Douglas PARTNERS

GROUNDED EXPERTISE

Report on Geotechnical Investigation

Proposed Residential Development

72 and 82-86 Menangle Road, Camden NSW

Prepared for Homes NSW

Project 239951.01

23 June 2026

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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
Author		23 June 2026
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Douglas Partners acknowledges Australia's First Peoples as the Traditional Owners of the Land and Sea on which we operate. We pay our respects to Elders past and present and to all Aboriginal and Torres Strait Islander peoples across the many communities in which we live, visit and work. We recognise and respect their ongoing cultural and spiritual connection to Country.

Executive Summary

This geotechnical report has been prepared to accompany a State Significance Development Application (SSDA) to expand social and affordable housing by using government land located at 72 and 82 – 86 Menangle Road, Camden NSW.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-116982991).

This report concludes that the proposed development is suitable from a geotechnical perspective and readily managed by conventional engineering design.

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Report on Geotechnical Investigation
Proposed Residential Development
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1. Introduction

This report presents the results of a geotechnical investigation for a proposed residential development.

This geotechnical investigation report has been prepared by Douglas Partners Pty Ltd as part of the Environmental Impact Statement (EIS) for a State Significant Development (SSD) application and concurrent rezoning for a social and affordable housing development at 72 and 82-86 Menangle Road, Camden.

The site is located at 72 and 82-86 Menangle Road, Camden, in the Camden Local Government Area (LGA) and has a combined site area of 7184 m^2.

The SSD application seeks approval for the construction of two residential flat buildings comprising a total of 95 social and affordable housing dwellings.

Investigation was carried out to assess the subsurface soil conditions underlying the sites to provide comment on the following:

- Site preparation and earthworks;
- Excavation conditions;
- Suitable batter slopes;
- Expected characteristic surface movements and classification of the site in accordance with AS 2870 based on reactivity of soil;
- Suitable footing options along with allowable bearing pressures and footing design parameters;
- Pavement subgrade design parameters;
- Salinity management plan; and
- Anticipated construction difficulties and potential solutions.

The investigation included the drilling of boreholes and laboratory testing of selected samples followed by engineering analysis and reporting. The details of the field work are presented in this report, together with comments relating to design and construction practice.

1.1 Secretary's environmental assessment requirements (SEARs)

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project SSD-116982991 on 11 May 2026 as detailed in Table 1 below.

Table 1: Environmental impact assessment requirements for the geotechnical assessment

Issue	SEARs Requirement	Summary	Section Reference
12. Ground and Groundwater Conditions	Groundwater Impact Assessment	Not required	Section 7.2.1
	Salinity Management Plan	Parameters for concrete and steel design requirements provided. Additional salinity management plan is not required.	Section 7.7
	Acid Sulfate Soils Management Plan	Not required	Section 7.8

This report must be read in conjunction with all appendices including the notes provided in Appendix A.

2. Proposed development

The SSD application seeks consent for the following:

- Site preparation works including excavation.
- Construction of two residential flat buildings containing 95 dwellings for the purpose of social and affordable housing.
- Construction of one level of basement parking for each residential flat building.
- Associated landscaping and communal open space.
- Infrastructure servicing.

Based on the information provided it is understood that the proposed bulk excavation for the basement level is designed to extend to approximately RL 85.8 m AHD.

3. Site description

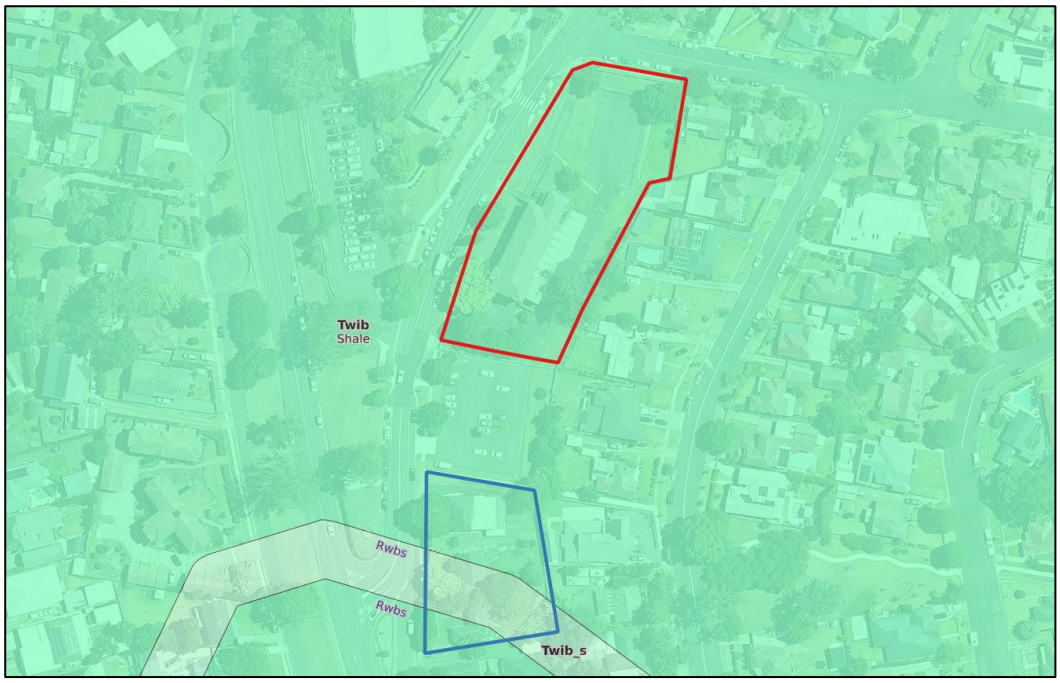
The site comprises two parcels of land with each parcel of land near-rectangular with a combined area of 7184 m^2. It is bounded by Menangle Road to the west, Gilbulla Avenue to the north and existing residential development to the south and east. The site surface gently slopes towards the south east with an overall difference in the elevation of approximately 4.4 m from the highest area (RL 86.2 m relative to Australian Height Datum (AHD)) located at Bore 102 to the lowest area (RL 81.8 m) located at the Bore 110.

4. Published data

4.1 Regional geology

The NSW Seamless Geological Series (GSNSW, 2019) indicates that the site is underlain by Triassic aged Bringelly Shale (mapping unit Twib) of the Wianamatta Group. Bringelly Shale typically comprises shale, carbonaceous claystone, claystone, laminite and fine to medium-grained lithic sandstone with occasional coal and tuff. A portion of the southern site (at 82-86 Menangle Road)

is underlain by Bringelly Shale sandstone of the Triassic age and Wianamatta Group (mapping unit 'Twib_s') which is typically comprised of fine to medium grained quartz-lithic sandstone.



Where: Dark green = Bringelly Shale (Twib)
Light green – Bringelly Shale Sandstone (Twib_s)

Figure 1: Regional geology

Site observations and borehole drilling indicate the mapping is consistent with the results of the investigation, with shale and sandstone inferred to be from Bringelly Shale being encountered at each borehole. The regional geology for the site is presented in Figure 1.

4.2 Soil landscape

Reference to the *Soil Landscapes of the Penrith 1:100 000 Sheet* (Bannerman & Hazelton, 2011) indicates that the Blacktown soil landscape group underlies the site.

The Blacktown soil landscape is residual in origin and is characterised by topography of gently undulating rises, with local relief to 30 m and slopes usually less than 5%, typically represented by broad rounded crests and ridges with gently inclined slopes. The mapping indicates this soil landscape comprises multiple soil horizons which vary between shallow red-brown podzolic soils (comprising mostly clayey soils on crests and upper slopes), to deep brown to yellow clay soils (on mid to lower slopes and in areas of poor drainage). These soils are typically of low fertility, moderately reactive, highly plastic and generally have a low wet-strength.

4.3 Acid sulfate soils

Reference to the acid sulphate soils information provided by the CSIRO Australian Soil Resource Information System website (CSIRO, 2014), the site is in an area mapped as having an 'extremely low probability of occurrence' (C4 rating) of acid sulfate soils.

4.4 Salinity

Reference to the Salinity Potential in Western Sydney Plan prepared by the Department of Infrastructure, Planning and Natural Resources in 2002, indicates that the site is mapped as low to moderate salinity potential.

5. Field work

5.1 Methods

The field work comprised the drilling of 10 boreholes (Bores 101 – 110) using either a track mounted drill rig or a mini excavator. The boreholes were drilled with 110mm continuous solid flight augers fitted with a tungsten-carbide (TC) bit to refusal on rock. Standard penetration testing (SPT) in soils was carried out in Bores 102, 104, 105, 109 and 110. Dynamic cone penetrometer (DCP) tests were carried out to depths of up to 1.2 m adjacent to the borehole locations to assess the penetration resistance of the near-surface soils.

The borehole locations were nominated by Douglas and shown on Drawing 1 (Appendix B). Electronic service clearance was undertaken at each borehole location prior to ground penetration. Surface levels relative to Australian Height Datum (AHD) and coordinates (to MGA2020 Zone 56) given on the borehole logs were determined using a differential GPS which has a nominal vertical and horizontal accuracy of ± 0.1 m. It is important to note that Douglas is not a registered surveyor, hence the coordinates and elevations must be considered approximate.

5.2 Results

Details of the subsurface conditions encountered in the boreholes are given in the logs in Appendix C. The logs should be read in conjunction with the accompanying notes defining classification methods and descriptive terms.

In summary, the succession of strata can be broadly summarised as:

Asphalt	Asphalt at Bore 107 to a depth of 0.1 m.
Fill/topsoil	Silty clay topsoil fill encountered at Bores 101 – 106 and 108 – 110 to depths in the range of 0.2 – 0..4 m.
Fill (uncontrolled)	Silty clay, gravelly sand or clayey silt fill encountered at Bores 102 – 107 and 110 to depths in the range of 0.4 – 1.3 m.
Clay (Residual)	Silty or sandy clay of firm to hard consistency encountered at each borehole location to depths in the range of 0.7 – 3.0 m.
Rock	Bringelly Shale and Sandstone of very low to low strength to limit of investigation depths of 0.9 m to 4.3 m in all boreholes.

No free groundwater was encountered in the boreholes during the field work. It should be noted that groundwater levels are affected by factors such as climatic conditions and soil permeability and will therefore vary with time.

Measurement of the standing water levels in the piezometers installed in BH102 and BH109 was undertaken, and the results are given in Table 2.

Table 2: Summary of groundwater well monitoring

Bore No.	Surface RL (m AHD)	Screened interval (m AHD)	Date	Groundwater depth (m)	Groundwater RL (m AHD)
BH102	86.2	85.2 – 82.2	23/02/2026	*ne*	*ne*
BH109	81.8	80.8 – 78.3		*ne*	*ne*

Where: 'ne' = not encountered

6. Laboratory testing

6.1 Plasticity and shrink swell index

Selected samples from the boreholes were tested in the laboratory for measurement of field moisture content, plasticity and shrink-swell index. The detailed laboratory test report sheets are presented in Appendix D, with the results summarised in Table 3 and a plasticity distribution presented in Figure 2.

Table 3: Summary of test results – Shrink-swell index and plasticity

Bore No.	Depth (m)	FMC (%)	I_{ss} (%/ΔpF)	LL (%)	PL (%)	PI (%)	LS (%)	Material
101	0.5 – 0.7	17.0	3.2	-	-	-	-	Silty Clay
102	0.5	13.8	-	38	18	20	9	Fill
103	0.5 – 0.7	17.5	3.4	-	-	-	-	Silty Clay
104	0.5	14.8	-	51	20	31	10	Fill
105	0.5	11.2	-	42	19	23	11.5	Fill
106	0.5 – 0.7	22.5	4.1	-	-	-	-	Silty Clay
107	1.0	21.2	-	57	22	35	13	Silty Clay
108	0.5	10.6	-	54	21	33	15	Sandy Clay
109	0.5	21.0	-	61	23	38	16.5	Silty Clay
110	0.5	24.9	-	52	20	32	15.0	Silty Clay

Where: FMC = Field moisture content, PL = Plastic limit, LL = Liquid limit, PI = Plasticity Index, LS = Linear shrinkage
Iss = Shrink-swell index

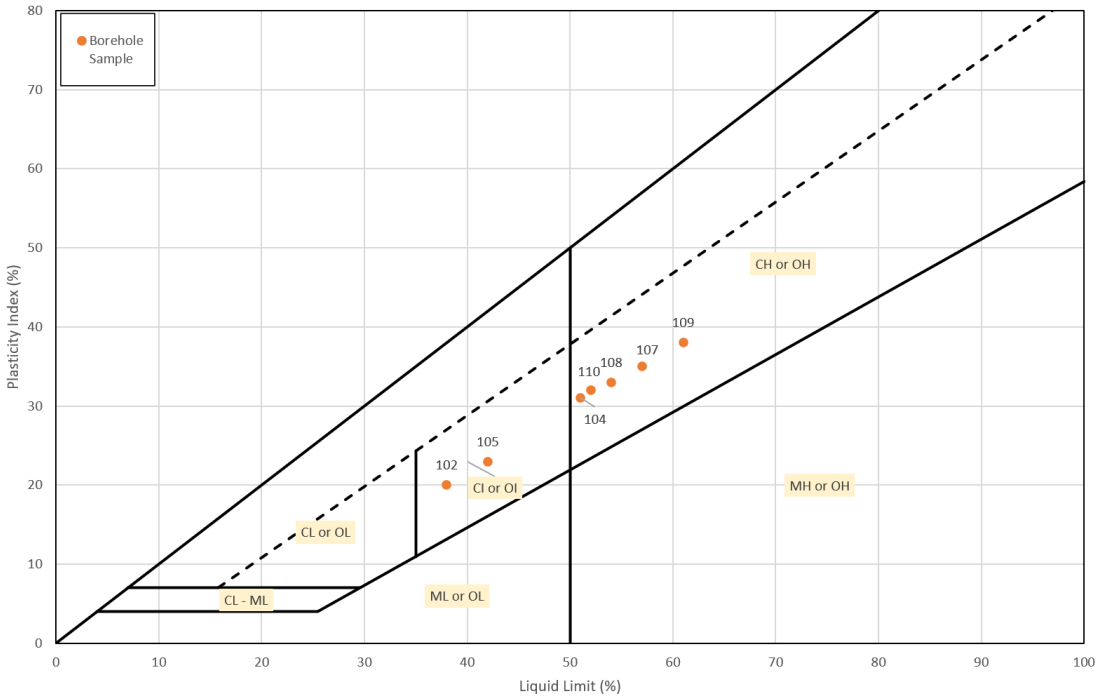


Figure 2: Plasticity distribution

The field moisture content of the plasticity test samples was 10.4% dry to 4.9% wet of the plastic limit. The plasticity results indicate the fill soils tested are of medium to high plasticity, natural soils tested are of high plasticity and would be susceptible to high shrink-swell movements with changes in moisture content. The shrink-swell index (I_{ss}) results indicates that the soils are of high shrink-swell potential.

6.2 Salinity, aggressivity, sodicity and dispersibility

Selected samples collected from the boreholes were tested in the laboratory for determination of pH, chloride concentration, sulphate concentration, electrical conductivity and texture. The detailed laboratory report sheets and a summary of the results provided in Summary Table C1 are given in Appendix C.

The number of samples tested for each parameter and the range of test results obtained are summarised in Table 4.

Table 4: Summary of test results – Chemical

Parameter		Units	Number of tests	Range of results
pH		pH units	43	4.7 – 6.0
Chlorides		(mg/kg)	19	10 – 640
Sulphates		(mg/kg)	20	23 – 150
Aggressivity (AS 2159: 2009)	to concrete	-	46	Non aggressive
	to steel	-	46	Non to mildly aggressive
Exchangeable Sodium (Na)		(meq/100g)	2	0.3

Parameter	Units	Number of tests	Range of results
CEC (cation exchange capacity)	(meq/100g)	2	8 – 52
Sodicity [Na/CEC]	(ESP%)	2	1 – 4
Sodicity Class	[after DLWC]	2	Non sodic
Emerson Class No.	-	2	2
EC1:5 [Lab.]	(mS/cm)	43	40.6 – 564.3
ECe [M x EC1:5]	(dS/m)	43	0.3 – 5.1
Salinity Class Richards (1954)	-	43	Non saline to moderately saline

Where: M = soil textural factor

Section 7.7 discusses the outcomes of the salinity and aggressivity testing and provides parameters for concrete and steel design requirements.

6.2.1 Aggressivity

Sample aggressivity classifications (refer Table C1, Appendix C) are based on pH, sulphate concentration, chloride concentration and calculated resistivity values and are assessed in accordance with AS 2159 *"Piling Design and Installation"* (AS 2159, 2009). The inferred low permeability of the sampled clay-rich soils indicate that soils at all boreholes are in Condition "B" (AS 2159, 2009).

The results indicate that of the 46 samples tested:

- All samples were non-aggressive to concrete; and
- 45 samples were non-aggressive, and one was mildly aggressive to steel.

6.2.2 Salinity

Sample salinity classifications (refer Table C1, Appendix C) are based on calculated ECe values using the method of Richards "*Diagnosis of Saline and Alkaline Soils."* (Richards, 1954).

The results indicate that of the 46 samples tested for salinity, 21 samples were non-saline, 18 were slightly saline and four were moderately saline.

6.3 Acid sulfate soils

Field screening tests were undertaken on 10 samples for measurement of pH in H_2O (pH_F) and pH after oxidation with H_2O_2 (pH_{FOX}). The detailed report sheets of the screening tests (pH_F and pH_{FOX}) are given in Appendix C with the results summarised below:

- The pH of samples in H_2O (pH_F) were in the range of 7.2 – 8.4.
- The pH of the samples following addition of H_2O_2 (pH_{FOX}) were in the range 8.4 – 8.5.

The detailed laboratory report sheets are given in Appendix C and commentary on the results are provided in Section 7.8.

7. Comments

7.1 General

The following comments are based on the surface and subsurface profiles encountered at the time of investigation.

These comments are provided to identify development constraints related to geotechnical and geological factors to assist in the detailed design of the development. As detailed design of the proposed development has not yet been undertaken, the comments given within this report must also be considered as being preliminary in nature. Once details are available, they should be made available for geotechnical review and comment.

7.2 Subsurface conditions

Based on the results of the investigation, the typical progression of strata underlying the site comprises:

- A surficial layer of topsoil to depths of up to 0.4 m, but typically 0.2 m or an asphalt surfacing to a depth of 0.1 m.
- Uncontrolled fill observed to depths of 1.3 m.
- Clays, typically stiff to very stiff, encountered to depths of up to 3.0 m underlying the site
- Shale or sandstone, typically very low to low strength, encountered from depths of 0.7 m.

7.2.1 Groundwater

Measurement from the monitoring wells indicate that groundwater was not encountered within the screened interval down to RL 78.3 m. The proposed basement excavation level of RL 85.8 m, is therefore likely to be well above the regional groundwater table which is expected to be deeper within the rock profile. Some seepage along the clay/rock interface (RL 79.0 – 85.9 m) and through joints in the rock would be expected, particularly after rain. This should be readily managed by draining to sumps , if required. It is noted that groundwater levels can fluctuate with seasonal climatic changes, topography and variability in the permeability of the subsurface strata.

7.3 Characteristic surface movement and site classification

The existing trees and the uncontrolled fill encountered in the boreholes result in the site being classified as a Class P site when assessed in accordance with the requirements of the *"Residential Slabs and Footings"* code (AS 2870, 2011). A class P site requires that the footings to be designed by a suitably qualified engineer in accordance with engineering principles. Standard footing designs in AS2870 Residential slabs and footings are not applicable for this site in its current condition.

If site preparation is undertaken in accordance with the methodology presented in Section 7.4.1 of this report, and all uncontrolled fill is removed from within the development footprint and zone of influence of structures, then based on soil reactivity alone, the shrink-swell surface movements including the additional movements associated with existing trees are estimated to be up to 75 mm (commensurate with a Class H2 [Highly Reactive] site).

It is noted however, that the above classification is appropriate for the undeveloped site and is independent of any proposed earthworks.

7.4 Earthworks

7.4.1 Site preparation

To prepare the site for the construction of the proposed development, the following general site preparation and procedures are suggested:

- Strip vegetation, topsoil and any unsuitable material (such as uncontrolled fill). Care should be exercised to separate topsoil, which could be used for landscaping or removal off site, and clay which could be re-used as structural fill subject to geotechnical inspection.
- Excavate soil and rock to design levels and stockpile excavated materials for possible re-use as fill, other than topsoil.
- Inspection and testing of the stripped or excavated surfaces by the geotechnical consultant prior to placement of fill or construction of footings and slabs.
- All filling should be placed in 250 mm (loose thickness) layers and compacted to a relative density ratio of 98% when compared to Standard maximum dry density (SMDD) with placement moisture contents within 2% Standard optimum moisture content (OMC). Beneath pavements and ground slabs, the upper 0.5 m of fill should be compacted to 100% SMDD.

Site observations have indicated the presence of uncontrolled fill and highly reactive clays which could be adversely affected by rain. The soils could rapidly lose strength after rain or saturation. As a result, surface drainage which directs runoff away from work areas should be installed prior to construction, possibly in conjunction with the designation of construction equipment haul routes to minimise trafficking of stripped areas.

Conventional sediment and erosion control measures should be implemented during the construction phase with exposed surfaces to be topsoiled and vegetated as soon as practicable following the completion of earthworks.

During inclement weather, or if the site is to be left unattended for an extended period, the upper surfaces of fill should be crowned, and preferably, sealed by smooth drummed plant. Any stockpiles should be sealed to facilitate water run-off.

All earthworks must be carried out in accordance with AS 3798 *"Guidelines on Earthworks for Commercial and Residential Developments"* (AS 3798, 2007), with inspection and testing carried out to a Level 1 standard as described in AS 3798.

7.4.2 Excavation conditions

Based on the results of the investigation, excavation is expected to within fill or natural soils or very low to low strength shale and should be readily achieved using conventional earthmoving equipment, such as medium sized excavators. Notwithstanding this, removal of rock must be based on an earthworks contractors' own assessment of the subsurface conditions. If the use of vibratory equipment encroaches within 40 m of any vibration sensitive structures, further assessment will be required and vibration monitoring should be undertaken.

It should be noted that any off-site disposal of spoil will generally require assessment for re-use or classification in accordance with current *Waste Classification Guidelines* (NSW EPA, 2014).

7.4.3 Material reuse

Excavated fill, natural soils (excluding topsoil) or very low to low strength rock encountered on site should be suitable for placement as engineered fill, although reuse of the material may require moisture conditioning to ensure placement of fill at the correct moisture content. Due to the natural soils being highly reactive, reusing this material as engineered fill may increase the shrink-swell surface movements.

Material proposed for reuse as controlled fill should not contain any particles greater than 150 mm. It is anticipated that the very low to low strength rock encountered is likely to be readily broken down to a suitable size beneath the construction plant used for placement. Although not encountered in the investigation, excavation in medium strength or stronger rock will likely generate significant quantities of oversize rock. This rock would not be suitable for reuse directly in fill areas and will require processing (breaking down and crushing using crushing plant) before being suitable for reuse as structural fill.

7.4.4 Batter slopes

Temporary slopes up to about 3 m in height through controlled fill or at least stiff natural clays should be feasible and constructed no steeper than 1(V):1.(H). Permanent batter slopes should be no steeper than 1(V):3(H) required to achieve an appropriate factor of safety. Erosion protection would be required for all exposed slopes, and any permanent batters which require maintenance may need to be flattened to 1(V):4(H).

Detailed stability analysis would be required for slopes greater than 3 m in height or where groundwater is encountered in the face.

Vertical excavations and where the above batter slopes cannot be adhered to are to be supported by engineer-designed retaining walls.

7.4.5 Retaining walls

Lateral earth pressure coefficients can be based on the parameters in Table 5 (below):

Table 5: Material Parameters

Retained Material	Bulk Density (kN/m^3)	Undrained Cohesion (kPa)	Drained Cohesion (kPa)	Drained Friction Angle (°)
Clay (stiff to very stiff) and controlled fill	20	75	3	26
Rock (very low to low strength)	22	-	20	28

Lateral earth pressure on the retaining wall can be calculated using the parameters given in Table 6 assuming a level surface behind the retaining wall.

Table 6: Lateral earth pressure parameters

Retained Material	K_0 [1]	K_a[1]		Passive Pressure (Short Term)[1]	K_p/Passive Pressure[1] (Long Term)
		Short Term	Long Term		
Clay (stiff to very stiff) and controlled fill	0.6	0.3	0.4	150 kPa	2.5
Rock (very low to low strength)	0.5	0.25	0.35	400 kPa	400 kPa

Where:
K_a = active earth pressure co-efficient, K_p = passive earth pressure co-efficient, K_o = at-rest earth pressure co-efficient
Note: (1) = Ultimate values with no reduction factor

'At rest' pressure coefficient (i.e., K_0) are appropriate where movement-intolerant services or adjacent structures are present

It is suggested that earth pressures on gravity or cantilever retaining walls due to the retained soils be based on a triangular pressure distribution using the appropriate values for unit weight and earth pressure coefficient in table and calculated as follows:

$$\sigma_z = \gamma.K.z$$

Where: σ_z = Horizontal pressure at depth z
γ = Unit weight of retained soil
K = Earth pressure coefficient

The pressure distribution given above does not include hydrostatic pressure due to groundwater behind retaining walls, which should be included in the design unless drainage is provided to prevent the build-up of hydrostatic pressures.

The design of any batter slopes and retaining walls should account for any surcharge loads and lateral loads, including adjacent pavements, access roads, buildings or similar. Design should also consider the effects of plant operating above excavations and/or retaining walls during construction.

7.5 Footings

Based on the results of the investigation, fill, natural soils or weathered rock are expected to be exposed at founding depths for high levels footings. High-level footings are not recommended in areas of uncontrolled fill unless site preparation is undertaken in accordance with Section 7.4.1 of this report, or if the uncontrolled fill is removed from within building footprints and zone of influence.

Alternatively, if site preparation is not undertaken in accordance with Section 7.4.1, piled foundations could be adopted, founding within natural soils or rock. The advantage of a footing-to-rock foundation system would be that settlements (both total and differential) would be minimal and not removing the existing fill will assist the handling of material and minimise vibrations during earthworks.

Footings may be designed using the parameters provided in Table 7.

Table 7: Footing design parameters

Material	Ultimate Parameters		Serviceability Parameters		Youngs Modulus, E' (MPa)
	Shaft Adhesion (kPa)	End Bearing Pressure (kPa)	Shaft Adhesion (kPa)	End Bearing Pressure (kPa)	
Clay (stiff to very stiff) and controlled fill	-	400	0	150	20
Rock – Very low strength or stronger shale or sandstone	150	3000	100	1000	100

All footing excavations should be inspected by the geotechnical consultant to confirm the design parameters adopted are appropriate for the conditions encountered and that the excavations are free of loose material and debris.

7.6 Subgrade design CBR

Based on Douglas experience of the surrounding area, it is suggested that a design CBR value ranging between 2.0% to 2.5% can be adopted for design of road and pavements. This design value will require verification testing of the actual subgrade once the road location is known and cut to fill works carried out exposing the actual pavement subgrade.

7.7 Durability design

A summary table is attached and presents the results of laboratory tests, assessments of soil aggressivity to concrete and steel, textural classification, calculated soil salinity ECe and salinity class inferred from ECe values using the method of Richards (1954).

The adopted aggressivity to concrete and steel, and salinity classifications are summarised in Table 8.

Table 8: Aggressivity and salinity classification summary

Exposure classification for concrete (AS 3600)	Exposure classification for concrete piles (AS 2159)	Exposure classification for steel piles (AS 2159)	Salinity classification (Richards 1954)
A2	Non-aggressive	Mildly aggressive	Moderately saline

The classifications given in Table 8 must be taken into account by the designer when determining durability and corrosion requirements as per AS 3600:2018 *"Concrete Structures"* (AS 3600, 2018), AS 2159:2009 *"Piling Design and Installation"* (AS 2159, 2009) and *"Precast concrete pipes" (AS 4058, 2007)* for:

- Concrete foundations and concrete structure (AS 3600).
- Concrete piles (AS 2159).
- Corrosion allowances for steel (as per AS 2159).
- Precast concrete pipes (as per AS 4058).

The above should be complementary to standard building practices.

7.8 Acid sulfate soils

Laboratory testing indicate that there is no presence of acid sulfate soils. Additionally:

- Reference to published CSIRO acid sulfate soils risk mapping (CSIRO, 2014) indicates the site is classified as having an "*extremely low probability of occurrence*";
- The elevation of the site (the lowest point being RL 81.8 m AHD) is well above the elevation (<10 m AHD) where ASS is normally encountered; and
- Field indications of acid sulfate soil conditions, such as presence of shell, jarositic horizons or substantial iron oxide mottling, were not observed during the investigation.

7.9 Drainage

Allowance should be made for the inclusion of sub-floor drainage to collect and discharge any groundwater seepage in a controlled manner. Consideration should be given to water quality if the subfloor drainage is discharged to stormwater.

Adequate surface and subsurface drainage should be installed and maintained at the site. All collected stormwater, groundwater and roof runoff should be discharged to the stormwater disposal system.

8. Conclusion

The results of the geotechnical investigation indicate that the site is underlain by fill and natural clays overlying weathered shale and sandstone. It is considered suitable for the proposed development following management, if required, of any uncontrolled fill. Comments have been provided on site preparation and earthworks, indicative design parameters, support, foundation options and geotechnical limitations relevant to the site and will be readily managed by conventional engineering design. Additional assessments and management plans stated in the SEARs for ground and groundwater conditions (i.e. groundwater impact assessment, salinity management plan and acid sulfate soils management plan) will not be required.

9. References

AS 2159. (2009). *Piling Design and Installation.* Standards Australia.

AS 2870. (2011). *Residential Slabs and Footings.* Standards Australia.

AS 3798. (2007). *Guidelines on Earthworks for Commercial and Residential Developments.* Standards Australia.

ASSMAC. (1998). *Acid Sulfate Soils Assessment Guidelines.* Acid Sulfate Soils Management Advisory Committee.

Bannerman, S. M., & Hazelton, P. A. (2011). *Soil Landscapes of the Penrith 1:100,000 Sheet report.* Office of Environment and Heritage, Sydney.

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10. **Limitations**

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 72 and 82-86 Menangle Road, Camden NSW in line with Douglas' proposal dated 19 December 2025 and acceptance received from Deborah Carlton of Homes NSW. The work was carried out under Homes NSW Infrastructure Advisory Services Contract – Short Form. This report is provided for the exclusive use of Homes NSW 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 Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas 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 Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas 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 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. Douglas 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 Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

About this Report

About this Report

October 2024

Introduction

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

Douglas' 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, Douglas 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, Douglas 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, Douglas 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, Douglas 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. Douglas 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.

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Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

Douglas Partners' reports, investigation logs, and other correspondence may use terminology which has quantitative or qualitative connotations. To remove ambiguity or uncertainty surrounding the use of such terms, the following sets of notes pages may be attached Douglas Partners' reports, depending on the work performed and conditions encountered:

- Soil Descriptions;
- Rock Descriptions; and
- Sampling, insitu testing, and drilling methodologies

In addition to these pages, the following notes generally apply to most documents.

Abbreviation Codes

Site conditions may also be presented in a number of different formats, such as investigation logs, field mapping, or as a written summary. In some of these formats textual or symbolic terminology may be presented using textual abbreviation codes or graphic symbols, and, where commonly used, these are listed alongside the terminology definition. For ease of identification in these note pages, textual codes are presented in these notes in the following style XW. Code usage conforms with the following guidelines:

- Textual codes are case insensitive, although herein they are generally presented in upper case; and
- Textual codes are contextual (i.e. the same or similar combinations of characters may be used in different contexts with different meanings (for example `PL` is used for plastic limit in the context of soil moisture condition, as well as in `PL(A)` for point load test result in the testing results column)).

Data Integrity Codes

Subsurface investigation data recorded by Douglas Partners is generally managed in a highly structured database environment, where records "span" between a top and bottom depth interval. Depth interval "gaps" between records are considered to introduce ambiguity, and, where appropriate, our practice guidelines may require contiguous data sets. Recording meaningful data is not always appropriate (for example assigning a "strength" to a concrete pavement) and the following codes may be used to maintain contiguity in such circumstances.

Term	Description	Abbreviation Code
Core loss	No core recovery	KL
Unknown	Information was not available to allow classification of the property. For example, when auguring in loose, saturated sand auger cuttings may not be returned.	UK
No data	Information required to allow classification of the property was not available. For example if drilling is commenced from the base of a hole predrilled by others	ND
Not Applicable	Derivation of the properties not appropriate or beyond the scope of the investigation. For example providing a description of the strength of a concrete pavement	NA

Graphic Symbols

Douglas Partners' logs contain a "graphic" column which provides a pictorial representation of the basic composition of the material. The symbols used are directly representing the material name stated in the adjacent "Description of Strata" column, and as such no specific graphic symbology legend has been provided in these notes.

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Soil Descriptions

Terminology
Symbols
Abbreviations

March 2024

Introduction

All materials which are not considered to be "in-situ rock" are described in general accordance with the soil description model of AS 1726-2017 Part 6.1.3, and can be broken down into the following description structure:

The "classification" comprises a two character "group symbol" providing a general summary of dominant soil characteristics. The "name" summarises the particle sizes within the soil which most influence its behaviour. The detailed description presents more information about composition, condition, structure, and origin of the soil.

Classification, naming and description of soils require the relative proportion of particles of different sizes within the whole soil mixture to be considered.

Particle size designation and Behaviour Model

Solid particles within a soil are differentiated on the basis of size.

The engineering behaviour properties of a soil can subsequently be modelled to be either "fine grained" (also known as "cohesive" behaviour) or "coarse grained" ("non cohesive" behaviour), depending on the relative proportion of fine or coarse fractions in the soil mixture.

Particle Size Designation	Particle Size (mm)	Behaviour Model	
		Behaviour	Approximate Dry Mass
Boulder	>200	Excluded from particle behaviour model as "oversize"	
Cobble	63 - 200		
Gravel[1]	2.36 - 63	Coarse	>65%
Sand[1]	0.075 - 2.36		
Silt	0.002 - 0.075	Fine	>35%
Clay	<0.002		

[1] – refer grain size subdivision descriptions below

The behaviour model boundaries defined above are not precise, and the material behaviour should be assumed from the name given to the material (which considers the particle fraction which dominates the behaviour, refer "component proportions" below), rather than strict observance of the proportions of particle sizes. For example, if a material is named a "Sandy CLAY", this is indicative that the material exhibits fine grained behaviour, even if the dry mass of coarse grained material may exceed 65%.

Component proportions

The relative proportion of the dry mass of each particle size fraction is assessed to be a "primary", "secondary", or "minor" component of the soil mixture, depending on its influence over the soil behaviour.

Component Proportion Designation	Definition[1]	Relative Proportion	
		In Fine Grained Soil	In Coarse Grained Soil
Primary	The component (particle size designation, refer above) which dominates the engineering behaviour of the soil	The clay/silt component with the greater proportion	The sand/gravel component with the greater proportion
Secondary	Any component which is not the primary, but is significant to the engineering properties of the soil	Any component with greater than 30% proportion	Any granular component with greater than 30%; or Any fine component with greater than 12%
Minor[2]	Present in the soil, but not significant to its engineering properties	All other components	All other components

[1] As defined in AS1726-2017 6.1.4.4

[2] In the detailed material description, minor components are split into two further sub-categories. Refer "identification of minor components" below.

Composite Materials

In certain situations, a lithology description may describe more than one material, for example, collectively describing a layer of interbedded sand and clay. In such a scenario, the two materials would be described independently, with the names preceded or followed by a statement describing the arrangement by which the materials co-exist. For example, "INTERBEDDED Silty CLAY AND SAND".

Soil Descriptions

Classification

The soil classification comprises a two character group symbol. The first character identifies the primary component. The second character identifies either the grading or presence of fines in a coarse grained soil, or the plasticity in a fine grained soil. Refer AS1726-2017 6.1.6 for further clarification.

Soil Name

For most soils, the name is derived with the primary component included as the noun (in upper case), preceded by any secondary components stated in an adjective form. In this way, the soil name also describes the general composition and indicates the dominant behaviour of the material.

Component [1]	Prominence in Soil Name
Primary	Noun (eg "CLAY")
Secondary	Adjective modifier (eg "Sandy")
Minor	No influence

[1] – for determination of component proportions, refer component proportions on previous page

For materials which cannot be disaggregated, or which are not comprised of rock or mineral fragments, the names "ORGANIC MATTER" or "ARTIFICIAL MATERIAL" may be used, in accordance with AS1726-2017 Table 14.

Commercial or colloquial names are not used for the soil name where a component derived name is possible (for example "Gravelly SAND" rather than "CRACKER DUST").

Materials of "fill" or "topsoil" origin are generally assigned a name derived from the primary/secondary component (where appropriate). In log descriptions this is preceded by uppercase "FILL" or "TOPSOIL". Origin uncertainty is indicated in the description by the characters (?), with the degree of uncertainty described (using the terms "probably" or "possibly" in the origin column, or at the end of the description).

Identification of minor components

Minor components are identified in the soil description immediately following the soil name. The minor component fraction is usually preceded with a term indicating the relative proportion of the component.

Minor Component Proportion Term	Relative Proportion	
	In Fine Grained Soil	In Coarse Grained Soil
With	All fractions: 15-30%	Clay/silt: 5-12% sand/gravel: 15-30%
Trace	All fractions: 0-15%	Clay/silt: 0-5% sand/gravel: 0-15%

The terms "with" and "trace" generally apply only to gravel or fine particle fractions. Where cobbles/boulders are encountered in minor proportions (generally less than about 12%) the term "occasional" may be used. This term describes the sporadic distribution of the material within the confines of the investigation excavation only, and there may be considerable variation in proportion over a wider area which is difficult to factually characterise due to the relative size of the particles and the investigation methods.

Soil Composition

Plasticity

Descriptive Term	Laboratory liquid limit range	
	Silt	Clay
Non-plastic materials	Not applicable	Not applicable
Low plasticity	≤50	≤35
Medium plasticity	Not applicable	>35 and ≤50
High plasticity	>50	>50

Note, Plasticity descriptions generally describe the plasticity behaviour of the whole of the fine grained soil, not individual fine grained fractions.

Grain Size

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

Grading

Grading Term	Particle size (mm)
Well	A good representation of all particle sizes
Poorly	An excess or deficiency of particular sizes within the specified range
Uniformly	Essentially of one size
Gap	A deficiency of a particular size or size range within the total range

Note, AS1726-2017 provides terminology for additional attributes not listed here.

Soil Condition

Moisture

The moisture condition of soils is assessed relative to the plastic limit for fine grained soils, while for coarse grained soils it is assessed based on the appearance and feel of the material. The moisture condition of a material is considered to be independent of stratigraphy (although commonly these are related), and this data is presented in its own column on logs.

Applicability	Term	Tactile Assessment	Abbreviation code
Fine	Dry of plastic limit	Hard and friable or powdery	w<PL
	Near plastic limit	Can be moulded	w=PL
	Wet of plastic limit	Water residue remains on hands when handling	w>PL
	Near liquid limit	"oozes" when agitated	w=LL
	Wet of liquid limit	"oozes"	w>LL
Coarse	Dry	Non-cohesive and free running	D
	Moist	Feels cool, darkened in colour, particles may stick together	M
	Wet	Feels cool, darkened in colour, particles may stick together, free water forms when handling	W

The abbreviation code NDF, meaning "not-assessable due to drilling fluid use" may also be used.

Note, observations relating to free ground water or drilling fluids are provided independent of soil moisture condition.

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

These concepts give an indication of how the material may respond to applied forces (when considered in conjunction with other attributes of the soil). This behaviour can vary independent of the composition of the material, and on logs these are described in an independent column and are generally mutually exclusive (i.e it is inappropriate to describe both consistency and compaction at the same time). The method by which the behaviour is described depends on the behaviour model and other characteristics of the soil as follows:

- In fine grained soils, the "consistency" describes the ease with which the soil can be remoulded, and is generally correlated against the materials undrained shear strength;
- In granular materials, the relative density describes how tightly packed the particles are, and is generally correlated against the density index;
- In anthropogenically modified materials, the compaction of the material is described qualitatively;
- In cemented soils (both natural and anthropogenic), the cemented "strength" is described qualitatively, relative to the difficulty with which the material is disaggregated; and
- In soils of extremely weathered material origin, the engineering behaviour may be governed by relic rock features, and expected behaviour needs to be assessed based the overall material description.

Quantitative engineering performance of these materials may be determined by laboratory testing or estimated by correlated field tests (for example penetration or shear vane testing). In some cases, performance may be assessed by tactile or other subjective methods, in which case investigation logs will show the estimated value enclosed in round brackets, for example (VS).

Consistency (fine grained soils)

Consistency Term	Tactile Assessment	Undrained Shear Strength (kPa)	Abbreviation Code
Very soft	Extrudes between fingers when squeezed	<12	VS
Soft	Mouldable with light finger pressure	>12 - ≤25	S
Firm	Mouldable with strong finger pressure	>25 - ≤50	F
Stiff	Cannot be moulded by fingers	>50 - ≤100	St
Very stiff	Indented by thumbnail	>100 - ≤200	VSt
Hard	Indented by thumbnail with difficulty	>200	H
Friable	Easily crumbled or broken into small pieces by hand	-	Fr

Relative Density (coarse grained soils)

Relative Density Term	Density Index	Abbreviation Code
Very loose	<15	VL
Loose	>15 - ≤35	L
Medium dense	>35 - ≤65	MD
Dense	>65 - ≤85	D
Very dense	>85	VD

Note, tactile assessment of relative density is difficult, and generally requires penetration testing, hence a tactile assessment guide is not provided.

Compaction (anthropogenically modified soil)

Compaction Term	Abbreviation Code
Well compacted	WC
Poorly compacted	PC
Moderately compacted	MC
Variably compacted	VC

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

AS1726-2017 considers weathered material to be soil if the unconfined compressive strength is less than 0.6 MPa (i.e. less than very low strength rock). These materials may be identified as "extremely weathered material" in reports and by the abbreviation code XWM on log sheets. This identification is not correlated to any specific qualitative or quantitative behaviour, and the engineering properties of this material must therefore be assessed according to engineering principles with reference to any relic rock structure, fabric, or texture described in the description.

Soil Origin

Term	Description	Abbreviation Code
Residual	Derived from in-situ weathering of the underlying rock	RS
Extremely weathered material	Formed from in-situ weathering of geological formations. Has strength of less than 'very low' as per as1726 but retains the structure or fabric of the parent rock.	XWM
Alluvial	Deposited by streams and rivers	ALV
Fluvial	Deposited by channel fill and overbank (natural levee, crevasse splay or flood basin)	FLV
Estuarine	Deposited in coastal estuaries	EST
Marine	Deposited in a marine environment	MAR
Lacustrine	Deposited in freshwater lakes	LAC
Aeolian	Carried and deposited by wind	AEO
Colluvial	Soil and rock debris transported down slopes by gravity	COL
Slopewash	Thin layers of soil and rock debris gradually and slowly deposited by gravity and possibly water	SW
Topsoil	Mantle of surface soil, often with high levels of organic material	TOP
Fill	Any material which has been moved by man	FILL
Littoral	Deposited on the lake or seashore	LIT
Unidentifiable	Not able to be identified	UID

Cobbles and Boulders

The presence of particles considered to be "oversize" may be described using one of the following strategies:

- Oversize encountered in a minor proportion (when considered relative to the wider area) are noted in the soil description; or
- Where a significant proportion of oversize is encountered, the cobbles/boulders are described independent of the soil description, in a similar manner to composite soils (described above) but qualified with "MIXTURE OF".

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

[1] Rock strength classification is based on UCS. The UCS to $I_{s(50)}$ ratio varies significantly for different rock types and specific ratios may be required for each site. The point load Index ranges shown above are as suggested in AS1726 and should not be relied upon without supporting evidence.

The following abbreviation codes are used for soil layers or seams of material "within rock" but for which the equivalent UCS strength is less than 0.6 MPa.

Scenario	Abbreviation Code
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The properties of the material encountered over this interval are described in the "Description of Strata" and soil properties columns.	SOIL
The material encountered has an equivalent UCS strength of less than 0.6 MPa, and therefore is considered to be soil (as per Note 1 of Table 20 of AS 1726-2017). The prominence of the material is such that it can be considered to be a seam (as defined in Table 22 of AS1726-2017) and the properties of the material are described in the defect column.	SEAM

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	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.	RS
Extremely weathered[1]	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	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not 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.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	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.	DW

[1] The parent rock type, of which the residual/extremely weathered material is a derivative, will be stated in the description (where discernible).

Degree of Alteration

The degree of alteration of the rock material (physical or chemical changes caused by hot gasses or liquids at depth) is classified as follows:

Term	Description	Abbreviation Code
Extremely altered	Material is altered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.	XA
Highly altered	The whole of the rock material is discoloured, usually by staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is changed by alteration. Some primary minerals are altered to clay minerals. Porosity may be increased by leaching or may be decreased due to precipitation of secondary materials in pores.	HA
Moderately altered	The whole of the rock material is discoloured, usually by 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.	MA
Slightly altered	Rock is slightly discoloured but shows little or no change of strength from fresh rock	SA
Note: If HA and MA cannot be differentiated use DA (see below)		
Distinctly altered	Rock strength usually changed by alteration. The rock may be highly discoloured, usually by staining or bleaching. Porosity may be increased by leaching or may be decreased due to precipitation of secondary minerals in pores.	DA

Degree of Fracturing

The following descriptive classification apply to the spacing of natural occurring fractures in the rock mass. It includes bedding plane partings, joints and other defects, but excludes drilling breaks. These terms are generally not required on investigation logs where fracture spacing is presented as a histogram, and where used are presented in an unabbreviated format.

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:

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

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

These terms may be used to describe the spacing of bedding partings in sedimentary rocks. Where used, these terms are generally presented in an unabbreviated format

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

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Cleavage	CL
Crushed seam	CS
Crushed zone	CZ
Drilling break	DB
Decomposed seam	DS
Drill lift	DL
Extremely Weathered seam	EW
Fault	F
Fracture	FC
Fragmented	FG
Handling break	HB
Infilled seam	IS
Joint	JT
Lamination	LAM
Shear seam	SS
Shear zone	SZ
Vein	VN
Mechanical break	MB
Parting	P
Sheared Surface	S

Rock Defect Orientation

Term	Abbreviation Code
Horizontal	H
Vertical	V
Sub-horizontal	SH
Sub-vertical	SV

Rock Defect Coating

Term	Abbreviation Code
Clean	CN
Coating	CT
Healed	HE
Infilled	INF
Stained	SN
Tight	TI
Veneer	VNR

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN
Pyrite	Py
Secondary material	MS
Silt	M
Quartz	Qz
Unidentified material	MU

Rock Defect Shape/Planarity

Term	Abbreviation Code
Curved	CU
Discontinuous	DIS
Irregular	IR
Planar	PR
Stepped	ST
Undulating	UN

Rock Defect Roughness

Term	Abbreviation Code
Polished	PO
Rough	RF
Smooth	SM
Slickensided	SL
Very rough	VR

Defect Orientation

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

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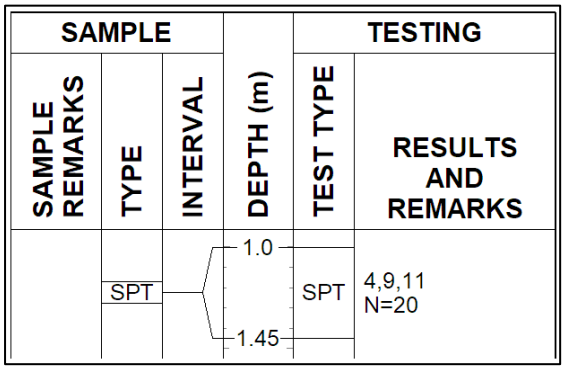
Sampling, Testing and Excavation Methodology

Terminology
Symbols
Abbreviations

October 2024

Sampling and Testing

A record of samples retained, and field testing performed is usually shown on a Douglas Partners' log with samples appearing to the left of a depth scale, and selected field and laboratory testing (including results, where relevant) appearing to the right of the scale, as illustrated below:



Sampling

The type or intended purpose for which a sample was taken is indicated by the following abbreviation codes.

Sample Type	Code
Auger sample	A
Acid Sulfate sample	ASS
Bulk sample	B
Core sample	C
Disturbed sample	D
Environmental sample	ES
Driven Tube sample	DT
Gas sample	G
Piston sample	P
Sample from SPT test	SPT
Undisturbed tube sample	U[1]
Water sample	W
Material Sample	MT
Core sample for unconfined compressive strength testing	UCS

[1] – numeric suffixes indicate tube diameter/width in mm

The above codes only indicate that a sample was retained, and not that testing was scheduled or performed.

Field and Laboratory Testing

A record that field and laboratory testing was performed is indicated by the following abbreviation codes.

Test Type	Code
Pocket penetrometer (kPa)	PP
Photo ionisation detector (ppm)	PID
Standard Penetration Test x/y =x blows for y mm penetration HB = hammer bouncing HW = fell under weight of hammer	SPT
Shear vane (kPa)	V
Unconfined compressive strength, (MPa)	UCS

Field and laboratory testing (continued)

Test Type	Code
Point load test, (MPa), axial (A), diametric (D), irregular (I)	PLT(_)
Dynamic cone penetrometer, followed by blow count penetration increment in mm (cone tip, generally in accordance with AS1289.6.3.2)	DCP9/150
Perth sand penetrometer, followed by blow count penetration increment in mm (flat tip, generally in accordance with AS1289.6.3.3)	PSP/150

Groundwater Observations

▷	seepage/inflow
▽	standing or observed water level
NFGWO	no free groundwater observed
OBS	observations obscured by drilling fluids

Drilling or Excavation Methods/Tools

The drilling/excavation methods used to perform the investigation may be shown either in a dedicated column down the left-hand edge of the log, or stated in the log footer. In some circumstances abbreviation codes may be used.

Method	Abbreviation Code
Direct Push	DP
Solid flight auger. Suffixes: /T = tungsten carbide tip, /V = v-shaped tip	AD[1]
Air Track	AT
Diatube	DT[1]
Hand auger	HA[1]
Hand tools (unspecified)	HAND
Existing exposure	X
Hollow flight auger	HSA[1]
HQ coring	HQ3
HMLC series coring	HMLC
NMLC series coring	NMLC
NQ coring	NQ3
PQ coring	PQ3
Predrilled	PD
Push tube	PT[1]
Ripping tyne/ripper	R
Rock roller	RR[1]
Rock breaker/hydraulic hammer	EH
Sonic drilling	SON[1]
Mud/blade bucket	MB[1]
Toothed bucket	TB[1]
Vibrocore	VC[1]
Vacuum excavation	VE
Wash bore (unspecified bit type)	WB[1]

[1] – numeric suffixes indicate tool diameter/width in mm

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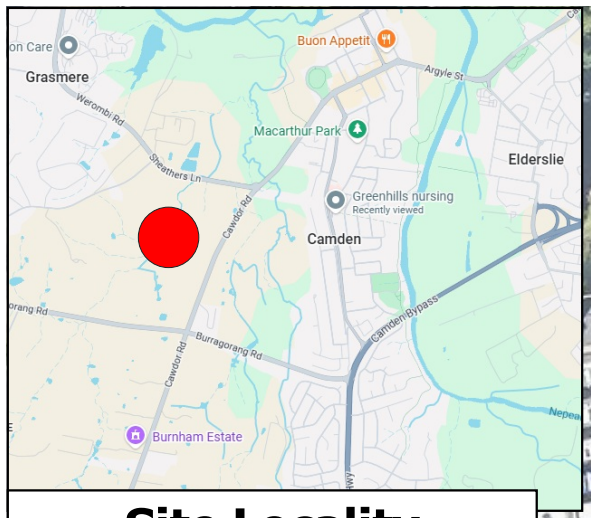
Appendix B

Drawing 1: Test Location Plan

Borehole logs (Bores 101 – 110)



Site Locality

Douglas PARTNERS | GROUNDED EXPERTISE

TITLE: **Test location plan**
Proposed residential development
72 and 82-86 Menangle Road, Camden NSW

N
MGA

OFFICE: Macarthur
DRAWN BY: JOR
DATE: 29/05/2026

CLIENT: Homes NSW
PROJ. #: 239951.01
DRAWING No: 1
REVISION: 1
SCALE: 1:650@A3

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 83.7 AHD
COORDINATE: E:287220.8, N:6228443.8
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 101
PROJECT No: 239951.01
DATE: 23/02/26
SHEET: 1 of 1

CONDITIONS ENCOUNTERED												SAMPLE				TESTING	
				SOIL				ROCK									
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	ORIGIN(#)	CONSIS.(*) DENSITY.(*)	MOISTURE	WEATH.	DEPTH (m)	ESTIMATED STRENGTH		SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
23/02/26 No free groundwater observed	83	0.20	FILL / TOPSOIL: Silty CLAY (CL-CI): brown; low to medium plasticity; trace fine to coarse gravel and rootlets.	TS	FILL	NA							ES		0.10		
			Silty CLAY (CH): pale brown ; high plasticity; trace fine to medium gravel.			St - VSt							A/D/ES		0.50		
													U50		0.66		
	82	1	From 1.10m: with extremely weathered to highly weathered shale bands		RS		w<PL						D		1.00	DCP9/150	5 10 15
			From 1.60m: grading to pale grey and pale brown			VSt to H							A/D		1.50		
		2											D		2.00		
	81	2.70	SHALE: grey. Bringelly Shale.					XW	2.70	VL			A/D		2.50		
		3											D		3.00		
	80		Borehole discontinued at 3.50m depth. Refusal on low strength shale.										A/D		3.50		
		4															
	79																

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hyundai 60CR9
METHOD: AD/T to 3.5m
REMARKS:

OPERATOR: Quake Excavations

LOGGED: SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 86.2 AHD
COORDINATE: E:287192.1, N:6228444.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 102
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(^) DENSITY.(^)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	TESTING DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
23/02/26 No free groundwater observed	86	0.20	FILL / TOPSOIL: Silty CLAY (CI-CH): brown; medium to high plasticity; trace fine gravel and rootlets.	TS	FILL	NA						ES		0.10				
			FILL / Silty CLAY (CI); medium plasticity; trace fine to medium gravel and rootlets, poorly compacted.		FILL	PC						A/D/ES		0.50				
		1										D/ES		1.00				
	85	1.30										SPT			SPT	4,4,3 N=7		
			Silty CLAY (CI-CH): red-brown and brown; medium to high plasticity; trace fine to medium gravel.			St	w<PL					A/D/ES		1.45				
			From 1.70m: grading to pale grey and pale brown															
		2	From 2.00m: with extremely weathered to highly weathered shale bands and sand		RS							D/ES		2.00				
	84					VSt						A/D		2.50				
												SPT			SPT	12,9,8 N=17		
		3.00	SHALE: grey and pale brown. Bringelly Shale.					XW - HW	3.00	VL		A/D		2.95 3.00				
	83											A/D		3.50				
		4							4.00	VL to L		SPT		4.00	SPT	12,16/150mm (HB)		
	82		Borehole discontinued at 4.30m depth. Refusal on low strength shale.											4.30				

NOTES: (#)Soil origin is "probable" unless otherwise stated. (^)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: MD 300
METHOD: AD/T to 4.3m
REMARKS:

OPERATOR: Traccess

LOGGED: AS
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 83.8 AHD
COORDINATE: E:287208.6, N:6228432.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 103
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed			FILL / TOPSOIL: Silty CLAY (CL-CI): dark brown; low to medium plasticity; trace fine to coarse gravel, with rootlets.	TS	FILL	NA	w=PL					ES		0.10		
		0.35	FILL / Gravelly SAND: dark grey; with fine to medium gravel, fine grained, poorly compacted.		FILL	PC	M									
		0.50	Silty CLAY (CH): brown; high plasticity; trace rootlets Below 0.8m: grading to pale brown.			St	w<PL - w=PL					A/D/ES U50		0.50 0.69		
	83	1			RS		w<PL					D		1.00		
	82	2.00	SHALE: pale grey; with clay bands. Bringelly Shale.			VSt		XW	2.00	VL		D		1.50 2.00	PP	280-340kPa
			Borehole discontinued at 2.10m depth. Refusal on low strength shale.													
	81	3														
	80	4														
	79															

DCP9/150 — 5 10 15

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hyundai 60CR9
METHOD: AD/T to 2.1m
REMARKS:

OPERATOR: Quake Excavations

LOGGED: AS
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 87.0 AHD
COORDINATE: E:287147.3, N:6228391.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 104
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	TESTING DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed		0.20	FILL / TOPSOIL: Clayey SILT (ML): dark brown; low plasticity; trace fine gravel and rootlets.	TS	FILL	NA						ES		0.10		
			FILL / Silty CLAY (CH): brown and orange-brown; high plasticity; trace fine to coarse gravel, well compacted .		FILL	WC	w<PL					A/D/ES		0.50	DCP9/150	5 10 15
		0.80	Sandy CLAY (CI-CH): pale brown; medium to high plasticity; trace fine to medium gravel, with extremely weathered to highly weathered sandstone bands.		RS	VSt - H						D/ES		1.00		
	86 1	1.10	SANDSTONE: orange-brown and grey. Bringelly Shale.					XW - HW	1.10	VL - L					SPT	9,13,14 N=27
			Borehole discontinued at 1.50m depth. Refusal on low strength shale.													
	85 2															
	84 3															
	83 4															
	2															

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: MD 300
METHOD: AD/T to 1.5m
REMARKS: Grass cover

OPERATOR: Traccess

LOGGED: AS
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 83.5 AHD
COORDINATE: E:287195.2, N:6228410.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 105
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed	83	0.10	FILL / TOPSOIL: Clayey SILT (ML): dark brown; low plasticity; trace fine to coarse gravel, with rootlets.		FILL	NA						ES		0.10		
			FILL / Clayey SILT (CI): brown and orange-brown; medium plasticity; trace fine to coarse gravel and rootlets, well compacted.		FILL	WC						A/D/ES		0.50	DCP9/150	5 10 15
		1										D/ES		1.00		
	82	1.10	Silty CLAY (CI-CH): pale brown; medium to high plasticity; trace fine to medium gravel.			F - St	w<PL					A/D		1.50	SPT	4,4,3 N=7
			From 1.80m: grading to pale grey and orange		RS	St						D		2.00		
			From 2.50m: with extremely weathered to highly weathered shale bands			VSt						A/D		2.50	SPT	7,9,13 N=22
	81	2.80	SHALE: grey and pale brown. Bringelly Shale.					XW - HW	2.80	VL - L		SPT		2.95		
		3	Borehole discontinued at 3.00m depth. Refusal on low strength shale.									D		3.00		
	80	4														
	79															

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: MD 300
METHOD: AD/T to 3m
REMARKS: Mulch cover

OPERATOR: Traccess

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 82.2 AHD
COORDINATE: E:287160.7, N:6228309.7
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 106
PROJECT No: 239951.01
DATE: 23/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed	82	0.20	FILL / TOPSOIL: Silty CLAY (CL-CI): dark brown; low to medium plasticity; trace fine to medium gravel and rootlets.	TS	FILL	NA						ES		0.10	DCP9/150	5 10 15
		0.40	FILL / Silty CLAY (CL-CI): brown; low to medium plasticity; trace fine to medium gravel, well compacted.		FILL	WC						A/D/ES		0.50		
			Silty CLAY (CH): brown; high plasticity; trace fine to medium gravel									U50		0.65		
		1	From 0.7m: grading to pale brown, with extremely weathered to highly weathered shale bands.		RS	St - VSt	w<PL					D		1.00		
	81	1.30	SHALE: pale brown. Bringelly Shale.					XW - HW	1.30	VL						
			Borehole discontinued at 1.50m depth. Refusal on low strength shale.									D		1.50		
		2														
	80															
		3														
	79															
		4														
	78															

NOTES: (#) Soil origin is "probable" unless otherwise stated. (*) Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hyundai 60CR9
METHOD: AD/T to 1.5m
REMARKS:

OPERATOR: Quake Excavations

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 83.8 AHD
COORDINATE: E:287175.2, N:6228381.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 107
PROJECT No: 239951.01
DATE: 23/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed		0.10	ASPHALT.		FILL	NA	NA					ES		0.10	DCP9/150	5 10 15
			FILL / Silty CLAY (CL-CI): brown; low to medium plasticity; trace fine to coarse gravel, well compacted.		FILL	WC						A/D/ES		0.50		
	83	0.70	Silty CLAY (CI-CH): brown and red-brown; medium to high plasticity; trace fine to medium gravel.									D/ES		1.00		
		1	From 1.30m: grading to pale brown				w<PL									
			From 1.80m: grading to pale brown and pale grey		RS	St - VSt						D		1.50		
	82	2	From 2.10m: with extremely weathered to highly weathered shale bands									D		2.00		
		2.40	SHALE: pale brown. Bringelly Shale.					XW - HW	2.40	VL		D		2.50		
	81	3	Borehole discontinued at 3.00m depth. Refusal on low strength shale.									D		3.00		
	80	4														
	79															

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hyundai 60CR9
METHOD: AD/T to 3m
REMARKS: Asphalt cover

OPERATOR: Quake Excavations

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 84.5 AHD
COORDINATE: E:287142.7, N:6228308.9
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 108
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed	84	0.20	FILL / TOPSOIL: Clayey SILT (ML): brown; low plasticity; trace rootlets.	TS	FILL	NA						ES		0.10	DCP9/150	5 10 15
			Sandy CLAY (CH): pale brown; high plasticity; trace fine gravel.		RS	St	w<PL					A/D/ES		0.50		
		0.70	SANDSTONE: pale brown. Bringelly Shale.			H		HW	0.70	VL						15/100mm
	83	1	Borehole discontinued at 0.90m depth. Refusal on low strength sandstone.													
	82	2														
	81	3														
	80	4														

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: Hyundai 60CR9
METHOD: AD/T to 0.9m
REMARKS: Grass cover

OPERATOR: Quake Excavations

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 81.8 AHD
COORDINATE: E:287164.9, N:6228283.6
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 109
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS	BACKFILL	WELL PIPE
23/02/26 No free groundwater observed	81	0.20	FILL / TOPSOIL: Silty CLAY (CL): brown; low plasticity; trace fine to coarse gravel and rootlets.	TS	FILL	NA						ES		0.10				
			Silty CLAY (CH): red-brown; high plasticity; trace fine to medium gravel.			St						A/D/ES		0.50	DCP9/150	5 10 15		
	80	1	From 1.10m: grading to pale brown and grey, with extremely weathered to highly weathered shale bands		RS	VSt	w=PL					D		1.00	SPT	12,11,13 N=24		
												SPT						
												A/D		1.45				
		2	From 2.50m: trace ironstone bands									D		2.00				
	79	2.80	SHALE: pale brown and grey. Bringelly Shale.					XW - HW	2.80	VL		A/D		2.50	SPT	9,13,17 N=30		
		3										SPT		2.95				
	78	4	Borehole discontinued at 3.50m depth. Refusal on low strength shale.															
	77																	

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: MD 300
METHOD: AD/T to 3m
REMARKS: Grass cover

OPERATOR: Traccess

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Homes NSW
PROJECT: Proposed Residential Development
LOCATION: 72 and 82-86 Menangle Road, Camden NSW

SURFACE LEVEL: 81.8 AHD
COORDINATE: E:287174.9, N:6228328.2
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: 110
PROJECT No: 239951.01
DATE: 19/02/26
SHEET: 1 of 1

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	SOIL ORIGIN(#)	SOIL CONSIS.(*) DENSITY.(*)	SOIL MOISTURE	ROCK WEATH.	ROCK DEPTH (m)	ROCK ESTIMATED STRENGTH	SAMPLE REMARKS	SAMPLE TYPE	SAMPLE INTERVAL	SAMPLE DEPTH (m)	TESTING TEST TYPE	TESTING RESULTS AND REMARKS
23/02/26 No free groundwater observed		0.20	FILL / TOPSOIL: Clayey SILT (ML): dark brown; low plasticity; trace rootlets.	TS	FILL	NA						ES		0.10		
		0.40	FILL / Silty CLAY (CL-CI): brown; low to medium plasticity; trace fine gravel and sand, well compacted.		FILL	WC										
	81	1	Silty CLAY (CH): brown; high plasticity; trace fine to medium gravel.			St	w>PL					A/D/ES		0.50	DCP9/150	5 10 15
			From 1.10m: grading to pale grey and orange-brown, with extremely weathered shale bands		RS									1	SPT	3,5,7 N=12
	80	2										A/D		1.50		
		2.10	SHALE: grey; with clay bands. Bringelly Shale.					XW - HW	2.10	VL		D		2.00		
	79	3	Borehole discontinued at 3.00m depth. Refusal on low strength shale.									A/D		2.50	SPT	10,9,16 N=25
	78	4														
	77															

NOTES: (#)Soil origin is "probable" unless otherwise stated. (*)Consistency/Relative density shading is for visual reference only - no correlation between cohesive and granular materials is implied.

PLANT: MD 300
METHOD: AD/T to 3m
REMARKS: Grass cover

OPERATOR: Traccess

LOGGED: AS/SC
CASING: Uncased

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Soil with Simple Rock Log

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Appendix C

Laboratory results

Salinity summary – Table C1

Material Test Report

Douglas Partners Pty Ltd
Macarthur Laboratory
18 Waler Crescent Smeaton Grange NSW 2567
Phone: (02) 4647 0075
Email: meregal.henakaa@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Report Number: **227992.05-2**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Corected the project number*
Date Issued: 19/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18336
Sample Number: MA-18336AI
Client Sample #: 102
Date Sampled: 23/02/2026
Dates Tested: 03/03/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **102 (1.5 m)**
Material: Silty CLAY, red-brown

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	As above		
Nature of Water	Distilled water		

Material Test Report

Douglas Partners Pty Ltd
Macarthur Laboratory
18 Waler Crescent Smeaton Grange NSW 2567
Phone: (02) 4647 0075
Email: meregal.henakaa@douglaspartners.com.au

Accredited for compliance with ISO/IEC 17025 - Testing

Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Report Number: **227992.05-2**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Corected the project number*
Date Issued: 19/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18336
Sample Number: MA-18336AJ
Client Sample #: 109
Date Sampled: 23/02/2026
Dates Tested: 03/03/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **109 (1.0 m)**
Material: Silty CLAY, red-brown

Emerson Class Number of a Soil (AS 1289 3.8.1)		Min	Max
Emerson Class	**2**		
Soil Description	As above		
Nature of Water	Distilled water		

Material Test Report

Report Number: **227992.05-2**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Corected the project number*
Date Issued: 19/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18336
Date Sampled: 23/02/2026
Dates Tested: 03/03/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Location: 70-78 and 82-86 Menangle Road, Camden

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Determination of pH of Soil (In-House) DP MAC1

Sample Number	Location	Depth (m)	Material	pH Value
MA-18336A	101	0.5	Soil	6.8
MA-18336B	101	2.0	Soil	8.8
MA-18336C	101	3.0	Soil	8.8
MA-18336D	102	0.5	Soil	7.5
MA-18336E	102	1.0	Soil	7.1
MA-18336F	102	1.5	Soil	9.0
MA-18336G	102	2.0	Soil	7.4
MA-18336H	102	2.5	Soil	8.5
MA-18336I	102	3.0	Soil	8.6
MA-18336J	102	3.5	Soil	8.6
MA-18336K	102	4.0 - 4.3	Soil	8.4
MA-18336L	103	0.5	Soil	7.8
MA-18336M	103	1.0	Soil	8.8
MA-18336N	103	2.0	Soil	8.9
MA-18336O	104	1.0	Soil	6.6
MA-18336P	104	1.0 - 1.45	Soil	8.1
MA-18336Q	105	0.5	Soil	7.2
MA-18336R	105	1.0	Soil	8.4
MA-18336S	105	1.5	Soil	8.4
MA-18336T	105	2.0	Soil	6.7
MA-18336U	105	2.5	Soil	8.7
MA-18336V	105	3.0	Soil	8.4
MA-18336W	106	0.5	Soil	6.6
MA-18336X	106	1.0	Soil	7.7
MA-18336Y	106	1.5	Soil	8.6
MA-18336Z	107	1.5	Soil	8.7
MA-18336AA	107	2.0	Soil	9.0
MA-18336AB	107	2.5	Soil	8.8
MA-18336AC	107	3.0	Soil	8.6
MA-18336AD	109	1.0	Soil	8.1
MA-18336AE	109	2.0	Soil	8.4

Sample Number	Location	Depth (m)	Material	pH Value
MA-18336AF	110	1.5	Soil	8.3
MA-18336AG	110	2.0	Soil	8.7
MA-18336AH	110	2.5	Soil	8.7

Material Test Report

Report Number: **227992.05-2**
Issue Number: 2 - *This version supersedes all previous issues*
Reissue Reason: *Corected the project number*
Date Issued: 19/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18336
Date Sampled: 23/02/2026
Dates Tested: 03/03/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Location: 70-78 and 82-86 Menangle Road, Camden

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Determination of EC of Soil (In-House) DP MAC2

Sample Number	Location	Depth (m)	Material	EC Value (µS/cm)
MA-18336A	101	0.5	Soil	123.50
MA-18336B	101	2.0	Soil	564.30
MA-18336C	101	3.0	Soil	413.10
MA-18336D	102	0.5	Soil	106.80
MA-18336E	102	1.0	Soil	58.70
MA-18336F	102	1.5	Soil	237.70
MA-18336G	102	2.0	Soil	276.80
MA-18336H	102	2.5	Soil	91.50
MA-18336I	102	3.0	Soil	268.40
MA-18336J	102	3.5	Soil	186.60
MA-18336K	102	4.0 - 4.3	Soil	165.20
MA-18336L	103	0.5	Soil	98.10
MA-18336M	103	1.0	Soil	315.40
MA-18336N	103	2.0	Soil	439.70
MA-18336O	104	1.0	Soil	71.10
MA-18336P	104	1.0 - 1.45	Soil	498.30
MA-18336Q	105	0.5	Soil	102.80
MA-18336R	105	1.0	Soil	478.90
MA-18336S	105	1.5	Soil	433.90
MA-18336T	105	2.0	Soil	384.80
MA-18336U	105	2.5	Soil	353.40
MA-18336V	105	3.0	Soil	368.20
MA-18336W	106	0.5	Soil	40.60
MA-18336X	106	1.0	Soil	92.70
MA-18336Y	106	1.5	Soil	149.40
MA-18336Z	107	1.5	Soil	260.70
MA-18336AA	107	2.0	Soil	316.20
MA-18336AB	107	2.5	Soil	333.20
MA-18336AC	107	3.0	Soil	369.80
MA-18336AD	109	1.0	Soil	136.60
MA-18336AE	109	2.0	Soil	322.50

Sample Number	Location	Depth (m)	Material	EC Value (µS/cm)
MA-18336AF	110	1.5	Soil	238.70
MA-18336AG	110	2.0	Soil	334.80
MA-18336AH	110	2.5	Soil	368.10

Material Test Report

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Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315D
Client Sample #:	102
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**102 , Depth: 0.5 m**
Material:	FILL/ Silty CLAY, brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	38		
Plastic Limit (%)	18		
Plasticity Index (%)	**20**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**9.0**		
Cracking Crumbling Curling	Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	13.8		

Material Test Report

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Laboratory Accreditation Number: 828

Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315E
Client Sample #:	104
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**104 , Depth: 0.5 m**
Material:	FILL/ Silty CLAY, brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	51		
Plastic Limit (%)	20		
Plasticity Index (%)	**31**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**10.0**		
Cracking Crumbling Curling	Cracking & Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	14.8		

Material Test Report

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Report Number: **239951.01-1**
Issue Number: 1
Date Issued: 26/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18315
Sample Number: MA-18315F
Client Sample #: 105
Date Sampled: 23/02/2026
Dates Tested: 26/02/2026 - 23/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location: **105 , Depth: 0.5 m**
Material: FILL/ Clayey SILT, brown

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

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**11.5**		
Cracking Crumbling Curling	Cracking & Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	11.2		

Material Test Report

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Laboratory Accreditation Number: 828

Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315G
Client Sample #:	107
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**107 , Depth: 1.0 m**
Material:	Silty CLAY, red brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	57		
Plastic Limit (%)	22		
Plasticity Index (%)	**35**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**13.0**		
Cracking Crumbling Curling	Cracking & Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	21.2		

Material Test Report

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Senior Technician
Laboratory Accreditation Number: 828

Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315H
Client Sample #:	108
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**108 , Depth: 0.5 m**
Material:	Sandy CLAY, pale brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	54		
Plastic Limit (%)	21		
Plasticity Index (%)	**33**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**15.0**		
Cracking Crumbling Curling	Cracking & Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	10.6		

Material Test Report

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Laboratory Accreditation Number: 828

Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315I
Client Sample #:	109
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**109 , Depth: 0.5 m**
Material:	Silty CLAY, brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	61		
Plastic Limit (%)	23		
Plasticity Index (%)	**38**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**16.5**		
Cracking Crumbling Curling	Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	21.0		

Material Test Report

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Senior Technician
Laboratory Accreditation Number: 828

Report Number:	**239951.01-1**
Issue Number:	1
Date Issued:	26/03/2026
Client:	Homes NSW
	Locked Bag 5000, Parramatta
Contact:	Deborah Carlton
Project Number:	239951.01
Project Name:	Proposed Residential Development
Project Location:	70-78 and 82-86 Menangle Road, Camden NSW
Work Request:	18315
Sample Number:	MA-18315J
Client Sample #:	110
Date Sampled:	23/02/2026
Dates Tested:	26/02/2026 - 23/03/2026
Sampling Method:	Sampled by Engineering Department
	The results apply to the sample as received
Preparation Method:	AS 1289.1.1 - Sampling and Preparation of Soils
Sample Location:	**110 , Depth: 0.5 m**
Material:	Silty CLAY, brown

Atterberg Limit (AS1289 3.1.2 & 3.2.1 & 3.3.1)		Min	Max
Sample History	Air Dried		
Preparation Method	Dry Sieve		
Liquid Limit (%)	52		
Plastic Limit (%)	20		
Plasticity Index (%)	**32**		

Linear Shrinkage (AS1289 3.4.1)		Min	Max
Moisture Condition Determined By	AS 1289.3.1.2		
Linear Shrinkage (%)	**15.0**		
Cracking Crumbling Curling	Cracking & Curling		

Moisture Content (AS 1289 2.1.1)		Min	Max
Moisture Content (%)	24.9		

Material Test Report

Report Number: **239951.01-1**
Issue Number: 1
Date Issued: 26/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18315
Date Sampled: 23/02/2026
Dates Tested: 26/02/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Location: 70-78 and 82-86 Menangle Road, Camden

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Determination of pH of Soil (In-House) DP MAC1

Sample Number	Location	Depth (m)	Material	pH Value
MA-18315K	101	0.5	Soil	7.3
MA-18315L	102	0.5	Soil	7.4
MA-18315M	104	0.5	Soil	6.9
MA-18315N	108	0.5	Soil	7.7
MA-18315O	109	0.5	Soil	8.2
MA-18315P	101	1.5	Soil	8.9
MA-18315Q	101	2.5	Soil	8.7
MA-18315R	101	3.5	Soil	8.7
MA-18315S	109	1.5	Soil	8.2
MA-18315T	109	2.5 - 2.95	Soil	8.7

Material Test Report

Report Number: **239951.01-1**
Issue Number: 1
Date Issued: 26/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18315
Date Sampled: 23/02/2026
Dates Tested: 26/02/2026 - 17/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Location: 70-78 and 82-86 Menangle Road, Camden

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Determination of EC of Soil (In-House) DP MAC2				
Sample Number	Location	Depth (m)	Material	EC Value (µS/cm)
MA-18315K	101	0.5	Soil	98.20
MA-18315L	102	0.5	Soil	107.40
MA-18315M	104	0.5	Soil	58.60
MA-18315N	108	0.5	Soil	156.40
MA-18315O	109	0.5	Soil	202.80
MA-18315P	101	1.5	Soil	396.20
MA-18315Q	101	2.5	Soil	483.60
MA-18315R	101	3.5	Soil	313.90
MA-18315S	109	1.5	Soil	163.20
MA-18315T	109	2.5 - 2.95	Soil	218.40

Material Test Report

Report Number: **239951.01-1**
Issue Number: 1
Date Issued: 26/03/2026
Client: Homes NSW
Locked Bag 5000, Parramatta
Contact: Deborah Carlton
Project Number: 239951.01
Project Name: Proposed Residential Development
Project Location: 70-78 and 82-86 Menangle Road, Camden NSW
Work Request: 18315
Date Sampled: 23/02/2026
Dates Tested: 26/02/2026 - 05/03/2026
Sampling Method: Sampled by Engineering Department
The results apply to the sample as received
Preparation Method: AS 1289.1.1 - Sampling and Preparation of Soils
Location: 70-78 and 82-86 Menangle Road, Camden

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Approved Signatory: Nilusha Arachchi
Senior Technician
Laboratory Accreditation Number: 828

Shrink Swell Index AS 1289 7.1.1 & 2.1.1					
Sample Number	MA-18315A	MA-18315B	MA-18315C		
Date Sampled	23/02/2026	23/02/2026	23/02/2026		
Date Tested	02/03/2026	02/03/2026	05/03/2026		
Material Source	**	**	**		
Sample Location	101 (0.5 - 0.66 m)	103 (0.5 - 0.69 m)	106 (0.5 - 0.65 m)		
Inert Material Estimate (%)	1	2	1		
Pocket Penetrometer before (kPa)	520	270	330		
Pocket Penetrometer after (kPa)	430	200	210		
Shrinkage Moisture Content (%)	20.4	24.3	21.6		
Shrinkage (%)	**4.0**	**6.1**	**4.6**		
Swell Moisture Content Before (%)	17.0	17.5	22.5		
Swell Moisture Content After (%)	23.2	22.8	30.3		
Swell (%)	**3.4**	**0.0**	**5.7**		
Shrink Swell Index Iss (%)	**3.2**	**3.4**	**4.1**		
Visual Description	Silty CLAY, pale brown	Silty CLAY, pale brown	Silty CLAY, pale brown		
Cracking	SC	SC	SC		
Crumbling	No	No	No		
Remarks	**	**	**		

Shrink Swell Index (Iss) reported as the percentage vertical strain per pF change in suction.
Cracking Terminology: UC Uncracked, SC Slightly Cracked, MC Moderately Cracked, HC Highly Cracked, FR Fragmented.
Scope of accreditation does not cover the performance of pocket penetrometer readings.

Table C1: Summary Table - Laboratory Tests and Assessments

Test Location	Sample Depth	pH	Chloride Concentration	Sulphate Concentration	Resistivity	Soil Condition	Sample Aggressivity Class					Exchangeable Sodium (Na) Concentration	Cation Exchange Capacity	Sodicity	Sodicity Class	Emerson Class Number	Dispersion?	Soil Texture Group	Textural Factor (M)	$EC_{1:5}$	EC_e	Exposure Classification	Sample Salinity Class
					By inversion of EC1:5		Aggr. to Concrete - from sample pH	Aggr. to Concrete - from Sulphate conc.	Aggr. to Steel - from sample pH	Aggr. to Steel - from Chloride conc.	Aggr. to Steel - from sample Resistivity			[Na/CEC]			(from Emerson Class)	(for detailed soil logs see Report Appendix)		[Lab.]	[M x $EC_{1:5}$]		(Based on sample ECe)
	(m bgl)	(pH units)	(mg/kg)	(mg/kg)	Ωcm	[AS2159-2009]	[AS2159-2009]					(meq/100g)	(meq/100g)	(%)	[after DLWC]		[AS1289.3.8.1]	[after DLWC]	[after DLWC]	(micro S/cm)	(deci S/m)	[AS3600.4.8.2]	[Richards 1954]
101	0.5	7.3	47	34	10183	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	0.3	8	4	Non-Sodic			Medium clay	7	98.2	0.7	A1	Non-Saline
101	1.5	8.9	120	54	2524	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light medium clay	8	396.2	3.2	A1	Slightly Saline
101	2.5	8.7	640	91	2068	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Heavy clay	6	483.6	2.9	A1	Slightly Saline
101	3.5	8.7	230	97	3186	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Medium clay	7	313.9	2.2	A1	Slightly Saline
101	0.5	6.8			8097	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	123.5	1.0	A1	Non-Saline
101	2	8.8			1772	B	Non-Aggressive		Non-Aggressive		Mild							Clay loam	9	564.3	5.1	A2	Moderately Saline
101	3	8.8			2421	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	413.1	3.5	A1	Slightly Saline
102	0.5	7.4	10	30	9311	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Medium clay	7	107.4	0.8	A1	Non-Saline
102	0.5	7.5			9363	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	106.8	0.9	A1	Non-Saline
102	1	7.1	23	24	17036	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light clay	8.5	58.7	0.5	A1	Non-Saline
102	1.5	9			4207	B	Non-Aggressive		Non-Aggressive		Non-Aggressive					2	Some	Clay loam	9	237.7	2.1	A1	Slightly Saline
102	2	7.4			3613	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	276.8	2.5	A1	Slightly Saline
102	2.5	8.5			10929	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	91.5	0.8	A1	Non-Saline
102	3	8.6			3726	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	268.4	2.3	A1	Slightly Saline
102	3.5	8.6			5359	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	186.6	1.7	A1	Non-Saline
102	4.0 - 4.3	8.4			6053	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	165.2	1.5	A1	Non-Saline
103	0.5	7.8	20	61	10194	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light medium clay	8	98.1	0.8	A1	Non-Saline
103	1	8.8			3171	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light medium clay	8	315.4	2.5	A1	Slightly Saline
103	2	8.9	430	54	2274	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Loam	10	439.7	4.4	A2	Moderately Saline
104	0.5	6.9	10	80	17065	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light medium clay	8	58.6	0.5	A1	Non-Saline
104	1	6.6			14065	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	71.1	0.6	A1	Non-Saline
104	1.0 - 1.45	8.1			2007	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	498.3	4.2	A2	Moderately Saline
105	0.5	7.2	20	140	9728	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light medium clay	8	102.8	0.8	A1	Non-Saline
105	1	8.4			2088	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	478.9	4.3	A2	Moderately Saline
105	1.5	8.4			2305	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	433.9	3.7	A1	Slightly Saline
105	2	6.7			2599	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	384.8	3.5	A1	Slightly Saline
105	2.5	8.7			2830	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Loam	10	353.4	3.5	A1	Slightly Saline
105	3	8.4			2716	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Medium clay	7	368.2	2.6	A1	Slightly Saline
106	0.5	6.6	10	23	24631	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Light medium clay	8	40.6	0.3	A1	Non-Saline
106	1	7.7			10787	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light medium clay	8	92.7	0.7	A1	Non-Saline
106	1.5	8.6			6693	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Loam	10	149.4	1.5	A1	Non-Saline
107	1.5	8.7	10	30	3836	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Clay loam	9	260.7	2.3	A1	Slightly Saline
107	2	9			3163	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Loam	10	316.2	3.2	A1	Slightly Saline
107	2.5	8.8			3001	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	333.2	2.8	A1	Slightly Saline
107	3	8.6			2704	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	369.8	3.3	A1	Slightly Saline
108	0.5	7.7	71	30	6394	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Medium clay	7	156.4	1.1	A1	Non-Saline
109	0.5	8.2	10	41	4931	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	0.3	52	1	Non-Sodic			Medium clay	7	202.8	1.4	A1	Non-Saline
109	1.5	8.2	53	75	6127	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Medium clay	7	163.2	1.1	A1	Non-Saline
109	2.5 - 2.95	8.7	150	48	4579	B	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive	Non-Aggressive							Medium clay	7	218.4	1.5	A1	Non-Saline
109	1	8.1			7321	B	Non-Aggressive		Non-Aggressive		Non-Aggressive					2	Some	Clay loam	9	136.6	1.2	A1	Non-Saline
109	2	8.4			3101	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Light clay	8.5	322.5	2.7	A1	Slightly Saline
110	1.5	8.3		60	4189	B	Non-Aggressive	Non-Aggressive	Non-Aggressive		Non-Aggressive							Light medium clay	8	238.7	1.9	A1	Non-Saline
110	2	8.7			2987	B	Non-Aggressive		Non-Aggressive		Non-Aggressive							Clay loam	9	334.8	3.0	A1	Slightly Saline
107	0.5		10	36		B		Non-Aggressive		Non-Aggressive													
107	1		27	33		B		Non-Aggressive		Non-Aggressive													
103	1.5		500	150		B		Non-Aggressive		Non-Aggressive													