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Geotechnics / Environment / Groundwater

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Report on
Geotechnical Investigation

New High School in Jerrabomberra
Part Lot 1 DP 1263364, Jerrabomberra

Prepared for
NSW Department of Education - School Infrastructure
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature		Date
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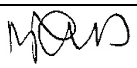
Reviewer		Michael Jones	16 September 2021

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Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au
Unit 2, 73 Sheppard Street
Hume ACT 2620
PO Box 1487
Fyshwick ACT 2609
Phone (02) 6260 2788

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1. Introduction

This Geotechnical Investigation accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) in support of an application for a State Significant Development (SSD No 24461956). The SSDA is for a new high school located at Jerrabomberra.

This report addresses the Secretary's Environmental Assessment Requirements (SEARs), notably:

SEARs Requirement	Response
Plans and Documents (Geotechnical Report)	Intrusive geotechnical investigation and recommendations for further site investigations

2. Proposal

The proposed development is for the construction of a new high school in Jerrabomberra. The proposal will meet community demand and to ensure new learning facilities are co-located near existing open space infrastructure. The proposal generally includes the following works:

- Site preparation;
- Construction of a series of buildings up to three storeys including administration/staff areas, library, hall and general learning spaces;
- Construction of new walkways, central plaza and outdoor games courts;
- Construction of a new at-grade car park; and
- Associated site landscaping and open space.

The proposal has been designed to accommodate approximately 500 students with Stream 3 teaching spaces, however the core facilities will be future proofed to a Stream 5 to enable possible future expansion to meet projected demand.

The proposal will include site preparation works, such as clearing and levelling to accommodate the proposed buildings and play areas. The proposal will involve the construction of a series of buildings housing general learning spaces, administration and staff wings, outdoor learning areas, a library and assembly hall.

The proposal will include construction of a new driveway and hardstand with access proposed off the northern stub road east of Environa Drive. Pedestrian access is proposed off Environa Drive and the northern stub road.

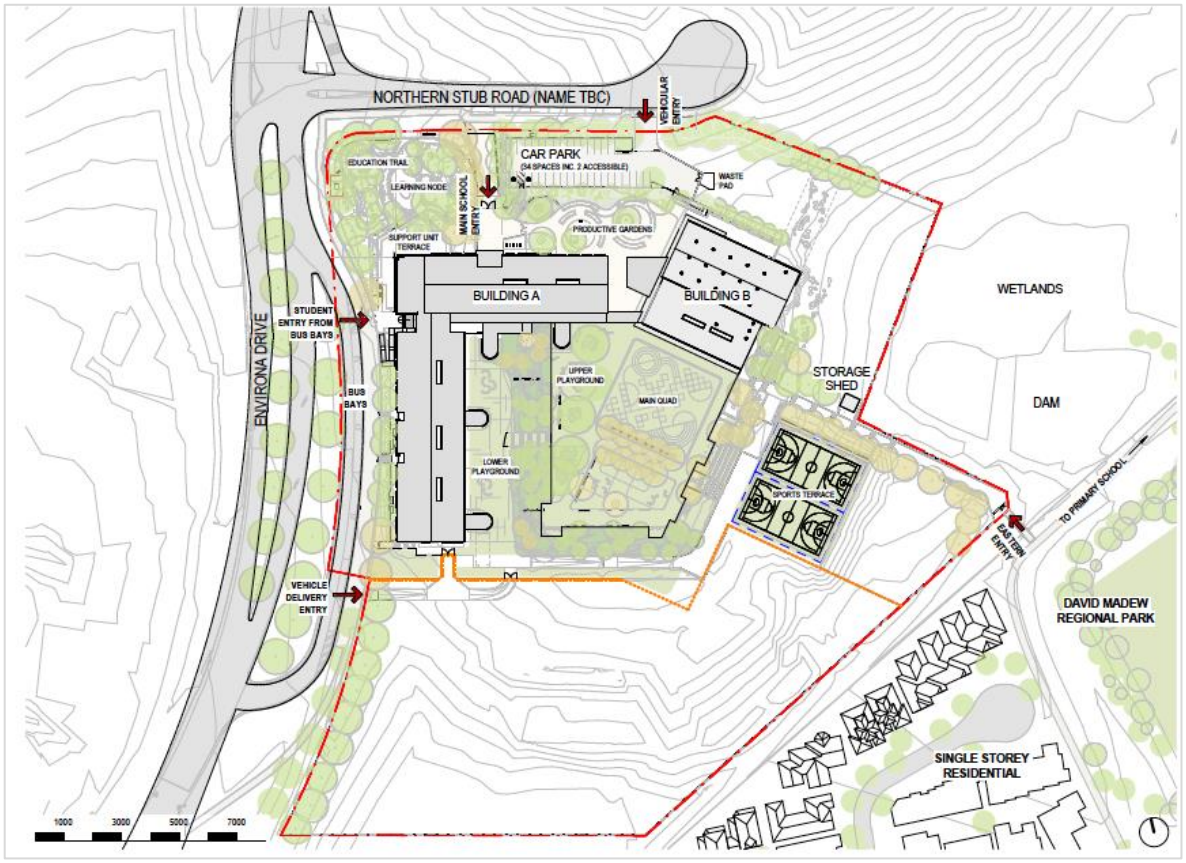

Figure 1: Proposed site plan
Source: TKD Architects

3. Site Description

The proposed development is located within the South Jerrabomberra Innovation Precinct, also referred as the Poplars Innovation Hub, in the local government area of Queanbeyan-Palerang Regional Council. The school site- is part of an existing lot (Lot 1 in DP 1263364), which is approximately 65.49ha in area and will be characterised by a mix of business park and open space uses and a new north-south connector road named Environa Drive.

Delivery of the Precinct is underway with Environa Drive currently under construction. Most of the-lot, however, remains undeveloped.

The school site is subject to a proposed lot (Lot 2 in DP 1263364), which was approved by Council under DA332-2015 on 10 March 2021 but is not yet registered. The approved lot is irregular in shape,

is largely cleared and is approximately 4.5ha in area. A small dam is located adjacent to the south eastern boundary of the site, which forms part of a broader wetland.

The site is located in excellent proximity to existing open space facilities. It adjoins David Madew Regional Park to the south east and is located 100m east of an existing recreational field associated with Jerrabomberra Public School.
A description of the site is provided in the table below.

Table 1: New High School in Jerrabomberra Site Description

Item	Description
Site address	School address yet to be determined however, it is located within the Jerrabomberra Innovation Precinct at 300 Lanyon Drive, Jerrabomberra.
Legal description	Lot 1 in DP 1263364 (existing) Lot 2 in DP 1263364 (proposed, but not registered)
Total area	Lot 1 – 65.49ha Lot 2 – 4.5ha
Frontages	The site provides frontage to Environa Drive and the northern stub road, both currently under construction.
Existing use	The site is undeveloped and contains a series of small vegetation clusters scattered across the site.
Existing access	Existing access is via an informal unsealed driveway off Tompsitt Drive along the northern boundary of the existing lot. The site will be accessed via Environa Drive and a secondary access road (North Road), which is currently under construction.
Context	Land to the south is primarily residential in nature. Jerrabomberra Public School and David Madew Regional Park are located to the east/south-east, while land to the west is undeveloped and features Jerrabomberra Creek. The site is located within the South Jerrabomberra Innovation Precinct, which is currently under construction. The areas north and west of the site are currently undeveloped but the site is currently undergoing a transition from rural to business park uses. Development further north on the opposite side of Tompsitt Drive and along Edwin Land Parkway includes retail and commercial uses. Development immediately to the south includes existing low density residential development. Land in the south west has been identified for future low density residential, light industrial and business park uses.

Figure 2: Site aerial depicting the land subject to the proposed High School.
Source: TKD Architects

4. Background Information

The work was commissioned in an email from NSW Department of Education - School Infrastructure NSW dated 24 February 2021 and was undertaken in accordance with Douglas Partners' proposal CAN200440 dated 18 December 2020 and email variation proposal dated 5 March 2021 and acceptance dated 19 March 2021. It should be noted that the information contained in Sections 1 – 3 of this report has been provided by the client as a preamble and DP has been required to reproduce these paragraphs in this report.

The investigation included the drilling of fourteen (14) boreholes followed by laboratory testing on selected samples. The details of the work undertaken are presented in this report, together with comments and recommendations on earthworks and site preparation, footing types, suitable bearing pressures, groundwater, pavements and site classification. Advice on seismicity and aggressivity will also be provided.

DP has also undertaken a contamination assessment with limited sampling which has been reported separately.

This report must be read in conjunction with the notes entitled *About this Report* which are included in Appendix A and the site layout and features are included in Drawing 1, Appendix B.

5. Regional Geology

Reference to BMR (1992) indicates that the majority of the site is underlain by rock units of the Deakin Volcanics and parts of the southern end by Quaternary aged alluvial deposits. The former typically comprise rhyodacitic ignimbrite with minor volcaniclastic and argillaceous sedimentary rocks and the latter gravel, silt, sand and clay.

An extract of the BMR map showing the indicated geological units is shown below in Figure 3.

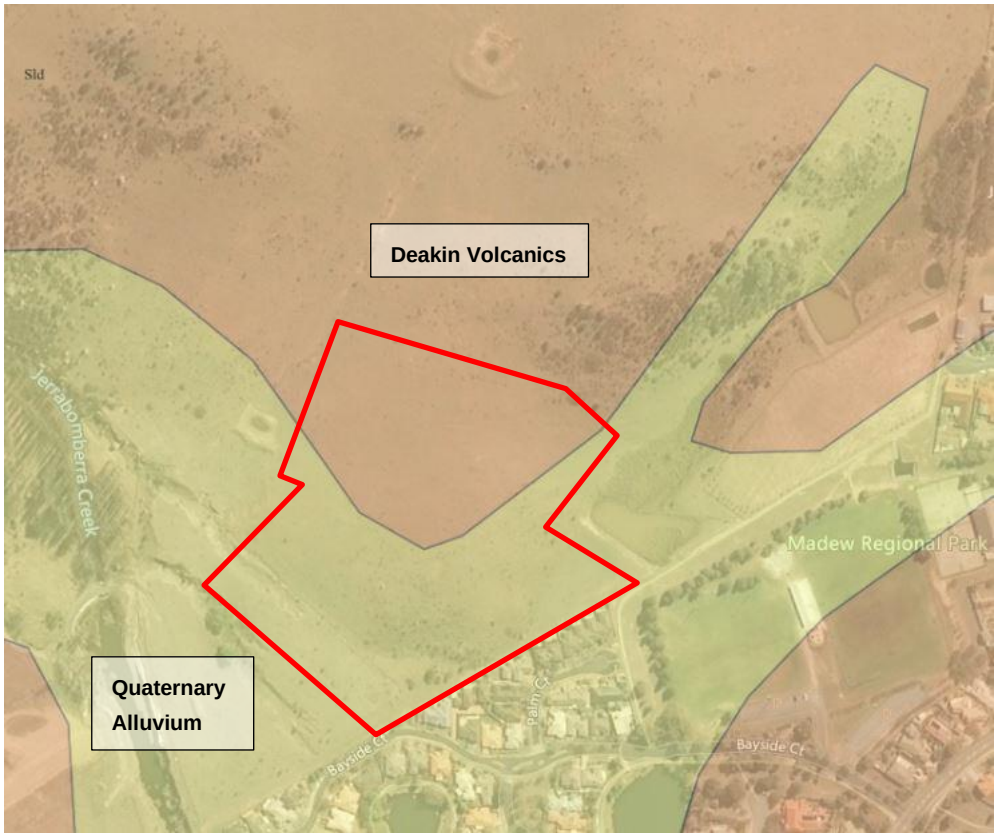

Figure 3: Extract from Geology Map and Approximate Site Boundary
Source: Douglas Partners Map

6. Field Work

6.1 Field Work Methods

The field work comprised the drilling of fourteen (14) boreholes using an EVH2100 drilling rig at the approximate locations shown on Drawing 1 in Appendix B. The boreholes were drilled through overburden soils and upper weathered rock with 110 mm diameter solid flight augers. Boreholes 2, 10 and 11 were augered to the limit of investigation depths of 6.0 m – 6.12 m.

The other eleven boreholes (Bores 1, 3 – 9 and 12 – 14) were continued into the bedrock with NMLC coring techniques to depths of 6.0 m – 7.0 m.

The boreholes were logged onsite by a geotechnical engineer. Disturbed and U_{50} samples were collected to assist in strata identification and for laboratory testing. Standard penetration tests (SPT's) were carried out at nominally 1.5 m test intervals to provide information on the strength of the overburden soils and samples for logging purposes. The SPT procedure is given in the notes included in Appendix C and the penetration N values are shown on the borehole logs.

The approximate test location coordinates provided on each borehole log were determined on site using a hand-held GPS which is accurate only to about 3 – 5 m. The surface levels shown on the borehole logs to Australian Height Datum (AHD) and coordinates to Map Grid of Australia (MGA, Zone 55) were determined using web-based mapping and the hand-held GPS and as such, are approximate only and not to be relied on.

6.2 Field Work Results

Subsurface conditions encountered are given in the borehole logs in Appendix C, which should be read in conjunction with the notes defining classification methods and descriptive terms.

The succession of strata is broadly summarised below:

- **TOPSOIL:** generally low plasticity clay with a various mixture of sand and silt in all boreholes to depths of 0.1 m – 0.35 m; overlying
- **COLLUVIUM / RESIDUAL:** generally low to medium plasticity clayey soils and medium dense to very dense sandy soils in Bores 1 – 6 and 8, from 0.1 m – 0.2 m depths to 0.3 m – 3.2 m depths;
- **EXTREMELY WEATHERED ROCK:** generally medium dense to very dense sandy soils with a various mixture of clay, silt and gravel in all the boreholes except Bores 4 and 14 from 0.15 m – 3.2 m depths to 0.3 m – 5.65 m depths;
- **BEDROCK:** variably extremely low to extremely high strength, extremely/highly weathered to fresh rhyodacitic ignimbrite in all boreholes from 0.3 m – 5.65 m depths to the limit of investigation depths of 6.0 m – 7.0 m.

No free groundwater was encountered during the drilling and coring of the boreholes. However, groundwater levels of 2.5 m – 5.7 m were observed in Bores 1, 3 - 5, 7 - 9 and 12 – 14, 24 hours after the boreholes were drilled. It is believed that due to the site being located on part of a ridgeline and elevated above the adjacent waterways, the groundwater that was observed was remnant driller's mud.

This, however, does not omit the potential for groundwater being located on site. Groundwater conditions rarely remain constant and can change seasonally due to variations in rainfall, temperature and soil permeability. For these reasons, it is noted that the moisture condition of the site soils may vary considerably from the time of the investigation compared to at the time of construction. It must be noted that due to the topography, sandy nature of the site soils and fractured weathered rock, groundwater seepages must be expected following periods of rainfall.

7. Laboratory Testing

Laboratory testing was performed on selected samples, and comprised the following:

- 3 Atterberg limits and linear shrinkage tests;
- 6 Uniaxial Compressive Strength (UCS) of Rock Core tests;
- 69 Point load index tests; and
- 2 pH, Chloride and Sulphate content (aggressivity) tests

The results of the laboratory testing are provided in detail in the test report sheets in Appendix D. The results of plasticity testing, aggressivity tests and UCS tests are summarised in Tables 2 – 5 below.

Table 2: Results of Atterberg Limits and linear shrinkage tests

Bore No.	Depth (m)	W_F (%)	W_L (%)	W_P (%)	PI (%)	LS (%)	Field Description
2	1.0	8.5	31	18	13	8.0	Silty Sandy Clay
3	1.0 – 1.2	9.9	35	16	19	9.5	Sandy Clay
12	0.1 – 0.35	5.9	21	19	2	1.5	Clayey Sand

Where W_F = Moisture content W_L = Liquid limit W_P = plastic limit
PI = Plasticity Index LS = Linear shrinkage

Table 3: Results of pH, Chloride and Sulphate Testing

Bore No.	Depth (m)	pH	Electrical Conductivity* (µS/cm)	Chloride (mg/kg)	Sulphate, as SO_4 (mg/kg)	Material
6	0.5	6.8	28	20	20	Sand
8	2.0	6.7	9	<10	20	Rhyodacitic Ignimbrite

Note: *EC in 1:5 soil:water solution

Table 4: Results of UCS Testing

Bore No.	Depth (m)	UCS (MPa)
3	6.65 – 7.0	34
4	5.7 – 6.0	31.4
7	4.72 – 3.0	2.7
8	5.29 – 5.54	116.3
9	6.13 – 6.3	2.8
13	5.47 – 6.0	131.4

The results of the aggressivity testing indicate that based on the low permeability soils above the water table the exposure classification for concrete and steel piles is *Non-Aggressive*.

A total of 69 point load strength index tests were undertaken on samples of the rock core, 25 were undertaken in the axial direction and 44 in the diametral direction. The test results give $I_{S(50)}$ values ranging from 0.0 to 10.52 MPa, indicating rock strengths tested to be of extremely low and very high strength. Based on the approximate relationship $q_u = 20 \times I_{s(50)}$, and the results of the UCS testing the estimated unconfined compressive strengths q_u range from 0 – 210.4 MPa. It is noted that during a number of axial tests and diametral tests, the rock failed along pre-existing planes of weakness (i.e. partially healed or insipient joints) and not through the rock fabric itself.

The California Bearing Ratio (CBR) testing was carried out during previous investigation (DP, 2019) on samples compacted to about 100% standard maximum dry density at close to optimum moisture content. The samples were soaked for four days under surcharge loading of 4.5 kg. The test locations are shown on Drawing 1 and the results are summarised in Table 5 below.

Table 5: Summary of Compaction & CBR Testing

Pit No	Depth (m)	FMC (%)	OMC (%)	MDD (t/m^3)	CBR (%)	Swell (%)	Field Description
1	2.3 – 2.5	5.7	12.5	1.91	25	0.0	Ignimbrite – VL – L strength
5	1.2 – 1.4	5.0	11.5	1.95	30	0.0	Ignimbrite – VL – L strength
7	1.2 – 1.4	7.2	13.5	1.91	7	0.0	Ignimbrite – VL strength
12	1.3 – 1.5	15.4	13.5	1.89	3.0	2.5	Silty Sandy Clay

Where: FMC = Field moisture content; MDD = Maximum dry density (standard)
OMC = Optimum moisture content; CBR = California bearing ratio
VL = Very low; L = Low

The results indicate that the soil and rock samples tested were well dry of standard optimum moisture values ranging up to about 7 percentage points dry to 2 percentage points wet. The clayey soils possess low soaked CBR strength.

8. Comments

8.1 General

The following comments are based on the results of limited subsurface investigation and Douglas Partners (DP) experience with similar projects. Whilst development details for the school have yet to be determined, it is likely that low rise school buildings, pavements and sports field and courts will be constructed. At this stage, it is not known whether there will be basement levels or significant retaining walls constructed at the site, though given the existing site levels excavation and filling is expected to create near-level construction platforms.

8.2 Site Classification

The site is classified as worst case Class M (moderately reactive) due to deeper clay layers in some of the boreholes (Bores 2, 3, 4, 5 and 8), based on limited subsurface information and determined in general accordance with the requirements of AS 2870:2011. It must be noted that large parts of the site would be equivalent to Class S (slightly reactive) conditions due to the presence of sandy soils and/or shallow rock.

Any areas of the site which have been subject to uncontrolled fill (historic or recent), would be classified as Class P.

The classification must be reassessed should the soil profile change either by adding fill or removing soil from the lot and/or if the presence of service trenches or retaining walls are within the zone of influence of the lot.

8.3 Earthworks and Site Preparation

8.3.1 Stripping

Site preparation for the construction of pavement areas and structures should include the removal of uncontrolled filling, roots, topsoils, vegetation and other deleterious materials such as organic matter and/or tree affected soils from the proposed construction areas.

Based on the results of the investigation, the depth of topsoil varied up to 0.4 m.

Whilst not observed at the test locations, any filling encountered during stripping works must be considered uncontrolled and fully removed unless Level 1 fill certification (AS3798:2007) is produced.

Silty sandy soils were encountered underlying the topsoil in some test locations up to 0.5 m depth and allowance should be made for its full removal though should be assessed at the time of construction by a geotechnical engineer. The extent of removal of silty soils underlying the site to be stripped would largely be dependent on the weather conditions at the time of stripping and the intended land use.

Deeper excavations could occur should localised thicker topsoils or unsuitable materials, including undocumented filling, be encountered, if inclement weather precedes construction or if the contractor adopts inappropriate stripping methods.

8.3.2 Site Trafficability

Following periods of wet weather, the natural surface across the site will be boggy and effectively untrafficable to all but tracked construction vehicles.

Some measures that can be undertaken to reduce the impact of wet weather on the earthworks construction include:

- retain grass cover wherever possible;

- provide cut surfaces with a slight but even cross-gradient to assist surface drainage;
- "seal" exposed fill surfaces at the end of each work day by running over with a smooth-wheeled roller;
- armour temporary access roads with rockfill; and
- form swale drains at upslope locations to help intercept surface and near-surface seepage water and to redirect it into existing drainage gullies or dams, or to sediment retention ponds.

8.3.3 Excavation Conditions

Removal of the topsoil, natural soils and up to low strength rock should be readily achievable using conventional earthmoving plant.

Large excavators with rock hammers, and single tyne ripper will be needed to remove medium or higher strength weathered rock in trenches, and ripping with a large dozer for bulk excavations. The excavatability of the rock will be largely dependent on the strength of the rock, the degree of fracturing and the dip of bedding within the rock mass. Low production rates will be experienced particularly where shallow rock was encountered, and blasting to loosen in areas of very high and extremely high strength rock to assist the excavation. Blasting of services lines in the deep bulk cut areas will be required in order to expedite trenching works. It must be noted that "blow-out" of trench excavations as a result of over-break of the rock mass will occur and as such contingency planning of additional work/backfilling to enable construction should be employed.

Groundwater seepages into excavations must be expected to occur from sandy/gravelly layers, and/or from fractures in the bedrock after periods or rain. Flows are likely to be continuous but readily controllable by gravity draining to a collection sump or pond.

Further comment can be provided once excavation depths are determined.

8.3.4 Excavation Support

Vertical excavations within the soil and weathered rock will not be stable. For excavations up to 3 m in depth, maximum temporary batter slopes of 1H:1V (horizontal : vertical) are recommended. Permanent batter slopes should not be steeper than 3H:1V and should generally be flatter where vegetation maintenance is required. Erosion protection must be provided for all permanent batters. Further advice should be sought if deeper excavations are proposed.

Surcharge loads should not be placed closer to the crest of the batter than a distance equal to the vertical height of the batter, unless specific geotechnical stability analysis shows that the loads can be placed closer.

Retaining structures, if required, may be preliminarily designed using the parameters in Table 6. It is suggested that preliminary design for cantilevered or walls anchored with a single row of anchors be based on a triangular distribution with the lateral earth pressure being determined as a proportion of the vertical stress as given in the following formula:

$$\sigma_z = K\, z\, \gamma,$$

where σ_z = Horizontal pressure at depth z (kPa)
K = Earth pressure coefficient
z = Depth (m)
γ = Unit weight of soil or rock (kN/m^3)

Table 6: Retaining Wall Design Parameters

Material	Unit Weight (kN/m^3)	Earth Pressure Coefficient		Ultimate Passive Earth Pressure (kPa)[1]
		Active (K_a)	At Rest (K_0)	
Controlled Fill	20	0.3	0.5	200
Very Stiff to Hard/ Medium Dense to Dense Natural Soil	20	0.3	0.5	250
Weathered Rock (very low strength and stronger)	22	0.25[2]	0.4[2]	400[2]

Notes: [1]Below a minimum of 0.5 m embedment below the base of the excavation;
[2]Provided that adverse jointing is not encountered in the rock.

The 'At Rest' coefficient (K_0) should be used where shoring walls are close to existing structures, to minimise ground (and wall) movements. Sections of the wall where small movements of the wall are acceptable can be designed for the 'active' (K_a) condition.

Embedment of the wall can be used to achieve passive support. A triangular passive earth pressure distribution (increasing linearly with depth) may be assumed, starting from 0.5 m below excavation toe/base level.

Lateral pressures due to surcharge loads from adjacent buildings, sloping ground surfaces, pavements and construction machinery should be included where relevant. Hydrostatic pressure acting on retaining walls should also be included in the design where adequate drainage is not provided behind the full height of the walls.

8.3.5 Excavated Material Re-Use

The topsoil and any upper silty sandy slopewash/colluvium layer are not considered to be suitable for engineering applications. The silty sand soil can be difficult to handle and compact and is prone to loss of strength upon saturation. Blending of the non-organic silty sand soils in small quantities (less than 20%) with the site clayey soils and weathered rock may produce a suitable material suitable for inclusion in controlled filling. Alternatively, the silty/sandy soil could be placed in non-structural applications.

The natural soils underlying the topsoil and silty sand soils generally comprise clayey and sandy soils with varying amounts of silt and gravel. This low to medium plasticity and granular soils appear suitable for use as general fill or controlled fill following blending and moisture reconditioning. The high plasticity clays are susceptible to shrink/swell movements with changes in moisture conditions. It is considered that the reuse of any medium to high plasticity soils for controlled fill applications should be used with caution otherwise site classifications used for dwelling footing systems would be required to be

significantly higher than in the natural state. It is advised that if reuse is required and then it should be used at depth (i.e. less than 1 m from surface).

Upon excavation/drilling, the extremely low to very low strength rock will most likely deteriorate to have similar properties as to clayey sand soil with reuse in general fill and controlled fill areas provided rock particles are broken down to less than 75 – 100 mm in size.

Rock greater than low to medium strength would likely excavate as cobble and boulder sized fragments, which would need to be crushed using a mobile crushing plant to achieve a general maximum particle size of 75 mm prior to use within fill areas. It is likely that minimal fines would be created during the rock crushing process and that blending with the overlying soil may be required to create a suitable (well graded) fill material.

If fill is imported to the site, then the engineering properties (e.g. plasticity, reactivity, CBR, etc.) should ideally be equivalent, or superior, to the existing suitable materials on site.

8.3.6 Filling Placement and Compaction

Prior to filling, the stripped surfaces must be inspected and/or test rolled in the presence of a geotechnical engineer. Any areas exhibiting significant deflections under test rolling must be appropriately treated at the direction of the geotechnical engineer.

All controlled filling should be placed in horizontal layers of maximum 250 mm loose thickness. Moisture content should be within the range ±2% of modified optimum.

All constructed fill batters should be constructed no steeper than 2.5:1 (horizontal:vertical), protected against erosion by vegetating the exposed surface and construction of toe and spoon drains as a means of controlling surface water flows on the batters. Flatter batters would be required should they need to be maintained regularly for safety reasons.

All controlled filling should be compacted to a minimum 95% modified maximum dry density.

To validate the filling quality, field inspections and in-situ testing of future earthworks must be undertaken in order to satisfy the requirements for Level 1 controlled filling AS 3798:2007.

8.4 Groundwater

Groundwater that was observed was believed to be remnant driller's mud from cored boreholes. No groundwater seepages were noted in auger only holes or during the auger phase of cored boreholes. During times of high rainfall, seepages at a higher level are likely to occur through fractures within the rock and/or within the extremely weathered permeable layers (i.e. gravelly sand/silty sand), particularly following periods of prolonged rain.

Surface drainage measures are recommended to divert overland stormwater flows around future structures and pavements to minimise the risk of adverse impacts of moisture ingress.

Drainage measures will also need to be provided for any subsurface structures or behind any retaining walls to allow any seepage to flow around the structures rather than exert hydrostatic pressures against them.

Groundwater conditions rarely remain constant and can change seasonally due to variations in rainfall, temperature and soil permeability. For these reasons, it is noted that the moisture condition of the site soils may vary considerably from the time of the assessment compared to at the time of construction.

8.5 Foundations

All footings must found within a uniform bearing stratum of suitable strength/material, below the zone of influence of any uncontrolled fill (if left in place), service trenches, backfill zones, retaining walls or underground structures. Masonry walls should be articulated in accordance with current best practice.

It is recommended that either bored piers or pad footings founding on rock would provide the most robust footing system to support columns, especially for two to three storey structures. Footings to rock would minimise total and differential settlements as it allows a strong uniform bearing stratum to be utilised. Bulk earthworks in areas of structures could then be treated as form fill as the structural loading would be transferred to the rock stratum. It should be noted that suitable compaction of the form fill still needs to be applied as the fill would be required to support services (i.e. piling rig, plant etc.). This should be to a Level 2 standard as defined in AS3798:2007.

Structure design will need to ensure suitable drainage and uniform moisture conditions are maintained in the vicinity of the footings otherwise footing performance would be compromised. Footing systems must be confirmed by a structural engineer taking into consideration any onsite or offsite constraints.

For building structures, suitable footing systems could include pad and strip footings (in controlled fill) or bored cast-in situ reinforced concrete piers. Suggested allowable base bearing pressures are as follows:

- Controlled fill 150 kPa
- Stiff / medium dense natural soils 100 kPa
- Very stiff to hard / dense natural soils 150 kPa
- Extremely low to very low strength bedrock 500 kPa
- Low strength bedrock 1000 kPa
- Medium to high strength bedrock 2500 kPa

Settlements of footings will be dependent on the applied load and the sizing of the footing and at this stage cannot be determined. Confirmation of suitable footing systems and expected settlements can be undertaken once building design is suitably advanced.

8.6 Pavement Design Considerations

A design California bearing ratio (CBR) of 3% is suggested as a preliminary value for sandy clay natural and fill soils at the site. However, should high plasticity clay soils be encountered either at the surface

or at shallow (less than 0.5 m) depth a lower CBR value of 1.5 – 2.0% should be adopted with the possible need for subgrade replacement. This should be confirmed by undertaking CBR tests. Areas with weathered rock exposed at subgrade level, a design CBR of 7% to 10% could be adopted, pending weathering and strength of the rock.

The CBR of any imported fill should also be assessed to confirm the suggested design value is appropriate.

All pavement preparation works should be undertaken under close supervision and consultation with the geotechnical consultant in order to avoid any unnecessary earthworks. The standard of construction, the selection of materials and quality of workmanship for the roads should satisfy the latest requirements of Queanbeyan Palerang Regional Council.

Surface and subsoil drainage must be installed and maintained to protect the pavement and subgrade. Subsoil drains should be located at a minimum of 0.5 m depth below the subgrade level and be included adjacent to any traffic islands.

8.7 Geotechnical Seismicity Parameters

In accordance with AS1170:2007 "*Structural Design Actions, Part 4: Earthquake Actions in Australia*", a hazard factor (Z) of 0.09 and a worst case site subsoil Class C_e are considered appropriate for the site.

9. References

AS 1289.6.3.1:1997 Rec 2013, *Soil strength and consolidation tests—Determination of the penetration resistance of a soil—Standard penetrometer test (SPT)*, Standards Australia.

AS 2870:2011, *Residential Slabs and Footings*, Standards Australia.

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BMR, 1992, *Geology of Canberra 1:100 000 Geological Series Sheet 8727*, Bureau of Mineral Resources, Geology and Geophysics.

DP, 2019, *'Report on Geotechnical Investigation Proposed STEM Secondary School Coachwood Avenue, Jerrabomberra'*, Douglas Partners Pty Ltd.

DP, 2021, *'Report on Desktop Geotechnical Assessment, Jerrabomberra High School, Part Lot 1 DP 1263364, Jerrabomberra'*, Douglas Partners Pty Ltd.

10. Limitations

Douglas Partners (DP) has prepared this report for this project at Jerrabomberra in accordance with DP's proposal CAN200440 dated 18 December 2020 and email variation proposal dated 5 March 2021 and acceptance received from Schools Infrastructure New South Wales (SINSW) dated 24 February 2021 and 19 March 2021, respectively. The work was carried out under contract ID SINSW01327/20, dated 3 March 2021. This report is provided for the exclusive use of School Infrastructure New South Wales (SINSW) for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawing 1

Northern Entry Road
Construction Site

Shallow Rock and Rock Outcropping

Shallow Rock and Rock Outcropping

Dam

1
2
3
4
5
6
7
8
9
10
11
12
13
14

1
5
7
12

Locality Plan

LEGEND

- Approximate Site Boundary
- Approximate Access Track Location
- Approximate Trench Excavation Location
- Approximate Sediment Quality Control Pond Location
- Approximate Stockpile Location
- Approximate Borehole Location
- Approximate Test Pit Location (DP, 2019)

0 20 40 60 80 100
1:2000 @ A3

NOTE: Base drawing from nearmap.com.au, dated 13 April 2020)

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Schools Infrastructure NSW		
OFFICE: Canberra	DRAWN BY: SDG	
SCALE: As Shown	DATE: 16.09.2021	

TITLE: **Test Location Plan**
Proposed Jerrabomberra High School
Part Lot 1 DP 1263364, Jerrabomberra

N

PROJECT No:	94188.02
DRAWING No:	R.001.D.001
REVISION:	4

Appendix C

Explanatory Notes
Borehole Logs
Core Photos

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Rock Strength

Rock strength is defined by the Unconfined Compressive Strength and it refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects.

The Point Load Strength Index $Is_{(50)}$ is commonly used to provide an estimate of the rock strength and site specific correlations should be developed to allow UCS values to be determined. The point load strength test procedure is described by Australian Standard AS4133.4.1-2007. The terms used to describe rock strength are as follows:

Strength Term	Abbreviation	Unconfined Compressive Strength MPa	Point Load Index * $Is_{(50)}$ MPa
Very low	VL	0.6 - 2	0.03 - 0.1
Low	L	2 - 6	0.1 - 0.3
Medium	M	6 - 20	0.3 - 1.0
High	H	20 - 60	1 - 3
Very high	VH	60 - 200	3 - 10
Extremely high	EH	>200	>10

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$. It should be noted that the UCS to $Is_{(50)}$ ratio varies significantly for different rock types and specific ratios should be determined for each site.

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Residual Soil	RS	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.
Extremely weathered	XW	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
Highly weathered	HW	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 recognisable. 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.
Moderately weathered	MW	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 recognisable, but shows little or no change of strength from fresh rock.
Slightly weathered	SW	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
Fresh	FR	No signs of decomposition or staining.
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	DW	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.

Rock Descriptions

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with occasional fragments
Fractured	Core lengths of 30-100 mm with occasional shorter and longer sections
Slightly Fractured	Core lengths of 300 mm or longer with occasional sections of 100-300 mm
Unbroken	Core contains very few fractures

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or stronger. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Symbols & Abbreviations

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

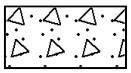
Symbols & Abbreviations

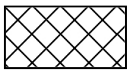
Graphic Symbols for Soil and Rock

General

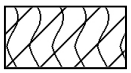

Asphalt

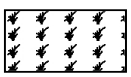

Road base


Concrete


Filling

Soils


Topsoil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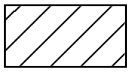
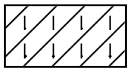
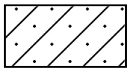
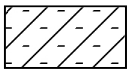
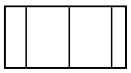

Clay

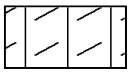

Silty clay

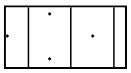

Sandy clay

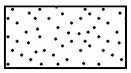

Gravelly clay

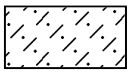

Shaly clay

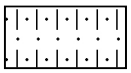

Silt


Clayey silt


Sandy silt

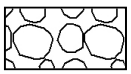

Sand

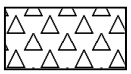

Clayey sand


Silty sand


Gravel

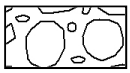

Sandy gravel


Cobbles, boulders

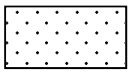

Talus

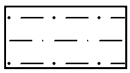
Sedimentary Rocks

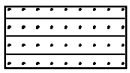

Boulder conglomerate

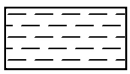

Conglomerate


Conglomeratic sandstone

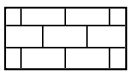

Sandstone


Siltstone

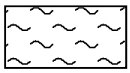

Laminite

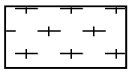

Mudstone, claystone, shale

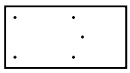

Coal


Limestone

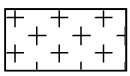
Metamorphic Rocks

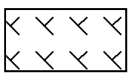

Slate, phyllite, schist

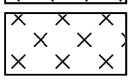

Gneiss

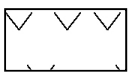

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite


Dacite, epidote


Tuff, breccia


Porphyry

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 599.5 AHD
EASTING: 699117
NORTHING: 6081810
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 94188.02
DATE: 15-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
599	0.1	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E			PID = 1.2 ppm
	0.4	Clayey Silty SAND (SM): fine to coarse grained, brown, low plasticity silt and clay, trace fine gravel, moist to dry, medium dense to dense, colluvial							D E S			PID = 1.3 ppm 13,21,40 N = 61
598	1	Silty SAND (SM): fine to coarse grained, pale brown, trace fine gravel and low plasticity clay, dry to moist, very dense, colluvial							D E			PID = 0.5 ppm
									D E S			PID = 0.0 ppm 27,30/100 refusal
597	2								D			
									D			
	3								D S			15,30/50 refusal
596	3.2	Clayey SAND (SW): fine to coarse grained, pale brown, low plasticity clay, trace fine gravel, dry to moist, very dense, possible residual/extremely weathered rhyodacite							D			
	4								D			
595						▷						
594	5	RHYODACITIC IGNIMBRITE: fine to coarse grained, brown, mottled dark brown, dry to moist, extremely low to very low strength, highly weathered, highly fractured						5.07m: J, 20°, ir, vr 5.13m: J, 20°, ir, vr 5.19m: J, 30°, pl, sm, fe stn 5.2m: End of run	C	11	0	PL(A) = 0.03
	5.65							5.21m: - 5.65m: CORE LOSS CORE LOSS: 440mm 5.79m: J, 5°, vr, pl 5.82m: J, 85°, pl, sm, fe stn 5.88m: J, 10°, vr, pl 5.96m: J, 10°, ir, vr 6m: End of run	C	44	18	PL(D) = 0
593	6	Bore discontinued at 6.0m -limit of investigation										
592	7											
591	8											
590	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 4.0m

TYPE OF BORING: 110mm solid flight auger to 4.00m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 4.6m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 604.25 AHD
EASTING: 699164
NORTHING: 6081804
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 94188.02
DATE: 15-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
604	0.2	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL		E	0.1		PID = 0.6 ppm		
		Silty Sandy CLAY (CL): low plasticity, brown, mottled red-brown, fine to coarse grained sand, trace rootlets, moist to dry, w<PL, stiff to very stiff, possible residual/colluvial		D E S	0.5		PID = 0.5 ppm 6,16,20 N = 36		
603	1			D E	0.95 1.0		PID = 0.7 ppm		1
	1.3								
	1.6	Clayey SAND (SC): fine to coarse grained, brown, low plasticity clay, trace fine gravel, dry to moist, dense to very dense, extremely weathered rhyodacite		D S	1.5 1.78		16,30/120 refusal		
602	2	RHYODACITIC IGNIMBRITE: fine to coarse grained, brown, mottled dark brown, dry to moist, very low to low strength, extremely to highly weathered, highly fractured		D	2.0				2
				D E	2.5		PID = 1.3 ppm		
601	3			D S	3.0		8,18,26 N = 44		3
				D	3.45 3.5				
600	4			D	4.0				4
				D S	4.5 4.73		4,30/75 refusal		
599	5			D	5.0				5
	6			D S	6.0		1,18,30/20 refusal		6
598	6.32	Bore discontinued at 6.32m -limit of investigation			6.32				
597	7								7
596	8								8
595	9								9

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 1.5m

TYPE OF BORING: 110mm solid flight auger to 1.60m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 605.0 AHD
EASTING: 699191
NORTHING: 6081775
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 94188.02
DATE: 15-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		B - Bedding J - Joint; S - Shear F - Fault	EW HW MW SW FS FR		Ex Low Very Low Low Medium High Very High Ex High		0.01 0.05 0.10 0.50 1.00					
605	0.15	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E			PID = 0.1 ppm
		Silty CLAY (CL): low plasticity, red, mottled brown, with fine grained sand, trace rootlets, dry to moist, w<PL, stiff, possible residual or colluvial							D E S			PID = 1.0 ppm 10,10,18 N = 28
604	1								D E			PID = 0.5 ppm
	0.9											
	1.4	Sandy CLAY (CL/CI): low to medium plasticity, pale brown, mottled brown, fine to medium grained sand, dry to moist, w<PL, stiff to very stiff, residual							D S			20,30/100 refusal
603	2	SAND (SW): fine to coarse grained, pale brown, mottled yellow, with low plasticity clay, trace fine gravel, dry to moist, very dense, extremely weathered rhyodacitic ignimbrite							D D			
602	3								D S			10,21,35 N = 56
									D E			PID = 0.2 ppm
601	4								D			
600	5								D S			4,27,26 N = 53
									D D			
	5.65	RHYODACITE IGNIMBRITE: fine to coarse grained, brown, mottled blue, moist, low to medium strength, moderately weathered, highly fractured						5.5m: CORE LOSS: 150mm 5.68m: - 5.71m: He J, 30°, pl, fe stn, cly co 5.73m: J, 20°, cu, sm, fe stn 5.8m: -6.00m: V J, 90°, pl, sm 5.85m: J, 75°, pl, sm, fe stn 5.92m: J, 15°, pl, sm, fe stn, cly vn 5.95m: J, 45°, pl, sm, fe stn 6m: - 6.10m: DB 6.1m: - 6.20m: CORE LOSS CORE LOSS: 100mm 6.2m: End of run 6.64m: J, 65°, pl, sm, fe stn 7m: End of run	C	82	49	
599	6											
	6.2	-from 6.2m, pale blue, mottled grey, dry to moist, very high strength, slightly weathered, slightly fractured							C	100	100	PL(D) = 4.9 PL(A) = 5.02 PL(D) = 4.51 UCS = 34.0 MPa
598	7											
	7.0	Bore discontinued at 7.0m -limit of investigation										
597	8											
596	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 5.5m

TYPE OF BORING: 110mm solid flight auger to 5.50m, then NMLC coring to 7.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 4.2m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 604.75 AHD
EASTING: 699249
NORTHING: 6081781
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 94188.02
DATE: 16-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
604	0.2	TOPSOIL/Silty CLAY (CL): low plasticity, dark brown, with rootlets, trace fine to medium grained sand and fine gravel, moist, firm to stiff, TOPSOIL							E			PID = 0.1 ppm
	0.7	Silty CLAY (CL): low plasticity. red-brown, with fine to coarse grained sand, dry to moist, w<PL, very stiff, possible residual or colluvial							D E S			PID = 0.1 ppm 8,11,12 N = 23
603	1.5	Sandy CLAY (CL): low plasticity, pale red-brown, fine to coarse grained sand, with silt, dry to moist, w<PL, very stiff to hard, possible residual							D E D S			PID = 0.0 ppm 25,15/70 refusal
602	2.6	RHYODACITIC IGNIMBRITE: fine to coarse grained, yellow-brown, dry to moist, very low to low strength, highly weathered, fractured						2.5m: CORE LOSS: 100mm	D E S C	50	50	~~PID = 5.0 ppm~~ 25/45 refusal
	3	-from 2.6m, yellow-brown, -from 2.9m, medium strength, moderately weathered, highly fractured						2.7m: End of run 2.8m: J, 40°, ir, ro, stn 2.89m: J, 10°, pl, ro, stn 3m: DB				PL(A) = 0.08 PL(D) = 0.09
601	4	-from 3.15m, pale grey-blue/pale grey-brown -from 3.5m, high strength, slightly weathered						3.15m: J, 65°, pl, ro, stn, cly vn 3.22m: J, 45°, pl, sm, stn, cly vn 3.27m: J, 45°, pl, ro, stn 3.42m: J, 75°, cu, sm, stn	C	100	47	PL(D) = 1.01 PL(A) = 0.09
600	5	-from 4.40m, blue-grey/grey-blue, very high strength -from 5.0m, fresh strained						3.5m: - 3.91m: J, 45°-55°, pl, sm, fe stn 4m: End of run 4.2m: J, 40°, pl, ro, stn 4.22m: J, 5°, pl, ro, stn 4.34m: J, 5°, ir, ro 4.57m: J, 50°, st, sm, fe stn	C	100	91	PL(A) = 3.57 PL(D) = 6.84
599	6 6.0	Bore discontinued at 6.0m -limit of investigation						4.74m: - 4.92m: J, 65°, pl, sm, fe stn 5m: DB 5.3m: End of run	C	100	100	PL(D) = 5.64 PL(A) = 3.83 UCS = 31.4 MPa
598	7											
597	8											
596	9											
595												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** SDG/EAGL **CASING:** HQ from 2.5m

TYPE OF BORING: 110mm solid flight auger to 2.50m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 3.6m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.0 AHD
EASTING: 69918
NORTHING: 6081768
DIP/AZIMUTH: 90°/--

BORE No: 5
PROJECT No: 94188.02
DATE: 16-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
600	0.2	TOPSOIL/Silty CLAY (CL): low plasticity, dark brown, with rootlets, trace fine to medium grained sand and fine gravel, moist, firm to stiff, TOPSOIL							E			PID = 1.0 ppm
									D			PID = 2.3 ppm
									E			4,6,8
									S			N = 14
599	1 1.0	Silty CLAY (CL): low plasticity, brown, mottled red, with fine to medium grained sand, with rootlets, moist to dry, w<PL, stiff, possible colluvial							D			PID = 2.0 ppm
									E			
		SAND (SW): fine to coarse grained, pale brown, with low plasticity clay, trace fine gravel, dry to moist, medium dense							D			
									S			10,12,13
598	2	-from 1.5m, extremely weathered rhyodacitic ignimbrite							D			N = 25
									D			
597	3								D			PID = 0.4 ppm
									E			4,30/50
									S			refusal
									D			
596	4 4.0	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, extremely low to low strength, highly weathered, highly fractured						4m: CORE LOSS: 230mm	C	100	92	
	4.23	-from 4.4m, very low						4.26m: J, 10°, ir, vr 4.395m: J, 45° un, vr	C	100	100	
								4.42m: He J, 5°, pl 4.46m: J, 10°, un, vr 4.5m: End of run 4.7m: DB 4.9m: H J, 60°, pl 5m: DB				PL(D) = 0.13 PL(D) = 0.11 PL(A) = 0.03 PL(A) = 0.06 PL(D) = 0.06 PL(D) = 0.05 PL(A) = 0.02
595	5	-from 5.3m, pale brown-orange						5.07m: He J, 15°, pl, cly co 2mm 5.15m: He J, 70°, pl, fe stn				
		-from 5.7m, extremely low to very low strength						5.3m: He J, 60°, pl, fe stn 5.33m: J, 40°, pl, vr, fe stn, cly vn 5.465m: He J, 5°, pls, cly co 5.5m: J, 40°, pl, sm, fe stn, cly vn 5.52m: J, 10°, ir, vr, fe stn 5.57m: He J, 60°, pl, fe stn, cly co 2mm 5.64m: He J, 20°, cly co 1mm 5.83m: He J, 45°, pl 5.9m: J, 30°, pl, vr, fe stn, cly vn 5.95m: DB				
594	6 6.0	Bore discontinued at 6.0m -limit of investigation						6m: End of run				
593	7											
592	8											
591	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 4.0m

TYPE OF BORING: 110mm solid flight auger to 4.00m, then NMLC coring to 6.0m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 3.75m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 604.75 AHD
EASTING: 699172
NORTHING: 6081755
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 94188.02
DATE: 17-3-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
604	0.1	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E U_{50}			PID = 0.0 ppm
	0.3	Silty CLAY (CL): low plasticity, brown, mottled red, with fine grained sand and rootlets, moist to dry, w<PL, stiff to very stiff, residual							D E S			PID = 0.0 ppm 24,28,30/130 refusal
603	1	SAND (SW): fine to coarse grained, pale brown, with low plasticity clay, trace fine gravel, dry to moist, very dense, extremely weathered rhyodacitic ignimbrite							D E D S			PID = 0.1 ppm 30/130 refusal
	2.0								D			
602	2.05	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, low to medium strength, highly weathered, highly fractured -from 2.5m, medium strength, highly to moderately weathered						2m: CORE LOSS: 50mm 2.05m: - 2.10m: too fractured to distinguish 2.13m: He J, 60°, pl, fe stn 2.18m: J, 45°, ir, sm, fe stn 2.21m: He J, 35°, pl, fe stn 2.25m: He J, 35°, ir, fe stn 2.3m: He J, 60°, pl, fe stn 2.37m: J, 45°, un, sm, fe stn, cly vn 2.38m: - 2.47m: too fractured to distinguish 2.47m: J, 45°, un, sm, fe stn, cly vn 2.68m: J, 50°, cu, sm, fe stn, cly vn 2.84m: J, 45°, pl, ro, fe stn, cly vn 2.87m: - 3.00m: J, generally 40°-80°, pl, sm, fe stn, cly vn/co 3m: - 3.07m: too fractured to distinguish 3.14m: He J, 85°, pl, fe stn 3.2m: - 3.30m: too fractured to distinguish 3.34m: He J, 85°, un, cly vn 3.38m: J, 10°, pl, sm, cly vn 3.5m: J, 20°, stm ro, cly vn 3.59m: J, 10°, un, ro, cly vn 3.6m: J, generally 20°-30°, pl, ro, fe stn, cly vn or 80°, pl, ro, fe stn 3.81m: J, 45°, ir, ro, fe stn, cly co 2mm 3.89m: He J, 10°, pl 3.95m: DB 4m: J, 15°, pl, sm 4.07m: J, 80°, pl, sm, cly vn, fe stn 4.13m: J, 10°, un, ro, fe stn, cly vn 4.25m: He J, 50°, pl 4.27m: J, 80°, pl, sm, fe stn, cly vn 4.33m: J, 10°, pl, sm, fe stn, cly vn 4.41m: J, 75°, pl, sm, fe	C	96	65	PL(D) = 0.38
601	4								C	100	53	PL(A) = 0.02 PL(D) = 0.33
600	5	-from 5.0m, low strength, highly weathered							C	100	71	PL(D) = 0.21 PL(D) = 0.81 PL(A) = 0.27
599	6	Bore discontinued at 6.0m -limit of investigation										
598	6.0											
597	7											
596	8											
595	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 2.0m

TYPE OF BORING: 110mm solid flight auger to 2.00m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 604.75 AHD
EASTING: 699172
NORTHING: 6081755
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 94188.02
DATE: 17-3-2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
594	11							stn, cly co 2mm 4.54m: He J, 5°, pl 4.55m: He J, 75°, un, cly co 2mm 4.62m: J, 45°, pl, sm, fe stn, cly vn 4.645m: J, 30°, un, ro, fe stn, cly vn 4.67m: J, 70°, ir, ro, fe stn 4.8m: DB 4.94m: He J, 80°, pl, fe stn 5m: J, 15°, ir, ro, fe stn 5.13m: He J, 75°, pl, fe stn 5.175m: J, 5°, pl, ro, fe stn, cly vn 5.23m: J, 20°, pl, ro, fe stn 5.24m: - 5.27m: too fractured to distinguish 5.37m: J, 10°, ir, ro, fe stn 5.45m: He J, 10°, pl, fe stn 5.47m: J, 15°, pl, ro, cly vn 5.58m: J, 20°, st, ro, fe stn, cly vn 5.59m: - 5.60m: too fractured to distinguish 5.7m: He J, 85°, pl, cly vn 5.76m: - 5.84m: too fractured to distinguish 5.9m: He J, 30°, pl, cly co 3mm 5.95m: - 6.00m: too fractured to distinguish				
593	12											
592	13											
591	14											
590	15											
589	16											
588	17											
587	18											
586	19											
585												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 2.0m

TYPE OF BORING: 110mm solid flight auger to 2.00m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 603.75 AHD
EASTING: 699224
NORTHING: 6081740
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 94188.02
DATE: 17-3-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
603	0.15	TOPSOIL/Sandy SAND (SM): fine to coarse grained, brown, low plasticity silt, with fine to medium gravel, moist to dry, medium dense, TOPSOIL							E			PID = 3.7 ppm
	0.4	SAND (SW): fine to coarse grained, pale brown, with low plasticity clay, trace fine gravel, dry to moist, very dense, extremely weathered rhyodacitic ignimbrite							D E S			PID = 8.6 ppm 25,30/75 refusal
602	1	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, mottled red-brown, dry to moist, very low to low strength, highly weathered, highly fractured with occasional extremely weathered seams							D E			PID = 14.7ppm
	2								D E S			PID = 3.8 ppm 30/135 refusal
									D			
601	2.8							2.5m: CORE LOSS: 300mm	D			
	3							2.92m: J, 30°, ir, ro, fe stn 3m: J, 45°, pl, ro, fe stn 3.05m: J, 15°, ir, ro, fe stn 3.09m: J, 70°, pl, ro, fe stn 3.14m: End of run	C			PL(A) = 0.25 PL(D) = 0.06
600	4							3.2m: J, 85°, pl, sm, fe stn 3.23m: J, 5°, ir, ro, fe stn 3.27m: J, 5°, ir, ro, fe stn 3.32m: J, 5°, ir, ro, fe stn	C			
	4.1	-from 4.5m, fractured						3.33m: - 3.44m: too fractured to distinguish 3.445m: J, 10°, ir, ro, fe stn 3.5m: - 3.57m: too fractured to distinguish 3.59m: J, 5°, ir, ro, fe stn	C			PL(D) = 0.07 UCS = 2.7 MPa
599	5	-from 5.1m, brown -from 5.27m, fragmented										
598	6	-from 5.6m, low strength						3.6m: CORE LOSS: 500mm	C			PL(D) = 0.11
	6.0	Bore discontinued at 6.0m -limit of investigation						4.13m: J, 20°, un, ro, fe stn, cly vn 4.27m: J, 30°, un, ro, fe stn 4.3m: J, 20°, ir, ro, fe stn 4.355m: J, 10°, un, ro, fe stn 4.42m: J, 45°, pl, sm, fe stn 4.43m: - 4.51m: too fractured to distinguish 4.51m: J, 20°, ir, ro 4.67m: J, 60°, pl, ro, fe stn 4.75m: He J, 50°, pl, fe stn 4.83m: He J, 45°, pl, fe stn 5m: J, 20°, pl, ro, fe stn 5.06m: J, 50°, pl, ro, fe stn 5.16m: J, 50°, pl, ro, fe stn 5.27m: - 5.60m: too fractured to distinguish 5.6m: End of run 5.65m: J, 10°, un, ro, fe stn 5.81m: J, 30°, ir, sm, fe stn				
597	7											
596	8											
595	9											
594												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 2.5m

TYPE OF BORING: 110mm solid flight auger to 2.50m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 2.5m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 603.75 AHD
EASTING: 699224
NORTHING: 6081740
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 94188.02
DATE: 17-3-2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
593	11							5.84m: J, 45°, pl, sm, fe stn 5.88m: J, 5°, ir, ro, fe stn 5.97m: J, 45°, pl, sm, fe stn 6m: End of run				
592	12											
591	13											
590	14											
589	15											
588	16											
587	17											
586	18											
585	19											
584												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 2.5m

TYPE OF BORING: 110mm solid flight auger to 2.50m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 2.5m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 599.25 AHD
EASTING: 699107
NORTHING: 6081727
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 94188.02
DATE: 17 - 18/3/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities	Type	Core Rec. %	RQD %	Test Results & Comments
			EW HW MW SW FS FR		Ex Low / Very Low / Low / Medium / High / Very High / Ex High		0.01 / 0.05 / 0.10 / 0.50 / 1.00	B - Bedding J - Joint S - Shear F - Fault				
599	0.2	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E U_{50}			PID = 20.2 ppm
	0.5	Silty SAND (SM): fine to coarse grained, red, mottled brown, trace fine gravel and rootlets, moist to dry, medium dense, colluvial							D E S			PID = 41.2 ppm 1,3,8 N = 11
598	1											PID = 3.5 ppm
	1.2	Sandy CLAY (CL): low plasticity, red, mottled brown, fine to coarse grained sand, trace fine gravel, moist to dry, w<PL, stiff to very stiff, colluvial							D E D			
	1.5								S			8,19,17 N = 36
597	2	SAND (SW): fine to coarse grained, red, mottled brown, with low plasticity clay and fine gravel, moist to dry, dense, extremely weathered rhyodacitic ignimbrite							D E D			PID = 1.2 ppm
	3	RHYODACITIC IGNIMBRITE: fine to coarse grained, red, mottled brown, dry to moist, low strength, highly weathered, highly fractured						2.7m: - 3.00m: fg 3m: - 3.10m: fg 3.16m: J, 85°, pl, sm, fe stn, cly vn 3.18m: J, 45°, pl, sm, fe stn, cly vn	C	100	0	
596		-from 2.7m, medium to high strength, moderately weathered, fragmented							C	100	0	
	4	-from 3.1m, , fractured to highly fractured						3.22m: - 3.37m: J, generally 20°-40° or 80°, pl/ir, sm-ro, fe stn, cly vn 3.42m: J, 45°, un, sm, fe stn 3.47m: J, 20°, pl, sm, cly vn	C	100	28	PL(D) = 3.1 PL(D) = 3.34 PL(D) = 4.54
595		-from 3.8m, very high strength, highly fractured										
		-from 4.0m, fractured										
		-from 4.15m, pale blue, moderately to slightly weathered										
594	5	-from 5.0m, slightly weathered						3.5m: - 3.67m: J, generally 30°-50°, pl, sm, fe stn 3.68m: - 3.78m: too fractured to distinguish 3.87m: J, 55°, pl, sm, fe stn, cly vn 4.05m: He J, 30°, pl, cly vn	C	100	48	PL(D) = 5.18 UCS = 116.3 MPa
	6	-from 5.8m, very high to extremely high strength, fresh, unbroken						4.13m: J, 30°, ir, ro, cly co 2mm 4.26m: J, 45°, un, sm, fe stn	C	100	100	PL(A) = 4.7 PL(D) = 9.58
593	6.26	Bore discontinued at 6.26m -limit of investigation						4.48m: J, 30°, ir, ro, fe stn 4.49m: - 4.55m: too fractured to distinguish 4.55m: DB - End of run 4.69m: He J, 50°, pl 4.79m: J, 50°, pl, sm, fe stn, cly vn 4.8m: -4.83m: fg 4.87m: J, 60°, pl, sm, fe stn 5m: J, 5°, un, sm 5.56m: - 5.61m: fg 5.59m: J, 20°, un, sm, fe stn, cly vn 5.64m: He J, 80°, un 5.7m: DB - End of run 6.26m: DB - End of run				
592	7											
591	8											
590	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** TBO/EAGL **CASING:** HQ from 2.7m

TYPE OF BORING: 110mm solid flight auger to 2.70m, then NMLC coring to 6.26m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 3.95m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 605.75 AHD
EASTING: 699188
NORTHING: 6081706
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 94188.02
DATE: 18-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
605	0.15	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E			PID = 7.9 ppm
	0.3	Clayey SAND (SC): fine to coarse grained, brown, low plasticity clay, trace low strength rhyodacitic gravel to 15mm, dry to moist, dense to very dense, extremely weathered rhyodacitic ignimbrite							D E S			PID = 14.2 ppm 23,25/30 refusal
	1								D E			PID = 5.1 ppm
604		RHYODACITIC IGNIMBRITE: fine to coarse grained, brown, dry to moist, very low to low strength, extremely to highly weathered, highly fractured						1.59m: J, 30°, pl, ro, fe stn	S			25/50 refusal
	2	-from 1.5m, very low to low strength, extremely to highly weathered, highly fractured						1.66m: J, 50°, ir, sm, fe stn 1.82m: J, 25°, ir, ro, fe stn 1.92m: J, 25°, ir, ro, fe stn 1.96m: J, 20°, ir, ro, fe stn	C	88	63	PL(D) = 0.15 PL(A) = 0.09 PL(D) = 0.03 PL(A) = 0.18
603	3							2.12m: J, 50°, ir, ro, fe stn 2.16m: J, 5°, ir, ro, fe stn 2.32m: J, 50°, pl, ro, fe stn				
	3.15	-from 3.15m, highly weathered						2.42m: J, 5°, ir, ro, fe stn, cly vn 2.475m: He J, 30°, pl 2.61m: He J, 10°, ir 2.635m: J, 20°, ir, ro, fe stn, cly vn	C	88		PL(A) = 0.01 PL(D) = 0.1
602	4	-from 4.0m, low to medium strength, highly to moderately weathered, highly fractured						2.66m: J, 70°, pl, sm, fe stn, cly vn				
	4.5							2.73m: J, 10°, ir, ro, fe stn, cly vn 2.81m: J, 5°, ir, ro, cly vn 2.82m: CORE LOSS: 330mm	C	90		PL(D) = 0.47 PL(A) = 0.3
601	5	-from 5.0m, medium strength, moderately weathered, highly fractured										PL(D) = 0.79
		-from 5.5m, low to medium strength, distinctly weathered, highly fractured				▷		3.15m: - 3.19m: too fractured to distinguish 3.21m: J, 60°, ir, ro, fe stn, cly vn	C	100		PL(D) = 0.22
600	6	-from 6.0m, medium strength, moderately weathered, highly fractured						3.23m: - 3.27m: too fractured to distinguish 3.3m: - 3.90m: J, generally 15°-30°, ir, ro, fe stn, cly vn				UCS = 2.8 MPa
	6.3	Bore discontinued at 6.3m -limit of investigation						3.9m: - 4.00m: too fractured to distinguish 4.1m: He J, 50°, pl, fe stn 4.2m: fg 4.4m: CORE LOSS: 100mm 4.51m: - 5.00m: J, generally 20°-30° or 70°, pl - ir, ro, fe stn 4.61m: J, 5°, pl, sm, fe stn 5m: - 5.27m: J, generally 45°-60°, pl/ir, ro, fe stn 5.27m: - 5.45m: too fractured to distinguish 5.45m: DB 5.46m: - 6.3m: J, generally 20°-50°, ir, ro, fe stn				
599	7											
598	8											
597	9											
596												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 1.5m

TYPE OF BORING: 110mm solid flight auger to 1.50m, then NMLC coring to 6.30m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 5.7m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 598.75 AHD
EASTING: 699097
NORTHING: 6081688
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 94188.02
DATE: 18-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
598	0.2	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL		E	0.1		PID = 0.5 ppm		
				D	0.5				
	0.55	Clayey SAND (SC): fine to coarse grained, red brown, low plasticity clay, trace silt, dry to moist, dense to very dense, extremely weathered rhyodacitic ignimbrite		S			26,32,30/100 refusal		
					0.8				
597	1	RHYODACITIC IGNIMBRITE: fine to coarse grained, brown, dry to moist		D	1.0		PID = 0.3 ppm		
				E					
		-from 1.2m, pale brown		E	1.5		PID = 0.4 ppm		
				S	1.6		30/100 refusal		
596	2			D	2.0				
				E	2.5				
	2.9								
595	3	SAND (SW): fine to coarse grained, brown/pale brown, trace low plasticity fines, dry to moist, dense, extremely weathered rhyodacite			3.0				
				S			40 refusal		
				E	3.45				
	3.7				3.5				
594	4	RHYODACITIC IGNIMBRITE: fine to coarse grained, brown, dry to moist, extremely low to very low strength, extremely to highly weathered, highly fractured							
		-from 4.20m, very low strength, highly weathered, highly fractured		D	4.5				
				E					
593	5	-from 4.70m, low strength, highly weathered, highly fractured							
		-from 5.00m, low to medium strength, highly to moderately weathered, highly fractured							
		-from 5.50m, low strength, highly weathered, highly fractured		E	5.5				
592	6			D	6.0		30/20 refusal		
	6.02	Bore discontinued at 6.02m		S	6.02				
		-limit of investigation							
591	7								
590	8								
589	9								

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** N/A

TYPE OF BORING: 110mm solid flight auger to 6.02m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 603.5 AHD
EASTING: 699157
NORTHING: 6081677
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 94188.02
DATE: 18-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
603	0.3	TOPSOIL/Silty Sandy CLAY (C:): low plasticity, brown, fine to coarse grained sand, with rootlets, dry to moist, w<PL, stiff to very stiff, TOPSOIL		E	0.1		PID = 1.9 ppm		
		Clayey SAND (SC): fine to coarse grained, red brown, low plasticity clay, trace silt, dry to moist, dense to very dense, extremely weathered rhyodacitic ignimbrite		D E S	0.5		PID = 2.0 ppm 3,11,14 N = 25		
	1			D E	0.95 1.0		PID = 3.0 ppm		1
602	1.3	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist		S	1.5		17,40/130 refusal		
		-from 1.8m, very low strength			1.78				
	2	-from 2.1m, very low to low strength		D E	2.5				2
601	3	-from 2.8m, low strength, highly weathered		D S	3.0		20,40/110 refusal		3
		-from 3.15m, very low to low strength			3.26				
600					3.5				
	4				3.9				4
599		-from 4.2m, extremely low to very low strength, extremely weathered		D E S	4.5 4.65		13,28,34 N = 62		
	5				4.95				5
598				E	5.5 5.55 5.6				
	6	-from 5.8m, very low strength, extremely to highly weathered, highly fractured		S	6.0		25/120 refusal		6
	6.12	-from 6.0m, low strength, highly weathered			6.12				
597		Bore discontinued at 6.12m -limit of investigation							
	7								7
596									
	8								8
595									
	9								9
594									

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** N/A

TYPE OF BORING: 110mm solid flight auger to 6.12m

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.5 AHD
EASTING: 699132
NORTHING: 6081649
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 94188.02
DATE: 18-3-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
600	0.15	TOPSOIL/Silty Sandy CLAY (C:): low plasticity, brown, fine to coarse grained sand, with rootlets, dry to moist, w<PL, stiff to very stiff, TOPSOIL							E U_{50}			PID = 2.9 ppm
									D			PID = 2.9 ppm
	0.8	Clayey SAND (SC): fine to coarse grained, pale grey-brown, low plasticity clay, trace low strength rhyodacitic gravel to 15mm, dry to moist, very dense, extremely weathered rhyodacitic ignimbrite							E S			20,40/120 refusal
599	1								E			PID = 0.8 ppm
									E S			32,40/60 refusal
	2	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, very low strength, extremely to highly weathered, fragmented -from 1.8m, very low to low strength							D			
598									E			
	3	-from 2.7m, low strength, highly weathered, highly fractured							S			20,35/20 refusal
597		-from 3.5m, very low to low strength, highly weathered, highly fractured						3.48m: - 3.50m: fg 3.52m: J, 88°, pl, ro 3.55m: - 3.59m: fg 3.65m: He J, 85°, pl, ro	C	100	0	
	4							3.67m: J, 75°, pl 3.7m: J, 45°, pl, ro, fe stn 3.72m: J, 20°, pl, sm, fe stn	C	88	56	PL(D) = 0.08 PL(A) = 0.08 PL(D) = 0.3
596	4.1	-from 4.1m, low strength				▷		3.73m: - 3.76m: fg 3.78m: J, 85°, pl, sm, fe stn 3.8m: J, 85°, pl, sm, fe stn 3.82m: J, 10°, st, ro, fe stn 3.83m: - 4.00m: fg				PL(D) = 0.08
	5							4m: CORE LOSS: 100mm	C	100	62	
595		-from 5.6m, medium strength, highly to moderately weathered, fractured										PL(A) = 0.37 PL(D) = 0.44
	6	Bore discontinued at 6.0m -limit of investigation										
594	6.0							4.1m: - 4.12m: fg 4.23m: J, 10°, un, ro 4.35m: J, 65°, pl, sm, fe stn 4.41m: J, 50°, sm, pl 4.42m: - 4.44m: J, 60°, sm, pl, fe stn, 10mm spacing 4.43m: J, 5°, pl, ro 4.48m: - 4.51m: J, 50°, pl, ro, 10mm spacing 4.49m: J, 40°, pl, ro 4.56m: J, 65°, st, sm, fe stn 4.78m: - 4.80m: fg 4.8m: - 4.83m: fg 5m: J, 5°, cu, sm, cly inf 5.1m: J, 20°, un, he 5.18m: J, 50°, cu, sm, fe stn 5.31m: J, 45°, pl, sm, fe stn 5.32m: J, 10°, pl, sm, fe stn 5.33m: J, 45°, pl, ro, fe stn 5.4m: J, 50°, pl, sm, fe stn 5.52m: J, 10°, un, ro				
593	7											
592	8											
591	9											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 3.0m

TYPE OF BORING: 110mm solid flight auger to 3.40m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 4.7m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.5 AHD
EASTING: 699132
NORTHING: 6081649
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 94188.02
DATE: 18-3-2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
590	11							5.58m: J, 40°, un, ro 5.59m: J, 5°, pl, ro 5.61m: J, 10°, pl, ro 5.75m: - 5.77m: J, 15°-40°, pl, ro, 5mm spacing 5.8m: J, 30°, pl, ro 5.82m: J, 5°, un, ro 5.91m: - 6.00m: fg				
589	12											
588	13											
587	14											
586	15											
585	16											
584	17											
583	18											
582	19											
581												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 3.0m

TYPE OF BORING: 110mm solid flight auger to 3.40m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 4.7m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.5 AHD
EASTING: 699208
NORTHING: 6081641
DIP/AZIMUTH: 90°/--

BORE No: 13
PROJECT No: 94188.02
DATE: 19-3-2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Degree of Weathering	Graphic Log	Rock Strength	Water	Fracture Spacing (m)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
600	0.15	TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E U_{50}			PID = 1.3 ppm
	0.4	Clayey SAND (SC): fine to coarse grained, red brown, low plasticity clay, dry to moist, dense to very dense, extremely weathered rhyodacitic ignimbrite							D E S			PID = 1.7 ppm 11,26,40/100 refusal
599	1	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, very low strength, extremely to highly weathered, highly fractured -from 1.8m, very low to low strength							E D S			PID = 1.8 ppm 17,42,25/40 refusal
598	2								E D			
597	3	-from 3.2m, low strength, highly weathered							S			12,35/100 refusal
		-from 3.6m, highly to moderately weathered						3.7m: J, 50°, un, sm, fe stn, cly vn	C	80	40	PL(A) = 0.09 PL(D) = 0.16
	4	-from 4.0m, moderately weathered						3.76m: J, 5°, ir, ro, fe stn, cly vn 3.78m: J, 5°, ir, ro, fe stn, cly vn 3.88m: J, 45°, ir, ro, fe stn, cly vn				PL(A) = 1.94 PL(D) = 1.8
596	4.1	-from 4.1m, high strength, moderately to slightly weathered, highly fractured -from 4.45m, pale blue -from 4.7m, blue, very high to extremely high strength, slightly weathered to fresh, slightly fractured to unbroken						4m: CORE LOSS: 100mm 4.1m: End of run 4.2m: J, 10°, ir, ro, fe stn, cly vn 4.25m: J, 50°, pl, sm, fe stn 4.445m: J, 10°, ir, ro, fe stn 4.5m: J, 85°, pl/cu, sm, fe stn, cly vn 4.88m: J, 60°, pl, sm 5m: DB 5.08m: DB 5.2m: J, 20°, ir, sm 5.31m: J, 75°, pl, sm, fe stn 5.4m: End of run 5.47m: J, 25°, ir, ro 6m: DB 6.07m: J, 80°, ir, ro 6.15m: End of run	C	100	82	PL(D) = 10.52 PL(A) = 7.2 PL(D) = 8.72
595	5											PL(D) = 8.85
	6								C	100	71	UCS = 131.4 MPa
	6.15	Bore discontinued at 6.15m -limit of investigation										
594	7											
593	8											
592	9											
591												

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 3.6m

TYPE OF BORING: 110mm solid flight auger to 3.60m, then NMLC coring to 6.15m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 4.0m 24 hrs after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.0 AHD
EASTING: 699233
NORTHING: 6081673
DIP/AZIMUTH: 90°/--

BORE No: 14
PROJECT No: 94188.02
DATE: 19-3-2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
600		TOPSOIL/Sandy CLAY (CL): low plasticity, dark brown, fine grained sand, with rootlets, moist, firm to stiff, TOPSOIL							E			PID = 1.4 ppm
	0.35	RHYODACITIC IGNIMBRITE: fine to coarse grained, pale brown, dry to moist, extremely low to very low strength, extremely to highly weathered, fragmented							D E S			PID = 4.8 ppm 13,28,25/50 refusal
599	1	-from 0.9m, very low to low strength							D E S			PID = 4.3 ppm 28/20 refusal
		-from 1.3m, very low strength						1.62m: J, pl, 30°, vr, fe stn	C	100	25	PL(A) = 0.71 PL(D) = 0.99
		-from 1.4m, low strength, highly weathered, highly fractured						1.65m: J, 35°, ir, ro, fe stn, cly vn				
598	2	-from 1.5m, low to medium strength, highly to moderately weathered, fractured						1.66m: - 1.90m: J, generally 20°-45°, ir, pl, ro, fe stn, cly vn	C	100	10	PL(D) = 1.15
		-from 1.8m, medium strength, moderately weathered						1.9m: End of run				
		-from 2.4m, medium to high strength						1.91m: - 2.26m: J, generally 20°-45°, ir, pl, ro, fe stn, cly vn				
597	3							2.32m: J, 80°, pl, ro, cly vn				
								2.36m: J, 30°, pl, ro, cly vn				PL(D) = 1.05
								2.4m: J, 40°, ir, ro, fe stn	C	85	12	
596	4							2.46m: He J, 45°				
								2.59m: H, 20°, ir, sm, fe stn, cly vn				
	4.36	-from 4.3m, medium to high strength, moderately weathered, fractured						2.71m: He J, 35°, pl, cly vn				PL(D) = 0.65
								2.8m: J, 45°, pl, sm, cly vn	C	94	27	PL(A) = 1.03
595	5							2.84m: J, 45°, pl, sm, cly vn				
								2.96m: J, 45°, pl, sm, fe stn	C	100	0	
		-from 5.4m, low to medium strength, highly to moderately weathered						3m: J, 55°, pl, sm, cly vn				
								3.13m: He J, 10°, ir				
						▼		3.18m: Too fractured to distinguish	C	100	30	PL(D) = 0.37
		-from 5.8m, medium to high strength, moderately weathered, fractured						3.2m: End of run				PL(A) = 0.51
594	6 6.0	Bore discontinued at 6.0m -limit of investigation						3.3m: J, 20°, st, sm, cly vn, fe stn				PL(D) = 1.94
								3.48m: J, 30°, ro, pl, fe stn				
								3.52m: J, 75°, ir, ro, fe stn, cly vn				
593	7							3.65m: J, 745°, pl, sm, fe stn, cly vn				
								3.75m: J, 20°, ro, un, fe stn, cly vn				
								3.78m: J, 5°, pl, sm, cly vn				
								3.85m: J, 45°, pl, sm, fe stn				
592	8							3.91m: - 4.12m: too fractured to distinguish				
								4.12m: CORE LOSS: 240mm				
								4.25m: End of run				
								4.43m: J, 5°, vr, pl				
								4.46m: J, 30°, pl, sm, cly vn				
591	9							4.52m: J, 30°, ir, sm, cly vn				
								4.57m: J, 60°, pl, sm, fe stn, cly vn				
								4.68m: J, 10°, un, ro, cly vn				
								4.74m: J, 10°, un, ro, cly vn				

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 1.5m

TYPE OF BORING: 110mm solid flight auger to 1.50m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 5.7m after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: NSW Department of Education
PROJECT: Jerrabomberra High School
LOCATION: Part Lot 1 DP 1263364, Jerrabomberra

SURFACE LEVEL: 600.0 AHD
EASTING: 699233
NORTHING: 6081673
DIP/AZIMUTH: 90°/--

BORE No: 14
PROJECT No: 94188.02
DATE: 19-3-2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
590								4.9m: End of run 4.91m: - 5.0m: too fractured to distinguish 5m: J, 45°, pl, cly vn 5.09m: J, 30°, st, ro, fe stn, cly vn 5.13m: J, 20°, sm, pl, fe stn, cly vn 5.22m: J, 20°, pl, sm, fe stn, cly vn 5.23m: - 5.4m: too fractured to distinguish 5.4m: End of run 5.41m: - 5.48m: too fractured to distinguish 5.66m: J, 30°, pl, ro, cly vn 5.76m: J, 45°, pl, vr, fe stn, cly co 5mm 5.87m: J, 30°, pl, sm, fe stn, cly vn 6m: End of run				
589	11											
588	12											
587	13											
586	14											
585	15											
584	16											
583	17											
582	18											
581	19											

RIG: EVH2100 **DRILLER:** S2S **LOGGED:** ADFH/EAGL **CASING:** HQ from 1.5m

TYPE OF BORING: 110mm solid flight auger to 1.50m, then NMLC coring to 6.00m

WATER OBSERVATIONS: No groundwater observed during augering or coring. Groundwater observed at 5.7m after the BH was drilled.

REMARKS: Location coordinates are in MGA94 Zone 55. Surface levels and coordinates are approximate only and must not be relied upon. GW assumed to be driller's water/mud.

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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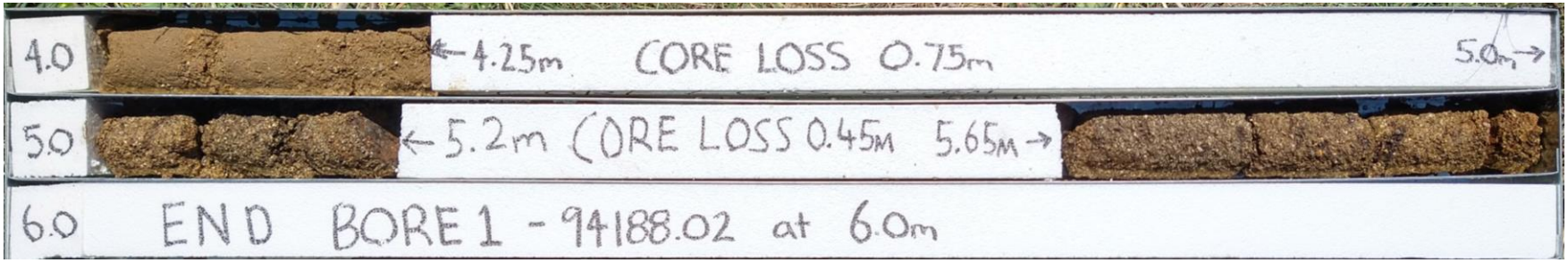
DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

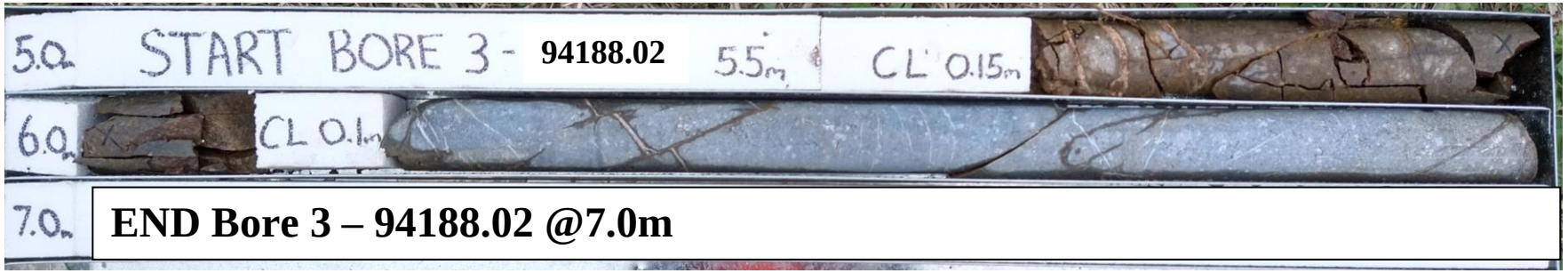
BORE: 1 DEPTH: 4.0 m –6.0 m PROJECT: 94188.02 March 2021



DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 3 DEPTH: 5.5 m –7.0 m PROJECT: 94188.02 March 2021

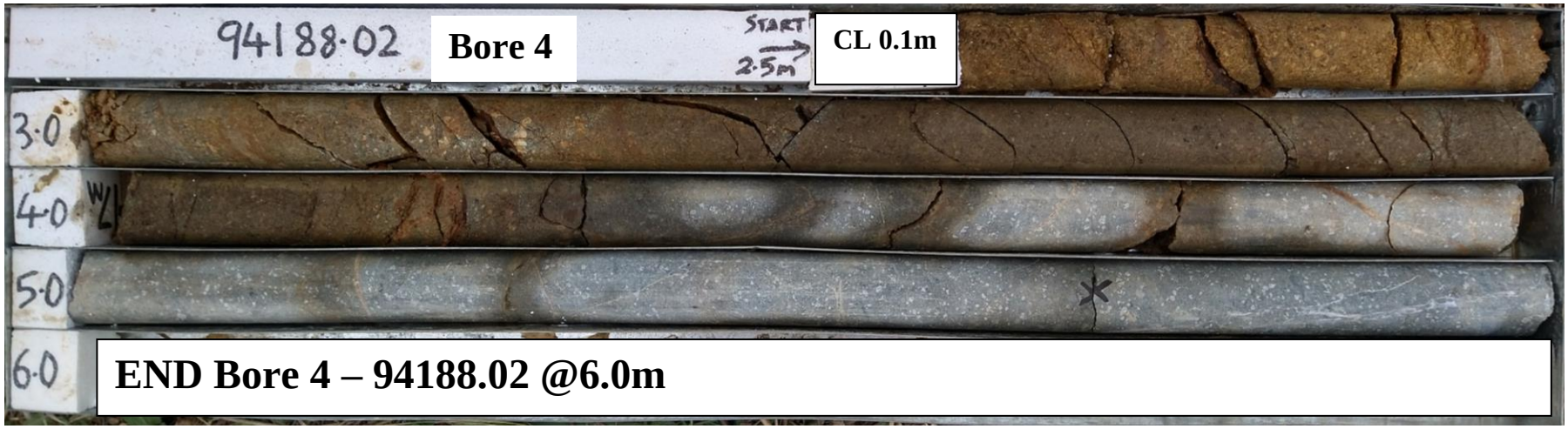


END Bore 3 – 94188.02 @7.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

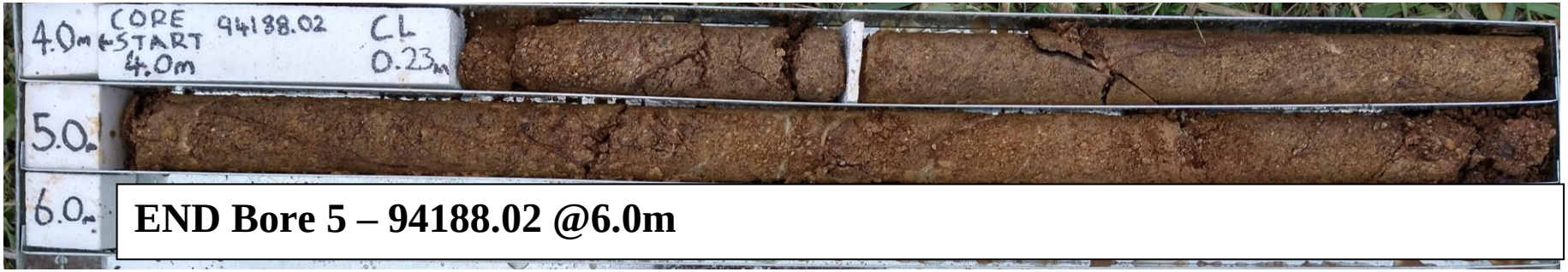
BORE: 4 DEPTH: 2.5 m –6.0 m PROJECT: 94188.02 March 2021



DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 5 DEPTH: 4.0 m –6.0 m PROJECT: 94188.02 March 2021



END Bore 5 – 94188.02 @6.0m

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 6 DEPTH: 2.0 m –6.0 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 7 DEPTH: 2.5 m –6.0 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 8 DEPTH: 2.7 m –6.26 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 9 DEPTH: 1.5 m –6.3 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 12 DEPTH: 3.4 m –6.0 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 13 DEPTH: 3.6 m –6.15 m PROJECT: 94188.02 March 2021

DOUGLAS PARTNERS PTY LTD

PROPOSED JERRABOMBERRA HIGH SCHOOL
PART LOT 1 DP 1263364, JERRABOMBERRA, NSW

BORE: 14 DEPTH: 1.5 m –6.0 m PROJECT: 94188.02 March 2021

END Bore 14 – 94188.02 @6.0m

Appendix D

Results of Laboratory Tests

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski
NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50MPa, AS 4133.1.1.1

Sample Number	NC-6582B
Sample Location	Bore 7
Depth (m)	4.72 - 5.0
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	38
Average Diameter (mm)	51.3
Average Height (mm)	119
Height to Diameter Ratio	2.3 : 1
Moisture Content (%)	5.5
Wet Mass / Unit Volume (t/m^3)	2.34
Dry Mass / Unit Volume (t/m^3)	2.21
Uniaxial Compressive Strength (MPa)	**2.7**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW
	Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.1 > 50MPa, AS 4133.1.1.1

Sample Number	NC-6582C
Sample Location	Bore 13
Depth (m)	5.47 - 6.0
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	1315
Average Diameter (mm)	51.7
Average Height (mm)	140
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	0.2
Wet Mass / Unit Volume (t/m^3)	2.70
Dry Mass / Unit Volume (t/m^3)	2.69
Uniaxial Compressive Strength (MPa)	**131.4**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW
	Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50MPa, AS 4133.1.1.1

Sample Number	NC-6582D
Sample Location	Bore 3
Depth (m)	6.65 - 7.0
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	315
Average Diameter (mm)	51.7
Average Height (mm)	129
Height to Diameter Ratio	2.5 : 1
Moisture Content (%)	0.6
Wet Mass / Unit Volume (t/m^3)	2.72
Dry Mass / Unit Volume (t/m^3)	2.70
Uniaxial Compressive Strength (MPa)	**34.0**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW
	Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50MPa, AS 4133.1.1.1

Sample Number	NC-6582G
Sample Location	Bore 4
Depth (m)	5.7 - 6.0
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	292
Average Diameter (mm)	51.7
Average Height (mm)	137
Height to Diameter Ratio	2.7 : 1
Moisture Content (%)	0.8
Wet Mass / Unit Volume (t/m^3)	2.72
Dry Mass / Unit Volume (t/m^3)	2.69
Uniaxial Compressive Strength (MPa)	**31.4**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW
	Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski
NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.1 > 50MPa, AS 4133.1.1.1

Sample Number	NC-6582H
Sample Location	Bore 8
Depth (m)	5.29 - 5.54
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	1164
Average Diameter (mm)	51.7
Average Height (mm)	133
Height to Diameter Ratio	2.6 : 1
Moisture Content (%)	1.0
Wet Mass / Unit Volume (t/m^3)	2.69
Dry Mass / Unit Volume (t/m^3)	2.66
Uniaxial Compressive Strength (MPa)	**116.3**
Comments	

Uniaxial Compressive Strength

Douglas Partners
Geotechnics / Environment / Groundwater

Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook Newcastle NSW 2310
Phone: (02) 4960 9600
Email: peter.gorseski@douglaspartners.com.au

Report Number:	94188.02_1
Issue Number:	1
Date Issued:	30.03.2021
Client:	NSW Dept of Education-School Infrastructure NSW
	Level 8, 259 George Street, Sydney NSW 2000
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6582
Date Sampled:	15 - 19.03.2021
Sampling Method:	Sampled by Others

The results apply to the sample as received

Accredited for Compliance with ISOIEC 17025 - Testing

Approved Signatory: Peter Gorseski

NATA Accredited Laboratory Number: 828

Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50MPa, AS 4133.1.1.1

Sample Number	NC-6582I
Sample Location	Bore 9
Depth (m)	6.13 - 6.3
Rock Description	Rhyodacitic Ignimbrite
Storage History and Environment	Tested as Received
Orientation to Bedding	-
Compression Machine	Automax Multitest
Date of Testing	29.03.2021
Duration of Test (seconds)	13
Average Diameter (mm)	51.6
Average Height (mm)	87
Height to Diameter Ratio	1.7 : 1
Moisture Content (%)	4.2
Wet Mass / Unit Volume (t/m^3)	2.41
Dry Mass / Unit Volume (t/m^3)	2.31
Uniaxial Compressive Strength (MPa)	**2.8**
Comments	

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Goulburn Laboratory
54 Sinclair Street Goulburn NSW 2580
Phone: 02 4822 8395
Email: brachlan.harris@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Report Number: **94188.02-3**
Issue Number: 1
Date Issued: 08/04/2021
Client: NSW Department of Education - School Infrastructure NSW
Level 8, 259 George Street, Sydney NSW 2000
Contact: Nick Mentis
Project Number: 94188.02
Project Name: SINSW01327/20, Jerrabomberra High School - Geotech and Contamination
Project Location: Lot 1 DP 1263364, Jerrabomberra
Work Request: 5727
Sample Number: GU-5727A
Date Sampled: 19/03/2021
Dates Tested: 24/03/2021 - 01/04/2021
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Sample Location: **Borehole 2 , Depth: 1.0**
Material: Silty Sandy Clay

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	31		
Plastic Limit (%)	18		
Plasticity Index (%)	**13**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	8.0		
Cracking Crumbling Curling	None		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	8.5

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Goulburn Laboratory
54 Sinclair Street Goulburn NSW 2580
Phone: 02 4822 8395
Email: brachlan.harris@douglaspartners.com.au

Report Number:	**94188.02-3**
Issue Number:	1
Date Issued:	08/04/2021
Client:	NSW Department of Education - School Infrastructure NSW Level 8, 259 George Street, Sydney NSW 2000
Contact:	Nick Mentis
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School - Geotech and Contamination
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	5727
Sample Number:	GU-5727B
Date Sampled:	19/03/2021
Dates Tested:	24/03/2021 - 01/04/2021
Sampling Method:	Sampled by Engineering Department *The results apply to the sample as received*
Sample Location:	**Borehole 3 , Depth: 1.0 - 1.2**
Material:	Sandy Clay

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Brachlan Harris
Assistant Laboratory Manager
Laboratory Accreditation Number: 828

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	35		
Plastic Limit (%)	16		
Plasticity Index (%)	**19**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	9.5		
Cracking Crumbling Curling	None		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	9.9

Material Test Report

Douglas Partners
Geotechnics / Environment / Groundwater
Douglas Partners Pty Ltd
Unanderra Laboratory
Unit 1/1 Luso Drive Unanderra NSW 2526
Phone: (02) 4271 1836
Fax: (02) 4271 1897
Email: anes.ibricic@douglaspartners.com.au

Report Number:	**94188.02-4**
Issue Number:	1
Date Issued:	14/04/2021
Client:	NSW Department of Education - School Infrastructure NSW Level 8, 259 George Street, Sydney NSW 2000
Contact:	Nick Mentis
Project Number:	94188.02
Project Name:	SINSW01327/20, Jerrabomberra High School - Geotech and Contamination
Project Location:	Lot 1 DP 1263364, Jerrabomberra
Work Request:	6950
Sample Number:	WO-6950A
Date Sampled:	15/03/2021
Dates Tested:	29/03/2021 - 12/04/2021
Sampling Method:	Sampled by Engineering Department *The results apply to the sample as received*
Sample Location:	**12 , Depth: 0.1 - 0.35m**
Material:	Clayey Sand

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Anes Ibricic
Laboratory Manager
Laboratory Accreditation Number: 828

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Oven Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	21		
Plastic Limit (%)	19		
Plasticity Index (%)	**2**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	1.5		
Cracking Crumbling Curling	Cracking		

Moisture Content (AS 1289 2.1.1)	
Moisture Content (%)	5.9

Misc Inorg - Soil				
Our Reference	UNITS	265015-11	265015-22	265015-31
Your Reference		BH03/1.0	BH06/0.5	BH08/2.0
Date Sampled		15/03/2021	17/03/2021	17/03/2021
Type of sample		Soil	Soil	Soil
Date prepared	-	29/03/2021	29/03/2021	29/03/2021
Date analysed	-	29/03/2021	29/03/2021	29/03/2021
pH 1:5 soil:water	pH Units	8.1	6.8	6.7
Electrical Conductivity 1:5 soil:water	µS/cm	[NA]	28	9
Chloride, Cl 1:5 soil:water	mg/kg	[NA]	20	<10
Sulphate, SO4 1:5 soil:water	mg/kg	[NA]	20	20
Resistivity in soil*	ohm m	[NA]	350	1,100
Estimated Salinity*	mg/kg	[NA]	96	30