation: 2.3 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								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations	
AD N W HQ	1 2 3	21/01/21 Encountered		-2		SM	FILL: SILTY SAND: fine to medium grained, dark brown to grey, trace of fine grained sub-angular gravels.	M	VL	100 200 300 400	FILL (TOPSOIL)		
				-1		SM		FILL: SILTY SAND: fine to medium grained, brown, with silts and clays.	M		VL - L	FILL (GENERAL)	
			SPT 2, 3, 1 N=4	1.0									
				2.0									
				-0									
			SPT 1, 4, 4 N=8	3.0		SP	SAND: fine to medium grained, grey.	M	L	ESTUARINE SOIL (POTENTIAL FILL)			
				-1									
				4.0		Pt	PEAT: dark grey to black, with tree rootlets / petrified roots, strong odour.	M	VS	SWAMP DEPOSITS			
				-2									
				5.0									
	-3												
	6.0												
	-4												
	7.0												
	-5		SPT 0, 0, 0 N=0										

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing N nil penetration no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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CDF 0 9 07_LIBRARY.GLB rev:AU Log COF BOREHOLE: NON CORED 754-NTLGE282007.GPJ <DrawingFile> 16/02/2021 11:41

Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH02**

sheet: 3 of 6

project no. **754-NTLGE282007**

date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **HL**

checked by: **SJB**

position: E: 384,289; N: 6,355,252 (MGA94)

surface elevation: 2.3 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															
method & support	penetration			water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations							
W HQ	1	2	3	Encountered	SPT 0, 0, 0 N=0	-14			CH	Silty CLAY: high plasticity, dark grey. (continued)	>Wp	VS	100	ALLUVIAL SOIL							
						SPT 0, 0, 0 N=0	-15						17.0								
				SPT 0, 0, 0 N=0	-16	18.0															
				SPT 0, 0, 0 N=0	-17	19.0			19.0m: becoming sandy, fine grained												
					-18	20.0															
					-19	21.0															
				SPT 9, 5, 10 N=15	-20	22.0		SC	CLAYEY SAND: fine to coarse grained, grey and mottled orange to brown.	M	MD		RESIDUAL SOIL								
					-21	23.0															

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing penetration water	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH02**

sheet: 4 of 6

project no. **754-NTLGE282007**

date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **HL**

checked by: **SJB**

position: E: 384,289; N: 6,355,252 (MGA94)

surface elevation: 2.3 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							
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 penetrometer (kPa) 100 200 300 400	structure and additional observations
	1	2											
	W	HQ				-22		SC	CLAYEY SAND: fine to coarse grained, grey and mottled orange to brown. (<i>continued</i>)	M	MD		RESIDUAL SOIL
			Encountered	SPT 5, 9, 9 N=18		25.0							
						-23							
						26.0							
						-24							
						27.0							
						-25							
				SPT 8/60mm HB N=R		28.0			Borehole GBH02 continued as cored hole				
						-26							
						29.0							
						-27							
						30.0							
						-28							
						31.0							
						-29							

method
AD auger drilling*
AS auger screwing*
WA hand auger
WB washbore
HA hand auger
PT push tube

* bit shown by suffix
e.g.
B blank bit
T TC bit
V V hit

support
M mud N nil
C casing

penetration
no resistance ranging to refusal

water
10-Oct-12 water level on date shown
water inflow
water outflow

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/remoulded (kPa)
R refusal
HB hammer bouncing

soil group symbol & soil description
based on AS 1726:2017

moisture condition
D dry
M moist
W wet
Wp plastic limit
WI liquid 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

Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH02**

sheet: 5 of 6

project no. **754-NTLGE282007**

date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **HL**

checked by: **SJB**

position: E: 384,289; N: 6,355,252 (MGA94)

surface elevation: 2.3 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				
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial; O = diametral a = axial; d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)	
											particular	general
		-22										
		-23										
		-24										
		-25										
		-26			SILTSTONE: with some orange to brown iron staining.	HW						
		-27			INTERBEDDED SILTSTONE (60%) AND SANDSTONE (40%): grey, fine grained sandstone.	SW						
		-28				SW - FR						
		-29										
		-30										
		-31										
		-32										
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Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH02**

sheet: 6 of 6

project no: **754-NTLGE282007**

date started: **21 Jan 2021**

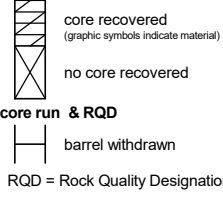
date completed: **22 Jan 2021**

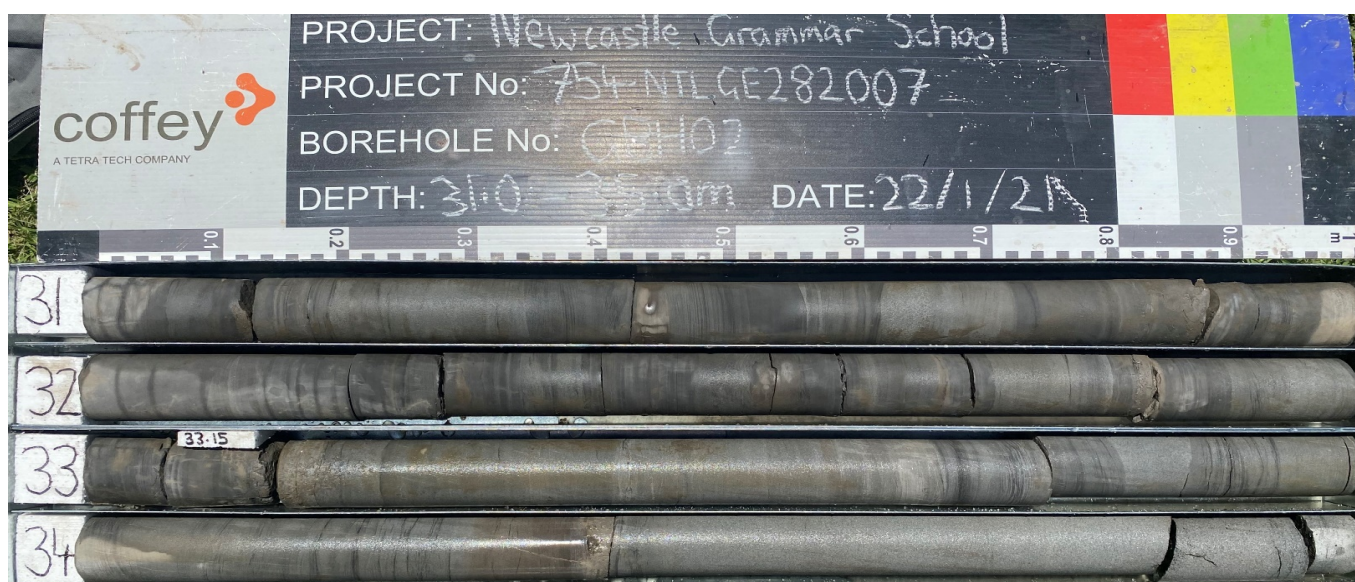
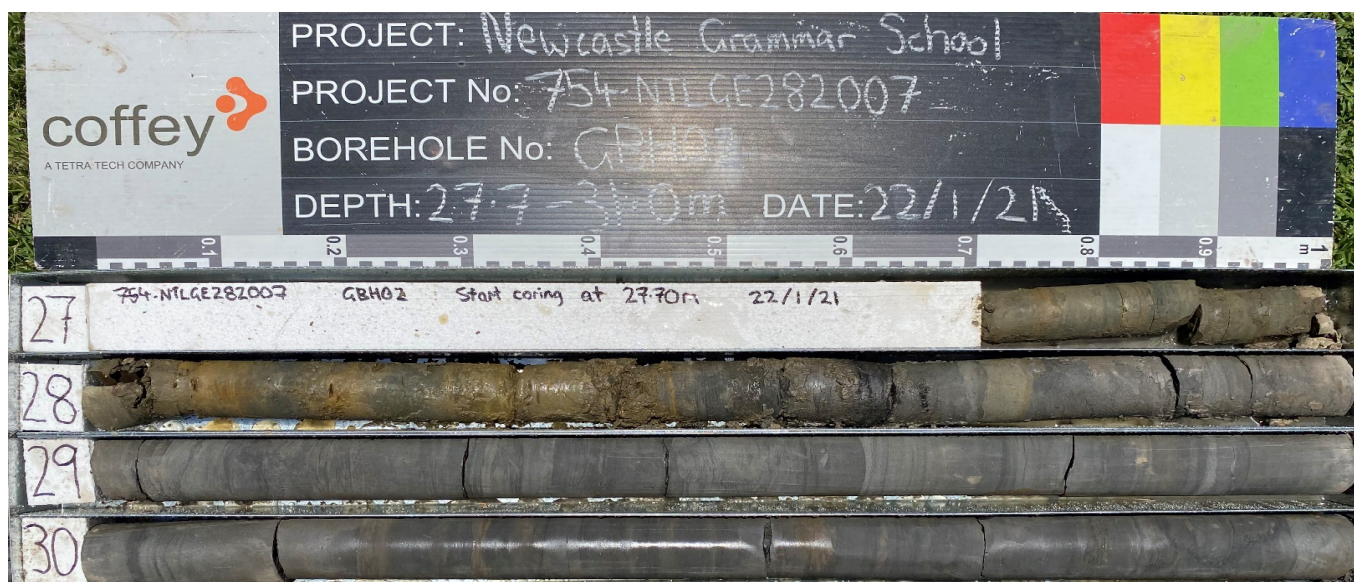
logged by: **HL**

checked by: **SJB**

position: E: 384,289; N: 6,355,252 (MGA94) surface elevation: 2.3 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			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
Encountered		-30			INTERBEDDED SILTSTONE (60%) AND SANDSTONE (40%): grey, fine grained sandstone. <i>(continued)</i>	SW - FR			100%		Drilling Break
		-31						a=1.24 d=0.18			Drilling Break
		-32			SANDSTONE: fine to medium grained, pale grey to grey.	SW - FR			90%		JT, 5°, PL, RO, VN - Coal PT, 5°, PL, RO, CN
		-33						a=2.33 d=1.33			JT, 90°, PL, RO, CN
		-34			Borehole GBH02 terminated at 36.15 m Target depth						JT, 60°, PL, RO, CN
		-35									
		-36									
		-37									

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube	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	graphic log / core recovery 	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	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
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drawn	SJB		client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH02 PT1

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drawn	SJB	 A TETRA TECH COMPANY	client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH02 PT2

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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							
method & support		penetration		water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
AD N W HQ PT	1 2 3	21/01/21	Encountered	SPT 1, 0, 0 N=0		-2	1.0		SM	FILL: SILTY SAND : brown to dark brown, trace of sub-rounded angular gravels with grass rootlets and woodchips on surface.				FILL (TOPSOIL)
									CL	FILL: Sandy CLAY : low plasticity, brown, traces of fine grained angular gravels.	D - M	VL - L		FILL (GENERAL)
									CL	FILL: Gravelly CLAY : brown to dark brown, fine to medium angular to sub-angular gravels.	M	VS		
									SP	FILL: SAND : fine to coarse grained, brown, trace fine grained sub-rounded gravels.	M	VL		FILL (COAL REJECT)
									GC	FILL: CLAYEY GRAVEL : fine to medium grained, black, coal reject gravels.	M	VL		
									Pt	PEAT: brown to dark brown.	>Wp	VS		SWAMP DEPOSITS
				SPT 0, 1, 1 N=2		-2	5.0							
						-3	6.0							
				SPT 0, 0, 0 N=0		-4	7.0							
						-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. B blank bit T TC bit V V bit		support M mud C casing N nil penetration water 10-Oct-12 water level on date shown water inflow water outflow		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/remoulded (kPa) R refusal HB hammer bouncing				soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit Wi liquid 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				

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH03**

sheet: 2 of 5

project no. **754-NTLGE282007**

date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **SR / SJB**

checked by: **SJB**

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

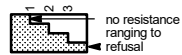
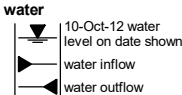
drilling fluid: Guar Gum

hole diameter : 150 mm

drilling information						material substance							
method & support	1 penetration	2	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 penetrometer (kPa) 100 200 300 400	structure and additional observations
W HQ	1 2 3		Encountered	SPT 5, 7, 6 N=13	-6	9.0		CL-Cl	Sandy CLAY: low to medium plasticity, grey, fine to medium grained sand, with traces of shells. <i>(continued)</i>	>Wp	VS - S		ESTUARINE SOIL
					-7	10.0							
				SPT 3, 0, 1 N=1	-8	11.0		SP	SAND: fine to medium grained, grey, slightly silty.	M	MD		
					-9	12.0		CH	Silty CLAY: high plasticity, grey, trace of sand and shells.	>Wp	VS		
				SPT 0, 0, 0 N=0	-10	13.0							
					-11	14.0							
					-12	15.0							
								SPT 0, 0, 0 N=0	-13				
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				support M mud N nil C casing penetration no resistance ranging to refusal water 10-Oct-12 water level on date shown water inflow water outflow			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/remoulded (kPa) R refusal HB hammer bouncing			soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WI liquid 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	

checked by: **SJB**

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								
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 penetrometer (kPa) 100 200 300 400	structure and additional observations
W HQ	1 2 3	Encountered						CH	Silty CLAY: high plasticity, grey, trace of sand and shells. <i>(continued)</i>	>Wp	VS		ALLUVIAL SOIL	
			SPT 2, 10, 9 N=19	-14		CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	>Wp	St - VSt		RESIDUAL SOIL			
				17.0			17.0m: becoming more sandy							
				-15										
			SPT 3, 3, 4 N=7	18.0			18.0m: traces of organic material							
				-16										
				19.0										
			SPT 3, 7, 8 N=15	-17			19.5m: traces of iron stained gravels							
				20.0										
				-18										
			SPT 8, 13, 13 N=26	-21.0					Borehole GBH03 continued as cored hole					
				-19										
				-22.0										
				-20										
				-23.0										
				-21										

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud N nil C casing penetration  water 	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WI liquid 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
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CDF 0 9 07_LIBRARY.GLB rev:AU Log COF BOREHOLE: CORED 754-NTLGE282007.GPJ <<DrawingFile>> 15/02/2021 18:47

Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH03**

sheet: 5 of 5

project no. **754-NTLGE282007**

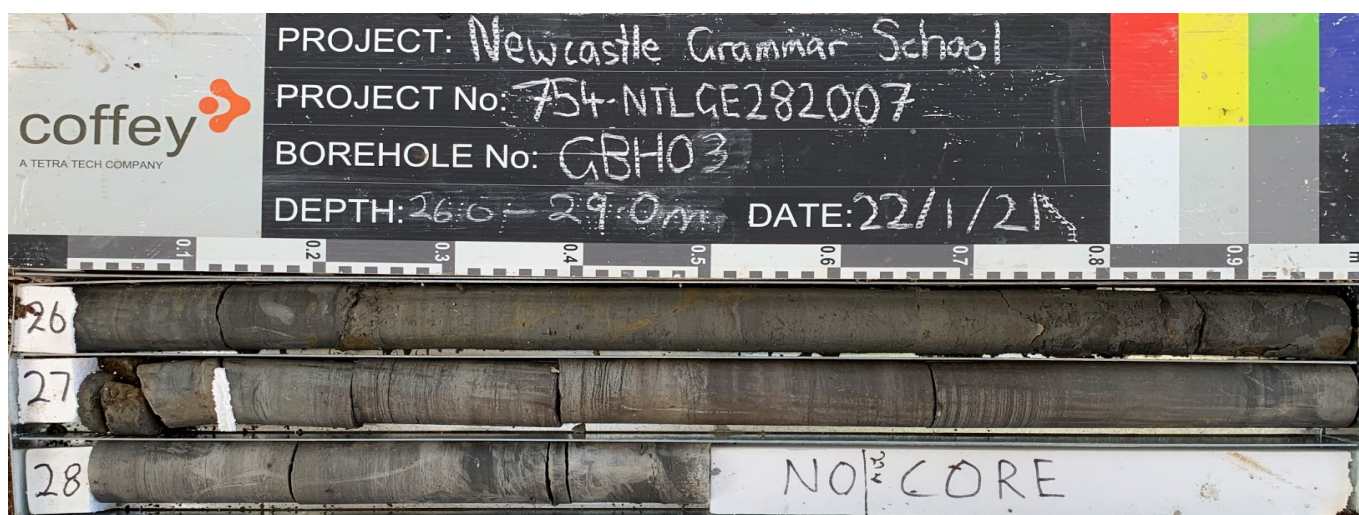
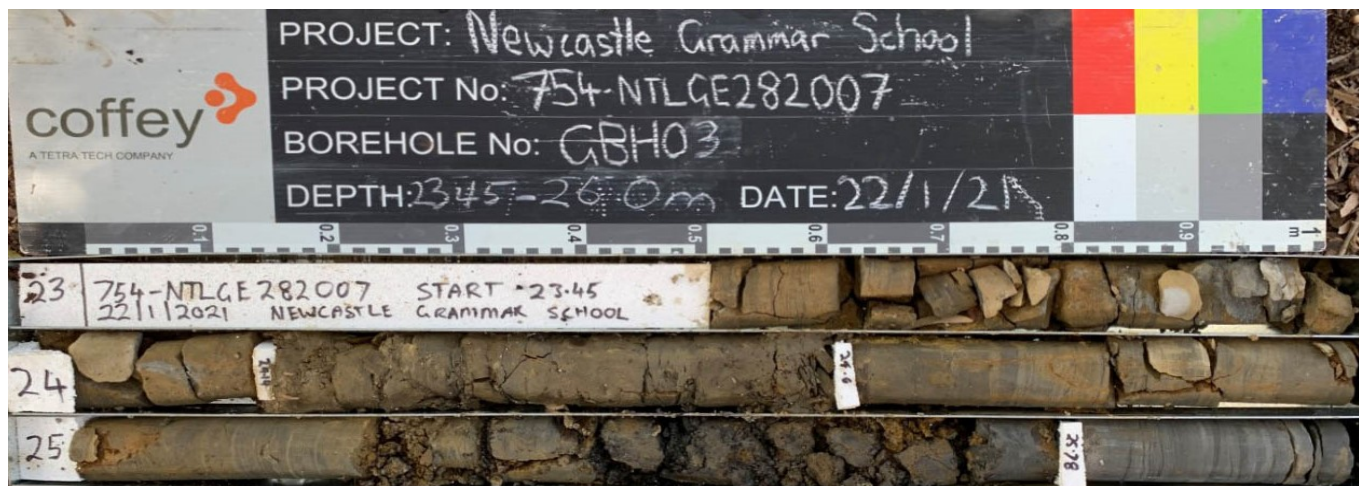
date started: **21 Jan 2021**

date completed: **22 Jan 2021**

logged by: **SR / SJB**

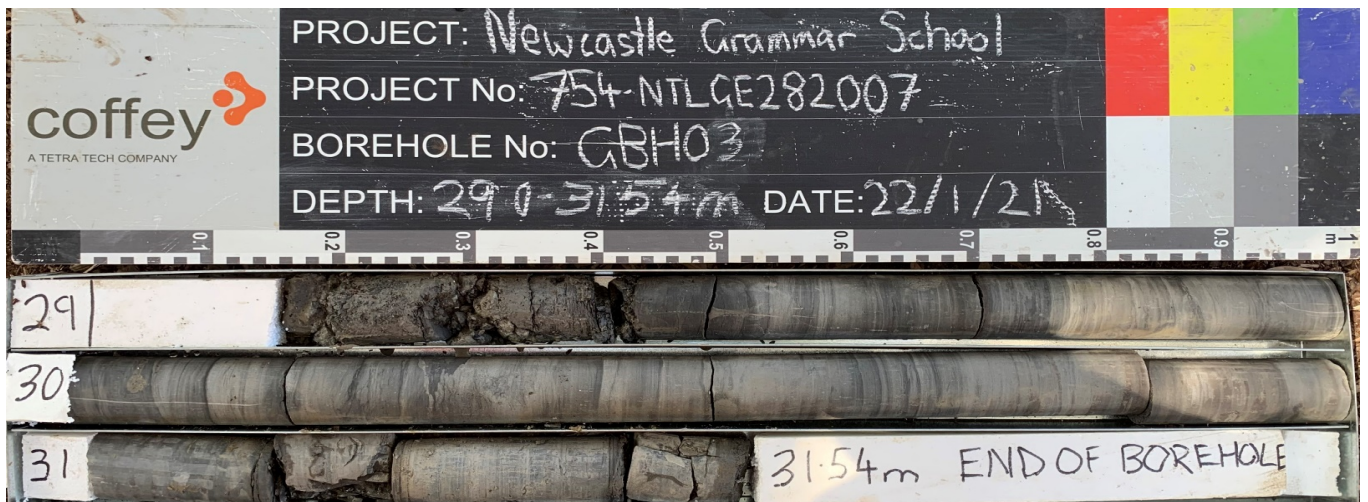
checked by: **SJB**

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															
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is(50) X = axial; O = diametral a = axial; d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)												
							VL L M H VH EH				particular general												
Encountered			-22		SILTSTONE: brown, laminated.	DW			0%		JT, 60°, PL, RO, Fe SN JT, 60°, PL, RO, Fe SN												
			-25.0		INTERLAMINATED SILTSTONE (60%) & SANDSTONE (40%): grey and dark grey, with iron staining.			d=0.06	0%		JT, 60°, PL, RO, Fe healed Drilling Break JT, 70 - 90°, UN, healed JT, 60°, PL, RO, Fe VN												
			-26.0		SANDSTONE: fine grained, brown.	HW - XW			20%		CS, Coal, 5 mm CS, Coal, 5 mm JT, 60 - 70°, PL, RO, Fe VN CS, Coal, 5 mm JT, 60 - 70°, PL, RO, Fe VN												
			-27.0		INTERLAMINATED SILTSTONE (50%) & SANDSTONE (50%): fine to medium grained, grey and dark grey, with carbonaceous laminations.	SW		a=0.70 d=0.17 a=0.27 d=0.22	80%		JT, 60 - 70°, CU, healed JT, 60 - 70°, CU, healed JT, 60 - 70°, UN, healed JT, 60 - 70°, UN, healed JT, 70°, PL, healed												
			-28.0		NO CORE: 0.65 m	SW - FR			63%		Drilling Break, on PT, X Drilling Break, on PT, X Drilling Break, on PT, X Drilling Break, on PT, X												
			-29.0		SILTSTONE: dark grey, some coal seams.	DW - SW					CS, Coal, 10 mm CS, Coal, 40 mm CS, Coal, 5 mm CS, Coal, 5 mm Drilling Break, on PT, X												
			-30.0		SANDY SILTSTONE: fine grained, dark grey, laminated.	SW		a=0.75 d=0.52	77%		Drilling Break, on PT, X Drilling Break CS, Coal, 5 mm JT, 80°, PL, VN CS, Coal, 5 mm JT, 60 - 70°, UN, CN												
			-31.0					a=0.50 d=0.23															
			-29			Borehole GBH03 terminated at 31.54 m Target depth																	
	method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube				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				graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)				weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high				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		



drawn	SJB		client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH03 PT1

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drawn	SJB	 A TETRA TECH COMPANY	client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH03 PT2

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Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH04**

sheet: 1 of 6

project no. **754-NTLGE282007**

date started: **23 Jan 2021**

date completed: **25 Jan 2021**

logged by: **HL / KF**

checked by: **SJB**

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								
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 penetrometer (kPa)	structure and additional observations	
AD N W HQ	1	23/01/21 Encountered					SP	FILL: SAND: fine to medium grained, brown, some silt, with grass rootlets.	M	VL - L	100 200 300 400	FILL (TOPSOIL)	
	2												
	3												
			SPT 3, 3, 2 N=5	-2	1.0								

method AD auger drilling* AS auger screwing* HA hand auger W washbore HA hand auger PT push tube * bit shown by suffix e.g. B blank bit T TC bit V V bit	support M mud C casing penetration water 10-Oct-12 water level on date shown water inflow water outflow	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/remoulded (kPa) R refusal HB hammer bouncing	soil group symbol & soil description based on AS 1726:2017 moisture condition D dry M moist W wet Wp plastic limit WL liquid 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
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client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH04**

sheet: 2 of 6

project no. **754-NTLGE282007**

date started: **23 Jan 2021**

date completed: **25 Jan 2021**

logged by: **HL / KF**

checked by: **SJB**

position: E: 384,367; N: 6,355,230 (MGA94)

surface elevation: 2.9 m (AHD)

angle from horizontal: 90°

drill model: Haniin D&B, Track mounted

drilling fluid: Guar Gum

hole diameter : 150 mm

drilling information					material substance							
method & support	1 penetration	2 water	3 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 penetrometer (kPa)	structure and additional observations
W HQ Encountered			SPT 2, 2, 2 N=4	-6 -7 -8 -9 -10 -11 -12 -13	9.0 10.0 11.0 12.0 13.0 14.0 15.0	SM	SILTY SAND: fine to medium grained, dark grey to brown, with clays, traces of shell fragments. (continued)	W	VL	100 200 300 400	ESTUARINE SOIL	
						CL-CI	Sandy CLAY: low to medium plasticity, grey, with fine to medium grained sand.	<Wp	S			
						SC	CLAYEY SAND: fine to medium grained, grey.	M	VL			
						CH	Silty CLAY: high plasticity, dark grey to brown.	>Wp	VS - S			
14.5m: becomes grey												

method

AD
AS
W
HA
PT

auger drilling*
auger screwing*
hand auger
washbore
hand auger
push tube

support

M
C

mud
casing

penetration

no resistance
ranging to
refusal

water

10-Oct-12 water
level on date shown
water inflow
water outflow

samples & field tests

B
D
E
SS
U##
HP
N
N*
Nc
VS
R
HB

bulk disturbed sample
disturbed sample
environmental sample
split spoon sample
undisturbed sample ##mm diameter
hand penetrometer (kPa)
standard penetration test (SPT)
SPT - sample recovered
SPT with solid cone
vane shear; peak/remoulded (kPa)
refusal
hammer bouncing

soil group symbol & soil description

based on AS 1726:2017

moisture condition

D
M
W
Wp
Wi

dry
moist
wet
plastic limit
liquid limit

consistency / relative density

VS
S
F
St
VSt
H
Fb
VL
L
MD
D
VD

very soft
soft
firm
stiff
very stiff
hard
friable
very loose
loose
medium dense
dense
very dense

* bit shown by suffix

e.g. AD/T

B blank bit

T TC bit

V V hit

Engineering Log - Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID. **GBH04**

sheet: 3 of 6

project no. **754-NTLGE282007**

date started: **23 Jan 2021**

date completed: **25 Jan 2021**

logged by: **HL / KF**

checked by: **SJB**

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								
method & support	penetration	water	samples & field tests	RL (m)	depth (m)	graphic log	soil group symbol	material description	moisture condition	consistency / relative density	hand penetrometer (kPa)	structure and additional observations
	1 2 3							SOIL NAME: plasticity or particle characteristic, colour, secondary and minor components			100 200 300 400	
							CL-CI	Sandy CLAY: low to medium plasticity, grey with some iron staining, fine to medium grained sand.	<Wp	St - VSt		RESIDUAL SOIL
			SPT 5, 7, 8 N=15		17.0							
				</								

Engineering Log - Cored Borehole

client: **Newcastle Grammar School**
principal:
project: **Newcastle Grammar School - Park Campus**
location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH04**
sheet: 4 of 6
project no. **754-NTLGE282007**
date started: **23 Jan 2021**
date completed: **25 Jan 2021**
logged by: **HL / KF**
checked by: **SJB**

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			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
		-14	17.0								
		-15	18.0								
		-16	19.0								
		-17	20.0								
		-18	21.0								
		-19	22.0								
		-20	23.0								
		-21			started coring at 23.98m						

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube	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	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run & RQD  barrel withdrawn RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	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
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Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH04**

sheet: 5 of 6

project no. **754-NTLGE282007**

date started: **23 Jan 2021**

date completed: **25 Jan 2021**

logged by: **HL / KF**

checked by: **SJB**

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					
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial; O = diametral; a = axial; d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)		
							VL L M H VH EH				particular	general	
Encountered			-22		INTERBEDDED SILTSTONE (80%) AND SANDSTONE (20%): orange to brown, fine to medium grained sandstone and dark grey siltstone. Massive to indistinctly bedded at 22°, iron stained, soft sediment deformation throughout, with carbonaceous laminations. <i>(continued)</i> 24.85m: carbaonaceous lamination, 6mm, 10°	HW		a=0.03 d=0.02	100%		JT, 46°, UN, RO, Fe SN	Defects are: PT, 5°, 15°, PL, UN, RO, Fe SN - Sand CN, unless otherwise described	
			-23		25.20 - 26.18m: weathered zone, decreased strength & discoloured brown 25.23m: siderite / ironstone band, 35mm, interlaminated, reddish brown	MW XW - HW			97%		SM, 5°, IR, hard clay to siltstone infill JT, 60°, PL, RO, Fe SN SM, 11°, UN, Clay, 8 mm SM, 26°, UN, Clay, 12 mm		
			-24		INTERLAMINATED SILTSTONE (40%) & SANDSTONE (60%): dark grey to grey, fine grained sandstone and dark grey siltstone, distinctly laminated at 5° to 10°, with extremely to very closely spread carbonaceous laminations.	MW SW		a=0.22 d=0.18 a=0.20 d=0.17					
			-25		SILTSTONE: dark grey, distinctly laminated at 5° to 10° with carboaceous laminations & sandsotne laminaitons.						JT, 72°, PL, RO, healed		
			-26		INTERLAMINATED SILTSTONE (40%) & SANDSTONE (60%): dark grey to grey, fine grained sandstone and dark grey siltstone, distinctly laminated at 5° to 10°, with extremely to very closely spread carbonaceous laminations.			a=1.00 d=0.86	70%		SM, 10°, PL, Clay SM, 15°, IR, Clay JT SM, 5°, PL, clay and rock fragments JT, 48°, PL, RO, CN		
			-27					a=0.34 d=0.24	96%				SM, 14°, PL, Clay, 10 mm SM, 15°, UN, Clay SM, 15°, UN, clay and rock fragments
			-28		30.97m: fossils up to 8mm, marine derived								
			-29										

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC/NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube		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		graphic log / core recovery core recovered (graphic symbols indicate material) no core recovered core run & RQD barrel withdrawn RQD = Rock Quality Designation (%)		weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high		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	
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Engineering Log - Cored Borehole

client: **Newcastle Grammar School**

principal:

project: **Newcastle Grammar School - Park Campus**

location: **127 Union Street, Cooks Hill, 2300**

Borehole ID: **GBH04**

sheet: 6 of 6

project no. **754-NTLGE282007**

date started: **23 Jan 2021**

date completed: **25 Jan 2021**

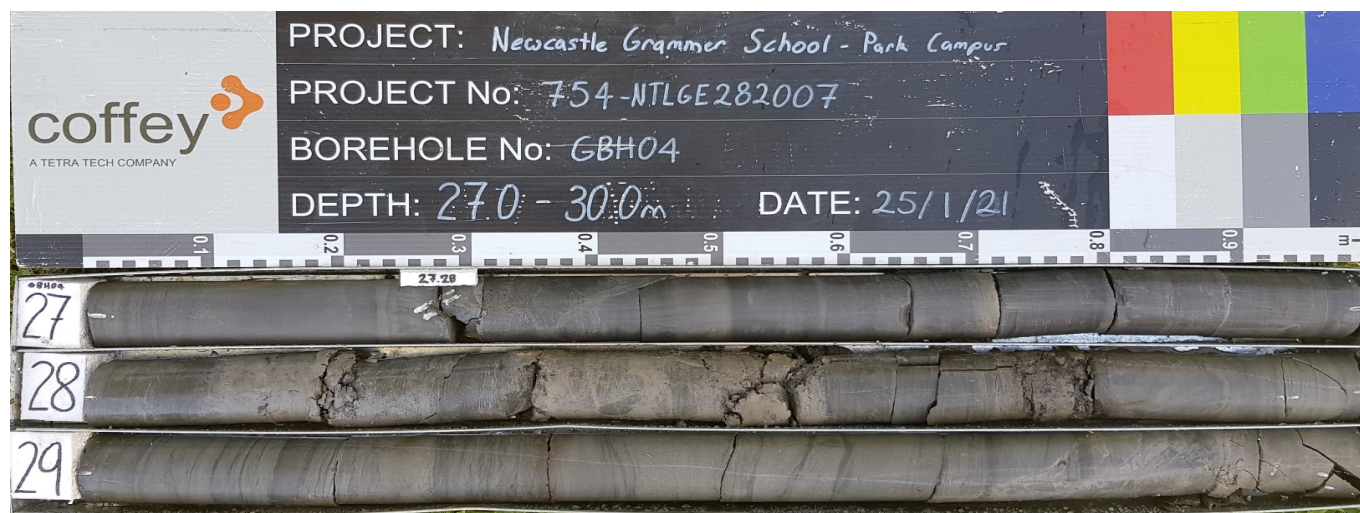
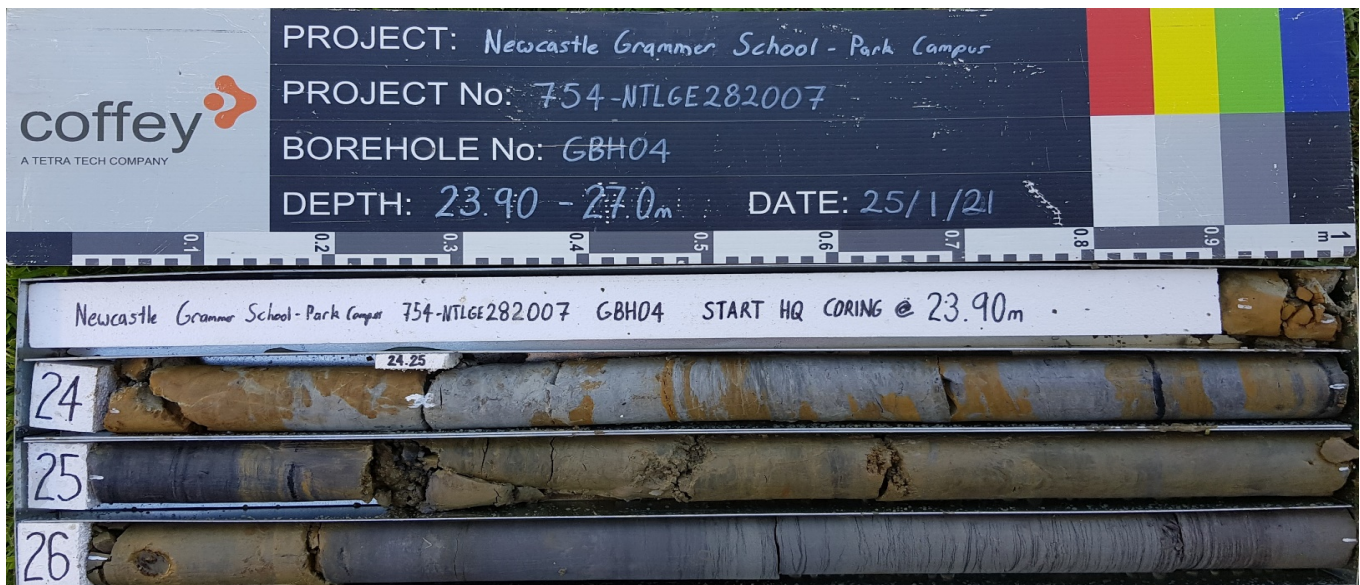
logged by: **HL / KF**

checked by: **SJB**

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

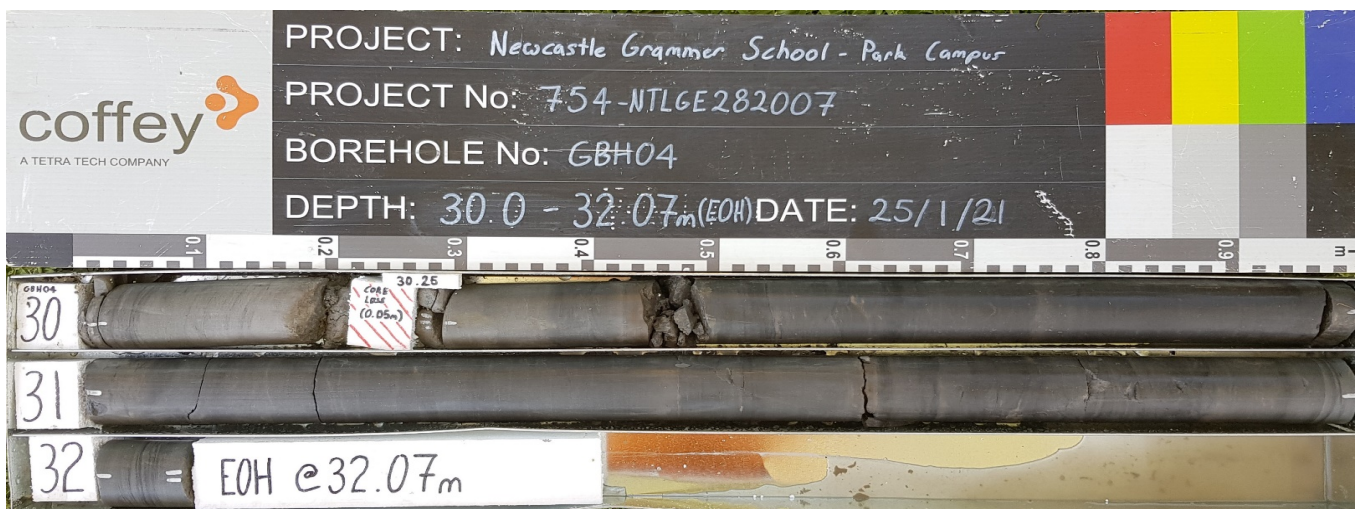
drilling information				material substance				rock mass defects			
method & support	water	RL (m)	depth (m)	graphic log	material description ROCK TYPE: grain characteristics, colour, structure, minor components	weathering & alteration	estimated strength & Is50 X = axial O = diametral a = axial d = diametral	samples, field tests & Is(50) (MPa)	core run & RQD	defect spacing (mm)	additional observations and defect descriptions (type, inclination, planarity, roughness, coating, thickness, other)
					Borehole GBH04 terminated at 32.07 m Target depth			a=0.77 d=0.52			
		-30	33.0								
		-31	34.0								
		-32	35.0								
		-33	36.0								
		-34	37.0								
		-35	38.0								
		-36	39.0								
		-37									

method & support AS auger screwing AD auger drilling CB claw or blade bit W washbore RR rock roller NMLC NMLC core (51.9 mm) NQ wireline core (47.6mm) HQ wireline core (63.5mm) PQ wireline core (85.0mm) HA hand auger PT push tube	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	graphic log / core recovery  core recovered (graphic symbols indicate material)  no core recovered core run & RQD  barrel withdrawn RQD = Rock Quality Designation (%)	weathering & alteration* RS residual soil XW extremely weathered HW highly weathered MW moderately weathered SW slightly weathered FR fresh *W replaced with A for alteration strength VL very low L low M medium H high VH very high EH extremely high	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
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drawn	SJB		client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNON STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH04 PT1

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drawn	SJB	 A TETRA TECH COMPANY	client:	NEWCASTLE GRAMMAR SCHOOL LTD	
approved	JD		project:	NEWCASTLE GRAMMAR SCHOOL PARK CAMPUS - STAGE 1	
date	19/02/2021			127 UNION STREET COOKS HILL	
scale	N/A		title:	CORE PHOTOGRAPH	
original size	A4		project no:	754-NTLGE282007	borehole no: GBH04 PT2

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Appendix B – Laboratory Testing

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Material Test Report

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

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



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



Chris Blackford
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

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 Assessment		
Date Tested		2/02/2021	
CBR at 5.0mm (%)	AS 1289.6.1.1	40	
Dry Density before Soaking (t/m ³)		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/m ³)		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 Assessment		
Sample Moisture Content	AS 1289.2.1.1		
Date Tested		4/02/2021	

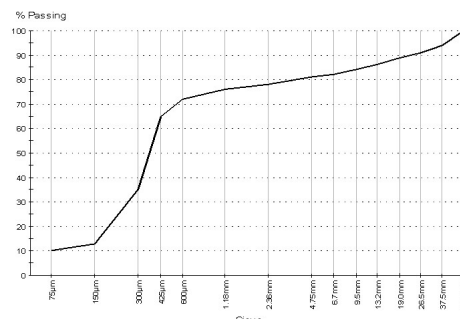
Particle Size Distribution

Method: AS 1289.3.6.1
Drying by: Oven
Date Tested: 4/02/2021

Note: Sample Washed

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

Chart



Comments

Samples tested and reported as received from client.

California Bearing Ratio Test Report

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

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



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




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

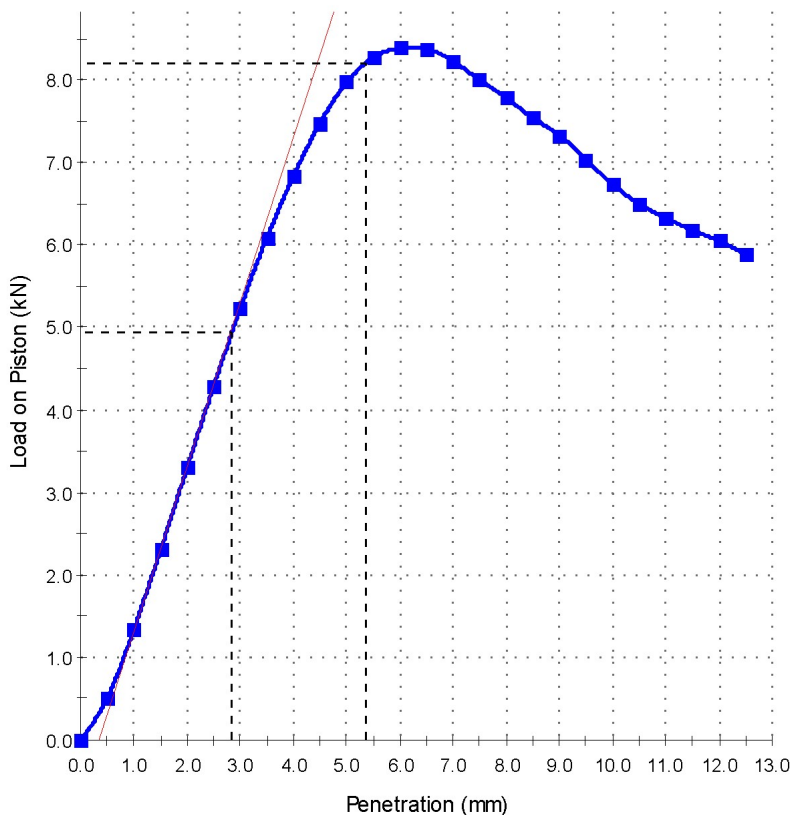
Sampling Method: Submitted by client

Material: Existing Ground

Source: On-Site

Specification: No Specification

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR at 5.0mm (%): **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

AS 1289.5.1.1

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 Determination Method: Visual/Tactile

Comments

Samples tested and reported as received from client.

Material Test Report

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

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



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




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

Samples tested and reported as received from client.

Material Test Report

Report No: NEWC21S-00602-1

Issue No: 1

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



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



Chris Blackford

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

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

Samples tested and reported as received from client.

Material Test Report

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

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



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



Chris Blackford
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

Samples tested and reported as received from client.

Material Test Report

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

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



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




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

Samples tested and reported as received from client.

California Bearing Ratio Test Report

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

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



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

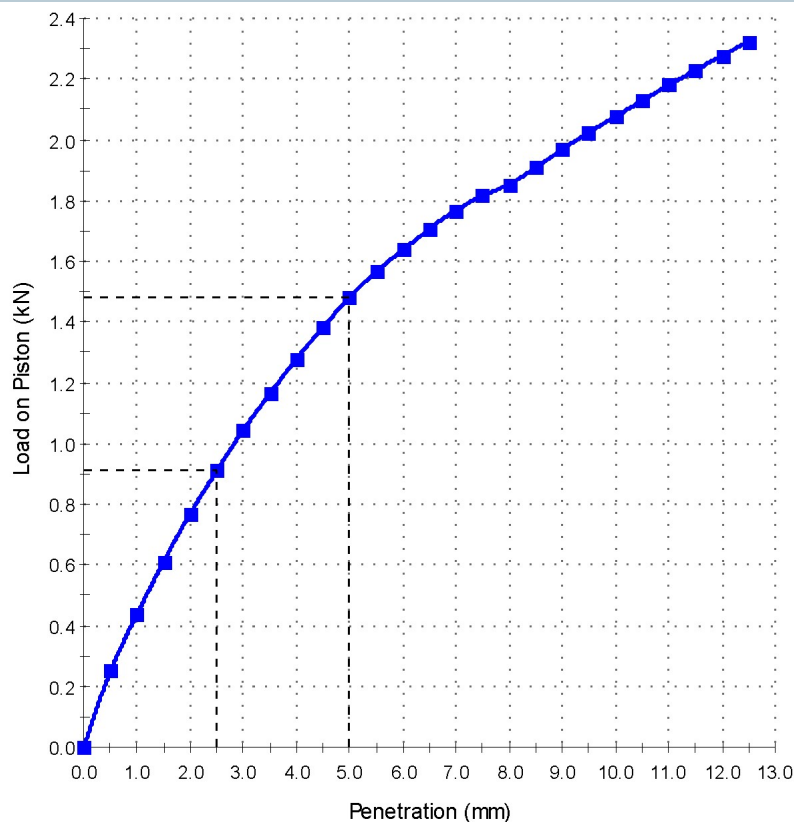



Approved Signatory: Chris Blackford
(Geotechnician)
NATA Accredited Laboratory Number: 431
Date of Issue: 10/02/2021

Sample Details

Sample ID: NEWC21S-00603	Sampling Method: Submitted by client
Client ID:	Material: Existing Ground
Date Sampled: 25/01/2021	Source: On-Site
Date Submitted: 27/01/2021	Specification: No Specification
Date Tested: 4/02/2021	
Project Location: Cooks Hill, NSW	
Sample Location: GBH03 @ 0.50-1.00m	

Load vs Penetration



Test Results

AS 1289.6.1.1

CBR at 5.0mm (%):	7
Dry Density before Soaking (t/m ³):	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/m ³):	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):	4
Retained on 19 mm Sieve (%):	0
CBR Moisture Content Method:	AS 1289.2.1.1
Sample Curing Time (h):	48
Plasticity Determination Method:	Visual/Tactile
AS 1289.2.1.1	
In Situ (Field) Moisture Content (%):	21.7

Comments

Samples tested and reported as received from client.

Material Test Report

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

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



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




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

Other Test Results

Description	Method	Result	Limits
-------------	--------	--------	--------

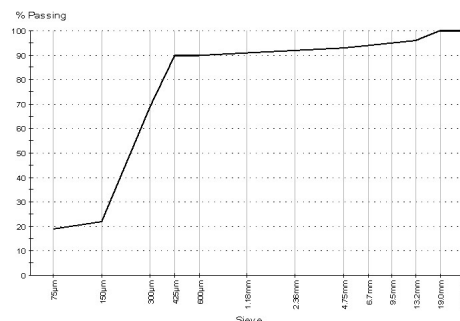
Particle Size Distribution

Method: AS 1289.3.6.1
Drying by: Oven
Date Tested: 4/02/2021

Note: Sample Washed

Sieve Size	% Passing	Limits
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	
75µm	19	

Chart



Comments

Samples tested and reported as received from client.

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										Test Machine: Grey / Digital					Date of Calibration: 15-Jan-21				
PROJECT: Newcastle Grammar School - Park Campus										Testing Locality: Newcastle Laboratory					Calibrated By: PCS Measurement Pty Ltd				
LOCATION: 127 Union Street, Cooks Hill, 2300										Tested By: HL					Sampled Date: 19-Nov-19				
										Test Date: 04-Feb-21					Storage Location: WARABROOK				
										Checked: SJB									
Borehole No. / Test Depth (m)		Rock Description	Moisture Condition ⁽³⁾ (N, D or S)	Diametral test							Axial or Irregular lump								Comments / Strength Classification
				Length L ⁽²⁾ (mm)	Diameter D (mm)	Load P (Gauge) (kN)	I _s =(P/D ²) x 1000 (MPa)	Size Correction _L F=(D/50) ^{0.45}	I _{s(50)} (MPa)	Strength Class (Diametral)	Width W (core diameter) (mm)	Platen Separation D ⁽²⁾ (mm)	D _e ²	Load (Gauge) (kN)	I _s =(P/D _e ²) x 1000 (MPa)	Size Correction F=(D _e /50) ^{0.45}	I _{s(50)} (MPa)	Strength Class (Axial)	
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

(1): N = Natural, D = Dry, S = Saturated
 (2): L > 0.5D, 0.3 < D/W < 1.0

 $I_{s(50)}$ MPa and Strength Classification

< 0.1	Very Low	1 - 3	High
0.1 - 0.3	Low	3 - 10	Very High
0.3 - 1	Medium	> 10	Extremely High

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



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



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.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	GBH02 2.5m	GBH02 4.0m	GBH02 8.5m	GBH02 10.0m	GBH02 11.5m
Sampling 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 Analysis									
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 @ 105-110°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 Analyser									
Chloride	16887-00-6	10	mg/kg		----	80	170	----	40



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	GHB02 14.5m	GHB02 16.0m	GHB02 17.5m	GHB02 19.0m	GBH03 3.0m
Sampling 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	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 Analysis									
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 @ 105-110°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 Analyser									
Chloride	16887-00-6	10	mg/kg		----	180	----	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	GBH03 4.5m	GBH03 7.5m	GBH03 10.5m	GBH03 12.0m	GBH03 15.0m
Sampling 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	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 Analysis									
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 @ 105-110°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 Analyser									
Chloride	16887-00-6	10	mg/kg		610	190	----	90	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	GBH03 16.5m	GBH03 18.0m	GBH03 19.5m	----	----
Sampling 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	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 @ 105-110°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 Analyser									
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

Appendix C – Cone Penetration Testing Interpretation

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PointID

CPT01

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

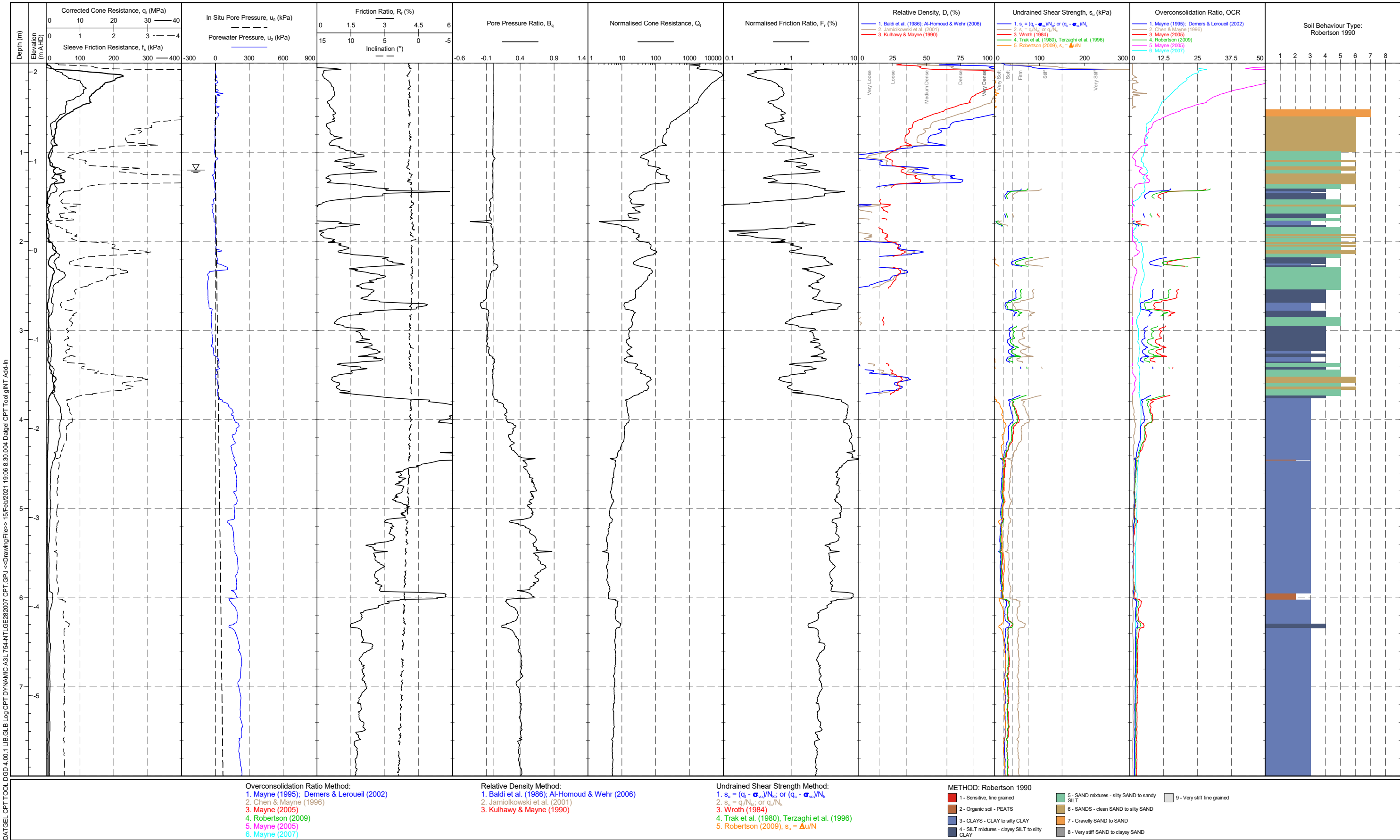
AREA :
EASTING : 384307.0 m
NORTHING : 6355275.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.10 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 1 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT01

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

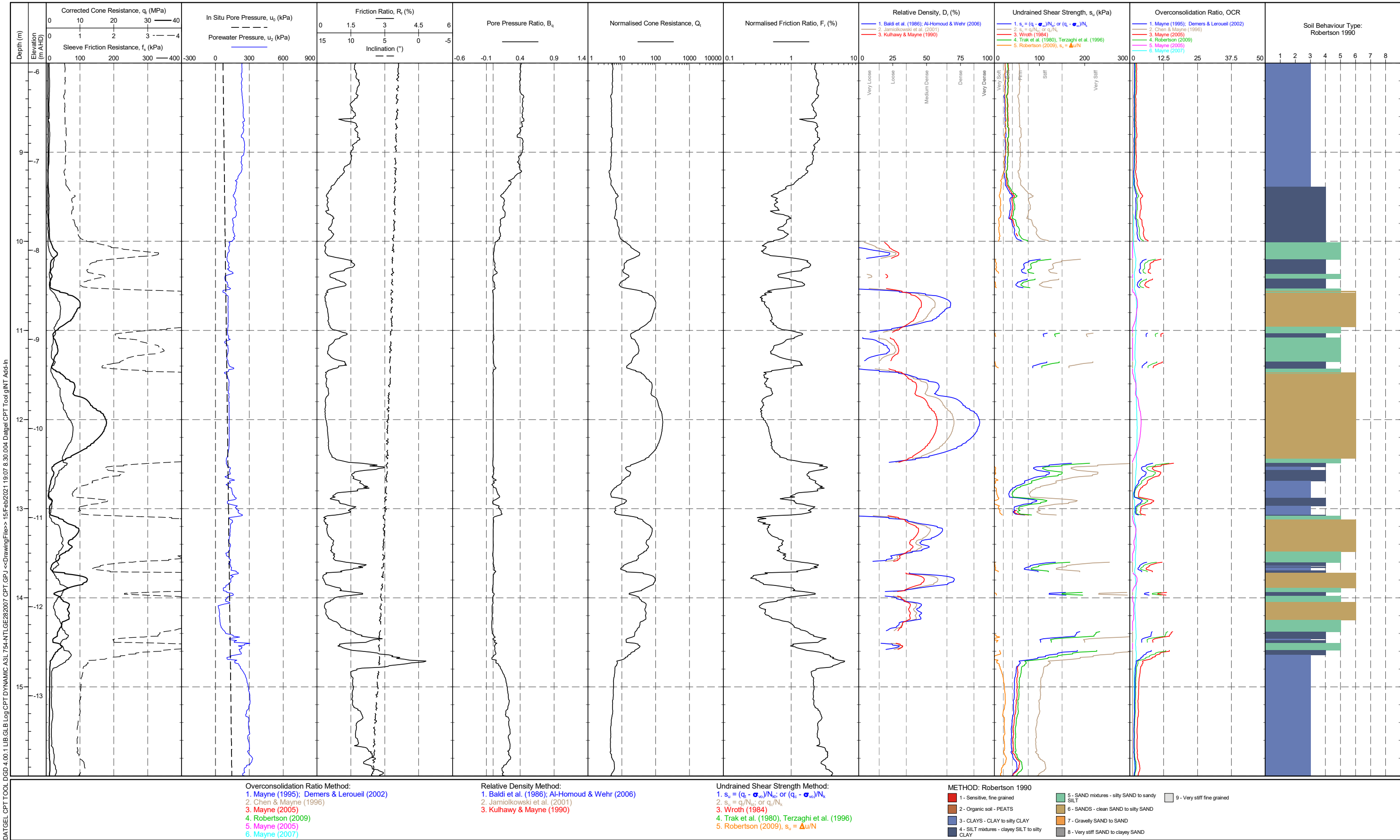
AREA :
EASTING : 384307.0 m
NORTHING : 6355275.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.10 m AHD

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



PointID

CPT01

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

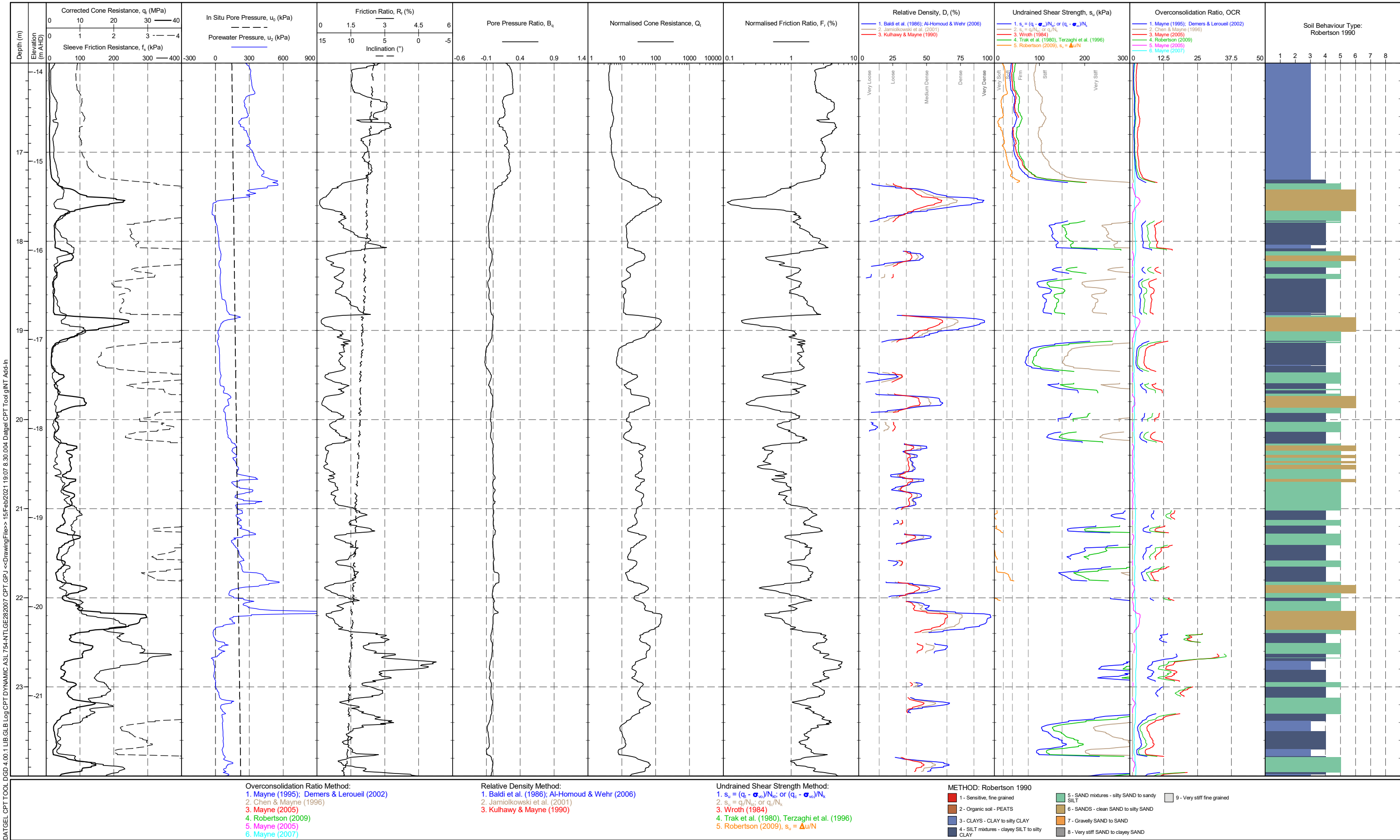
AREA :
EASTING : 384307.0 m
NORTHING : 6355275.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.10 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 3 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT01

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

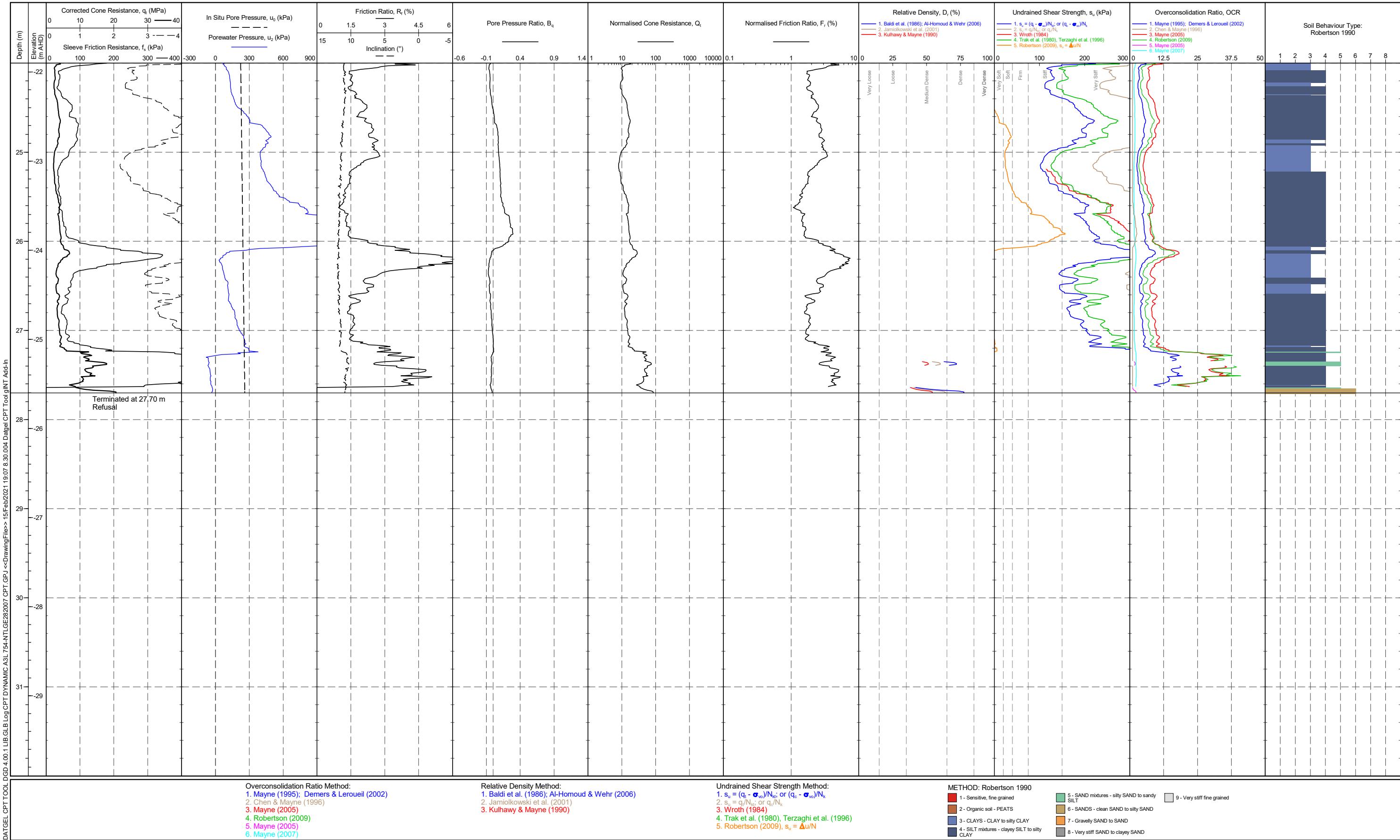
AREA :
EASTING : 384307.0 m
NORTHING : 6355275.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.10 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 4 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT02

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

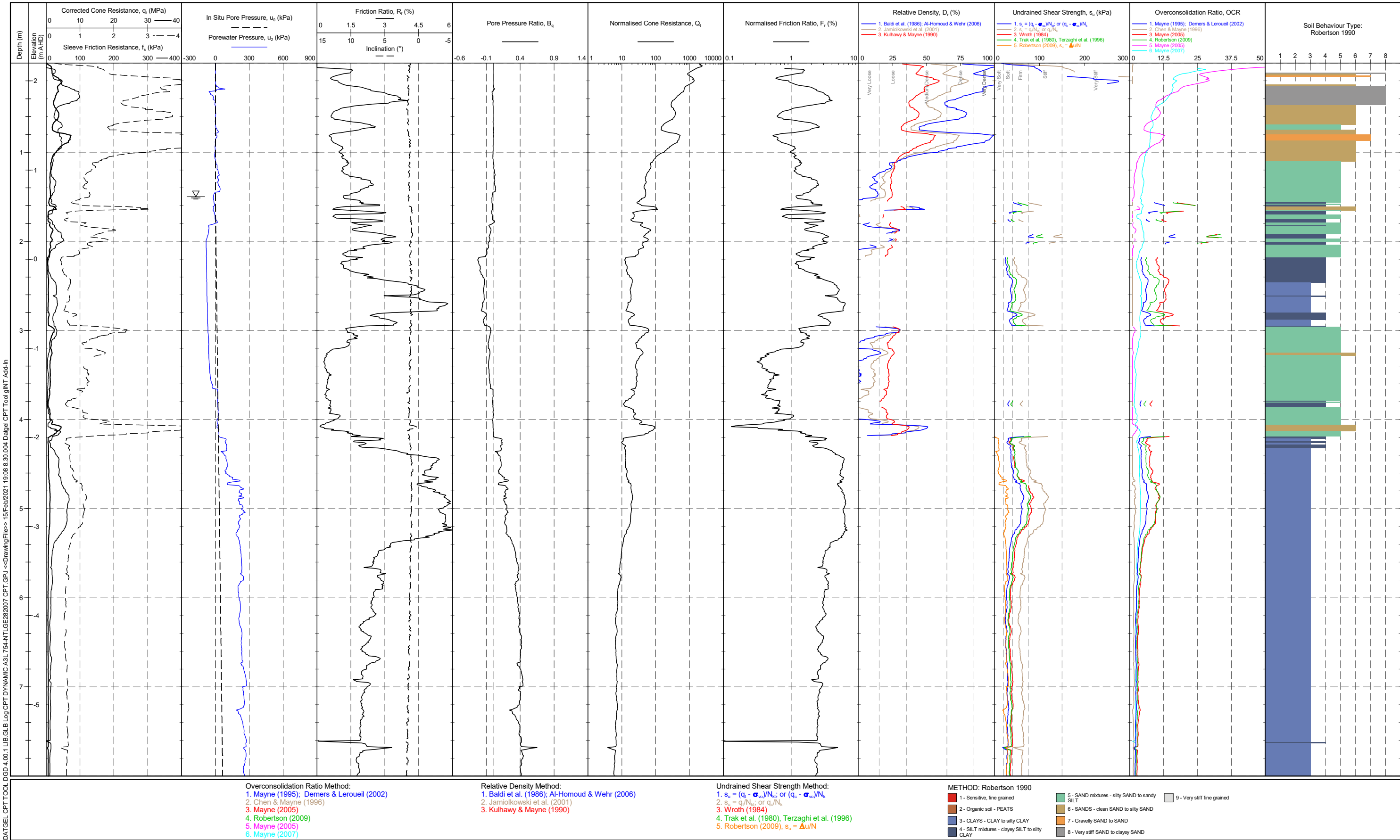
AREA :
EASTING : 384300.0 m
NORTHING : 6355260.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.20 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 1 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT02

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

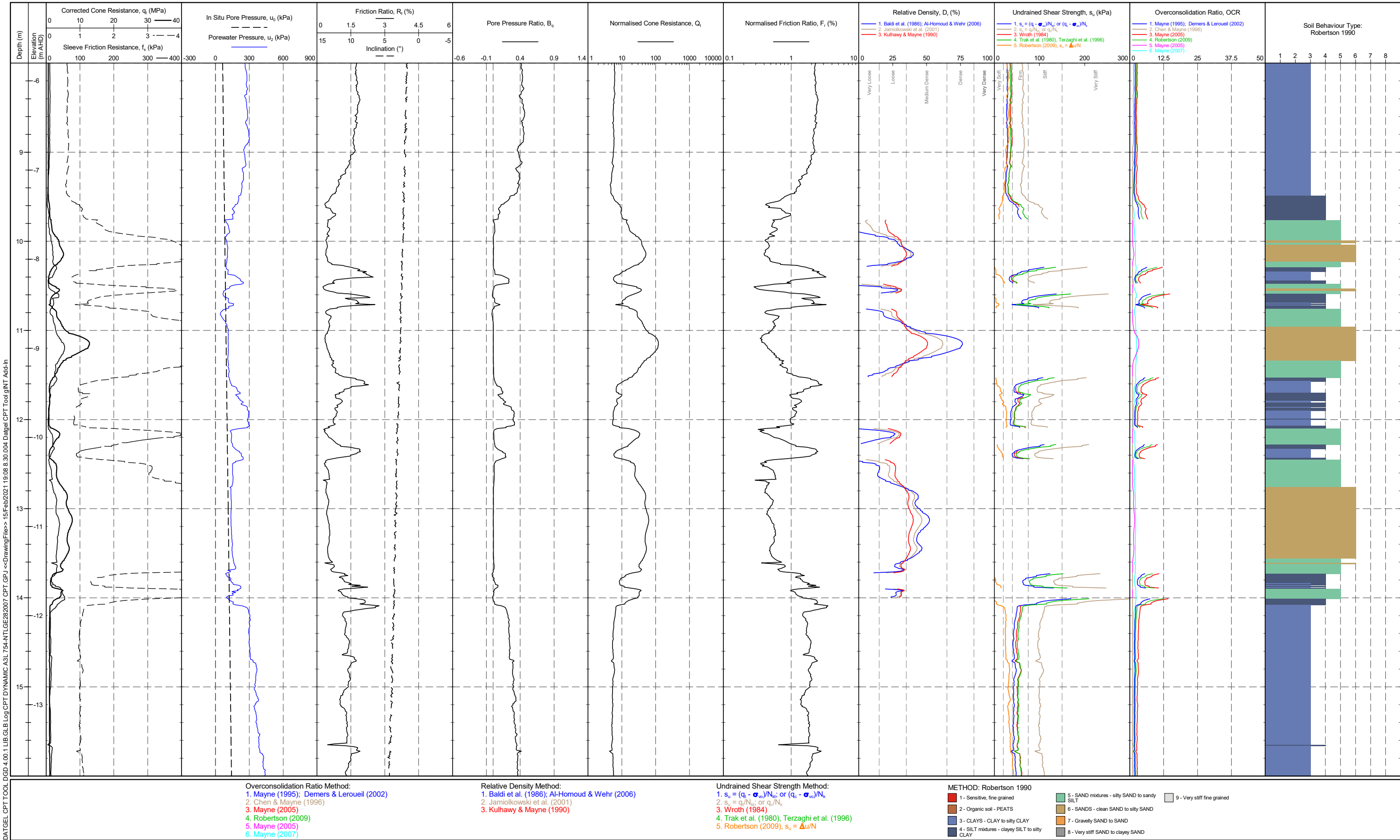
AREA :
EASTING : 384300.0 m
NORTHING : 6355260.0 m
COORD. SYS.: MGA94 Zone 56
ELEVATION : 2.20 m AHD

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



PointID

CPT02

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

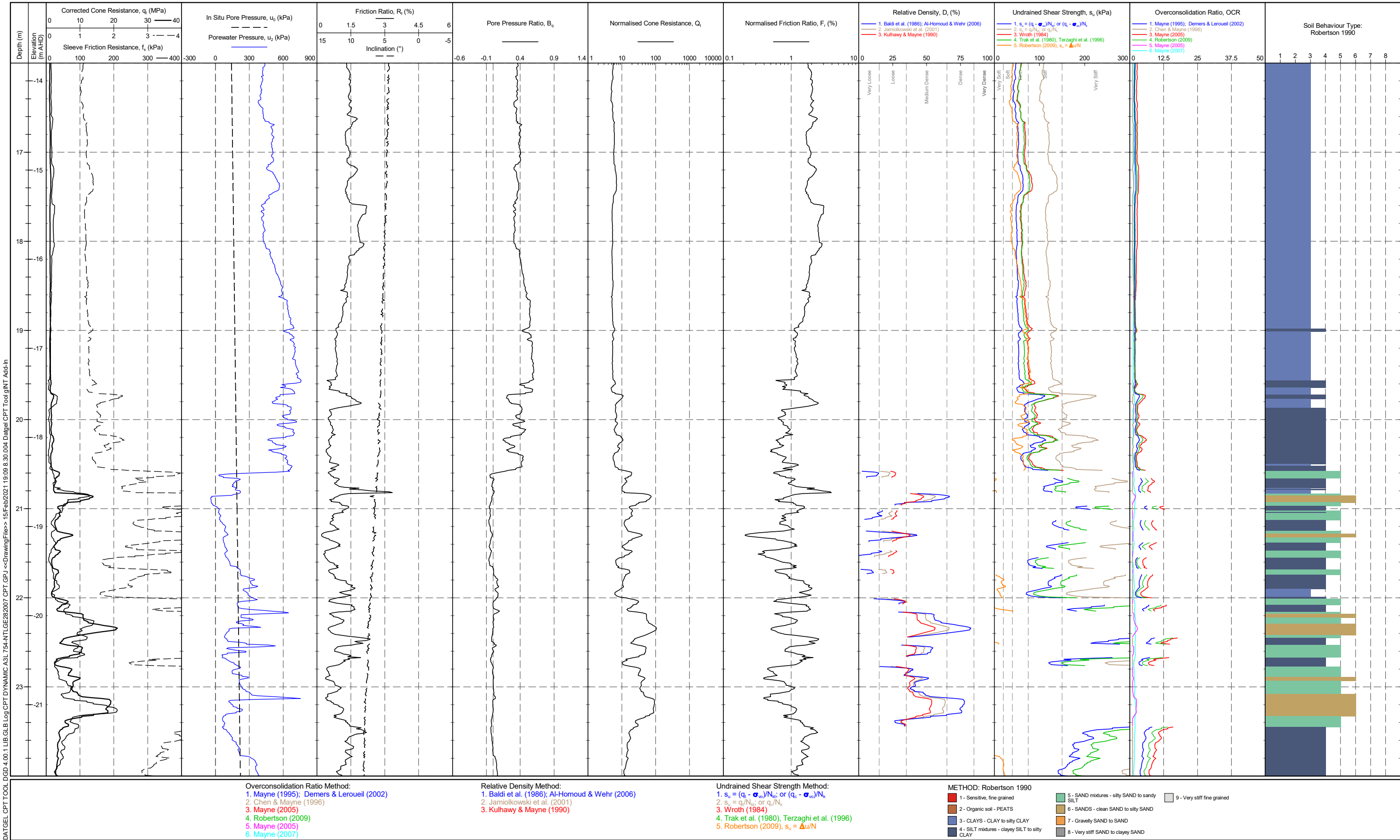
AREA :
EASTING : 384300.0 m
NORTHING : 6355260.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.20 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 3 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT02

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

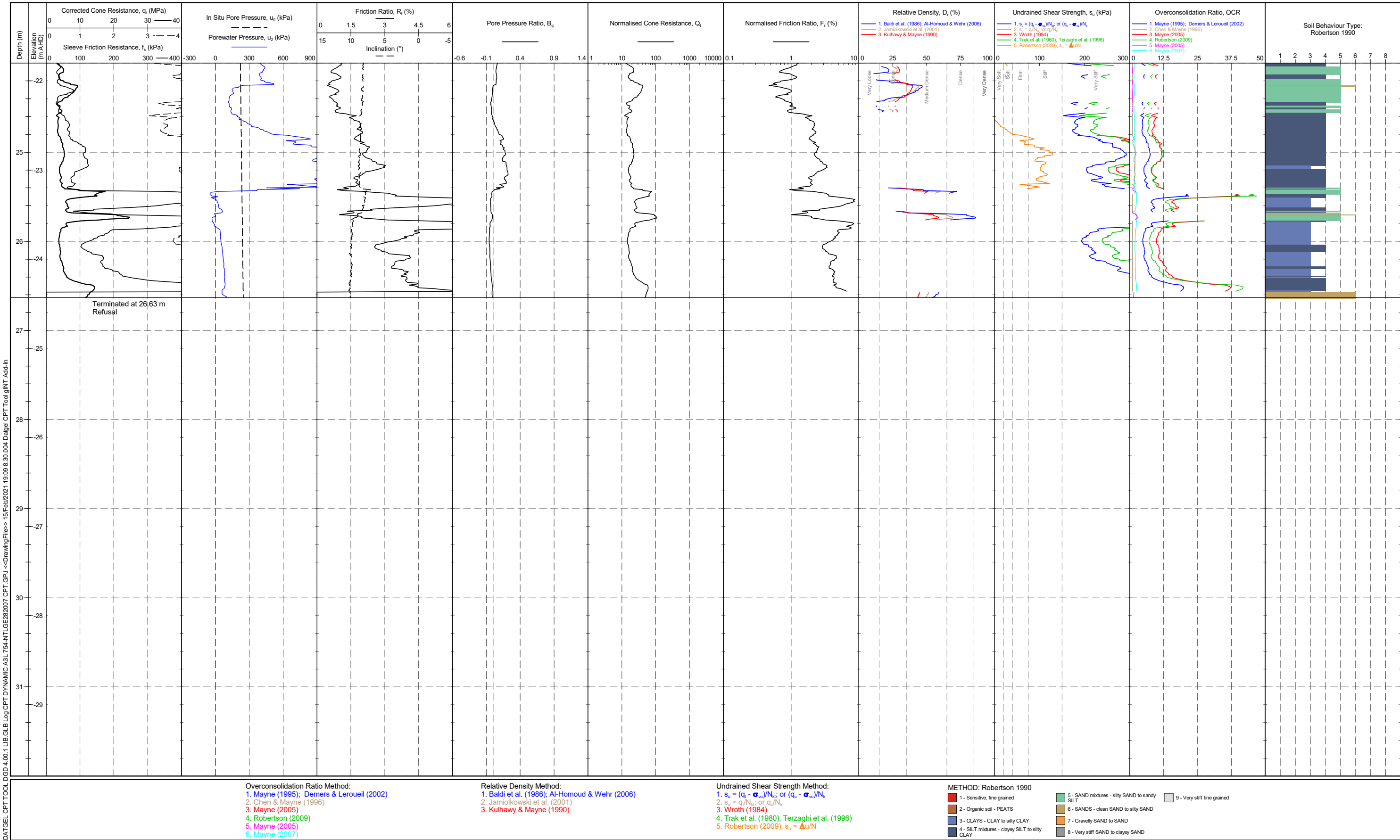
AREA :
EASTING : 384300.0 m
NORTHING : 6355260.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.20 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

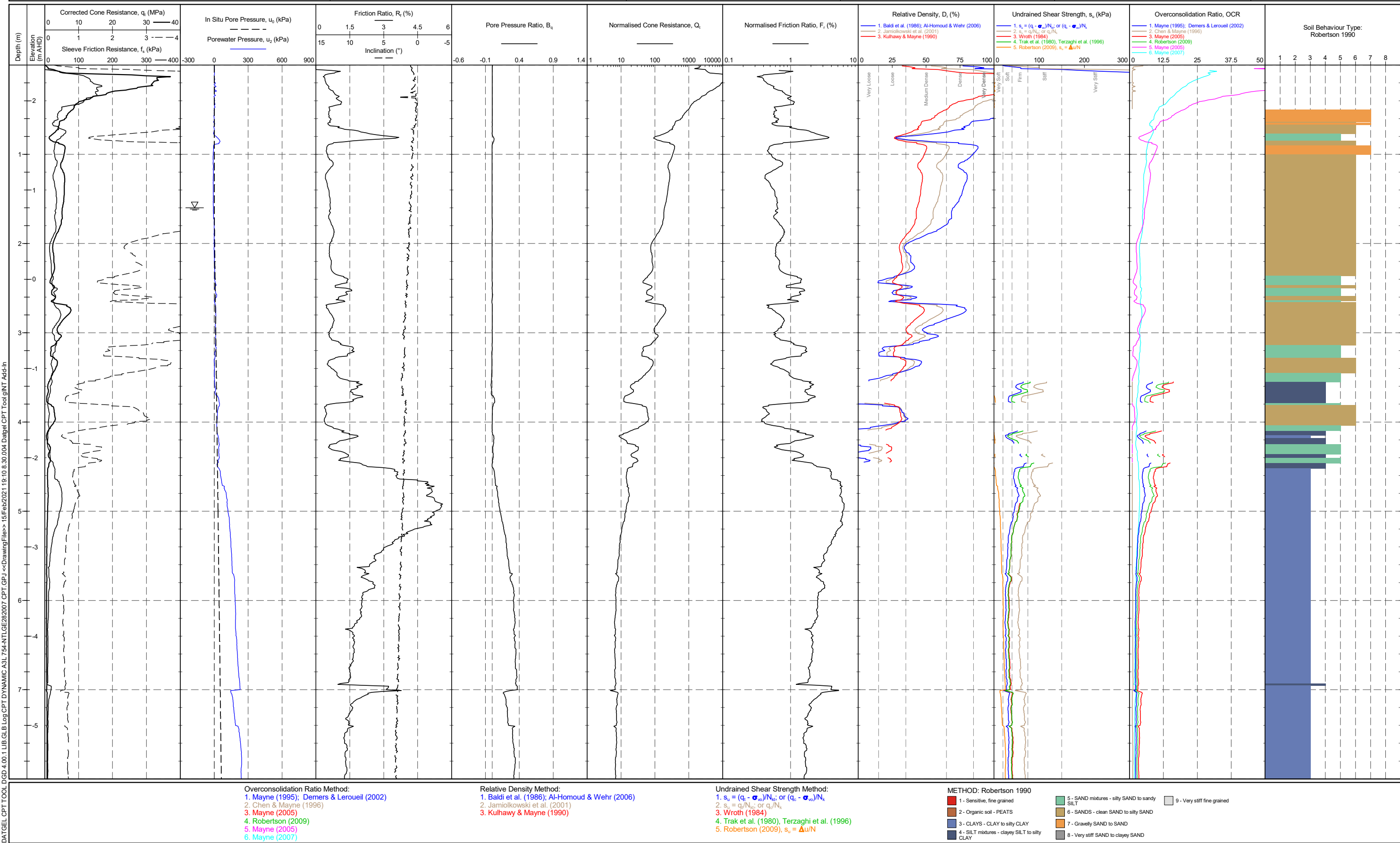
SHEET : 4 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT03

CLIENT : Newcastle Grammar School	AREA :	RIG : 20T Truck	CHECKED BY :	REMARK	SHEET : 1 OF 4
ENGINEER : IG	EASTING : 384297.0 m	CONE TYPE : PC	CHECKED DATE :		STATUS :
PROJECT : Newcastle Grammar School - Park Campus	NORTHING : 6355244.0 m	CONE ID : C10CFIIP.C19137	APPROVED BY :		DATE : 20/01/2021
LOCATION : 127 Union Street, Cooks Hill	COORD. SYS. : MGA94 Zone 56	OPERATOR : NB	APPROVED DATE :		
PROJECT No. : 754-NTLGE282007	ELEVATION : 2.40 m AHD				



PointID

CPT03

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

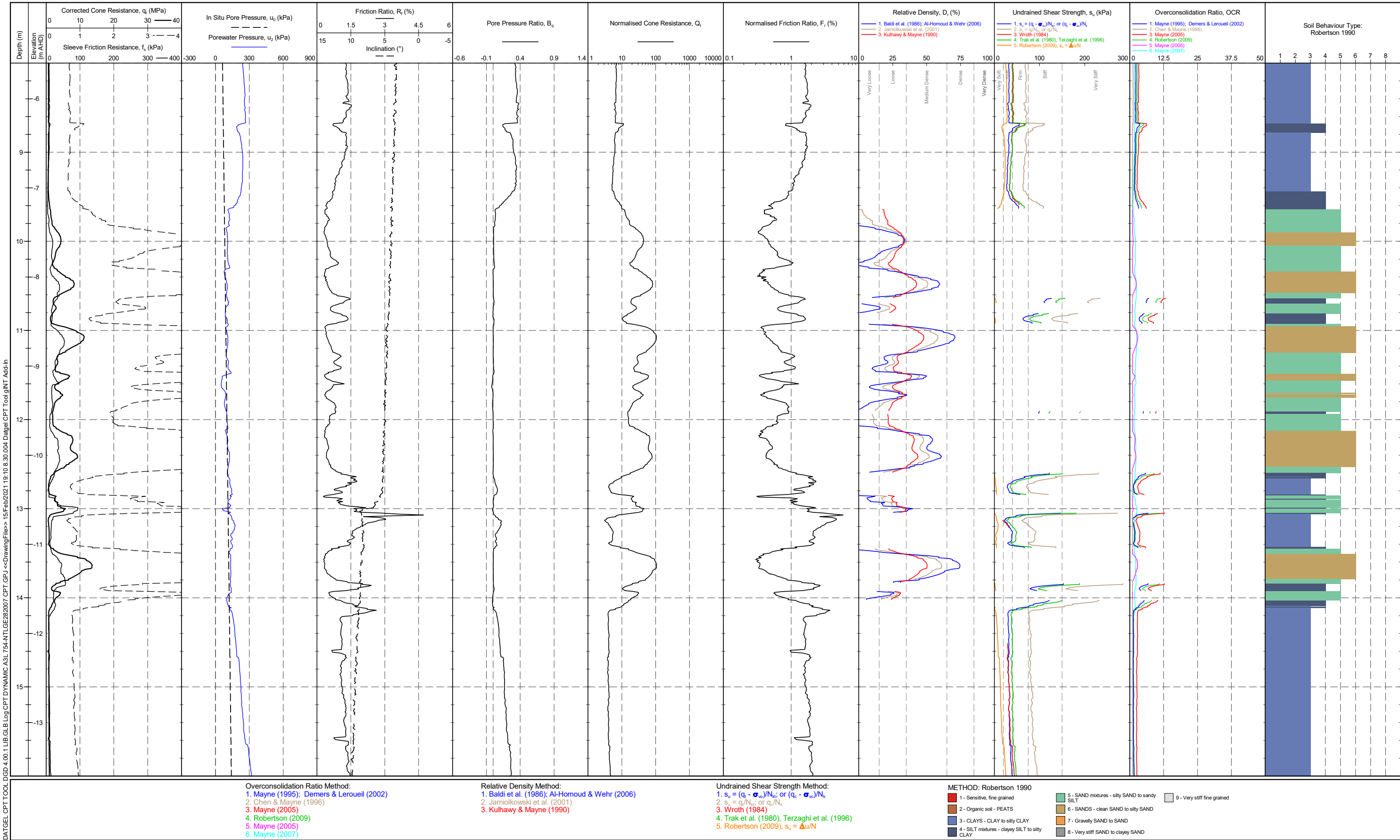
AREA :
EASTING : 384297.0 m
NORTHING : 6355244.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.40 m AHD

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



PointID

CPT03

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

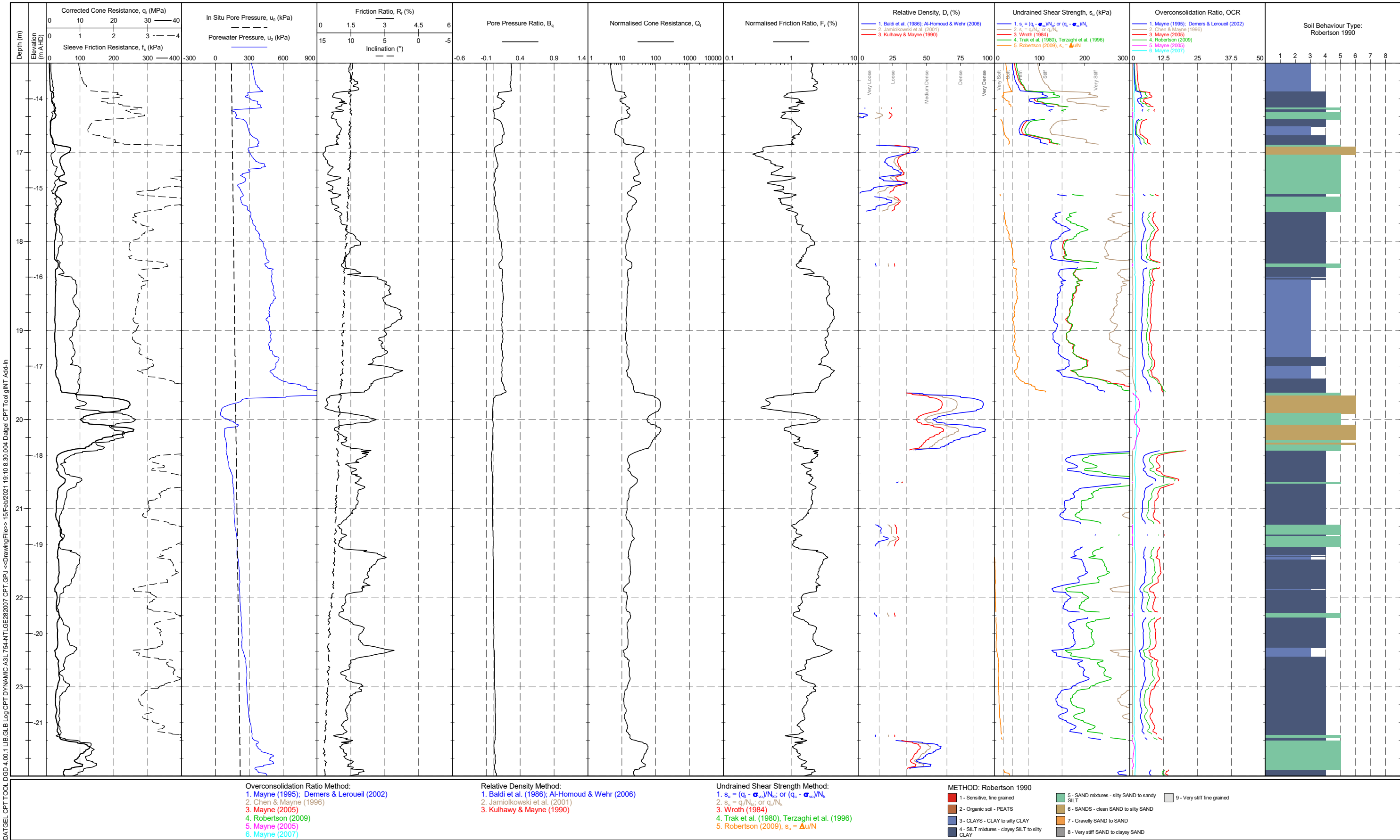
AREA :
EASTING : 384297.0 m
NORTHING : 6355244.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.40 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 3 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT03

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

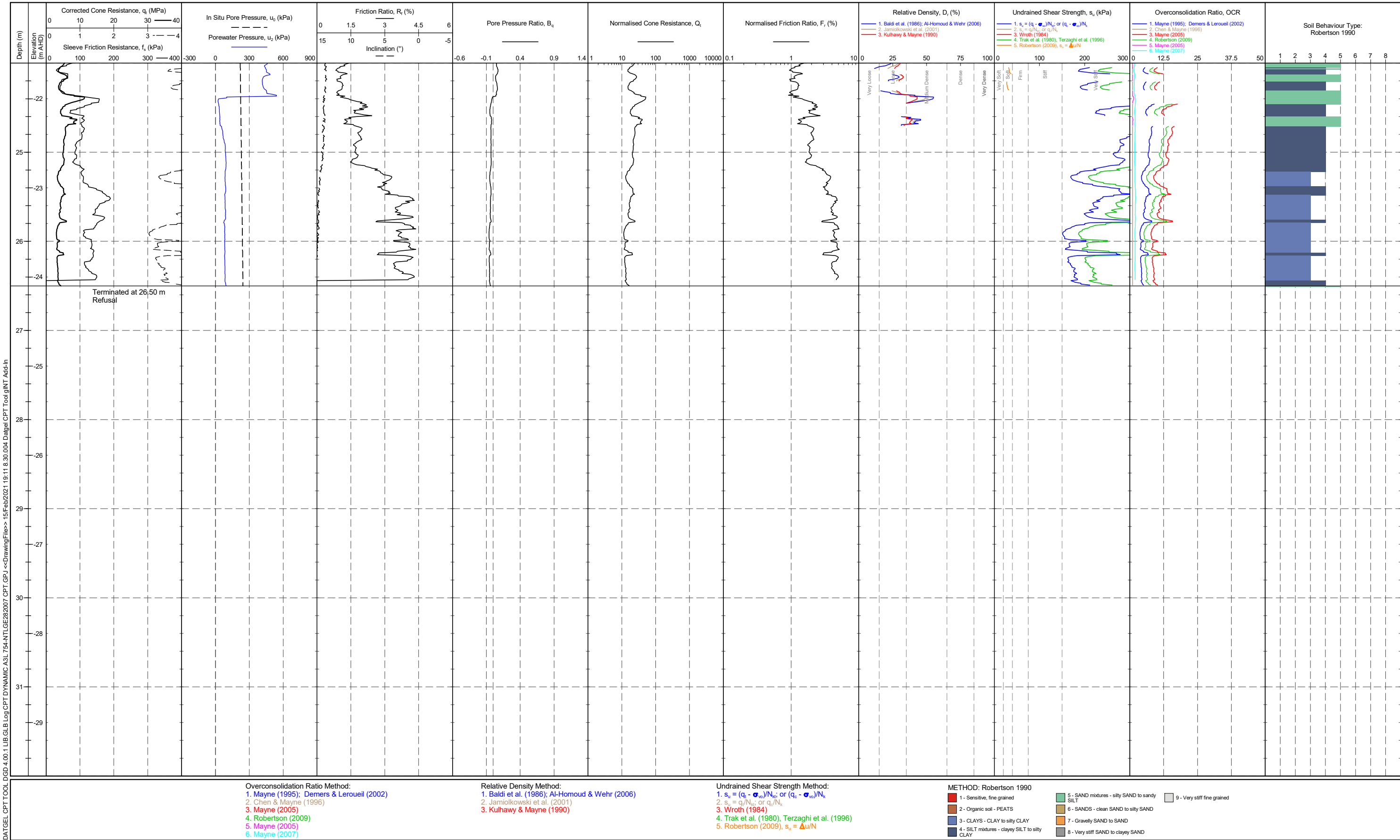
AREA :
EASTING : 384297.0 m
NORTHING : 6355244.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.40 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 4 OF 4
STATUS :
DATE : 20/01/2021



PointID

CPT04

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

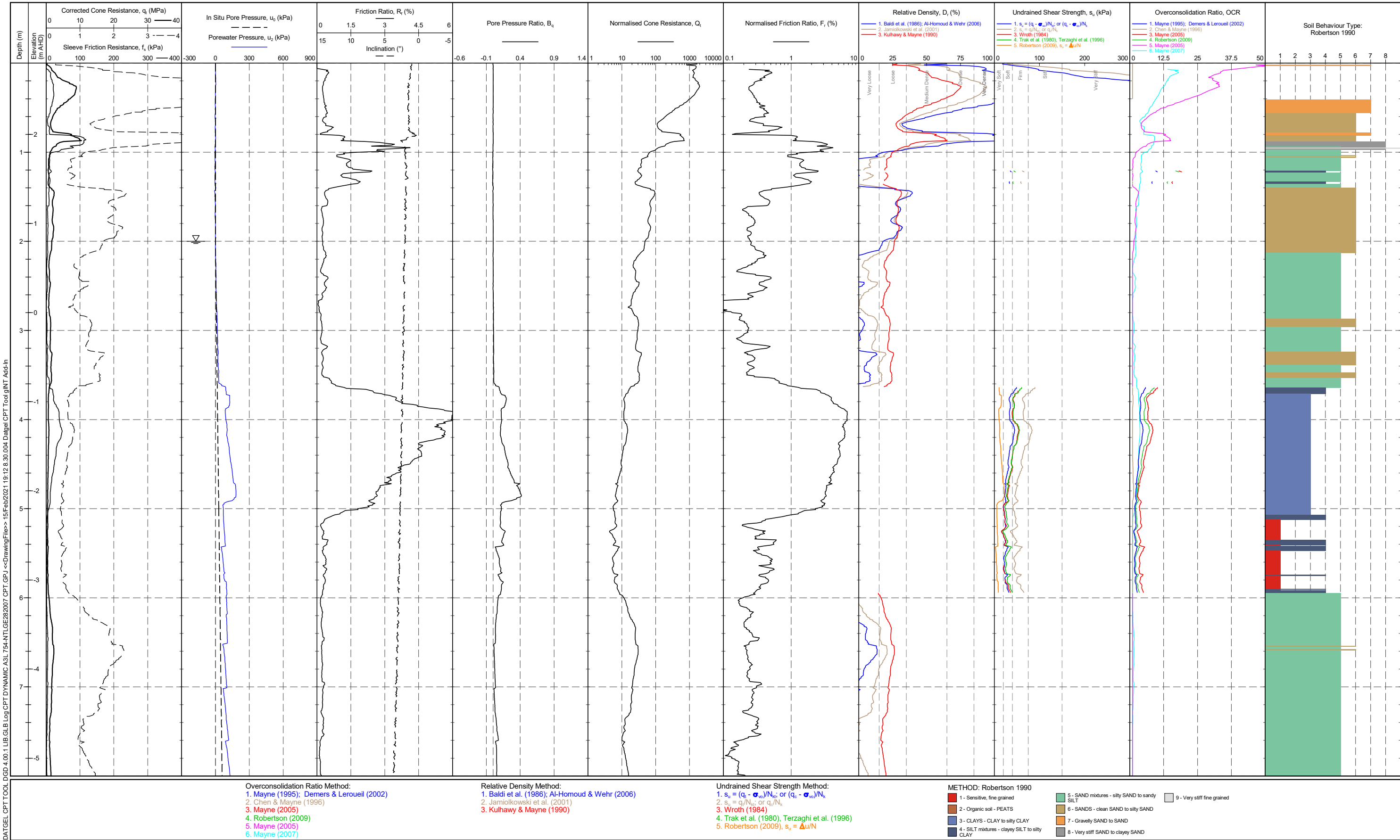
AREA :
EASTING : 384327.0 m
NORTHING : 6355211.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.80 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

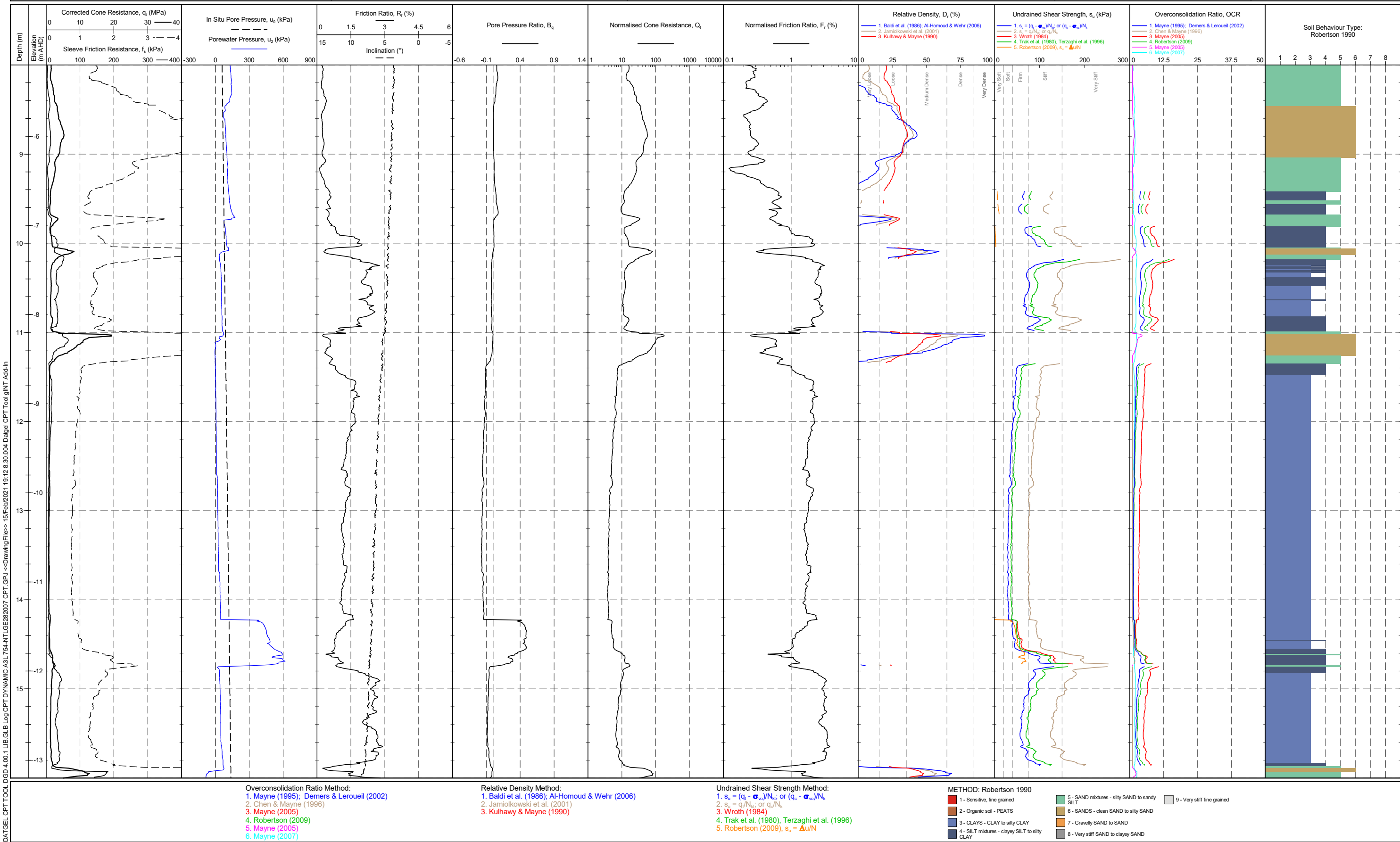
SHEET : 1 OF 3
STATUS :
DATE : 21/01/2021



PointID

CPT04

CLIENT : Newcastle Grammar School	AREA :	RIG : 20T Truck	CHECKED BY :	REMARK	SHEET : 2 OF 3
ENGINEER : IG	EASTING : 384327.0 m	CONE TYPE : PC	CHECKED DATE :		STATUS :
PROJECT : Newcastle Grammar School - Park Campus	NORTHING : 6355211.0 m	CONE ID : C10CFIIP.C19137	APPROVED BY :		DATE : 21/01/2021
LOCATION : 127 Union Street, Cooks Hill	COORD. SYS. : MGA94 Zone 56	OPERATOR : NB	APPROVED DATE :		
PROJECT No. : 754-NTLGE282007	ELEVATION : 2.80 m AHD				



PointID

CPT04

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

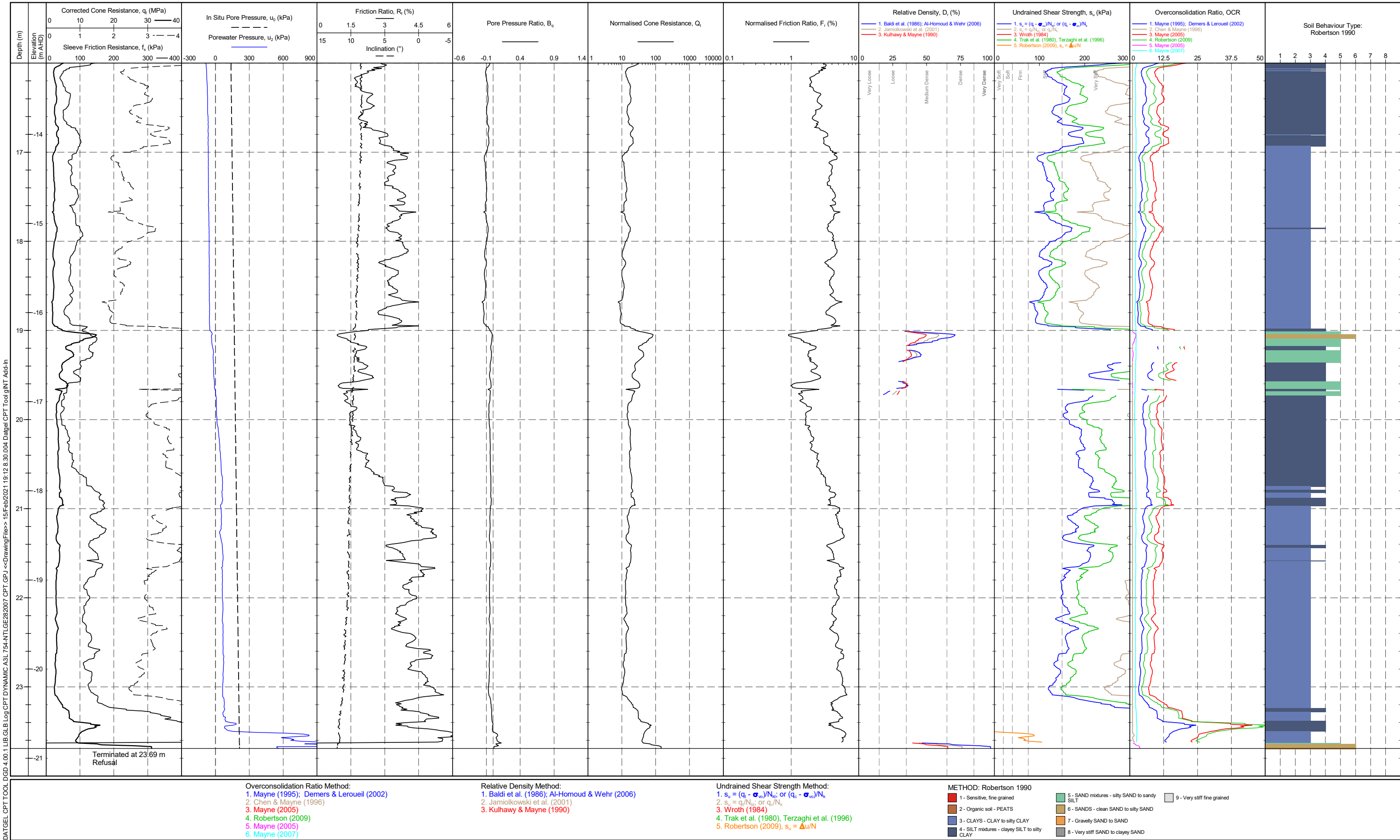
AREA :
EASTING : 384327.0 m
NORTHING : 6355211.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.80 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 3 OF 3
STATUS :
DATE : 21/01/2021



PointID

CPT05

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

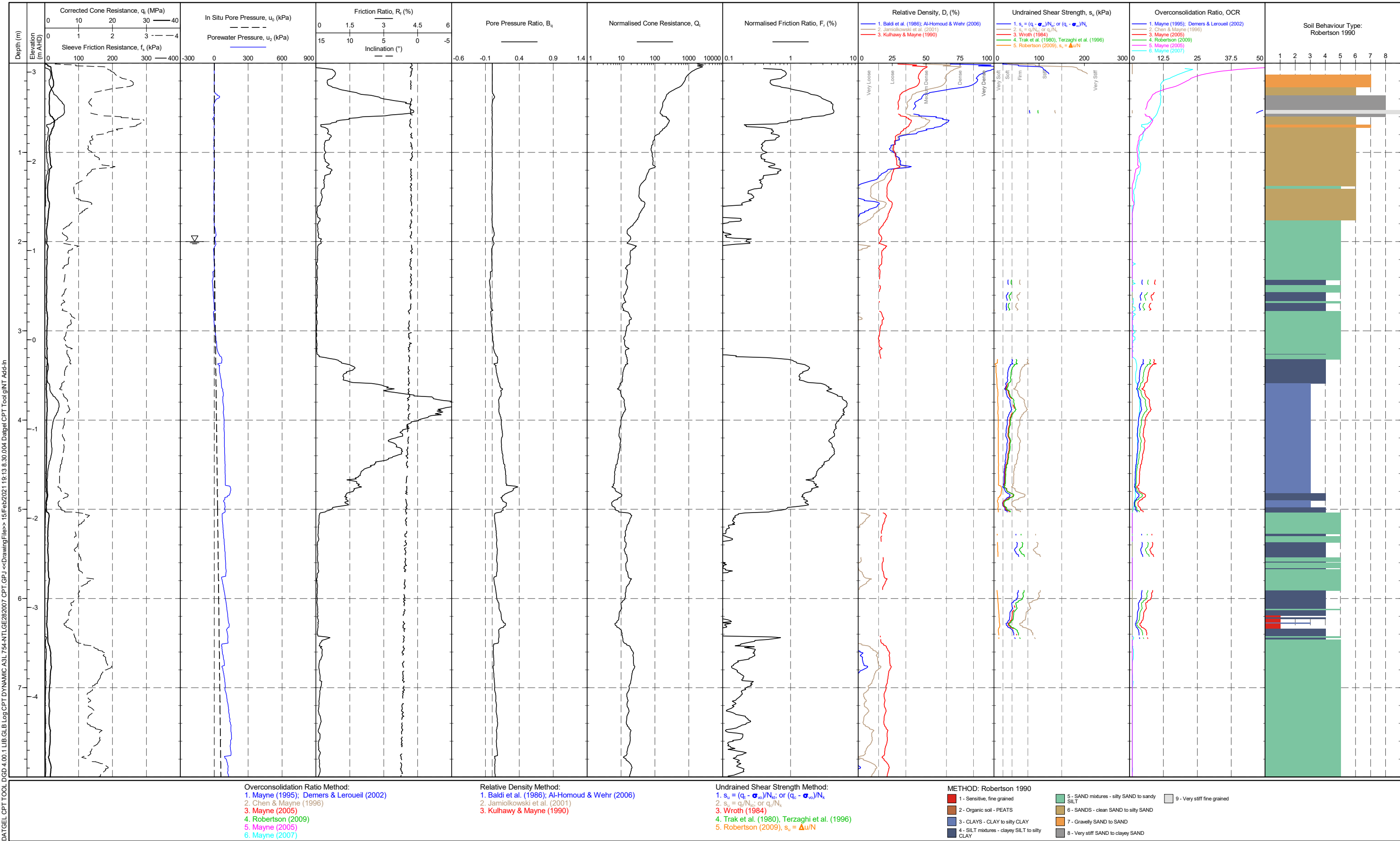
AREA :
EASTING : 384357.0 m
NORTHING : 6355218.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 3.10 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

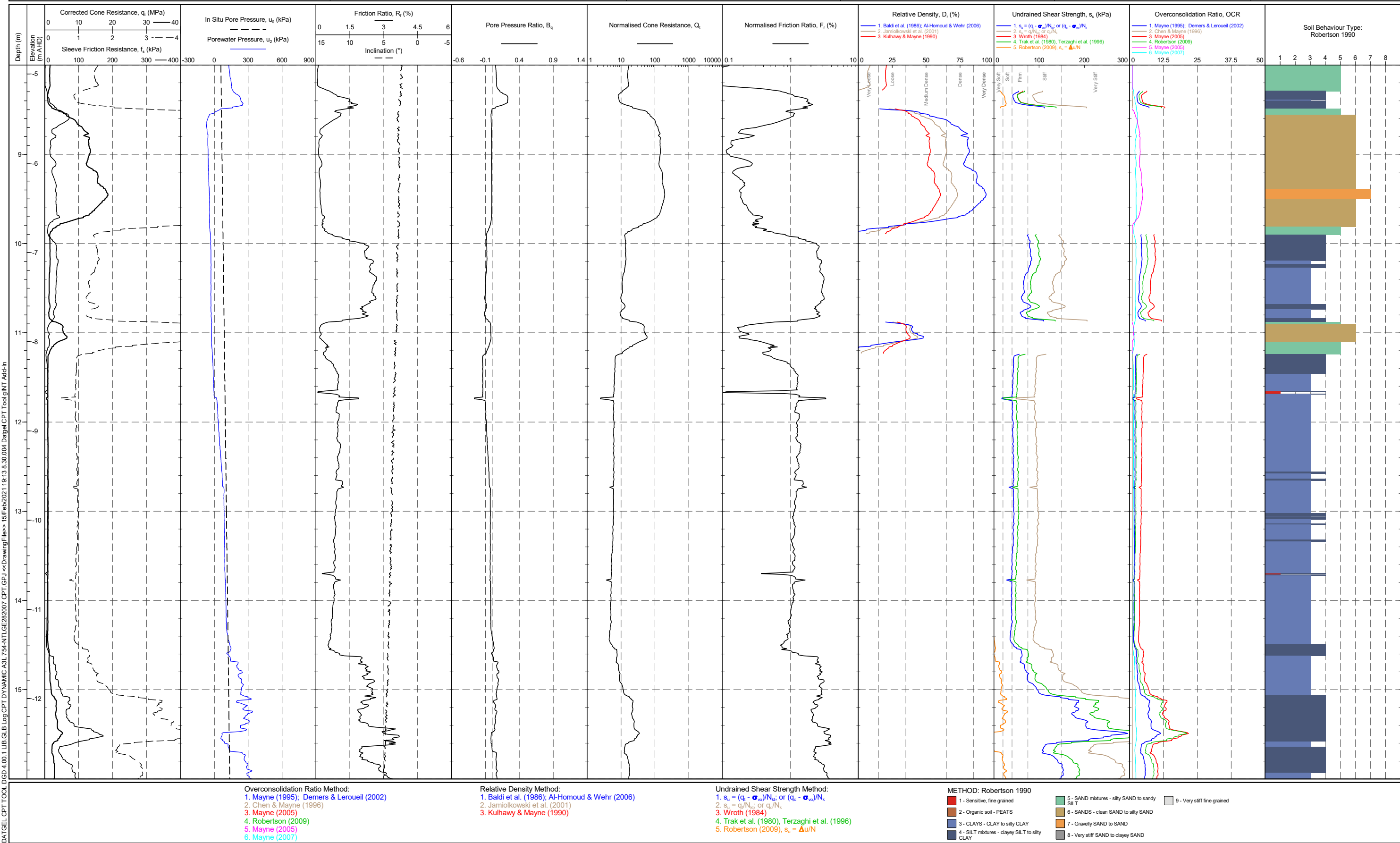
SHEET : 1 OF 4
STATUS :
DATE : 21/01/2021



PointID

CPT05

CLIENT : Newcastle Grammar School	AREA :	RIG : 20T Truck	CHECKED BY :	REMARK	SHEET : 2 OF 4
ENGINEER : IG	EASTING : 384357.0 m	CONE TYPE : PC	CHECKED DATE :		STATUS :
PROJECT : Newcastle Grammar School - Park Campus	NORTHING : 6355218.0 m	CONE ID : C10CFIIP.C19137	APPROVED BY :		DATE : 21/01/2021
LOCATION : 127 Union Street, Cooks Hill	COORD. SYS. : MGA94 Zone 56	OPERATOR : NB	APPROVED DATE :		
PROJECT No. : 754-NTLGE282007	ELEVATION : 3.10 m AHD				



PointID

CPT05

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

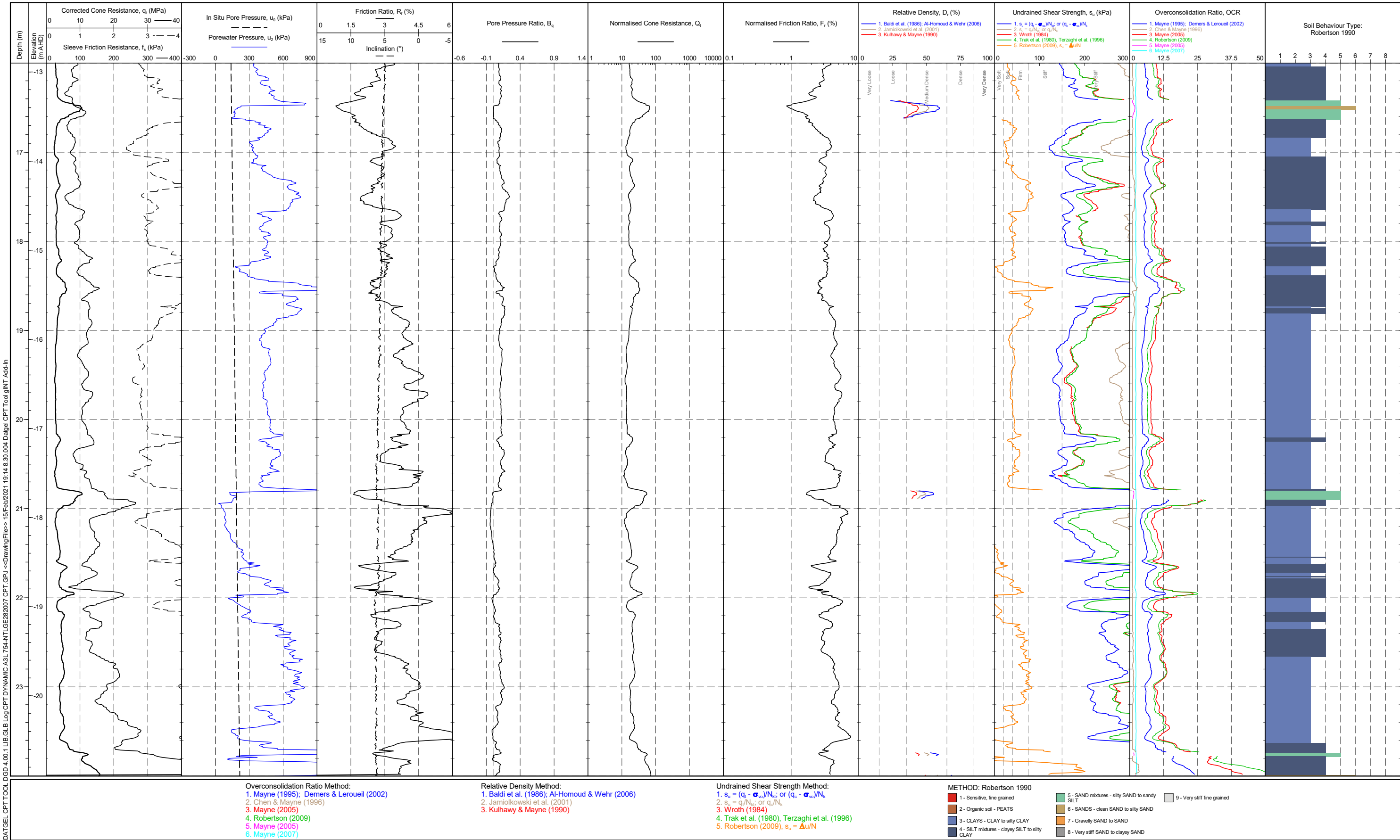
AREA :
EASTING : 384357.0 m
NORTHING : 6355218.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 3.10 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

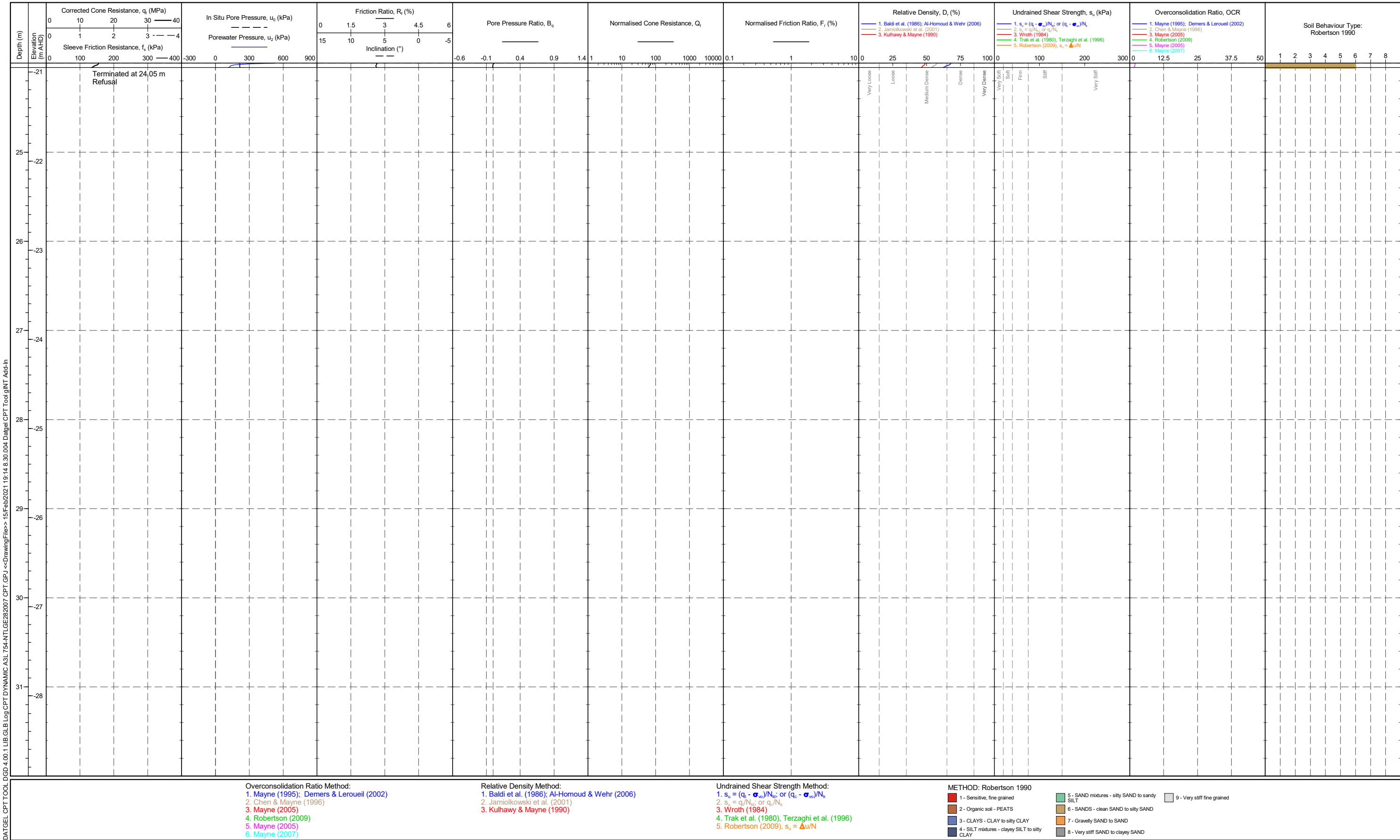
SHEET : 3 OF 4
STATUS :
DATE : 21/01/2021



PointID

CPT05

CLIENT : Newcastle Grammar School	AREA :	RIG : 20T Truck	CHECKED BY :	REMARK	SHEET : 4 OF 4
ENGINEER : IG	EASTING : 384357.0 m	CONE TYPE : PC	CHECKED DATE :		STATUS :
PROJECT : Newcastle Grammar School - Park Campus	NORTHING : 6355218.0 m	CONE ID : C10CFIIP.C19137	APPROVED BY :		DATE : 21/01/2021
LOCATION : 127 Union Street, Cooks Hill	COORD. SYS. : MGA94 Zone 56	OPERATOR : NB	APPROVED DATE :		
PROJECT No. : 754-NTLGE282007	ELEVATION : 3.10 m AHD				



PointID

CPT06

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

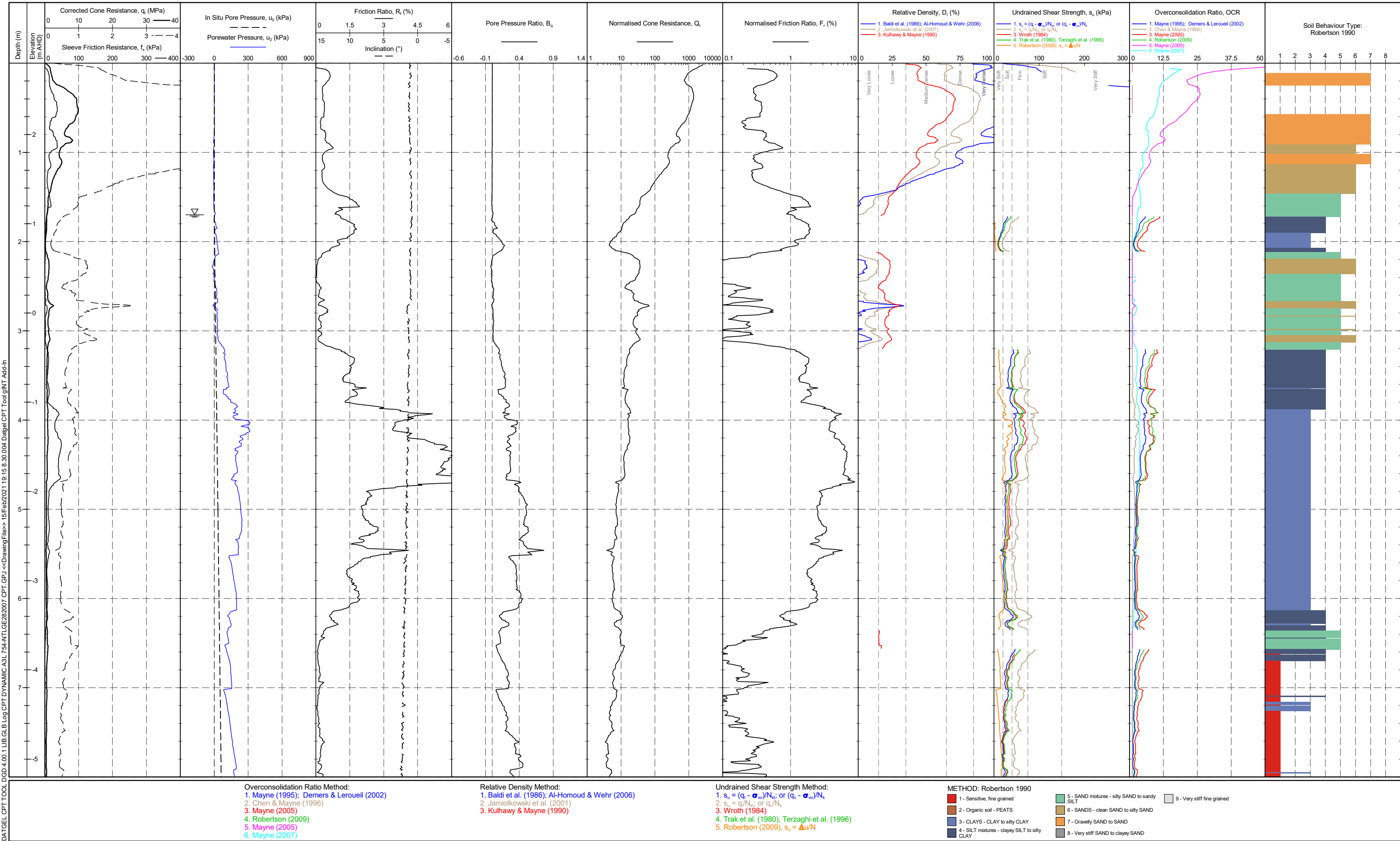
AREA :
EASTING : 384362.0 m
NORTHING : 6355234.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.80 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 1 OF 3
STATUS :
DATE : 21/01/2021



PointID

CPT06

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

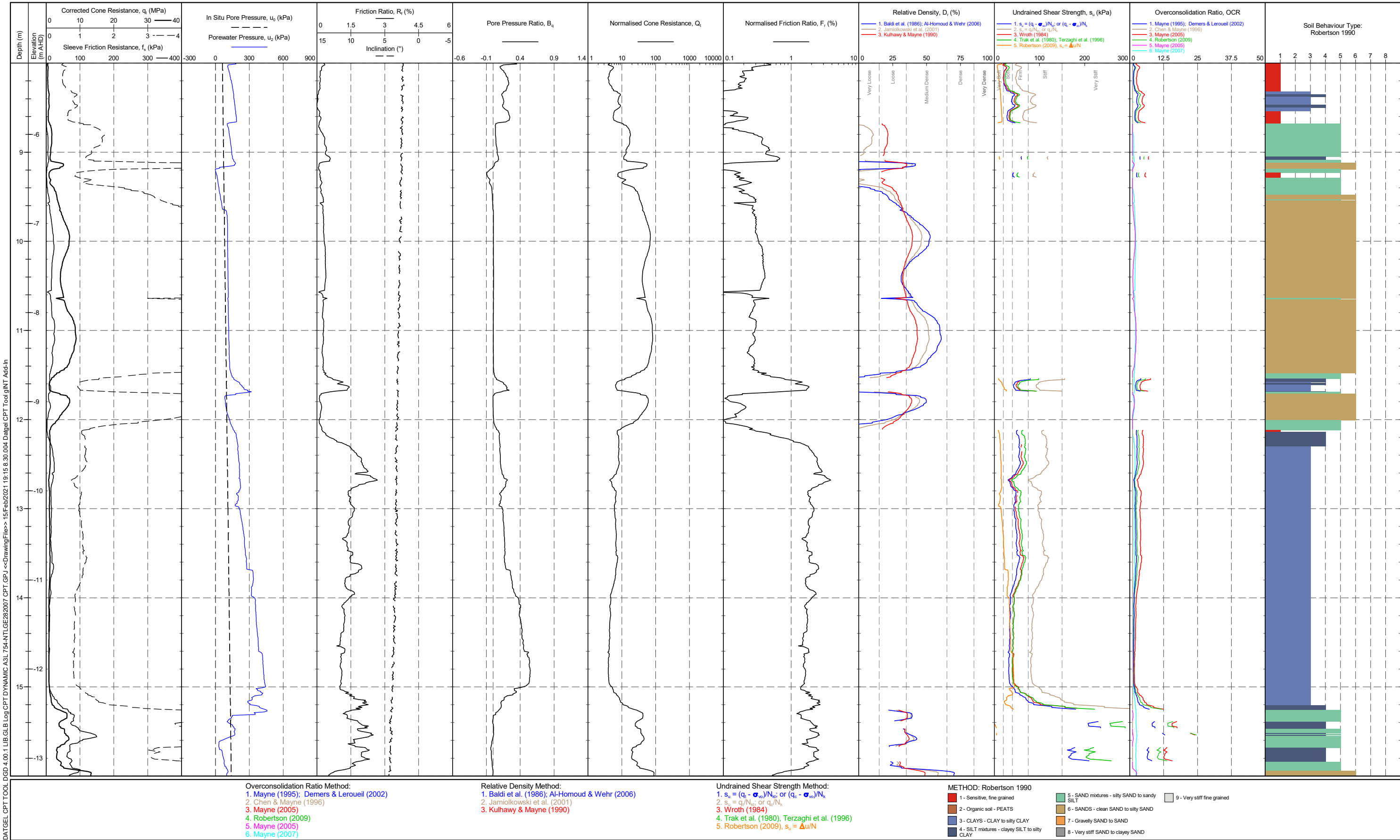
AREA :
EASTING : 384362.0 m
NORTHING : 6355234.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.80 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 2 OF 3
STATUS :
DATE : 21/01/2021



PointID

CPT06

CLIENT : Newcastle Grammar School
ENGINEER : IG
PROJECT : Newcastle Grammar School - Park Campus
LOCATION : 127 Union Street, Cooks Hill
PROJECT No. : 754-NTLGE282007

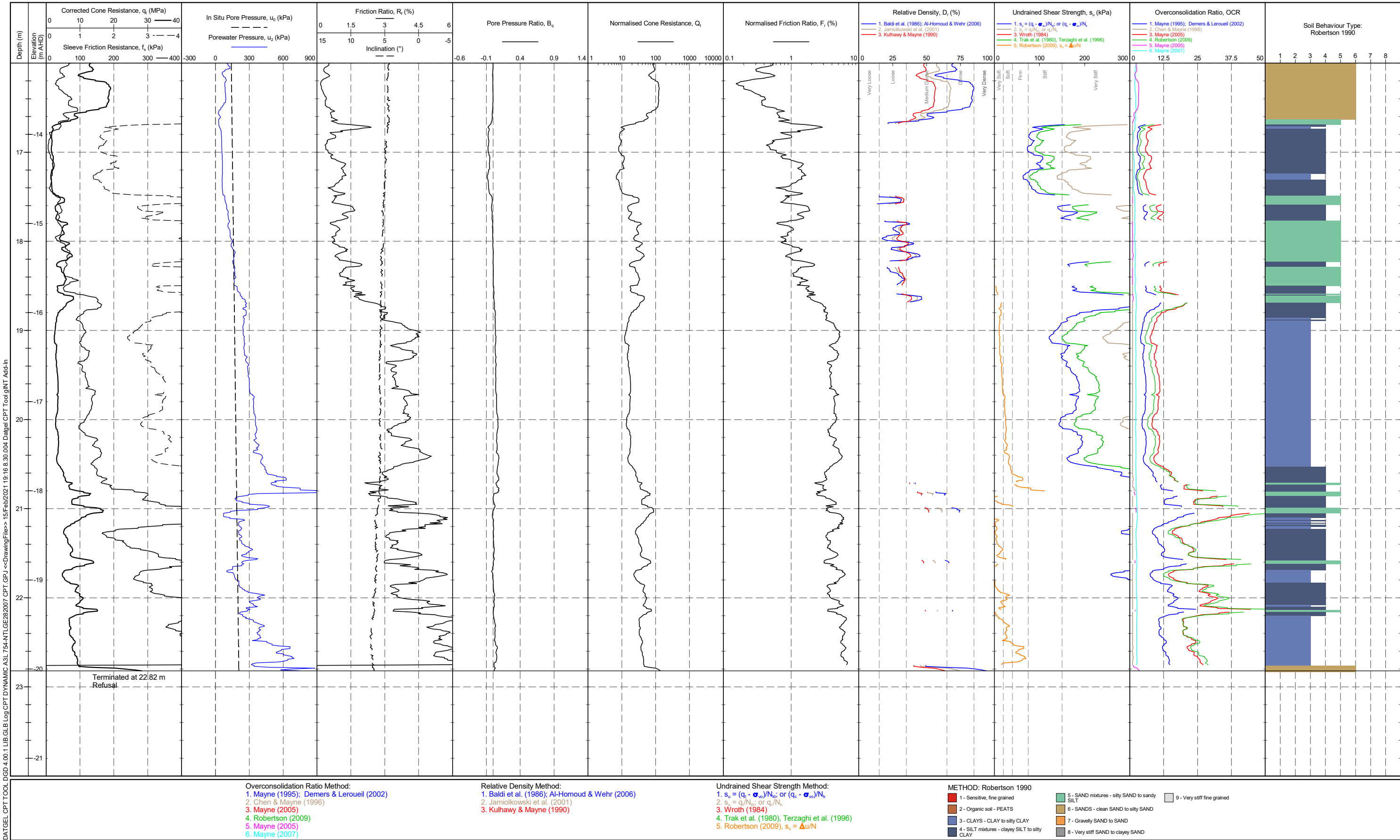
AREA :
EASTING : 384362.0 m
NORTHING : 6355234.0 m
COORD. SYS. : MGA94 Zone 56
ELEVATION : 2.80 m AHD

RIG : 20T Truck
CONE TYPE : PC
CONE ID : C10CFIIP.C19137
OPERATOR : NB

CHECKED BY :
CHECKED DATE :
APPROVED BY :
APPROVED DATE :

REMARK

SHEET : 3 OF 3
STATUS :
DATE : 21/01/2021



Estimated Shear Strength (S_u) of Cohesive Soils versus Depth

