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Our Ref: PSM4693-012L REV5

21 January 2025

Project Lead, Major Projects The Department of Education Level 8, 259 George Street Sydney NSW 2000 Sonia.DaSilva1@det.nsw.edu.au

Attention: Sonia Mallos

Dear Sonia

RE: NEW HIGH SCHOOL FOR SCHOFIELDS AND TALLAWONG GEOTECHNICAL INVESTIGATION

1. Introduction

This geotechnical investigation report has been prepared to support a Review of Environmental Factors (REF) for the NSW Department of Education (DoE) for the construction and operation of the new Schofields - Tallawong High School (the activity).

The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37A of the T&I SEPP.

This document has been prepared in accordance with the relevant aspects of the *Guidelines for Division 5.1 assessments* (the Guidelines) by the Department of Planning, Housing and Infrastructure (DPHI). The purpose of this report is to present the results of the geotechnical investigation undertaken by PSM for The Department of Education (DoE) for the proposed new Schofields - Tallawong High School.

Note, PSM had previously completed a geotechnical investigation for Landcom in 2022 where the proposed Schofields - Tallawong High School boundary is located within the boundary of the previous work, refer to Figure 1 (Ref to PSM4935-006L REV 1, dated 3 November 2022). For completeness, relevant investigation results of the previous investigation are reproduced in this report.

Figure 2 presents the site locality plan of the Schofields - Tallawong High School.

2. Site Description

The site is known as 201 Guntawong Road, Tallawong, NSW, 2762 (the site), and is legally described as part of Lot 1 in Deposited Plan 1283186. The site is located at the corner of Guntawong Road and Clarke Street, Tallawong and is approximately 4 hectares in area. The site has an approximately 100-metre-long frontage to Guntawong Road along its northern boundary. Nirmal Street provides a partial frontage along the eastern boundary of the site with plans to extend Nirmal Street to provide a future connection to Guntawong Road.

The site is predominantly cleared land and consists of grassland with several patches of remnant native vegetation particularly within the northern portion of the site. As a result of precinct wide rezonings, the surrounding locality is currently transitioning from a semi-rural residential area to a highly urbanised area with new low to me-dium density residential development with supporting services. The site is located approximately 1.5km to the north west of Tallawong Metro Station and is also serviced by an existing bus stop along Guntawong Road.

Inset 1 below provides an aerial image of the site.



Inset 1: Aerial Photograph of Site (Source: Urbis, 2024)

3. Proposed Activity Description

The proposed activity is for the construction and operation of a new high school known as Schofields - Tallawong High School. The new high school will accommodate up to 1,000 students. The school will provide 49 permanent teaching spaces (PTS), and 3 support teaching spaces (STS) across three buildings.

The buildings will be three-storey in height and will include teaching spaces, specialist learning hubs, a library, administrative areas and a staff hub. Additional core facilities are also proposed including a standalone school hall, a carpark, a pick up and drop off zone along Nirmal Street, two sports courts and a sports field.

Specifically, the proposal involves the following:

- Three learning hubs (three-storeys in height) accommodating 49 general teaching spaces and 3 support learning units (SLUs).
- Other core facilities including amenities, library, staff hub and administrative areas.
- Standalone school hall.
- Separate carpark with 72 spaces.
- Kiss and drop zone along Nirmal Street.
- Open play space including sports courts and sports field.

• Public domain works.

The proposed site access arrangements are as follows:

- Main pedestrian entrance to be located off Nirmal Street.
- Kiss and drop zone proposed along Nirmal Street.
- Onsite parking access via Nirmal Street.

Inset 2 provides an extract of the proposed site plan.



Inset 2: Proposed Site Plan (Source: djrd Architects, 2024)

4. Site History

4.1 Historical Aerial Photographs

A review of historical aerial photographs from the NSW Government's Historical Imagery database and Nearmap had previously been undertaken to assess the historical land usage of the wider project area. A summary of the historical changes at the site is outlined below:

- 1947: Undeveloped vacant land. Scattered trees and heavy vegetation coverage across site with the outlines of Frist Pounds Creek observed south of The Site.
- 1975: Partial land clearance observed for the site area since 1947 photograph. Small buildings and structures for agricultural use have been constructed in the centre and northeast portions of The Site.

The site environment does not appear to have changed significantly since 1975.

Appendix A presents a compilation of historical aerial photographs between 1947 and 2024 for the previous site area.

5. 2022 Geotechnical Investigation for Landcom

5.1 Fieldwork – 26 to 28 September 2022

The Stage 1 investigation fieldwork was carried out between 26 to 28 September 2022, during which:

- Five (5) boreholes were drilled to depths of between 0.7 m to 7.1 m using a ute mounted rig
- Fifteen (15) testpits were excavated to depths of between 0.65 to 3.0 m using a 5 tonne excavator
- Dynamic Cone Penetrometer (DCP) testings were performed at the majority of the borehole and test pit locations.

Figure 1 presents an overview of the previous project area and the approximate testing locations.

Soil samples collected from the boreholes and testpits were sent to geotechnical laboratories for the following testing:

- 5 x California Bearing Ratio (CBR): Tests were undertaken on 4 day-soaked samples compacted to 98% MDD at OMC, with a 4.5 kg surcharge.
- 4 x Shrink-Swell index tests.
- 4 x Atterberg limit tests.
- 4 x Moisture Content tests.
- 4 x Aggressivity and Salinity tests.

Refer to PSM4693-006L Rev1 for details of the 2022 investigation.

The relevant tabulated borehole and test pit logs, DCP test results, CBR test results, Shrink Swell Index test results, Atterberg Limits Test and moisture content test results and aggressivity and salinity laboratory test certificates from the 2022 investigation are reproduced in Appendices B to G respectively.

6. 2024 Investigation for The Department of Education

6.1 Fieldwork

The fieldwork was undertaken between 2 to 4 October 2024 and included the following:

- Drilling of five (5) boreholes with a 6-tonne truck mounted drilling rig to depths of between 8.66 m and 11.1 m below ground level (mbgl). The holes were advanced using a rotary auger drill with a tungsten carbide (Tc) drill bit in some FILL units and typically with a V-shaped drill bit in soil and some weathered rock units until practical refusal. This was followed with triple tube coring in NMLC size to recover bedrock.
- Piezometers were installed in three (3) boreholes: BH06, BH08 and BH09.
- The full-time supervision of a PSM engineer who undertook the following tasks:
 - Direct the service locating and investigation locations.
 - Take photographs of the recovered rock cores.
 - Perform point load tests on the recovered rock cores.
 - Prepare engineering field logs of the material encountered.

Prior to the investigation, the test locations were checked with service plans from Before You Dig Australia (BYDA) and a certified service locator to detect and ensure they were free of any underground services.

Upon completion of BH05 and BH07, the borehole was reinstated by backfilling with cuttings. The investigation locations were measured with a handheld GPS unit with horizontal accuracy up to \pm 5 m and surveyed with a real time kinematic (RTK) workflow and corrections from the AUSCORS network base with a vertical accuracy up to 50 mm.

Figure 2 presents the approximate borehole locations.

Figures 3 to 8 present some selected site photographs.

Appendix H presents the engineered borehole logs from the 2024 SI.

Appendix I presents the piezometer construction records.

Appendix J presents the point load test results.

7. Site Conditions

7.1 Geological Setting

The 1:100,000 Penrith Geological map (1991) indicates the site is primarily underlain by the Wianamatta Group formation (Bringelly Shale – Rwb) comprising shale, carbonaceous claystone, claystone, laminate, fine to medium-grained litic sandstone, rare coal and tuff.



Inset 3: Geological Map of the Proposed The Site, Site Boundary Marked in Red.

7.2 Surface Conditions

At the time of fieldwork, the site mainly consisted of grassed areas with mature sparse trees, abandoned sheds, stockpiles and dirt access tracks.

The overall site is bounded by residential lots to the North, Guntawong road to the West and open grassed areas to the East and South. The site is generally slopping towards the south-westerly direction.

At the of fieldwork the following observations were made:

- Previous agricultural infrastructure was still present on site consisting of sheds, metal and wooden fences and gates, timber utility poles and localised areas with concrete pavements and bricks (Photos 3 and 4 of Figure 4).
- Stockpile observed near BH05 (Photo 4 of Figure 4).
- Mature sparse trees of approximately up to 15 to 20 m throughout Site, mainly towards the northwestern portion (Photo 4 of Figure 4).

7.3 Subsurface Conditions

The subsurface conditions encountered within this investigation and the relevant 2022 site investigation testing locations are summarised in Table 1. Borehole logs for this investigation are provided in Appendix H. Relevant borehole and test pit tabulated logs, and DCP testing results in the 2022 site investigation are provided in Appendix B and Appendix C

With regards to the sub-surface conditions PSM notes the following:

- EXISTING FILL is localised and highly variable with maximum observed FILL thickness of 1.9 m. It was mainly encountered near the previous agricultural infrastructure consisting of the following:
 - Some areas with concrete pavements up to 200 mm
 - A brick structure with voids was encountered in BH05 up to 1.2 m depth. Similar unexpected finds may be present around this area.
- A deeper soil cover encountered at BH08.
- The Bringelly Shale bedrock units have been classified in accordance with Pells et al. (2019)¹.

Table 1 – Summary of Inferred Subsurface Conditions Encountered in PSM Boreholes and Test Pits

Inferred Unit	Depth to Top of Inferred Unit (m)	Material Description
TOPSOIL	0.0	CLAY to Silty CLAY trace sand and gravel: low to medium plasticity, brown to dark brown; sand fine to coarse grained, gravel fine to medium grained, sub-angular, up to 10 mm; moist (>PL) to wet, very soft to firm consistency; organic odour and rootlets observed.
		SAND with clay and gravel, fine grained, brown and grey; low plasticity; clay low plasticity; gravel fine to medium grained, sub-angular, up to 10 mm; moist, inferred loose density; brick fragments up to 50 mm observed.
	0.1 to 0.2	CLAY trace gravel to Sandy Gravelly CLAY: medium plasticity, red brown to brown; sand fine to coarse grained, gravel fine to coarse grained, sub-rounded to sub-angular, up to 20 mm; moist (<pl), stiff<br="">consistency.</pl),>
		Along/near the existing access track areas:
FILL		Silty Gravelly CLAY; medium plasticity, dark brown; gravel fine to coarse grained, sub-angular, up to 10 mm; moist, stiff consistency, some rootlets.
		Gravelly SAND trace silt: fine grained, dark brown; gravel fine to coarse grained, sub-angular, up to 30 mm; moist, inferred loose to medium dense.
		In some localised areas (near BH05): Concrete slabs up to 200 mm thick and brick structures up to 1.2 m.
		COBBLES comprising of BRICK fragment and VOID, brick structure observed, void existed within the brick structure.
NATURAL SOIL	0.2 - 0.6	CLAY to Gravelly CLAY trace sand: medium to high plasticity, red brown/ brown and pale grey; sand fine to coarse grained; gravel fine to coarse grained, sub-angular to sub-rounded, up to 30mm; dry to moist (<pl), consistency;="" fragments<="" shale="" stiff="" td="" to="" very=""></pl),>

¹ Pells, P.J.N., Mostyn G., Bertuzzi R. and Wong P.K., 2019. Classification of Sandstones and Shales in the Sydney Region: A Forty Year Review. Australian Geomechanics, 54(2), pp. 29-55.

Inferred Unit	Depth to Top of Inferred Unit (m)	Material Description
BEDROCK A – Class IV/V	1.62 – 7.2 [1]	 SHALE: pale to dark grey, yellow brown to red brown, moist to dry, extremely weathered, very low to low strength LAMINITE: dark brown to dark grey and pale grey, poorly to well developed, thinly laminated to laminated, distinct rock fabric, highly to moderately weathered, very low to low to medium strength, some iron staining and clay seams throughout; approximately 80-90% SHALE; dark brown and dark grey and 10-20% SANDSTONE; fine to medium grained, brown and pale grey.
BEDROCK B - Class III	5.4 to 8.7	LAMINITE: dark brown to dark grey and pale grey, well developed, thinly laminated to laminated, distinct rock fabric, moderately weathered to fresh, low to medium strength, with some high strength, some iron staining along defects; approximately 80-90% SHALE; dark brown and dark grey and 10-20% SANDSTONE; fine to medium grained, brown and pale grey.
BEDROCK C – Class II or better	7.0 to 9.8	LAMINITE: dark grey and pale grey, well developed thinly laminated to laminated, distinct rock fabric, slightly weathered to fresh, medium strength with some high strength; approximately 60-90% SHALE: dark grey and brown and 10-40% SANDSTONE; fine to medium grained, pale grey.

¹ Bedrock was not encountered in all boreholes and test pits

² Fill was not encountered in all boreholes and test pits

The thickness of each geological unit encountered in the boreholes and test pits are summarised in Table 2.

Table 2 – Summary of Inf	erred Subsurface Con	ditions Encountered	in PSM Boreholes
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	De	epth / R	L to Top of In	ferred Geolo	ogical Units (Dept	th m BGL/ RI	_ m AHD)
TESTING ID	TODOOU		NATURAL			6	FOU [1]
10	TOPSOIL	FILL	SOIL	А В С		С	EOH
BH05 ^[4]	0 / 44.6	0.1 / 44.5	N.E. ²	2.0 / 42.7	5.4 / 39.2	7.0 / 37.6	8.7 / 36.0
BH06 ^[4]	0 / 44.8	N.E.	0.2 / 44.6	2.1 / 42.7	5.9 / 38.9	7.7 / 37.1	10.6 / 34.2
BH07 ^[4]	0 / 39.7	N.E.	0.2 / 39.5	2.2 / 37.5	5.4 / 34.3	7.7 / 32.0	10.6 / 29.1
BH08 ^[4]	0 / 38.6	N.E.	0.2 / 38.4	7.2 / 31.4	8.7 / 29.9	9.5 / 29.1	11.1 / 27.5
BH09 ^[4]	0 / 41.9	0.2 / 41.7	0.5 / 41.4	1.6 / 40.3	7.4 / 34.5	9.8 / 32.1	10.5 / 31.4
BH_02 ^[5]	0.0	N.E.	0.4	2.3	N.E.	N.E.	3.2
BH_03 ^[5]	0.2	0.0	0.4	N.E.	N.E.	N.E.	3
BH_04 ^[5]	N.E.	0.0	0.25	N.E.	N.E.	N.E.	1.4
TP_01 ^[5]	N.E.	0.0	0.6	N.E.	N.E.	N.E.	3.0
TP_02 ^[5]	0.0	N.E.	0.3	2.8	N.E.	N.E.	3.0
TP_15 ^[5]	0.0	N.E.	0.2	N.E.	N.E.	N.E.	3.0

¹ EOH = End of Hole.

- ² Table is in the format: Depth (metres below ground level) / RL (m AHD).
- ³ N.E. = Not Encountered.
- ⁴ Boreholes undertaken in this 2024 investigation
- ⁵ Boreholes and testpits undertaken in 2022 investigation. The surface RL of testing locations was not measured during the time of investigation.

Table 3 presents the inferred RL to top of BEDROCK units for each proposed building. We note that this is for initial planning and costing purposes and the founding conditions will need to be confirmed based on inspections during piling.

Table 3 – Approximate RL to top of Inferred BEDROCK units for respective buildings

		INFERRED APPROXIMATE RL (m AHD) TO TOP OF BEDROCK UNIT						
Building	Relevant BH (s)	BEDROCK A – SHALE CLASS V/IV	BEDROCK B – SHALE CLASS III	BEDROCK C- SHALE CLASS II or better				
Building A	BH06	42.7	38.9	37.1				
Building B	BH05/BH09	41.5	36.9	34.9				
Building C	BH06/BH07	40.1	36.6	34.6				
Building D	BH09	40.3	34.5	32.1				

7.4 Groundwater

Groundwater was observed in all three piezometers. Table 4 summarises the measured groundwater levels within the constructed piezometers.

Table 4 – Groundwater Levels

Borehole ID	Screened Material	Date of Measurement	Depth to groundwater (m BGL)	Measured groundwater level (RL m AHD)
BH06	NATURAL SOIL & BEDROCK A TO C	3/10/2024	3.5	41.3
BH08	BEDROCK A TO C	4/10/2024	1.0	37.6
BH09	NATURAL SOIL & BEDROCK A TO C	4/10/2024	1.2	40.7

8. Laboratory Testing Results

8.1 CBR Test Results

Table 5 presents a summary of the CBR test results. These test results are included in Appendix D, Table 5.

Table 5 – Summary of PSM CBR Test Results

Borehole ID	Depth (m)	Material Description	Soaked CBR (%)	ОМС (%)	Standard Maximum Dry Density (t/m ³)	Swell (%)	
TP_01	0.9 – 1.2	NATURAL – CLAY trace gravel	1.5 *	19.0	1.64	2.0	
TP_02	0.5 – 0.8	NATURAL – CLAY trace gravel	2.5 *	20.6	1.66	2.0	

Notes: * Indicates Soaked CBR value at 2.5 mm penetration

8.2 Shrink Swell Index Test Results

Table 6 presents a summary of the Shrink Swell index test results. These test results are included in Appendix E.

Table 6 – Summary of Shrink Swell Index Test Results

Borehole ID	Depth (m)	Material Description	Swell on Saturation (%)	Shrinkage (%)	Shrink Swell Index (%/pF)
BH_02	0.5	NATURAL – CLAY with gravel	0.5	3.2	1.90
BH_03	0.5	NATURAL – Sandy CLAY trace gravel	0.0	2.2	1.20
BH_04	0.5	NATURAL – CLAY trace gravel	1.9	4.8	3.21

8.3 Atterberg Limit Test and Moisture Content Test Results

Table 7 presents a summary of the Atterberg limit test results and moisture content test results. These test results are included in Appendix F.

Table 7 - Summary of Atterberg Limit Test Results and Moisture Content Test Result
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Borehole ID	Depth (m)	Material Description	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Linear Shrinkage (%)
TP_02	0.9	NATURAL – CLAY trace gravel	22.7	39	14	25	9.5
TP_03	0.5	NATURAL – CLAY trace gravel	22.7	52	15	37	14

8.4 Aggressivity and Salinity Test Results

Table 8 presents a summary of the analytical laboratory testing results. All completed tests from the previous SI were provided for a wider array of data and to mitigate any effects of outliers. Detailed results are provided in Appendix G.

Table 8 – Summary	of A	nalytical	PSM I	Laboratory	/ Test	Results
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Borehole ID – Depth	Motorial Description		Moisture	Chloride by	Soluble	Electrical	Resistivity	E	xchar [r	igeable neq/10	e Cati 0g]	ons	ESP
	Material Description	рн	[%]	Analyser [mg/kg]	[mg/kg]	[µS/cm]	ohm.cm	Ca	Mg	к	Na	CEC	[%]
BH_04 – 0.25 m	NATURAL – CLAY trace gravel	6.0	18.1	220	70	142	2170	2.1	6.2	0.4	1.4	10.1	14.0
TP_06 – 0.5 m	NATURAL – CLAY trace gravel	5.2	20.8	30	50	42	5020	0.7	3.7	0.4	0.5	7.3	9.9
BH_01 – 3.0 m	NATURAL – CLAY trace gravel	8.8	17.0	250	100	280	880	0.4	6.9	<0.2	3.6	11.1	32.6
TP_08 – 0.5 m	NATURAL – CLAY trace gravel	5.4	17.4	30	80	67	3730	0.4	6.4	0.3	1.2	9.0	14.4

9. Salinity and Aggressivity Assessment

9.1 Soil Chemistry

The salinity and aggressivity test results summarised in Table 8 indicate the following:

- pH of the soil samples analysed to be in the range of 5.2 to 8.8
- Concentrations of chlorides in samples analysed to be in the range of 30 mg/kg to 250 mg/kg
- Concentrations of sulphates in samples analysed to be in the range of 50 mg/kg to 100 mg/kg
- The 1:5 soil to water extraction and subsequent electrical conductivity (EC1:5) of the soil samples analysed to be in the range of 42 µS/cm to 280 µS/cm.

9.2 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (ECe) as per Richards (1954). The method of conversion from EC1:5 to ECe (electrical conductivity of saturated extract) is based on DLWC (2002) and given by ECe = EC1:5 x M, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested has been assessed as "Medium clay" or "Heavy clay" with a corresponding M of 7 or 6 respectively. The salinity classification for the soil samples that were tested is presented in Table 9.

Sample ID & Depth	EC _{1:5} (dS/m)	Soil Type	м	EC _e (dS/m)	Salinity Class
BH_04 – 0.25 m	0.142	Heavy clay	6	0.852	Non-saline
TP_06 – 0.5 m	0.042	Heavy clay	6	0.252	Non-saline
BH_01 – 3.0 m	0.280	Medium clay	7	1.960	Non-saline
TP_08 – 0.5 m	0.067	Heavy clay	6	0.402	Non-saline

Table 9 – Salinity Classification

It is assessed that soils tested on site are classified as "Non-Saline".

Table 4.8.2 of Australian Standard AS3600-2009 "Concrete Structures" provides an exposure classification for concrete structures in saline soils based on soil electrical conductivity (EC_e). We assess the exposure classification for this site is "A2".

9.3 Aggressivity / Corrosivity

Table 4.8.1 of Australian Standard AS 3600 (2018) Concrete Structures provides criteria for exposure classification for concrete in sulphate soils based on sulphate content and acidity in the soil and groundwater. Based on the laboratory results of the soil testing completed, we assess the exposure classification for concrete in the soil to be "A2".

Table 6.4.2(C) of Australian Standard AS 2159 (2009) "Piling Design and Installation" provides criteria for exposure classification for concrete piles based on sulphates in the soil and groundwater, soil and groundwater pH, and chlorides in groundwater. Based on laboratory results of the soil testing completed and previous testing, we assess the exposure classification for concrete piles in the soil to be "Non-aggressive" to "Mild".

Table 6.5.2(C) of Australian Standard AS 2159 (2009) "Piling – Design and Installation" provides criteria for exposure classification for steel piles based on soil and groundwater pH, chlorides in soil and groundwater and resistivity. Based on laboratory results of the soil testing completed and previous testing, we assess the exposure classification for steel piles in the soil to be "Non-aggressive" to "Moderately aggressive".

9.4 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink / swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from the laboratory results was compared to the criteria provided in "Site Investigations for Urban Salinity", DLWC (2002). In the inferred NATURAL SOIL unit, the laboratory testing shows ESP ranges from 9.9% to 32.6%, indicating that the NATURAL SOIL on the site is classified as "sodic" to "highly sodic", as per DLWC (2002).

10. Geotechnical Design Advice

10.1 General

We note that details of the proposed earthworks (e.g., depth of fill) are not known to PSM. The design advice provided in the following sections has been prepared on the following basis:

- The subsurface conditions are as described in Section 7.3.
- The earthworks are to be completed in accordance with the PSM DRAFT bulk earthworks specification (**the Specification**) (ref. PSM4693-013S DRAFT) or an approved equivalent. We note that local Council may have its own earthworks specification. When completing the subdivisional works, the contractor shall consider these requirements as additional to the ones in the Specification. Where opposing requirements are present further advice should be sought.

10.2 Excavation Conditions

Excavation of the TOPSOIL, EXISTING FILL, NATURAL SOIL and BEDROCK units should be achievable using conventional earth moving equipment with some rock breaking using rippers or impact hammers possibly required in the BEDROCK unit.

Prospective contractors should make their own assessment of excavatability based on the borehole and test pit logs and their site inspection and experience. It is our experience that excavatability is heavily dependent on both the operator and the plant used. Any contractor should satisfy itself regarding excavatability, especially in the BEDROCK units.

We note the presence of concrete slabs and the possibility of unexpected finds e.g. brick structure. around the previous agricultural infrastructure.

Please note that during our geotechnical investigation the 6-tonne truck mounted drill rig encountered practical refusal while augering with a V-bit in four boreholes.

Rock breaking equipment will generate vibrations that may impact on neighbouring structures. Where controls on vibrations are required, the contractor should consider the use of smaller hammers, rock saws and grinders to undertake the excavation.

10.3 Groundwater

Where excavations deeper than 1 m are proposed these may encounter perched water/groundwater.

We expect that seepage is likely to occur through joints/defects in the bedrock during excavation. Further, inflow may occur through the soil units in transient conditions. Based on our experience with projects in a similar geological environment such seepage should be able to be controllable during construction by conventional sump and pump systems.

Should higher localised inflows be encountered localised grouting can be undertaken to reduce the inflows.

In the permanent condition, typically basements these units will be designed as drained structures (if permitted by the relevant authorities).

Should a drained basement be adopted, provision will need to be made for permanent and effective drainage. Such permanent drainage systems will need to be able to be maintained throughout the life of the structures and thus allow for access to flushing to remove chemical deposits that may build up over time or include redundancy in the system to allow for possible reduction in capacity in the future.

Details of the drainage system are a matter of design but would typically include a sub-floor drainage blanket with slotted drainage pipes within drainage aggregate, plus strip drains behind the shotcreted / concreted walls (or a plenum space between the rock face and an internal dry-wall where shotcrete is not required), and sump and pump system with the ability to effectively back flush the system for long-term maintenance. The BEDROCK units may degrade with time if left exposed with ongoing groundwater seepage. It is recommended that shotcrete facing be provided to protect against degradation.

Disposal of water from the sumps, during construction and particularly in the permanent condition, into the stormwater or sewer system may be possible but will be subject to regulatory approvals and sediment controls. These should be negotiated with the relevant authorities (e.g., council, Sydney Water, NSW Office of Water). Particularly for permanently drained structures we note the requirements of the NSW Aquifer Interference Policy apply, as a drained basement will permanently affect the groundwater levels at the site and surrounding area.

We note that groundwater drawdown can result in settlement of soft and firm ground. Given the current elevation of the water table and the stiffness of the ground, we consider that the effects of drawdown on neighbouring structures would be negligible.

Alternatively, a tanked basement can be adopted. Where a tanked basement is proposed, the retaining walls and floor slabs will need to be designed to resist full hydrostatic pressures. Uplift pressures on the slab and building may require tension piles or anchors to resist the loads.

Should a drained basement be adopted, we recommend prior to excavation, we will return to site to install hobo data loggers (which record daily groundwater levels) in the existing piezometers near the proposed basement footprint to enable continuous long-term groundwater monitoring. This will assist in the confirmation of design groundwater levels and inform long-term inflows. The groundwater monitoring results will be collected from the hobo data loggers after 3-6 months of being installed.

10.4 Site Classification (AS2870)

We note that the proposed high school (multi storey buildings) is outside the scope of AS2870-2011 "Residential slabs and footings". Nevertheless we provide the following advice regarding site classification:

- 1. In cut areas within the NATURAL SOIL unit, structures that are within the scope of AS2870-2011 be designed for a site classification of Class "H1" with the characteristic surface movement, ys, in the range 40 mm to 60 mm in accordance with Table 2.1 of AS2870-2011 following reclassification.
- 2. In fill areas, further assessment of the site classification would be required and will depend on the fill materials, depth of fill and the manner in which it was placed.
 - a. Where existing fill is present and there is no earthworks documentation (records), the fill cannot be considered as "controlled fill" and thus the site is classified as Class "P" in accordance with AS2870-2011. Further detailed investigation and assessment should be undertaken to allow for reclassification. Alternatively, Fill encountered on site can be removed and replaced as part of the bulk earthworks. Following removal, structures that are within the scope of AS2870-2011 be designed for a site classification of Class "H1" in accordance with Table 2.1 of AS2870-2011 following reclassification.
 - b. Where new fill will be placed in accordance with PSM bulk earthworks specification or an approved equivalent, the site can be reclassified from Class "P" to Class "H1"., provided the fill is placed in accordance with PSM bulk earthworks specification or an approved equivalent.

Should a 300mm inert material be placed as Engineering FILL forming t the surface of the landform, this would reduce the reactivity and a Class "M" classification can be adopted. Typical inert material comprises sandstone fill, that is fill won from excavations in slightly weathered and fresh sandstone.

The dwelling and surrounds should be maintained in accordance with the recommendations in AS2870-2011 as reflected in CSIRO Information Sheet BTF18 titled "Foundation Maintenance and Footing Performance: A Homeowners Guide" (i.e. CSIRO Information Sheet).

10.5 Earthquake Site Classification

Throughout the Site, the depth to the top of BEDROCK varies from 1.6 to 7.2 m. We note, the proposed pad levels (bulk earthworks levels) of the Site is currently unknown.

In accordance with Clause 4.1 of AS1170.4-2007 (Earthquake actions in Australia):

- Where the depth to BEDROCK is:
 - Less than 3 m, a site can be classified as a Class B_e (rock) site and
 - Between 3 and 20 m, a site can be classified as a Class C_e (shallow soil) site.

There is generally a deeper soil profile around the vicinity of BH08.

Based on the BEDROCK levels, we note that the buildings could span multiple classifications. We note that for some structures a B_e classification can be more adverse than a C_e classification and given that particular regions of the Site are in between the boundary of both classifications, the designer should satisfy itself that its design is suitable for the borderline classification.

10.6 Foundations

10.6.1 Shallow Foundations

It is expected that the part of foundations used for the proposed high school at the sites would typically include strip, pad, or other shallow footings.

Pad footings can be proportioned on the basis of an allowable bearing pressure (ABP) for centric vertical loads provided in Table 10. Further advice should be sought if the footings are located adjacent to a batter or wall.

We note that an allowable bearing pressure (ABP) is not a soil property. It depends on many factors such as the size of the footings, the embedment depth, the load direction and eccentricity, the stiffness of the footing, the adopted factor of safety (FOS), as well as the soil properties. As footings get bigger or deeper the capacity increases rapidly, and as the load gains eccentricity or becomes inclined, the capacity reduces rapidly.

Settlements in the NATURAL SOIL unit can be estimated using the elastic moduli provided in Table 10.

When assessing the settlement of the shallow footings, the designer needs to consider the additional ground settlement due to the total building load on both shallow and deeper units. The differential settlement due to the building load shall also be assessed.

Foundation conditions at the proposed shallow pad footing locations should be inspected by a suitably qualified geotechnical engineer prior to the pouring of concrete.

Table 10 – Foundation Parameters of Inferred Geotechnical Units

	Bulk Unit	So Effeo Strei Param	oil ctive ngth neters	Ultimate Bearing Pressure	Allowable Bearing Pressure	Ultimate Allowable Shaft Shaft		Elastic Parameters		'S
inferred Unit	Weight (kN/m ³)	c' (kPa)	<i>φ</i> ' (deg)	under Vertical Centric Loading (kPa) (ABP) under Vertical Centric Loading (kPa) (ABP) under Vertical Centric Loading (kPa)		Adhesion (kPa)	Long Term Youngs Modulus (MPa)	Long Term Shear Modulus (MPa)	Poisson's Ratio	
ENGINEERED FILL / NATURAL SOIL	18	0	30	420	100 [1]	20 ^[6]	10 ^[6]	10	3	0.3
BEDROCK A – Class IV/V	22	5	30	3,000 [2]	700 [3]	50 ^{[4][5]}	25 ^{[4][5]}	100	40	0.25
BEDROCK B – Class III	24	150	30	6,000 ^[2]	2,000 ^[3]	350 [4][5]	175 [4][5]	300	125	0.2
BEDROCK C – Class II	24	250	35	10,500 [2]	3,500 ^[3]	600 [4][5]	300 [4][5]	700	290	0.2

Pad footings (for ABP of 100 kPa) should have a minimum horizontal dimension of 0.5 m and a minimum embedment depth of 0.5 m

² Ultimate values occur at large settlement (>5% of minimum footing dimensions)

³ ABP is an end bearing pressure to cause settlement of <1% of minimum footing dimensions

⁴ Clean socket of roughness category R2 or better.

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⁵ Ultimate and allowable shaft adhesion values applied for piles in tension and compression

⁶ Ultimate and allowable shaft adhesion values applied for piles in compression, and no shaft adhesion for piles in tension.

10.6.2 Piled Foundation

Piled foundations should be founded within the BEDROCK units.

Piles should be designed in accordance with the requirements in AS 2159 (2009), *Piling – Design and Installation*. Selection of the pile system depends on many considerations and should be undertaken by the designer in conjunction with the Principal and contractor/builder. The parameters provided in Table 10 may be adopted in the design of piles founded in the BEDROCK units.

The foundation designer should note the following with regards to the pile design:

- The ABP needs to be confirmed by a geotechnical engineer during a pile inspection
- Under permanent load, the contribution of side adhesion for soils including soil units should be ignored
- Pile settlement needs to be checked using the recommended elastic parameters in Table 10.

The bearing capacities provided are contingent on piles or footings being vertically and centrally loaded. Further advice should be sought if the footings are not vertically and centrically loaded. Should higher bearing capacities be required in Table 10, further advice should be sought from PSM. The bearing capacity in the Bedrock unit is expected to increase with depth.

Where piles are proposed near vertical excavations the ultimate and allowable bearing capacities will be significantly reduced and further particular advice should be sought.

With regards to the pile design, we recommend that:

- A geotechnical strength reduction factor, $\phi_g = 0.60$ (AS2159-2009 CL 4.3.2) be adopted for a high redundancy for an assessed average risk rating (ARR) of 3.0. This should be reviewed to suit the specific design and construction methods proposed by the structural designers.
- It may be possible to increase the pile reduction factors, if the details of the proposed pile installation procedures indicate a high level of quality control with regards to concrete placement, base cleanliness, etc.
- A geotechnical strength reduction factor $\phi_g = 0.40$ is adopted from then no pile testing will be required (AS2159-2009 CL 8.2.4 (b)).

Where the pile is sized using the allowable bearing capacity in Table 10 (i.e., assuming all serviceability load is carried by the base), the settlement would be expected to be less than 1% of the pile diameter plus elastic shortening of the pile itself.

Although the building loads are not given, we expect the piles to be founded at least in Class III BEDROCK. For initial sizing, we recommend that Class III be assumed to occur below the top of Class III levels presented in Table 3 for each building.

Further advice should be sought if piles are to be founded within a unit other than BEDROCK.

Piling is likely to extend below the groundwater table. This should be considered when making decisions regarding the piling methodology to adopt.

10.7 Permanent and Temporary Slopes

The batter slope angles shown in Table 11 are recommended for the design of batters up to 3 m height and above the groundwater table, subject to the following recommendations:

- 1. The batters shall be protected from erosion.
- 2. Permanent batters shall be drained.
- 3. Temporary batters shall not be left unsupported for more than 1 month without further advice, and inspection by a geotechnical engineer should be undertaken following significant rain events.
- 4. Where loads are imposed or structures/services are located within on batter height of the crest of the batter, further advice should be sought.

Steeper batters may be possible subject to further advice, typically including inspection during construction.

Where Fill is not engineered/controlled fill, batter slope angles should be assessed by a geotechnical engineer.

Table 11 – Design Batter Slope Angles

Unit	Temporary	Permanent
SOIL UNITS, e.g., ENGINEEERED FILL, NATURAL SOIL	2H : 1V	2.5H : 1V
BEDROCK A TO C	1H : 1V	1.5H : 1V

10.8 Slabs

The design of slabs on ground can be based on a subgrade with a long-term Young's Modulus (E) presented in Table 10.

We note that the environmental effects (e.g. drying or wetting up of the finished surface) affecting the land prior to the proposed high school works should be taken into account by the various designers of the proposed high school.

The civil and structural engineers should consider likely heave / settlement due to the effect of climatic factors in their designs.

For Class "H1" areas we assess that, for the natural site, cut and fill placed in accordance with the Specification, the characteristic surface movement, y_s , would be in the range 40 mm to 60 mm.

We recommend that all structures and services be detailed such that they preclude any local wetting up or drying out of the subgrade after initial equilibrium is reached following construction of the slab and that the subgrade be within specification at the time of construction of the slab. We note that normal mounding or sagging away from the perimeter of covered areas will still occur and perimeters, or open joints, will still respond to environmental changes.

For effectively sealed areas away from the perimeter, the design should allow for the following:

- Differential mound movement, $y_m = 0.35y_s$ (e.g., 14mm to 20 mm for Class H1). We note that this is not the total heave or settlement but the estimated local heave or settlement due to fill variability.
- Local tilts of up to approximately 1 in 400.

Mounds at perimeters or penetrations of slabs open to the environment can be taken to be as per AS2870-2011 for y_s stated above.

Further mitigation of these movements can include construction of an external pavement around the perimeter of the warehouse, a cut off wall and/ or placement of at least 0.3 m of well compacted non-reactive fill material such as Sandstone Fill.

We note that desiccation and/or wetting up of the pad surface is possible should it be exposed to the elements for an extended period of time, particularly at completion of the bulk earthworks prior to the builder taking responsibility for the pad. To reduce the likelihood of this and preserve the pad condition we recommend the following should be:

- Placement of a sacrificial layer comprising road base or other equivalent material
- Grade the pad surface to reduce the extent and severity of standing water during and after weather events
- Minimise the time between the completion of earthworks and the builder commencing construction of the building.

Where suspended slabs are proposed, and the Designer would like to isolate the suspended ground slab from reactive soil movement a void former between the slab and the ground could be adopted. In assessing the thickness of void former, the designer shall consider the advice regarding site classification and design slab on ground for reactivity in this section.

10.9 Pavements

Subgrade CBR for pavement design depends on the material at the finished subgrade levels. The CBR tests undertaken by PSM (refer to Table 5) indicate a CBR value between 1.5% and 2.5%.

A CBR of 2.0% can be adopted for subgrade and fill formed in bulk earthworks constructed in accordance with the Specification.

Subgrade CBR for pavement design depends on the material at the finished subgrade levels.

We recommend that specific CBR testing be undertaken at subgrade level when pavement layouts are finalised. CBR testing shall be undertaken for any new imported material within the pavement subgrade (e.g., within 1 m below pavement).

10.10 Excavation Support and Retaining Walls

Permanent cuts in the units steeper than the recommended permanent slopes in Section 10.7 will need to be supported by some form of retaining structure.

The selection of the appropriate retaining wall is a matter of design. The designer should consider the following factors in making its selection:

- Technical factors:
 - Performance
 - Ground conditions (this is addressed with the design parameters)
 - Groundwater
 - Surcharge loading and
 - The proximity of structures, buildings, roads, etc.
- Non-technical factors:
 - Cost (to build and to maintain)
 - Other constraints such as real estate, neighbouring site/boundary, aesthetics, legislation, etc.

The design of these structures should be based on the following:

- Proposed wall geometry.
- Effective strength parameters in Table 10 when assessing the earth pressure on retaining structures
- Lateral earth pressures of soil units, and a lateral pressure of 10 kPa for vertical cuts in the BEDROCK units. This is to allow for blocks and rock wedges formed due to adverse defects that may exist within the units.
- Surcharge loads behind retention.
- Water pressure (depending on the type of structure).

Further we note that the advice given in this report is in terms of working pressures and actions, and the designer needs to apply appropriate load and strength reduction factors, etc., in its design.

Note that the design of the retaining wall may be based either K_a or K_0 earth pressures for soil units where the design earth pressure coefficients are summarised in Table 12. Design using active earth pressures provides the minimum lateral earth pressure that must be supported to avoid failure and requires a wall that can rotate or translate to allow the pressures to reduce to these values (vertical and lateral movements up to 2% of height may occur, typical movements will be much less).

Where the design is based on K_0 earth pressures, construction should be carefully controlled to avoid unwanted effects. It should be noted that designing for K_0 pressures does not ensure that movement does not occur. Movements are controlled by the construction method, especially sequence.

Table 12 – Design Batter Slope Angles

Inferred Unit	Bulk Unit Weight (kN/m³)	Poisson's Ratio	Lateral Earth Pressure Coefficient at Rest K ₀	Active Lateral Earth Pressure Coefficient K _a	Passive Lateral Earth Pressure Coefficient K _p
ENGINEERED FILL / NATURAL SOIL	18	0.3	0.5	0.33	3

Both surface and sub-surface drainage need to be designed and constructed properly to prevent pore water pressures from building up behind the retaining walls or appropriate water pressures must be included in the design.

Where basement deeper than a single level is proposed within the BEDROCK unit further advice should be sought.

11. Potential Geotechnical Risks

11.1 Buried Structures

As discussed, it was observed from historical imageries and site investigations that in the north-east and central portion of the site, there are buildings and structures for agricultural use. It is thus likely that the following structures are still present below ground:

- Structure foundations including concrete slabs on ground, concrete footings. It is PSM opinion that these structures present risks to the proposed high school works including:
 - Risk of "hard spots" resulting in differential settlements of overlying structures. If the feature is
 not removed, this risk can be mitigated by minimum cover over such features. Specific advice
 should be sought. In our experience minimum covers of 0.8 m are required to mitigate their
 effect on overlying structures.
 - Construction risks with regards to installation of new services, shallow footings and pile foundations. That is these could present as obstructions particularly to piles.
 - Concrete slabs also reduce the ability of the underlying materials to be assessed as part of the site preparation works.
- Decommissioned services. A number of services including pipes varying dimensions are likely to be
 present within the site. These present a low risk for future settlement caused by future collapse of
 the pipes, poor backfilling of pipe trenches and pits and preferential/uncontrolled transmittal of water.
 Review of historical photos, and subgrade preparation in accordance with the DRAFT Specification
 can mitigate these risks to where they are acceptable. Water carrying services not intended to be
 used will need to be decommissioned either by removal or grouting. Grouting is recommended where
 these are located more than 2.0 m down and more likely to intersect groundwater.

When selecting appropriate foundation systems particular consideration shall be given to the possible presence of such buried structures.

It should be noted that quantifying possible buried structures is difficult to achieve prior to the proposed high school works and intensive investigations may be required. The site preparation will need to address the possible presence of buried slabs, footings, and services associated with historical land use. The majority of this work is typically undertaken as part of the demolition stage prior to the site preparation and earthworks stage.

Where footings or services are removed careful attention shall be given to limit the amount of ground that is disturbed and backfill the void in accordance with the Specification adjusted for the use of smaller compaction

equipment. It would be prudent to backfill using material less susceptible to water and that can be compacted with smaller equipment. Sandstone VENM, recycled concrete and to a lesser extent fresh shale VENM would be ideal materials for completing this detailed backfilling."

11.2 Variable Depths to Top of BEDROCK units

The investigation result of the Site shows variable depths to the top of BEDROCK units. The range of depths to the top of BEDROCK units from the surface level is summarised:

- BEDROCK A (Class IV/V) 1.6 m to 7.2 m
- BEDROCK B (Class III) 5.4 m to 8.7 m
- BEDROCK C (Class II or better) 7.0 to 9.8m.

The designer should recognise this degree of variability in the planning, costing and design phases. The founding conditions will need to be confirmed based on inspections during piling.

11.3 Localised Existing FILL

Existing FILL as uncontrolled FILL was observed to be highly localised and variable across the site with maximum depth of 2.0m. The existing FILL will need to be addressed as part of the subgrade preparation works. The PSM DRAFT Earthwork Specification PSM4693-013S provides an approach to the treatment of existing FILL in the subgrade.

11.4 Trafficability

The natural clay is observed to have poor trafficability during and following periods of wet weather. Track mounted plant would be expected to be able to traffic the site under most conditions. Should large pilling rigs be proposed, these would need specific assessment depending on the plant type, track geometries and required bearing capacities. It is possible that in some areas, a working platform may be required to provide consistent all weather accessible surface. For initial planning and estimating purposes a working platform comprising 100mm to 300mm of Sandstone FILL should be allowed for. Tyred vehicles and dump trucks would likely need designated routes with temporary all weathered haul roads.

12. Mitigation Measures

Table 13 summarises the mitigation measures to be implemented for the activity.

Table 13 - Mitigation Measures

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
1. Buried Structures	Before / during construction	Site preparation and associated earthworks works shall be undertaken in accordance with PSM in accordance with PSM DRAFT Earthwork Specification PSM4693-013S. For more details, please refer to Section 11.1 of this report.	Reduce uncertainties during site preparation and construction risk.
2. Variable Depths to Top of BEDROCK units	During design stage and construction stage	The designer should recognise this degree of variability in the planning, costing and design phases. The founding conditions will need to be confirmed based on inspections during piling.	Reduce construction and subsurface risks and any potential damages.
3. Treatment of localised Existing FILL	During construction / excavation	Treatment of Existing FILL shall be undertaken in accordance with The PSM DRAFT Earthwork Specification PSM4693-013S.	Reduce geotechnical uncertainty and construction risk.
4. Improve Site Trafficability	During construction	For initial planning and estimating purposes a working platform in some areas comprising 100mm to 300mm of Sandstone FILL should be allowed for to provide a consistent all weather accessible surface. Tyred vehicles and dump trucks would likely need designated routes with temporary all weathered haul roads.	Improve constructability and traffic accessibility throughout the site.
5. Prepare / review hazardous material register	Prior to demolition works	Demolition works should be undertaken by licenced contractors with appropriate asbestos removal accreditation. If the building is demolished a site clearance certificate must be provided on completion of the works. If a hazardous material register for the site is not present, a	Identify and remove hazardous materials to eliminate the risk of exposure to workers and the surrounding environment.
		hazardous materials management inspections and surveys is to be conducted by a qualified consultant prior to demolition of a building.	
6. Encountering any unidentified potentially contaminated soils	During excavation or construction activities	Notify / contact Environmental consultant immediately.	Reduce / eliminate potential contamination of soils or watercourses.

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
			Eliminate risks to works and the surrounding environment.
7. Exporting any material off site (VENM & ENM assessments)	During excavation or construction activities	Material exported off site should be assessed in accordance with EPA (Environmental Protection Authority) guidelines for Excavated Natural Material (ENM) and Virgin Excavated Natural Material (VENM). Notify / contact Environmental consultant regarding sampling, testing, reviewing and documenting.	To ensure compliance with environmental regulations set by the NSW EPA and to contribute to sustainable land and construction uses. This also prevents environmental harm by ensuring the soils are free from contaminants.
8. Salinity assessment	During excavation or construction activities	Salinity testing has been undertaken for the site and all samples indicated "non-saline" conditions.	To assess the salinity of soils within the site and if management of saline soil is required. Ensure the appropriate concrete exposure classification is adopted.
9. Erosion control and surface flow	During excavation or construction activities	We understand that the civil designer has designed or will design the stormwater system, surface gradients and landscaping requirements to control surface flows and minimise soil erosion and the effects of soil erosion on adjacent waterways. We understand that appropriate erosion control will also be included during construction.	To control surface flows and minimise soil erosion
10. Groundwater Inflow control	During excavation or construction activities and operation	Based on the geotechnical investigation the groundwater levels are observed to be 1 m to 3.5 m below the ground surface levels. Where excavations deeper than 1 m are proposed these may encounter perched water/groundwater. From our experience with projects in a similar geological environment such seepage should be able to be controllable during construction by conventional sump and pump systems. Disposal of water from the sumps, during construction and particularly in the permanent condition, into the stormwater or	To control groundwater inflow and assess the impact of groundwater resources

Mitigation Number/Name	Aspect/Section	Mitigation Measure	Reason for Mitigation Measure
		approvals and sediment controls. These should be negotiated with the relevant authorities (e.g., council, Sydney Water, NSW Office of Water). Particularly for permanently drained structures we note the requirements of the NSW Aquifer Interference Policy apply, as a drained basement will permanently affect the groundwater levels at the site and surrounding area.	
		Should a drained basement be adopted, we recommend prior to excavation, we will return to site to install hobo data loggers (which record daily groundwater levels) in the existing piezometers near the proposed basement footprint to enable continuous long-term groundwater monitoring. This will assist in the confirmation of design groundwater levels and inform long- term inflows. The groundwater monitoring results will be collected from the hobo data loggers after 3-6 months of being installed. For details, please refer to Section 10.3 of this report.	

13. Evaluation of Environmental Impacts

From a geotechnical perspective, the potential impacts of the activity can be appropriately mitigated or managed in accordance with the recommended measures presented in Table 13.

The extent and nature of the potential impacts are low and will not have significant impact on the locality, community and/or the environment.

Should there be any queries, do not hesitate to contact the undersigned.

Yours Sincerely

HENRY ZHANG GEOTECHNICAL ENGINEER

WILLIAM WEI SENIOR GEOTECHNICAL ENGINEER

DAVID PICCOLO PRINCIPAL

Encl.	Figure 1	Overview of Locality Plan (Site and Landcom SI)
	Figure 2	Site Locality Plan
	Figure 3 to 8	Selected Site Photographs
	Appendix A	Historical Aerial Photographs
	Appendix B	Tabulated Borehole and Test Pit Logs
	Appendix C	DCP Results
	Appendix D	CBR Results
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	Appendix F	Atterberg Limit Test and Moisture Content Results
	Appendix G	Aggressivity and Salinity Results
	Appendix H	Engineered Borehole Logs: BH05 to BH09
	Appendix I	Piezometer Construction Records
	Appendix J	Point Load Test Results
	Appendix K	Bulk Earthworks Specification (PSM4693-013S REV1 DRAFT)



Aerial imagery from Nearmap of site conditions on 28 October 2024.

A3	PSM4693-012L	Figure 1	
		-	

29 Nov 2024



Approximate Site Extents - Schofields - Tallawong High School

- 2022 Landcom Site Investigation - Project Boundary

Proposed Site Plan

- Approximate Borehole Locations (2024 Oct)
- Approximate Test Pits Undertaken (2022 Landcom Site Investigation)
- Approximate Boreholes Undertaken (2022 Landcom Site Investigation)

Note: Aerial imagery from Nearmap of site conditions on 28 October 2024.



80 100 m	The Department of Education Geotechnical Investigation Schofields - Tallawong High Schhol Guntawong Road		
Revision: A	SITE LOCALITY PLAN		
Paper Size: A3	PSM4693-012L	Figure 2	



Photo 1 - General Site Photo facing West near BH09 (2 October 2024)



Photo 2 - General Site Photo facing North-East near BH08 (3 October 2024)

The Department of Education Geotechnical Investigation Schofields - Tallawong High School SELECTED SITE PHOTOGRAPHS (1 OF 6) Figure 3 PSM4693-012L

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Photo 3 - Previous agricultural infrastructure near BH05 (2 October 2024)



Photo 4 - Mature sparse trees up to 15-20 m height, a stockpile and timber power poles located immediately north of BH05 (2 October 2024)

The Department of Education

Geotechnical Investigation

Schofields - Tallawong High School

SELECTED SITE PHOTOGRAPHS (2 OF 6)



PSM4693-012L Figure 4

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Photo 5 - 6-tonne track mounted drill rig used for BH05, BH06 & BH09 (photo taken at BH06)



Photo 6 - 6-tonne track mounted drill rig used for BH07 & BH08 (photo taken at BH08)

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The Department of Education Geotechnical Investigation Schofields - Tallawong High School



SELECTED SITE PHOTOGRAPHS (3 OF 6)

Figure 5

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Photo 9 - Completed standpipe piezometer (BH09)



Photo 10 - Specialised Sand' material used for gravel pack/filter pack in piezometers

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The Department of Education Geotechnical Investigation Schofields - Tallawong High School



SELECTED SITE PHOTOGRAPHS (5 OF 6)

Figure 7

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Photo 11 - Bentonite pellets used as an annular seal & backfill for piezometers (BH09)



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Appendix A Historical Aerial Photographs



PSM4693-012L

Appendix A1



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Appendix B Tabulated Borehole and Test Pit Logs

Borehole ID	Approximate Depth (m)	Material Encountered	Notes	
	0 – 0.4	Silty CLAY trace gravel; medium plasticity, dark brown; sub-angular gravel up to 10 mm; moist wet, very soft to soft, rootlets	Grassed surface area TOPSOIL	
		CLAY trace gravel; high plasticity, red brown; sub-angular gravel up to 10 mm; moist, soft		
	0.4 - 2.3	At 0.5 m: becoming stiff to very stiff	NATURAL SOIL Shrink-swell	
		At 1.0 m: becoming very stiff to hard, dry	sample at 0.5 m	
BH_02		At 2.3 m: V-bit auger refusal		
		SHALE: pale to dark grey and red brown, dry, extremely weathered, very low strength		
		2.3 – 3.2 At 2.7 m: becoming low strength		BEDROCK
		At 3.2 m: TC-bit auger refusal		
	3.2	Borehole terminated at 3.0 m	Target Depth	

Borehole ID	Approximate Depth (m)	Material Encountered	Notes
	0 – 0.2	Access track area FILL	
	0.2 - 0.4	Silty CLAY trace gravel; low to medium plasticity, dark brown; sub-angular gravel up to 5 mm; dry, stiff	TOPSOIL
			NATURAL SOIL
BH_03	0.4 – 0.8	Sandy CLAY; medium plasticity, red mottled grey; fine to medium grained sand; dry, stiff	Shrink-swell sample at 0.5 m
		CLAY trace gravel; high plasticity, red brown; sub-angular gravel up to 10 mm; dry, stiff to very stiff	
	0.8 – 3.0	At 1.7 m: becoming pale red and brown	NATURAL SOIL
		At 2.5 m: becoming medium to high plasticity, red mottled grey, very stiff	
	3.0	Borehole terminated at 3.0 m	Target Depth

Borehole ID	Approximate Depth (m)	Material Encountered	Notes
	0 – 0.25	Silty gravelly CLAY; medium plasticity, dark brown; sub-angular gravel up to 10 mm; moist, stiff, rootlets	Grassed surface area / access track area FILL
		CLAY trace gravel; medium to high plasticity, red brown; sub-angular gravel up to 10 mm; moist, stiff	NATURAL SOIL
BH_04	0.25 – 1.4	At 0.6 m: becoming pale grey and red	Disturbed sample at 0.25 m
		At 0.9 m: becoming very stiff to hard	Shrink-swell sample at 0.3 m
		At 1.4 m: V-bit auger refusal	
	1.4	Borehole terminated at 1.4 m	Target Depth

Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
	0-0.3	Gravelly silty CLAY; medium plasticity, dark brown; sub-angular gravel up to 10 mm; brick fragments observed up to 30mm; moist, very soft to soft, rootlets	Grassed surface area FILL
	0.3 – 0.6 SAND with clay and gravel, fine grained, brown and grey; low plasticity; sub-angular gravel up to 10 mm; brick fragments observed up to 50mm; stiff to very stiff, soft to firm		FILL
TP_01		CLAY trace gravel; medium plasticity, red brown; sub-angular gravel up to 10 mm; dry to moist, stiff, pp 190 kPa	NATURAL SOIL
	0.6 – 3.0 At 2.0 m: becoming red mottled grey, very stiff, pp 220 - 300 kPa		CBR sample at 0.9 m
		At 2.8 m: becoming dark red mottled grey, very stiff to hard pp 350 – 400 kPa	
	3.0 Test pit terminated at 3.0		Target Depth

Note: PP = Pocket Penetrometer



Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
	0 – 0.3	Silty CLAY trace gravel; low to medium plasticity, dark brown; sub-angular gravel up to 10 mm; wet, very soft to soft, rootlets	Grassed surface area TOPSOIL
		CLAY trace gravel; medium to high plasticity, red brown; sub-angular gravel up to 10 mm; moist, firm to stiff	
TP_02	0.3 – 2.8	At 0.5 m: becoming stiff to very stiff	NATURAL SOIL
		At 1.0 m: pp 200 kPa	CBR sample at 0.5 m
		At 2.0 m: becoming grey mottled red, very stiff, pp 220 to 300 kPa, rock fragments observed	
		At 2.5 m: rock fabric visible	
	2.8 - 3.0	SHALE: grey and yellow brown with dark grey bands, moist, extremely weathered, very low to low strength	BEDROCK
	3.0	Test pit terminated at 3.0	Target Depth

Note: PP = Pocket Penetrometer



Test Pit ID	Approximate Depth (m)	Material Encountered	Notes
	0-0.2	Silty CLAY; low plasticity, dark brown; moist, soft to firm, rootlets	Grassed surface area, ponding water at the surface level adjacent to test pit TOPSOIL
TP_15	0.2 – 3.0	CLAY; high plasticity, yellow brown; dry to moist, stiff At 0.7 m: becoming CLAY trace gravel, red brown; sub-rounded gravel up to 8 mm; very stiff At 0.8 m: PP 200 – 290 kPa At 1.5 m: PP 200 – 280 kPa	NATURAL SOIL
	3.0	Test pit terminated at 3.0 m	Target Depth

Note: PP = Pocket Penetrometer



Appendix C DCP Results



DYNAMIC CONE PENETROMETER TEST RESULTS

Job No.	PSM4693				Sheet	of 1
Project	Landcom Gunta	awong Road, So	Date Tested	26-28/09/2022		
Test Method	AS 1289.6.3.2 Purposes - 9 kg L	1997 Methods of Dynamic Cone Pe	Engineering	Drop Height Hammer Mass	510 mm 9 kg	
Tested by	WW/HZ				Тір Туре	CONICAL
Test Depth	DCP02	DCP03	DCP04	DCP05	DCP06	DCP17
Location	BH02	BH03	BH04	IP01	1P02	1P15
0.10	I	3	5 F	 	1	1
0.20	0	7	5 F	 	0	1
0.30 -	1	/ 	5	1	1	1
0.40	0	5	3	I	2	3
0.50	1	3	4	3	3	3
0.60 -	3	3	4	5	6	5
0.70	0	3	4 TD	8	8 TD	
0.80	/	5	U	/	U I D	U I D
0.90 -	7	6		/		
1.00	12	8		ID		
1.10	14	12				
1.20 -	ID	ID				
1.30						
1.40						
1.50 -						
1.60						
1.70						
1.80 -						
1.90						
2.00						
2.10 -						
2.20						
2.30						
2.40 -						
2.50						
2.60						
2 70 -						
2 80						
2.90						
3 00 -						
3 10						
3 20						
3.30						
3.40						
3.50						
3.60 -						
3 70						
3.70						
3.00 ····						
3.30 -						
4.00 -	Comments: TD	- Terminated D	epth			

Appendix D CBR Results

 115 Wicks Road

 Macquarie Park, NSW 2113

 Telephone:
 02 9888 5000

 Facsimile:
 02 9888 5001



FOUR DAY SOAKED CALIFORNIA BEARING RATIO TEST REPORT

Client: PSM Job No	Pells Sullivan Meynink b.: PSM4693					Report No.: Report Date: Page 1 of 1	L4829 - 1 5/10/2022
					Should be 0.4	m	
TESTPIT NUMBER	R	TP 01	TP 02	TP 03	TP 0.4	TP 05	
DEPTH (m)		0.9	0.5	0.5	0.5	0.5	
Surcharge (kg)		4.5	4.5	4.5	4.5	4.5	
Maximum Dry Den	isity (t/m³)	1.64 STD	1.66 STD	1.66 STD	1.53 STD	1.48 STD	
Optimum Moisture	Content (%)	19.0	20.6	21.5	25.1	28.0	
Moulded Dry Dens	ity (t/m ³)	1.61	1.64	1.63	1.49	1.44	
Sample Density Ra	atio (%)	98	98	98	98	98	
Sample Moisture F	Ratio (%)	101	96	99	101	102	
Moisture Contents							
Insitu (%)		22.7	22.6	27.3	27.3	30.5	
Moulded (%)	1	19.1	19.7	21.2	25.3	28.5	
After soaking) and						
After Test, To	op 30mm(%)	32.7	29.6	31.9	34.1	39.5	
	Remaining Depth (%)	23.3	21.4	22.6	26.8	31.5	
Material Retained	on 19mm Sieve (%)	0	0	8*	0	0	
Swell (%)		2.0	2.0	1.5	1.5	1.5	
C.B.R. value:	@2.5mm penetration	1.5	2.5				
	@5.0mm penetration			3.5	2.0	4.0	

NOTES: Sampled and supplied by client. Samples tested as received.

· Refer to appropriate Test Pit logs for soil descriptions

• Test Methods : AS 1289 6.1.1, 5.1.1 & 2.1.1.

• Date of receipt of sample: 29/09/2022.

NATA Accredited Laboratory Number:1327 Accredited for compliance with ISO/IEC 17025 - Testing. This document shall not be reproduced except In full without approval of the laboratory. Results relate only to the items tested or sampled.

E 05/10/2022

Authorised Signature / Date (D. Treweek) TP02 & TP03 dried back prior to testing as too saturated.

· * Denotes not used in test sample.

Appendix E Shrink-Swell Index Test Results



SHRINK - SWELL TEST REPORT TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink PSM Job No.: PSM4693

Report No.: L4829 - 1 Report Date: 7/10/2022 Page 1 of 4

Should be BH_02

Testpit No .:	-02	Depth	n: 0.5m			
MOISTURE BEFORE TEST	CONTENT (SWELL)	ESTIMATED U BEFORE		COMPRESSIVE STR	ENGTH AFTER	TEST
22.1%	23.1%	380.470	kPa	1	340.400	kPa
LOAD	SETTLEMENT BEFORE SAT	UNDER LOAD		SWELL ON SATURATION		SHRINKAGE
25	0.0%			0.5%		3.2%



Notes: Sampled and supplied by client. Sample tested as received-

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.



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Authorised Signature / Date (D. Treweek) 7/10/22



SHRINK - SWELL TEST REPORT TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink PSM Job No.: PSM4693

Report No.: L4829 - 1 Report Date: 7/10/2022 Page 2 of 4

Should be BH_03

Testpit No.:	-03	Depth	: 0.5m			
MOISTUR	CONTENT (SWELL)	ESTIMATED U	NCONFINE	O COMPRESSIVE STR	ENGTH	
BEFORE TEST	AFTER TEST	BEFORE	TEST		AFTER	TEST
20.1%	20.4%	310	kPa		340	kPa
LOAD	SETTLEMEN BEFORE SA	T UNDER LOAD TURATION		SWELL ON SATURATION		SHRINKAGE
25	0.0%	, D		0.0%		2.2%



Notes: Sampled and supplied by client. Sample tested as received.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.



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Authorised Signature / Date (D. Treweek) 7/10/22.



SHRINK - SWELL TEST REPORT TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink PSM Job No.: PSM4693 Report No.: L4829 - 1 Report Date: 7/10/2022 Page 3 of 4



Notes: Sampled and supplied by client. Sample tested as received.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.



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Authorised Signature / Date (1992 _____e (D. Treweek) 7/10/22



SHRINK - SWELL TEST REPORT TEST METHOD: AS1289 7.1.1

Client: Pells Sullivan Meynink PSM Job No.: PSM4693

Report No.: L4829 - 1 Report Date: 7/10/2022 Page 4 of 4



Notes: Sampled and supplied by client. Sample tested as received.

- Suction Value used in calculation = 1.8pF
- Volume Change Coefficient (α) was assumed = 2
- Visually estimated inclusions by volume = 0-5%
- Shrinkage Cracking = Moderate
- Soil Crumbling = none
- Date of receipt of sample: 29/09/2022.



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Authorised Signature / Date 1102

Appendix F Atterberg Limit Test and Moisture Content Test Results



MOISTURE CONTENT, ATTERBERG LIMITS AND LINEAR SHRINKAGE TEST REPORT

Client: Pells Sullivan Meynink PSM Job No.: PSM4693
 Report No.:
 L4829 - 3

 Report Date:
 12/10/2022

 Page 1 of 1
 1

AS 1289	TEST METHOD	2.1.1	3.1.2	3.2.1	3.3.1	3.4.1
	DEPTH m	MOISTURE CONTENT	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	LINEAR SHRINKAGE
		%	%	%	%	%
01	0.9	22.7	39	14	25	9.5
02	0.5	22.7	52	15	37	14.0*
06	0.5	23.3	60	21	39	14.0*
08	0.5	22.6	67	20	47	16.5*

Notes:

• The test sample for liquid and plastic limit was air-dried & dry-sieved

• The linear shrinkage mould was 125mm

• Refer to appropriate notes for soil descriptions

• Date of receipt of sample: 29/09/2022.

• Sampled and supplied by client. Samples tested as received.

• * Denotes Linear Shrinkage curled.



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4 12/10/2022 Authorised Signature / Date (D. Treweek)

Appendix G Aggressivity and Salinity Test Results



CERTIFICATE OF ANALYSIS

Work Order	ES2234646	Page	: 1 of 3
Client	: PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD	Laboratory	Environmental Division Sydney
Contact	: WILLIAM WEI	Contact	: Customer Services ES
Address	G3, 56 DELHI ROAD	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
	NORTH RYDE NSW, AUSTRALIA 2113		
Telephone	:	Telephone	: +61-2-8784 8555
Project	: PSM4693	Date Samples Received	: 28-Sep-2022 14:10
Order number	:	Date Analysis Commenced	: 30-Sep-2022
C-O-C number	:	Issue Date	14-Oct-2022 18:39
Sampler	: HENRY ZHANG		Hac-MRA NATA
Site	:		
Quote number	: EN/333		The Annual A
No. of samples received	: 5		Accredited for compliance with
No. of samples analysed	: 4		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.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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 Contract 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.

- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- ED007 and ED008: When Exchangeable AI is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCI Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + AI3+).

• ALS is not NATA accredited for the calculation of saturated resistivity in a soil.

Page : 3 of 3 Work Order : ES2234646 Client : PELLS SULLIVAN MEYNINK T/A PSM Admin PTY LTD Project : PSM4693



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	BH04 0.25m	TP06 - 0.5m	BH01 - 3m	TP8 - 0.5m	
		Sampli	ng date / time	26-Sep-2022 00:00	27-Sep-2022 00:00	26-Sep-2022 00:00	27-Sep-2022 00:00	
Compound	CAS Number	LOR	Unit	ES2234646-001	ES2234646-002	ES2234646-003	ES2234646-005	
				Result	Result	Result	Result	
EA002: pH 1:5 (Soils)								
pH Value		0.1	pH Unit	6.0	5.2	8.8	5.4	
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C		1	µS/cm	142	42	280	67	
EA055: Moisture Content (Dried @ 105-11	0°C)							
Moisture Content		1.0	%	18.1	20.8	17.0	17.4	
EA084: Saturated Resistivity								
Resistivity at 25°C		10	ohm cm	2170	5020	880	3730	
ED006: Exchangeable Cations on Alkalin	e Soils							
Exchangeable Calcium		0.2	meq/100g			0.4		
Exchangeable Magnesium		0.2	meq/100g			6.9		
Exchangeable Potassium		0.2	meq/100g			<0.2		
Exchangeable Sodium		0.2	meq/100g			3.6		
Cation Exchange Capacity		0.2	meq/100g			11.1		
Exchangeable Sodium Percent		0.2	%			32.6		
ED007: Exchangeable Cations								
Exchangeable Calcium		0.1	meq/100g	2.1	0.7		0.4	
Exchangeable Magnesium		0.1	meq/100g	6.2	3.7		6.4	
Exchangeable Potassium		0.1	meq/100g	0.4	0.4		0.3	
Exchangeable Sodium		0.1	meq/100g	1.4	0.5		1.2	
Cation Exchange Capacity		0.1	meq/100g	10.1	7.3		9.0	
Exchangeable Sodium Percent		0.1	%	14.0	9.9		14.4	
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	70	50	100	80	
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	220	30	250	30	

Appendix H Engineered Borehole Logs: BH05 to BH09

Ĩ	Ρ		S	M														Γ	Borehole ID
	T			~															BH05
17	A straight	·	•••	~	1														Page 1 of 3
E	ng	jin	ee	rin	g Log - I	Nor	n Co	ored	Bo	reho	ble	Project N	No.:		Ρ	SM	146	93	
	Clie	ent:	+ NIz	mo	The D Schofi	epar	tment	t of Ed	lucatio	on Schor	ol	Commer	nced:		0	4/1	0/2	024	4
	Hol	e L	000	tion:	See Fi	igure	1	awong	,			Logged	By:		A	4/ I	ΙΖ	024	+
	Hol	e P	odo	ion:	30443	5.0 n	n E 6	27097	4.7 m	N MG	GA2020 Zone 56		d By:	11	D	P			
	Hol	e D)ian	neter:	wounting.	110) mm	lacki	nouni		Bearing:	Datum:	ace.	AH	ID	111		Op	perator: JK Drilling
				Drilli	ng Informa	tion					Soil Descrip	otion							Observations
Mathod		Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, beha particle characteristics of pr component, colour, secondary co additional observations	viour or imary omponents, s	Moisture Condition	Consistency / Relative Density	Per	Ha netro UC (kF	nd ome CS Pa)	eter	Structure, Zoning, Origin, Additional Observations
			z				43.6	- - - 1 -		CL-CI	TOPSOIL: Silty CLAY trace sand a low to medium plasticity, dark brow lfine to medium grained; gravel fine grained, sub-angular, up to 10 mm odour and rootlets observed. FILL: COBBLES comprising of BR fragments/VOID, brick structure of void existed within the brick structure void existed within the brick structure plasticity, brown; sand fine to med gravel fine to coarse grained, sub- to 20 mm; some brick fragments.	and gravel; vn; sand to medium n; organic / / ICK Dserved, Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre. Jre.	M (> <u>P</u> L) M						0.00: Grassed surface. Inferred TOPSOIL. 0.10: Inferred FILL, bricks observed.
and Map Tool Lib: PSM 3.02.1 2019-03-06 Prj: PSM 3.02.1 2019-03-06							41.6 42.6	- - - - - - - - - - - - - - - - - - -			Continued on cored borehole shee		M (<pl)< td=""><td></td><td></td><td></td><td></td><td></td><td>1.99: Inferred BEDROCK at 2.0 m</td></pl)<>						1.99: Inferred BEDROCK at 2.0 m
EH NZ AU PSM4693.GPJ < <drawingfile>> 14/10/2024 14.31 10.03.00.09 Datgel Fence at</drawingfile>							40.6	4	-										
PSM 3.02.2 LIB.GLB Log PSM AU NONCORE	AD/ AD/ WB SPT PT AS	M T - -W -St - Pt - At	Aug Aug ash and uger	od er drill er drill oore ard pe ube Screv	ing TC bit ing V bit enetration test ving	Pe	lo resi R	tion stance efusal		W ⊳ Infl ⊲ Par ■ Co	Ater Samples ar low U - Undisturbed 3 rtial Loss D - Disturbed 3 SPT - Standard Per mplete Loss ES - Environment TW - Thin Walled LB - Large Disturb	d Tests Sample mple letration Test al Sample led Sample	N	foistu D M W	re (Dry Moi We	ditio ist t	on	Consistency/Relative Density VS - Very soft S - Soft F - Firm St - Stift VSt - Very stiff H - Hard VL - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense VD - Very dense Ce - Compact

	P	S	M											[Borehole ID
	T		\approx													BH05
	1.000	•••	\sim													Page 2 of 3
Ε	ngi	nee	ering	Log	j - C	ore	d Bo	orehole			Project	No.:	Р	SM469	3	
	Clier	nt:		Th	e De	partm	ent of	Education			Comme	nced:	0	4/10/20	24	
	Proje Hole	ect Na Loca	ame: ation:	Se	e Fig	ias - i jure 1	allaw	ong Hign School			Comple Logged	ted: By:	0 A	4/10/20 L/HZ	24	
	Hole	Posi	tion:	30	4435	.0 m E	6270)974.7 m N MGA202	0 Zone 56		Checke	d By:	D	Ρ		
	Drill Barre	Mode el Typ	el and M be and L	lounti _engtl	ng: h:	6-toni NML0	netra C3m	ck mounted drill rig	Inclination: Bearing:	-90°	RL Surf Datum:	ace:	44.60 AHD	m C	Oper	rator: JK Drilling
		Dril	ling Info	ormat	ion				Rock Subs	tance					R	ock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Materia ROCK NAME: part colour, fabric/text components, moisture, l	al Description ticle/grain charac ure, inclusions o mineral composi	cteristics, r minor tion, alteration	Weatherin ≷ ≩ ≩ ≩ ਨੂ	Strei Is(f O - Dia	ngth 50) Axial metral	Defec Spacin (mm)	t g 000	Defect Descriptions / Comments Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
H PSM4683.GPJ <-C/rawing-file>> 14/10/2024 14/29 10.0300.08 Darget Fence and Map Tod ILIb: PSM 3.02.1 2019-03-06 Pr; PSM 3.02.1 2019-03-06 Pr	0-20% Water Return	65 53	is(50) d=0.09 a=0.38 MPa is(50) d=0.01 a=0.03 MPa is(50) a=0.31 d=0.04 MPa		40.6 41.6 42.6 43.6			Continued from non-co LAMINITE: dark brown developed to well deve laminated, distinct rock and clay seams observ SHALE; dark brown an SANDSTONE; fine to n 3.30 m: Becomes well of 4.30 m: Becomes brow 4.50 m: Becomes dark	red borehole she brown and dark loped, thinly lam fabric, some iron ed; approximate d dark grey and hedium grained, developed.	pet grey, inated to n staining 10% brown.						 2.00: Water loss experienced during coring probably due to the void from the pre-existing brick structure. BP, 5°, CL 5 mm, PR, S BP, 5°, CL 5 mm, PR, S SM, 5°, CL 40 mm, PR, S SM, 1°, CL 30 mm, PR, S SM, 1°, CL 20 mm, PR, S SM, 1°, CL 40 mm, PR, S
M 3.02.2 LIB.GLB Log PSM AU CORE BH	AD, AD, WB HQ PQ SP PT WF	/T - Aug /V - Aug /V - Aug /V - Aug /V - Wa /3 - Wir /3 - Wa	ethod ger drilling ger drilling V shbore eline core (eline core (ndard pene sh tube ter pressur	FC bit / bit (63.5 mr (85.0 mr etration t	m) m) test	Gra		ater w al Loss plete Loss pg/Core Loss recovered (hatching tes material) re recovery	Weat XW - Extre HW - Extre HW - Model SW - Sligh FR - Frest Stern VL - Very L - Low M - Medil H - High VH - Very FH - Frest	hering mely Weathered y Weathered rately Weathered tity Weathered n gth Low um High mely High	Def FT - F SS - S BP - B SM - S IS - III JT - JJ CO - C CZ - C VN - V FZ - F BSH - B	ect Type ault hear Surfac hear Zone edding parti eam bint ontact rushed Zone ein racture Zone edding Shea	e ng e ar	Infilling/ CN - C SN - S VN - V CO - C RF - R G - G S - S CA - C CL - C FE - Im QZ - Q	Coat lean tain eneer oating ock fra ravel and ilt alcite lay on uartz	ting Roughness SL - Slickensided PCL - Polished S - Smooth RF - Rough VR - Very Rough Shape PR - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular

1	P	S	M										Γ	Borehole ID
	Т		**											BH05
	* court		\sim											Page 3 of 3
E	ngi	nee	ering	Log) - C	Core	d Bo	orehole			Project I	No.:	PSM4693	
	Clier Proie	nt: ect Na	ame.	Th Sc	e De hofie	partm Ids - T	ent of allaw	Education			Commer	nced: ed:	04/10/2024	
	Hole	Loca	ation:	Se	e Fig	gure 1			07 50		Logged	By:	AL/HZ	
	Hole	Posi Mode	tion:	30	4435	6-ton	: 6270	ck mounted drill rig	U Zone 56	-90°	Checked RL Surfa	By:	DP 60 m	
	Barr	el Typ	be and L	ength	h:	NML	C 3 m		Bearing:		Datum:	AH	D Ope	erator: JK Drilling
		Drill	ling Info	ormat	ion				Rock Subs	stance				Rock Mass Defects
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Materia ROCK NAME: part colour, fabric/text components, moisture, r	al Description icle/grain chara ure, inclusions o mineral compos	cteristics, or minor ition, alteration	Weathering ≳≩≩ § ∰	Strength Is(50) ● - Axial ○ - Diametra	Defect Spacing (mm) ⊞ ೪ ⊗ ⊗ ⊗ ∞	Defect Descriptions / Comment Description, alpha/beta, infilling or coating, shape, roughness, thickness, other
		65	Is(50) d=0.37 a=0.71 MPa Is(50) d=0.47 a=1.74 MPa		38.6	- - - 6 -		LAMINITE: dark brown developed, thinly lamina rock fabric, some iron s approximately 90% SH, grey and 10% SANDST grained, brown. 5.90 m: Becomes dark approximately 80% SH, grey and 20% SANDST grained, pale grey.	and dark grey, ated to laminate taining along de ALE; dark brow 'ONE; fine to m grey and pale g ALE; dark brow 'ONE; fine to m	well d, distinct fects; n and dark edium rey; n and dark edium				^C SZ, CL & RF 230 mm, PR, S −FZ, RF VN, PR, S −SM, 1°, CL 20 mm, PR, S −FZ, RF 30 mm, PR, S −BP, 2°, FE SN, PR, S −BP, 0°, FE SN, PR, S −FZ, RF 20 mm, PR, S
PSM 3.02.1 2019-03-06 Pr; PSM 3.02.1 2019-03-06 NMLC	0-20% Water Return	46	МРа		 36.6 37.6									BP, 1°, CN, PR, S BP, 0°, FE, SN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S BP, 2°, CN, PR, S BP, 0°, CN, PR, S BP, 1°, CN, PR, S BP, 1°, CN, PR, S BP, 1°, CN, PR, S
J < <drawingf#e>> 14/10/2024 14/29 10.03.00.08 Dagel Fence and Map Tool Lib:</drawingf#e>			ls(50) d=0.64 MPa		35.6	- - - - 9- - - -		Hole Terminated at 8.60 Target depth	6 m					
2.2 LIB.GLB Log PSM AU CORE BH PSM4693.GP.	AD AD WE HQ PQ SP PT WF	M /T - Aug /V - Aug /V - Aug /V - Aug // - Aug // - Aug // - Sta // - Pus // - Pus // - Pus	ethod ger drilling 1 shbore eline core (eline core (ndard pene h tube ter pressure	C bit / bit 63.5 mr 85.0 mr tration t e test	n) n) test	Gra	Wa > Inflor □ Parti ■ Com bhic Lo Core indica	ater v al Loss plete Loss og/Core Loss recovered (hatching tes material)	Weat XW - Extr HW - Higt MW - Mod SW - Stigg FR - Fres Stren VL - Verg L - Low M - Med H - Hot	thering emely Weathered ly Weathered lerately Weathered thy Weathered thy Weathered the gth t Low	I I I I I I I I I I I I FT Fa SS Sh SZ Sh BP Be SM SE Sh SP JJ Jo CO CC CZ CR CZ CR VN VE VN VE	ct Type ult ear Surface ear Zune dding parting am liled Seam nt ntact ushed Zone in	Infilling/Co CN - Clean SN - Stain VN - Venet CO - Coatir RF - Rock G - Grave S - Sand Z - Sitt CA - Calcit CL - Clay	ating Roughness SL - Slickensided POL - Polished rg RF - Rough rggments VR - Very Rough I Shape PR - Planar e CU - Curved UN - Undulating
PSM 3.0	gged in	accorda	nce with AS	1726:201	7 Geote	- E	⊢ No co e investig	re recovery ations	VH - Veny EH - Extr	/ High emely High	F∠ - Fra BSH - Be DB - Dri	dding Shear lling Break	QZ - Quart X - Carbo	z IR - Irregular naceous



Notes:

Crosses drawn on the core in red indicate "drilling breaks"

Guntawong Road Schofields Schofields - Tallawong High School CORE PHOTOS BH05 (2.00 to 7.00 m) (Core Photo 1 OF 2) PSM4693-012L Appendix A

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IM



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E	Ľ	•••	•	\sim															Page 1 of 4
E	Eng	jino	eel	ring	Log - l	Nor	n Co	ored	Во	rehc	ole		Project N	lo.:		PS	SM4	∟ 693	
Γ	Clie	ent:			The De	epar	tment	of Ed	ucatio	on			Commer	nced:		02	2/10/	201	4
	Pro Hol	oject le Lo	Na Nat	me: ion [.]	Schofi See Fi	elds aure	- Talla 1	awong	g High	Scho	l		Complet	ed: Bv [.]		02 Al	2/10/ /HZ	201	4
	Hol	le P	ositi	on:	30441	7.2 n	n E 62	27101	4.9 m	N MG	A2020 Zone 56		Checked	l By:		DF	5	-	
	Dril	ll Mo	odel	and l	Mounting:	6-te	onne) mm	track ı	noun	ted dril	ll rig Inclination: -9	0°	RL Surfa	ice:	44 A L	.80 	m	0	perator: IK Drilling
┢	110			Drillin	a Informa	tion	5 11111				Soil I	Descript	ion		AI			0	
-					g morna						30/1	Jescript			iţ				
	Method	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Des SOIL NAME: Plastici particle characteris component, colour, seco additional obs	ty, behavio tics of prim ondary con ervations	our or nary nponents,	Moisture Condition	Consistency / Relative Dens	Pen 00	Hand etron UCS (kPa		- Structure, Zoning, Origin, Additional Observations
								-		CL-CI	TOPSOIL: CLAY trace sa plasticity, brown; sand fine organic odour and rootlets	nd; low to e to coarse s observed	medium e grained; l	M (<pl)< td=""><td>F </td><td></td><td></td><td></td><td>0.00: Grassed surface. Inferred TOPSOIL. 0.20: Inferred NATURAL SOIL.</td></pl)<>	F 				0.00: Grassed surface. Inferred TOPSOIL. 0.20: Inferred NATURAL SOIL.
								-			CLAY; medium plasticity, yellow brown.	red brown	and		F 				
								-											
	AUN		z				43.8	1-			1.0 m: Becomes pale brow	wn.		M	St				
								-						(<pl)< td=""><td></td><td></td><td></td><td></td><td></td></pl)<>					
								-			1.5 m: Becomes CLAY tra plasticity, brown; gravel fir sub-rounded, up to 30 mn	ace gravel: ne to coars n.	: medium se grained,		St to				
2019-03-06							42.8	2-							VSt				
SM 3.02.1								-			Continued on cored boreh	nole sheet							2.09: V-bit Refusal, Inferred BEDROCK (at 2.1 m
.1 2019-03-06 Prj: P								-											
I LIb: PSM 3.02							œ	-											
ce and Map Toc							4	3-											
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2.2 LIB.GLB Log PSM AU NONCOR	AD/ AD/ WB SPT PT AS	Μ Τ - Α -₩a -₩a - ₽u - Ρu - Αu	etho Auge Auge ashb anda ish tu iger :	d r drillin r drillin ore rd pen ibe Screwi	g TC bit g V bit etration test ng		lo resi:	t ion stance efusal		M ⊳ Infl ⊲ Pa ◀ Co	rater San ow U - Undi rtial Loss D - Distu mplete Loss SPT - Stan ES - Ervir TW - Thin LB - Large	iples and sturbed Sam dard Pene fonmental Walled e Disturber	<i>Tests</i> ample ple tration Test Sample d Sample		ioistui D M W	re Co - [- N - \	ondi Dry Moist Wet	tion	Consistency/Relative Density VS - Very soft S - Soft F - Firm St - Stiff VSt - Very stiff H - Hard VL - Very loose L - Loose MD - Medium dense D - Dense
PSM 3.02	_ogged	in acc	ordan	e with A	S 1726:2017 Geol	technica	al site inv	estigations	3										Ce - Cemented C - Compact

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	1.00	•••	\sim															Page	e 2 of 4	
Ε	ngi	nee	ring	Log) - C	ore	d Bo	orehole			Pr	oject	t No.	:	Ρ	SM46	693			
	Clier	nt:		Th	e De	partm	ent of	Education			Co	omm	ence	ed:	0	2/10/2	2014			
	Proj∉ Hole	ect Na Loca	ame: ation:	Sc Se	e Fig	ure 1	allaw	ong Hign School			Lo	omple	eted: d By:		0 A	2/10/2 L/HZ	2014			
	Hole	Posi	tion:	30	4417	.2 m E	6271	014.9 m N MGA2020	Zone 56		Cł	necke	ed By	y:	D	P				
	Drill Barre	Mode el Typ	el and M be and L	lounti _engtl	ng: h:	6-toni NML(netra C3m	ck mounted drill rig I	nclination: Bearing:	-90°	RI Da	_ Sur atum	face :	:	44.80 AHD) m	Оре	rator: JK	Drilling	
		Dril	ling Info	ormat	ion				Rock Subst	ance							F	Rock Mass	Defects	
Method	Water	RQD (%)	amples and ield Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material ROCK NAME: partic colour, fabric/textur components, moisture, mi	Description le/grain charact e, inclusions or neral compositi	eristics, minor on, alteration	Wea	atheri		Streng Is(50 ● - Ax - Diam	gth)) ial netral ∞ ♀ - ∓	Def Spa (m	ect cing m)	Defect Des Descriptior or coating thic	criptions / Comm ı, alpha/beta, infi , shape, roughne kness, other	nents illing ess,
			ωщ	-								:≥ ø	ш > . 		<u>- > ш</u> 	> 0 c	107			
346					42.8 43.8			Continued from non-core	d borehole shee	et										
2.1 20194		0						LAMINITE: dark brown/br	own and dark g	rey,		Ø						— BP, 2°, FE → BP, 3°, CN	SN, PR, S I. PR, S	
t and Map Tool Lib: PSM 3.02.1 2019-03-06 Prj: PSM 3.0	er Return 02/09/24				41.8			laminated, distinct rock fa and clay seams observed SHALE; dark brown and SANDSTONE; fine to me	bric, some iron bric, some iron t; approximately dark grey and 1 dium grained, b	v 90% v 90% 0% rown.								BP, 1°, FE FZ, 0°, RF JT, 78°, CC SM, 0°, Cl SM, 0°, Cl SM, 0°, Cl – SM, 1°, Cl – FZ, 0°, RF – BP, 0°, Ch	SN, PR, S 20 mm, PR, S N, PR, S - & RF 50 mm, F 30 mm, PR, S - 20 mm, PR, S - 20 mm, PR, S - 40 mm, PR, S I, PR, S I, PR, S	۶R,
SM4693.GPJ < <drawingfile>> 14/10/2024 14.29 10.03.00.09 Dagel Feno NML(</drawingfile>	80-100% Wa	60	ls(50) d=0.04 MPa ls(50) d=0.12 MPa		40.8	 4 		4.15 m: Becomes dark br brown bands.	own with alterna	ating light								- BP, 10°, C - BP, 0°, Ch - BP, 5°, Ch - BP, 0°, Cl ⊐ JT, 60°, C - BP, 1°, Cl	:N, PR, S J, PR, S J, PR, S . VN, PR, S N, PR, S . VN, PR, S	
PSM 3.02.2 LIB.GLB Log PSM AU CORE BH PS	AD AD WE HQ PQ SP PT WF	/T - Aug /V - Aug 8 - Wa 3- Wir 3- Wir 7- Sta - Pus PT - Wa accorda	ethod jer drilling T er drilling V shbore eline core (eline core (ndard pene th tube ter pressure nce with AS	C bit / bit 63.5 mr 85.0 mr etration t e test 1726:201	n) n) test 7 Geote	Graj		ater v al Loss plete Loss og/Core Loss recovered (hatching tes material) re recovery ations	Weath XW - Extrem HW - Highly MW - Moder SW - Slightly FR - Fresh Streng VL - Very Li L - Low M - Highly H - High VH - Very H H - High VH - Very H	ering lely Weathered Weathered ately Weathered / Weathered weathered m m n igh lely High	<u>ı </u>	De FT - SS - SZ - BP - SM - IS - JT - CO - CZ - VN - FZ - BSH - DB -	Fault Shear S Shear Z Bedding Seam Infilled S Joint Contact Crushed Vein Fracture Bedding Drilling	Type Surface Cone g parting Seam d Zone e Zone g Shear Break		Infillin CN - SN - VN CO - RF - G - S - CA - CA - CL - FE - QZ - X -	g/Coa Clean Stain - Veneer Coating Rock fr Gravel Sand Silt Calcite Clay Iron Quartz Carbon	agments	Roughness SL - Slickensided POL - Polished S - Smooth RF - Rough VR - Very Rough Shape PR - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	

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7	1.000		00														Page 3 of 4
E	ngi	nee	ring l	Log	- C	ore	d Bo	orehole			Pro	ject N	lo.:	Р	SM46	93	
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	Drill Barre	Mode el Typ	el and M be and L	ountin ength	ig: :	NMLC	ne tra C 3 m	ck mounted drill rig	Inclination: Bearing:	-90°	RL Dat	Surfa um:	ice:	44.80 AHD	m	Оре	rator: JK Drilling
		Drill	ing Info	rmati	on				Rock Subs	tance						F	Rock Mass Defects
				ons)			D	Materia	al Description				Streng Is(50	ith)			Defect Descriptions / Comments
5	3 _	(%)	s and sts	(Luge			hic Lo	ROCK NAME: par	ticle/grain charac	cteristics,	Weat	hering	● - Axi O - Diam	ial etral	Def Spac	ect cing	Description, alpha/beta, infilling
Meth	Wate	RQD	Sample: Field Te	WPT	RL (m)	Depth (m)	Grap	components, moisture,	mineral composi	tion, alteration	N N	NW SW	н м г / г - 0.3 - 1.3	는 문 표 8 연 원	8 8 %	1000	thickness, other
								LAMINITE: dark brown developed to well deve	/brown and dark loped, thinly lam	grey, inated to							
		60				_		and clay seams observ SHALE; dark brown an	d dark grey and	ly 90% 10%							— BP, 8°, CN, PR, S
			ls(50)			_		SANDSTONE; fine to n brown.(continued)	nedium grained,								— BP, 5°, CN, PR, S
			a=0.16 MPa			_		5.68 - 5.88 m: Disturbe	d zone.			4		i i			– BP, 3°, CN, PR, S
					8.8	6					F4 I I						¹ BP, 1°, CN, PR, S ¹ SZ, RF & CL 70 mm, PR, S
			le(50)		С	-											— SM, 1°, CL 30 mm, PR, S BP, 2°, CN, PR, S
			d=0.16 MPa			-		LAMINITE: grev and da	ark grev, well dev	veloped.							H BP, 2°, CN, PR, S H BP, 0°, CN, PR, S H FZ, RF 90 mm, PR, S
						-		thinly laminated to laminated to laminately 70-90%	nated, distinct ro SHALE: dark gre	ck fabric; ey and							BP, 1°, FE SN, PR, S BP, 3°, CN, PR, S
			ls(50) a=0.24 MPa			-		grey.	fine to medium	grained, pale							□ BP, 0°, RF 10 mm, PR, S □ BP, 2°, CN, PR, S □ BP, 2°, CN, PR, S
			in a	-	37.8	7-								i i l			BP, 1°, CN, PR, S BP, 2°, CN, PR, S
19-03-06	L	31			.,	-											SM, 0°, RF 20 mm, PR, S SM, 1°, RF 20 mm, PR, S
A 3.02.1 20	ater Ret					-											[∼] BP, 0°, CN, PR, S − BP, 1°, CN, PR, S
06 Pri: PSN	0% Wa					-											
12019-03-4	80-10					-											BP, 2°, CN, PR, S BP, 0°, CN, PR, S BP, 0°, CN, PR, S
PSM 3.02.			ls(50) d=0.32	-	36.8	8-											
Tool Lib: I			a=0.47 MPa Is(50)			-											
and Map			d=0.16 a=0.91 MPa			-								i i			
atgel Fence						-											— BP, 2°, RF 20 mm, PR, S
3.00.09 Da						-											— BP, 1°, CN, PR, S
14:29 10.0				-	35.8	9—											
4/10/2024		34				-											BP, 0°, CN, PR, S JT, 32°, CN, PR, S
gFile>> 1/		~				-											^C BP, 0 [°] , CN, PR, S
< <drawin< td=""><td></td><td></td><td>ls(50) d=1 12</td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>i i l</td><td></td><td></td><td></td></drawin<>			ls(50) d=1 12			-								i i l			
4693.GPJ			a=1.24 MPa			-											— BP, 2°, CN, PR, S
RE BH PS.		<u>Ме</u> Л - Анс	ethod	C bit		<u></u>	Wa	ater	Weat XW - Extre	hering mely Weathered	I I I F	Defe T - Fau	1 164 <i>ct Type</i>		Infillin CN -	g/Coa Clean	ting Roughness SL - Slickensided
SM AU CO	AD/ AD/ WB	V-Aug - Was 3- Win	er drilling V shbore	bit))		> Inflov ☐ Parti ■ Com	w al Loss plete Loss	HW - High MW - Mode SW - Sligh	ly Weathered erately Weathered tly Weathered	S B	S - Shi Z - Shi P - Bei	ear Surface ear Zone dding parting		SN - VN CO -	Stain - Veneer Coating	POL - Polished S - Smooth J RF - Rough
LB Log P!	PQ SP	3- Wire 3- Wire T- Star	eline core (8 ndard penel	35.0 mm tration te	i) est	Gra	ohic Le	og/Core Loss	FR - Fresl Stren VL - Very	n gth Low	S S S	M - Sea S - Infi T - Joi	am Iled Seam nt ntact		RF - G - S - 7	Rock fr Gravel Sand Sitt	agments VR - Very Rough Shape PR - Planar
02.2 LIB.GI	WP	- Pus T-Wat	ter pressure	e test			Core indica	recovered (hatching tes material)	L - Low M - Medi H - High	um	C C V F	Z - Cru Z - Cru N - Vei Z - Fra	ished Zone n icture Zone		2 - CA - CL - FE -	Calcite Clay Iron	CU - Curved UN - Undulating ST - Stepped
PSM 3.0	ogged in	accorda	nce with AS 1	726:2017	Geotec	^ل لٹیپیں hnical sit	- INO CO e investig	ations	VH - Very EH - Extre	High mely High	B C	SH - Bei B - Dri	dding Shear lling Break		QZ - X -	Quartz Carbon	IR - Irregular aceous

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E	ngi	nee	ering	Log	J - C	ore	d B	orehole			Ρ	roje	ect N	lo.:			PSN	Л46	93			
	Clier Proie	nt: ect N	ame [.]	Th Sc	e De hofie	partm lds - 1	ent of allaw	Education ong High School			C	om	mer nlet	ncec ed·	1:	(02/1	10/2	014			
	Hole	Loca	ation:	Se	e Fig	jure 1	- 007/	014.0 NI MC 02020 7		50	L	ogg	ed l	By:			AL/I	ΗZ	014			
	Hole Drill	Mode	el and M	lounti	nq:	.2 11 c	ne tra	ck mounted drill rig Ind	clinat	ion: -90°	R	L S	скес Gurfa	ice:		44.8	0 m	1				
	Barr	el Ty	be and L	engt	h:	NML	C 3 m	Be	earing	g:	D	atu	m:			AHD)		Ope	erator:	JK Drilling	
	1	Dril	ling Info	ormat	ion				Rock	Substance				1 -						Rock I	lass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material D ROCK NAME: particle colour, fabric/texture components, moisture, min	escrip /grain inclus eral co	tion characteristics, sions or minor omposition, alteratior	We	eathe ≩ ≩	ering	VL 0.1 O	treng ls(50) - Axi Diam	th) al etral ॢ₽ ⊟	<20	Defe Spac (mr 8 8	ect ing n)	Defe Des or c	t Descriptions / Comme cription, alpha/beta, infili oating, shape, roughnes thickness, other	ent ing ss,
NMLC		84	ls(50) d=0.72 a=0.87			-		LAMINITE: grey and dark <u>c</u> thinly laminated to laminate approximately 70-90% SH/ 10-30% SANDSTONE: fine grey.(<i>continued</i>)	irey, w d, dis ALE: d to me	vell developed, tinct rock fabric; lark grey and edium grained, pale										BP, BP, BP,	2°, CN, PR, S 3°, CN, PR, S 3°, CN, PR, S	
14683.GPJ < <drawingfile>> 14/10/2024 14/29 10.03.00.09 Dargel Fence and Map Tool ILb: PSM 3.02.12019-03-06 Prt, PSM 3.02.1 2019-03-06</drawingfile>			MPa		30.8 31.8 32.8 33.8 33.8			Hole Terminated at 10.60 r Target depth	n													
PSM 3.02.2 LIB.GLB Log PSM AU CORE BH PS	AD AD WE HC PC SP PT WF	/T - Aug /V - Aug 3 - Wa 3 - Wir 3 - Wir 7 - Sta - Pus PT - Wa accorda	ethod ger drilling shore eline core (eline core (ndard pene sh tube ter pressur	I FC bit / bit 63.5 mi 85.0 mi stration e test 1726:201	n) n) test 7 Geote	Gra	Main Stress Stres	ater v al Loss polete Loss pg/Core Loss recovered (hatching tes material) re recovery ations	XW HW SW FR VL L M H VH EH	Weathering - Extremely Weathered - Highly Weathered - Slightly Weathered - Sresh Strength - Very Low - Low - Medium - High - Very High - Extremely High		FT SS SZ BP SM IS JT CO CZ VN FZ BS ¹ DB	Defe - Fa - Sh - Sh - Se - Infi - Joi - Co - Cri - Ve - Fra H - Be - Dri	ct T aut ear Su ear Zo dding p am lled Se nt ntact ished 2 n icture 2 dding s lling Bi	rface ne parting eam Zone Shear reak	1 1	Int	Fillin CN - SN - VN - CO - RF - G - S - CA - CL - FE - QZ - X -	g/Co Clean Stain Venee Coatir Rock 1 Grave Sand Silt Calcite Clay Iron Quartz Carbo	r g ragments	Roughness SL - Slickensided POL - Polished S - Smooth RF - Rough VR - Very Rough VR - Planar CU - Curved UN - Undulating ST - Stepped IR - Irregular	





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E	İnç	gino	ee	ring	Log - I	Nor	n Co	ored	Во	reho	ble	Project I	No.:		P	SM	469	93	
	Cli Pro	ent:	Na	me.	The De Schofi	epari elds	tment - Talla	of Ed	ucatio High	on Schoo	ol	Comme	nced:		0;	3/1(3/1()/2()/2(014 014	4
	Но	ole Lo	ocat	ion:	See Fi	gure	1		,g			Logged	By:		A	L/H	Z	01-	T
-	Ho	ill M	ositi ndel	on: and	30431	2.3 n	$n \ge 62$	track	0.4 m		A2020 Zone 56	Checked	d By:	39	D	P m			
	Но	le D	iam	eter:	wounting.	110) mm	uuun			Bearing:	Datum:		AH	HD			Op	perator: JK Drilling
			l	Drillin	ig Informa	tion					Soil Descrip	otion							Observations
Mothod	INIEILIOO	Penetration	Support	Water	Samples Tests Remarks	Recovery	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description SOIL NAME: Plasticity, behav particle characteristics of pr component, colour, secondary co additional observations	viour or mary mponents,	Moisture Condition	Consistency / Relative Density	Per	Hai ietro UC (kP	nd ome S Pa)	ter	Structure, Zoning, Origin, Additional Observations
Γ										CL	TOPSOIL: Silty CLAY; low plasticit brown, organic odour and rootlets	y, dark observed.	M (>PL)	S					0.00: Grassed surface. Inferred TOPSOIL.
										СІ	CLAY trace sand and gravel: medi plasticity, brown and pale grey; san	um nd fine to		F					0.20: Inferred NATURAL SOIL.
											sub-angular, up to 30 mm.	se grained,							
								_			0.7 m: Becomes red brown.								
							8.7	1-					M						
			z					-					(\FL)	St					
								-											
								-			1.5 m: Becomes Gravelly CLAY tra brown: gravel fine to coarse graine	ace sand; d.							
								-			sub-rounded, up to 20 mm; shale t	ragments.	·						
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3LB Log F	PT AS	- Pu - Au	ish ti iger :	ibe Screwi	ng		///] R	efusal			TW - Thin Walled LB - Large Disturb	ed Sample							H - Hard VL - Very loose L - Loose
3.02.2 LIB.C																			MD - Medium dense D - Dense VD - Very dense
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Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons)	RL (m)	Depth (m)	Graphic Log	Material ROCK NAME: partic colour, fabric/textui components, moisture, m	Description le/grain characteris œ, inclusions or min ineral composition,	tics, ior alteration	Weat	hering	Stro Is O - D - 0 - 0 - 0 - 0 - 0	ength (50) Axial iametral ⊊ ≅ , , , , , , , , , , , , , , , , ,	St (1000	Defect pacing (mm)	Defect D Descript or coati	escriptions / Comment ion, alpha/beta, infilling ng, shape, roughness, hickness, other	
2019-03-06					37.7 38.7	- - - - - - - - - - - - - - - - - - -		Continued from non-core LAMINITE: dark brown/b poorly dev. rock fabric to	d borehole sheet rown and some dar developed, thinly	k grey,							— SM, 0°,	CL 5 mm, PR, S	
PSM4693.GFJ < <drawningfile>> 14/10/2024 14:29 10.030.049 Daggel Ferrora and Map Tool ILIb: PSN 3.02.12019.03-06 Pri; PSN 3.02.1 NMLC</drawningfile>	80-100% Water Return	19	Is(50) a=0.13 MPa Is(50) d=0.18 MPa Is(50) d=0.05 MPa Is(50) d=0.02 MPa		35.7 36.7			laminated, distinct rock fa throughout rock mass; a grey and dark brown and medium grained, brown.	bric, clay seams prox. 90% SHALE; 10% SANDSTONE	dark ;; fine to							BP, 1°, BP, 2°, − SM, 0°, − BP, 5°, BP, 1°, − BP, 2°, − BP, 1°, − BP, 1°, − BP, 3°,	CL 1 mm, PR, S CL 1 mm, PR, S CL 150 mm, PR, S CL 150 mm, PR, S CL 1 mm, PR, S CL VN, PR, S CL VN, PR, S	
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NA athord	Water	RQD (%)	Samples and Field Tests	WPT (Lugeo	RL (m)	Depth (m)	Graphic Log	Materia ROCK NAME: parti colour, fabric/textu components, moisture, n	I Description cle/grain chara ure, inclusions nineral compo	acteristics, or minor sition, alteratior	Weathering ≳≩≩§≋⊞	is(50) g ●-Axia O-Diame	al etral 。 ₽ Ħ	Defect Spacing (mm)	Defect De Descriptio or coatin th	scriptions / Comment: yn, alpha/beta, infilling g, shape, roughness, ickness, other
wingFle>> 14/10/2024 14/29 10.03.00.09 Dagel Fenos and Map Tod Lb: PSM 3.02.1 2019-03-06 Pig PSM 3.02.1 2019-03-06	NMILO 80-100% Water Return	92 89	Is(50) d=0.22 a=0.2 MPa Is(50) d=0.18 MPa Is(50) d=0.18 MPa Is(50) d=0.6 MPa Is(50) d=0.8 MPa		30.7 31.7 32.7 33.7			LAMINITE: dark grey/da grey/brown, well develop rock fabric; approximate grey and dark brown an fine to medium grained, 6.40 m: Becomes dark g occasional sections of d developed, thinly lamina developed, thinly lamina 8.85 m: Becomes pale of laminated to laminated; dark grey and 30% SAN grained, pale grey.	rk brown and ped, thinkj lam ly 70-80% SAN pale grey and pale (ark brown/bro ted to laminate grey and dark (pproximately IDSTONE; fine	pale inated, distinct ALE; dark USTONE; brown. grey with wn, well ed. grey, thinly 70% SHALE; e to medium					BP, 0°, 0 BP, 1°, 0 FZ, 0°, R - FZ, 0°, R - BP, 1°, 0 - BP, 3°, C - BP, 3°, C - BP, 2°, C - BP, 0°,	:L VN, PR, S :L VN, PR, S F 40 mm, PR, S F 10 mm, PR, S :L VN, PR, S E SN, PR, S :L VN, PR, S :E SN, PR, S :L VN, PR, S :E SN, PR, S
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Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeon	RL (m)	Depth (m)	Graphic Log	Material ROCK NAME: partic colour, fabric/textu components, moisture, m	Description :le/grain characteristics, re, inclusions or minor ineral composition, alter	ation	Wea ≳ ≩	athe § §	ring 8 ಱ	sl .● ם-0 : ר עד	i(50) - Axia liame ⊊	ll tral	<20	De Spa (m	fect acing im)	1000	Defect Des Descriptio or coating thi	criptions / Cor n, alpha/beta, l, shape, rough ckness, other	nment infilling nness,
NMLC		92				-		LAMINITE: dark grey and thinly laminated to lamina approximately 70-80% S 20-30% SANDSTONE; f grey.	I pale grey, well develop ated, distinct rock fabric; HALE; dark grey and ine to medium grained, p	oed, oale											—BP, 0°, Cl	N, PR, S	
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Appendix A



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I	Eng	gin	ee	rin	g Log - I	Noi	n Co	ored	Во	reho	le	Project N	No.:		P	SM4	L 693	3
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ł				Drill	ling Informa	tion					Soil Descri	otion					-	Observations
ł											Material Description			/ sity				
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Ī										CL-CI	TOPSOIL: CLAY; low to medium p dark brown, organic odour and roo	olasticity, otlets		F				0.00: Grassed surface. Inferred TOPSOIL.
								-		CI	observed. CLAY; medium plasticity, red brow			F				0.20: Inferred NATURAL SOIL.
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							9	-		CI	CLAY trace gravel: medium plasti brown and red brown; gravel fine t grained, sub-angular, up to 20 mm 5.3 m: Becomes yellow brown and	itty, yellow o coarse ۱. I grey.	M (<pl)< td=""><td></td><td>1</td><td></td><td>4</td><td>0</td><td></td></pl)<>		1		4	0	
	ADN		z				32				6.0 m: Becomes CLAY with sand a brown; sand fine to coarse grained to coarse grained, sub-angular, up shale fragments.	and gravel: J; gravel fine to 40 mm;		VSt					
3.02.1 2019-03-06							31.6	7-			6.8 m: Becomes Gravelly CLAY w brown.	ith sand; 	D						7.15: V-bit Refusal, Inferred BEDROCK
VCORE BH NZ AU PSM4693.GPJ < <drawingfile> 14/10/2024 14:32 10.03.00.09 Datgel Fence and Map Tool Lib: PSM 3.02.1 2019-03-06 Prj: PSM 3</drawingfile>			ethc	d ar drillin	og TC bit	Pe	9.62	8		и > Infl	Continued on cored borehole sheet	nd Tests Sample	Λ	Moistu	re O	cond	litio		Consistency/Relative Density
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	_	(%	pur s	-ngeor			c Log	Mater ROCK NAME: pa	rial Descripti article/grain c	on characteristics.	We	eather	ing	IS(5 A - ● Dia	oU) vxial metral	D Sp	efect acing	Def	ect Descriptions / Comments
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1 2019-0								NO CORE: 100 mm th	nick.									-7.2 ma	20: Possibly some caved in aterial and several illing/mechanical fractures
PSM 3.02						-		developed rock mass	to develope me clav sea	d, thinly laminated, ms: approximately	0							be	tween 7.2 to 7.95 m.
03-06 Prj:						-		90% SHALE: grey and grained, brown.	d 10% SANI	OSTONE; fine	r4								7 BE 200 mm BB S
2.12019-						-		7.60 m: Becomes dar sections of dark grey a thinly lamainted, distin	k brown and and pale gre	l brown with some ey, well developed, c: approximately									., RF 300 mm, PR, S
: PSM 3.0				ŀ	30.6	8-		80% SHALE: dark bro SANDSTONE; fine to	wn/dark gre medium gra	y and 20%								-FZ	RE&CL200mm PRS
Tool Lib		5				-		grey 8.00 - 8.52 m: Disturb	ed zone con									BF	2, 0°, CN, PR, S
and Map	r Retur		ls(50) a=0.36			-		clay seams and fractu	red zones.	5									/, RF 50 mm, PR, S /, 2°, CL 15 mm, PR, S
Gel Fence	Wate		MPa			-		8.52 m: Becomes dar brown, well developed	k grey/pale g t. thinly lami	grey and some								-SN	И, 1°, CL 5 mm, PR, S И, 3°, CL 5 mm, PR, S
00.09 Dat	-100%					-		fabric; approximately a brown and 10-20% SA	30-90% SHA ANDSTONE	ALE: dark grey and ; fine to medium									И, 4°, CL 10 mm, PR, S И, 2°, CL 10 mm, PR, S И 2° RE 40 mm, PR, S
29 10.03.	80		ls(50) a=0.91		-0.62	9-		grained, pale grey.			li							SN	<i>I</i> , 1°, RF 10 mm, PR, S , 78°, CN, UN, RF
/2024 14:2			MPa			-					li							FZ	, RF 20 mm, PR, RF
>> 14/10						-					li							⊡-BF F}BF	2, 2°, CN, PR, S 2, 1°, CN, PR, S
rawingFile		83	ls(50) d=0.96 MPa			_		9.5 m: Becomes dark	grey and pa	ale grey.	ļį							BF	², 2°, CN, PR, S ², 0°, CN, PR, S
GPJ < <d< td=""><td></td><td></td><td>ls(50) a=1.58 MPa</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>ļį</td><td>ii.</td><td></td><td></td><td></td><td></td><td></td><td> B⊦</td><td>7, 1°, CN, PR, S</td></d<>			ls(50) a=1.58 MPa								ļį	ii.						B⊦	7, 1°, CN, PR, S
SM4693.											Ľ								
ORE BH 1	AD	M T - Aug	e thod Jer drilling T(C bit			Wa > Inflov	ater	XW	Weathering - Extremely Weathered		De FT -	Fault	Туре	;	Infill CN	ing/Co	ating	SL - Slickensided
SM AU C	AD WE HO	/V-Aug 3 - Wa 3- Win	er drilling V shbore eline core (6	bit 3.5 mn	n)		☐ Parti ■ Com	al Loss plete Loss	MW SW	 Inginy weathered Moderately Weathered Slightly Weathered Fresh 		SZ - BP -	Shear Beddir	Zone ng parti	ng	VN CC	- Vene - Coati	er ng	S - Smooth RF - Rough
B Log P	PQ	3-Win T-Sta	eline core (8 ndard penet	5.0 mn	n) est	Gra	ohic Le	og/Core Loss	FK VL	- Fresh Strength - Very Low		SIM - IS - JT -	Joint	d Seam		K⊢ G S	 Rock Grave Sand 	n agments el	, vr very Kougn
2.2 LIB.GI	PT WF	- Pus PT-Wa	ter pressure	test			_ Core indica	recovered (hatching tes material)	L M H	- Low - Medium - High		CU - CZ - VN -	Crushe Vein Front	ed Zone	•	Z CA CL	 Silt Calci Clay 	te	CU - Curved UN - Undulating
PSM 3.0;	.ogged in	accorda	nce with AS 1	726:201	7 Geoteo	- Hittan	 No co investigation 	re recovery ations	VH EH	 Very High Extremely High 		F∠ - BSH - DB -	Beddir Drilling	ne ∠one ng Shea g Break	ar		 Iron Quar Carb 	iz onaceous	IR - Irregular

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E	ngi	inee	ring	Log	J - C	ore	d Bo	orehole			P	roject	No.:		F	PSM	469	3			
	Clier Proi	nt: ect Na	ame.	Th Sc	ie De hofie	partm Ids - 1	ent of allaw	Education ong High School			C C	omme omple	ence	d:	()3/1()3/1()/20)/20	14 14			
	Hole	e Loca	ition:	Se	e Fig	jure 1					Lo	oggeo	I By:		ļ	AL/H	Z				
	Hole	Posi Mode	tion:	30 Iounti	4372	.6 m E	= 6270	2897.2 m N MGA2020 2	one 56	_90°	C		ed By	':	1 28 60)P					
	Barr	el Typ	e and l	_engt	h:	NML	C 3 m	Be	earing:	-00	D	atum:			AHD		(Dpe	rator:	JK Drilling	
	-	Drill	ing Info	ormat	ion				Rock Subs	stance								F	Rock Ma	ass Defects	
				eons)			D D	Material D	escription				S	treng Is(50	th)	_			Defect	Descriptions / Com	iments
þ	2 5	(%) (ests	(Luge			ohic Lo	ROCK NAME: particle colour, fabric/texture	/grain chara	cteristics, or minor	We	atherir		- Axi Diam	al etral	Sp	etec bacin mm)	it Ig	Descri	ption, alpha/beta, ir	nfilling ness.
Meth	Wate	RQE	Sample Field T	MPT	RL (m)	Depth (m)	Grap	components, moisture, min	eral compos	ition, alteration	NX NX	MM SW	FR VL 0.1	T∑T 3	ен ³ ЕН ³⁰	<20 60	200	1000		thickness, other	,
								LAMINITE: dark grey and p thinly laminated, distinct roo	ale grey, we k fabric; ap	ell developed, proximately									—BP, 2	°, CN, PR, S	
	Return							SANDSTONE; fine to medi	um grained,	pale grey.									-BP 1	°CNPRS	
	Water	83																	BP, 2 JT, 85	°, CN, PR, S 5°, healed, UN, S	
Z	-100%		ls(50) d=0.72																¹ BP, 3 ¬BP, 2	', CN, PR, S '', CN, PR, S	
	80		wra		7.6	11-													DF, 2	, ON, FN, 3	
			ls(50) a=0.86 MPa		7	-		Hole Terminated at 11.10 r	n												
						-	-														
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					0.6	12-	-														
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ORE BH I	AD	// //T - Aug	ethod er drilling	FC bit			Wa > Inflo	nter	Weat XW - Extre HW - High	thering emely Weathered		De FT - F	fect T ault	ype		Infil Cl	ling/	Coa lean	ting	Roughness SL - Slickensider POL - Polisbed	d
PSM AU C	AD WI HC)/V-Aug 3-Wa 23-Wir	er drilling \ shbore eline core (/ bit (63.5 mr	m)	<	⊲ Parti ⊲ Com	al Loss plete Loss	MW - Mod SW - Sligt FR - Free	lerately Weathered htly Weathered		SZ - S BP - E SM - S	Shear Zo Bedding Seam	one parting		U CI RI	N -V D- C	eneer oating ock fra	l agments	S - Smooth RF - Rough VR - Very Rough	
Boll Blag	PC SF PT	03-Win 9T-Star - Pus	eline core (ndard pene h tube	85.0 mr etration	m) test	Gra	phic L	og/Core Loss	VL - Very	igth Low		IS - I JT - J CO - (nfilled S loint Contact	eam		G S Z	- G - S - S	ravel and ilt	J	Shape PR - Planar	
.02.2 LIB.C	w	PT - Wat	er pressur	e test			L Core indica	recovered (hatching tes material) re recoverv	M - Med H - High VH - Vcc	lium 1 / High		CZ - (VN -) FZ - F	Crushed /ein racture	Zone Zone		C/ CI FE	A - C - C - In	alcite lay on		CU - Curved UN - Undulating ST - Stepped	
PSM 3	ogged ir	accorda	nce with AS	1726:201	7 Geote	نىيىت chnical sit	e investig	ations	EH - Extre	emely High		BSH - E DB - E	Bedding Drilling E	Shear Ireak		Q. X	z - Q - C	uartz arbon	aceous	IR - Irregular	



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Ξn	gi	ine	ee	rin	g Log -	Nor	n Co	ored	Во	reho	ble		Project	No.:		PS	M469	3
C		nt:	Na	mo.	The D Schof	epart	tment	of Ed	ucatio 1 High	on Scho	ol		Comme	enced:		04/	/10/20	24
Н	ole	e Lo	ocat	tion:	See F	igure	1	27000	o 4			20 7	Logged	By:		AL	/HZ	27
	ole	Pe Mo	osit odel	ion: and	30446	6.5 n	n E 62	track	8.1 m	N MG	II ria	Inclination -90°	Checke RL Sur	ed By:	41	DP 90 r	, n	
Н	ole	e Di	iam	eter		110) mm		1			Bearing:	Datum:		Ał	HD	(Dperator: JK Drilling
			1	Drilli	ing Informa	tion		-				Soil Desci	iption					Observations
	ç	-			Samples				b	ion		Material Descriptio	ı		cy / ensity	F	land	
2	etratio		port	er	Tests Remarks	covery		Denth	phic L	ssificat		SOIL NAME: Plasticity, beh particle characteristics of	aviour or orimary	sture	isisten ative D	Pene l	tromete JCS kPa)	er Structure, Zoning, Origin, Additional Observations
	Pen	5	Sup	Wat		Rec	(m)	(m)	Gra	Syn	0	additional observatio	ns	Moi Con	Relo	100	000 000 000 000 000 000 000 000 000 00	
										CL	TOF plas	PSOIL: CLAY trace sand and ticity, dark brown; sand fine	gravel; low o coarse rained	M (>PL)			0.00: Grassed surface. Inferred TOPSOIL.
										CI	sub	rounded, up to 10 mm, orga lets.	nic odour and	i)	F			0.20: Inferred FILL.
									$\left \right $	СІ	FILI	.: CLAY trace gravel; mediur brown, gravel fine grained, s	n plasticity, ub-rounded		 F			0.50: Inferred NATURAL SOIL.
			7								CLA	Y: medium plasticity, red bro	wn.	.'				
							6.01	1-						M (<pl< td=""><td>)</td><td></td><td></td><td></td></pl<>)			
				$\mathbf{\Sigma}$											St			
				04/09/24							1.1	m: Recomes CLAX with gray	ol: brown and					
F	D										red sub	brown; gravel fine to mediun angular, up to 30 mm; shale	el; brown and i grained, fragments.	`				1.50: V-bit Refusal, Inferred BEDROO at 1.62 m.
									-		Con	tinued on cored borehole sh	eet					
							39.9	2-	-									
									-									
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									-									
							38.9	3-	-									
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		Me	etho	d		Pe	enetrat	tion		<u> </u> и	Vater	Samples	nd Tests		/ Noistu	re Co	nditior	n Consistency/Relative Dens
A A W	D/T D/V /B -	- A - A	Auge Auge	er drill er drill	ing TC bit ing V bit		lo resis	stance		⊳ Inf ⊲ Pa	low Irtial L	U - Undisturbe D - Disturbed S SPT - Standard P	l Sample ample enetration Te	st	D M W	- D - N - V	ry loist /et	VS - Very soft S - Soft F - Firm
S P	PT -	-Sta Pu	anda sh ti	ard pe ube	enetration test		R	efusal		I Co	omplet	e Loss ES - Environmer TW - Thin Walled LB - Large Distu	ital Sample rbed Sample					St - Stiff VSt - Very stiff H - Hard
~		πu	Acı	JUIE!	wii ly								campio					L - Very loose L - Loose MD - Medium dense D - Dense
oga	ed in	acci	ordan	ce with	AS 1726:2017 Geo	otechnica	al site inve	estigation	6									VD - Very dense Ce - Cemented C - Compact
ogg	ed in	acci	ordan	ce with	AS 1726:2017 Geo	otechnica	al site inve	estigation	5									C - Compact

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E	ngi	nee	ering l	_00	g - C	ore	d Bo	orehole			Project N	lo.:	P	SM469	93		
	Clien	it:		Th	ne De	partm	ent of	Education			Commer	nced:	04	/10/20	024		
	Hole	Loca	ation:	Se	e Fig	jure 1	allaw	Shg high School			Logged I	eu. By:	AL	_/HZ	024		
	Hole	Posi	tion:	30)4466	.5 m E	E 6270	0898.1 m N MGA2020 Z	one 56		Checked	l By:	DI	5			
	Drill I Barre	Mode el Typ	el and Mo be and Lo	ounti engt	ing: h:	6-ton	ne tra C 3 m	ck mounted drill rig Inc	aring: -90°		RL Surfa Datum:	ice: 4 A	1.90 HD	m	Оре	rator: JK	Drilling
		Drill	ling Info	rmat	tion			R	Rock Substance						F	Rock Mass	Defects
F				(su				Matarial Da	ecription			Strengt	h			Defect De	corintians / Commonts
_ ۲		(%)	and ts	Lugeo			ic Log	ROCK NAME: particle/	grain characteristics,	v	Veathering	● - Axia O - Diame	l tral	Defe Spaci	ect ing	Descriptio	n, alpha/beta, infilling
Metho	Nater	RQD (amples eld Tes	VPT (RL (m)	Depth (m)	Graph	colour, fabric/texture, components, moisture, mine	inclusions or minor ral composition, altera	tion	: 3 3 3 m	- 0.3 - 1.3 - 1.3	, 2	(mm ສຸລຸຊິ	1) 2 8	or coating th	g, shape, roughness, ickness, other
-	-	-	йі́	-	(,	(,				5	1 	TRACT	<u> </u>				
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					40.9	1-							il				
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								Continued from non-cored b	oorehole sheet	-+							
						-											
					39.9	2-	$\left \right\rangle$										
						.	łŇ										
						-	$\left \right $										
		0				.	$\langle \rangle$									2.69. Doc	sibly come coved in
						.		LAMINITE: dark brown/brow defined rock fabric, some cla	vn and pale grey, poor ay seams; approximat	ly ely						material a	and several echanical fractures
	nm				38.9	3-		90% SHALE: dark brown ar fine grained, brown.	nd 10% SANDSTONE;							between	2.68 to 3.0 m.
0	ter Ret					.											
NML)% Wat					-											
	80-100					.		3.55 m: Becomes dark grey	and brown, well							—BP, 1°, C	L 1 mm, PR, S
			ls(50) d=0.01 a=0.03			.		developed, thinly laminated, approximately 90% SHALE: and 10% SANDSTONE: fine	, distinct rock fabric; : dark grey and brown							— SM, 2°, C	CL 250 mm, PR, S
			MPa		37.9	4-			e grained, brown.								I 1 mm DD S
						.							il		i	∼ BP, 2°, C ¬ BP, 3°, C	L 1 mm, PR, S L 1 mm, PR, S L 1 mm, PR, S
		72											i		i	¹ SM, 2°, C	CL 20 mm, PR, S
b			ls(50) d=0.02			.							i				
			MPa			-											
			other						10/							тіпа	
	AD/ AD/	Me T - Aug V - Aug	e trioa jer drilling T(jer drilling V	C bit bit			₩a > Inflov		XW - Extremely Weathered	ed .	FT - Far SS - Sh	cτ ι ype ult ear Surface	I	CN - SN -	/COa Clean Stain	ung	KOUGNNESS SL - Slickensided POL - Polished
	WB HQ	- Wa 3- Win	shbore eline core (6	- 33.5 m	m)	 	Parti	al Loss plete Loss	MW - Moderately Weather SW - Slightly Weathered FR - Fresh	red	S∠ - Sh BP - Be SM - Se	ear ∠one dding parting am		VN - CO - RF -	veneer Coating Rock fra	l agments	S - Smooth RF - Rough VR - Very Rough
0	SP1 PT	- vvir F- Star - Pus	ndard penet h tube	ration	test	Gra	phic Lo	og/Core Loss recovered (hatching	Strength VL - Very Low L - Low		IS - Infi JT - Joi CO - Co	nt nt ntact ushed Zopo		G - S - Z -	Gravel Sand Silt Calcito		Shape PR - Planar CU - Curved
	WP	T-Wat	ter pressure	test			∫ indica L No co	tes material) re recovery	M - Medium H - High VH - Very High EH - Extremely High		VN - Ve FZ - Fra BSH - Be	n icture Zone dding Shear		CL - FE - QZ -	Clay Iron Quartz		UN - Undulating ST - Stepped IR - Irregular

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E	ngi	nee	ring	Log	- C	ore	d Bo	orehole			Projec	ct No.:	F	PSM4693		
	Clien	it: oct Na	ame [.]	The Sci	e Dep hofiel	oartme ds - T	ent of allaw	Education ong High School			Comn	nenced:	C)4/10/2024		
	Hole	Loca	tion:	See	e Fig	ure 1		2000 4 N MC 4000	0 7 50		Logge	ed By:	4	AL/HZ		
	Hole Drill	Posi Mode	l and M	304 Iountir	1466. na:	5 m E	: 6270	ck mounted drill rig	J Zone 56	-90°	Check RL Si	ked By:	41 9() m		
	Barre	el Typ	e and L	_ength	'9. I:	NMLC	C 3 m		Bearing:	00	Datun	n:	AHD	Ор	erator:	JK Drilling
		Drill	ing Info	ormati	on				Rock Subst	ance					Rock Ma	ss Defects
				eons)			Бo	Materia	I Description			Strei	ngth 50)	Defect	Defect [Descriptions / Comment
poq	er	0 (%)	les and Tests	T (Lug	ы	Denth	phic L	ROCK NAME: parti colour, fabric/textu	cle/grain characte ure, inclusions or	eristics, minor	vveathe	ring ●- A O - Dia	axial metral	Spacing (mm)	Descrip or coa	otion, alpha/beta, infilling ting, shape, roughness,
Met	Wat	RQ	Samp Field	WP	(m)	(m)	Gra	components, moisture, n	nineral compositio	on, alteration	NX H NY	ME Z ⊐ ⊠	- ° 6 E A B	600 600 600 600		thickness, other
						-		LAMINITE: dark grey ar thinly laminated, distinct 80-90% SHALE: dark gi	d brown, well dev rock fabric; approred rey and 10-20%	veloped, oximately					BP, 2°	, CL 1 mm, PR, S , CL 1 mm, PR, S
			ls(50) d=0.08			-		SANDSTONE; fine to m	edium grained, b	rown.						
		01	ls(50) d=0.02			-										, RF 10 mm, PR, S
		7:	a=0.2 MPa			-									SM, 0°	, RF 20 mm, PR, S , CL VN, PR, S , RF 10 mm, PR, S
					35.9	6—										
			ls(50) d=0			-										
			a=0.1 MPa			-		6.40 m: Becomes dark (grey pale and pal	e grey.						, CL VN, PR, S , CL VN, PR, S , BE 10 mm BB S
						_									-SM, 0°	, CL 50 mm, PR, S
					6	-									— SM, 3°	, RF 20 mm, PR, S
	_				34.	7—									– SM, 2° ∖ BP, 2°	', CL 20 mm, PR, S , CL VN, PR, S
	r Returr														—BP, 4°	, CL VN, PR, S
NMLC	% Wate		ls(50) d=0 a=0.33 MPa													
	80-100					_									— ВР, 2°	, RF 10 mm, PR, S
		83			33.9	8—									-FZ, 2°, -SZ, 3°	, RF 20 mm, PR, S , CL 20 mm, PR, S
					.,	-									BP, 2°	, CN, PR, S , CN, PR, S , CN, PR, S
			ls(50) d=0 a=0.17 MPa			-									—BP, 4°	, CN, PR, S
						-									SM, 0°	', RF 20 mm, PR, S ', CL 30 mm, PR, S
						-									—BP, 0°	, RF 10 mm, PR, S
					32.9	9—										, CL VN, PR, S , CN, PR, S
						-									¹ BP, 0°	, RF 30 mm, PR, S , CN, PR, S
			ls(50) d=0.4 a=0.6			-		0.50 m. 0.70 m. Distud							— ВР, 2° — ВР, 5°	, CN, PR, S , CN, PR, S
		76	MPa			_		9.50 m - 9.70 m: Disturc	ied zone.						— BP, 1° ∼ BP, 2°	, CN, PR, S , CN, PR, S
		-				_									⊢FZ, 0° ,	RF 50 mm, PR, S
	AD/	Me T - Aug	ethod er drilling 1	TC bit			Wa > Inflor	ater	Weather XW - Extrem	ering ely Weathered Weathered	D ۲۲ -	Fault		Infilling/Co CN - Clean SN - Stain	ating	Roughness SL - Slickensided
	AD/ WB HQ	V-Aug - Was 3- Wire	er drilling \ hbore eline core (/ bit 63.5 mm	ı)	<	⊐ Parti ⊲ Com	al Loss plete Loss	MW - Modera SW - Slightly FR - Fresh	Weathered	SZ - SZ - BP - SM -	Shear Zone Bedding parti Seam	ng	VN - Vener CO - Coatii RF - Rock	er ng fragments	S - Smooth RF - Rough VR - Very Rough
	PQ: SP ⁻ PT	o- Wire Γ- Star - Pus	eiine core (ndard pene h tube	85.0 mm etration te	n) est	Graj	ohic Lo Core	og/Core Loss recovered (hatching	VL - Very Lo L - Low	th _{Dw}	IS - JT - CO -	Infilled Seam Joint Contact	2	G - Grave S - Sand Z - Silt	-! -	Shape PR - Planar CU - Curved
	WP	T - Wat	er pressur	e test		\ge 1	indica - No co	tes material) re recovery	M - Mediun H - High VH - Very Hi	n igh	VN - FZ - BSH	Vein Fracture Zone - Bedding Shea	e ar	CL - Clay FE - Iron QZ - Quart	z	UN - Undulating ST - Stepped IR - Irregular
Log	iged in	accordar	nce with AS	1726:2017	7 Geoteo	hnical site	e investig	ations	⊏H - Extrem	eiy nigh	DB -	Drilling Break		X - Carbo	naceous	-

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	1 angel		~~																	Page 4 of 4	
E	ngi	nee	ering	Log	J - C	ore	d Bo	orehole			Pro	oject	No	:		PSN	/46	93			
	Clier Proje	nt: ect Na	ame:	Th Sc	le De hofie	partme lds - T	ent of allaw	Education ong High School			Co Co	mme mple	ence eted	ed: :		04/1 04/1	0/2 0/2	024 024			
	Hole		ation:	Se 30	e Fig	jure 1	: 627()898 1 m N MGA2020) Zone 56		Log	ggeo	l By			AL/ŀ	ΗZ				
\vdash	Drill	Mode	el and M	ounti	ng:	6-toni	ne tra	ck mounted drill rig	Inclination:	-90°	RL	Sur	face	у. Э:	41.9	0 m	1				
\vdash	Barr	el Ty	be and L	.engt	h:	NMLC	C 3 m		Bearing:		Da	tum			AHE) 		Ор	erator:	JK Drilling	
		Dril	ling Info	ormat	ion	1			Rock Sub	stance	-			Stren	ath				Rock I	Nass Defects	
Method	Water	RQD (%)	Samples and Field Tests	WPT (Lugeons	RL (m)	Depth (m)	Graphic Log	Materia ROCK NAME: parti colour, fabric/textu components, moisture, r	l Description icle/grain chara ure, inclusions on nineral compos	cteristics, or minor ition, alteration	Wea ≳ ≩	therir ≩ ≳	ла С	Is(5 ● - A - Diar	0) xial metral 	<20	Defe Spac (mr	ect cing n)	Defe Des or c	ct Descriptions / Cor cription, alpha/beta, oating, shape, rougl thickness, other	mment infilling hness,
NMLC		76	ls(50) d=0.8 a=0.72			-		LAMINITE: dark grey/pa well developed, thinly la approximately 80-90% \$ and 10-20% SANDSTO pale grey.	le grey and so minated, disting SHALE: dark gr NE; fine to mee	me brown, ct rock fabric; ey and brown łium grained,									BP, BP, BP, JT, BP, BP,	0°, RF 20 mm, PR, 1°, CN, PR, S 3°, CN, PR, S 87°, CN, PR, S 0°, CN, PR, S	S
868.3.GPJ < <drawingfile>> 14/10/2024 14/29 10.03.00.08 Dagel Fence and Map Tool Ltb: PSM 3.02.12019-03-06 Prj: PSM 3.02.12019-03-06</drawingfile>			MPa		27.9 28.9 29.9 30.9			Hole Terminated at 10.5 Target depth	i0 m												
PSM 3.02.2 LIB.GLB Log PSM AU CORE BH PS	AD AD WE HC PG SP PT WF	M //T - Aug //V - Aug //V - Aug 3 - War 3 - War 3 - Wir 17 - Sta - Pus PT - War accorda	ethod ger drilling T ger drilling V shbore eline core (eline core (eline core (ndard pene sh tube ter pressure nce with AS ⁴	C bit / bit 63.5 mi 85.0 mi tration f e test	n) n) test 7 Geote	Gran	Market Market Market Market Parti Com Core indica No cc e investio	ater ater w al Loss pojete Loss poj/Core Loss poj/Core Loss tes material) re recovery ations	Weai xw - Extr HW - Higg MW - Sigg FR - Free VL - Ven L - Low M - Higg VH - Higg VH - Higg VH - Ven EH - Higg	thering emely Weathered larately Weathered lerately Weathered thy Weathered thy Weathered thy Weathered thy Weathered thy Weathered thy Weathered the Weathe		De FT - I SS - S SZ - S BP - I SM - S IS - I JT - S CO - C CZ - C CZ - C VN - Y FZ - I BSH - I DB - I	Fact Shear Shear Seddin Seam nfilled Joint Contac Crushe /ein Fractur Beddin Drilling	Type Surface Zone g partin Seam t d Zone e Zone g Shea Break	g r	Inf	CN - SN - SN - CO - CO - G - S - CO - CO - CO - CO - CO - CO - CO - CO	g/Co Clean Stain Venee Coatir Rock Grave Sand Silt Calcit Clay Iron Quart Carbo	ating er bg fragments I e z naceous	Roughness SL - Slickensid POL - Polished S - Smooth RF - Rough VR - Very Roug PR - Planar CU - Curved UN - Undulatin ST - Stepped IR - Irregular	SS Jed gh





Appendix I Piezometer Construction Records

JOB no.:

PSM4693



PROJECT: Schofields - Tallawong High School



JOB no.:

PSM4693

PROJECT: Schofields - Tallawong High School



Pells Sullivan Meynink

SM

Engineering Consultants Rock - Soil - Water JOB no.:

PSM4693



PROJECT: Schofields - Tallawong High School



Appendix J Point Load Test Results



POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	PSM4693-	012L												Sheet 1	of	2
Project	Schofie	elds - Tallav	vong High	School	l, Guntav	wong Ro	bad									
Test Method	AS 4133.4.1	1-2007 Metho	ods of testin	g rocks fo	or enginee	ring purpo	oses -	Sampling Technique	NLMC					Sampling Da	ate 2/10/2	024
	Determinati	on of point loa	ad strength	index	Ū	0, ,		Storage History	North Ry	de office :	storage			Testing Date	2/10/2	:024
Test Machine	GSA 6510-0	0704						Moisture Condition	Natural		Ū			Tested By	HZ	
Calibration Date	14/1/2021							Loading Rate	< 30 sec	onds				,		
Calibration Date						Di	ametral Te	ets		onao		Avial .	Tests			
Rock T	vne	Location	Depth						\M/		D	1	10010			AS 1726:2017
)po	Looudon	(m)	(mm)	L (mm)	(kN)	's(50) (MPa)	Failure Mode	(mm)	(mm)	(kN)	I _s (MPa)	's(50) (MPa)	Failur	e Mode	Strength Class
I AMIN	ITE	BH05	2 44	50	60	0.2	01	Parallel to bedding	50	25	0.7	04	(u)	Through	substanc	
LAMIN	ITE	BH05	3.00	50	50	0.0	0.0	Parallel to bedding	50	50	0.1	0.0	0.0	Bad brea	ak	#N/A
LAMIN	ITE	BH05	4.00	50	40	0.1	0.0	Parallel to bedding	50	40	0.8	0.3	0.3	Through	substance	e VL/M
LAMIN	ITE	BH05	5.40	50	60	0.9	0.4	Parallel to bedding	50	40	1.8	0.7	0.7	Through	substance	e M
LAMIN	ITE	BH05	6.30	50	75	1.2	0.5	Parallel to bedding	50	40	4.4	1.7	1.7	Through	substance	e <i>M/H</i>
LAMIN	ITE	BH06	4.18	50	70	0.1	0.0	Parallel to bedding								VL
LAMIN	ITE	BH06	4.60	50	80	0.3	0.1	Parallel to bedding								L
LAMIN	ITE	BH06	5.54				-	Ū Ū	50	40	0.4	0.2	0.2	Through	substance	e L
LAMIN	ITE	BH06	6.16	50	50	0.4	0.2	Parallel to bedding				-	-			L
LAMIN	ITE	BH06	6.67				_	Ū Ū	50	40	0.6	0.2	0.2	Through	substance	e L
LAMIN	ITE	BH06	7.90	50	70	0.8	0.3	Parallel to bedding	50	40	1.2	0.5	0.5	Through	substance	e M
LAMIN	ITE	BH06	8.13	50	100	0.4	0.2	Parallel to bedding	50	40	2.3	0.9	0.9	Through	substance	e L/M
LAMIN	ITE	BH06	9.54	50	100	2.8	1.1	Parallel to bedding	50	45	3.5	1.2	1.2	Through	substance	e H
LAMIN	ITE	BH06	10.36	50	100	1.8	0.7	Parallel to bedding	50	40	2.2	0.9	0.9	Through	substance	e M
LAMIN	ITE	BH07	3.28					_	50	50	0.4	0.1	0.1	Through	substance	e L
LAMIN	ITE	BH07	3.82	50	70	0.5	0.2	Parallel to bedding						_		L
LAMIN	ITE	BH07	4.27	50	70	0.1	0.0	Parallel to bedding	50	30	0.3	0.2	0.1	Through	substance	e #N/A
LAMIN	ITE	BH07	5.38	50	80	0.6	0.2	Parallel to bedding	50	40	0.5	0.2	0.2	Through	substance	e L
LAMIN	ITE	BH07	6.46	50	70	0.5	0.2	Parallel to bedding								L
LAMIN	ITE	BH07	6.86	50	80	1.5	0.6	Parallel to bedding								М
LAMIN	ITE	BH07	7.73	50	180	2.0	0.8	Parallel to bedding								М
LAMIN	ITE	BH07	8.65	50	100	1.2	0.5	Parallel to bedding	50	45	3.3	1.2	1.2	Through	substance	e M/H
LAMIN	ITE	BH07	9.52	50	190	2.5	1.0	Parallel to bedding								н
LAMIN	ITE	BH08	8.40						50	50	1.1	0.3	0.4	Through	substance	e M
LAMIN	ITE	BH08	8.96						50	40	2.3	0.9	0.9	Through	substance	e M
LAMIN	ITE	BH08	9.47	50	100	2.4	1.0	Parallel to bedding	50	40	4.0	1.6	1.6	Through	substanc	e M/H
By:	AL/HZ			Checke	ed:		DP							Date:	14/10	/2024

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POINT LOAD STRENGTH INDEX TEST RESULTS

Job No.	PSM4693-0	012L												Sheet	2	of	2
Project	Schofields	s - Tallawoi	ng High S	chool, G	Guntawo	ng Road	1										
Test Method	AS 4133.4.1-2007 Methods of testing rocks for engineering purposes Determination of point load strength index				oses -	Sampling Technique Storage History	echnique NLMC story North Ryde office storage				Sampling Date 2/10/2024 Testing Date 2/10/2024						
Test Machine	GSA 6510-0	704						Moisture Condition	Natural					Tested By	HZ	Z	
Calibration Date	14/1/2021							Loading Rate	< 30 sec	ronds				,			
Calibration Bato						Dia	ametral Te	ests	000000	.0.140		Axial ⁻	Tests				1
Rock T	уре	Location	Depth	D (mm)	L (mm)	P (kN)	I _{s(50)} (MPa)	Failure Mode	W (mm)	D	P (kN)		I _{s(50)}	Failu	ire Mod	le	- AS 1726:2017 Strength Class
I AMINI	TE	BH08	10.60	50	130	1.8	(min d)	Parallel to hedding	(11111)	(11111)	(101)	(ivii a)	(ivir u)				м
LAMINI	TE	BH08	11.05	00	100	1.0	0.7	r araner to bedanig	50	50	26	0.8	0.9	Throual	h substi	ance	M
LAMIN	TE	BH09	3.61	50	60	0.0	0.0	Parallel to bedding	50	25	0.1	0.0	0.0	Bad bre	ak		#N/A
LAMIN	TE	BH09	4.39	50	120	0.1	0.0	Parallel to bedding	50	50	0.4	0.1	0.1	Bad bre	ak		#N/A
LAMINI	TE	BH09	5.48	50	70	0.0	0.0	Parallel to bedding	50	40	0.5	0.2	0.2	Bad bre	eak		#N/A
LAMIN	TE	BH09	5.21	50	80	0.2	0.1	Parallel to bedding									VL
LAMIN	TE	BH09	6.10	50	60	0.0	0.0	Parallel to bedding	50	50	0.3	0.1	0.1	Bad bre	ak		#N/A
LAMINI	TE	BH09	7.28	50	60	0.0	0.0	Parallel to bedding	50	50	1.0	0.3	0.3	Through	h substa	ance	#N/A
LAMINI	TE	BH09	8.11	50	100	0.0	0.0	Parallel to bedding	50	50	0.5	0.2	0.2	Bad bre	eak		#N/A
LAMINI	TE	BH09	9.28	50	75	1.0	0.4	Parallel to bedding	50	50	1.8	0.6	0.6	Through	h substa	ance	М
By:	AL/HZ			Checke	ed:		DP							Date:	14	4/10/20	024

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Appendix K Bulk Earthworks Specification (ref.PSM4693-013S REV1 DRAFT)

New High School for Schofields and Tallawong

Bulk Earthwork Specification. Filling, Cutting and Testing.

PSM4693-013S REV1 DRAFT 21 November 2024



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1. Scope

This specification details the requirements for the bulk earthworks to be undertaken at the proposed Schofields -Tallawong High School ('The Site') for The Department of Education (DoE). The area where this specification is applicable is shown in Figure 1. This includes areas where material is filled or cut to bulk earthworks level (BEL) within the site.

Fill placed in accordance with this specification is denoted as Engineered Fill.

This specification does not address any environmental, contamination, demolition or erosion issues or additional regulatory/approval requirements (e.g. Council Consent Conditions) associated with the earthworks.

2. Site preparation works

The following tasks shall be undertaken as part of the Site Preparation Works:

- 1. To prepare the site for the earthworks:
 - a. Removal of stockpiles and mounds.
 - b. Clearing of the area including removal and disposal of all trees, stumps, roots, bush, other organic material, all vegetation both living and dead, all minor man-made structures (e.g. fences) and all rubbish.
 - c. Grubbing operations shall be carried out to a minimum depth of 0.5m below the surface, where grubbing is required.
 - d. Stripping of topsoil and stockpiling for potential blending with Engineered Fill (refer Section 3.3.2).
 - e. Demolition of structures as directed by the Principal. Extent of demolition works are not addressed by this Specification.
 - f. Decommissioning the services from the pre-existing infrastructure. This is to include backfilling any voids such that they do not collapse or undergo excessive settlement under the weight of the filling and building loads. Backfilling is to be undertaken with one of the following materials:
 - i. Cement stabilised sand (min. 3% cement) placed in accordance with the supplier requirements or
 - ii. Mass concrete or grout as approved by PSM.
 - iii. Engineered fill placed in accordance with Clauses 3.5 and 3.6 of the Specification.

Where any excavation is required to complete the above tasks, the surface exposed at completion of the excavation shall be treated in accordance with the Subgrade Preparation requirements in Clause 3.1.

3. Filling Works

3.1 Subgrade Preparation

The condition of the subgrade should be assessed immediately prior to the commencement of filling.

All Engineered Fill is to be placed on one of the following materials:

- 1. Bedrock.
- 2. Natural insitu material of at least stiff consistency.
- 3. Engineered compacted fill placed in accordance with this or other approved specifications for which the Geotechnical Inspection and Testing Authority (GITA) has a Level 1 certificate certifying compliance with that approved specification AND of at least stiff consistency.
- 4. Existing fill / pavements / slabs and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM. PSM may also direct a bridging layer of Engineered Fill be placed and compacted to a Dry or Hilf Density Ratio (Standard Compaction) of between 98% and 102%. Any such layer shall be a Lot under Clause 5.3.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be moisture conditioned and compacted to be in accordance with



Clauses 3.5 and 3.6 of this specification. Engineered Fill shall be placed only on subgrade approved by the GITA as being in accordance with this specification.

3.2 Base Geometry

The slope of any buried batter shall be less (flatter) than 1H:1V unless otherwise directed by PSM.

The contractor shall remove or flatten any geometrical obstructions (e.g. protrusions or holes) such that subsequent Engineered Fill can be placed to achieve the requirements of this specification.

Engineered Fill shall be placed only on areas where the base geometry has been approved by the GITA.

3.3 Material

3.3.1 Imported Fill

Imported Engineered Fill is to conform to one of the following definitions:

1. "Virgin excavated natural material" (VENM) as defined by the Protection of the Environment Operations Act 1997 No 156, Schedule 1, on Page 209:

"Virgin excavated natural material (eg clay, gravel, sand, soil and rock) that is not mixed with any other waste and that:

- i. has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphide ores or soils, or
- ii. consists of excavated natural materials that meet such criteria as may be approved by the EPA".
- 2. "Excavated natural material" (ENM) as defined under Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014:

"Excavated natural material is naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

- *i.* been excavated from the ground, and
- *ii.* contains at least 98% (by weight) natural material, and
- iii. does not meet the definition of Virgin Excavated Natural Material in the Act.
- *iv.* Excavated Natural Material does not include material that has been located in a hotspot; that has been processed; or that contains asbestos, Acid Sulphate Soils (ASS), Potential Acid Sulphate soils (PASS) or sulfidic ores."

3.3.2 Site Won Material

Site Won material shall comprise material won from excavations on site including natural and existing fill, including crushed concrete pavement on site. They need to satisfy Clause 3.3.3.

3.3.3 All Fill

The Engineered Fill shall be approved by the GITA as suitable for use in a structural fill.

Engineered Fill shall not comprise unsuitable material that includes:

- organic soils, such as many topsoils, severely root-affected subsoils and peat;
- silts, or materials that have the deleterious engineering properties of silt;
- other materials with properties that are unsuitable for the forming of structural fill; unless it is approved by PSM,

The GITA shall assess that the proportion of deleterious material in each Lot is not greater than 1% by weight. Deleterious material is defined by Table 3015.6 of the RMS QA Specification 3051 (Edition 7 June 2020) as:

"Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood and Other Vegetable Matter"

If the GITA is not able to visually assess the above criterion, the GITA shall arrange appropriate testing.



All Engineered Fill particles shall be able to be incorporated within a single layer. Further, less than 30% of particles shall be retained on the 37.5 mm sieve.

Engineered Fill shall be able to be tested in accordance with the Standard Compaction method (AS1289.5.4.1) or Hilf test method (AS1289.5.7.1). These methods require less than 20% retained on the 37.5 mm sieve. Where between 20% and 30% of particles are retained on the 37.5 mm sieve the above test methods shall still be adopted and test reports annotated appropriately.

These requirements should be met by the material after placement and compaction.

Only material approved by the GITA shall be placed as Engineered Fill.

3.4 Fill Zonation and Placement

HOLD POINT

Process Held	Placing of Fill
Submission detail	The Contractor / GITA submit to PSM a Weekly Certificate as defined in Clause 7.2.1of this specification for the earthworks completed to the previous Saturday no later than 5 pm of the subsequent Wednesday.
Release of Hold Point	PSM to confirm receipt of Weekly Certificate and recommend release of Hold Point if initial assessment of the Weekly Certificate indicates it complies with requirements of this specification. The contract superintendent should then release the Hold Point if it considers appropriate.

Engineered Fill shall be placed in accordance with the following requirements:

- 1. In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the GITA.
- 2. The compacted thickness of each layer shall be equal to or less than 300 mm.

Engineered Fill shall only be placed on subgrade in accordance with this specification and approved by the GITA.

3.5 Compaction

Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.

The insitu density shall be measured over the full depth of each layer placed.

3.6 Moisture Control

The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.

Placement moisture content of the Engineered Fill shall be measured.

4. Cutting

4.1 Subgrade Condition

The subgrade is to comprise one of the following materials:

- 1. Bedrock.
- 2. Natural insitu material of at least stiff consistency.
- 3. Existing fill and other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be excavated and filled to the BEL in accordance with this specification.



5. Survey

5.1 Filling Areas

The survey requirements are as follows:

- 1. Any approved subgrade shall be surveyed prior to first filling such that subgrade levels are established to within ± 0.1 m. The area subject to approval shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
- 2. The Lot boundaries shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
- 3. The location of the field density tests shall be assessed and shown on the Lot boundary plan drawing to an accuracy of at least +/-5 m in plan.
- 5. The elevation of the field density tests shall be surveyed to an accuracy of +/-0.05 m.

The plan drawing shall show at the boundaries of the site and other identifiable site features, so as to allow the location of the lots and the test to be recoverable.

5.2 Cutting Areas

Any approved subgrade for cut areas shall be surveyed such that subgrade levels are established to within ± 0.1 m.

6. Inspection and Testing

6.1 Role of the GITA

A NATA accredited Geotechnical Inspection and Testing Authority (GITA) shall be contracted to document and certify that the works undertaken by the contractor has been completed in accordance with the relevant design and specifications.

6.2 Level 1 Control

The GITA shall adopt Level 1 responsibility as described in Section 8.2 of AS 3798-2007 "Guidelines on earthworks for commercial and residential developments":

"The primary objective of Level 1 Inspection and Testing is for the geotechnical inspection and testing authority (GITA) to be able to express an opinion on the compliance of the work. The GITA is responsible for ensuring that the inspection and testing are sufficient for this purpose.

The geotechnical inspection and testing authority needs to have competent personnel on site at all times while earthwork operations are undertaken. Such operations include:

- Completion of removal of top soil
- Placing of imported or cut material
- Compaction and adding/removal of moisture
- Trenching and backfilling
- Test rolling
- Testing.

The superintendent should agree a suitable inspection and testing plan prior to commencement of the works.

On completion of the earthworks, the GITA will usually be required to provide a report setting out the inspections, sampling and testing it has carried out, and the locations and results thereof. Unless very unusual conditions apply, the GITA should also be able to express an opinion that the works (as far as it has been able to determine) comply with the requirements of the specification and drawings."



For this particular contract, Level 1 responsibility includes:

- 1. Lot testing as per Clause 6.3 of this specification.
- 2. A frequency of compaction testing not less than that specified in Clause 6.4 of this specification.
- 3. The GITA documenting and reporting its activity in the terms required by Clause 7 of this specification.
- 4. The GITA undertaking adequate inspections and testing to comply with the above requirements and to be able to certify the fill in the terms required by Clause 7 of this specification.

6.3 Lot Testing

This specification requires lot testing to be undertaken.

A Lot is defined as a single layer of Engineered Fill consisting of uniform material which has undergone similar treatment (both moisture conditioning and compaction) and that represents no more than one day's work.

Lot testing comprises the following:

- 1. A Lot shall be identified by the Contractor or the GITA with a Lot Number and presented for testing.
- 2. A Lot shall be deemed to be in accordance with the specification if all the tests undertaken within the Lot are in accordance with the specification, i.e. "a none to fail basis".
- 3. If any one test undertaken within a Lot fails, the whole of the Lot shall be reworked and retested.

Any portion of the placed Engineered Fill must be part of a single lot and all Lots will require approval by the GITA.

6.4 Testing Frequency (Compaction Testing)

The frequency of compaction testing for each lot shall be the greater of:

- a. 1 test per 500 m³ of material placed
- b. 3 tests per lot.

A laboratory moisture content test shall be undertaken for each field density test.

6.5 **Proof Rolling and Plate Load Testing**

Proof rolling, together with minor boxing out and refilling, of the upper surface of the bulk earthworks will be undertaken as directed by PSM. The plant to be adopted depends upon the design loads adopted by the structural engineers for each section of the site.

Plate load testing shall be undertaken at the direction of PSM at final bulk earthworks level (BEL) prior to placement of roadbase or capping material. Expected test frequency is approximately a day of testing for each building pad.

The contractor is to make a suitable reaction (eg 20 tonne excavator) available for the tests.

6.6 Inspection, Testing and Survey

The GITA shall at least undertake the following tasks:

Cut areas

- 1. Identify the subgrade as one of the subgrade types listed in Clause 4.1 of this specification and assess that the subgrade condition of cut areas is in accordance with the subgrade condition requirements of Clause 4.1 of this specification.
- 2. Should Engineered Fill be required to fill overcut areas, assess that filling has been placed in accordance with this specification.

Fill areas

3. Identify the subgrade as one of the subgrade types listed in Clause 3.1 of this specification and assess that the subgrade condition of any area prior to placement of fill material is in accordance with the subgrade preparation requirements of Clause 3.1 of this specification. Should the subgrade material comprise "Other materials as approved by PSM, eg. existing fill intended to be left in place.", PSM should be requested to inspect and provide approval prior to filling.



The GITA needs to include / refer to PSM approval in its weekly report for subgrade comprising existing fill and other materials as approved by PSM

- 4. Assess that the base geometry of any area prior to placement of fill material is in accordance with the base geometry requirements of Clause 3.2 of this specification.
- 5. Assess that the material placed is in accordance with the fill material requirements of Clause 3.3 of this specification.
- 6. Assess that the Engineered Fill has been placed in accordance with the requirements for fill zonation and placement of Clause 3.4 of this specification.
- 7. Assess that each Lot as presented for approval by the contractor is in accordance with the requirements for Lot definition of Clause 6.3 of this specification.
- 8. Ensure that the survey requirements in Clause 4 of this specification have been completed.
- 9. Estimate the approximate volume of Engineered Fill placed in each Lot presented for approval.
- 10. Conduct Lot testing in accordance with the construction control testing requirements of Clauses 6.3 and 6.4 of this specification.
- 11. Assess that the compaction of each Lot is in accordance with the requirements of Clause 3.5 of this specification. The GITA shall select a depth of insitu density tests that allows the density of the full layer to be assessed.
- 12. Assess that the moisture variation of each Lot is in accordance with the requirements for moisture control in Clause 3.6 of this specification.
- 13. Conduct material property testing in accordance with the material testing requirements in this specification.

7. Reporting and Certification

7.1 Reporting

The GITA shall produce at least the following reports:

- 1. Subgrade Approval Reports (a sample is attached). Such a report shall:
 - *a.* Document assessments undertaken for tasks 1 and task 3 of Clause 6.6 including reporting the subgrade type.
 - b. Document the subgrade survey that has been undertaken.
 - *c.* Approve or reject the subgrade condition and base geometry for filling, based on tasks 3 and 4 of Clause 6.6.
 - *d.* Approve or reject the subgrade condition for cut areas based on task 1.
- 2. Lot Approval Reports (a sample is attached). Such a report shall:
 - *a.* Document assessments, testing and survey undertaken for tasks 3 to 13 of Clause 6.6.
 - b. Report the results of testing undertaken for task 10 of Clause 6.6.
 - c. Approve or reject lots based on tasks 11 and 12 of Clause 6.6.
- 3. *Material Testing Reports.* Such a report shall:
 - *a.* Report the results of material property testing undertaken for task 13 of Clause 6.6.
- 4. Daily Reports (a sample is attached). Such a report shall be completed daily and shall:
 - a. Document time spent on site by the GITA personnel.
 - b. List subgrade assessments and approvals undertaken each day with reference to relevant Subgrade Approval Report(s).
 - c. List Lots presented, accepted and approved or rejected each day, with reference to relevant Lot Approval Report(s).



- d. List survey undertaken each day as for task 8 of Clause 6.6 and not already documented in the Subgrade or Lot Approval Reports.
- e. Document other relevant activities undertaken on site that day (site instructions, breakdowns, compaction equipment used, etc.).

7.2 Certification

7.2.1 Weekly Certificates

The GITA shall produce a Weekly Certificate for any week in which earthworks are undertaken in accordance with this specification. The Weekly Certificate will cover all works from the previous Weekly Certificate until the end of work on a Saturday.

The Weekly Certificate shall transmit the following:

- Copy or reference to the complete specification document(s)
- Subgrade Approval Reports
- Lot Approval Reports
- Material property testing reports
- Daily Reports
- Survey of subgrade geometry prior to filling or in cut areas
- Plan survey drawing showing lot boundaries and location of density tests
- Survey documenting filling undertaken to date and showing location of testing
- Provide an Excel spreadsheet presenting the results of the week's acceptance testing completed by the GITA.

And certify that:

"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4693-013S RevX dated XXX)."

7.2.2 Interim or Final Filling Certificate

At the completion of the bulk earthworks, or as requested by the Client, the GITA shall provide an Interim or Final Filling Certificate which shall:

- 1. Transmit a reference list of the Weekly Certificates.
- 2. Provide an Excel spreadsheet presenting the results of all the acceptance testing completed by the GITA.
- **3.** Certify that "All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. Ref. PSM4693-013S RevX dated XXX)."



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Approximate Site Extents - Schofields - Tallawong High School

Approximate Stage 1 Development Plan

Note: Aerial imagery from Nearmap of site conditions on 28 October 2024.

Legend

80 100 m	The Departmen Geotechnical Schofields Tallaw Guntawo LOCALI ⁻	nt of Education Investigation rong High School rng Road IY PLAN		
Paper Size: A3	PSM4693-013S	Figure 1		

Appendix A Subgrade Approval Report


GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

SM

P

NATA accreditation number

SUBGRADE APPROVAL REPORT

Client:				Contractor:				
Job number:				Report number:				
Project:				Technician:				
Subarade a	ireas assessed.							
	Date	Approximate	Subgrade description	Geometry summary	Specification	Compliance	Survey	Approved
Alea ID	Date	extent		Geometry summary	reference	(Pass/Fail)	reference	(Yes/No)
		DV						
COMMENT	S:							
Signed:				Date:				

Appendix B Lot Approval Report





GEOTECHNICAL INSPECTION AND TESTING AUTHORITY NATA accreditation number

LOT APPROVAL REPORT

Client:			Report number:			
Job number:		Report date:				
Project:			Technician:			
Contractor:			Test methods:			
LOT ID:			Sheet	of		
Retest (Yes/No)			Original test repo	ort number:		
Specification reference						
Location:						
Lot boundary survey reference/location:						
Materials description:	(MATERIAL TYPE, colour, minor components, maximum particle size)					
Material identification:	(Identify the material as defined in Clause 2.3.1, Clause 2.3.2 or Clause 2.3.3 of the Specification)					
Deleterious material assessment:	(Report proportion of deleterious material)					
Layer thickness:		-	- · · · · · · · · · · · · · · · · · · ·			
Accepted as Lot. (Tes/NO)		-	Date:			
Approximate volume (m3)			Number of tests	required:		
		-				
Test ID No.		10				
Test soil description						
Date tested:						
Grid reference						
Surveyed test locations (RL,E,N)						
Test depth (mm)						
Max size (mm)						
% Oversize material (wet)						
Field wet density (t/m ³)						
Field moisture content (%)						
PWCD (t/m ³)						
Compactive effort						
Moisture variation (%)						
HILF density ratio (%)						
TEST (Pass/Fail)						
LOT APPROVAL	(Pass/Fail)	Signed:		Date:		

Appendix C Daily Report





GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

DAILY REPORT

Client: Job number: Proiect:			Report number: Report date:	
Location: Contractor			Level of testing: Technician:	Level 1
Time on site: Time off site:				
1. Subgrade Appr	oval			
Areas ID	Subgrade Approval Report No:	Comments		
2. Lot Approval				
Lot ID	Lot Approval Report No:	Comments		
3. Survey				
Type of survey.	Survey undertaken by:	Reference		
A Instructions ro	coived on site	I		
+. Instructions fer				
5. Instructions giv	ven on site			
COMMENTS:				
Signed:			Date:	

Appendix D Certification Letter (Sample Only)



Our Ref:

Date:

Addressed to: Earthwork Contractor

Attention: Earthwork Contractor Representative

Dear

RE: SAMPLE INTERIM (OR FINAL) FILLING CERTIFICATE SCHOFIELDS - TALLAWONG HIGH SCHOOL, BULK EARTHWORKS CERTIFICATION OF EARTHWORKS BETWEEN [DATE OF COMMENCEMENT] AND [DATE OF COMPLETION]

In the period between [date start] and [date finish] the contractor has undertaken earthworks in areas XXX and XXX.

During the above period:

- The GITA has prepared the following Subgrade Approval Reports:
- 1. Subgrade Approval Report No 1
- 2.
- The GITA has prepared the following Lot Approval Reports:
- 1. Lot Approval Report No 1
- 2.
- The GITA has prepared the following Daily Reports
- 1. Daily Report No 1.....
- 2.

2.

- The following subgrade survey was undertaken:
- 1. Subgrade Survey reference.....
- The following weekly survey was undertaken:
- 1. Weekly survey of week endingreference......
- 2.

.

Copies of all the above documents are attached.

The GITA certifies that all the earthworks undertaken in the above stated period are documented in the above reports and have been undertaken in accordance with the Specifications (ref. PSM3821-006S, dated XXX) a copy of which is attached, with the exception of:

1. List outstanding issues (not approved subgrade, lots, unsuitable material, failed tests etc.)

2.

Signed

GITA