

Nowra Build to Rent

Geotechnical Investigation Report

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Stantec Australia Pty Ltd

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Prepared by
Aaron Coghlan



Reviewed/Approved by
David Ronchi



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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Landcom have engaged Stantec Australia Pty Ltd (Stantec) to undertake a geotechnical investigation for a proposed building site on the corner of Beinda Street and Bolong Road, Bomaderry NSW. The current proposed development comprises two buildings, each with an on-grade, undercroft carpark and between 2 and 3 storeys of residential apartments above the carpark between two (2) and three (3) stories with options for undercroft parking.

This report has been carried out in accordance with Stantec variation proposal 989265 “Additional Geotechnical Testing and Design Support” dated 14th June 2023 [Prop. Ref 989265], and variation 001 “Additional Geotechnical Investigation Nowra BTR” dated 10th January 2024 [VAR001].

Original study area for proposed site is provided in Figure 1-1. The current site development layout has been modified since the initial investigation plan and is presented in Figure 1-2 .



Figure 1-1: Site location



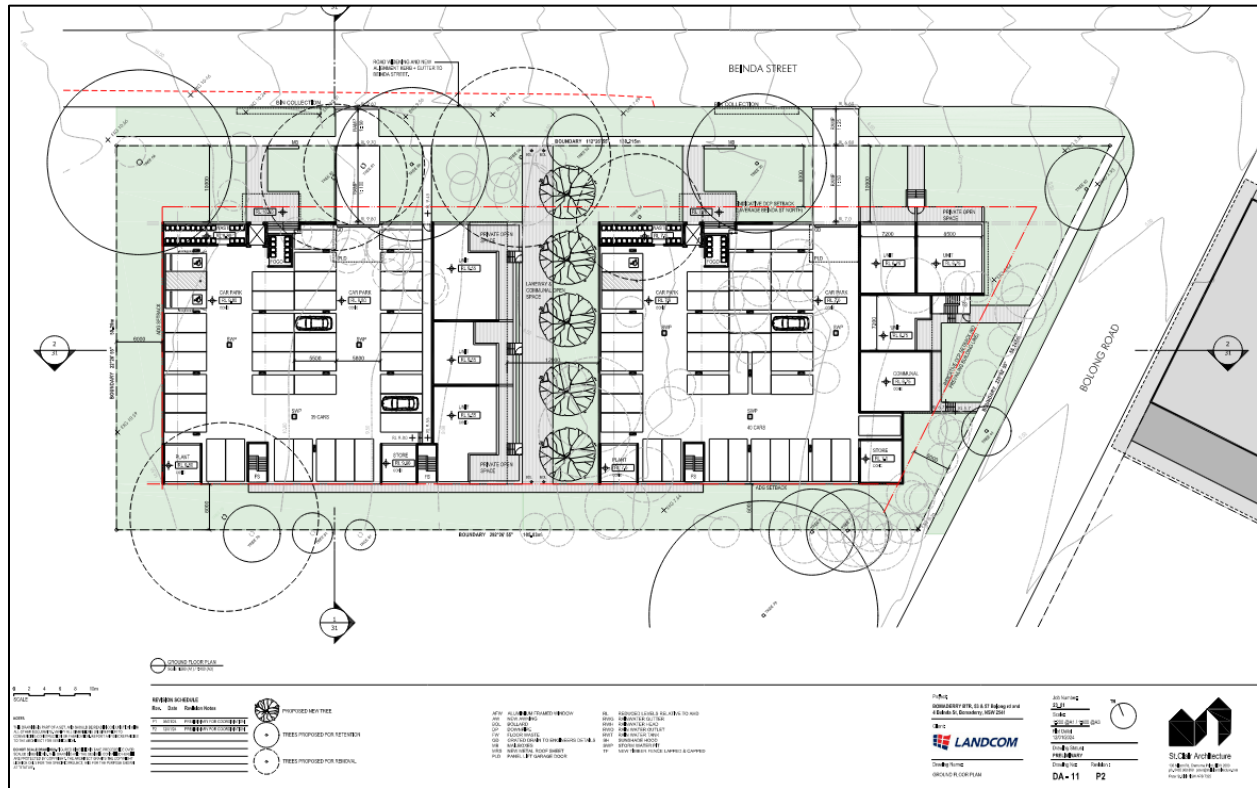


Figure 1-2: Current site development layout

1.2 OBJECTIVES

A geotechnical investigation was to be undertaken to access the geotechnical conditions for proposed residential developments for the Build To Rent pilot projects with the following objectives:

- Introduction, overview, and background of the investigation.
- Review of published information regarding the site including site geology, topography, acid sulfate soils and soil landscape maps.
- Site investigation and fieldwork summary
- Investigation results including fieldwork results, borehole plans, in situ tests, subsurface conditions and groundwater conditions.
- Laboratory testing results.
- Recommendation of parameters for permanent retaining walls and shallow foundation design, excavatability and site preparation. Parameters inclusive of the following:
 - Site classification to AS2870.
 - Site sub-soil classification to AS1170.4.
 - Soil density.
 - Friction angle and Earth pressure coefficients.



1.3 REGIONAL GEOLOGY

Review of the 1:100,000 Shoalhaven Coastal Quaternary Geology Map indicates that within the tributary west of the site the following alluvial units are present:

- Qavf – Quaternary alluvial and colluvial fan: fluvial sand, silt, gravel, clay
- Qhas – Holocene backswamp: organic mud, peat, silt clay.
- Qhal – Alluvial levee/overbank deposits: fluvially deposited fine to medium grained lithic to quartz rich sand, silt and clay.

Reference to the MinView spatial geology website (NSW Department of Planning, Industry and Environment, 2023) indicates the site is underlain by:

- Pshn – Nowra Sandstone from the parent unit Shoalhaven Group consisting of Fine- to very coarse-grained quartzose sandstone, with a three-fold subdivision: a very coarse-grained base with minor pebbly lenses, a central siltstone zone and a cross-bedded medium-grained quartz sandstone up-sequence.

The regional geology plan is presented in Attachment A.

1.4 SITE OBSERVATIONS

A site walkover was carried out on 22nd June 2023 with the following preliminary site observations provided:

- General site location is to the east of a local tributary which flows south and joins Bomaderry Creek.
- From the crest of the site, the slope grades at ~5 degrees towards Belinda Street to the east.
- Rock outcrop comprising highly to moderately weathered sandstone of medium to high strength was observed throughout the site becoming less visible towards Bolong Road to the east.
- Experience locally with the rock unit indicates a more weathered cap of up to 3m of highly to moderately weathered sandstone becoming slightly weathered and high strength (dark grey) with depth. The rock can contain concentrations of fossils.

Selected photos from the site walkover are presented in the Appendix B.

1.5 GEOTECHNICAL SITE CONSTRAINTS

Based on the site walkover, the following geotechnical site constraints were identified prior to the site investigation:

- Shallow bedrock inferred to be covering most of the site comprising highly to moderately weathered sandstone of medium to high strength. In terms of excavatability, based on previous road cutting experience sandstone is likely to require breaking to hard ripping with blasting not expected to be approved given proximity to residential areas.
- Western boundary with banks sloping down to the backswamp with building to consider appropriate set back to satisfy slope stability and any inferred future bank regression.
- Potential fill profile in the southwestern corner of the site.
- Perched water tables on top of horizontally bedded rock and potential for localised peat and hanging swamps.



2.0 GEOTECHNICAL INVESTIGATION

2.1 FIELD INVESTIGATION

2.1.1 Environmental and Heritage

A heritage consultant was engaged by Landcom and undertook a site visit on 25th July 2023 to confirm that site investigation works would not disturb any significant sites.

2.1.2 Service Location

Underground utility location was undertaken on 25th July 2023 and 29th January 2024 by an accredited contractor and comprised clearing of borehole and test pit locations using Cable Avoidance Tool (CAT) prior to drilling commencing. A service location clearance report was presented on-site to Stantec's site representative.

2.1.3 Intrusive Investigation

An intrusive investigation was undertaken from 26th to 28th July 2023, and on 29th January 2024, comprising the following:

- Drilling of three (3) deep boreholes, BH01 to BH03 to retrieve a minimum core length of 10.0m bgl. These boreholes were developed into wells, with 50mm casings and a 3m screen inserted from the base of each borehole.
- Drilling of three (3) additional deep boreholes, BH201 to BH203 to a maximum depth of 6.54m bgl.
- Boreholes were drilled with a track mounted drill rig and solid flight auger techniques. Upon auger refusal, the borehole was advanced using NMLC coring techniques through sandstone rock until target depth was achieved.
- Excavation of six (6) test pits, TP101 to TP106 to a maximum depth of 2.6m upon bucket refusal.
- Dynamic Cone Penetration test (DCP) were conducted at each test pit location prior to excavation.
- The borehole and test pit locations were selected based on the previous site mapping and risk assessment undertaken by Stantec to provide data at the most critical point for assessment of slope remediation.
- Engineering assessment of the subsurface profiles encountered in accordance with AS1726 – 2017 (Standards Australia Limited, 2017) by a geotechnical engineer from Stantec.
- The test pits were backfilled with material retrieved from excavation and compacted using excavator bucket and returned to existing surface level. Grass was replaced over the surface of the test pits.
- The test pit locations were recorded by a hand-held GPS device with a ± 5 m accuracy. The borehole locations were recorded by a licensed surveyor.

A site plan with borehole locations is provided in Appendix A. Engineering logs of the boreholes are presented in Appendix C together with explanatory notes.



2.2 LABORATORY TESTING

Laboratory testing conducted on strategically selected samples recovered during the fieldwork comprised the following:

- Five (5) Uniaxial Compressive Strength (UCS) tests.

Testing was conducted at NATA accredited laboratories, ASCT Illawarra. Laboratory test certificates are included in Appendix D.

3.0 RESULTS OF INVESTIGATION

3.1 SUBSURFACE CONDITIONS

Materials encountered in the boreholes were consistent with the geological map. In summary, subsurface conditions encountered in the boreholes are provided Table 3-1 and Table 3-2 below.

Table 3-1 Summary of subsurface units

Unit	Material Type	Description of Layer
T	TOPSOIL	Sandy SILT; low plasticity, brown, dark brown, fine to coarse sand, with medium rounded to sub-rounded gravel
F	Fill	Silty SAND; fine to coarse grained, brown, low plasticity fines with fine to coarse sub-rounded to sub-angular gravel, trace glass, bricks, plastic, fabric, timber, sand lens, rubber, metal, ceramic.
R	RESIDUAL	Silty SAND; fine to coarse grained, brown, low plasticity fines
S	SANDSTONE ROCK	SANDSTONE; medium to coarse grained, highly weathered to fresh, medium to high strength

Table 3-2 Depth to top of subsurface units – deep boreholes.

Unit	Deep Borehole – Depth mbgl (m)					
	BH01	BH02	BH03	BH201	BH202	BH203
Unit T	-	0.00	0.00	0.00	0.00	0.00
Unit F	0.00	-	-	-	-	-
Unit R	-	-	-	-	-	-
Unit S	0.50	0.22	0.10	0.10	0.15	0.10
Termination Depth (mbgl)	11.55	11.93	11.52	6.40	6.54	6.45
Reason for Termination	Target depth	Target depth	Target depth	Target depth	Target depth	Target depth

Notes:

- mbgl: Meters below ground level



Table 3-3 Depth to top of Subsurface Units – Test Pits

Unit	Shallow boreholes – Depth mbgl (m)					
	TP101	TP102	TP103	TP104	TP105	TP106
Unit T	-	0.00	0.00	0.00	0.00	0.00
Unit F	0.00	-	-	0.10	0.10	0.40
Unit R	2.20	-	-	-	-	-
Unit S	2.40	0.20	0.25	0.35	0.40	0.70
Termination Depth (mbgl)	2.40	0.20	0.25	0.35	0.40	0.70

Notes:

- mbgl: Meters below ground level

For details of the subsurface conditions encountered, reference should be made to the engineering logs presented in Appendix C, together with Explanatory Notes.

3.2 CLASSIFICATION OF ROCK

The sedimentary rocks at Nowra which are Permian Age deposits of the Shoalhaven Group largely resemble the sandstones and shales of the Triassic Age Hawkesbury Sandstone and shales.

Consequently, the sedimentary rocks encountered in the project area within Unit 5 have been categorised adopting the classification system documented in (Pells, et al., 1998) which is summarised in Table 3-4 below.

Table 3-4: Sandstone classification

Rock class	Unconfined Compressive Strength (MPa)	Defect spacing (mm)	Allowable seams (%)	Characteristic UCS value for design (MPa)
SANDSTONE CLASS V	>1	-	-	1
SANDSTONE CLASS IV	>2	>60	<10	3
SANDSTONE CLASS III	>7	>200	<5	7
SANDSTONE CLASS II	>12	>600	<3	20
SANDSTONE CLASS I	>24	>600	<1.5	40

Based on review of the borehole logs, the following boundaries between the rock units has been designated which includes three (3) boreholes (BH01, BH02 and BH03.) An equivalent percentage of seams has been adopted to account for the presence of fossil voids within the highly and moderately weathered rock. Corresponding rock class horizons are provided in Table 3-5.



Table 3-5 Depth to top of rock class (m)

Unit	Depth at top of rock class (m)					
	BH01	BH02	BH03	BH201	BH202	BH203
TOP OF UNIT S	0.5	0.22	0.1	0.1	0.15	0.1
SS CLASS V	0.5	-	0.1	0.1	0.15	0.1
SS CLASS IV	-	-	-	-	0.6	0.35
SS CLASS III	0.74	0.22	1.24	0.4	4.74	2.18
SS CLASS II	3.95	4.39	4.2	4.22	-	-
SS CLASS I	8.12	9.25	9.5	-	-	-
Termination RL(m)	11.55	11.93	11.52	6.4	6.54	6.45

3.3 GROUNDWATER OBSERVATIONS

Groundwater was measured in BH01, BH02 and BH03 between 8:00 and 11:00am on 1st August 2023 after well had been purged at least 24 hours earlier. The proximity to Bomaderry Creek which is a tidally influenced body of water may cause the groundwater levels to fluctuate tidally. It should be noted that groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Ground water was not encountered prior to adopting core drill methods in BH201, BH202 and BH203, and the introduction of drilling fluid precludes identification of standing water levels in these three (3) boreholes. It is also noted that boreholes were immediately backfilled following drilling which precluded longer term monitoring of groundwater levels.

Ground water levels are presented in Table 3-6 below.

Table 3-6 Ground Water depth

Groundwater depth (mbgl)					
BH01	BH02	BH03	BH201	BH202	BH203
3.20	2.70	7.00	NO	NO	NO

Notes:

- NO: not observed

3.4 LABORATORY TESTING

Selected samples from the boreholes were tested at NATA accredited laboratories for testing. Rock strength testing was undertaken and is summarized in Table 3-7 below. Laboratory test certificates are attached in Appendix E.



Table 3-7 Rock testing

Borehole	Depth (m)	Uniaxial compressive strength (MPa)	Moisture content (%)	Failure Mode
BH01	3.10-3.30	31.0	2.9	Double Shear
BH01	5.10-5.30	54.1	3.8	Double Shear
BH201	0.40-0.70	34.0	2.9	Tensile Dominated
BH202	0.75-1.00	20.0	4.0	Mixed Mode
BH203	1.85-2.00	42.0	3.7	Tensile Dominated

4.0 RECOMMENDATIONS

4.1 EARTHQUAKE SITE CLASSIFICATION

Based on the classification system presented in AS 1170.4-2007 "Structural Design Actions Part 4: Earthquake Actions in Australia" and the encountered shallow bedrock, the site is deemed to have the following site subsoil classification:

- Class Ae – Strong Rock. The Hazard Design Factor (Z) of 0.09 is recommended.

4.2 SITE CLASSIFICATION

Based on our experience of the shallow rock in this area, it is recommended that residential slabs and footings are designed in accordance with recommendations in AS2870-2011 for a Class A site provided that footings are founded in the natural ground.

4.3 FOUNDATION DESIGN

4.3.1 Shallow foundations

Allowable and ultimate bearing capacities for mass concrete pad footing are presented in Table 4-1 below.

Table 4-1: Ultimate bearing capacity for rock units

Rock Class	γ_b (kN/m ³)	Allowable bearing capacity (MPa) ¹	Ultimate bearing capacity (MPa)	Design Young's Modulus (MPa)
SANDSTONE CLASS V	21	0.8	3.5	50
SANDSTONE CLASS IV	22	1.5	5	100
SANDSTONE CLASS III	23	3.5	20	350
SANDSTONE CLASS II	24	5.0	60	900
SANDSTONE CLASS I	24	8.0	120	2000

Notes:

1. Bearing pressure to limit settlement to <1% of minimum footing dimension.



Footings construction methods should be “flexible” in that footing excavations can be readily deepened or widened to target more competent materials should lower bearing capacity materials be present. Bearing pressures nominated above are based on footing bases founding a minimum of 0.50m into the founding material.

The nominated bearing pressures assume that all loose, disturbed or softened materials will be removed from footing excavations prior to casting concrete. If the material at the base of the excavation is allowed to wet and soften, it must be over-excavated until competent material is encountered and replaced with lean mix concrete or compacted granular fill. Footing excavation should be inspected by a suitably experienced geotechnical engineer or engineering geologist prior to installing reinforcing and casting concrete to confirm that founding conditions are consistent with the design values.

4.3.2 Deep foundations

Geotechnical design parameters for the encountered rock within the project site have been developed based on the results of in-situ and laboratory testing of selected samples undertaken during previous geotechnical investigations, values documented in the literature (e.g Pells, et al, 1998) for Sydney Sandstone and Shale and previous experience in similar geology. The parameters developed are shown in Table 4-2 and are unfactored and are suitable for use either in limit state or global factor of safety design.

Table 4-2: Ultimate end bearing/shaft adhesion values for rock units

Rock Class	γ_b (kN/m ³)	Ultimate end bearing (MPa)	Allowable bearing capacity (MPa) ¹	Ultimate shaft adhesion in compression (kPa)	Design Young's Modulus (MPa)
SANDSTONE CLASS V	21	3.5	0.8	150	50
SANDSTONE CLASS IV	22	5	1.5	250	100
SANDSTONE CLASS III	23	30	3.5	800	350
SANDSTONE CLASS II	24	60	5.0	1500	900
SANDSTONE CLASS I	24	120	8.0	3000	2000

Notes:

1. Skin friction (f_s) and base resistance (f_b) as defined in AS2159-2009.
2. Ignore bored pile shaft within 1.5m of ground surface to account for potential site disturbance and moisture change effects
3. Ultimate shaft adhesion based on a clean rock socket with roughness category R2 or better (Pells 1998)
4. Bearing pressure to limit settlement to <1% of minimum footing dimension.

Piles should be designed for both ultimate and serviceability conditions. Ultimate end bearing and shaft adhesion values are to be used with appropriate load factors and geotechnical strength reduction factors to assess ultimate capacity. The rock mass modulus values provided is to be used to calculate settlements to assess serviceability.

The geotechnical strength reduction factor will depend on various influences such as the level of information available for the rock and the level of construction control. Based on the above influence factors applicable for the site and uncertainty with construction method and quality control etc., an average risk rating, ARR and geotechnical strength reduction factor, Φ_{gb} should be calculated. For limit state strength design, a geotechnical strength reduction factor (Φ_{gb}) of 0.45 can be applied to the ultimate capacity presented in. Pile testing requirements will be dependent on AS2159-2009. For piles subject to uplift loads, the



geotechnical strength should be multiplied by a factor of 0.7 in addition to the geotechnical strength reduction factor.

The design values require good construction practices which includes socket cleaning and concreting in a continuous process without delay. It is recommended that an experienced geotechnical engineer or engineering geologist observes pile drilling as well as shaft and mechanical base cleaning to confirm the adequacy of founding strata. Such observations would be undertaken from the piling platform level and would include observation of returned cuttings and drill rig performance, as well as the effectiveness of shaft roughening (if required) and down-hole cleaning.

4.4 RETAINING WALLS

Geotechnical parameters to be used for retaining wall design is provided in **Table 4-3** below.

Table 4-3: Geotechnical Design Parameters for Retaining Wall Design

Description	γ (kN/m ³)	c_u (kPa)	c' (kPa)	ϕ (deg)	Active earth pressure coefficient (Ka)	Passive earth pressure coefficient (Kp)	E (MPa)	ν
TOPSOIL	-	-	-	-	-	-	-	-
FILL (Imported Engineered Fill)	20	-	2	32	-	-	35	0.35
RESIDUAL – medium dense (Silty SAND)	19	-	0	30	-	-	25	0.3
SANDSTONE CLASS V	21	-	20	35	0.22	15.73	100	0.3

NOTES:

NE: Not Encountered

c_u : Undrained shear strength

ϕ : Internal Friction Angle

NA: Not Available

c' : Drained shear strength

γ : Unit Weight

E: Elasticity Modulus

4.5 EROSION

Provision of suitable vegetation protection and adequate drainage would be required as a minimum erosion protection measure. Appropriate surface drainage should be installed to intercept and reduce the velocity of up-slope overland surface flows and to restrict overland surface flows from flowing onto adjacent areas where practical.

All collected stormwater should be appropriately detained in on-site storage or detention basins and discharged in a controlled manner where required. This should be conducted in accordance with the relevant council requirements.

In general, the dispersion potential can be ameliorated by regimented compaction and moisture control during fill placement. A suitable thickness of topsoil (preferably >150 mm) should also be provided to promote vegetation growth for longer-term erosion control.



4.6 EARTHWORKS

4.6.1 Site Preparation

Prior to bulk earthworks, any fill, pavement or structure footings areas shall be cleared of any foreign matter or unsuitable material which includes but is not limited to the following:

- Vegetation or organic matter;
- Topsoil or soil significantly affected by roots or root fibres;
- Any scattered waste or dumped materials;
- Uncontrolled filling which would be subject to further assessment; and
- Loose or low strength (soft) soils or otherwise 'unsuitable' soils.

Given the shallow rock encountered across the site and likelihood for silty organic deposits accumulating in hollows in the horizontally bedded rock, it is recommended that all overburden is removed and the rock is exposed across the site.

Deleterious materials that cannot be reused on site shall be disposed of at a licenced waste facility and classified in accordance with the NSW EPA Waste Classification Guidelines. Stripped topsoils may be stockpiled for re-use where suitable. Topsoil stockpiles shall not exceed 2.5m and the maximum batter shall not exceed 2H:1V. Stockpiles of topsoil should be in accordance with Shoalhaven Development Construction Specifications – C213 Earthworks.

If proposed development extends to areas of uncontrolled fill, the fill should be removed and replaced with engineered fill material. This is due to unknown conditions of fill and potential for instability or differential settlement due to lack of compaction. Appropriate drainage system (sub soil drainage) should also be provided.

4.6.2 Drainage

Prior to earthworks, appropriate site surface drainage and other run off control measures should be implemented to prevent ponding and scouring during the construction, and to minimise the risk of trafficability issues on site clays during and after inclement weather conditions. These measures may include temporary drains, surface grading along with erosion and sediment control and should be appropriately reinstated following the construction.

Care should be exercised in constructing up-slope overland surface flows particularly in times of inclement weather. Depending on the conditions encountered, subsurface drainage may be required at the base of existing gullies or drainage lines prior to filling.

Given the shallow rock encountered across the site, pavements will either require perimeter subsoil drains or drainage rock to prevent saturation of pavement layers around pavements.



4.6.3 Excavation and Trench Stability

Subject to further geotechnical assessment, temporary excavations or trenches in the weathered rock profile would be expected to stand close to vertical in the short-term (i.e. less than construction period). Unsupported short-term excavations or trenches may undergo some local slumping into the excavation in Residual/Alluvial stratum or where seepage occurs. Temporary excavations in the slightly weathered rock profile would stand vertical but care would be required to remove any large rock masses or loose material.

Excavations in the vicinity of existing road embankments or structures should be fully supported in accordance with the design to ensure no inadvertent instability affecting adjacent infrastructure.

Where personnel are to enter excavations, options for short-term excavations include benching or battering back of the excavations to 1 Vertical to 1 Horizontal (1H:1V) within the very stiff or better residual soil and extremely weathered rock profile, or the support of excavations. Short-term excavations within the more competent rock may be battered at steeper than 1V:1H and may not require support, however this would be subject to specific geotechnical assessment. Unsupported excavations should be limited to 1m.

It is recommended that long-term excavations in the soil profile or weathered rock shall be either battered at 1V:3H or flatter and protected against erosion or be supported by engineered and suitably constructed retaining walls.

Seepage or inflow may be encountered during construction and allowance should be made for control such as sump and pump.

4.6.4 Filling

Following site preparation works, fill should be placed and compacted in accordance with the following guidelines and specifications;

- AS 3798-2007 Earthworks for Commercial and Residential Development;
- Shoalhaven Development Construction Specifications – C213 Earthworks, dated July 1997.

It is expected that construction of temporary and permanent fill platforms during the bulk earthworks, to support structural loads associated with the commercial development and carpark, would include the following;

- Removal of any existing uncontrolled fill and topsoil or otherwise unsuitable soils from areas where controlled fill is to be placed.
- Locations where controlled fill is not required, e.g. under piled structures or not under any development areas such as the pad sites or carpark may have uncontrolled fill left in place.
- Terracing of the exposed subgrade slope in the area where fill is to be placed if slopes are steeper than 1V:4H at the start of filling level.
- Where rock is not encountered, the exposed subgrade should be scarified and compacted using a heavy vibrating pad foot roller to achieve a dry density ratio of at least 100% Standard compaction



and within $\pm 2\%$ of Standard Optimum Moisture Content (SOMC) in accordance with AS1289.5.1.1, 5.4.1 or 5.7.1.

- Any soft or weak areas identified during the subgrade compaction process or proof rolling, that do not respond to further compaction, should be removed and replaced with select fill in layers not exceeding 200mm loose thickness and each layer compacted to achieve a Dry Density Ratio of at least 100% Standard and within $\pm 2\%$ of SOMC in accordance with AS1289 5.1.1, 5.4.1 or 5.7.1.
- Excavations to remove any soft or weak areas should have side slopes battered not steeper than 2H:1V unless geotechnical assessment is undertaken. Should extensive soft or weak areas be encountered, further geotechnical advice should be sought.
- Engineered fill should be placed in uniform horizontal layers with maximum thickness of 200mm after compaction. Each layer should be compacted to a minimum dry density ratio of 98% Standard Compaction at moisture contents in the order of 60% to 90% of the Optimum Moisture Content beneath pad sides and buildings. Layers beneath pavement areas should be compacted to a minimum dry density ratio of 100% Standard Compaction at $\pm 2\%$ of SOMC. Over compaction and/or placement of clays significantly dry of OMC should be avoided.
- The top layer of embankment within 200mm of the design subgrade level should be compacted to a minimum dry density ratio of 100% Standard Compaction at moisture contents in the order of 60% to 90% of the Optimum Moisture Content.
- Exposed subgrade and all fill layers should be test-rolled immediately following completion of compaction. If further test polling is required at later date, the surface should be moisture conditions as required, and given not less than four coverages of the testing roller prior to test rolling.

4.7 PAVEMENT DESIGN

4.7.1 Pavement subgrade conditions

Given the shallow sandstone across the site, a subgrade CBR of 15% is recommended for pavement design. It should however be noted that ripping/scratching of the rock surface to ensure adequate drainage and no pooling of water is recommended to increase pavement longevity.

4.7.2 Pavement Thickness Design

Landcom have provided Stantec with a design traffic loading for the internal pavements of the site of 1×10^5 , this value has been utilised for calculation of the thickness for both flexible and rigid pavement designs required for the project. Pavement design has been undertaken in accordance with (Austroads Ltd, 2017) and locally utilised AUS-SPEC standards (AUS-SPEC 0042).

A project reliability of 90% has been assessed for the site design based on AUS-SPEC 0042.

4.7.2.1 Flexible Pavement Design

Based on the design inputs discussed, the recommended pavement thickness design is given in **Table 4-4** below



Table 4-4 Flexible Pavement Thickness Design

Location	Minimum Design Subgrade CBR Value (%)	Suggested Pavement Thickness (mm)	Pavement Composition
Internal Pavements	15	270	14/7 double coat spray seal plus primer 100mm thickness of CRB20-2 base material. 150mm thickness of CRS40 subbase material.

It is noted that the design thickness proposed is the minimum requirement in accordance with AUS-SPEC 0042.

A 14/7 double spray has been proposed due to the high rainfall average annual rainfall of the region and existing drainage issues at the site. The seal should be in accordance with AUS-SPEC 1143 Sprayed bituminous surfacing.

Pavement material should be placed and compacted in layers not exceeding 200mm compacted thickness. Placement should be in accordance with AUS-SPEC 1112 Earthworks and AUS-SPEC 1141 Pavement Base and Subbase.

Inspection of subgrade following stripping by a suitably qualified geotechnical engineer at the time of construction is recommended to confirm subsurface conditions.

Table 4-6 Pavement Compaction Requirements

Layer	Minimum Compaction Ratio	Moisture Variation from Optimum Moisture Content
Pavement Material (Base and Subbase)	98% Modified Maximum Dry Density	± 2%
Subgrade	100% Standard Maximum Dry Density	± 2%

4.7.2.2 Rigid Pavement Design

It is acknowledged that AUS-SPEC 0042 nominates a 35 year design life for flexible pavements as opposed to a 40 year design life for rigid pavements, it has been assumed that the supplied DESA value of 1×10^5 represents the 35 year period, as such a new N_{DT} (cumulative number of heavy vehicle axle groups) has been back calculated for 40 years based on the following assumptions:

- AADT of 100
- 3% Heavy Vehicles
- ESA/HVAG = 1.039 (in accordance with TLD used for the pavement design)



Based on the back calculation the N_{DT} appropriate for rigid pavement design is 5.8×10^5 . Based on a design subgrade CBR of 15% and a 100mm thick lean-mix concrete subbase, an effective CBR for design of 75% has been assessed. The design has been undertaken for an undowelled plain concrete pavement (PCP). It is noted that lean mix concrete has been selected as (Austroads Ltd, 2017) nominates good performance pairs with plain concrete pavements. Based on a project reliability, a Load Safety Factor of 1.3 has been utilised.

Table 4-7: Rigid Pavement thickness design

Location	Minimum Design Subgrade CBR Value (%)	Suggested Pavement Thickness (mm)	Pavement Composition
Internal Pavements	15	280	180mm thickness of concrete base 100mm thickness of lean mix concrete subbase.

Subbase material (lean-mix concrete) is to be cement bound material with a minimum 28 unconfined compressive strength of 5MPa (blended with fly ash) or 7MPa (without fly ash). Construction of subbase is to be in accordance with AUS-SPEC 1132.

Base concrete is to have a minimum 28-day flexural strength 4.5MPa and a minimum 28-day compressive strength of 32MPa. Slabs are to be maximum 4.3m long with undowelled skewed joints. Construction of concrete base to be in accordance with AUS-SPEC 1133

4.8 EXCAVATABILITY

Fill was observed throughout the site which comprised silty sands and sandy silts, underlain by highly to slightly weathered sandstone.

Targeted rock strength testing of select units within the recovered core has been carried out using the Point Load Strength Index Apparatus. Subsequent data reduction of average rock defect spacing versus point load strength index $Is(50)$, has allowed for these units to be accurately categorised into a Rock Strength and Excavatability Classification. Rock strength and defect spacing has been correlated to a maximum depth of 11.5m below existing ground. The excavatability graph determined by Pettifer and Hookes (1994) is presented in Figure 4-1. The Pettifer and Hookes graph is an empirical determination based on the point load strength and fracture spacings of encountered rock. Typically, the smaller the spacing (more fractures) and the lower the strength, the 'easier' the rock excavation.

The following comments are provided:

- The results of the investigations indicate that excavations and stripping could be readily undertaken in the surficial soil and fill to depths of between 1.4m and 2.00m bgl at the area surrounding BH01 only.



- Hard ripping to breaking bordering on blasting is expected at surface surrounding BH01 to BH03, and BH201 to BH203.
- As controlled blasting/pre-blasting is not likely to be feasible given close proximity to residential areas, alternative options such as cross ripping, hydraulic hammering, rock sawing or grinding methods should be considered. In addition, pre-split holes along the desired basement profile should be considered at approximate 0.5m spacing which should be confirmed by earthworks contractor.

The costs associated with either option should be carefully considered, particularly in relation to the feasibility of establishing such large capacity dozers and the costs associated with the low production rate expected. It is recommended that the earthworks contractor conduct a site-specific assessment including an inspection of the site.

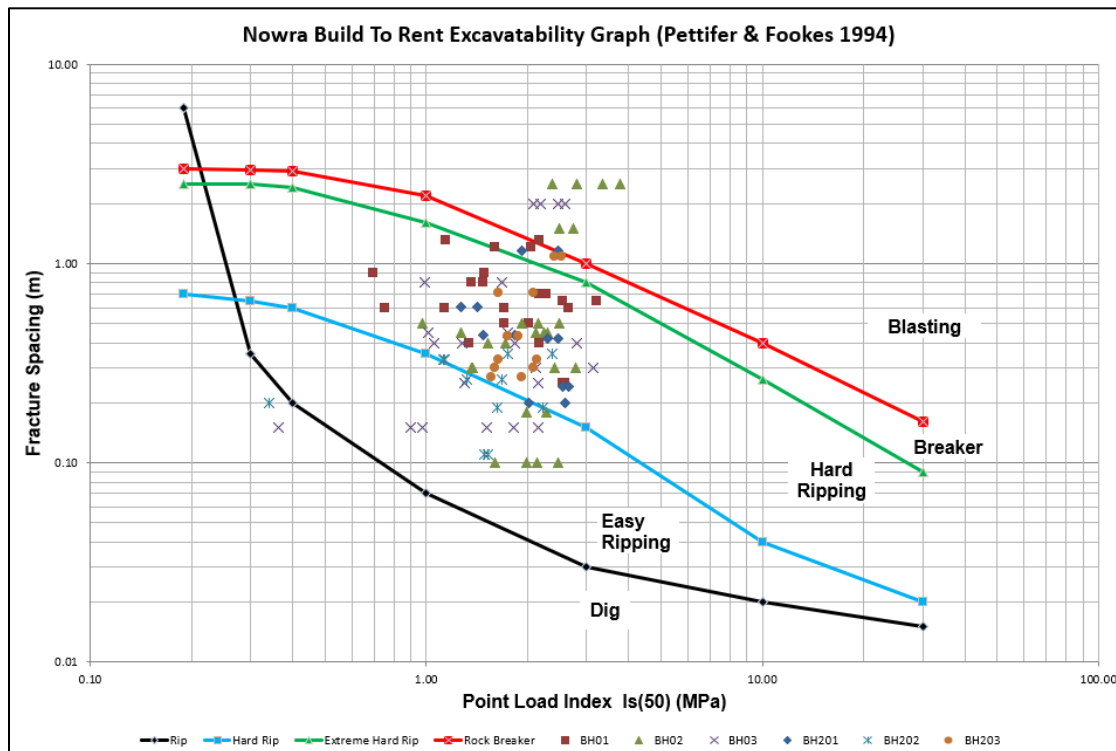


Figure 4-1: Excavatability Assessment (Pettifer & Fookes 1994)

4.9 CONSTRUCTABILITY

The presence of shallow rock on the site is expected to present the following constructability challenges:

- Excavation for a basement level car parking will likely be a time consuming and expensive exercise with potential impact on the community from noise levels.
- Excavation for services will likely be problematic as indicated in the excavatability assessment (section 4.7).
- Pavement profiles will need to carefully detail drainage and may require the use of free draining rock layers prior to placement of pavement layers.



5.0 CLOSURE

We appreciate the opportunity to work collaboratively with you on this project. Our team looks forward to bringing our high level of expertise to deliver successful outcomes in your future projects.

Your attention is drawn to the appended document titled “*Important Information about this Geotechnical Report*” found in Appendix E. This document is intended to clarify to the reader what the realistic expectations of this report should be, and what is the correct use of the document. Misinterpretation of geotechnical information presents significant risk to projects: The document includes a discussion on general limitations of geotechnical services, which by nature, are based extensively on opinion and judgement.

The statements included in this document are not intended to be exculpatory clauses or to reduce the general responsibility accepted by Stantec, but rather to identify where Stantec and our Client’s responsibilities lie. The statements ensure that all parties that may rely on the report are aware of their respective responsibilities.

For further enquiries, please do not hesitate to contact Stantec on the information supplied.



6.0 REFERENCES

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Appendix A SITE PLAN





Site Plan

Build to Rent (BtR), South Coast
Bomaderry, NSW

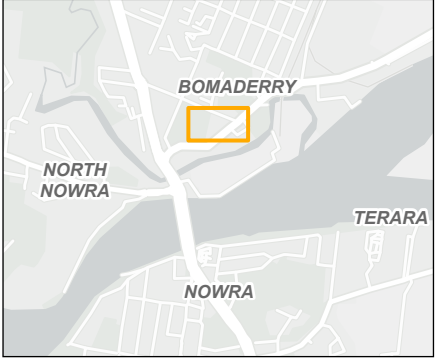
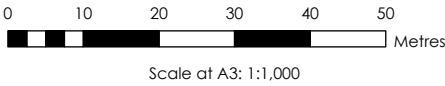
Project Code: 304001019-GS-001
Drawn By: TB, Checked By: SM
Rev: 05
Date: 2024-02-26

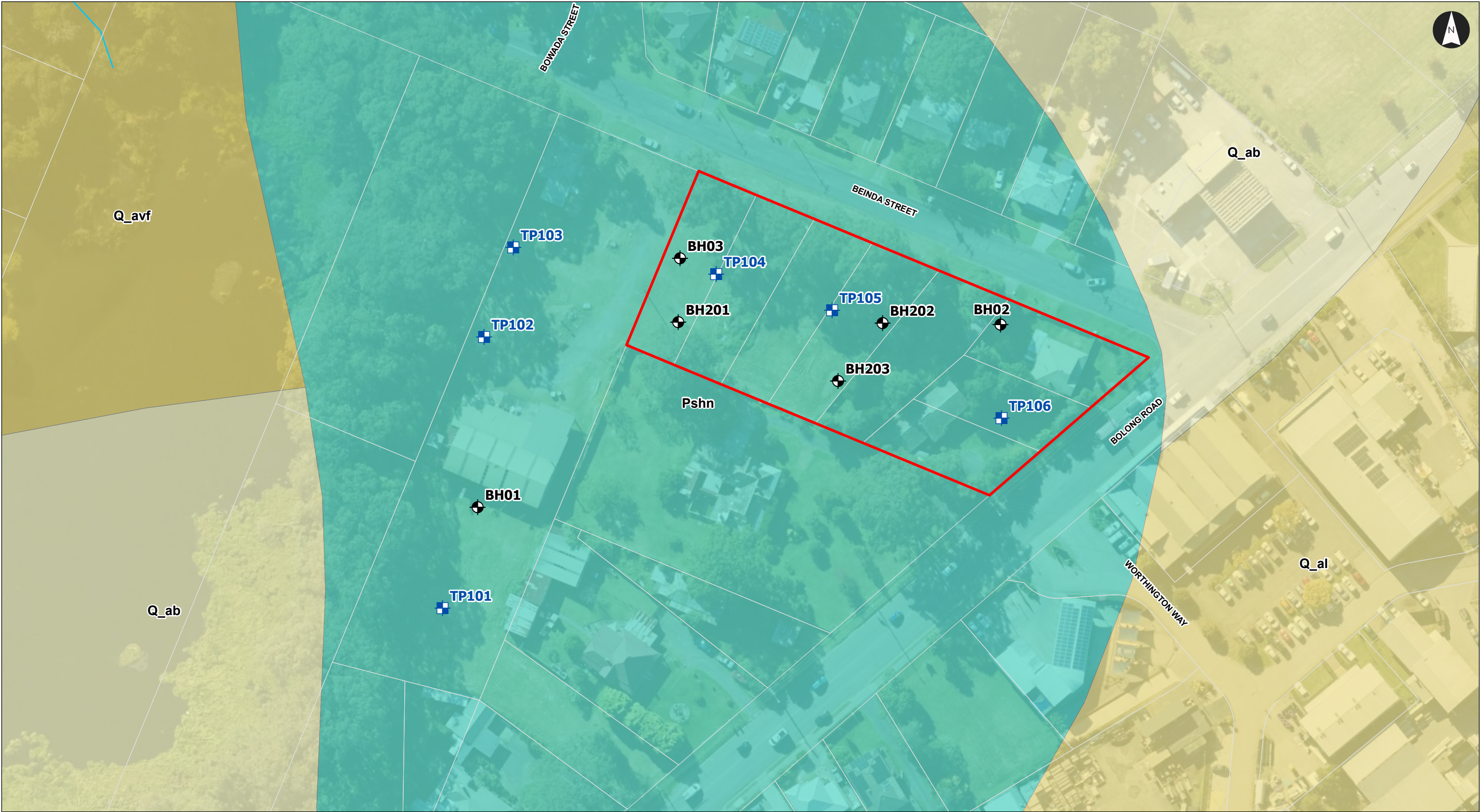


- Legend**
- Site Boundary
 - Borehole
 - Test Pit
 - Grab Sample
 - Watercourse
 - 2m Contours
 - Cadastre

Notes:
1. Map displayed in GDA2020 MGA Zone 56

References:
1. Aerial imagery (MetroMap, May 2023)
2. Watercourse and Cadastre (NSW SS, 2023)
3. 2m Contours (LPI LiDAR, 2010)





Geology Plan

Build to Rent (BtR), South Coast
Bomaderry, NSW

Project Code: 304001019-GS-003
Drawn By: TB, Checked By: SM
Rev: 04
Date: 2024-02-26

Legend

- Site Boundary
- Borehole
- Test Pit
- Watercourse
- Cadastral

Seamless Geology

- Q_ab - Organic-rich mud, peat, silt, clay.
- Q_al - Fluvially deposited fine- to medium-grained lithic to quartz-rich sand, silt, clay.
- Q_avf - Fluvially-deposited quartz-lithic sand, silt, gravel, clay.
- Pshn - Fine- to very coarse-grained quartzose sandstone, with a three-fold subdivision: a very coarse-grained base with minor pebbly lenses, a central siltstone zone and a cross-bedded medium-grained quartz sandstone up-sequence.

Notes:

1. Map displayed in GDA2020 MGA Zone 56

References:

1. Aerial imagery (MetroMap, May 2023)
2. Watercourse and Cadastre (NSW SS, 2023)
4. Seamless Geology (GSNSW, 2021)

01020304050

Metres

Scale at A3: 1:1,000

Appendix B PHOTO REPORT





PHOTO P1 - WESTERN SLOPE BANK SLOPING AT ~20 DEGREES



PHOTO P2 - IRREGULAR HUMMOCKY SURFACE INDICATING PRESENCE OF FILL

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Client:	LANDCOM
Project:	NOWRA BUILD TO RENT - GEOTECH INSPECTION
Cardno Reference	304001019
Title:	Photo Report
Size:	A4



PHOTO P3 - WESTERN BOUNDARY LOOKING NORTH WITH ROCK OUTCROP



PHOTO P4 - WESTERN BOUNDARY BANK SLOPING AT ~10 DEGREES

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PHOTO P5 - LOOKING WEST TOWARDS SWAMP CROSSING ON BEINDA STREET



PHOTO P6 - LOOKING NORTH WITH ROCK OUTCROP

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PHOTO P7 - ROCK OUTCROP ALONG NORTHERN BOUNDARY ADJACENT TO BEINDA STREET ENTRANCE



PHOTO P8 - ROCK FILL FLOATER OF HIGHLY TO MODERATLY WEATHERED SANDSTONE MEDIUM TO HIGH STRENGTH

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PHOTO P9 - ALONG INTERNAL BOUNDARY LOOKING EAST TOWARDS BELINDA WITH ROCK OUTCROP



PHOTO P10 - ROCK OUTCROP IN NATURE STRIP ADJACENT TO CORNER INTERSECTION WITH BELINDA STREET

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Size:	A4



PHOTO P11 - LOOKING TOWARDS INTERNAL BOUNDARY FROM BELINDA STREET WITH INFERRED ROCK OUTCROP

Appendix C SUBSURFACE LOGS AND EXPLANATORY NOTES



Explanatory Notes

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. Material descriptions are deduced from field observation or engineering examination, and may be appended or confirmed by in situ or laboratory testing. The information is dependent on the scope of investigation, the extent of sampling and testing, and the inherent variability of the conditions encountered.

Subsurface investigation may be conducted by one or a combination of the following methods.

Method	
Test Pitting: excavation/trench	
BH	Backhoe bucket
EX	Excavator bucket
R	Ripper
H	Hydraulic Hammer
X	Existing excavation
N	Natural exposure
Manual drilling: hand operated tools	
HA	Hand Auger
Continuous sample drilling	
PT	Push tube
PS	Percussion sampling
SON	Sonic drilling
Hammer drilling	
AH	Air hammer
AT	Air track
Spiral flight auger drilling	
AS	Auger screwing
AD/V	Continuous flight auger: V-bit
AD/T	Continuous spiral flight auger: TC-Bit
HFA	Continuous hollow flight auger
Rotary non-core drilling	
WB	Washbore drilling
RR	Rock roller
Rotary core drilling	
PQ	85mm core (wire line core barrel)
HQ	63.5mm core (wire line core barrel)
NMLC	51.94mm core (conventional core barrel)
NQ	47.6mm core (wire line core barrel)
DT	Diatube (concrete coring)

Sampling is conducted to facilitate further assessment of selected materials encountered.

Sampling method	
Soil sampling	
B	Bulk disturbed sample
D	Disturbed sample
C	Core sample
ES	Environmental soil sample
SPT	Standard Penetration Test sample
U	Thin wall tube 'undisturbed' sample
Water sampling	
WS	Environmental water sample

Field testing may be conducted as a means of assessment of the in situ conditions of materials.

Field testing	
SPT	Standard Penetration Test
HP/PP	Hand/Pocket Penetrometer
Dynamic Penetrometers (blows per noted increment)	
DCP	Dynamic Cone Penetrometer
PSP	Perth Sand Penetrometer
MC	Moisture Content
VS	Vane Shear
PBT	Plate Bearing Test
IMP	Borehole Impression Test
PID	Photo Ionization Detector

If encountered, refusal (R), virtual refusal (VR) or hammer bouncing (HB) of penetrometers may be noted.

The quality of the rock can be assessed by the degree of natural defects/fractures and the following.

Rock quality description	
TCR	Total Core Recovery (%) (length of core recovered divided by the length of core run)
RQD	Rock Quality Designation (%) (sum of axial lengths of core greater than 100mm long divided by the length of core run)

Notes on groundwater conditions encountered may include.

Groundwater	
Not Encountered	Excavation is dry in the short term
Not Observed	Water level observation not possible
Seepage	Water seeping into hole
Inflow	Water flowing/flooding into hole

Perched groundwater may result in a misleading indication of the depth to the true water table. Groundwater levels are also likely to fluctuate with variations in climatic and site conditions.

Notes on the stability of excavations may include.

Excavation conditions	
Stable	No obvious/gross short term instability noted
Spalling	Material falling into excavation (minor/major)
Unstable	Collapse of the majority, or one or more face of the excavation

Explanatory Notes: General Soil Description

The methods of description and classification of soils used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, a material is described as a soil if it can be remoulded by hand in its field condition or in water. The dominant component is shown in upper case, with secondary components in lower case. In general descriptions cover: soil type, plasticity or particle size/shape, colour, strength or density, moisture and inclusions.

In general, soil types are classified according to the dominant particle on the basis of the following particle sizes.

Soil Classification		Particle Size (mm)
CLAY		< 0.002
SILT		0.002 to 0.075
SAND	fine	0.075 to 0.21
	medium	0.21 to 0.6
	coarse	0.6 to 2.36
GRAVEL	fine	2.36 to 6.7
	medium	6.7 to 19
	coarse	19 to 63
COBBLES		63 to 200
BOULDERS		> 200

Soil types may be qualified by the presence of minor components on the basis of field examination methods and/or the soil grading.

Terminology	In coarse grained soils		In fine soils
	% fines	% coarse	% coarse
Trace	≤5	≤15	≤15
With	>5, ≤12	>15, ≤30	>15, ≤30

The strength of cohesive soils is classified by engineering assessment or field/lab testing as follows.

Strength	Symbol	Undrained shear strength
Very Soft	VS	≤12kPa
Soft	S	12kPa to ≤25kPa
Firm	F	25kPa to ≤50kPa
Stiff	St	50kPa to ≤100kPa
Very Stiff	VSt	100kPa to ≤200kPa
Hard	H	>200kPa

Cohesionless soils are classified on the basis of relative density as follows.

Relative Density	Symbol	Density Index
Very Loose	VL	<15%
Loose	L	15% to ≤35%
Medium Dense	MD	35% to ≤65%
Dense	D	65% to ≤85%
Very Dense	VD	>85%

The plasticity of cohesive soils is defined by the Liquid Limit (LL) as follows.

Plasticity	Silt LL	Clay LL
Low plasticity	≤ 35%	≤ 35%
Medium plasticity	N/A	> 35% ≤ 50%
High plasticity	> 50%	> 50%

The moisture condition of soil (w) is described by appearance and feel and may be described in relation to the Plastic Limit (PL), Liquid Limit (LL) or Optimum Moisture Content (OMC).

Moisture condition and description	
Dry	Cohesive soils: hard, friable, dry of plastic limit. Granular soils: cohesionless and free-running
Moist	Cool feel and darkened colour: Cohesive soils can be moulded. Granular soils tend to cohere
Wet	Cool feel and darkened colour: Cohesive soils usually weakened and free water forms when handling. Granular soils tend to cohere

The structure of the soil may be described as follows.

Zoning	Description
Layer	Continuous across exposure or sample
Lens	Discontinuous layer (lenticular shape)
Pocket	Irregular inclusion of different material

The structure of soil layers may include: defects such as softened zones, fissures, cracks, joints and root-holes; and coarse grained soils may be described as strongly or weakly cemented.

The soil origin may also be noted if possible to deduce.

Soil origin and description	
Fill	Anthropogenic deposits or disturbed material
Topsoil	Zone of soil affected by roots and root fibres
Peat	Significantly organic soils
Colluvial	Transported down slopes by gravity/water
Aeolian	Transported and deposited by wind
Alluvial	Deposited by rivers
Estuarine	Deposited in coastal estuaries
Lacustrine	Deposited in freshwater lakes
Marine	Deposits in marine environments
Residual soil	Soil formed by in situ weathering of rock, with no structure/fabric of parent rock evident
Extremely weathered material	Formed by in situ weathering of geological formations, with the structure/fabric of parent rock intact but with soil strength properties

The origin of the soil generally cannot be deduced solely on the appearance of the material and the inference may be supplemented by further geological evidence or other field observation. Where there is doubt, the terms 'possibly' or 'probably' may be used

Explanatory Notes: General Rock Description

The methods of description and classification of rocks used in this report are based on Australian Standard AS1726-2017 Geotechnical Site Investigations. In practice, if a material cannot be remoulded by hand in its field condition or in water, it is described as a rock. In general, descriptions cover: rock type, grain size, structure, colour, degree of weathering, strength, minor components or inclusions, and where applicable, the defect types, shape, roughness and coating/infill.

Rock types are generally described according to the predominant grain or crystal size, and in groups for each rock type as follows.

Rock type	Groups
Sedimentary	Deposited, carbonate (porous or non), volcanic ejection
Igneous	Felsic (much quartz, pale), Intermediate, or mafic (little quartz, dark)
Metamorphic	Foliated or non-foliated
Duricrust	Cementing mineralogy (iron oxides or hydroxides, silica, calcium carbonate, gypsum)

Reference should be made to AS1726 for details of the rock types and methods of classification.

The classification of rock weathering is described based on definitions in AS1726 and summarised as follows.

Term and symbol	Definition
Residual Soil RS	Soil developed on rock with the mass structure and substance of the parent rock no longer evident
Extremely weathered XW	Weathered to such an extent that the rock has 'soil-like' properties. Mass structure and substance still evident
Distinctly weathered DW	The strength is usually changed and may be highly discoloured. Porosity may be increased by leaching, or decreased due to deposition in pores. May be distinguished into MW (Moderately Weathered) and HW (Highly Weathered).
Slightly weathered SW	Slightly discoloured; little or no change of strength from fresh rock
Fresh Rock FR	The rock shows no sign of decomposition or staining

The rock material strength can be defined based on the point load index as follows.

Term and symbol	Point Load Index I_{s50} (MPa)
Very Low VL	0.03 to 0.1
Low L	0.1 to 0.3
Medium M	0.3 to 1.0
High H	1.0 to 3
Very High VH	3 to 10
Extremely High EH	> 10

It is important to note that the rock material strength as above is distinct from the rock mass strength which can be significantly weaker due to the effect of defects.

A preliminary assessment of rock strength may be made using the field guide detailed in AS1726, and this is conducted in the absence of point load testing.

The defect spacing measured normal to defects of the same set or bedding, is described as follows.

Definition	Defect Spacing (mm)
Thinly laminated	< 6
Laminated	6 to 20
Very thinly bedded	20 to 60
Thinly bedded	60 to 200
Medium bedded	200 to 600
Thickly bedded	600 to 2000
Very thickly bedded	> 2000

Terms for describing rock and defects are as follows.

Defect Terms			
Joint	JT	Sheared zone	SZ
Bedding Parting	BP	Seam	SM
Foliation	FL	Vein	VN
Cleavage	CL	Drill Lift	DL
Crushed Seam	CS	Handling Break	HB
Fracture Zone	FZ	Drilling Break	DB

The shape and roughness of defects in the rock mass are described using the following terms.

Planarity		Roughness	
Planar	PR	Very Rough	VR
Curved	CU	Rough	RF
Undulose	UN	Smooth	S
Irregular	IR	Slickensided	SL
Stepped	ST	Polished	POL
Discontinuous	DIS		

The coating or infill associated with defects in the rock mass are described as follows.

Infill and Coating		
Clean	CN	
Stained	SN	
Carbonaceous	X	
Minerals	MU	Unidentified mineral
	MS	Secondary mineral
	KT	Chlorite
	CA	Calcite
	Fe	Iron Oxide
	Qz	Quartz
Veneer	VNR	Thin or patchy coating
Coating	CT	Infill up to 1mm

Graphic Symbols Index

	CLAY		SILT		SAND		GRAVEL		
	Silty CLAY		Clayey SILT		Clayey SAND		Clayey GRAVEL		
	Sandy CLAY		Sandy SILT		Silty SAND		Silty GRAVEL		
	Gravelly CLAY		Gravelly SILT		Gravelly SAND		Sandy GRAVEL		
	Silty Gravelly CLAY		Clayey Sandy SILT		Clayey Silty SAND		Clayey Silty GRAVEL		
	Silty Sandy CLAY		Clayey Gravelly SILT		Clayey Gravelly SAND		Clayey Sandy GRAVEL		
	Sandy Gravelly CLAY		Sandy Gravelly SILT		Silty Gravelly SAND		Silty Sandy GRAVEL		
	COBBLES & BOULDERS		Sedimentary rock: fine, mostly clay (CLAYSTONE)		Igneous rock: Felsic, fine (RHYOLITE)				
	PEAT, highly organic soil		Sedimentary rock: fine, mostly silt (SILTSTONE)		Igneous rock: Felsic, coarse (GRANITE)				
	TOPSOIL		Sedimentary rock: fine, silt and clay (MUDSTONE, SHALE, LAMINITE)		Igneous rock: Mafic, fine to medium (BASALT, DOLERITE)				
	FILL		Sedimentary rock: medium (SANDSTONE, GREYWACKE)		Igneous rock: Mafic, coarse (GABBRO)				
	FILL: Asphalt or Bituminous Seal		Sedimentary rock: fine to coarse, angular (BRECCIA)		Metamorphic rock: Foliated, fine to medium (SLATE, PHYLLITE, SHIST)				
	FILL: Ballast		Sedimentary rock: coarse, rounded (CONGLOMERATE)		Metamorphic rock: Foliated, coarse (GNEISS)				
	FILL: Concrete		Sedimentary rock: Organic (COAL)		Metamorphic rock: Non-foliated (QUARTZITE, HORNFELS, MARBLE)				
	FILL: Roadbase		Sedimentary rock: Carbonate (LIMESTONE, DOLOMITE)						
			Sedimentary rock: Volcanic (TUFF, VOLCANIC BRECCIA, AGGLOMERATE)						

Hole No: BH01

Client: Landcom Project: Nowra Build to Rent Location: Beinda Street, Bomaderry	Job No: 304001019 Angle from Horizontal: 90° Mounting: Track Logged By: AC	Sheet: 1 of 3 Surface Elevation: 9.981 m AHD Driller: TM Contractor: Total Drilling Checked By: DR
Position: E280876.982 N6140040.773 56 MGA2020 Rig Type: Hanjin D&B 8D Casing Diameter: HW Data Started: 7-27-23 Date Completed: 7-27-23		

Drilling			Water	Sampling & Testing	RL (m AHD)	Depth (m)	Material Description						Monitoring Well Details
Method	Resistance	Casing		Sample or Field Test			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
WB – AD/V –	E	HW ↕		ES 0.10 m				SM	FILL: Silty SAND: fine to coarse grained, brown, low plasticity silt	M		FILL	
WB –	H								GW	SANDSTONE, RECOVERED AS SANDY GRAVEL: coarse, pale orange / pale grey			WEATHERED ROCK
						9	1						
						8	2						
						7	3						
						6	4						
						5	5						
						4	6						
						3	7						
						2	8						
						1	9						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom Project: Nowra Build to Rent Location: Beinda Street, Bomaderry	Job No: 304001019 Angle from Horizontal: 90°	Sheet: 2 of 3 Surface Elevation: 9.981 m AHD
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Position: E280876.982 N6140040.773 56 MGA2020	Rig Type: Hanjin D&B 8D	Driller: TM
Casing Diameter: HW	Mounting: Track	Contractor: Total Drilling
Bit Type: impreg	Bit Condition: good	Checked By: DR
Data Started: 7-27-23	Date Completed: 7-27-23	Logged By: AC

Coring				Depth (m)	Material Description	Weathering	Estimated Strength Is ₍₅₀₎ MPa	Average Natural Defect Spacing (mm)	Defect Description		Monitoring Well Details
Method	Fluid	TCR (%)	RQD (%)						Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other	
					0.74m START CORING AT 0.74m						
	0% Water LOSS	97	97	9 1	SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining	HW				1.18 m: BP, 5°, IR, RF, CN	
				8 2	1.74m fossil void closed 1.82m fossil void - 5mm, open 2.07m fossil void - 2mm, open 2.13m fossil void - 2mm, open					2.17 m: BP, 3°, IR, RF, CT, CLAY, pale grey 2.34 m: HB	
				7 3	2.45m 2.50m CORE LOSS 0.05m (2.45-2.50) SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining	HW				2.93 m: HB 3.04 m: HB	
	0% Water LOSS	100	100	6 4	3.54-3.57m fossil void, 30mm, open 2.16m fossil void - 5mm, open 3.74m fossil void - 10mm open 3.95m Grey	SW				3.69 m: BP 3.95 m: BP, 3°, IR, RF, CT, SILT, black 4.04 m: HB 4.26 m: DB 4.50 m: BP, 5°, IR, RF, CN 4.77 m: HB 4.92 m: BP, 5°, IR, RF, CN 5.28 m: BP, 10°, IR, RF, CN 5.45 m: BP, 5°, IR, RF, CN 5.69 m: BP, 10°, IR, RF, VNR, SILT, black 6.19 m: HB 6.58 m: BP, 10°, IR, RF, VNR, SILT, black 7.07 m: HB 7.27 m: BP, 5°, IR, RF, VNR, SILT, black 7.97 m: BP, 10°, IR, RF, VNR, SILT, black 8.12 - 8.13 m: SM, 3°, SILT, black 8.90 m: HB 9.06 m: BP, 5°, IR, RF, CN 9.44 m: HB	
	0% Water LOSS	100	100	3 7	6.73m void, 10mm open						
	0% Water LOSS	100	100	1 9							

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER  Water Level on date shown  water inflow  water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Slockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide QZ Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom		Project: Nowra Build to Rent		Location: Beinda Street, Bomaderry		Job No: 304001019		Sheet: 3 of 3	
Position: E280876.982 N6140040.773 56 MGA2020		Angle from Horizontal: 90°		Surface Elevation: 9.981 m AHD					
Rig Type: Hanjin D&B 8D		Mounting: Track		Driller: TM					
Casing Diameter: HW		Bit Type: impreg		Bit Condition: good		Contractor: Total Drilling			
Data Started: 7-27-23		Date Completed: 7-27-23		Logged By: AC		Checked By: DR			

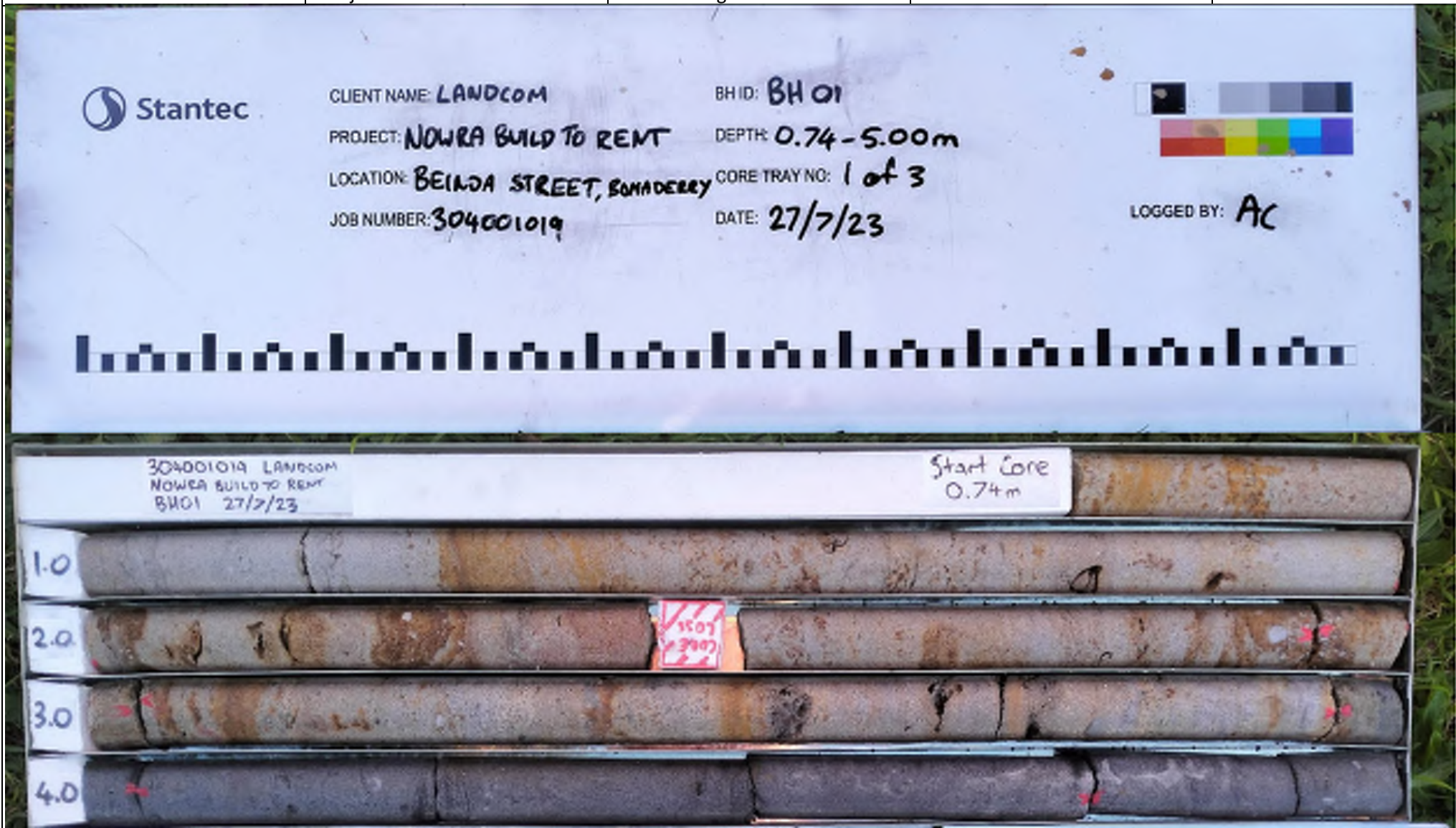
Coring				Material Description				Defect Description				Monitoring Well Details
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{s(50)}$ MPa ● Axial ○ Diametral VL 0.1 L 0.3 M 1 T 3 VH 10 EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	
NMLC 0% Water LOSS	100	100	-1	11	11.55m	[Green pattern]	SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining (<i>continued</i>)	SW	[Pattern]	[Pattern]	[Pattern]	10.38 m: BP, 5°, IR, RF, CN
							10.90 m: BP, 5°, IR, RF, CN					
				-2	12		TERMINATED AT 11.55 m Target depth. Groundwater standpipe installed					
				-3	13							
				-4	14							
				-5	15							
				-6	16							
				-7	17							
				-8	18							
				-9	19							

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Slockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

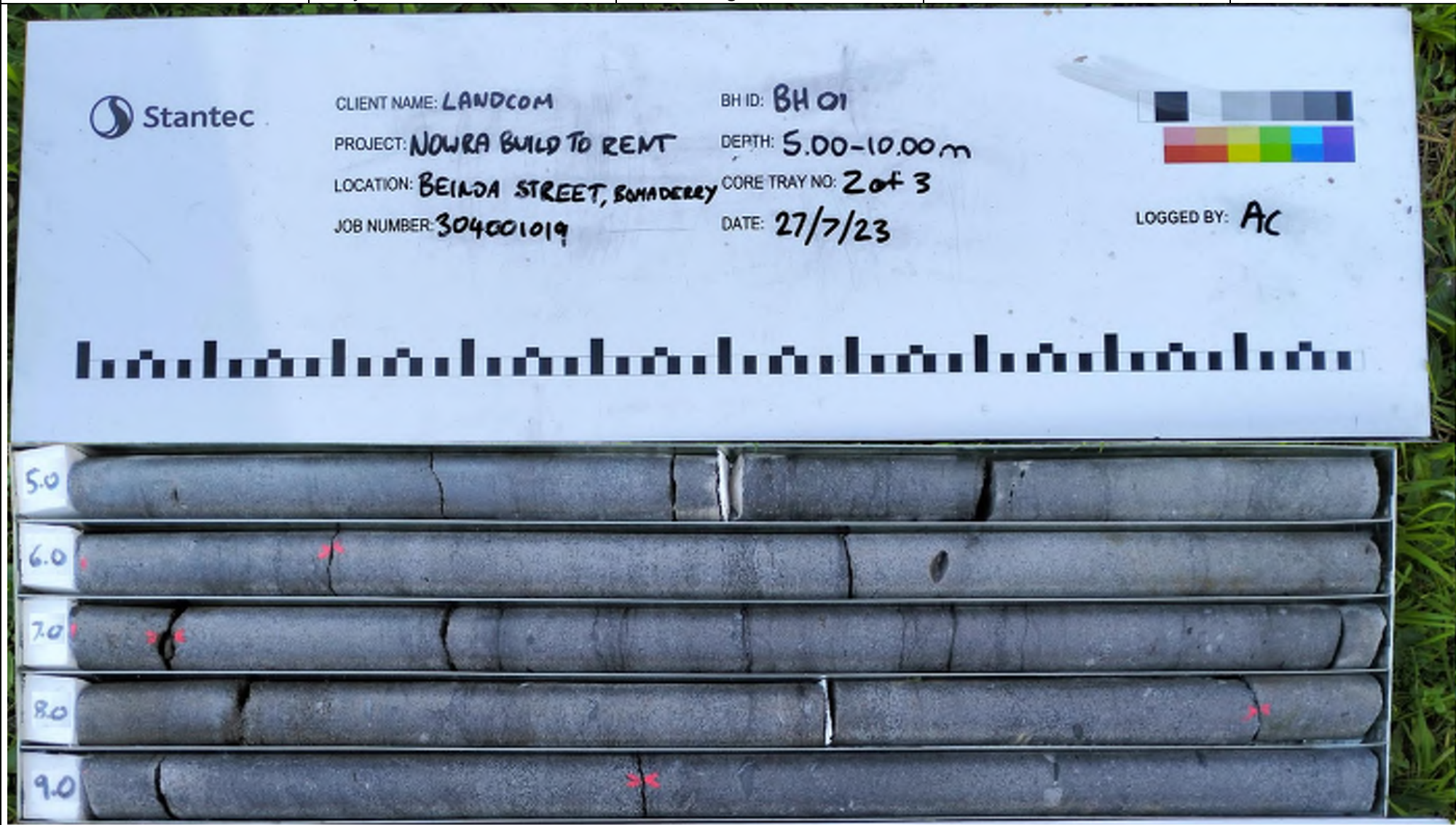


TITLE BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH01			
PROJECT NUMBER 304001019	TEST DATE 27/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 1 OF 3 0.74-5.00m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR



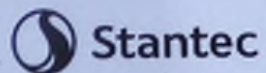


TITLE		BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH01	
PROJECT NUMBER 304001019	TEST DATE 27/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 2 OF 3 5.00-10.00m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR





TITLE		BOREHOLE CORE PHOTOGRAPH	
		Nowra Build to Rent – BH01	
PROJECT NUMBER	TEST DATE	INCLINATION:	CORE LENGTH: BOX 3 OF 3
304001019	27/7/2023	-90 DEGREES	10.00-11.55m
DRILL RIG:	CONTRACTOR:	LOGGED BY:	CHECKED BY:
Hanjin B&B 8D	Total Drilling	AC	DR



CLIENT NAME: LANDCOM

BH ID: BH 01

PROJECT: NOWRA BUILD TO RENT

DEPTH: 10.00 - 11.55

LOCATION: BEINDA STREET, BUNDABERG

CORE TRAY NO: 3 of 3

JOB NUMBER: 304001019

DATE: 27/7/23

LOGGED BY: AC



Hole No: BH02

Client: Landcom		Job No: 304001019		Sheet: 1 of 3	
Project: Nowra Build to Rent		Angle from Horizontal: 90°		Surface Elevation: 6.906 m AHD	
Location: Beinda Street, Bomaderry		Rig Type: Hanjin D&B 8D		Mounting: Track	
Position: E281018.675 N6140086.946 56 MGA2020		Casing Diameter: N/A		Driller: TM	
Data Started: 7-28-23		Date Completed: 7-28-23		Contractor: Total Drilling	
		Logged By: AC		Checked By: DR	

Drilling			Water	Sampling & Testing	RL (m AHD)	Depth (m)	Material Description						Monitoring Well Details
Method	Resistance	Casing		Sample or Field Test			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations	
AD/V	E	N/A					0.22m	Sandy SILT: low plasticity, brown, fine sand	M (<PL)		TOPSOIL		
								Continued as Cored Drill Hole					
						6	1						
						5	2						
						4	3						
						3	4						
						2	5						
						1	6						
						0	7						
						-1	8						
						-2	9						
						-3							

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom
Project: Nowra Build to Rent
Location: Beinda Street, Bomaderry

Job No: 304001019

Sheet: 2 of 3

Position: E281018.675 N6140086.946 56 MGA2020 Angle from Horizontal: 90° Surface Elevation: 6.906 m AHD
Rig Type: Hanjin D&B 8D Mounting: Track Driller: TM
Casing Diameter: N/A Bit Type: impreg Bit Condition: good Contractor: Total Drilling
Data Started: 7-28-23 Date Completed: 7-28-23 Logged By: AC Checked By: DR

Coring				Depth (m)	Material Description				Defect Description				Monitoring Well Details
Method	Fluid	TCR (%)	RQD (%)		Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{s(50)}$ MPa ● Axial ○ Diametral VL 0.1 L 0.3 M 1 H 3 V 10 EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other		
NMLC													
					0.22m START CORING AT 0.22m								
		0% Water LOSS	100	95		SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining	MW					0.72 m: BP, 0°, IR, RF, CN 0.76 m: BP, 0°, IR, RF, VNR, SILT; black, organics 1.20 m: BP, 3°, IR, RF, SN, Fe 1.44 - 1.45 m: SM, 0°, IR, RF, VNR, CLAY; pale grey 1.81 m: BP, 0°, IR, RF, VNR, CLAY; pale grey 2.09 m: HB 2.30 - 2.31 m: SM, 0°, IR, RF, VNR, CLAY; pale grey 2.37 - 2.39 m: SM, 0°, IR, RF, FILLED, Sandy CLAY; low plasticity, pale grey, coarse, rounded sand	
	08-01-28					2.49m fossil void, 10mm, open 2.58m 2 n.o. fossil void, 5mm open 2.69m 3 n.o. fossil void, 10mm, open 2.72 fossil void, 3mm, open 2.82m fossil void, 5mm, open	SW MW SW					3.17 m: HB	
		0% Water LOSS	100	95		2.95m 3.10m 3.40m 3.55m 3.70m grey 3.11m fossil void, 5mm, open grey pale grey 4.28m 4.39m pale grey 4.35m fossil void, 2mm, open grey	SW MW SW MW SW				3.63 - 3.66 m: SM, 15°, IR, RF, FILLED, SILT, black 4.10 m: BP, 10°, IR, RF, CN 4.20 m: BP, 5°, IR, RF, VNR, SILT, black 4.30 m: BP, 3°, IR, RF, CN 4.34 m: BP, 0°, IR, RF, CN 4.73 m: BP, 5°, IR, RF, CN		
												4.93 m: HB 5.05 m: HB 5.18 - 5.19 m: SM, 3°, IR, RF, VNR, SILT, black 5.36 m: BP, 3°, IR, RF, VNR, SILT, black 5.54 m: BP, 5°, IR, RF, VNR, SILT, black 5.67 m: BP, 3°, IR, RF, CT, SAND, medium grained, round 5.70 m: BP, 3°, IR, RF, CT, SAND, medium grained, round 5.88 m: BP, 5°, IR, RF, CN 6.04 m: BP, 0°, IR, RF, CN 6.50 m: BP, 3°, IR, RF, CN 6.60 m: BP, 3°, IR, RF, CN 6.61 m: BP, 3°, IR, RF, CN 6.80 m: BP, 3°, IR, RF, CN 7.21 m: BP, 5°, IR, RF, VNR, SILT, black 7.49 m: HB	
		0% Water LOSS	100	100								8.71 m: BP, 0°, IR, RF, CN 9.19 - 9.21 m: SM, 3°, SAND; grey, fine to medium grained 9.24 m: BP, 3°, IR, RF, CN	
												9.86 m: HB	

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer		WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)		ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered		DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break		PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished		COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide QZ Quartz	
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Hole No: BH02

Client:	Landcom
Project:	Nowra Build to Rent
Location:	Beinda Street, Bomaderry

Job No: 304001019

Sheet: 3 of 3

Position: E281018.675 N6140086.946 56 MGA2020

Angle from Horizontal: 90°

Surface Elevation: 6.906 m AHD

Rig Type: Hanjin D&B 8D

Mounting: Track

Driller: TM

Casing Diameter: N/A

Bit Type: impreg

Bit Condition: good

Contractor: Total Drilling

Data Started: 7-28-23

Date Completed: 7-28-23

Logged By: AC

Checked By: DR

[illegible]



TITLE		BOREHOLE CORE PHOTOGRAPH	
		Nowra Build to Rent – BH02	
PROJECT NUMBER	TEST DATE	INCLINATION:	CORE LENGTH: BOX 1 OF 3
304001019	28/7/2023	-90 DEGREES	0.22-5.00m
DRILL RIG:	CONTRACTOR:	LOGGED BY:	CHECKED BY:
Hanjin B&B 8D	Total Drilling	AC	DR



CLIENT NAME: LANDCOM

BH ID: BH02

PROJECT: NOWRA BUILD TO RENT

DEPTH:

LOCATION: BEINDA STREET, BOMADERRY

CORE TRAY NO: 1 of 3

JOB NUMBER: 304001019

DATE: 28/7/23

LOGGED BY: AC



304001019 LANDCOM 28/7/23
NOWRA BUILD START CORE 0.22m

1.0

2.0

3.0

4.0



TITLE		BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH02	
PROJECT NUMBER 304001019	TEST DATE 28/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 2 OF 3 5.00-10.00m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR



CLIENT NAME: LANDCOM

BH ID: BH02

PROJECT: NOWRA BUILD TO RENT

DEPTH: 5.0-10.0

LOCATION: BEINDA STREET, BOMADERRY

CORE TRAY NO: 2 of 3

JOB NUMBER: 304001019

DATE: 28/7/23



LOGGED BY: AC



5.0

6.0

7.0

8.0

9.0



TITLE		BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH02	
PROJECT NUMBER 304001019	TEST DATE 28/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 3 OF 3 10.00-11.93m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR



Client:	Landcom
Project:	Nowra Build to Rent
Location:	Beinda Street, Bomaderry

Job No: 304001019

Sheet: 1 of 3

Position: E280932.632 N6140104.558 56 MGA2020

Angle from Horizontal: 90°

Surface Elevation: 10.616 m AHD

Rig Type: Hanjin D&B 8D

Mounting: Track

Driller: TM

Casing Diameter: HW

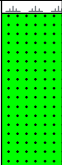
Contractor: Total Drilling

Data Started: 7-27-23

Date Completed: 7-27-23

Logged By: AC

Checked By: DR

Drilling			Water	Sampling & Testing	RL (m AHD)	Depth (m)	Material Description					Monitoring Well Details		
Method	Resistance	Casing		Sample or Field Test			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density		STRUCTURE & Other Observations	
AS RR	E	HW	ES 0.10 m		ML	GW	0.10m	Sandy SILT; low plasticity, brown, fine to coarse sand	M (<PL)		TOPSOIL			
	VH													ROCK
	F													
							1.24m	SANDSTONE, RECOVERED AS SANDY GRAVEL: coarse, pale orange / pale grey						
Continued as Cored Drill Hole														
							9							
							2							
							8							
							3							
							7							
							4							
							6							
							5							
							6							
							4							
							7							
							3							
							8							
							2							
							9							
							1							

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Stantec Australia PTY LTD

Client: Landcom	Job No: 304001019	Sheet: 2 of 3
Project: Nowra Build to Rent		
Location: Beinda Street, Bomaderry		
Position: E280932.632 N6140104.558 56 MGA2020	Angle from Horizontal: 90°	Surface Elevation: 10.616 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: TM
Casing Diameter: HW	Bit Type: impreg	Bit Condition: good
Data Started: 7-27-23	Date Completed: 7-27-23	Logged By: AC
		Checked By: DR

Coring				Depth (m)	Material Description				Defect Description				Monitoring Well Details
Method	Fluid	TCR (%)	RQD (%)		RL (m AHD)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{s(50)}$ MPa ● Axial ○ Diametral VL 0.1 L 0.3 L 1 L 3 L 10 L 30 L 100 L 300 L 1000 L 3000 VH 10 30 100 300 1000 3000	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other	
				10									
				1									
						1.24m START CORING AT 1.24m							
						1.38m CORE LOSS 0.14m (1.24-1.38)							
				9		SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining	HW					1.44 m: JT, 45°, IR, RF, CN	
	0% Water LOSS	88	68	2								1.50 - 1.51 m: SM, FILLED, SILT, black with organics	
				8		2.38m fossil; void closed						1.65 m: BP, 3°, IR, RF, C	
				3		2.47-2.56m voided fossil zone, 5% Voids						1.80 m: HB	
						2.56m Fossil; void - 10mm, open						1.90 m: BP, 3°, IR, RF, C	
				7		2.80-2.81m Fossil; void - 10mm, open						1.95 m: BP, 3°, IR, RF, C	
						3.14m						2.11 m: BP, 10°, IR, RF, C	
				4		3.30m grey	SW					2.18 m: BP, 10°, IR, RF, C	
						3.50m pale grey	MW					3.08 m: BP, 15°, IR, RF, C	
	0% Water LOSS	100	96	6		3.38m Fossil; void - 5mm, open	SW					3.42 - 3.43 m: SM, 3°, FILLED, SILT, black	
						3.45-3.48m fossil; void, 30mm						3.90 m: BP, 15°, IR, RF, C	
				5		grey						3.95 m: BP, 10°, IR, RF, C	
						4.19 Fossil; void - 10mm, open						4.10 m: BP, 10°, IR, RF, C	
				5		5.34m fossil; void closed						4.21 m: BP, 10°, IR, RF, C	
						5.37m fossil; void closed						4.82 m: BP, 3°, IR, RF, VNR, SILT, black	
				6								5.10 m: BP, 10°, IR, RF, C	
												5.55 m: HB	
				7								6.09 m: BP, 0°, IR, RF, C	
	0% Water LOSS	100	100	4								6.89 - 6.90 m: SM, 0°, SILT, black	
												7.05 m: HB	
				3								7.33 - 7.34 m: SM, 0°, SILT, black	
												7.85 m: BP, 0°, IR, RF, C	
				8								7.89 m: BP, 0°, IR, RF, C	
												8.03 m: HB	
				2								8.06 m: HB	
												8.27 m: BP, 0°, IR, RF, C	
	0% Water LOSS	100	97	9								8.59 m: BP, 3°, IR, RF, C	
												8.71 m: BP, 3°, IR, RF, C	
												8.75 m: BP, 5°, IR, RF, C	
												8.79 m: BP, 0°, IR, RF, C	
												8.93 m: BP, 3°, IR, RF, C	
												9.13 m: BP, 3°, IR, RF, C	
				1								9.52 m: HB	

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer		WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)		ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered		DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break		PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Slockensided POL Polished		COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz	
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom		Job No: 304001019		Sheet: 3 of 3	
Project: Nowra Build to Rent		Angle from Horizontal: 90°		Surface Elevation: 10.616 m AHD	
Location: Beinda Street, Bomaderry		Rig Type: Hanjin D&B 8D		Driller: TM	
Position: E280932.632 N6140104.558 56 MGA2020		Mounting: Track		Contractor: Total Drilling	
Casing Diameter: HW		Bit Type: impreg		Bit Condition: good	
Data Started: 7-27-23		Date Completed: 7-27-23		Logged By: AC	
Checked By: DR					

Coring				Material Description				Defect Description				Monitoring Well Details	
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is ₍₅₀₎ MPa ● Axial ○ Diametral VL 0.1 L 0.3 M 1 S 3 T 10 VEH 10 EH 20	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual		Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other
NMLC	0% Water LOSS	100	97	0	11		SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining (continued)	SW				10.02 m: HB 10.70 m: HB 10.93 m: HB	
				-1	12		TERMINATED AT 11.52 m Target depth. Groundwater standpipe installed						
				-2	13								
				-3	14								
				-4	15								
				-5	16								
				-6	17								
				-7	18								
				-8	19								
				-9									

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Slockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom
Project: Nowra Build to Rent
Location: Beinda Street, Bomaderry

Job No: 304001019

Sheet: 2 of 3

Position: E280880.000 N6140040.000 56 MGA2020 Angle from Horizontal: 90° Surface Elevation:
Rig Type: Hanjin D&B 8D Mounting: Track Driller: TM
Casing Diameter: HW Bit Type: impreg Bit Condition: good Contractor: Total Drilling
Data Started: 27/07/23 Date Completed: 27/07/23 Logged By: AC Checked By: DR

Coring					Material Description					Defect Description					Monitoring Well Details	
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{s(50)}$ MPa ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other				
↑ NMLC	0% Water LOSS	97	97		0.74m		START CORING AT 0.74m									
					1		SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining	HW				1.18 m: BP, 5°, IR, RF, CN				
					2		1.74m fossil void closed 1.82m fossil void - 5mm, open 2.07m fossil void - 2mm, open 2.13m fossil void - 2mm, open				2.17 m: BP, 3°, IR, RF, CT, CLAY, pale grey 2.34 m: HB					
		0% Water LOSS	100	100		2.45m		CORE LOSS 0.05m (2.45-2.50)	HW							
	3						SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining				2.93 m: HB 3.04 m: HB					
	4						3.54-3.57m fossil void, 30mm, open 2.16m fossil void - 5mm, open 3.74m fossil void - 10mm open 3.95m Grey	SW			3.69 m: BP 3.95 m: BP, 3°, IR, RF, CT, SILT, black 4.04 m: HB 4.26 m: DB 4.50 m: BP, 5°, IR, RF, CN 4.77 m: HB 4.92 m: BP, 5°, IR, RF, CN 5.28 m: BP, 10°, IR, RF, CN 5.45 m: BP, 5°, IR, RF, CN 5.69 m: BP, 10°, IR, RF, VNR, SILT, black 6.19 m: HB 6.58 m: BP, 10°, IR, RF, VNR, SILT, black 7.07 m: HB 7.27 m: BP, 5°, IR, RF, VNR, SILT, black 7.97 m: BP, 10°, IR, RF, VNR, SILT, black 8.12 - 8.13 m: SM, 3°, SILT, black					
		0% Water LOSS	100	100		6.73m		void, 10mm open								
	7										8.90 m: HB 9.06 m: BP, 5°, IR, RF, CN					
	8										9.44 m: HB					
		0% Water LOSS	100	100		9										

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DMLC Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide QZ Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom Project: Nowra Build to Rent Location: Beinda Street, Bomaderry	Job No: 304001019 Surface Elevation:	Sheet: 3 of 3
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Position: E280880.000 N6140040.000 56 MGA2020 Rig Type: Hanjin D&B 8D Casing Diameter: HW Data Started: 27/07/23	Angle from Horizontal: 90° Mounting: Track Bit Type: impreg Date Completed: 27/07/23	Driller: TM Contractor: Total Drilling Checked By: DR
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Coring					Material Description					Defect Description					Monitoring Well Details
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{S(50)}$ MPa ● - Axial ○ - Diametral VL 0.1 L 0.3 M 1 H 3 VH 10 EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other			
NMLC ↓								SANDSTONE, medium to coarse grained, pale grey with orange-brown iron staining <i>(continued)</i>	SW				10.38 m: BP, 5°, IR, RF, CN 10.90 m: BP, 5°, IR, RF, CN		
		100	100		11		11.55m	TERMINATED AT 11.55 m Target depth. Groundwater standpipe installed							
					12										
					13										
					14										
					15										
					16										
					17										
					18										
					19										

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER  Water Level on date shown  water inflow  water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions



TITLE		BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH03	
PROJECT NUMBER 304001019	TEST DATE 27/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 1 OF 3 1.24-6.00m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR



CLIENT NAME: LANDCOM

BH ID: BH03

PROJECT: NOWRA BUILD TO RENT

DEPTH: 1.24-6.00

LOCATION: BEINDA STREET

CORE TRAY NO: 1 & 3

JOB NUMBER: 304001019

DATE: 27/7/23



LOGGED BY: AC



304001019 BH03
27/7/23 START 1.24m

2.0

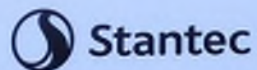
3.0

4.0

5.0



TITLE		BOREHOLE CORE PHOTOGRAPH Nowra Build to Rent – BH03	
PROJECT NUMBER 304001019	TEST DATE 27/7/2023	INCLINATION: -90 DEGREES	CORE LENGTH: BOX 2 OF 3 6.00-11.00m
DRILL RIG: Hanjin B&B 8D	CONTRACTOR: Total Drilling	LOGGED BY: AC	CHECKED BY: DR



CLIENT NAME: LANDCOM

BH ID: BH 03

PROJECT: NOWRA BUILD TO RENT

DEPTH: 6.00-11.00

LOCATION: BEINDA STREET

CORE TRAY NO: 1 & 3

JOB NUMBER: 304001019

DATE: 27/7/23

LOGGED BY: AC



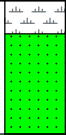


TITLE		BOREHOLE CORE PHOTOGRAPH	
		Nowra Build to Rent – BH03	
PROJECT NUMBER	TEST DATE	INCLINATION:	CORE LENGTH: BOX 3 OF 3
304001019	27/7/2023	-90 DEGREES	11.00-11.52m
DRILL RIG:	CONTRACTOR:	LOGGED BY:	CHECKED BY:
Hanjin B&B 8D	Total Drilling	AC	DR



Hole No: BH201

Client: Landcom	Job No: 304001019	Sheet: 1 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280935.000 N6140095.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 10.500 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA		Contractor: South Coast Drilling
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Drilling			Sampling & Testing		Material Description							
Method	Resistance	Casing	Water	Sample or Field Test	RL (m AHD)	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	E	NA	Not Encountered					ML	0.10m Sandy SILT: low plasticity, brown, fine grained sand	M (>PL)		TOPSOIL
	GP							0.40m SANDSTONE, recovered as Sandy GRAVEL: fine to coarse, pale orange, grey, fine to coarse grained sand, inferred high strength rock	ROCK			
					10.0	0.5			Continued as Cored Drill Hole			
										</		

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

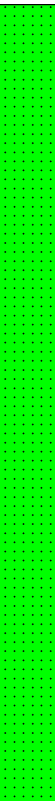
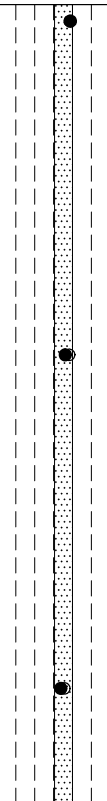
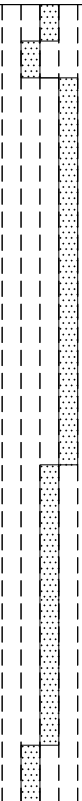
Client: Landcom	Job No: 304001019	Sheet: 2 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280935.000 N6140095.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 10.500 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA	Bit Type:	Bit Condition:
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Coring				Depth (m)	Material Description				Defect Description			
Method	Fluid	TCR (%)	RQD (%)		RL (m AHD)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is ₍₅₀₎ MPa ● - Axial ○ - Diametral VL 0.1 L M H T 3 VH 10 EH 20 L 0.1 L M H T 3 VH 10 EH 20	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other
NMLC	0% Water LOSS	100	97	10.0	0.5	0.40m START CORING AT 0.40m	MW					
				9.5	1.0	SANDSTONE, fine to coarse grained, brown, orange-brown					1.02 m: HB	
				9.0	1.5					1.11 m: BP, 3°, IR, RF, CN 1.14 m: BP, 3°, IR, RF, CN		
				8.5	2.0	becoming grey, with trace fossil voids up to 10mm @ 1.88m bgl	SW			1.78 m: BP, 3°, IR, RF, CN 1.94 m: BP, 3°, IR, RF, CN		
				8.0	2.5	2mm fossil void @ 2.53m bgl 2mm fossil void @ 2.70m bgl 3mm fossil void @ 2.78m bgl				2.14 m: BP, 3°, IR, RF, CN 2.18 m: BP, 3°, IR, RF, CN 2.21 m: BP, 3°, IR, RF, CN		
		88	100	7.5	3.0	10mm fossil void @ 3.08m bgl 3mm fossil void @ 3.11m bgl				2.44 m: BP, 3°, IR, RF, CN 2.79 m: BP, 3°, IR, RF, CN		
				7.0	3.5	5mm fossil void @ 3.94m bgl				3.08 m: BP, 3°, IR, RF, CN 3.50 m: BP, 3°, IR, RF, CN 3.87 m: BP, 3°, IR, RF, CN		

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom	Job No: 304001019	Sheet: 3 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280935.000 N6140095.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 10.500 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA	Bit Type:	Bit Condition:
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Coring				Material Description					Defect Description			
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is ₍₅₀₎ MPa ● - Axial ○ - Diametral VL 0.1 0.3 1 3 10 30 60 100 300 600 1000 2000 L M H VL VH EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other
NMLC	0% Water LOSS	88	100	6.0	4.5		SANDSTONE, fine to coarse grained, brown, orange-brown (continued)	SW				— 4.11 m: BP, 3°, IR, RF, CN
					5.5		5.0					3mm fossil void @ 5.27m bgl
				5.0	5.5							— 4.79 m: HB
				4.5	6.0							— 5.38 m: BP, 0°, IR, RF, CN
												— 5.78 m: BP, 0°, IR, RF, CN
												— 6.22 m: BP, 0°, IR, RF, CN
				4.0	6.5		TERMINATED AT 6.40 m Target depth					
				3.5	7.0							
				3.0	7.5							

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH201

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 1 of 2
0.40-5.00mDRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-201

PROJECT: NOWRA BUILD TO RENT

DEPTH: 0.40-0.50

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 1 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC

NOWRA BUILD TO RENT 304001019
LANDCOM 29/1/2024 START CORE 0.4m

1.0

2.0

3.0

4.0



TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH201

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 2 of 2
5.00-6.40mDRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-201

PROJECT: NOWRA BUILD TO RENT

DEPTH: 5.0-6.40m

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 2 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC



5.0

6.0

END CORE 6.40m

Hole No: BH202

Client:	Landcom
Project:	Nowra Build to Rent
Location:	Beinda St, Bomaderry NSW

Job No: 304001019

Sheet: 1 of 3

Position: E280990.000 N6140096.000 56H MGA20

Angle from Horizontal: 90°

Surface Elevation: 8.500 m AHD

Rig Type: Hanjin D&B 8D

Mounting: Track

Driller: CM

Casing Diameter: NA

Contractor: South Coast Drilling

Data Started: 29/01/23

Date Completed: 29/01/23

Logged By: AC

Checked By: RD

Drilling				Sampling & Testing		Material Description						
Method	Resistance	Casing	Water	Sample or Field Test	RL (m AHD)	Depth (m)	Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	E	NA	Not Encountered		8.0	0.5	ML	ML	Sandy SILT: low plasticity, brown, fine grained sand	M (>PL)		TOPSOIL
	VH						GP	SANDSTONE, recovered as Sandy GRAVEL: fine to coarse, pale orange, grey, fine to coarse grained sand, inferred high strength rock		ROCK		
Continued as Cored Drill Hole												

Client: Landcom
Project: Nowra Build to Rent
Location: Beinda St, Bomaderry NSW

Job No: 304001019

Sheet: 2 of 3

Position: E280990.000 N6140096.000 56H MGA20
Angle from Horizontal: 90°
Surface Elevation: 8.500 m AHD

Rig Type: Hanjin D&B 8D
Mounting: Track
Driller: CM

Casing Diameter: NA
Bit Type:
Bit Condition:
Contractor: South Coast Drilling

Data Started: 29/01/23
Date Completed: 29/01/23
Logged By: AC
Checked By: RD

Coring				Depth (m)	Material Description				Defect Description			
Method	Fluid	TCR (%)	RQD (%)		Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is ₍₅₀₎ MPa ● - Axial ○ - Diametral VL 0.1 L M H T 3 VH 10 EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other	
				8.0	0.5							
					0.60m	START CORING AT 0.60m						
						SANDSTONE, fine to coarse grained, pale grey, orange-brown	MW				0.66 m: BP, 3°, IR, RF, SN, Fe 0.74 m: BP, 3°, IR, RF, SN, Fe 0.77 m: BP, 3°, IR, RF, SN, Fe 1.10 m: BP, 0°, IR, RF, SN, Fe 1.15 m: BP, 0°, IR, RF, CN 1.20 m: BP, 0°, IR, RF, CN 1.40 m: BP, 0°, IR, RF, SN, Fe 1.46 m: BP, 0°, IR, RF, CN 1.54 m: BP, 18°, IR, RF, CN 1.58 m: BP, 5°, IR, RF, CN 1.69 m: BP, 5°, IR, RF, CN 1.71 m: BP, 5°, IR, RF, CN 1.91 m: BP, 3°, IR, RF, CN 2.06 m: BP, 15°, IR, RF, CN 2.32 m: JT, 60°, IR, RF, CN 2.47 m: BP, 30°, IR, RF, CN 2.51 m: BP, 10°, IR, RF, CN 2.59 m: BP, 3°, IR, RF, CN 2.94 m: BP, 20°, IR, RF, CN 3.14 m: BP, 5°, IR, RF, CN 3.20 m: JT, 45°, IR, RF, CN 3.25 m: BP, 10°, IR, RF, CN 3.38 m: BP, 3°, IR, RF, CN 3.42 m: BP, 3°, IR, RF, CN 3.76 m: BP, 20°, IR, RF, CN 3.90 m: BP, 20°, IR, RF, CN 3.95 m: BP, 20°, IR, RF, CN	
						2mm fossil void @ 3.71m bgl						

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom	Job No: 304001019	Sheet: 3 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280990.000 N6140096.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 8.500 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA	Bit Type:	Bit Condition:
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Coring				Material Description					Defect Description				
Method	Fluid	TCR (%)	RQD (%)	RL (m AHD)	Depth (m)	Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is ₍₅₀₎ MPa ● - Axial ○ - Diametral VL 0.1 0.3 0.5 1 3 5 10 30 60 100 300 600 1000 2000 L M H VL ₃ VH ₃ EH	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other	
NMLC	0% Water LOSS	100	84	4.0	4.5		SANDSTONE, fine to coarse grained, pale grey, orange-brown (<i>continued</i>) 15mm fossil void @ 4.15m bgl	SW				3.96 m: BP, 20°, IR, RF, CN 4.15 m: BP, 3°, IR, RF, CN 4.35 m: BP, 3°, IR, RF, CN 4.44 m: BP, 3°, IR, RF, CN 4.50 m: BP, 3°, IR, RF, CN 4.57 m: BP, 20°, IR, RF, CN 4.65 m: BP, 15°, IR, RF, CN 4.67 m: BP, 5°, IR, RF, CN 4.71 m: BP, 5°, IR, RF, CN 4.74 m: BP, 5°, IR, RF, CN	
				3.5	5.0		5.09 m: BP, 0°, IR, RF, CN						
NMLC	0% Water LOSS	100	84	3.0	5.5		5mm fossil void @ 6.12m bgl	SW				5.59 m: BP, 0°, IR, RF, CN 6.02 m: BP, 3°, IR, RF, CN 6.13 m: BP, 10°, IR, RF, CN 6.16 m: BP, 15°, IR, RF, CN	
				2.5	6.0		6.42 m: BP, 3°, IR, RF, CN						
NMLC	0% Water LOSS	100	84	2.0	6.5		6.54m TERMINATED AT 6.54 m Target depth	SW					
				1.5	7.0								
NMLC	0% Water LOSS	100	84	1.0	7.5			SW					

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer				WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)				ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered				DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break				PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished				COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz			
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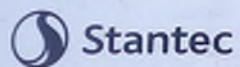
Refer to explanatory notes for details of abbreviations and basis of descriptions



TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH202

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 1 of 2
0.60-5.00DRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-202

PROJECT: NOWRA BUILD TO RENT

DEPTH: 0.60-5.00m

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 1 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC

304001019 NOWRA BUILD TO RENT BH202
LANDCOM 29/1/2024 START CORE 0.60m

1.0

2.0

3.0

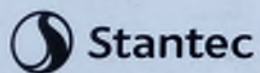
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TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH202

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 2 of 2
5.00-6.54mDRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-202

PROJECT: NOWRA BUILD TO RENT

DEPTH: 5.0-6.54m

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 2 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC



5.0

6.0

END CORE 6.54m

Client: Landcom	Job No: 304001019	Sheet: 1 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280977.000 N6140077.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 8.600 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA		Contractor: South Coast Drilling
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Drilling			Water	Sampling & Testing	RL (m AHD)	Depth (m)	Material Description					
Method	Resistance	Casing		Sample or Field Test			Graphic Log	Classification	SOIL TYPE, plasticity or particle characteristic, colour, secondary and minor components ROCK TYPE, grain size and type, colour, fabric & texture, strength, weathering, defects and structure	Moisture Condition	Consistency Relative Density	STRUCTURE & Other Observations
AD/T	E	NA	Not Encountered		8.5		ML	0.10m	Sandy SILT: low plasticity, brown, fine grained sand	M (>PL)		TOPSOIL
	VH								SANDSTONE, recovered as Sandy GRAVEL: fine to coarse, pale orange, grey, fine to coarse grained sand, inferred high strength rock			ROCK
								Continued as Cored Drill Hole				
						0.5						
						8.0						
						1.0						
						7.5						
						1.5						
						7.0						
						2.0						
						6.5						
						2.5						
						6.0						
						3.0						
						5.5						
						3.5						
						5.0						

METHOD EX Excavator bucket R Ripper HA Hand auger PT Push tube SON Sonic drilling AH Air hammer PS Percussion sampler AS Short spiral auger AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller	PENETRATION VE Very Easy (No Resistance) E Easy F Firm H Hard VH Very Hard (Refusal) WATER  Water Level on Date shown  water inflow  water outflow	FIELD TESTS SPT - Standard Penetration Test HP - Hand/Pocket Penetrometer DCP - Dynamic Cone Penetrometer PSP - Perth Sand Penetrometer MC - Moisture Content PBT - Plate Bearing Test IMP - Borehole Impression Test PID - Photoionisation Detector VS - Vane Shear; P=Peak, R=Residual (uncorrected kPa)	SAMPLES B - Bulk disturbed sample D - Disturbed sample ES - Environmental sample U - Thin wall tube 'undisturbed' MOISTURE D - Dry M - Moist W - Wet PL - Plastic limit LL - Liquid limit w - Moisture content	SOIL CONSISTENCY VS - Very Soft S - Soft F - Firm St - Stiff VSt - Very Stiff H - Hard RELATIVE DENSITY VL - Very Loose L - Loose MD - Medium Dense D - Dense VD - Very Dense
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom	Job No: 304001019	Sheet: 2 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280977.000 N6140077.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 8.600 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA	Bit Type: impreg	Bit Condition: good
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Coring				Depth (m)	Material Description				Defect Description			
Method	Fluid	TCR (%)	RQD (%)		Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength Is(50) MPa ● - Axial ○ - Diametral VL 0.1 L 0.3 M 0.5 T 1 H 3 EH 10	Average Natural Defect Spacing (mm) 20 60 200 600 2000	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other	
				8.5		0.35m START CORING AT 0.35m						
				8.0		SANDSTONE, fine to coarse grained, pale grey, orange-brown	MW					0.43 m: BP, 5°, IR, RF, CN
				7.5								0.61 m: BP, 5°, IR, RF, VNR, clay, pale grey
				7.0								0.71 m: BP, 5°, ST, RF, CN
				6.5								0.80 m: JT, 90°, IR, RF, CN
				6.0								0.90 m: BP, 5°, IR, RF, CN
				5.5								1.17 m: BP, 10°, IR, RF, CN
				5.0								1.44 m: BP, 3°, IR, RF, CN
				4.5								1.65 m: BP, 3°, ST, RF, CN
				4.0								2.08 m: BP, 3°, IR, RF, CN
				3.5								2.17 m: BP, 3°, IR, RF, CN
				3.0								3.25 m: BP, 3°, IR, RF, CN
				2.5								3.58 m: BP, 3°, IR, RF, CN
				2.0								3.69 m: BP, 3°, IR, RF, CN
				1.5								3.73 m: BP, 3°, IR, RF, CN
				1.0								3.86 m: BP, 3°, IR, RF, CN
				0.5								
				0.0								

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Qz Quartz
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Refer to explanatory notes for details of abbreviations and basis of descriptions

Client: Landcom	Job No: 304001019	Sheet: 3 of 3
Project: Nowra Build to Rent		
Location: Beinda St, Bomaderry NSW		
Position: E280977.000 N6140077.000 56H MGA20	Angle from Horizontal: 90°	Surface Elevation: 8.600 m AHD
Rig Type: Hanjin D&B 8D	Mounting: Track	Driller: CM
Casing Diameter: NA	Bit Type: impreg	Bit Condition: good
Data Started: 29/01/23	Date Completed: 29/01/23	Logged By: AC
		Checked By: RD

Coring				Depth (m)	Material Description				Defect Description			
Method	Fluid	TCR (%)	RQD (%)		Graphic Log	SOIL TYPE, plasticity or particle characteristic, colour, secondary & minor components	ROCK NAME, grain size and type, colour, fabric and texture, inclusions & minor components	Weathering	Estimated Strength $I_{s(50)}$ MPa	Average Natural Defect Spacing (mm)	Visual	Additional Data DEFECT TYPE, orientation, shape, roughness, infilling or coating, thickness, other
NMLC	0% Water Loss	100	96	4.5		SANDSTONE, fine to coarse grained, pale grey, orange-brown (continued)		SW	VL 0.1 0.3 0.5 1 3 5 10 30 60 100 300 600 1000 2000	20 60 200 600 2000		4.19 m: BP, 3°, IR, RF, CN 4.34 m: BP, 3°, IR, RF, CN 5.10 m: BP, 3°, IR, RF, CN 5.33 m: BP, 0°, IR, RF, CN 5.46 m: BP, 0°, IR, RF, CN 6.06 m: BP, 5°, IR, RF, CN 6.11 m: BP, 0°, IR, RF, CN 6.15 m: BP, 0°, IR, RF, CN
				4.5		5mm fossil void @ 4.33m bgl						
				4.0		3mm fossil void @ 4.60m bgl						
				5.0		5mm fossil void @ 4.93m bgl						
				3.5								
				5.5								
				3.0								
				6.0								
				2.5								
				6.5		TERMINATED AT 6.45 m Target depth						
				2.0								
				7.0								
				1.5								
				7.5								
				1.0								

DRILLING AD/V Solid flight auger: V-Bit AD/T Solid flight auger: TC-Bit HFA Hollow flight auger WB Washbore drilling RR Rock roller PQ Rotary core (85mm) HQ Rotary core (63.5mm) NMLC Rotary core (51.94mm) DT Diatube concrete coring PT Push tube PS Percussion sampling SON Sonic drilling AH Air hammer	WATER Water Level on date shown water inflow water outflow ROCK QUALITY DESCRIPTIONS RQD Rock Quality Designation (%) TCR Total Core Recovery (%)	ROCK STRENGTH EH Extremely High VH Very High H High M Medium L Low VL Very Low ROCK WEATHERING FR Fresh SW Slightly Weathered DW Distinctly Weathered MW Moderately Weathered HW Highly Weathered XW Extremely Weathered	DEFECT TYPE JT Joint SZ Sheared zone BP Bedding Parting SM Seam FL Foliation VN Vein CL Cleavage CS Crushed Seam FZ Fracture Zone DL Drift Lift HB Handing Break DB Drilling Break	PLANARITY CU Curved DIS Discontinuous IR Irregular PR Planar ST Stepped UN Undulose ROUGHNESS VR Very Rough RF Rough S Smooth SL Stockensided POL Polished	COATING CN Clean SN Stained VNR Veneer (thin or patchy) CT Coating (up to 1mm) INFILL MATERIALS X Carbonaceous MU Unidentified mineral MS Secondary mineral KT Chlorite CA Calcite Fe Iron Oxide Oz Quartz
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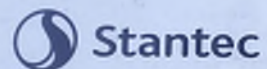
Refer to explanatory notes for details of abbreviations and basis of descriptions



TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH203

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 1 of 2
0.45-5.00mDRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-203

PROJECT: NOWRA BUILD TO RENT

DEPTH: 0.45-5.0m

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 1 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC

304001019 NOWRA BUILD TO RENT
LANDCOM 29/1/2024 START CORE 0.45m

1.0

2.0

3.0

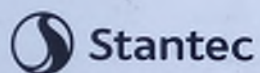
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TITLE:

BOREHOLE CORE PHOTOGRAPH

Nowra Build to Rent - BH203

PROJECT NO:
304001019TEST DATE:
29/01/2024INCLINATION:
-90°CORED LENGTH: BOX 2 of 2
5.00-6.45DRILL RIG:
Hanjin B&B 8DCONTRACTOR:
South Coast DrillingLOGGED BY:
ACCHECKED BY:
DR

CLIENT NAME: LANDCOM

BH ID: BH-203

PROJECT: NOWRA BUILD TO RENT

DEPTH: 5.0 - 6.45m

LOCATION: BEINDA ST, BOMADERRY

CORE TRAY NO: 1 of 2

JOB NUMBER: 304001019

DATE: 29/1/2024

LOGGED BY: AC



5.0

6.0

END CORE 6.45m

Appendix D LABORATORY CERTIFICATES



Report on Uniaxial Compressive Strength (UCS)

Client:	Stantec Australia Pty Ltd	Report No:	1211
Client Address:	16 Burelli St, Wollongong NSW 2500	Report Date:	31/07/2023
Project:	Geotechnical Testing	Report Page:	Page 1 of 1
Works Component:	Beinda Street, Bomaderry	Project No:	26
Material Used:	Core	Test Request:	304001019
Material Description:	Sandstone	Lot Number:	-
Lot Comments:	-	ITP/PCP Number:	-
Lab Test Date/s:	Laboratory testing 29/07/2023	Control Line:	BH01
Sample Date:	27/07/2023	Sample Number:	13335

Uniaxial Compressive Strength

Client ID Number		Failure Mode	(DS) Double Shear
Borehole	BH01	Failure Sketch	
Depth	3.1-3.3m		
Lithological Description	Sedimentary		
Type of Testing Machine	ILLACON02		
Date of Test	29/07/2023		
Height (mm)	143.0		
Diameter (mm)	51.8		
Test Duration (mins)	5.90	Rate Displacement (mm/min)	0.10
UCS (Mpa)	31	Moisture Content (%)	2.9

Specimen - Before Testing



Specimen - After Testing


Sampling & Test Methods (Results relate only to the items sampled/tested)

Sampled by Client: Results apply to the sample/s as received. **
 As Received: Samples stored & Tested in as received condition.
 AS4133.4.2.2: (2013) Determination of Uniaxial Compressive Strength (<50MPa)
 AS4133.1.1.1: (2005) Determination of moisture content of rock, oven drying.

(** NATA accreditation does not cover the performance of this service)

Report Endorsement


Accredited for compliance with
 ISO/IEC 17025 - Testing.
 NATA Accreditation number: 20656

Issued By:



P. Baltoski
 Approved Signatory

Report on Uniaxial Compressive Strength (UCS)

Client:	Stantec Australia Pty Ltd	Report No:	1212
Client Address:	16 Burelli St, Wollongong NSW 2500	Report Date:	31/07/2023
Project:	Geotechnical Testing	Report Page:	Page 1 of 1
Works Component:	Beinda Street, Bomaderry	Project No:	26
Material Used:	Core	Test Request:	304001019
Material Description:	Sandstone	Lot Number:	-
Lot Comments:	-	ITP/PCP Number:	-
Lab Test Date/s:	Laboratory testing 29/07/2023	Control Line:	BH01
Sample Date:	27/07/2023	Sample Number:	13336

Uniaxial Compressive Strength

Client ID Number		Failure Mode	(DS) Double Shear
Borehole	BH01	Failure Sketch	
Depth	5.1-5.3m		
Lithological Description	Sedimentary		
Type of Testing Machine	ILLACON02		
Date of Test	29/07/2023		
Height (mm)	147		
Diameter (mm)	51.8		
Test Duration (mins)	6.85	Rate Displacement (mm/min)	0.10
UCS (Mpa)	54.1	Moisture Content (%)	3.8

Specimen - Before Testing



Specimen - After Testing


Sampling & Test Methods (Results relate only to the items sampled/tested)

Sampled by Client: Results apply to the sample/s as received. **
 As Received: Samples stored & Tested in as received condition.
 AS4133.4.2.1: (2007) Determination of Uniaxial Compressive Strength (50MPa & greater)
 AS4133.1.1.1: (2005) Determination of moisture content of rock, oven drying.

(** NATA accreditation does not cover the performance of this service)

Report Endorsement


Accredited for compliance with
 ISO/IEC 17025 - Testing.
 NATA Accreditation number: 20656

Issued By:



P. Baltoski
 Approved Signatory

**ASCT Illawarra**

Postal: 2/15 Miall Way, Albion Park Rail NSW 2527

Lab: 2/15 Miall Way, Albion Park Rail NSW 2527

Telephone: +61 (02) 4256 1684

E-Mail: illawarra@asct.com.au

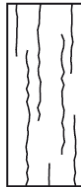
Mobile: 0497 979 929

A.B.N. 34 635 062 609

Report on Uniaxial Compressive Strength (UCS)

Client:	Stantec Australia Pty Ltd	Report No:	1336-UCS
Client Address:	16 Burelli St, Wollongong NSW 2500	Report Date:	5/02/2024
Project:	Geotechnical Testing	Report Page:	Page 1 of 1
Works Component:	Nowra Build To Rent - Beinda Street, Bomaderry	Project No:	26
Material Used:	-	Test Request:	304001019
Material Description:	Sandstone Core	Lot Number:	-
Lot Comments:	-	ITP/PCP Number:	-
Lab Test Date/s:	Laboratory testing 02/02/2024	Control Line:	BH201
Sample Date:	29/01/2024	Sample Number:	20074

Uniaxial Compressive Strength

Client ID Number		Failure Mode	(d) Tensile Dominated
Borehole	BH201	Failure Sketch	
Depth	0.4-0.7		
Lithological Description	Sedimentary		
Type of Testing Machine	ILLACON02		
Date of Test	2/02/2024		
Height (mm)	132.0		
Diameter (mm)	51.3		
Test Duration (mins)	9.30	Rate Displacement (mm/min)	0.10
UCS (Mpa)	34	Moisture Content (%)	2.9

Specimen - Before Testing



Specimen - After Testing

**Sampling & Test Methods (Results relate only to the items sampled/tested)**

Sampled by Client: Results apply to the sample/s as received. **
As Received: Samples stored & Tested in as received condition.
AS4133.4.2.2: (2013) Determination of Uniaxial Compressive Strength (<50MPa)
AS4133.1.1.1: (2005) Determination of moisture content of rock, oven drying.

(** NATA accreditation does not cover the performance of this service)

Report Endorsement

Accredited for compliance with
ISO/IEC 17025 - Testing.
NATA Accreditation number: 20656

Issued By:

P. Baltoski
Approved Signatory

Report on Uniaxial Compressive Strength (UCS)

Client:	Stantec Australia Pty Ltd	Report No:	1337-UCS
Client Address:	16 Burelli St, Wollongong NSW 2500	Report Date:	5/02/2024
Project:	Geotechnical Testing	Report Page:	Page 1 of 1
Works Component:	Nowra Build To Rent - Beinda Street, Bomaderry	Project No:	26
Material Used:	-	Test Request:	304001019
Material Description:	Sandstone Core	Lot Number:	-
Lot Comments:	-	ITP/PCP Number:	-
Lab Test Date/s:	Laboratory testing 02/02/2024	Control Line:	BH202
Sample Date:	29/01/2024	Sample Number:	20075

Uniaxial Compressive Strength

Client ID Number		Failure Mode	(c) Mixed Mode
Borehole	BH202	Failure Sketch	
Depth	0.75-1.00		
Lithological Description	Sedimentary		
Type of Testing Machine	ILLACON02		
Date of Test	2/02/2024		
Height (mm)	132.1	Rate Displacement (mm/min)	0.10
Diameter (mm)	51.7	Moisture Content (%)	4.0
Test Duration (mins)	5.30		
UCS (Mpa)	20		

Specimen - Before Testing



Specimen - After Testing


Sampling & Test Methods (Results relate only to the items sampled/tested)

Sampled by Client: Results apply to the sample/s as received. **
 As Received: Samples stored & Tested in as received condition.
 AS4133.4.2.2: (2013) Determination of Uniaxial Compressive Strength (<50MPa)
 AS4133.1.1.1: (2005) Determination of moisture content of rock, oven drying.

(** NATA accreditation does not cover the performance of this service)

Report Endorsement


Accredited for compliance with ISO/IEC 17025 - Testing.
 NATA Accreditation number: 20656

Issued By:



P. Baltoski
 Approved Signatory

**ASCT Illawarra**

Postal: 2/15 Miall Way, Albion Park Rail NSW 2527

Lab: 2/15 Miall Way, Albion Park Rail NSW 2527

Telephone: +61 (02) 4256 1684

E-Mail: illawarra@asct.com.au

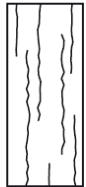
Mobile: 0497 979 929

A.B.N. 34 635 062 609

Report on Uniaxial Compressive Strength (UCS)

Client:	Stantec Australia Pty Ltd	Report No:	1338-UCS
Client Address:	16 Burelli St, Wollongong NSW 2500	Report Date:	5/02/2024
Project:	Geotechnical Testing	Report Page:	Page 1 of 1
Works Component:	Nowra Build To Rent - Beinda Street, Bomaderry	Project No:	26
Material Used:	-	Test Request:	304001019
Material Description:	Sandstone Core	Lot Number:	-
Lot Comments:	-	ITP/PCP Number:	-
Lab Test Date/s:	Laboratory testing 02/02/2024	Control Line:	BH203
Sample Date:	29/01/2024	Sample Number:	20076

Uniaxial Compressive Strength

Client ID Number		Failure Mode	(d) Tensile Dominated
Borehole	BH203	Failure Sketch	
Depth	1.85-2.00		
Lithological Description	Sedimentary		
Type of Testing Machine	ILLACON02		
Date of Test	2/02/2024		
Height (mm)	133.9		
Diameter (mm)	51.1		
Test Duration (mins)	7.30	Rate Displacement (mm/min)	0.10
UCS (Mpa)	42	Moisture Content (%)	3.7

Specimen - Before Testing



Specimen - After Testing

**Sampling & Test Methods (Results relate only to the items sampled/tested)**

Sampled by Client: Results apply to the sample/s as received. **
As Received: Samples stored & Tested in as received condition.
AS4133.4.2.2: (2013) Determination of Uniaxial Compressive Strength (<50MPa)
AS4133.1.1.1: (2005) Determination of moisture content of rock, oven drying.

(** NATA accreditation does not cover the performance of this service)

Report Endorsement

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Issued By:

P. Baltoski
Approved Signatory

Important Information about this Geotechnical Report

Scope of Work

The purpose of this report and any associated documentation is expressly stated in the document. This document does not form a complete assessment of the site, and no implicit determinations about Stantec's scope can be taken if not specifically referenced. Whilst this report is intended to reduce geotechnical risk, no level of detail or scope of work can entirely eliminate risk.

The nature of geotechnical data typically precludes auxiliary environmental assessment without undertaking specific methods in the investigation. Therefore, unless it is explicitly stated in the scope of work, this report does not provide any contamination or environmental assessment of the site or adjacent sites, nor can it be inferred or implied from any component of the document.

The scope of work, geotechnical information, and assessments made by Stantec may be summarised in the report; however, all aspects of the document, including associated data and limitations should be reviewed in its entirety.

Standard of care

Stantec have undertaken investigations, performed consulting services, and prepared this report based on the Client's specific requirements, data that was available or was collected, and previous experience.

Stantec's findings and assessment represent its reasonable judgment, diligence, skill, with sound professional standards, within the time and budget constraints of its commission. No warranty, expressed or implied, is made as to the professional advice included in this report.

Data sources

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Subsurface conditions are complex and can be highly variable; they cannot be accurately defined by discrete investigations. Geotechnical data is based on investigation locations which are explicitly representative of the specific sample or test points. Interpretation of conditions between such points cannot be assumed to represent actual subsurface information and there are unknowns or variations in ground conditions between test locations that cannot be inferred or predicted.

The precision and reliability of interpretive assessment between discrete points is dependent on the uniformity of the subsurface strata, as well as the frequency, detail, and method of sampling or testing.

Subsurface conditions are formed by various natural and anthropogenic processes and therefore are subject to change over time. This is particularly relevant with changes to the site ownership or usage, site boundary or layout, and design or planning modifications. Aspects of the site may also not be able to be determined due to physical or project related constraints and any information provided by Stantec cannot apply following modification to the site, regulations, standards, or the development itself.

It is important to appreciate that no level of detail in investigation, or diligence in assessment, can eliminate uncertainty related to subsurface conditions and thus, geotechnical risk. Stantec cannot and does not provide unqualified warranties nor does it assume any liability for site conditions not observed or accessible during the investigations.

Verification of opinions and recommendations

Geotechnical information, by nature, represents an opinion and is based extensively on judgement of both data and interpretive assessments or observation. This report and its associated documentation are provided explicitly based on Stantec's opinion of the site at the time of inspection, and cannot be extended beyond this.

Any recommendations or design are provided as preliminary until verified on site during project implementation or construction. Inspection and verification on site shall be conducted by a suitably qualified geotechnical consultant or engineer, and where subsurface conditions or interpretations differ from those provided in this document or otherwise anticipated, Stantec must be notified and be provided with an opportunity to review the recommendations.

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