GEOTECHNIQUE PTY LTD
An eiaustralia company
ABN 64 002 841 063

Additional Intrusive Geotechnical Investigation

Proposed Upgrades to Northmead Public School

52A Moxhams Road, Northmead

Report No 20429/9-AA Updated

Lemko Place, Penrith NSW 2750 PO Box 880, Penrith NSW 2751
Telephone (02) 4722 2700
E-mail: info@geotech.com.au www.geotech.com.au

ABN 64 002 841 063

COVER PAGE

Document Prepared by

Geotechnique Pty Ltd
1 Lemko Place, Penrith NSW 2750
PO Box 880, Penrith NSW 2751
Email: Geotech@geotech.com.au
Tel: +61 2 4722 2700
www.geotech.com.au

Document Information

Document Title	Intrusive Geotechnical Investigation Report
Site Address	52A Moxhams Road, Northmead
Job No	20429/9
Report No	20429/9-AA
Client	School Infrastructure NSW (SINSW) c/-RP Infrastructure Pty Ltd
Client Address	Level 9, 20 Bond Street, Sydney NSW 2001
Client Contact	Joe Wood

Document Control

Rev	Date	Revision Detail/Status	Author	Reviewer	Approver
0	05/12/2024	Initial Issue	Indra Jworchan		Indra Jworchan
1	07/02/2025	Updated	Indra Jworchan		Indra Jworchan

Author Signature	
Name	Indra Jworchan
Title	Principal Engineer

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

GEOTECHNIQUE®
PTY LTD
ABN 64 002 841 063
An eiaustralia company

Job No: 20429/9
Our Ref: 20429/9-AA Updated
7 February 2025

NSW Department of Education
School Infrastructure NSW (SINSW)
c/- RP Infrastructure Pty Ltd
Level 9, 20 Bond Street
SYDNEY NSW 2001
Email: joe.wood@rpinfrastructure.com.au

Attention: Mr Joe Wood

Dear Sir

re: **Upgrades to Northmead Public School (ID 2763)**
52A Moxhams Road, Northmead
Additional Intrusive Geotechnical Investigation (IGI) Report

Please find herewith additional Intrusive Geotechnical Investigation (IGI) report prepared for the proposed upgrade works in Northmead Public School.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

INDRA JWORCHAN
Principal Geotechnical Engineer
BEng MEng MIEAust CPEng NER APEC Engineer IntPE(Aus)
Email: indra@geotech.com.au

Lemko Place, Penrith NSW 2750 PO Box 880, Penrith NSW 2751
Telephone (02) 4722 2700
E-mail: info@geotech.com.au www.geotech.com.au

GEOTECHNIQUE PTY LTD

An eiaustralia company

ABN 64 002 841 063

EXECUTIVE SUMMARY

Schools Infrastructure NSW (SINSW) has commissioned Geotechnique Pty Ltd for preparation of an Additional Intrusive Geotechnical Investigation (IGI) Report for proposed upgrade works in Northmead Public School (PS) located at 52A Moxhams Road, Northmead. The assessments and recommendations presented in this IGI report are summarised below:

- The subsurface profile across Northmead PS comprises a sequence of topsoil/fill and residual soils underlain by bedrock shale. The thickness of fill is variable. Although bedrock was not encountered in all boreholes, the depth to bedrock is anticipated to vary from about 3.0m to 4.5m from existing ground surface.
- The depth to groundwater across the site is likely to be in excess of 4.0m from existing ground surface under normal climatic conditions. It should however be noted that fluctuations in the level of groundwater might occur due to variations in rainfall and/or other factors not evident during drilling.
- Subsurface conditions across the site may be represented by a Geotechnical Model constituting two Geotechnical Units namely, residual soils and bedrock as detailed in Table 1.
- Residual soils across the site are suitable for use in controlled fill after removal of deleterious materials (such as topsoil, organic matter, very high plasticity clay, silt etc) and moisture conditioning. Controlled fill should be placed and compacted in accordance with Australian Standard AS3798.
- The soils likely to be disturbed or excavated during the proposed upgrade works are non-saline and not acid sulphate soils. Therefore, earthworks for proposed upgrade may be carried out without a Saline Soil Management Plan and Acid Sulphate Soil Management Plan. However, a Soil Management Plan should be implemented to minimise impacts from erodible soils.
- Site preparation for proposed upgrade works is likely to involve excavation and fill operations. Excavations can be achieved using conventional earthmoving equipment such as excavators and dozers and fill should be placed in accordance with Australian Standard AS3798 and recommendations provided in this report. It is unlikely that the excavation works will encounter significant groundwater inflow. Minor groundwater inflow or seepage, if encountered, can be handled with conventional sump and pump method.
- Cut and fill slopes during and after proposed upgrade works should be battered for stability or retained with engineered retaining structures. For excavations within residual soils and controlled fill, recommended batter slopes for short term (temporary) stability is 1.0 vertical to 1.0 horizontal and that for long term (permanent) stability is 1.0 vertical to 2.5 horizontal.
- If batter slopes steeper than those recommended above are required, the batter slopes should be retained with engineered retaining structures. Appropriate retaining structures for the proposed development are anticipated to include gravity walls or cantilever walls or gravity walls designed for earth pressure parameters provided in this report.
- At the completion of earthworks, the building platforms for future buildings are anticipated to vary from controlled fill to residual soils. Therefore, we anticipate appropriate the site for proposed building belongs to Class M in accordance with Australian Standard AS2870.

- Appropriate footings for the proposed buildings and retaining structures comprise shallow (pad or strip) footings founded on controlled fill or residual soils, or deep footings socketed into bedrock. Deep footings (bored piers, screw piles etc) may be preferable if footings are required to withstand significant lateral and uplift loads. It is anticipated that the allowable bearing pressures for shallow footings founded in controlled fill and residual soils will vary from 100kPa to 200kPa. The allowable bearing pressure for deep footings socketed into bedrock is 1000kPa or more.
- The site for the proposed upgrade works are assessed to have a "Very Low Risk" of slope instability to the property at existing conditions. It is also our assessment that the risk of slope instability across the site can be maintained at "Very Low" so that the sites will be suitable for proposed upgrade works from slope stability considerations provided earthworks and construction of proposed structures are carried out in accordance with recommendations provided in this report.
- Although dispersive soils may impose some constraints on proposed upgrade works, the limitations are minor and can be addressed if earthworks are carried out in accordance with a Soil Management Plan provided in this report.

From geotechnical engineering considerations, there are no significant geotechnical limitations on proposed upgrade works in Northmead PS. Therefore, it is our assessment that the Northmead PS is suitable for proposed upgrade works provided earthworks and designs of retaining walls, ground floor slabs and footings of proposed building and other structures are carried out in accordance with recommendations provided in this report.

GEOTECHNIQUE PTY LTD

TABLE OF CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

This Intrusive Geotechnical Investigation (IGI) report has been prepared to accompany a Review of Environmental Factors (REF) prepared for the Department of Education (DoE) relating to upgrades to Northmead Public School (the activity) under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and *State Environmental Planning Policy (Transport and Infrastructure) 2021* (SEPP TI).

This document has been prepared in accordance with the *Guidelines for Division 5.1 assessments* (the Guidelines) by the Department of Planning, Housing and Infrastructure.

This report examines and takes into account the relevant environmental factors in the Guidelines and *Environmental Planning and Assessment Regulations 2021* under Section 170, Section 171 and Section 171A of the EP&A Regulation**.**

2.0 PROPOSED ACTIVITY DESCRIPTION

The proposed activity for upgrades to Northmead Public School includes:

- One (1) new single storey classroom building comprising of four (4) general learning spaces (GLS), two (2) special program spaces, a singular learning commons space and a singular multi-purpose space;
- Minor internal alterations to an existing Admin Building (known as Building A); and
- Removal of existing portable classroom buildings containing six (6) classrooms.

3.0 ACTIVITY SITE

The project site is located at 52A Moxhams Road, Northmead, and is legally described as:

- Lot 1 DP 366405;
- Lot 1 DP 176742;
- Lot 1 DP 20061; and
- Lot 1 DP 209810.

Northmead Public School is located on the southern side of Moxhams Road and on the western side of Kleins Road.

Figure 1 in the following page is an aerial photograph of the school.

Figure 2 shows the footprint of proposed single storey classroom building.

4.0 DECLARATION

This report has been prepared to provide assessment of subsurface conditions across the proposed development site in order to provide geotechnical recommendations on site preparation and the design of the proposed school structures. The IGI was completed in accordance with Australian Standard AS1726 (Reference 1).

Figure 1 - Location of Northmead Public School

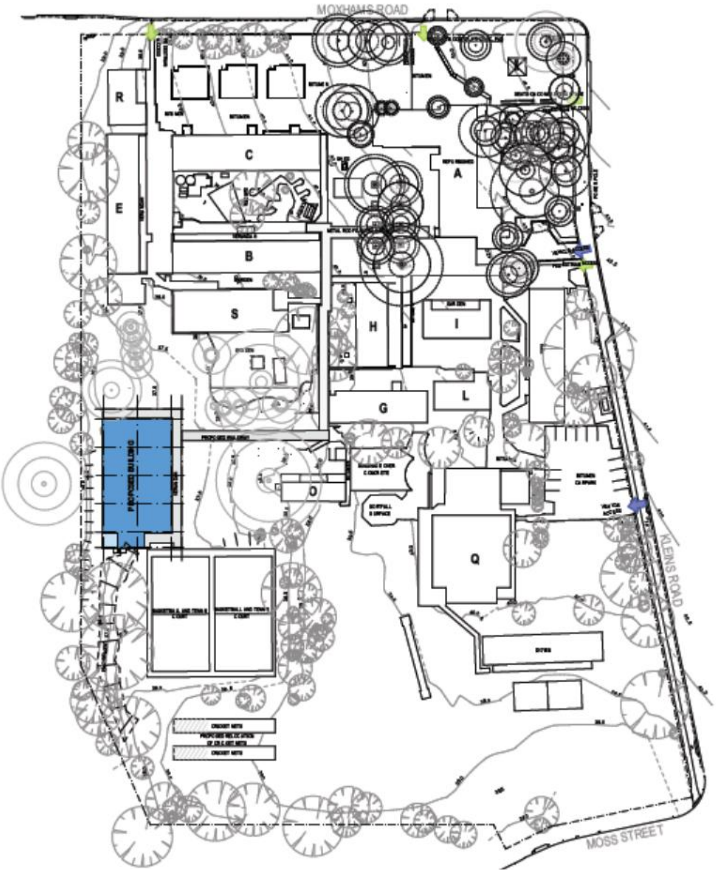


Figure 2 – Footprint of Proposed Classroom Building (Shaded Blue) in Northmead Public School

5.0 BACKGROUND INFORMATION

5.1 Regional Geology and Soil Landscape

Reference to the Geological Map of Penrith (scale 1:100,000) indicates that the bedrock at the site is Hawkesbury sandstone, comprising medium to coarse grained quartz sandstone, very minor shale and laminite lenses.

The Soil Landscape Map of Penrith indicates that the landscape at the site belongs to the Luddenham Group, which is characterised by undulating to rolling low hills on Wianamatta Group shale, often associated with Minchinbury Sandstone, with local relief of 50m to 80m, ground surface slopes of 5% to 20%, narrow ridges, hillcrests and valleys. Soil in this group is likely to be up to 1.5m deep, highly plastic, moderately reactive, locally impermeable and susceptible to high erosion hazards.

5.2 Results of Preliminary Geotechnical Desktop Study

Preliminary Geotechnical Desktop Study (PGDS) for the proposed upgrade indicates the following:

- The sub-surface profile across the site comprises a sequence of topsoil/fill and residual soil underlain by bedrock. Topsoil/fill comprises clayey silt of low plasticity and residual soil comprises gravelly silty clay and silty clay of medium plasticity. Bedrock is extremely weathered sandstone. The depth to groundwater is anticipated to be more than 2.0m.
- The Northmead PS site has very low salinity potential. Therefore, earthworks (disturbance or excavation of soils) for proposed development works may be carried out without a Saline Soil Management Plan.
- There are no known or probabilities of occurrences of acid sulphate soils across Northmead PS and the risk of acid sulphate occurrence is “Low”. Therefore, earthworks for proposed development works can be carried out without an approved Acid Sulphate Soil Management Plan.
- A Geotechnical Model constituting two Geotechnical Units is suggested for the proposed upgrade works in Northmead PS. Units 1 is residual soil and Unit 2 is bedrock.
- Proposed building site belongs to Class M in accordance with Australian Standard AS2870.
- Appropriate footings for proposed building would comprise shallow footings (pad and strip footings) founded on controlled fill and/or residual soils, or deep footings (bored piers or screw piles) socketed into bedrock.
- The risk of slope instability does not impose any limitation of proposed upgrade works.

6.0 ADDITIONAL INTRUSIVE GEOTECHNICAL INVESTIGATION

6.1 Field Works

Fieldworks for additional IGI were carried out on 7 November 2024 and consisted of the following:

- Reviewing geological and soil landscape maps and PGDR relevant to the site to obtain general idea on geotechnical conditions across the site.
- Reviewing services plans obtained from “Before You Dig Australia” to locate existing services across the site.
- Carrying out a walkover survey to assess existing site conditions and nominate five borehole locations uniformly distributed in accessible portions within the footprint of proposed classroom building or immediate vicinity.

- Scanning proposed borehole locations with aim of avoiding damages to existing underground services during field works for IGI.
- Drilling six (6) boreholes (BH101 to BH106) using an auger mounted on an excavator. These boreholes were terminated at auger refusal in bedrock or depth of about 4.0m from existing ground surface, whichever occurs first. Approximate borehole locations are indicated on Drawing No 20429/9-AA1 presented in Appendix A. Borehole logs are also presented in Appendix A.
- Conducting Dynamic Cone Penetrometer (DCP) tests adjacent to selected boreholes to assess strength of subsurface soils. DCP tests were terminated at depths of about 1.0m to 1.5m. DCP test results are included in appropriate borehole logs.
- Measuring depths to groundwater level or seepage in boreholes where encountered.
- Collecting representative soil samples from boreholes for visual assessment and laboratory testing.
- Backfilling the boreholes with recovered materials after logging and sampling.

Field works were supervised by a Field Engineer from this company, responsible for walk over survey, nominating borehole locations, conducting DCP tests, sampling, and preparation of field logs.

6.2 Subsurface Profile

The sub-surface profiles encountered in boreholes are detailed in the borehole logs presented in Appendix A and summarised below in Table 1.

Table 1 - Sub-surface Profiles encountered in Boreholes

Borehole No	Ground Surface RL (m AHD)	Termination Depth (m)	Depth for Topsoil/ Fill (m)	Depth for Residual Soil (m)	Depth to Bedrock (m)
BH101	36.50	1.5	0.0-0.5	0.5-1.3	1.3
BH102	37.81	0.8	-	0.0-0.7	0.7
BH103	37.99	0.9	0.0-0.5	0.5-0.9	0.9
BH104	39.59	1.5	0.0-0.5	0.5-1.4	1.4
BH105	36.29	5.2	0.0-2.5	2.5-4.0	4.0
BH106	36.42	3.0	0.0->3.0	-	-

Table 1 indicates that the subsurface profiles across the site generally comprise a sequence of fill and residual soils underlain by bedrock. The depth to bedrock is anticipated to vary from about 1.5m to 5.0m from existing ground surface, deeper in northern portion of the site with significant fill. The subsurface materials may in general be described as follows:

Fill	Silty SAND fine to medium grained, brown, moist, with some gravel, bricks
	Gravelly CLAY, low plasticity, brown, moist, with some sand and cobbles
Residual Soil	Silty CLAY, low to medium plasticity, brown, moisture content generally lower than plastic limit, stiff to very stiff
	Silty SAND, fine grained, brown, medium dense
Bedrock	SANDSTONE, fine grained, brown, extremely to slightly weathered, low to high strength

Groundwater level was not encountered in boreholes up to their termination depths of about 0.8m to 5.2m from existing ground surface. However, minor seepage was encountered at depths of 3.0m to 5.0m in the northern portion of the site with significant fill. We anticipate that the depth to regional groundwater level across the site to be more than 5.0m and therefore seepage observed in two boreholes is assessed to be infiltrated surface water or perched water. However, it should be noted that the groundwater levels might vary due to rainfall and other factors not evident during field work.

6.3 Laboratory Tests

Representative soil samples recovered from boreholes were tested in the NATA accredited laboratories in accordance with relevant Australian Standards to determine the following:

- Atterberg limits to assess reactivity of soils.
- Electrical Conductivity (EC), pH, chloride, sulphate, and resistivity to assess salinity and aggressivity of soils.

Detailed laboratory test results are presented in Appendix B and summaries of test results are presented in the following Tables 2 and 3.

Table 2 - Results of Atterberg Limits Tests

Borehole No	Sample Depth (m)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Shrinkage Limit (%)
BH103	0.8-1.0	36.0	19.0	17.0	7.5
BH104	1.0-1.5	42.0	19.0	23.0	12.0
BH105	1.5-1.95	65.0	26.0	39.0	15.0
BH105	3.0-3.45	33.0	29.0	4.0	16.0
BH106	1.5-1.95	Not Obtainable			

Table 3 - Results of Chemical Properties Tests

Borehole No	Sample Depth (m)	EC (µS/cm)	pH	Chloride (ppm)	Sulphate (ppm)	Resistivity (ohm-m)
BH101	0.5-1.0	41	5.1	8.8	24	14000
BH103	0.8-1.0	21	5.6	1.7	12	29000
BH104	1.0-1.5	20	6.0	3.7	14	22000
BH105	3.0-3.45	41	4.5	22	14	17000
BH105	4.5-4.95	39	4.9	17	26	16000
BH106	1.5-1.95	39	8.0	2.8	12	9800
BH106	2.0-2.5	21	6.4	4.4	6.3	18000

6.4 Existing Fill

As indicated in Table 1, all boreholes encountered fill. The thickness of fill varies from about 0.5m to about 3.0m. But fill thicker than 1.5m is localised only in the northern portion of proposed building footprint. Fill comprises layers of fine to medium grained silty sand and gravelly clay of low plasticity.

We do not have information on how existing fill was placed. Therefore, even if DCP tests indicate that the fill is likely to be moderately compacted, the fill appears to be variably compacted, especially in area where thicker fill is encountered. Therefore, as it exists the fill is considered to be unsuitable as load bearing foundation for the proposed upgrade works.

Therefore, we recommend that the existing fill should be removed and/or replaced with controlled fill as part of site preparation so that controlled fill can be used as foundation materials for the proposed upgrade works. The fill materials may be used selectively use in controlled fill.

6.5 Reactivity of Foundation Soils

PGDR indicated that the shrink swell index of a residual soil sample is 1.1%/pF. Atterberg Limits presented in Table 2 indicate that the foundation soils are generally of low to medium plasticity except for the sample of fill obtained from BH105. Therefore, it is our assessment that the soils across the site are only slightly reactive and therefore susceptible to minor shrink and swell movements.

6.6 Soils Salinity

Soil salinity is generally assessed by measuring Electrical Conductivity (EC) of a soil sample made up of 1:5 soil water suspension. Thus, determined EC is multiplied by a factor varying from 6 to 23, based on the texture of the soil sample, to obtain Corrected Electrical Conductivity designated as ECe (Reference 2). Alternatively, ECe may be directly measured in soil saturation extracts. Soils are classified as saline if ECe of the saturated extracts exceed 4.0dS/m. The criteria for assessment of soil salinity classes are shown in the following Table 4 (Reference 2).

Table 4 - Criteria for Soil Salinity Classification

Classification	EC_e (dS/m)	Comments
Non-saline	<2	Salinity effects mostly negligible
Slightly saline	2 – 4	Yields of very sensitive crops may be affected
Moderately saline	4 – 8	Yields of many crops affected
Very saline	8 – 16	Only tolerant crops yield satisfactorily
Highly saline	>16	Only a few tolerant crops yield satisfactorily

Electrical conductivity (EC) values for representative soil samples are summarised in Table 3. For sandy soils encountered across the site an appropriate multiplying factor is assumed to vary from 10 to 12. Even if a factor of 12 is used, ECe values for representative soil samples are estimated to be less than 2.0dS/m. Therefore, soils likely to be disturbed or excavated during proposed upgrade works are considered to be non-saline. Therefore, earthworks for the proposed upgrade works may be carried out without a Saline Soils Management Plan.

6.7 Exposure Classification

Australian Standard AS2870 (Reference 3) provides guidelines to assess Exposure Classification for saline and acid/sulphate soils. Table 5 below provides salinity and Exposure Classifications based on EC_e, and Table 6 provides Exposure Classification based on acidic and sulphate soils.

Table 5 – Exposure Classifications for Saline Soils

Electrical Conductivity, EC_e (dS/m)	Exposure Classification	Salinity Classification
<2	A1	Non-saline
2 – 4	A1	Slightly saline
4 – 8	A2	Moderately saline
8 – 16	B1	Very saline
>16	B2	Highly saline

Table 6- Exposure Classifications for Sulphate Soils

Sulphate expressed as SO_3		pH	Exposure Classification*	
In Soil (ppm)	In Groundwater (ppm)		Soil Condition A	Soil Condition B
<5000	<1000	>5.5	A2	A1
5000-10000	1000-3000	4.5-5.5	B1	A2
10000-20000	3000-10000	4.0-4.5	B2	B1
>20000	>10000	<4.0	C2	B2

Approximately 100ppm of SO_4 = 80ppm of SO_3
*Soil Condition A = high permeability soils (e.g. sands and gravels) which are below groundwater
*Soil Condition B = low permeability soils (e.g. silts and clays) and all soils above groundwater

As stated, above soils across the school are predominantly sandy and therefore “Soil Condition A” is assessed to be appropriate. Therefore, based on laboratory test results presented in Tables 3 and guidelines on Exposure Classifications presented in Tables 5 and 6, the Exposure Classifications for proposed building site is assessed to be Class A1 to A2. Therefore, we recommend that the proposed upgrade works use construction materials (such as concrete, bricks) and construction methods appropriate for Exposure Class A2.

6.8 Aggressivity Classification

Australian Standard AS2159 (Reference 4) provides Aggressivity Classifications of soil and groundwater applicable to iron/steel and concrete piles that may be used for proposed upgrade works. The Aggressivity Classifications applicable to iron/steel piles is provided below in Table 7 and Aggressivity Classification applicable to concrete piles is provided in Table 8.

Table 7 - Aggressivity Classification for Steel

Chloride		pH	Resistivity (ohm cm)	Soil Condition A*	Soil Condition B#
In Soil (ppm)	In Water (ppm)				
<5000	<1000	>5.0	>5000	Non-aggressive	Non-aggressive
5000-20000	1000-10000	4.0-5.0	2000-5000	Mild	Non-aggressive
20000-50000	10000-20000	3.0-4.0	1000-2000	Moderate	Mild
>50000	>20000	<3.0	<1000	Severe	Moderate

*Soil Condition A = high permeability soils (e.g. sands and gravels) which are below groundwater
#Soil Condition B = low permeability soils (e.g. silts and clays) and all soils above groundwater

Table 8 - Aggressivity Classification for Concrete

Sulphate expressed as SO_4		pH	Chloride in Water (ppm)	Soil Condition A	Soil Condition B
In Soil (ppm)	In Groundwater (ppm)				
<5000	<1000	>5.5	<6000	Mild	Non-aggressive
5000-10000	1000-3000	4.5-5.5	6000-12000	Moderate	Mild
10000-20000	3000-1000	4.0-4.5	12000-30000	Severe	Moderate
>20000	>10000	<4.0	>30000	Very Severe	Severe

Approximately 100ppm of SO_4 = 80ppm of SO_3

As discussed above “Soil Conditions A” is assessed to be appropriate for the proposed building site. Therefore, based on laboratory test results presented in Tables 3 and guidelines on Aggressivity Classifications presented in Tables 7 and 8, the proposed building site is assessed to be Non-aggressive to steel piles but Non-aggressive to Mildly Aggressive to concrete piles. pH is dominant for concrete piles.

Therefore, we recommend that the steel and concrete piles supporting proposed structures are designed to suit Non-aggressive and Mildly Aggressive sites respectively (Reference 4).

6.9 Geotechnical Model

Based on borehole information detailed above, a Geotechnical Model constituting three Geotechnical Units and detailed below in Table 9 is suggested for the proposed building site. Each Geotechnical Unit represents a specific nature of soil and/or bedrock encountered across the site.

Table 9 – Recommended Geotechnical Model

Geotechnical Unit	Material Description	Indicative Depth to Top of Unit (m)
Unit 1	Existing Fill	0.0
Unit 2	Residual Soils/Controlled Fill	0.5-1.0
Unit 3	Bedrock - Sandstone	1.0-5.0

It is noted that the residual soils are overlain generally by 0.2m to more than 3.0m thick fill. However, fill thicker than 0.5m is localised. Therefore, we anticipate that the existing fill within the footprint of the proposed building will be removed and replaced with controlled fill placed in accordance with recommendations provided below in this report. Controlled fill can be considered to belong to Unit 2. Indicative strength parameters, in terms of cohesion and internal friction angle, as well as modulus for each Geotechnical Unit are presented below in Table 10.

Table 10 – Effective Strength Parameters and Modulus

Geotechnical Units	Unit Weight (kN/m^3)	Cohesion (kPa)	Friction Angle (deg)	Young's Modulus (MPa)	Poisson's Ratio
Unit 1	17.5	0.0	00.0	5.0	0.30
Unit 2	19.0	0.0	30.0	30.0	0.30
Unit 3	22.0	1300.0	34.0	150.0	0.25

6.10 Site Preparation – Excavation Condition

If the proposed upgrade works require ground bearing slabs and pavement, site preparation for proposed upgrade works will involve removal of existing fill and other unsuitable foundation materials. It is possible that the existing fill within the building footprint is left as it is if building slabs are designed as suspended slabs. However, we anticipate the excavation during site preparation will be limited to fill and residual soils. Therefore, it is our assessment that the proposed excavations can be achieved using conventional earthmoving equipment such as excavators and dozers.

Ground vibration during excavation works is represented by maximum peak particle velocity. It is anticipated that the existing structures in the vicinity of the site can tolerate ground vibration of about 5.0mm/s to 10.0mm/s. We also anticipate that the proposed excavations will result in ground vibrations that are likely to be within tolerable limits for stability of existing structures in the vicinity of the site.

We do not anticipate significant groundwater inflow during the proposed excavation. Minor groundwater inflow, if any, could be handled by a conventional sump and pump method. It should however be noted that fluctuations in the level of groundwater and/or seepage might occur due to variations in rainfall and/or other factors not evident during field works.

6.11 Site Preparation – Fill Placement

If site preparation for proposed upgrade works involves removal of existing fill and other unsuitable foundation materials, there will be need for placement of fill during construction of building platform. Fill placement should be carried out in a controlled manner. We recommend the following procedures for placement of controlled fill.

- Strip existing fill and stockpile separately for possible future uses or dispose off the site. Fill materials may be selectively used in controlled fill.
- Undertake proof rolling (using an 8 to 10 tonnes roller) of the exposed residual soils to detect potentially weak spots (ground heave). Excavate areas of localised heaving to a depth of about 300mm and replace with granular fill/crushed sandstone, compacted as described below.
- Undertake proof rolling of soft spots backfilled with granular fill, as described above. If the backfilled area shows movement during proof rolling, this office should be contacted for further recommendations.
- Place suitable fill materials on proof rolled surface. Fill should be placed in horizontal layers of 200mm to 250mm maximum loose thickness and compacted to a Minimum Dry Density Ratio (MDDR) of 98% Standard, at moisture content within 2% of Optimum Moisture Content (OMC). Controlled fill should preferably comprise non-reactive fill (e.g. crushed sandstone), with a maximum particle size not exceeding 75mm, or low plasticity clay. The residual soils and bedrock obtained from excavations within the site may also be selectively used in controlled fill, after crushing to sizes finer than 75mm, moisture conditioning, and removal of unsuitable materials.
- Fill placement should be supervised to ensure that material quality, layer thickness, testing frequency and compaction criteria conform to the specifications. We recommend "Level 1" supervision and testing in accordance with AS3798 (Reference 5).

6.12 Batter Slopes and Retaining Structures

As described above, site preparation for the proposed upgrade works will involve some cut and fill operations. Cuts are likely to be limited within fill and residual soils. The cut and fill slopes should be battered for stability or retained by engineered retaining structures. If cut and fill slopes are to be battered for stability, we recommend the following batter slopes:

- For short-term stability in controlled fill and residual soils = 1 vertical to 1 horizontal
- For long-term stability in controlled fill and residual soils = 1 vertical to 2.5 horizontal

We do not anticipate need of retaining structures. But if cut and fill slopes steeper than those recommended above are required for whatever reason, these slopes should be retained by engineered retaining structures. Appropriate retaining structures for the proposed upgrade works are anticipated to comprise cantilever walls and gravity walls. The pressure distribution on such walls is assumed to be triangular in shape and estimated as follows:

$$p_h = \gamma kH$$

Where,

p_h = Horizontal pressure (kN/m^2)
γ = Total unit weights of retained materials (kN/m^3)
k = Coefficient of earth pressure (k_a or k_o)
H = Retained height (m)

For design of flexible retaining structures where some lateral movement is acceptable, an active earth pressure coefficient (k_a)of 0.35 is recommended. However, if it is critical to limit the horizontal deformation, use of an earth pressure coefficient at rest (k_0) of 0.55 is recommended. These coefficients are based on the assumptions that the ground level behind the retaining structure is horizontal, and the retained material is effectively drained. Additional earth pressures resulting from surcharge load (buildings, infrastructures, etc) on retained materials and groundwater pressure, if any should also be allowed for in design of retaining structures. The design of any retaining structure should also be checked for bearing capacity, overturning, sliding and overall stability of the slope.

6.13 Site Classification

Australian Standard AS2870 (Reference 3) suggests that a building site is classified based on thickness of clayey foundation soils and reactivity (shrink swell movements) of foundation soils.

The proposed building site is underlain by fill of variable thickness which is assessed to be unsuitable foundation materials at the currently existing conditions. Therefore, as it exists the site is assessed to belong to “Class P” in accordance with Australian Standard AS2870 (Reference 3).

But if site preparation involved removal of existing fill and replacing with controlled fill, the thickness of clayey foundation soils (including controlled fill and residual soils) within the footprint of proposed building is anticipated to vary from about 1.0m to about 3.0m. It is our assessment that the reactivity of fill materials will be similar to that of residual soils across the site. Therefore, if existing fill and replacing with controlled fill, the proposed building site is assessed to belong to “Class M” in accordance with Australian Standard AS2870 (Reference 4). However, suggested site classification should be confirmed by sampling and testing of foundation soils after construction of building platform is completed.

6.14 Floor Slabs and Footings

As discussed above in this report, depending on whether existing fill is removed or not, the foundation materials at ground floor level of proposed building will be fill at existing condition or controlled fill.

If existing fill is left at existing conditions, the ground floor slabs of the proposed building should be designed and constructed as suspended slabs supported by footings designed in accordance with recommendations provided in this report. But if existing fill is replaced with controlled fill the ground floor slabs of the proposed building may be designed and constructed as ground bearing slabs, or suspended slabs supported by footings designed in accordance with recommendations provided in this report.

Ground bearing floor slabs on controlled fill may be designed to suit “Class M” site in accordance with Australian Standard AS2870 (Reference 3). Alternatively, we recommend a Modulus of Subgrade Reaction value of 25kPa/mm for design of ground-bearing slabs on controlled fill.

Loading conditions for the proposed building are not known at this stage. However, we consider that appropriate footings would comprise shallow footings (pad and strip footings) founded on controlled fill, residual soils or bedrock or deep footings (bored piers or screw piles) founded on bedrock. Deep footings would be preferable if footings are required to support high vertical loads as well as significant lateral and uplift pressures. As it is preferable that the footings are founded on similar foundation materials and because bedrock is anticipated at shallow depths across the footprint of the proposed building except in northern portion of the site, we consider it preferable that the footings founded on bedrock. However, recommended allowable bearing pressures for design of shallow as well as deep footings are presented in the following Table 11.

Table 11– Recommended Allowable Bearing Pressures

Founding Material	Founding Depth from Existing Ground Surface (m)	Ultimate Bearing Pressure (kPa)	Ultimate Shaft Adhesion (kPa)	Allowable Bearing Pressure (kPa)	Allowable Shaft Adhesion (kPa)
Unit 2 Controlled Fill/Residual Soil	0.5-1.0	350.0	30.0	200.0	Ignore
Unit 3 Bedrock	1.0-5.0	3000.0	200.0	1000.0	100.0

The following should be noted:

- The ultimate bearing pressure and shaft adhesion are based on the ultimate capacities mobilised at large displacements, about 5.0% to 10.0% of pile diameter or minimum footing width. These values assume a clean rock socket with a roughness Category of R2 or better (Reference 6).
- The allowable bearing pressure and shaft adhesion are based on the capacities mobilised at displacements of about 1.0% of pile diameter or minimum footing width.
- The ultimate and allowable bearing pressures for Unit 3 are based on the assumptions that the piers are socketed at last 0.3m into appropriate rock units.
- Differential settlements are estimated to be about halves the estimated total settlements.
- The shaft adhesions against uplift pressures are halves the shaft adhesions for compressive loads presented in above table.
- For limit state design, geotechnical strength reduction factor ϕ_g of 0.50 is recommended in accordance with AS2159 (Reference 4). However, reduction factor ϕ_g can be increased up to 0.7 to 0.8 if pile design is verified by analyses of pile load tests and sufficient construction monitoring is carried out.

It is preferable that the footings are founded on similar foundation. As depths of bedrock with the recommended allowable bearing pressures is anticipated to vary across the site, the founding depths of footings to be constructed will also vary. Therefore, an experienced Geotechnical Engineer should confirm bearing pressures at founding levels during construction, on the basis of assessment made during footing excavation or pier hole drilling.

7.0 POTENTIAL GEOTECHNICAL CONSTRAINTS OR RISKS

Based on anticipated site conditions, the potential geotechnical constraints or risks on proposed upgrade works include the following:

- The risk of variability in the thickness of fill across the site.
- The risk of variability in the depth to bedrock across the site.
- The risk that the existing fill across the site may be uncontrolled in nature.
- The risk of presence of dispersive soils.

Boreholes distributed across the site encountered fill. The thickness of fill across the site varies from about 0.5m to more than 3.0m from existing ground surface. Likewise, the depth to bedrock across the site varies from about 1.0m to 5.0m. It will be preferably that footings of proposed buildings are founded on similar foundation materials. Therefore, designer of building should consider impacts of this variability on design and costing of the building.

Fill generally comprises layers of fine to medium grained silty sand and gravelly clay of low plasticity. Although the existing fill appears to be moderately compacted, there is no evidence that the fill is controlled fill. In addition, soils across the site may be dispersive. Therefore, designer of the activities should consider (1) likelihood that the soils may be dispersive and existing fill may not be suitable foundation materials AND (2) their impacts on design and costing of the building.

However, it is our assessment that the abovementioned geotechnical constraints or risks can be managed so that the site is suitable for proposed upgrade works. Recommended mitigation measures to address the abovementioned geotechnical constraints are provided below in this report.

8.0 MITIGATION MEASURES FOR GEOTECHNICAL RISKS

As discussed above in this report, the potential geotechnical constraints or risk on proposed upgrade works include variabilities in thickness and nature of existing fill and depth to bedrock. Table 12 below presents recommended mitigation measures to address the geotechnical constraints or risks.

Table 12 – Recommended Mitigation Measures to Manage Geotechnical Risks

Geotechnical Constraints/Risks	Mitigation Measures	Reasons for Mitigation Measures
Variability in fill thickness	The designer should recognise variability in thickness of fill across the site and ascertain that the design allows for this variability and its implications in project costing. The fill thickness may be confirmed by inspections during construction stage.	Reduce surprises/ uncertainties in foundation conditions and reduce risk of variation claims during construction stage
Variability in depth to bedrock	The designer should recognise variability in the depth to bedrock to ascertain that the designs are appropriate to site conditions and its impact on project costing. The depth to bedrock will need to be confirmed by inspections during construction stage	Reduce surprises/ uncertainties in foundation conditions and achieve appropriate and reliable foundation design to minimise risk of potential variation claims during construction stage
Nature of Fill	The designer should recognise the possibility that the existing fill across the site is uncontrolled and therefore unsuitable foundation materials.	To ascertain scope of site preparation and minimise any potential risk of variation claims during construction stage
Dispersive Soil	The designer should recognise that the subsurface soils across the site are dispersive and susceptible to erosion. Therefore, disturbance and excavation of soils across the site should be carried out in accordance Construction Management Plan to minimise and manage impacts from dispersive soils. Such a plan can be developed in accordance with Guidelines provided in NSW Department of Housing, Managing Urban Stormwater, Soils and Construction, 1998. The cost for management of erodible soil should also be considered in project costing.	To manage adverse impacts from the erodible soils to proposed activity and vice versa and to develop appropriate soil management plan to reduce impact on environment and variation claims during construction stage.

9.0 SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

Based on nature of potential geotechnical risks or issues at the proposed development site, it is our assessment that the potential impacts of the proposed upgrade work or activity can be appropriately mitigated or managed in accordance with the recommended mitigation measures presented in Table 12. Therefore, from geotechnical engineering consideration, it is determined that the extent and nature of potential impacts from the proposed upgrade work or activity on the locality, community and/or the environment are insignificant with “Low” risk.

10.0 CONCLUSIONS

Based on results of PGDS and IGI, it is our assessment that the 52A Moxhams Road, Northmead, is suitable for proposed upgrade works from geotechnical engineering considerations provided: (1) geotechnical constraints imposed by presence of fill and variation in thickness of fill and depth to bedrock are addressed in accordance with mitigation measures provided in this report; and (2) site preparation and design of floor slabs and footings of proposed building are carried out in accordance with recommendations provided in this report. Furthermore, from geotechnical engineering considerations the extent and nature of potential impacts from the proposed upgrade work on the locality, community and/or the environment are insignificant.

If you have any questions, please do not hesitate to contact the undersigned.

Yours faithfully
GEOTECHNIQUE PTY LTD

INDRA JWORCHAN
Principal Geotechnical Engineer

11.0 LIST OF REFERENCES

1. Australian Standard AS1726-2017, Geotechnical Site Investigation 2017.
2. Lillicrap, A and McGhie, S., Site Investigation for Urban Salinity, Department of Land and Water Conservation, 2002.
3. Australian Standard AS2870-2011, Residential Slabs and Footings, 2011.
4. Australian Standard AS2159-2009, Piling – Design and Installation, 2009.
5. Australian Standard AS3798-2007, Guidelines on Earthworks for Commercial and Residential Developments, 2007.
6. Pells, P. J. N, State of Practice for the Design of Socketed Piles in Rocks, Proceeding 8th Australian New Zealand Conference on Geomechanics, Hobart, pp 1-307-327.

ATTACHMENT A

Drawing No 20429/9-AA1 Plan Showing Locations of Boreholes

Borehole Logs

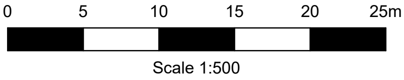
Imagery © NearMap.com

LEGEND

🟥 Site Boundary

- — — Proposed Building Footprint

● Borehole



GEOTECHNIQUE ®
PTY LTD

An eiaustralia company

PO Box 880
Penrith NSW 2750
Tel: 02 4722 2700

e-mail:info@geotech.com.au
www.geotech.com.au

Contract No DDWO 0513/23
Northmead Public School (2763)
Various Lots
52A Moxhams Road, Northmead

Borehole Locations

Drawing No: 20429/9-AA1
Job No: 20429/9
Drawn By: MH
Date: 13 November 2024
Checked By: JH

File No: 20429-9
Layers: 0, AA1

BOREHOLE LOG

BH ID: BH101

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈36.50 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	▭ DCP BLOWS 0 5 10 15 20 25 30	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00		36.50	FILL: Silty SAND: brown, fine grained, trace gravels	- - D	MD - D	2 7 6 16 78	FILL
		BH101_0.50-1.00	■	0.50		36.00	Silty CLAY: low plasticity, brown with sand	M ≈ PL - M < PL	- - VSt	9 13 11 6/50mm	RESIDUAL SOIL
				1.30		35.20	SANDSTONE: fine grained, brown, moderately weathered, medium strength				BEDROCK
						35.00	Terminated at 1.50m. Termination due to Auger and SPT refusal on bedrock.				

DEPTH (m): 0 1 2 3 4 5 6 7 8 9 10

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

GEOTECHNIQUE® PTY LTD

BOREHOLE LOG

BH ID: BH102

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈37.81 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS 0 5 10 15 20 25 30	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH102_0.50-0.80		0.00		37.81	Silty SAND: fine grained, brown trace gravels	- - D	MD - D	4 6 10 10 10	RESIDUAL SOIL
			■	0.50		37.31	Silty SAND: fine grained, brown	D - M	MD - D	6 10	
			■	0.70		37.11	SANDSTONE: fine grained, brown, moderately to slightly weathered, high strength			8/50mm	BEDROCK
						37.01	Terminated at 0.80m. Termination due to Auger and SPT refusal on bedrock.				

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH103

Location	Northmead Public School	**Started**	07 November 2024
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024
Job No.	20429/9	**Logged By**	JH **Date** 07 November 2024
Sheets	1 of 1	**Review By**	JH **Date** 07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈37.99 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS (0 5 10 15 20 25 30)	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00		37.99	FILL: Silty SAND: brown with gravels and brick fragments	- - D	MD - D	5 8 7 8 9	FILL
		BH103_0.80-1.00	■	0.50		37.49	Silty CLAY: low to medium plasticity, brown with sand	M ≈ PL - M < PL	- - VSt	8 10 12/50mm	RESIDUAL SOIL
				0.90		37.09	SANDSTONE: fine grained, brown, slightly weathered, high strength				BEDROCK
						36.99	Terminated at 1.00m. Termination due to Auger and SPT refusal on bedrock.				

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

GEOTECHNIQUE® PTY LTD

BOREHOLE LOG

BH ID: BH104

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈39.59 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS 0 5 10 15 20 25 30	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00	▨	39.59	FILL: Silty SAND: fine grained,brown, trace of gravels and brick fragments	- - D	MD - D	6 8 12/50mm	FILL
		BH104_1.00-1.50	■	0.50	▤	39.09	Silty CLAY: low to medium plasticity, brown,	M ≈ PL - M < PL	St - VSt		RESIDUAL SOIL
				1.40		38.19	SANDSTONE: fine grained, brown, moderately to slightly weathered, high strength				BEDROCK
						38.09	Terminated at 1.50m. Termination due to Auger refusal on bedrock.				

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

GEOTECHNIQUE® PTY LTD

BOREHOLE LOG

BH ID: BH105

Location Northmead Public School
Client NSW department of education School Infrastructure
Job No. 20429/9
Sheets 1 of 1
Started 07 November 2024
Completed 07 November 2024
Logged By JH **Date** 07 November 2024
Review By JH **Date** 07 November 2024

Drilling Contractor Geotrace Australia
Plant Comacchio Geo 205
Surface RL ≈36.29 m (AHD)
Inclination 90°
Latitude -
Longitude -

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH105_1.50-1.95 SPT 1.50-1.95 4,5,8 N=13 BH105_2.00-2.50		0.00		36.29	FILL: Silty CLAY: low plasticity, brown with sand and gravels	- - D	-	FILL
		BH105_3.00-3.45 SPT 3.00-3.45 4,8,15 N=23		2.50		33.79	Silty CLAY: medium plasticity, brown with sand	M ≈ PL - M < PL	St - VSt	RESIDUAL SOIL
		BH105_4.50-4.95 SPT 4.50-4.95 6,12,21 N=33		4.00		32.29	SANDSTONE: fine grained, pale grey, highly to moderately weathered, low to medium strength			BEDROCK
	▷	BH105_5.00-5.02 SPT 5.00-5.02 8/20 mm HB N=R		5.00		31.29	SANDSTONE: fine grained, pale grey, slightly weathered, high strength			
						31.09	Terminated at 5.20m. Termination due to Auger refusal on bedrock.			

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH106

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈36.42 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00	▨	36.42	FILL: Gravelly CLAY: low plasticity, brown with sand, cobbles and brick fragments			FILL
		BH106_1.50-1.95 SPT 1.50-1.95 1,0,1 N=1	■	1.50	▨			D - M	-	
		BH106_2.00-2.50	■	2.00	▨					
	▷				▨					
				3.00		33.42	Terminated at 3.00m. Refusal on obstruction.			

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH101

Location Northmead Public School
Client NSW department of education School Infrastructure
Job No. 20429/9
Sheets 1 of 1

Started 07 November 2024
Completed 07 November 2024
Logged By JH **Date** 07 November 2024
Review By JH **Date** 07 November 2024

Drilling Contractor Geotrace Australia
Plant Comacchio Geo 205
Surface RL ≈36.50 m (AHD)
Inclination 90°
Latitude -
Longitude -

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS (0 5 10 15 20 25 30)	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00		36.50	FILL: Silty SAND: brown, fine grained, trace gravels	- - D	MD - D	2 7 6 16 78	FILL
		BH101_0.50-1.00		0.50		36.00	Silty CLAY: low plasticity, brown with sand	M ≈ PL - M < PL	- - VSt	9 13 11 6/50mm	RESIDUAL SOIL
				1.30		35.20	SANDSTONE: fine grained, brown, moderately weathered, medium strength				BEDROCK
						35.00	Terminated at 1.50m. Termination due to Auger and SPT refusal on bedrock.				

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH102

Location Northmead Public School
Client NSW department of education School Infrastructure
Job No. 20429/9
Sheets 1 of 1

Started 07 November 2024
Completed 07 November 2024
Logged By JH **Date** 07 November 2024
Review By JH **Date** 07 November 2024

Drilling Contractor Geotrace Australia
Plant Comacchio Geo 205
Surface RL ≈37.81 m (AHD)
Inclination 90°
Latitude -
Longitude -

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH102_0.50-0.80		0.00		37.81	Silty SAND: fine grained, brown trace gravels	- - D	MD - D	4 6 10 10 10	RESIDUAL SOIL
			■	0.50		37.31	Silty SAND: fine grained, brown	D - M	MD - D	6 10 8/50mm	
			■	0.70		37.11	SANDSTONE: fine grained, brown, moderately to slightly weathered, high strength				BEDROCK
						37.01	Terminated at 0.80m. Termination due to Auger and SPT refusal on bedrock.				

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

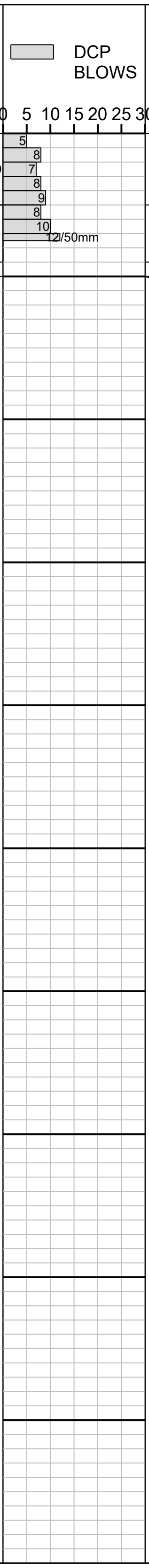
BOREHOLE LOG

BH ID: BH103

Location	Northmead Public School		**Started**	07 November 2024	
Client	NSW department of education School Infrastructure		**Completed**	07 November 2024	
Job No.	20429/9		**Logged By**	JH	**Date** 07 November 2024
Sheets	1 of 1		**Review By**	JH	**Date** 07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈37.99 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00	37.99	FILL: Silty SAND: brown with gravels and brick fragments	- - D	MD - D	FILL
		BH103_0.80-1.00	■	0.50	37.49	Silty CLAY: low to medium plasticity, brown with sand	M ≈ PL - M < PL	- - VSt	RESIDUAL SOIL
				0.90	37.09 36.99	SANDSTONE: fine grained, brown, slightly weathered, high strength			BEDROCK
						Terminated at 1.00m. Termination due to Auger and SPT refusal on bedrock.			



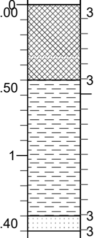
This log should be read in conjunction with EI Australia's accompanying explanatory notes.

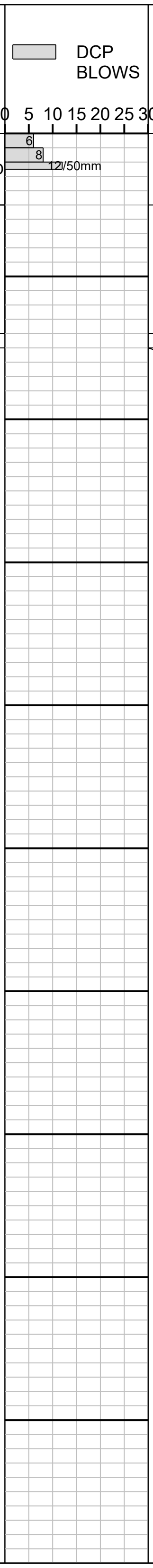
BOREHOLE LOG

BH ID: BH104

Location	Northmead Public School	**Started**	07 November 2024
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024
Job No.	20429/9	**Logged By**	JH **Date** 07 November 2024
Sheets	1 of 1	**Review By**	JH **Date** 07 November 2024
Drilling Contractor	Geotrace Australia	**Surface RL**	≈39.59 m (AHD)
Plant	Comacchio Geo 205	**Inclination**	90°
Latitude	-	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00		39.59	FILL: Silty SAND: fine grained,brown, trace of gravels and brick fragments	- - D	MD - D	6 8 12/50mm	FILL
		BH104_1.00-1.50		0.50		39.09	Silty CLAY: low to medium plasticity, brown,	M ≈ PL - M < PL	St - VSt		RESIDUAL SOIL
				1.40		38.19 38.09	SANDSTONE: fine grained, brown, moderately to slightly weathered, high strength				BEDROCK
							Terminated at 1.50m. Termination due to Auger refusal on bedrock.				





This log should be read in conjunction with EI Australia's accompanying explanatory notes.

GEOTECHNIQUE® PTY LTD

BOREHOLE LOG

BH ID: BH105

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈36.29 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH105_1.50-1.95 SPT 1.50-1.95 4,5,8 N=13 BH105_2.00-2.50		0.00		36.29	FILL: Silty CLAY: low plasticity, brown with sand and gravels	- - D	-	FILL
		BH105_3.00-3.45 SPT 3.00-3.45 4,8,15 N=23		2.50		33.79	Silty CLAY: medium plasticity, brown with sand	M ≈ PL - M < PL	St - VSt	RESIDUAL SOIL
		BH105_4.50-4.95 SPT 4.50-4.95 6,12,21 N=33		4.00		32.29	SANDSTONE: fine grained, pale grey, highly to moderately weathered, low to medium strength			BEDROCK
	▷	BH105_5.00-5.02 SPT 5.00-5.02 8/20 mm HB N=R		5.00		31.29	SANDSTONE: fine grained, pale grey, slightly weathered, high strength			
						31.09	Terminated at 5.20m. Termination due to Auger refusal on bedrock.			

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

BOREHOLE LOG

BH ID: BH106

Location	Northmead Public School	**Started**	07 November 2024		
Client	NSW department of education School Infrastructure	**Completed**	07 November 2024		
Job No.	20429/9	**Logged By**	JH	**Date**	07 November 2024
Sheets	1 of 1	**Review By**	JH	**Date**	07 November 2024

Drilling Contractor	Geotrace Australia	**Surface RL**	≈36.42 m (AHD)	**Latitude**	-
Plant	Comacchio Geo 205	**Inclination**	90°	**Longitude**	-

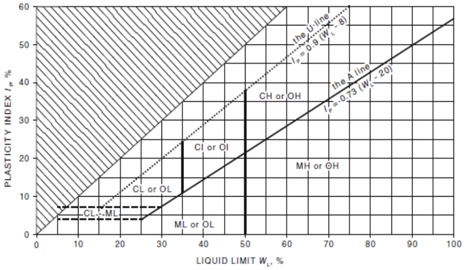
METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	▷	BH106_1.50-1.95 SPT 1.50-1.95 1,0,1 N=1 BH106_2.00-2.50	■	0.00	▨	36.42	FILL: Gravelly CLAY: low plasticity, brown with sand, cobbles and brick fragments	D - M	-	FILL
				3		33.42	Terminated at 3.00m. Refusal on obstruction.			

This log should be read in conjunction with EI Australia's accompanying explanatory notes.

Log Symbols & Abbreviations (Non-cored Borehole Log)

Log Column	Symbol/Value	Description		
Drilling Method	V-bit	Hardened steel 'V' shaped bit attached to auger		
	TC-bit	Tungsten Carbide bit attached to auger		
	RR	Tricone (Rock Roller) bit		
	DB	Drag bit		
	BB	Blade bit		
Groundwater	Dry	Groundwater not encountered to the drilled or auger refusal depth		
	▼	Groundwater level at depths shown on log		
	▶	Groundwater seepage at depths shown on log		
Environment Sample	GP	Glass bottle and plastic bag sample over depths shown on log		
	G	Glass bottle sample over depths shown on log		
	P	Plastic bag sample over depths shown on log		
PID Reading	100	PID reading in ppm		
Geotechnical Sample	DS	Disturbed Small bag sample over depths shown on log		
	DB	Disturbed Bulk sample over depths shown on log		
	U_{50}	Undisturbed 50mm tube sample over depths shown on log		
Field Test	N=10 3,5,5	Standard Penetration Test (SPT) 'N' value. Individual numbers indicate blows per 150mm penetration.		
	N=R 10,15/100	'R' represents refusal to penetration in hard/very dense soils or in cobbles or boulders. The first number represents10 blows for 150mm penetration whereas the second number represents 15 blows for 100mm penetration where SPT met refusal		
	DCP/PSP 5 6 R/10	Dynamic Cone Penetration (DCP) or Perth Sand Penetrometer (PSP). Each number represents blows per 100mm penetration. 'R/10' represents refusal after 10mm penetration in hard/very dense soils or in gravels or boulders.		
Classification	GP	Poorly Graded GRAVEL		
	GW	Well graded GRAVEL		
	GM	Silty GRAVEL		
	GC	Clayey GRAVEL		
	SP	Poorly graded SAND		
	SW	Well graded SAND		
	SM	Silty SAND		
	SC	Clayey SAND		
	ML	SILT / Sandy SILT / clayey SILT, low plasticity		
	MI	SILT / Sandy SILT / clayey SILT, medium plasticity		
	MH	SILT / Sandy SILT / clayey SILT, high plasticity		
	CL	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, low plasticity		
	CI	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, medium plasticity		
	CH	CLAY / Silty CLAY / Sandy CLAY / Gravelly CLAY, high plasticity		
Moisture Condition Cohesive soils	M<PL	Moisture content less than Plastic Limit		
	M=PL	Moisture content equal to Plastic Limit		
	M>PL	Moisture content to be greater than Plastic Limit		
Cohesionless soils	D	Dry	-	Runs freely through hand
	M	Moist	-	Tends to cohere
	W	Wet	-	Tends to cohere
Consistency Cohesive soils		**Term**	**Undrained shear strength, C_u (kPa)**	**Hand Penetrometer (Qu)**
	VS	Very Soft	≤12	<25
	S	Soft	>12 & ≤25	25 – 50
	F	Firm	>25 & ≤50	50 – 100
	St	Stiff	>50 & ≤100	100 – 200
	VSt	Very Stiff	>100 & ≤200	200 – 400
	H	Hard	>200	>400
Density Index Cohesionless soils		**Term**	**Density Index, I_D (%)**	**SPT 'N' (blows/300mm)**
	VL	Very Loose	≤15	≤5
	L	Loose	>15 & ≤35	>5 & ≤10
	M	Medium Dense	>35 & ≤65	>10 & ≤30
	D	Dense	>65 & ≤85	>30 & ≤50
	VD	Very Dense	>85	>50
Hand Penetrometer	100 200	Unconfined compressive strength (q_u) in kPa determined using pocket penetrometer, at depths shown on log		
Remarks		Geological origin of soils		
	Residual	Residual soils above bedrock		
	Alluvium	River deposited Alluvial soils		
	Colluvial	Gravity deposited Colluvial soils		
	Aeolian	Wind deposited Aeolian soils		
	Marine	Marine Soils		

AS1726 : 2017– Unified Soil Classification System

Major Divisions		Particle size (mm)	Group Symbol	Typical Names	Field Identifications Sand and Gravels			Laboratory classification					
OVERSIZE	BOULDERS	>200						Use the gradation of material passing 63mm for classification of fractions according to the criteria given in 'Major Divisions'	% Fines (2)	Plasticity of Fine Fraction	$C_u = D_{60}/D_{10}$	$C_c = (D_{30})^2/(D_{10}D_{60})$	Notes
	COBBLES	63											
COARSE GRAINED SOIL (more than 65% of soil excluding oversize fraction is greater than 0.075mm)	GRAVEL (more than half of coarse fraction is larger than 2.36mm)	Coarse 19	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength				≤5	-	>4	between 1 and 3	1. Identify lines by the method given for fine grained soils 2. Borderline classifications occur when the percentage of fines (fraction smaller than 0.075mm size) is greater than 5% and less than 12%. Borderline classifications require the use of dual symbols e.g. SP-SM, GW-GC
		Medium 6.7	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines, uniform gravels	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength				≤5	-	Fails to comply with above		
			GM	Silty gravels, gravel-sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength				≥12	Below 'A' line or I_p<4	-	-	
		Fine 2.36	GC	Clayey gravels, gravel-sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength				≥12	Above 'A' line or I_p>7	-	-	
	SAND (more than half of coarse fraction is smaller than 2.36mm)	Coarse 0.6	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate sizes, not enough fines to bind coarse grains, no dry strength				≤5	-	>6	between 1 and 3	
		Medium 0.21	SP	Poorly graded sands and gravelly sands; little or no fines, uniform sands	Predominantly one size or range of sizes with some intermediate sizes missing, not enough fines to bind coarse grains, no dry strength				≤5	-	Fails to comply with above		
		Fine 0.075	SM	Silty sands, sand-silt mixtures	'Dirty' materials with excess of non-plastic fines, zero to medium dry strength				≥12	Below 'A' line or I_p<4	-	-	
			SC	Clayey sand, sand-clay mixtures	'Dirty' materials with excess of plastic fines, medium to high dry strength				≥12	Above 'A' line of I_p>7	-	-	
FINE GRAINED SOIL (more than 35% of soil excluding oversize fraction is less than 0.075mm)	SILT (0.075mm to 0.002mm) & CLAY (<0.002mm) Liquid Limit<50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	**Dry Strength**	**Dilatancy**	**Toughness**						
					None to low	Slow to rapid	Low		More than 35% passing 0.075mm	Below 'A' line			
			CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium			Above 'A' line			
			OL	Organic silts and organic silty clays of low plasticity	Low to medium	Slow	Low			Below 'A' line			
	SILT (0.075mm to 0.002mm) & CLAY (<0.002mm) Liquid Limit>50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Low to medium	None to slow	Low to medium			Below 'A' line			
			CH	Inorganic clays of medium to high plasticity, fat clays	High to very high	None	High			Above 'A' line			
			OH (1)	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Low to medium			Below 'A' line			
	HIGHLY ORGANIC SOILS		Pt (1)	Peat and highly organic soils	Identified by colour, odour, spongy feel and generally by fibrous texture				Effervesces with H_2O_2				

Log Symbols & Abbreviations (Cored Borehole Log)

Log Column	**Symbol / Abbreviation**	**Description**	
Core Size		Nominal Core Size (mm)	
	NQ	47	
	NMLC	52	
	HQ	63	
Water Loss	——◀	Complete water loss	
	——◁	Partial water loss	
Weathering (AS1726:2017)	RS	Residual Soil	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported
	XW	Extremely Weathered	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible
	HW	Highly Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching, or may be decreased due to deposition of weathering products in pores.
	MW	Moderately Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock
	SW	Slightly Weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change in strength from fresh rock
	FR	Fresh	Rock shows no sign of decomposition of individual minerals or colour changes
		Note : Where it is not possible to distinguish between HW and MW rock the term Distinctly Weathered (DW) may be used. DW is defined as 'Rock strength usually changed by weathering. The rock may be highly discoloured, usually by ironstaining. Porosity may be increased by leaching, or may be decreased by deposition of weathering products in pores'	
Strength (AS1726:2017)		**Term**	**Point Load Strength Index (I_{s50}, MPa)**
	VL	Very Low	≥0.03 ≤0.1
	L	Low	>0.1 ≤0.3
	M	Medium	>0.3 ≤1
	H	High	>1 ≤3
	VH	Very High	>3 ≤10
	EH	Extremely High	>10
Defect Spacing		**Description**	**Spacing (mm)**
		Extremely closely spaced	<20
		Very closely spaced	20 to 60
		Closely spaced	60 to 200
		Medium spaced	200 to 600
		Widely spaced	600 to 2000
		Very widely spaced	2000 to 6000
		Extremely widely spaced	>6000
Defect Description (AS1726:2017) Type			
	Pt	Parting	
	Jo	Joint	
	Sh	Sheared Surface	
	Sz	Sheared Zone	
	Ss	Sheared Seam	
	Cs	Crushed Seam	
	Is	Infilled Seam	
	Ews	Extremely Weathered Seam	
Macro-surface geometry	St	Stepped	
	Cu	Curved	
	Un	Undulating	
	Ir	Irregular	
	Pl	Planar	
Micro-surface geometry	Vro	Very Rough	
	Ro	Rough	
	Sm	Smooth	
	Po	Polished	
	Sl	Slickensided	
Coating or infilling	cn	clean	
	sn	stained	
	vn	veneer	
	cg	coating	

AS1726 – Identification of Sedimentary Rocks for Engineering Purposes

Grain Size mm		Bedded rocks (mostly sedimentary)									
More than 20	20	Grain Size Description				At least 50% of grains are of carbonate				At least 50% of grains are of fine-grained volcanic rock	
	6	RUDACEOUS		CONGLOMERATE Rounded boulders, cobbles and gravel cemented in a finer matrix Breccia Irregular rock fragments in a finer matrix		LIMESTONE and DOLOMITE (undifferentiated)		Calcirudite		Fragments of volcanic ejecta in a finer matrix Rounded grains AGGLOMERATE Angular grains VOLCANIC BRECCIA	SALINE ROCKS Halite Anhydrite
	2										
	0.6	ARENACEOUS	Coarse	SANDSTONE Angular or rounded grains, commonly cemented by clay, calcite or iron minerals Quartzite Quartz grains and siliceous cement Arkose Many feldspar grains Greywacke Many rock chips				Calcarenite		Cemented volcanic ash TUFF	Gypsum
	0.2		Medium								
	0.06		Fine								
	0.002	ARGILLACEOUS		MUDSTONE	SILTSTONE Mostly silt	Calcareous Mudstone		Calcisiltite	**CHALK**	Fine-grained TUFF	
	Less than 0.002			SHALE Fissile	CLAYSTONE Mostly clay			Calcilutite		Very fine-grained TUFF	
Amorphous or crypto-crystalline				Flint: occurs as hands of nodules in the chalk Chert: occurs as nodules and beds in limestone and calcareous sandstone							COAL LIGNITE
				Granular cemented – except amorphous rocks							
				SILICEOUS		CALCAREOUS				SILICEOUS	CARBONACEOUS
				SEDIMENTARY ROCKS Granular cemented rocks vary greatly in strength, some sandstones are stronger than many Igneous rocks. Bedding may not show in hand specimens and is best seen in outcrop. Only sedimentary rocks, and some metamorphic rocks derived from them, contain fossils Calcareous rocks contain calcite (calcium carbonate) which effervesces with dilute hydrochloric acid							

AS1726 – Identification of Metamorphic and Igneous Rocks for Engineering Purposes

Obviously foliated rocks (mostly metamorphic)			Rocks with massive structure and crystalline texture (mostly igneous)					Grain size (mm)
Grain size description		MARBLE QUARTZITE Granulite HORNFELS Amphibolite Serpentine	Grain size description	Pegmatite		GABBRO	Pyrosenite	More than 20 20
COARSE	GNEISS Well developed but often widely spaced foliation sometimes with schistose bands Migmatite Irregularly foliated: mixed schists and gneisses		COARSE	GRANITE	Diorite		Peridorite	6
				These rocks are sometimes phorphyritic and are then described, for example, as porphyritic granite				2
MEDIUM	SCHIST Well developed undulose foliation; generally much mica		MEDIUM	Micorgranite	Microdiorite	Dolerite		0.6
				These rocks are sometimes phorphyritic and are then described as porphyries				0.2
								0.06
FINE	PHYLLITE Slightly undulose foliation; sometimes 'spotted'		FINE	RHYOLITE	ANDESITE	BASALT		0.002
	SLATE Well developed plane cleavage (foliation)			These rocks are sometimes phorphyritic and are then described as porphyries				Less than 0.002
	Mylonite Found in fault zones, mainly in igneous and metamorphic areas			Obsidian	Volcanic glass			Amorphous or cryptocrystalline
CRYSTALLINE				Pale<--->Dark				
SILICEOUS		Mainly SILICEOUS		ACID Much quartz	INTERMEDIATE Some quartz	BASIC Little or no quartz	ULTRA BASIC	
METAMORPHIC ROCKS Most metamorphic rocks are distinguished by foliation which may impart fissility. Foliation in gneisses is best observed in outcrop. Non-foliated metamorphics are difficult to recognize except by association. Any rock baked by contact metamorphism is described as 'hornfels' and is generally somewhat stronger than the parent rock Most fresh metamorphic rocks are strong although perhaps fissile			IGNEOUS ROCKS Composed of closely interlocking mineral grains. Strong when fresh; not porous Mode of occurrence : 1 Batholith; 2 Laccoliths; 3 Sills; 4 Dykes; 5 Lava Flows; 6 Veins					

ATTACHMENT B

Laboratory Test Results

Material Test Report

Report Number: **20429/9-1**
Issue Number: 1
Date Issued: 29/11/2024
Client: SINSW

Project Number: 20429/9
Project Name: Proposed School Upgrade
Project Location: Northmead Public School, Northmead
Work Request: 37
Sample Number: S-37B
Date Sampled: 07/11/2024
Dates Tested: 20/11/2024 - 22/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: In accordance with the test method
Sample Location: **Northmead Public School, Northmead , Depth: BH103 0.8 - 1.0**
Material: Silty CLAY, low to medium plasticity, brown with sand

GEOTECH
TESTING PTY LTD
ABN 71 076 676 321

Geotech Testing Pty Ltd
Penrith Laboratory
34 Borec Road Penrith NSW 2750
Phone: (02) 4722 2744
Email: matthew@geotech.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mathew Morley
Laboratory Manager

NATA Accredited Laboratory Number: 2734

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	36		
Plastic Limit (%)	19		
Plasticity Index (%)	**17**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**7.5**		
Cracking Crumbling Curling	None		

This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Report Number: **20429/9-1**
Issue Number: 1
Date Issued: 29/11/2024
Client: SINSW

Project Number: 20429/9
Project Name: Proposed School Upgrade
Project Location: Northmead Public School, Northmead
Work Request: 37
Sample Number: S-37C
Date Sampled: 07/11/2024
Dates Tested: 20/11/2024 - 25/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: In accordance with the test method
Sample Location: **Northmead Public School, Northmead , Depth: BH104 1.0 - 1.5**
Material: Silty CLAY, low to medium plasticity, brown

GEOTECH
TESTING PTY LTD
ABN 71 076 676 321

Geotech Testing Pty Ltd
Penrith Laboratory
34 Borec Road Penrith NSW 2750
Phone: (02) 4722 2744
Email: matthew@geotech.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

NATA
WORLD RECOGNISED ACCREDITATION

Approved Signatory: Mathew Morley
Laboratory Manager
NATA Accredited Laboratory Number: 2734

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	42		
Plastic Limit (%)	19		
Plasticity Index (%)	**23**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**12.0**		
Cracking Crumbling Curling	None		

This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Report Number: **20429/9-1**
Issue Number: 1
Date Issued: 29/11/2024
Client: SINSW

GEOTECH
TESTING PTY LTD
ABN 71 076 676 321

Geotech Testing Pty Ltd
Penrith Laboratory
34 Borec Road Penrith NSW 2750
Phone: (02) 4722 2744
Email: matthew@geotech.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mathew Morley
Laboratory Manager
NATA Accredited Laboratory Number: 2734

Project Number: 20429/9
Project Name: Proposed School Upgrade
Project Location: Northmead Public School, Northmead
Work Request: 37
Sample Number: S-37D
Date Sampled: 07/11/2024
Dates Tested: 20/11/2024 - 22/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: In accordance with the test method
Sample Location: **Northmead Public School, Northmead , Depth: BH105 1.5 - 1.95**
Material: Fill, Silty CLAY, low plasticity, brown, with sand and gravel

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	65		
Plastic Limit (%)	26		
Plasticity Index (%)	**39**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**15.0**		
Cracking Crumbling Curling	None		

This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

Report Number: **20429/9-1**
Issue Number: 1
Date Issued: 29/11/2024
Client: SINSW

Project Number: 20429/9
Project Name: Proposed School Upgrade
Project Location: Northmead Public School, Northmead
Work Request: 37
Sample Number: S-37E
Date Sampled: 07/11/2024
Dates Tested: 20/11/2024 - 21/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: In accordance with the test method
Sample Location: **Northmead Public School, Northmead , Depth: BH105 3.0 - 3.45**
Material: Silty CLAY, medium plasticity, brown with sand

GEOTECH TESTING PTY LTD
ABN 71 076 676 321

Geotech Testing Pty Ltd
Penrith Laboratory
34 Borec Road Penrith NSW 2750
Phone: (02) 4722 2744
Email: matthew@geotech.com.au

WORLD RECOGNISED ACCREDITATION

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mathew Morley
Laboratory Manager

NATA Accredited Laboratory Number: 2734

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	33		
Plastic Limit (%)	29		
Plasticity Index (%)	**4**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.1		
Linear Shrinkage (%)	**16.0**		
Cracking Crumbling Curling	None		

This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

Material Test Report

GEOTECH
TESTING PTY LTD
ABN 71 076 676 321

Geotech Testing Pty Ltd
Penrith Laboratory
34 Borec Road Penrith NSW 2750
Phone: (02) 4722 2744
Email: matthew@geotech.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Mathew Morley
Laboratory Manager
NATA Accredited Laboratory Number: 2734

Report Number: **20429/9-1**
Issue Number: 1
Date Issued: 29/11/2024
Client: SINSW

Project Number: 20429/9
Project Name: Proposed School Upgrade
Project Location: Northmead Public School, Northmead
Work Request: 37
Sample Number: S-37F
Date Sampled: 07/11/2024
Dates Tested: 20/11/2024 - 20/11/2024
Sampling Method: AS 1289.1.2.1 6.5.3 - Power auger drilling
Preparation Method: In accordance with the test method
Sample Location: **Northmead Public School, Northmead , Depth: BH106 1.5 - 1.95**
Material: Fill, Gravelly CLAY, low plasticity, brown with sand, cobbles and brick fragments

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	Not Obtainable		
Plastic Limit (%)	Not Obtainable		
Plasticity Index (%)	**Non Plastic**		
Slips in cup			

This document shall not be reproduced except in full without the approval of the laboratory.
Results relate only to the items tested/sampled.

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Indra Jworchan
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	indra.jworchan@geotech.com.au
Project	**20429/9 Northmead Public School**
Order Number	**20429/9**
Samples	7

LABORATORY DETAILS

Manager	Shane McDermott
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE274088 R0**
Date Received	14/11/2024
Date Reported	20/11/2024

COMMENTS

Accredited for compliance with ISO/IEC 17025 - Testing. NATA accredited laboratory 2562(4354).

SIGNATORIES

Dong LIANG

Metals/Inorganics Team Leader

pH in soil (1:2) [AN101] Tested: 15/11/2024

			BH101 SOIL 0.5-1.0 7/11/2024	BH103 SOIL 0.8-1.0 8/11/2024	BH104 SOIL 1.0-1.5 9/11/2024	BH105 SOIL 3.0-3.45 10/11/2024	BH105 SOIL 4.5-4.95 11/11/2024
PARAMETER	**UOM**	**LOR**	**SE274088.001**	**SE274088.002**	**SE274088.003**	**SE274088.004**	**SE274088.005**
pH (1:2)	pH Units	-	5.1	5.6	6.0	4.5	4.9

			BH106 SOIL 1.5-1.95 12/11/2024	BH106 SOIL 2.0-2.5 13/11/2024
PARAMETER	**UOM**	**LOR**	**SE274088.006**	**SE274088.007**
pH (1:2)	pH Units	-	8.0	6.4

Conductivity and TDS by Calculation - Soil [AN106] Tested: 15/11/2024

PARAMETER	UOM	LOR	BH101 SOIL 0.5-1.0 7/11/2024 SE274088.001	BH103 SOIL 0.8-1.0 8/11/2024 SE274088.002	BH104 SOIL 1.0-1.5 9/11/2024 SE274088.003	BH105 SOIL 3.0-3.45 10/11/2024 SE274088.004	BH105 SOIL 4.5-4.95 11/11/2024 SE274088.005
Conductivity of Extract (1:5 as received)	µS/cm	1	41	21	20	41	39
Salinity (by calculation)*	mg/kg	5	150	77	75	160	150

PARAMETER	UOM	LOR	BH106 SOIL 1.5-1.95 12/11/2024 SE274088.006	BH106 SOIL 2.0-2.5 13/11/2024 SE274088.007
Conductivity of Extract (1:5 as received)	µS/cm	1	39	21
Salinity (by calculation)*	mg/kg	5	140	73

Conductivity (1:2) in soil [AN106] Tested: 15/11/2024

PARAMETER	UOM	LOR	BH101 SOIL 0.5-1.0 7/11/2024 SE274088.001	BH103 SOIL 0.8-1.0 8/11/2024 SE274088.002	BH104 SOIL 1.0-1.5 9/11/2024 SE274088.003	BH105 SOIL 3.0-3.45 10/11/2024 SE274088.004	BH105 SOIL 4.5-4.95 11/11/2024 SE274088.005
Conductivity (1:2) @25 C*	µS/cm	1	70	34	45	58	63
Resistivity (1:2)*	ohm cm	-	14000	29000	22000	17000	16000

PARAMETER	UOM	LOR	BH106 SOIL 1.5-1.95 12/11/2024 SE274088.006	BH106 SOIL 2.0-2.5 13/11/2024 SE274088.007
Conductivity (1:2) @25 C*	µS/cm	1	100	55
Resistivity (1:2)*	ohm cm	-	9800	18000

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography [AN245] Tested: 15/11/2024

			BH101 SOIL 0.5-1.0 7/11/2024	BH103 SOIL 0.8-1.0 8/11/2024	BH104 SOIL 1.0-1.5 9/11/2024	BH105 SOIL 3.0-3.45 10/11/2024	BH105 SOIL 4.5-4.95 11/11/2024
PARAMETER	**UOM**	**LOR**	**SE274088.001**	**SE274088.002**	**SE274088.003**	**SE274088.004**	**SE274088.005**
Chloride	mg/kg	0.25	8.8	1.7	3.7	22	17
Sulfate	mg/kg	0.5	24	12	14	14	26

			BH106 SOIL 1.5-1.95 12/11/2024	BH106 SOIL 2.0-2.5 13/11/2024
PARAMETER	**UOM**	**LOR**	**SE274088.006**	**SE274088.007**
Chloride	mg/kg	0.25	2.8	4.4
Sulfate	mg/kg	0.5	12	6.3

Moisture Content [AN002] Tested: 14/11/2024

PARAMETER	UOM	LOR	BH101 SOIL 0.5-1.0 7/11/2024 SE274088.001	BH103 SOIL 0.8-1.0 8/11/2024 SE274088.002	BH104 SOIL 1.0-1.5 9/11/2024 SE274088.003	BH105 SOIL 3.0-3.45 10/11/2024 SE274088.004	BH105 SOIL 4.5-4.95 11/11/2024 SE274088.005
% Moisture	%w/w	1	13.8	10.8	12.5	17.8	17.2

PARAMETER	UOM	LOR	BH106 SOIL 1.5-1.95 12/11/2024 SE274088.006	BH106 SOIL 2.0-2.5 13/11/2024 SE274088.007
% Moisture	%w/w	1	8.7	6.6

METHOD	METHODOLOGY SUMMARY
AN002	The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.
AN101	pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, an extract with water is made at a ratio of 1:2 and the pH determined and reported on the extract after 1 hour extraction (pH 1:2) or after 1 hour extraction and overnight aging (pH (1:2) aged). Reference APHA 4500-H+.
AN106	Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos /cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.
AN106	Resistivity of the extract is reported on the extract basis and is the reciprocal of conductivity. Salinity and TDS can be calculated from the extract conductivity and is reported back to the soil basis.
AN245	Anions by Ion Chromatography: A water sample or extract is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO2, NO3 and SO4 are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

*	NATA accreditation does not cover the performance of this service.	-	Not analysed.	UOM	Unit of Measure.
		NVL	Not validated.	LOR	Limit of Reporting.
**	Indicative data, theoretical holding time exceeded.	IS	Insufficient sample for analysis.	↑↓	Raised/lowered Limit of Reporting.
		LNR	Sample listed, but not received.		
***	Indicates that both * and ** apply.				

Unless it is reported that sampling has been performed by SGS, the samples have been analysed as received.
Solid samples expressed on a dry weight basis.

Where "Total" analyte groups are reported (for example, Total PAHs, Total OC Pesticides) the total will be calculated as the sum of the individual analytes, with those analytes that are reported as <LOR being assumed to be zero. The summed (Total) limit of reporting is calculated by summing the individual analyte LORs and dividing by two. For example, where 16 individual analytes are being summed and each has an LOR of 0.1 mg/kg, the "Totals" LOR will be 1.6 / 2 (0.8 mg/kg). Where only 2 analytes are being summed, the " Total" LOR will be the sum of those two LORs.

Some totals may not appear to add up because the total is rounded after adding up the raw values.

If reported, measurement uncertainty follow the ± sign after the analytical result and is expressed as the expanded uncertainty calculated using a coverage factor of 2, providing a level of confidence of approximately 95%, unless stated otherwise in the comments section of this report.

Results reported for samples tested under test methods with codes starting with ARS-SOP, radionuclide or gross radioactivity concentrations are expressed in becquerel (Bq) per unit of mass or volume or per wipe as stated on the report. Becquerel is the SI unit for activity and equals one nuclear transformation per second.
Note that in terms of units of radioactivity:

a. 1 Bq is equivalent to 27 pCi
b. 37 MBq is equivalent to 1 mCi

For results reported for samples tested under test methods with codes starting with ARS-SOP, less than (<) values indicate the detection limit for each radionuclide or parameter for the measurement system used. The respective detection limits have been calculated in accordance with ISO 11929.

The QC and MU criteria are subject to internal review according to the SGS QAQC plan and may be provided on request or alternatively can be found here: www.sgs.com.au/en-gb/environment-health-and-safety.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law .

This report must not be reproduced, except in full.

STATEMENT OF QA/QC PERFORMANCE

SE274088 R0

CLIENT DETAILS

Contact	Indra Jworchan
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	indra.jworchan@geotech.com.au
Project	**20429/9 Northmead Public School**
Order Number	**20429/9**
Samples	7

LABORATORY DETAILS

Manager	Shane McDermott
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE274088 R0**
Date Received	14 Nov 2024
Date Reported	20 Nov 2024

COMMENTS

All the laboratory data for each environmental matrix was compared to SGS' stated Data Quality Objectives (DQO). Comments arising from the comparison were made and are reported below.

The data relating to sampling was taken from the Chain of Custody document.
This QA/QC Statement must be read in conjunction with the referenced Analytical Report.
The Statement and the Analytical Report must not be reproduced except in full.

All Data Quality Objectives were met with the exception of the following:

Extraction Date	Conductivity (1:2) in soil	1 item
	Conductivity and TDS by Calculation - Soil	1 item
	pH in soil (1:2)	1 item
	Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography	1 item
Analysis Date	Conductivity (1:2) in soil	1 item
	Conductivity and TDS by Calculation - Soil	5 items

SAMPLE SUMMARY

Sample counts by matrix	7 Soil	Type of documentation received	COC
Date documentation received	14/11/2024	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	22.8°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	None	Samples clearly labelled	Yes
Complete documentation received	Yes		

SGS holding time criteria are drawn from current regulations and are highly dependent on sample container preservation as specified in the SGS "Field Sampling Guide for Containers and Holding Time" (ref: GU-(AU)-ENV.001). Soil samples guidelines are derived from NEPM "Schedule B(3) Guideline on Laboratory Analysis of Potentially Contaminated Soils". Water sample guidelines are derived from "AS/NZS 5667.1 : 1998 Water Quality - sampling part 1" and APHA "Standard Methods for the Examination of Water and Wastewater" 21st edition 2005.

Extraction and analysis holding time due dates listed are calculated from the date sampled, although holding times may be extended after laboratory extraction for some analytes. The due dates are the suggested dates that samples may be held before extraction or analysis and still be considered valid.

Extraction and analysis dates are shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria. If the

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101	SE274088.001	LB330027	07 Nov 2024	14 Nov 2024	14 Nov 2024	15 Nov 2024†	14 Nov 2024	15 Nov 2024†
BH103	SE274088.002	LB330027	08 Nov 2024	14 Nov 2024	15 Nov 2024	15 Nov 2024	15 Nov 2024	15 Nov 2024
BH104	SE274088.003	LB330027	09 Nov 2024	14 Nov 2024	16 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH105	SE274088.004	LB330027	10 Nov 2024	14 Nov 2024	17 Nov 2024	15 Nov 2024	17 Nov 2024	15 Nov 2024
BH105	SE274088.005	LB330027	11 Nov 2024	14 Nov 2024	18 Nov 2024	15 Nov 2024	18 Nov 2024	15 Nov 2024
BH106	SE274088.006	LB330027	12 Nov 2024	14 Nov 2024	19 Nov 2024	15 Nov 2024	19 Nov 2024	15 Nov 2024
BH106	SE274088.007	LB330027	13 Nov 2024	14 Nov 2024	20 Nov 2024	15 Nov 2024	20 Nov 2024	15 Nov 2024

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101	SE274088.001	LB330000	07 Nov 2024	14 Nov 2024	14 Nov 2024	15 Nov 2024†	14 Nov 2024	18 Nov 2024†
BH103	SE274088.002	LB330000	08 Nov 2024	14 Nov 2024	15 Nov 2024	15 Nov 2024	15 Nov 2024	18 Nov 2024†
BH104	SE274088.003	LB330000	09 Nov 2024	14 Nov 2024	16 Nov 2024	15 Nov 2024	16 Nov 2024	18 Nov 2024†
BH105	SE274088.004	LB330000	10 Nov 2024	14 Nov 2024	17 Nov 2024	15 Nov 2024	17 Nov 2024	18 Nov 2024†
BH105	SE274088.005	LB330000	11 Nov 2024	14 Nov 2024	18 Nov 2024	15 Nov 2024	18 Nov 2024	18 Nov 2024
BH106	SE274088.006	LB330000	12 Nov 2024	14 Nov 2024	19 Nov 2024	15 Nov 2024	19 Nov 2024	18 Nov 2024
BH106	SE274088.007	LB330000	13 Nov 2024	14 Nov 2024	20 Nov 2024	15 Nov 2024	20 Nov 2024	18 Nov 2024

Moisture Content

Method: ME-(AU)-[ENV]AN002

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101	SE274088.001	LB329953	07 Nov 2024	14 Nov 2024	21 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH103	SE274088.002	LB329953	08 Nov 2024	14 Nov 2024	22 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH104	SE274088.003	LB329953	09 Nov 2024	14 Nov 2024	23 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH105	SE274088.004	LB329953	10 Nov 2024	14 Nov 2024	24 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH105	SE274088.005	LB329953	11 Nov 2024	14 Nov 2024	25 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH106	SE274088.006	LB329953	12 Nov 2024	14 Nov 2024	26 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024
BH106	SE274088.007	LB329953	13 Nov 2024	14 Nov 2024	27 Nov 2024	14 Nov 2024	19 Nov 2024	18 Nov 2024

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101	SE274088.001	LB330027	07 Nov 2024	14 Nov 2024	14 Nov 2024	15 Nov 2024†	16 Nov 2024	15 Nov 2024
BH103	SE274088.002	LB330027	08 Nov 2024	14 Nov 2024	15 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH104	SE274088.003	LB330027	09 Nov 2024	14 Nov 2024	16 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH105	SE274088.004	LB330027	10 Nov 2024	14 Nov 2024	17 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH105	SE274088.005	LB330027	11 Nov 2024	14 Nov 2024	18 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH106	SE274088.006	LB330027	12 Nov 2024	14 Nov 2024	19 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024
BH106	SE274088.007	LB330027	13 Nov 2024	14 Nov 2024	20 Nov 2024	15 Nov 2024	16 Nov 2024	15 Nov 2024

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Name	Sample No.	QC Ref	Sampled	Received	Extraction Due	Extracted	Analysis Due	Analysed
BH101	SE274088.001	LB330039	07 Nov 2024	14 Nov 2024	14 Nov 2024	15 Nov 2024†	13 Dec 2024	20 Nov 2024
BH103	SE274088.002	LB330039	08 Nov 2024	14 Nov 2024	15 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024
BH104	SE274088.003	LB330039	09 Nov 2024	14 Nov 2024	16 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024
BH105	SE274088.004	LB330039	10 Nov 2024	14 Nov 2024	17 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024
BH105	SE274088.005	LB330039	11 Nov 2024	14 Nov 2024	18 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024
BH106	SE274088.006	LB330039	12 Nov 2024	14 Nov 2024	19 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024
BH106	SE274088.007	LB330039	13 Nov 2024	14 Nov 2024	20 Nov 2024	15 Nov 2024	13 Dec 2024	20 Nov 2024

SURROGATES

Surrogate results are evaluated against upper and lower limit criteria established in the SGS QA/QC plan (Ref: MP-(AU)-[ENV]QU-022). At least two of three routine level soil sample surrogate spike recoveries for BTEX/VOC are to be within 70-130% where control charts have not been developed and within the established control limits for charted surrogates. Matrix effects may void this as an acceptance criterion. Water sample surrogate spike recoveries are to be within 40-130%. The presence of emulsions, surfactants and particulates may void this as an acceptance criterion.

Result is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No surrogates were required for this job.

Blank results are evaluated against the limit of reporting (LOR), for the chosen method and its associated instrumentation, typically 2.5 times the statistically determined method detection limit (MDL).

Result is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB330027.001	Conductivity (1:2) @25 C*	µS/cm	1	<1

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result
LB330000.001	Conductivity of Extract (1:5 as received)	µS/cm	1	<1
	Salinity (by calculation)*	mg/kg	5	<5

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result
LB330039.001	Chloride	mg/kg	0.25	<0.25
	Sulfate	mg/kg	0.5	<0.5

DUPLICATES

Duplicates are calculated as Relative Percentage Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

NOTE: The RPD reported is calculated from the unrounded data for the original and replicate result. Manual calculation of the RPD from the rounded data reported may

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE273965.010	LB330027.014	Conductivity (1:2) @25 C*	µS/cm	1	78	88	32	12
		Resistivity (1:2)*	ohm cm	-	13000	11000	30	12
SE274088.007	LB330027.022	Conductivity (1:2) @25 C*	µS/cm	1	55	59	34	6
		Resistivity (1:2)*	ohm cm	-	18000	17000	30	6

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE273999.005	LB330000.026	Conductivity of Extract (1:5 as received)	µS/cm	1	46	50	34	9
SE274088.007	LB330000.025	Conductivity of Extract (1:5 as received)	µS/cm	1	21	18	40	15
		Salinity (by calculation)*	mg/kg	5	73	62	45	15

Moisture Content

Method: ME-(AU)-[ENV]AN002

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE273999.005	LB329953.011	% Moisture	%w/w	1	4.5	5.5	50	20
SE274088.007	LB329953.022	% Moisture	%w/w	1	6.6	7.9	44	18

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE273965.010	LB330027.014	pH (1:2)	pH Units	-	5.3	5.5	32	3
SE274088.007	LB330027.022	pH (1:2)	pH Units	-	6.4	6.4	32	0

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Original	Duplicate	Parameter	Units	LOR	Original	Duplicate	Criteria %	RPD %
SE273965.010	LB330039.014	Chloride	mg/kg	0.25	3.3	4.5	36	30
		Sulfate	mg/kg	0.5	46	62	34	30
SE274088.007	LB330039.022	Chloride	mg/kg	0.25	4.4	4.7	35	7
		Sulfate	mg/kg	0.5	6.3	10	54	49

LABORATORY CONTROL SAMPLES

Laboratory Control Standard (LCS) results are evaluated against an expected result, typically the concentration of analyte spiked into the control during the sample preparation stage, producing a percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA /QC plan (Ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended dagger symbol (†) when outside suggested criteria.

Conductivity (1:2) in soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB330027.002	Conductivity (1:2) @25 C*	µS/cm	1	280	303	70 - 130	91

Conductivity and TDS by Calculation - Soil

Method: ME-(AU)-[ENV]AN106

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB330000.002	Conductivity of Extract (1:5 as received)	µS/cm	1	290	303	85 - 115	96

pH in soil (1:2)

Method: ME-(AU)-[ENV]AN101

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB330027.003	pH (1:2)	pH Units	-	7.5	7.415	98 - 102	101

Soluble Anions in Soil from 1:2 DI Extract by Ion Chromatography

Method: ME-(AU)-[ENV]AN245

Sample Number	Parameter	Units	LOR	Result	Expected	Criteria %	Recovery %
LB330039.002	Chloride	mg/kg	0.25	38	40	70 - 130	96
	Sulfate	mg/kg	0.5	38	40	70 - 130	96

MATRIX SPIKES

Matrix Spike (MS) results are evaluated as the percentage recovery of an expected result, typically the concentration of analyte spiked into a field sub -sample during the sample preparation stage. The original sample's result is subtracted from the sub-sample result before determining the percentage recovery. The criteria applied to the percentage recovery is established in the SGS QA/QC plan (ref: MP-(AU)-[ENV]QU-022). For more information refer to the footnotes in the concluding page of this report.

Recovery is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the end of this report for failure reasons.

No matrix spikes were required for this job.

MATRIX SPIKE DUPLICATES

Matrix spike duplicates are calculated as Relative Percent Difference (RPD) using the formula: RPD = | OriginalResult - ReplicateResult | x 100 / Mean

The original result is the analyte concentration of the matrix spike. The Duplicate result is the analyte concentration of the matrix spike duplicate.

The RPD is evaluated against the Maximum Allowable Difference (MAD) criteria and can be graphically represented by a curve calculated from the Statistical Detection Limit (SDL) and Limiting Repeatability (LR) using the formula: MAD = 100 x SDL / Mean + LR

Where the Maximum Allowable Difference evaluates to a number larger than 200 it is displayed as 200.

RPD is shown in **Green** when within suggested criteria or **Red** with an appended reason identifer when outside suggested criteria. Refer to the footnotes section at the

No matrix spike duplicates were required for this job.

FOOTNOTES

Samples analysed as received.

Solid samples expressed on a dry weight basis.

QC criteria are subject to internal review according to the SGS QA/QC plan and may be provided on request or alternatively can be found here: https://www.sgs.com.au/~/media/Local/Australia/Documents/Technical Documents/MP-AU-ENV-QU-022 QA QC Plan.pdf

*	NATA accreditation does not cover the performance of this service.
**	Indicative data, theoretical holding time exceeded.
***	Indicates that both * and ** apply.
-	Sample not analysed for this analyte.
IS	Insufficient sample for analysis.
LNR	Sample listed, but not received.
LOR	Limit of reporting.
QFH	QC result is above the upper tolerance.
QFL	QC result is below the lower tolerance.
①	At least 2 of 3 surrogates are within acceptance criteria.
②	RPD failed acceptance criteria due to sample heterogeneity.
③	Results less than 5 times LOR preclude acceptance criteria for RPD.
④	Recovery failed acceptance criteria due to matrix interference.
⑤	Recovery failed acceptance criteria due to the presence of significant concentration of analyte (i.e. the concentration of analyte exceeds the spike level).
⑥	LOR was raised due to sample matrix interference.
⑦	LOR was raised due to dilution of significantly high concentration of analyte in sample.
⑧	Reanalysis of sample in duplicate confirmed sample heterogeneity and inconsistency of results.
⑨	Recovery failed acceptance criteria due to sample heterogeneity.
⑩	LOR was raised due to high conductivity of the sample (required dilution).
†	Refer to relevant report comments for further information.

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client only. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

This test report shall not be reproduced, except in full.

E-MAILED
12/11 @ 7.48pm

SGS EHS Sydney COC
SE274088

GEOTECHNIQUE PTY LTD

Laboratory Test Request / Chain of Custody Record

Lemko Place
PENRITH NSW 2750

P O Box 880
PENRITH NSW 2751

Tel: (02) 4722 2700
Fax: (02) 4722 6161
email: info@geotech.com.au

Page 1 of 1

TO: SGS ENVIRONMENTAL SERVICES
UNIT 16
33 MADDOX STREET
ALEXANDRIA NSW 2015

PH: 02 8594 0400 FAX: 02 8594 0499

ATTN: MS ANGELA MAMALICOS

Sampling By: JH
Job No: 20429/9
Project: Proposed School Upgrade
Project Manager: IJ
Location: Northmead Public School

	Sampling details					Sample type		Results required by:									
	Location		Depth (m)	Date	Time	Soil	Water	Salinity EC (1:5)	Aggressivity Suite								KEEP SAMPLE
1	BH101		0.5-1.0	7/11/2024		DS		✓	✓								YES
2	BH103		0.8-1.0	8/11/2024		DS		✓	✓		Aggressivity suit includes pH, SO4, Cl and Resistivity						YES
3	BH104		1.0-1.5	9/11/2024		DS		✓	✓								YES
4	BH105		3.0-3.45	10/11/2024		DS		✓	✓								YES
5	BH105		4.5-4.95	11/11/2024		DS		✓	✓								YES
6	BH106		1.5-1.95	12/11/2024		DS		✓	✓								YES
7	BH106		2.0-2.5	13/11/2024		DS		✓	✓								YES

Relinquished by			Received by		
Name	Signature	Date	Name	Signature	Date
Indra Jworchan		12/11/2024			14.11.24 9:00

Legend:
WG Water sample, glass bottle
WP Water sample, plastic bottle
USG Undisturbed soil sample (glass jar)
DSG Disturbed soil sample (glass jar)
DSP Disturbed soil sample (small plastic bag)
✓ Test required
* Purge & Trap
\# Geotechnique Screen
@ mole H^+/tonne

SAMPLE RECEIPT ADVICE

SE274088

CLIENT DETAILS

Contact	Indra Jworchan
Client	Geotechnique
Address	P.O. Box 880 NSW 2751
Telephone	02 4722 2700
Facsimile	02 4722 6161
Email	indra.jworchan@geotech.com.au
Project	**20429/9 Northmead Public School**
Order Number	**20429/9**
Samples	7

LABORATORY DETAILS

Manager	Shane McDermott
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
Samples Received	Thu 14/11/2024
Report Due	Thu 21/11/2024
SGS Reference	**SE274088**

SUBMISSION DETAILS

This is to confirm that 7 samples were received on Thursday 14/11/2024. Results are expected to be ready by COB Thursday 21/11/2024. Please quote SGS reference SE274088 when making enquiries. Refer below for details relating to sample integrity upon receipt.

Sample counts by matrix	7 Soil	Type of documentation received	COC
Date documentation received	14/11/2024	Samples received in good order	Yes
Samples received without headspace	N/A	Sample temperature upon receipt	22.8°C
Sample container provider	SGS	Turnaround time requested	Standard
Samples received in correct containers	Yes	Sufficient sample for analysis	Yes
Sample cooling method	None	Samples clearly labelled	Yes
Complete documentation received	Yes		

Unless otherwise instructed, water and bulk samples will be held for one month from date of report, and soil samples will be held for two months.

COMMENTS

This document is issued by the Company under its General Conditions of Service accessible at www.sgs.com/en/Terms-and-Conditions.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

SAMPLE RECEIPT ADVICE

SE274088

CLIENT DETAILS

Client Geotechnique

Project 20429/9 Northmead Public School

SUMMARY OF ANALYSIS

No.	Sample ID	Conductivity (1:2) in soil	Conductivity and TDS by Calculation - Soil	Moisture Content	pH in soil (1:2)	Soluble Anions in Soil from 1:2 DI Extract by Ion
001	BH101 0.5-1.0	2	2	1	1	2
002	BH103 0.8-1.0	2	2	1	1	2
003	BH104 1.0-1.5	2	2	1	1	2
004	BH105 3.0-3.45	2	2	1	1	2
005	BH105 4.5-4.95	2	2	1	1	2
006	BH106 1.5-1.95	2	2	1	1	2
007	BH106 2.0-2.5	2	2	1	1	2

The above table represents SGS' interpretation of the client-supplied Chain Of Custody document.
The numbers shown in the table indicate the number of results requested in each package.
Please indicate as soon as possible should your request differ from these details .
Testing as per this table shall commence immediately unless the client intervenes with a correction .