Douglas PARTNERS

GROUNDED EXPERTISE

Specialist Advice

Report on Geotechnical Investigation

Proposed Residential Development

12-20 Berry and 11-19 Holdsworth Street, St Leonards NSW

Prepared for The Trustee for Altis ARET Sub Trust 22

Project 210589.01

23 October 2025

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

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

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Appendix A: About This Report

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Report on Geotechnical Investigation
Proposed Residential Development
12-20 Berry and 11-19 Holdsworth Street, St Leonards NSW

1. Introduction

This report prepared by Douglas Partners Pty Ltd (Douglas) presents the results of a geotechnical investigation undertaken for a proposed residential development at 12-20 Berry and 11-19 Holdsworth Street, St Leonards NSW (the site, refer Figure 1). The investigation was commissioned by email instructing to proceed dated 20 May 2025 from Craig Sanders of Essence on behalf of The Trustee for Altis ARET Sub Trust 22 and was undertaken in accordance with Douglas' proposal 210589.03.P.001.Rev0 dated 13 May 2025.



Figure 1: Aerial Photograph of the Site (Red Boundary)

The investigation was carried out to provide information on the subsurface conditions for design and planning purposes. The initial investigation (2021 and 2022) included the drilling of six rock cored boreholes (BH1 to BH6) and the installation of three groundwater monitoring wells, with a supplementary investigation which included the extension of three of the rock cored boreholes (BH1A, BH3A and BH6A) to deeper depths and the installation of a further three groundwater monitoring wells. Subsequently, an additional investigation was carried out in 2023 comprising three additional boreholes and the installation of three additional groundwater monitoring wells (BH101 to BH103).

The current detailed investigation included the drilling of an additional three boreholes and the installation of a further three groundwater monitoring wells. Details of the field and laboratory testing are given in this report, together with comments on design and construction issues.

Based on the latest "for information" architectural drawings by Turner (refer Appendix B), dated 22 September 2025, it is understood that the proposed development will include the demolition of existing structures and the construction of two residential towers (12 storeys) over upper ground and ground levels including three basement parking levels (B1 to B3).

Drawing no: DA-110-004, GA Plans Basement 03 shows the Finished Floor Level (FFL) at RL 54.6 m. Given the sloping / stepped nature of the site, the bulk excavation level is anticipated to extend to depths of up to approximately 21 m to 14 m along the northern boundary of the basement extent and 16 m to 11 m along the southern boundary of the basement extent.

2. Site Description

The site comprises 10 adjacent properties (12-20 Berry St and 11-19 Holdsworth Ave, St Leonards) which are situated between Berry Rd and Holdsworth Ave. The site is approximately rectangular with an area of about 5,000 m^2 and situated on a south facing hillside that slopes down towards River Rd (refer site survey, Appendix C). The site levels were observed to be following the general shape of the surrounding hillside and falling from RL 75.6 m AHD at the north-western corner to RL 65.6 m AHD at the south-eastern corner of the site.

At the time of DP's presence on site during the most recent investigation, most of the residential buildings had been demolished. The site is situated within an area of residential use with large developments in progress surrounding the site. A summary of the current land uses adjacent to the proposed development site is provided in Table 1.

Table 1: Summary of Adjacent Land Use

Direction Relative to the Site	Land Use Description
North	Generally comprising residential houses of between 1 and 2 levels, with a residential development beyond
East	Multiple 6 to 11 level apartment buildings currently being constructed over basement car parking (known as The Newlands)
South	Large bulk excavation being undertaken for a proposed residential development (known as Waterstone) along the southern perimeter of the site.
West	Four 3 to 10 level apartment buildings currently being constructed over basement car parking (known as Park Road)

3. Published Data

3.1 Regional Geology

Reference to the Sydney 1:100 000 Geological Sheet indicated that the site is underlain by Ashfield Shale which is typically a dark grey to black shale and laminite. The site is also near a boundary with Hawkesbury Sandstone (approx. 20 m to the south of the site, refer Figure 2) which typically comprises medium to coarse grained quartz sandstone with some shale bands or lenses. The results of the investigation on the site confirmed the regional mapping with interbedded siltstone and sandstone intersected at shallow depths with sandstone below.



Figure 2: NSW Seamless Geology Map with Approximate Site Location

Within the Sydney area the most comment defects within the Hawkesbury Sandstone are widely spaced horizontal bedding planes, typically 1-3 m, and two orthogonal sets of steeply dipping joints. The joints typically have dips of 75 to 90 degrees from horizontal (i.e. close to vertical) and are orientated with strikes just east of north (about 010 degrees) and just south of east (about 110 degrees). Apart from these main defects sets there are likely to be other less common joints or faults with moderate dips of 20-30 degrees and 40-60 degrees.

3.2 Hydrogeology

Registered groundwater bore GW072478 is located approximately 800 m to the north-west of the site (near North Shore Private Hospital), indicate that the standing water level is at approximately RL 48 m. The groundwater observations from the groundwater monitoring wells (BH101 to BH105) installed by Douglas are summarised in Section 6.2.

It is noted that groundwater levels vary over time due to climatic and human influences and will temporarily rise following periods of prolonged rainfall.

3.3 Soil Landscape

Reference to the Sydney 1:100 000 Soil Landscape Sheet indicates that the site is underlain by shallow to moderately deep erosional soils over the bedrock.

3.4 Acid Sulfate Soils

Reference to the regional Acid Sulphate Soils (ASS) Risk map indicates that there is no known occurrence of Acid Sulphate Soils (ASS) at the site.

3.5 Salinity

In reference to the Map of Salinity Potential in Western Sydney, the site is not situated within the mapped salinity boundaries and is therefore not considered to be within an area with potential for dryland salinity. Furthermore, based on the location and elevation of the site, it is within an area that is not likely to be affected by salinity.

4. Field Work Methods

4.1 Revision 0 (Report Dated 22 July 2022)

The initial field work for the geotechnical investigation was undertaken between 2 December 2021 and 17 December 2021 and included:

- On-site electronic scanning for buried services at proposed borehole locations;
- Drilling of six boreholes (BH1 to BH6) using a tight access track mounted drilling rig. The boreholes were drilled into the weathered rock to depths of between 1.2 m and 5.6 m using solid flight augers. The boreholes were then continued to depths of between 14.7 m and 15.0 m using NMLC diamond coring equipment to obtain continuous core samples of the bedrock;
- Standard penetration tests (SPTs) were undertaken at regular intervals within the soil profile;
- Installation of three groundwater monitoring wells (BH1, BH3 and BH6) to allow for the measurement of groundwater levels;
- A rising head permeability test in the wells. The water column in the wall was removed and then the rise in the water level (i.e. recharge) was measured at regular time intervals.
- BH2, BH4 and BH5 were backfilled with spoil and topped up with concrete to existing surface level.

The previous supplementary field work for the investigation was undertaken between 24 March 2022 and 12 April 2022 and included:

- Drilling of three boreholes (BH1A, BH3A and BH6A) using a tight access track mounted drilling rig. The boreholes were set out approximately 1 m from the original boreholes (BH1, BH3 and BH6) and drilled out to the original borehole depths using a PCD bit. The boreholes were then continued to depths of between 20.4 m and 24.0 m using NMLC diamond coring equipment to obtain continuous core samples of the bedrock;
- Installation of three groundwater monitoring wells (BH1A, BH3A and BH6A) to allow for the measurement of groundwater levels;

4.2 Revision 1 to 3 (Reports dated 8 May 2023, 18 and 23 August 2023)

The additional field work for the geotechnical investigation was undertaken between 13 February 2023 and 14 March 2023 and included:

- On-site electronic scanning for buried services at proposed borehole locations;
- Drilling of three boreholes (BH101, BH102 and BH103) using a tight access track mounted drilling rig at BH102 and BH103 and hand-portable drilling rig at BH101. The boreholes were drilled into the weathered rock to depths of between 0.33 m and 2.5 m using solid flight augers or hand tools. The boreholes were then continued to depths of between 19.64 m and 30.0 m using NMLC and HQ (BH103 only) diamond coring equipment to obtain continuous core samples of the bedrock. BH102 was reamed with a 96 mm PCD bit after coring to increase the internal diameter of the borehole;
- Standard penetration tests (SPTs) were undertaken at regular intervals within the soil profile of BH102 and BH103;
- Installation of three groundwater monitoring wells (BH101, BH102 and BH103) to allow for the measurement of groundwater levels.

4.3 Revision 4 (this report)

The recent field work for the geotechnical investigation was undertaken between 2 September 2025 and 4 September 2025 and included:

- On-site electronic scanning for buried services at proposed borehole locations;
- Drilling of three boreholes (BH104, BH105 and BH106) using a track mounted drilling rig. The boreholes were drilled down to 14 m, 17.5 m and 13 m depths using a PCD bit for BH104, BH105 and BH106, respectively. The boreholes were then continued to depths of between 24.1 m and 28.0 m using HQ diamond coring equipment to obtain continuous core samples of the bedrock;

  Installation of two groundwater monitoring wells (BH104 and BH105) to allow for the measurement of groundwater levels.

4.4 General

The well in BH101 was constructed using 32 mm external diameter Class 18 un-plasticised poly-vinyl chloride (uPVC). The other wells (BH102 to BH105) were constructed using a 60 mm external diameter uPVC casing. Slotted screen sections comprised 0.4 mm aperture, machine-slotted, Class 18 uPVC pipe, finished with a bottom cap. A durable single sized (poorly graded) quartzose sand filter was placed around the screened section and sealed with bentonite to prevent any surface water from entering the borehole(s). The remaining section of the borehole(s) was backfilled with sand/spoil to the surface. The wells were finished with a gatic cover installed flush with the existing surface level.

The locations of the boreholes are shown in Drawing 1 in Appendix D. The borehole locations for BH101 were measured from existing site features and levels were estimated using the supplied survey plan (refer Appendix C). Locations for BH102, BH103 and BH106 were surveyed by Douglas with a dGPS. Pinnacle surveyors recorded the locations of BH104 and BH105 and provided the information to Douglas.

5. Field Work Results

The detailed borehole logs and rock core photographs are included in Appendix D, together with notes defining classification methods and terms used to describe the soils and rocks.

5.1 Boreholes

Based on the results of the site investigation, the sequence of subsurface materials encountered at the site, in increasing depth order, is summarised in Table 2. Discussion on the selection of the 'Units' is provided in Section 7.

Table 2: Summary of the Subsurface Profile

Unit	Material	Depth Range to Top of Unit (m)	RL Range to Top of Unit (m AHD)	Thickness (m)	General Description
1	Filling / Residual Soil	0	65.3 to 74.9	0.1 to 4.2	Typically 40mm thick asphaltic concrete (BH2 and BH4), 70mm thick brick pavers (BH5, BH6, BH102 to BH104) and 140mm thick concrete (BH101 and BH105) underlain by grey-brown silty clay topsoil and medium plasticity, brown clay of stiff to very stiff consistency.
2	VL-L Sandstone	0.1 to 2.8	62.8 to 72.7	1.3 to 5.6	Generally highly to moderately weathered red-brown to brown, very low to low strength sandstone.
3	M & H Sandstone	4.0 to 5.7	60.8 to 69.9	9.1 to 22	Generally slightly weathered to fresh, pale brown, medium and high strength sandstone.
4	M Siltstone	13.7 to 22.3	46.1 to 56.8	0.7 to 2.4	Observed within BH101, BH6A, BH103, BH104, BH105 and BH106. Generally fresh, grey to dark grey, medium strength siltstone.

Notes: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength

5.2 Groundwater and Permeability Tests

Groundwater was not observed during auger or PCD drilling of the boreholes. The essential use of water as a drilling fluid during coring of the boreholes precluded any further groundwater observations. The installed monitoring wells were purged dry of drilling fluids using a bailer (BH101) and a downhole pump (BH102 to BH105). A summary of the most recent measured groundwater levels following purging is provided in Table 3.

Table 3: Summary of Groundwater Measurements following Purging (BH101 to BH105)

Manual Groundwater Readings of BH101 to BH105							
Borehole ID	Groundwater Level (RL, AHD)						Comment
	22 and 23 May-2025	26-May-25	27-Jun-25	6-Aug-25	4-Sep-25	29-Sep-25	
BH101	51.7	51.6	51.4	51.7	51.7	51.5	Groundwater level **below** proposed basement FFL level (RL 54.6 m)
BH102	52.8	NR	52.1	52.6	52.7	52.5	
BH103	52.0	52.1	52.0	52.2	52.1	51.7	
BH104	NI	NI	NI	NI	52.8	52.5	
BH105	NI	NI	NI	NI	52.7	52.3	

NR = Not Recorded; NI = Groundwater Monitoring Well Not Installed

Falling head permeability tests were carried out in BH101, BH102 and BH105 and rising head permeability tests were carried out within BH102, BH103 and BH105, to evaluate the rock mass hydraulic conductivity (or permeability). Permeability testing in BH101, BH102 and BH103 was carried out between 22 and 27 May 2025. Permeability testing in BH105 was carried out on 4 and 5 September 2025 (no tests carried out in BH104 based on its position relative to BH102). The test involves the addition of water or removing water (for rising head and falling head permeability tests, respectively) and measuring the changes in water level within the well at regular time intervals. The results of the permeability tests using Hvorslev's (1951) method are summarised in Table 4 below.

Table 4: Hydraulic Conductivity Test Results

Borehole	No. of Tests	Hydraulic Conductivity, k (m/s)
BH101	3	1.5×10^{-7} to 1.4×10^{-7}
BH102	3	2.3×10^{-7} to 1.8×10^{-8}
BH103	3	8.8×10^{-8} to 7.7×10^{-8}
BH105	3	6.8×10^{-6} to 6.4×10^{-6}

Groundwater monitoring was undertaken within the installed monitoring wells BH102 and BH103 between 22 May 2025 and 29 September 2025, while BH101 was monitored from 27 June 2025 to 29 September 2025. A summary of the observed groundwater levels is provided within Table 5 with detailed graphs provided within Appendix G.

Table 5: Summary of Groundwater Observations during Monitoring Periods

Borehole ID	Surface RL (m AHD)	Minimum Groundwater RL (m AHD)	Maximum Groundwater RL (m AHD)
BH101	68.2	51.0	51.6
BH102	70.6	52.3	53.8
BH103	65.3	51.4	52.3

Refer to Section 7 and 9.4 for further comments on groundwater.

6. Laboratory Testing

6.1 Aggressivity Testing

Laboratory testing was carried out on six soil samples and one water sample to determine aggressiveness for exposure classification of buried concrete and steel elements.

The results of the laboratory testing are summarised in Table 6. The detailed laboratory test reports are given in Appendix F.

Table 6: Summary of Chemical Laboratory Test Results

Borehole	Material	Depth (m)	Conductivity (µS/cm)	pH	Cl (PPM)	SO_4 (PPM)
BH1	Clay	0.9 – 1.0	100	5.5	<10	170
BH2	Silty Clay	0.4 – 0.5	32	4.7	<10	34
BH3	Clay	0.4 – 0.5	28	6.0	10	<10
BH4	Weathered Sandstone	2.4 – 2.5	25	5.0	<10	23
BH5	Clay	1.0 – 1.45	19	5.4	<10	20
BH6	Weathered Sandstone	4.0 – 4.3	21	5.0	21	58
BH103	Water	-	240	7.1	10	40

Notes: Cl = Chloride ion concentration, SO_4 = Sulphate ion concentration, PPM = Parts Per Million

6.2 Point Load Index ($Is_{(50)}$) Tests

Axial point load strength index testing ($Is_{(50)}$) was carried out on 224 rock samples. Results ranged from 0.1 MPa to 2.8 MPa which correspond to low and high strength rock, respectively. The $Is_{(50)}$ results suggest Unconfined Compressive Strengths of between about 2.0 MPa and 56 MPa based on a conversion factor of 20 as per AS1726. The $Is_{(50)}$ results are shown on the borehole logs as PL(A) at the respective depths. The results of the axial tests versus the RL have been plotted on the graph in Figure 3.

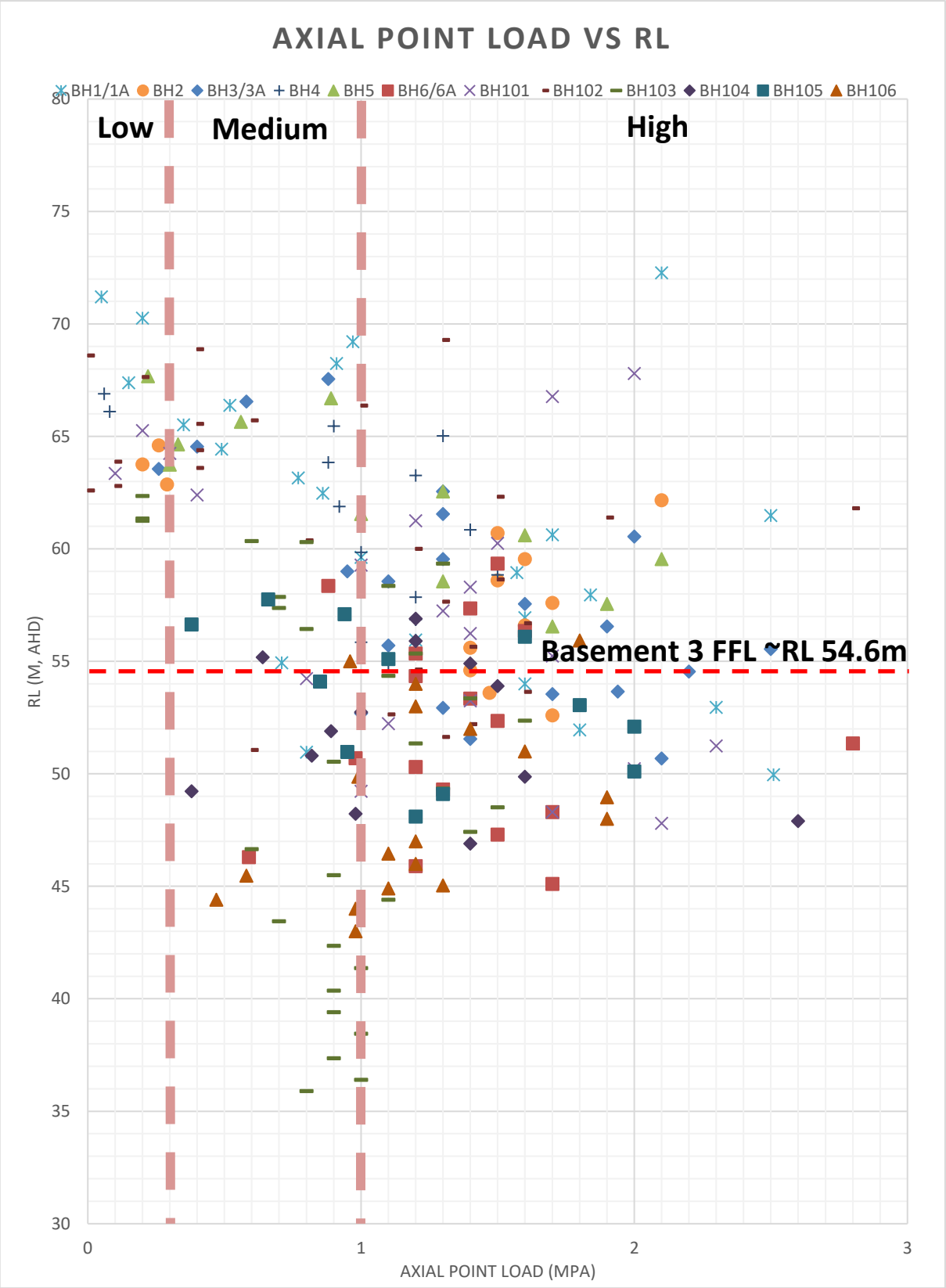


Figure 3: Axial Point Load (MPa) vs RL (m, AHD) Graph

6.3 Uniaxial Compressive Strength and Deformation Tests

Uniaxial Compressive Strength (UCS) with elastic modulus and Poisson's ratio testing was carried out on eight (8) selected samples of sandstone. The test result sheets are included in Appendix F and summarised in Table 7.

Table 7: Results of UCS and Deformation Testing

Bore	Depth (m)	Uniaxial Compressive Strength (MPa)	Tangent		Secant	
			Elastic Modulus (GPa)	Poisson's Ratio	Elastic Modulus (GPa)	Poisson's Ratio
BH101	18.00-18.35	42.0	20.0	0.14	14.0	0.11
BH102	18.70-18.96	27.1	11.09	0.37*	8.36	0.29*
BH103	18.29-18.50	24.0	19.0	0.12	13.0	0.10
BH104	20.86-21.00	32.2	11.5	0.36*	10.1	0.19
BH104**	21.86-22.00	5.2	-	-	-	-
BH105	24.00-24.14	38.8	-	-	-	-
BH105	26.17-26.30	32.0	-	-	-	-
BH106**	22.32-22.55	26.9	2.5	0.36*	2.5	0.27*

* Poisson's ratio values higher than expected, not to be relied upon.
** Represents UCS tests carried out on Siltstone

7. Geotechnical Model

From the investigation, the site is underlain by a thin surficial layer of fill and residual clay over shallow sandstone bedrock. Minimal cutting and filling of the land is evident at the test locations as seen by the minimal fill depths observed, however deeper depths of fill may be present along the shared property boundaries, especially near retaining walls. The likely depth/height of prior cutting and filling is estimated to be less than 2 m.

Groundwater seepage was not observed during the field investigation, however ephemeral seepage flow across the top of the rock and along bedding planes/joints within the rock should be anticipated. The permanent groundwater table is likely to be located well below the proposed excavation level, however it should be noted that groundwater levels are transient and may fluctuate over time, particularly following periods of heavy rainfall. The groundwater levels measured within the monitoring wells (BH101 to BH105) indicate the maximum groundwater level measured at RL 52.8 m, at least 1.5 m below the anticipated bulk excavation level (RL 54.3 m).

For design purposes, the observed subsurface profile during the investigation has been grouped into four geotechnical units. Four geotechnical cross sections (Section A-A', B-B', C-C' and D-D') showing the interpreted subsurface profile between the borehole locations are shown on Drawing 2 to 5 in Appendix D, respectively.

The interpreted depth and RLs at the top of the various units at each test location are shown in Table 8. Reference should be made to the borehole logs for more detailed information and descriptions of the soil and rock profile. A summary of the geotechnical model is presented in Table 8.

Table 8: Summary of Geotechnical Model

Unit	Material	Depth [m] Reduced Level (m AHD) to Top of Each Unit											
		BH1/ BH1A	BH2	BH3/ BH3A	BH4	BH5	BH6/ BH6A	BH101	BH102	BH103	BH104	BH105	BH106
1	Fillg / Residual Soil	[0] (73.9)	[0] (67.5)	[0] (71.5)	[0] (65.8)	[0] (71.5)	[0] (65.3)	[0] (68.2)	[0] (70.6)	[0] (65.3)	[0] (70.9)	[0] (75.1)	[0] (69.0)
2	VL-L Sandstone	[1.0] (72.9)	[1.0] (66.5)	[2.0] (69.5)	[2.0] (63.8)	[2.4] (69.1)	[3.0] (62.3)	[0.13] (68.07)	[0.35] (70.25)	[2.5] (62.8)	D D	D D	D D
3	M & H Sandstone	[4.0] (69.9)	[5.1] (62.4)	[4.6] (66.9)	[4.7] (61.1)	[4.2] (67.3)	[5.6] (57.9)	[5.7] (62.5)	[4.04] (66.56)	[4.45] (60.85)	[14.0]* (56.9)	[17.5]* (57.6)	[13.0]* (56.0)
4	M Siltstone	N.E	N.E	N.E	N.E	N.E	[19.1] (46.2)	N.E	N.E	[19.2] (46.1)	[21.7] (49.3)	[19.0] (56.1)	[22.3] (46.7)

Notes: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength, N.E = Not encountered, D = Destructive Drilling
*Top of unit determined at the start of rock coring

8. Proposed Development

Based on the supplied architectural concept drawings prepared by Turner, it is understood that the proposed development will include the demolition of existing structures on the site followed by the construction of two residential towers of 12 storeys over two partial ground floor levels and a shared basement. It is further understood from the architectural drawings that three basement levels are proposed with the lowest (Basement 3) at a FFL of 54.6 m AHD.

Given the sloping / stepped nature of the site, the bulk excavation level is anticipated to extend to depths of up to approximately 21 m to 14 m along the northern boundary of the basement extent and 16 m to 11 m along the southern boundary of the basement extent, assuming a bulk excavation level of RL 54.3 m AHD (200 mm thick slab and 100 mm thick sub slab drainage layer). The approximate basement extent is shown in Drawing 1 in Appendix D.

9. Comments

9.1 Site Excavation

9.1.1 Dilapidation Surveys

Dilapidation surveys should be carried out on adjacent / existing buildings, pavements and infrastructure that may be affected by the excavation works. The dilapidation surveys should be undertaken before the commencement of any excavation work in order to document any existing defects so that claims for damage due to construction related activities can be accurately assessed.

9.1.2 Excavation Conditions

Based on the borehole logs, the proposed bulk excavation works are anticipated to extend through all Units (soil and rock) outlined in Table 8. The extent of the bulk excavation is also shown in Drawings 1 to 5 in Appendix D. The excavatability of the materials that will likely be encountered during the bulk excavation works are summarised in Table 9. The detailed excavation for footings, services and side walls within low strength or stronger rock will generally require the use of a rotary rock saw / grinder or hydraulic rock hammers.

The excavation rate that can be achieved, particularly within medium and high strength rock, varies considerably and is dependent upon the degree of jointing in the rock, the rock strength, the type of machinery being used and the skill of the operator. It is suggested that bulk excavation tenderers be required to make their own assessment of the equipment required to carry out the work. Contractors may inspect the rock core samples at the Douglas office in West Ryde prior to submitting final tenders (rock cores are generally kept for 6 months after drilling unless longer holding times are requested).

Table 9: Summary of Soil and Rock Excavatability

Unit	Material	Material Strength	Excavatability
1	Filling / Residual Soil	Sandy Clay / Sand	Excavated using excavators with bucket attachments. However, the assistance of rock hammering or ripping will probably be required for effective removal of any medium to high strength ironstone bands within the weathered rock profile.
2	VL-L	Very Low to Low Strength Sandstone	
3	M & H Sandstone	Medium and High Strength Sandstone	Hard ripping using a large 'bulldozer' (such as a D9 or larger plant), or excavators fitted with either ripping tynes or rock hammers. Rock hammers or saws / grinders are generally required for effective excavation of slightly fractured and unbroken rock. Some of the unbroken, high strength rock may be effectively 'unrippable' with very low productivity.
4	M Siltstone	Medium Strength Siltstone	

9.1.3 Vibrations

During excavation, it will be necessary to use appropriate methods and equipment to keep ground vibrations at adjacent buildings and structures within acceptable limits. The level of acceptable vibration is dependent on various factors including the type of structure (e.g. reinforced concrete or brick structures etc.), its structural condition, the frequency range of vibrations produced by the construction equipment, the natural frequency of the structure and the vibration transmitting medium.

Ground vibration can be strongly perceptible to humans at levels above 2.5 mm/s vector sum peak particle velocity (VSPPV). This is generally much lower than the vibration levels required to cause structural damage to buildings. The Australian Standard AS2670.2-1990 "Evaluation of human exposure to whole-body vibrations – continuous and shock induced vibrations in buildings (1-80 Hz)" indicates an acceptable day time limit of 8 mm/s VSPPV for human comfort.

Based on the experience of Douglas and with reference to AS 2670, it is suggested that a maximum VSPPV of 8 mm/s (applicable at the foundation level of existing buildings) be adopted for this site for both architectural and human comfort considerations.

As the magnitude of vibration transmission is site specific, it is recommended that a vibration trial be undertaken at the commencement of rock excavation. The trial may indicate that smaller or different types of excavation equipment should be used for bulk (or detailed) excavation purposes.

To reduce the effects of vibrations from hydraulic rock hammers, the work method should allow for:

- Rock sawing around the perimeter of the excavation and perimeter of the pad footings; and
- Use of rock hammers in short burst to prevent generation of resonant frequencies.

9.1.4 Disposal of Excavated Material

All excavated materials will need to be disposed of in accordance with the provisions of the current legislation and guidelines including the *Waste Classification Guidelines* (EPA, 2014). This includes filling and natural materials that may be removed from the site.

Reference should be made to advice provided in the contamination reports by the contamination consultant.

9.2 Excavation Support

Vertical excavations within the soil (Unit 1) and weathered/ jointed rock profile (Unit 2 and some of less competent Unit 3) will require both temporary and permanent lateral support during and after excavation.

The bulk excavation of the neighbouring property along the southern boundary should be confirmed prior to design of the site retention and foundation system. Should the neighbouring bulk excavation be at a higher level than RL 54.3 m then careful consideration should be given to the stability of the neighbouring excavation and their foundations as it may be undermined. Should the neighbouring bulk excavation be at a lower level than RL 54.3 m then consideration should be given to the founding level of the proposed foundations which may need to be deepened to the same level as the neighbouring bulk excavation level if feasible. The above information should be provided to the project geotechnical engineer for comment during concept design phase.

9.2.1 Batter Slopes and Vertical Rock Faces

Suggested temporary and permanent batter slopes for unsupported excavations up to a maximum height of 4 m are shown in Table 10. If surcharge loads are applied near the crest of the slope then further specific geotechnical review and probably flatter batters or stabilisation using rock bolts or soil nails may be required.

Table 10: Recommended Batter Slopes for Exposed Material

Unit	Material	Maximum Temporary Batter Slope (H : V)	Maximum Permanent Batter Slope (H : V)
1	Filling / Residual Soil	1.5 : 1	2 : 1**
2	VL-L Sandstone	0.5 : 1*	1 : 1*
3	M & H Sandstone	Vertical*	Vertical*
4	M Siltstone	Vertical*	Vertical*

Note: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength
* Subject to jointing assessment by experienced Geotechnical Engineer/Engineering Geologist
** Permanent batters in soil may need to be reduced to 3H: 1V to facilitate maintenance of grassed slopes, if required

Competent medium strength or stronger sandstone will generally be stable when cut vertically provided there are no adversely oriented joints or other defects present. All vertical faces in rock should be inspected by an experienced geotechnical engineer as the excavation progresses in depth intervals of no deeper than 1.5 m. The purpose of the inspections is to identify the extent of shotcrete face protection required and to check for the presence of any adverse defects daylighting into the excavation face which may require additional stabilisation measures (such as rock bolts, anchors or shotcrete).

Given that the typical main joint sets within Hawkesbury Sandstone in the Sydney region are oriented at a slight angle to the proposed excavation faces, it is expected that there will be some narrow wedges formed where these near vertical joints intersect the excavation faces and rock bolts may be required to stabilise these wedges.

Allowance should be made for ground anchors, rockbolts and shotcrete support. All clay seams and siltstone/shale layers (>50 mm thick) will require shotcrete protection to prevent future weathering and regression. All thick siltstone / shale seams will also require, in addition to the shotcrete face protection, rockbolts or anchor support.

9.2.2 Retaining Walls

Where batter slopes cannot be used, shoring walls will be required to support the Unit 1 and 2 materials as outlined in Table 8 and Table 9. Anchored soldier pile walls are often used to provide temporary retaining support to soils and weathered rock. The soldier piles are usually spaced at approximately 2 m to 2.5 m centres, however, more closely spaced piles may be required to reduce wall movements, or prevent collapse of infill materials, particularly where pavements, structures or services are located in close proximity to the excavation.

It may be possible to terminate the shoring piles within unsupported Unit 3 medium strength or stronger sandstone above the bulk excavation level. In this case it will be essential for an experienced geotechnical engineer or engineering geologist to assess the stability of the rock directly beneath each pile toe immediately after it is exposed during bulk excavation. No passive pressure will be available and as such, it will generally be necessary to restrain the toe of the piles with temporary or permanent rock bolts or anchors, as appropriate.

It is suggested that preliminary design of cantilevered shoring systems (or shoring with one row of anchors or propping) be based on a triangular earth pressure distribution using the earth

pressure coefficients provided in Table 11. 'Active' earth pressure coefficient (K_a) values may be used where some wall movement is acceptable, and 'at rest' earth pressure (K_o) values should be used where the wall movement needs to be reduced (i.e. adjacent to existing structures or utilities).

Table 11: Recommended Design Parameters for Shoring Systems

Unit	Material	Unit Weight (kN/m^3)	Earth Pressure Coefficient	
			Active (K_a)	At Rest (K_o)
1	Filling / Residual Soil	20	0.35	0.5
2	VL-L Sandstone	22	0.15	0.25
3	M & H Sandstone	24	0*	0*
4	M Siltstone	24	0*	0*

Note: EL = Extremely Low Strength, VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength
* Subject to jointing assessment by experienced Geotechnical Engineer/Engineering Geologist

The design for lateral earth pressures where multiple rows of anchors or propping are used (i.e. two rows or more of anchors or props) may be based on a trapezoidal earth pressure distribution. The following earth pressure magnitudes are considered appropriate, where H is the height of soil and very low to low strength rock to be retained, in metres:

- 6H kPa, where some lateral movement is allowed; and
- 8H kPa, where lateral movements need to be limited (e.g. next to buildings and services).

Note these earth pressure distributions are "pressure envelopes", selected to ensure that no row of anchors is overloaded during the temporary support phase. The actual magnitude and distribution of lateral earth pressures may differ from the uniform distribution given above. The actual earth pressure distribution can be assessed using numerical methods.

In all cases, additional surcharge loads such as new and existing footings, construction loads, traffic loads etc., must be allowed for in the design, applied as a rectangular earth pressure distribution over the depth of influence.

The earth pressure loading described above does not include earthquake loads or hydrostatic pressures. Unless positive drainage measures are incorporated to prevent water pressure build-up behind the walls, the full hydrostatic head should be allowed for in design. Drainage could comprise 150 mm wide strip drains pinned to the face at 1 m to 2 m centres behind shotcrete in-fill panels. The base of the strip drains should extend out from the shoring wall to allow any seepage to flow into a perimeter toe drain which is connected to the stormwater drainage system.

Staged excavation and inspection by a suitably qualified geotechnical engineer will be required to confirm that the rock in front of the wall / pile is not adversely affected by discontinuities. Piles

supporting structural compression loads should be taken to below the bulk excavation and designed based on the allowable foundation pressures given in Section 9.5.

The final or detailed design of shoring walls is normally undertaken using interactive computer programs such as WALLAP or FLAC/PLAXIS, which can take soil-structure interaction into account during the progressive stages of wall construction, anchoring and bulk excavation. Based on the shallow soil profile it is recommended FLAC/PLAXIS (or similar) be used for the assessment.

9.2.3 Passive Resistance

Passive resistance for piles founded in rock below the base of the bulk excavation (including allowance for services and/or footings) may be based on the ultimate passive restraint values provided in Table 12. This ultimate value represents the pressure mobilised at high displacements and therefore it will be necessary to incorporate a factor of safety of at least 3 to limit wall movement. The top 0.5 m of the socket should be ignored due to possible disturbance and over-excavation.

Table 12: Recommended Passive Resistance Values

Unit	Foundation Stratum	Maximum Ultimate Passive Pressure (kPa)
2	VL-L Sandstone	400*
3	M & H Sandstone	1500*
4	M Siltstone	

Note: VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength
* subject to geotechnical inspection

9.2.4 Ground Anchors

The design of temporary and permanent ground anchors/rock bolts for the support of excavations and / or shoring systems may be carried out on the basis of the maximum bond stresses given in Table 13. The use of permanent anchors, if required, would need careful attention to corrosion protection for which further geotechnical advice should be sought. A detailed specification would need to be prepared for the installation and stressing of permanent anchors.

Anchors can also be used vertically as hold down anchors to resist temporary or long-term uplift (to be designed in accordance with AS4678). The designer should check the cone-pull-out failure mechanism by assuming a 90° cone in medium to high strength, slightly fractured (or better quality) sandstone. Note that the buoyant weight of the rock should be used below the water table. Support elements used for lateral support should be bonded in the stronger rock, inclined as required, but preferably not steeper than 30° below the horizontal.

Table 13: Recommended Bond Stresses for Rock Anchor Design

Unit	Material Description	Maximum Ultimate Bond Stress (kPa)
2	VL-L Sandstone	250
3	M & H Sandstone	1000
4	M Siltstone	750

The values in Table 13 should be confirmed by pull-out tests prior to installation of support elements. Ultimately, it is the contractor's responsibility to ensure that the correct design values (specific to the support system and method of installation) are used and that the support element holes are carefully cleaned prior to grouting.

After temporary support elements have been installed, it is recommended that they are tested to 125% (150% for permanent anchors) of their nominal working load. Where stress relief or further unavoidable movement of the shoring is expected, it is recommended that the support elements are locked off at a lower value than their working loads (if possible) to accommodate the additional movement and subsequent increase in stress in the support elements. Alternatively, the support elements need to be designed to accommodate the increase in stress due to stress relief movement. During construction, checks should be carried out to confirm that the load in the support elements is maintained and that losses due to creep or other causes do not occur.

Care should be exercised to ensure that anchors are installed progressively and stressed prior to excavation of the next drop to ensure that stability is maintained at all times.

Shorter support elements (i.e., rockbolts, dowels and pins) may be required to support any unstable rock wedges, slivers or blocks. Short dowels and pins may be required to support feather edges where sub-parallel joints intersect the face.

9.3 Excavation Induced Ground Movement and Adjacent Buildings

Horizontal movements due to stress relief will occur during the excavation works. Based on published literature and Douglas experience, the lateral deflection associated with excavation in Hawkesbury Sandstone may be in the order of 0.05% to 0.15% of the excavation height in rock, which corresponds to approximately:

- 10 mm to 30 mm for a 20 m depth excavation in the approximate northern half of the basement extent; and
- 8 mm to 24 mm for a 16 m depth excavation in the approximate southern half of the basement extent.

The above predicted deflections would generally be greatest at the centre of the excavated faces and would reduce with distance away from the excavation face/boundary. It is expected that deflections at the surrounding buildings, which typically have a setback of about 2 m or more from the common site boundary, would be less than the values indicated above.

It is generally not possible / practical to provide restraint (i.e. anchoring) for the relatively high in-situ horizontal stresses associated with stress relief movements. Therefore, it is recommended

that appropriate allowance be made for movements of this order in the design, planning and construction.

Precise survey and/ or inclinometer monitoring of excavation faces and nearby buildings/ structures should be carried out to assess vertical and horizontal movements during the excavation. The survey and/ or inclinometer monitoring should commence prior to excavation to provide a baseline and should continue every 1.5 m drop of the excavation. If deflections show an increase in the rate of movement or exceed the predicted movements, then the structural engineer and geotechnical engineer should be contacted for immediate review.

If a more accurate assessment of predicated ground movements at surrounding buildings as a result of the proposed excavations is required then numerical modelling (using commercially available software such as FLAC/PLAXIS) of the proposed excavation adjacent to the neighbouring buildings may be required.

9.4 **Groundwater**

The graphs in Appendix G show the water levels in BH101, BH102 and BH103 over thirteen to eighteen weeks between 23 May 2025 (BH102 and BH103) and 27 June 2025 (BH103) to 29 September 2025 ranging from RL 51.0 m to RL 53.8 m AHD and have remained at that level consistently over the monitoring period. Rainfall is also shown on the graphs. Given the depth of the basements (deepest basement level at RL 54.6 m), it is expected that the proposed bulk excavation levels will not extend below the recorded water levels.

Groundwater flow is expected to follow the topography and flow along the top of the rock, finding its way down into the rock below and through the three-dimensional network of discontinuities (joints and bedding planes) in the rock mass. Comparing the water levels at the five “deep” well locations (BH101 to BH105) indicates the flow would be from west to east as it is likely affected by the neighbouring developments.

Seepage during construction and in the long term should be expected along the top of rock (particularly after periods of wet weather) and through the joints and bedding planes in the rock face. Seepage may be relatively minor during dry periods and will increase during and following wet periods. Around the perimeter of the excavation, most inflow is likely to occur through the upslope faces, with some upward flow through the floor. Initially, higher inflow may be experienced due to stress relief/unloading opening of local discontinuities.

As the basement excavation is unlikely to intercept the regional groundwater table, the Aquifer Interference Policy does not apply, and a simple risk-based assessment can be undertaken in accordance with the NSW DPIE Groundwater Guidelines.

It is assumed from the measured groundwater levels, that the risk of impact on groundwater and associated groundwater receptors due to the basement excavation is considered negligible as the development is not expected to intercept the groundwater table.

During construction and in the long-term, it is anticipated that seepage into the excavation should be readily controlled by perimeter drains, connected to a "sump-and-pump" system typically installed for drained basements. Approval from WaterNSW, however, will be required prior to designing and constructing a drained basement. A drained basement, if approved by WaterNSW, will require permanent subfloor drainage to direct seepage to the stormwater

drainage system for which Council approval will be required. The disposal requirements of water collected on-site will be dependent on the chemical composition of the water. Note that a drained basement will act as a low point to which groundwater will flow. Therefore, if present, any contamination within the surrounding groundwater system could flow into the basement and adversely affect the quality of the water collected on site.

Previous experience in Sydney is that seepage will likely contain relatively high levels of soluble iron that will form a precipitate in the form of a gelatinous 'sludge' when exposed to oxygen. This 'sludge' has the potential to block-up subsoil (gravel) drains and 'seize-up' pumps. Therefore, detailing of subfloor drains, sumps and pumps should incorporate provision for regular maintenance such as flushing and 'rodding' of drains and/or 'baffle' pits.

Notwithstanding the above, it should be noted that groundwater levels are transient and may fluctuate over time, particularly, following periods of heavy rainfall.

9.5 **Foundations**

Footings may be designed using the values given in Table 14. For bored piles, if required, shaft adhesion values for uplift (tension) may be taken as being equal to 70% of the shaft adhesion values for compression in Table 14.

Table 14: Recommended Design Parameters for Foundation Design

Unit	Foundation Stratum	Maximum Allowable Pressure (Serviceability)		Maximum Ultimate Pressure (Ultimate)		Young's Modulus, E (MPa)
		End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	End Bearing (kPa)	Shaft Adhesion (Compression) (kPa)	
2	VL-L Sandstone	1,000	100	3,000	150	100
3	M Sandstone	3,500	350	40,000	1,500	750
4	M Siltstone					
3	M-H Sandstone	6,000	600	60,000	1,500	1,500

EL = Extremely Low Strength, VL = Very Low Strength, L = Low Strength, M = Medium Strength, H = High Strength

To use a bearing pressure value for design of greater than 3.5 MPa, a minimum of six cored bores are required with spoon testing carried out in a third of footings across the site during construction. If bearing pressures greater than 6 MPa are used in design, then cored bores at a maximum 10 m grid spacing or cored bores for 50% of footings and spoon testing carried out on the remaining footings are required. For spoon testing, a 50 mm diameter hole is drilled below the base of the footing to a depth of 1.5 times the footing width, followed by testing to check for the presence of weak layers or clay bands.

Footings (i.e. pads or piles) founded on the edge or within the zone of influence of vertical rock excavations, would be subject to assessment of jointing in the rock. Examples of where such a scenario could occur include:

- Footings founded outside of basement excavation and near the vertical cut face for the basement excavation or footings at bulk excavation level near the southern boundary if the neighboring basement is at a lower level than RL 54.3 m ; and
- Shoring piles (if adopted) terminated above the bulk excavation level in the Unit 3 rock.

Generally the allowable bearing pressure for footings founded near the edge of vertical rock excavations on Unit 3 medium and high strength sandstone (or stronger) should be limited to about 1,500 kPa. If deeper excavation exposes adverse jointing in the rock below the footings, then stabilisation using rock bolts/anchors/shotcrete and/or underpinning may be required.

Alternatively, the footings may be taken down below the zone of influence of a vertical cut face, in which case there would be no need to reduce the bearing pressure.

Foundations proportioned on the basis of the allowable bearing pressures in Table 13 would be expected to experience total settlements of less than 1% of the footing width under the applied working load, with differential settlements between adjacent columns expected to be less than half of this value.

Footings designed using ultimate values and Limit State Design will need to consider serviceability which usually governs the design in this case. For pile design, a basic geotechnical strength reduction factor, Φ_{gb}, of about 0.56 (or possibly higher) calculated from Table 4.3.2 (A, B, and C) of AS2159-2009: Piling Design and Installation, is considered feasible. However, the structural engineer will need to make their own assessment with the final (Φ_{gb}) number being dependent on the design and installation method (and associated risk rating) adopted by the structural engineer. A higher Φ_{gb} value could be achieved if pile load testing is carried out.

All footings should be inspected by a geotechnical engineer to confirm that foundation conditions are suitable for the design parameters. If weak seams or defects are encountered, footings may need to be deepened until suitable founding material is reached. Alternatively the footing can be enlarged, or redesigned for a lower bearing pressure, keeping in mind the increase in potential settlement with width increase. Ideally, all footings should be founded on similar rock. Occasionally weaker siltstone lenses (such as Unit 4) within the sandstone can be encountered. Should the strength be weaker than that nominated in the table above then further assessment will be required.

9.6 **Pavements and Engineered Filling**

It is expected that the subgrade for the new pavements along the entrance driveway will generally comprise residual clay, for which a preliminary CBR value of 3% may be adopted for preliminary pavement design purposes. It is recommended that once the existing surface levels at the location of the proposed driveway have been stripped, an inspection be carried out by an experienced geotechnical engineer to confirm the appropriate CBR value to use for design.

Site preparation will be required prior to construction of proposed pavements/ driveways. Earthworks recommendations provided in this report should be complemented by reference to AS 3798 – 2007 Guidelines on earthworks for commercial and residential developments.

The following methodology is suggested for subgrade preparation of pavements and for raising of site levels using engineered filling:

- Strip the filling down to the surface of the residual soils / rock;
- Where soil / filling is exposed, proof rolling of the subgrade will be required. Proof rolling of the exposed subgrade should be carried out prior to placement of any filling or the construction of slabs. Proof rolling should comprise six passes of a smooth drum roller (say at least 10 tonne). The final pass should be carried out under the observation of a geotechnical engineer to identify any soft or saturated zones. Any such zones should be over-excavated to a maximum depth of 600 mm and replaced with compacted durable granular material.
- If any filling is required to raise surface levels, it should be placed in layers not greater than 200 mm loose thickness and compacted to between 98% to 100% of Standard dry density, with moisture content within ±2% of the optimum moisture content.
- The filling, natural residual soil and rock on the site is suitable for reuse as engineered filling provided it has a maximum particle size of 100 mm. Reuse should also consider the contamination status and is subject to approval by an environmental consultant.

9.7 Seismic Design

In accordance with the Earthquake Loading Standard, AS1170.4, 2024, the site has a site sub-soil class of rock (B_e). Class Ce (Shallow soil) areas also exist where the soil surface layer is more than 3 m in depth.

9.8 Soil Aggressivity

In accordance with AS2159-2009, the results of the chemical laboratory testing indicate that the soils are moderate and non-aggressive to buried concrete and non-aggressive to buried steel, respectively (refer Table 15 below).

Table 15: Soil Aggressivity Results

Borehole ID	Depth (m)	Material	Aggressivity to concrete	Aggressivity to steel
BH1	0.9 – 1.0	Clay	Moderate	Non-Aggressive
BH2	0.4 – 0.5	Silty Clay	Moderate	Non-Aggressive
BH3	0.4 – 0.5	Clay	Non-Aggressive	Non-Aggressive
BH4	2.4 – 2.5	Weathered Sandstone	Moderate	Non-Aggressive
BH5	1.0 – 1.45	Clay	Moderate	Non-Aggressive
BH6	4.0 – 4.3	Weathered Sandstone	Moderate	Non-Aggressive
Aggressivity levels as per AS 2159-2009			Very Severe	
			Severe	
			Moderate	
			Mild	
			Non-Aggressive	

10. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report for this project at 12-20 Berry and 11-19 Holdsworth Street, St Leonards NSW in line with Douglas' proposal dated 13 May 2025 and acceptance received from Craig Sanders of Essence on behalf of The Trustee for Altis ARET Sub Trust 22 dated 20 May 2025. The work was carried out under the project Engagement Terms (Consultancy Agreement). This report is provided for the exclusive use of The Trustee for Altis ARET Sub Trust 22 for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

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

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing

locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

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

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

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

This report provides specialist advice only and no part of it is considered a Regulated Design under the Design and Building Practitioner Act 2020 (NSW).

Appendix A

About this Report

About this Report

November 2023

Introduction

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

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

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This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

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

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

Groundwater

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

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

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

Reports

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

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

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

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

continued next page

About this Report

Site Anomalies

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

Information for Contractual Purposes

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

Site Inspection

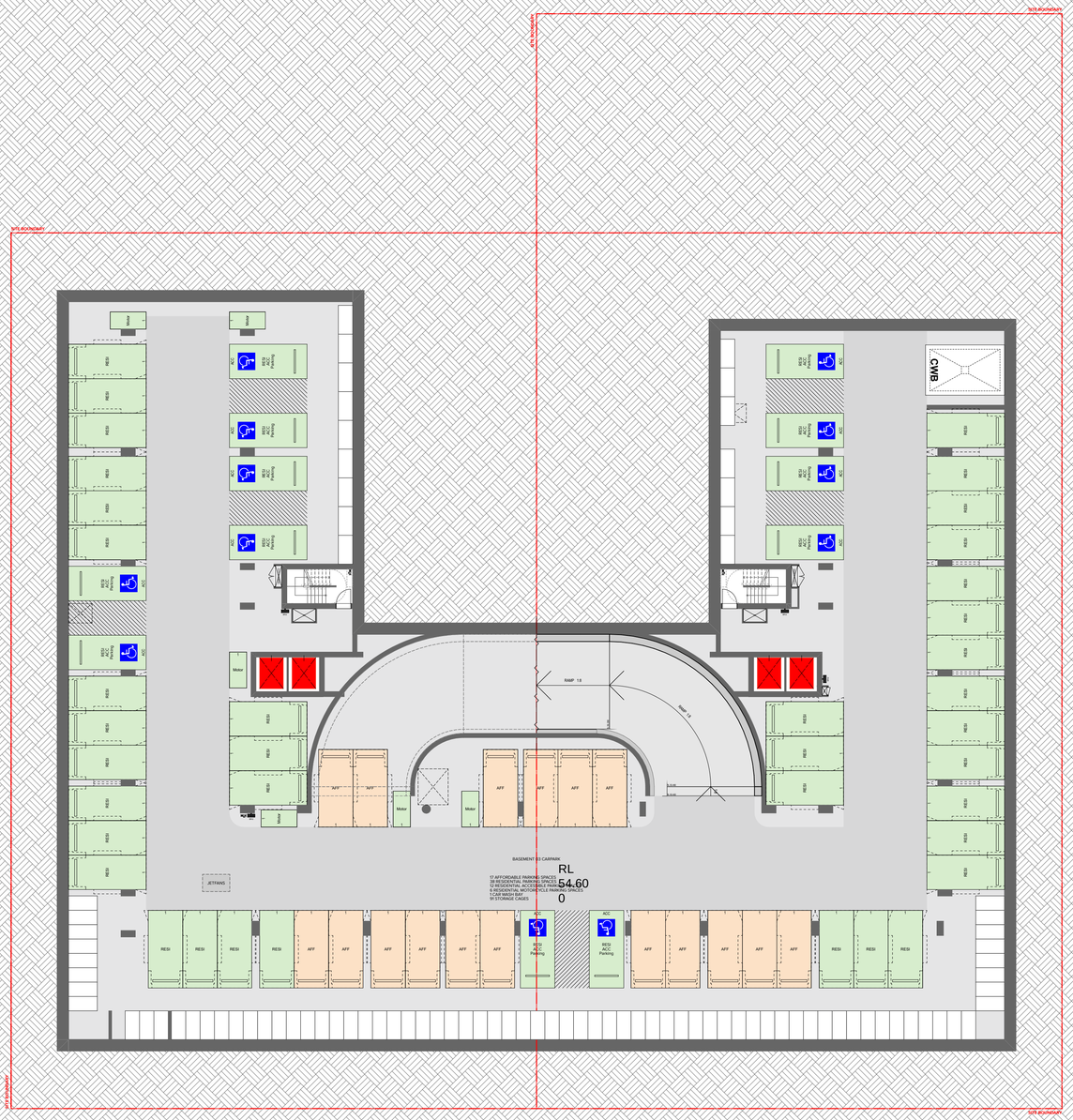
The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

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Appendix B

Proposed Development Drawings



NOTES

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DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6685, ABN 86 064 084 911

CLIENT

BARINGS

Level 19/60 Castlereigh Street,
Sydney NSW 2000
Australia

Rev	Date	Approved by	Notes
A	30/07/2025	JMC	For Information
B	25/08/2025	JMC	For Information
C	27/08/25	JMC	For Information
D	22/09/2025	JMC	For Information

Project Title
Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title
GA Plans
Basement 03

Scale
1:200 @A1, 50%@A3

Status
For Information

Project No.
22050 CC/PS/KZ/AS

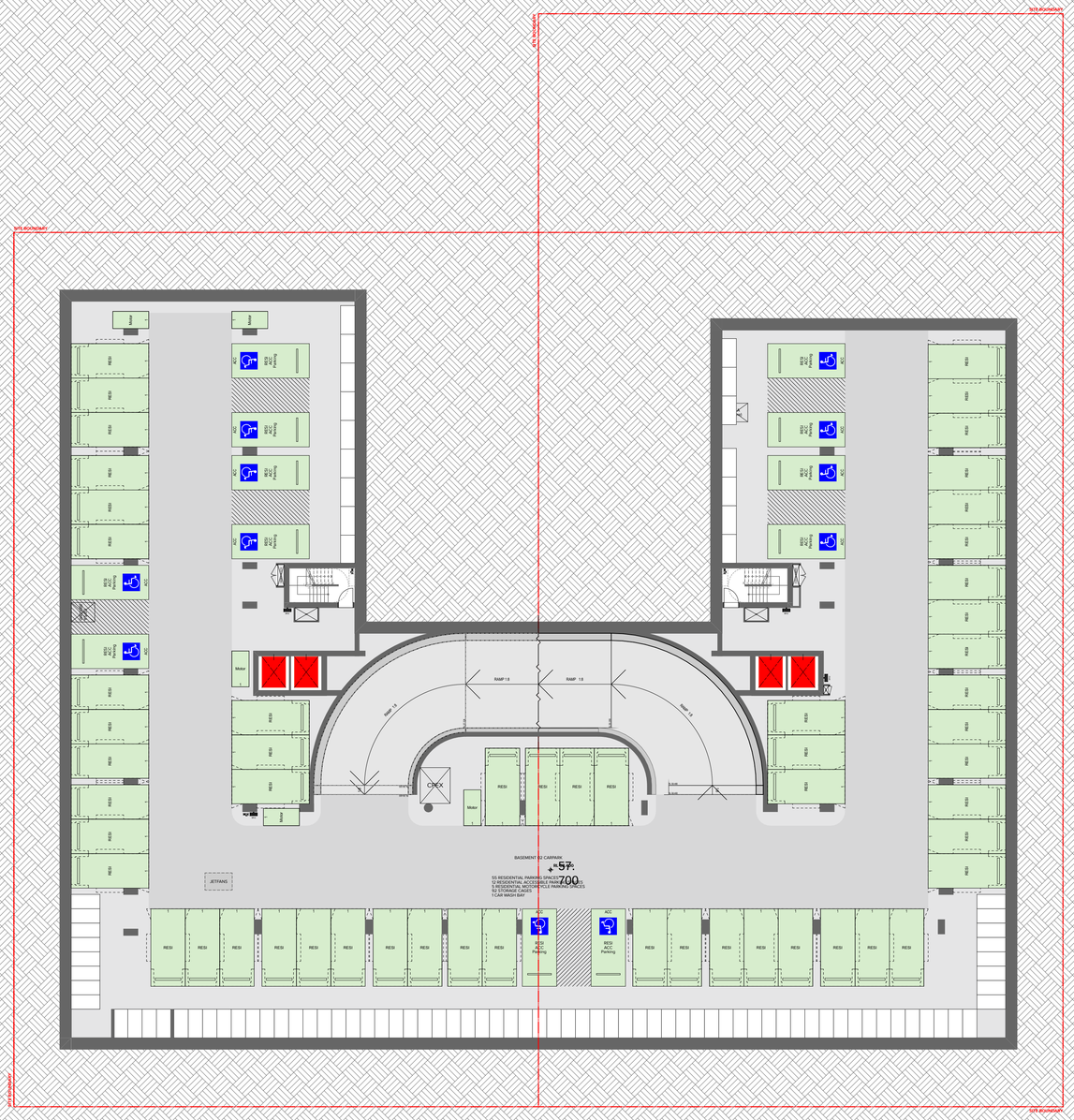
Drawn by

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NOTES

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D	22/09/2025	JMC	For Information

Project Title
Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title
GA Plans
Basement 02

Scale
1:200 @A1, 50%@A3

Status
For Information

Project No.
22050 CC/PS/KZ/AS

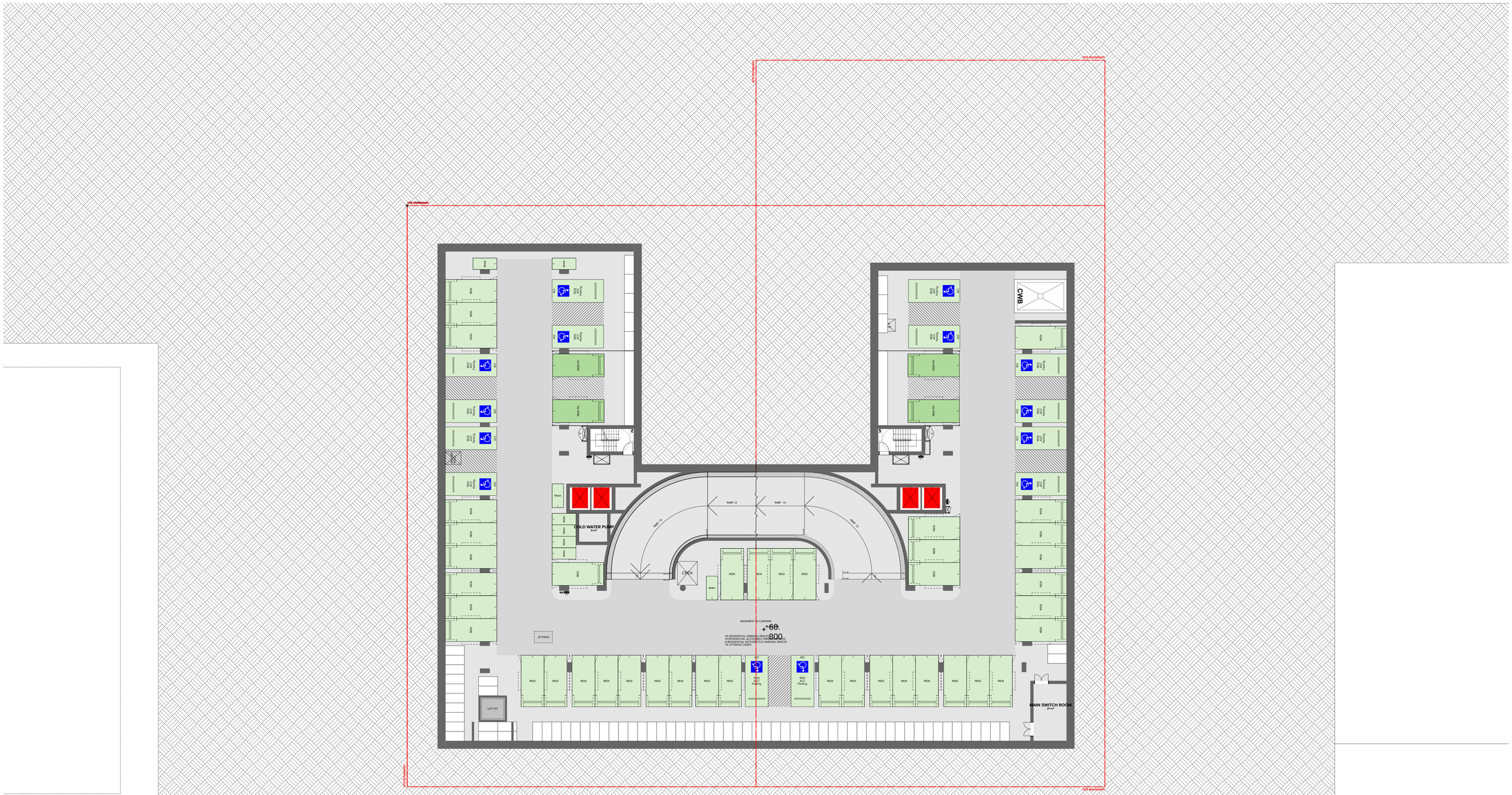
Drawn by

Dwg No.
DA-110-005

Rev
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DLCS Quality Endorsed Company ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 094 694 911

CLIENT

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Sydney NSW 2000
Australia

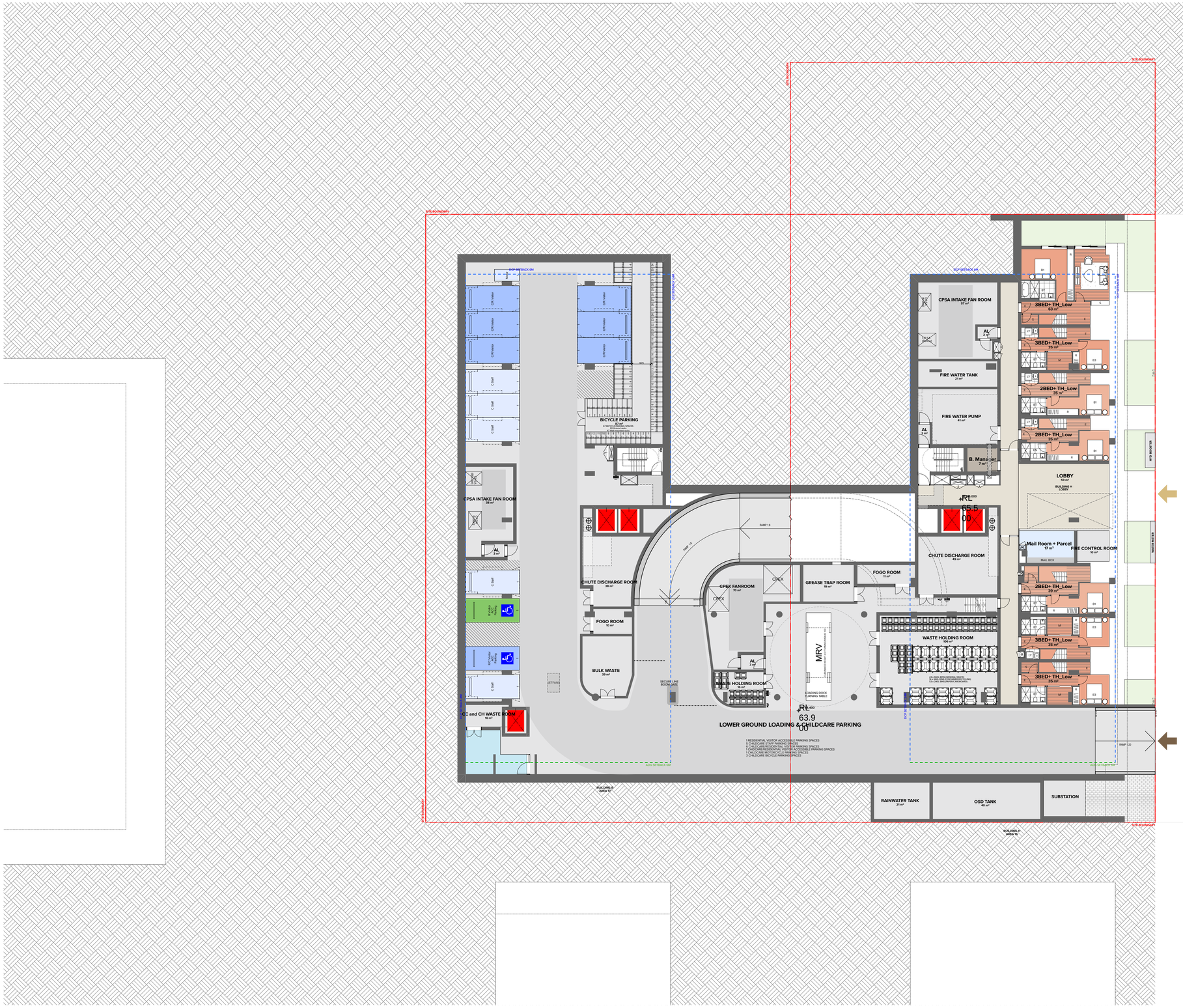
Rev	Date	Approved by	Notes
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B	25/08/2025	JMC	For Information
C	27/08/25	JMC	For Information
D	22/09/2025	JMC	For Information

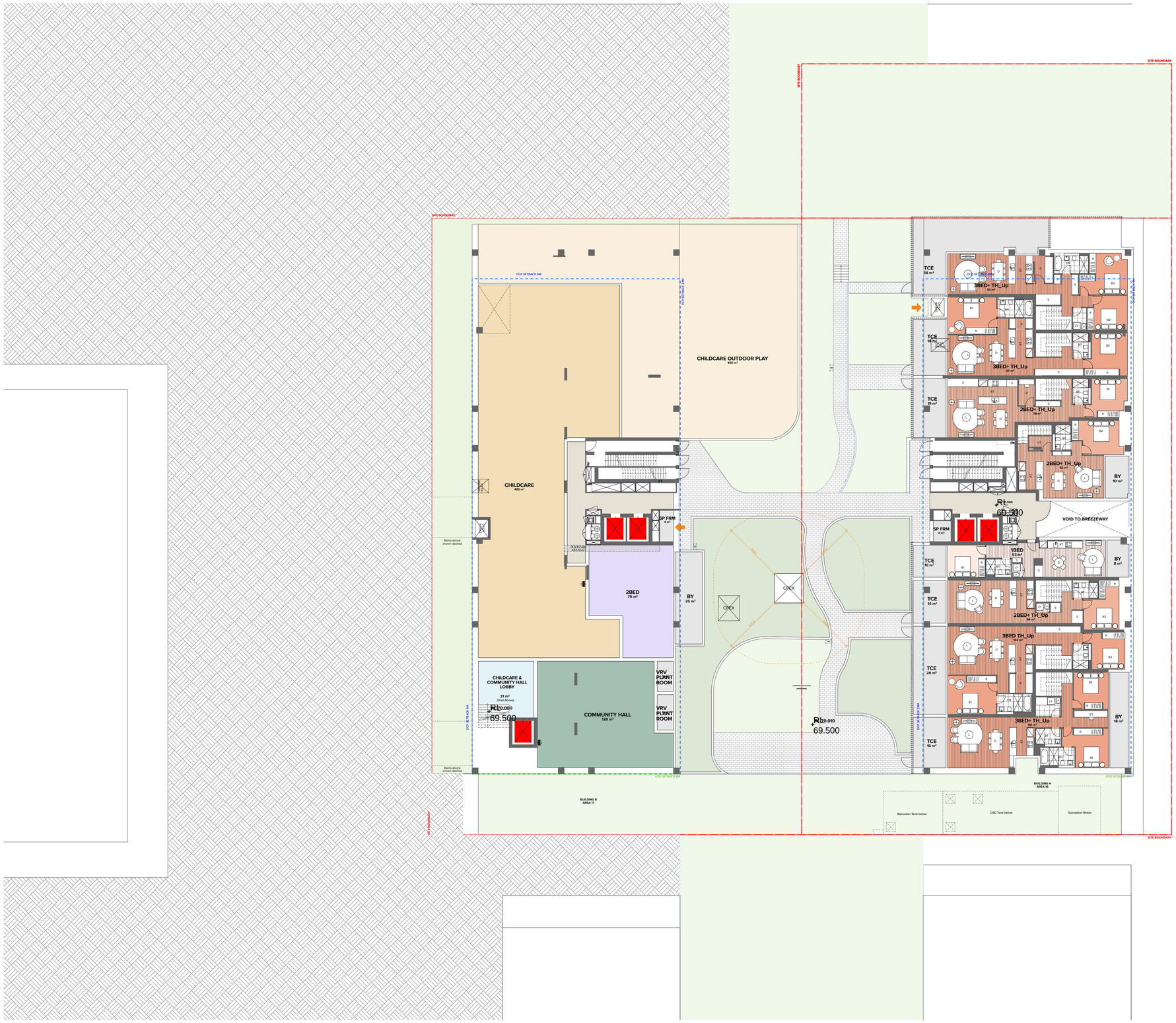
Project Title
Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title
GA Plans
Basement 01

Scale: **1:200 @A1, 50%@A3**
Status: **For Information**
Project No.: **22050 CC/PS/KZ/AS**
Dwg No.: **DA-110-006**
Rev: **D**
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SITE BOUNDARY
SITE BOUNDARY
SITE BOUNDARY



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DLCS Quality Endorsed Company: ISO 9001:2015, Registration Number 20476
Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

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Sydney NSW 2000
Australia

Rev	Date	Approved by	Notes
A	30/07/2025	JMC	For Information
B	25/08/2025	JMC	For Information
C	27/08/25	JMC	For Information
D	22/09/2025	JMC	For Information

Project Title

Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title

GA Plans
Ground Level

Scale: 1:200 @A1, 50%@A3
Status: For Information
Project No.: 22050 CC/PS/KZ/AS
Dwg No.: DA-110-008
Rev: D
Drawn by
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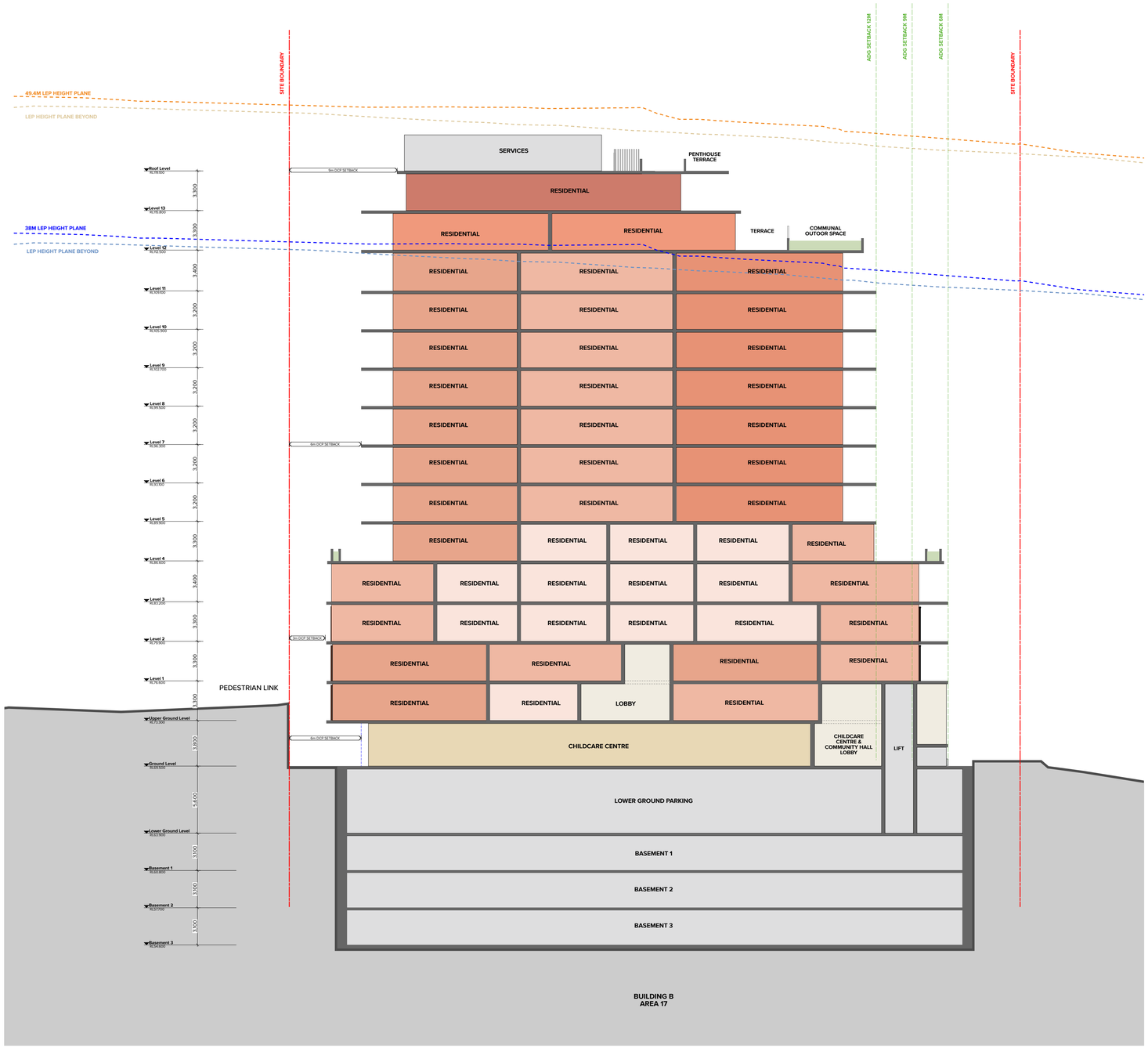
Rev	Date	Approved by	Notes
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02	9/22/25	JMC	For Information

Project Title
Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title
GA Sections
Section AA

Scale: 1:200 @A1, 50%@A3
Status: For Information
Project No.: 00000
Dwg No.: DA-310-101
Drawn by: PS/CC
Rev: 02
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Nominated Architect: Nicholas Turner 6665, ABN 86 064 084 911

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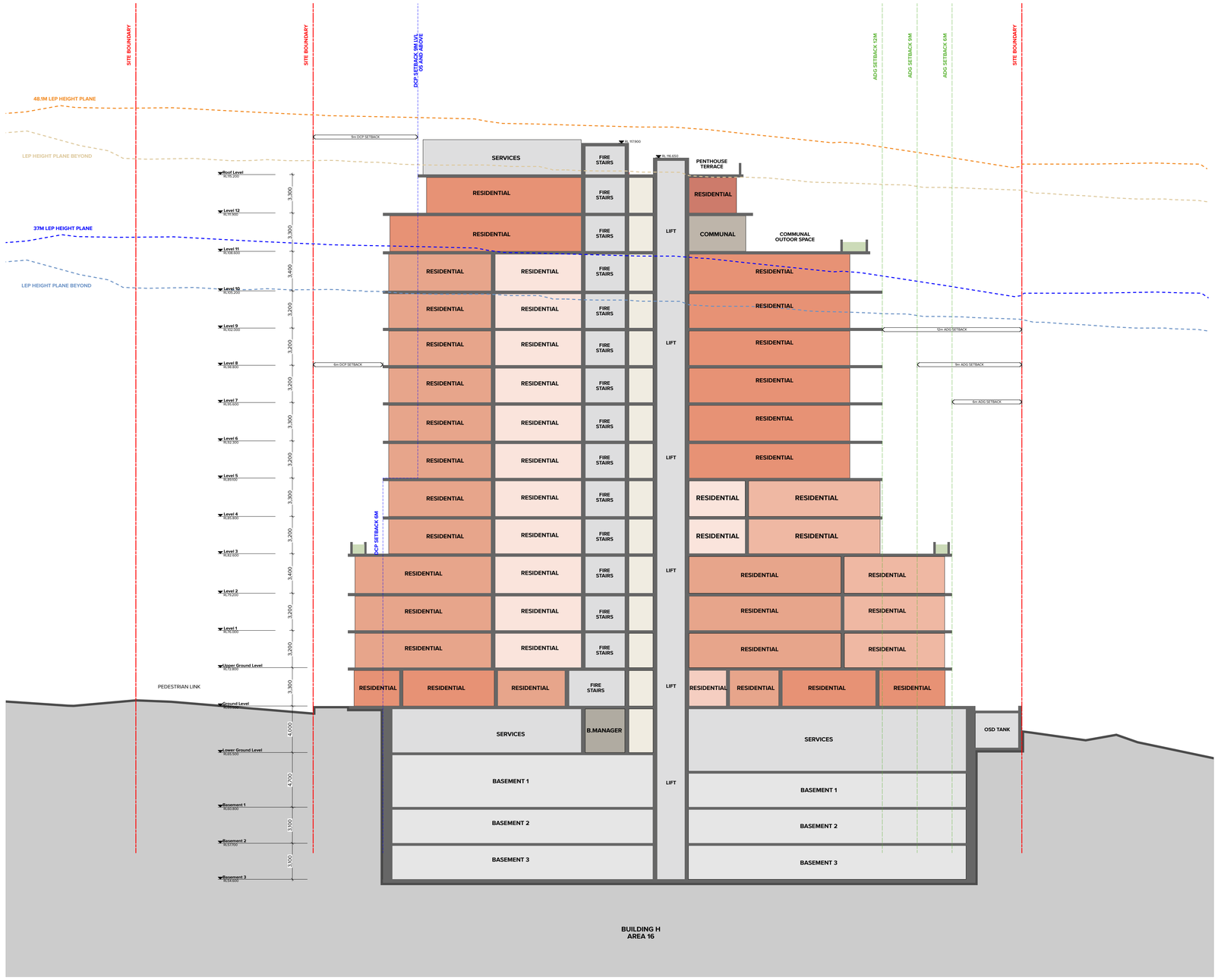
Rev	Date	Approved by	Notes
01	9/9/25	JMC	For Information
02	9/22/25	JMC	For Information

Project Title
Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title
GA Sections
Section CC

Scale: 1:200 @A1, 50%@A3
Status: For Information
Project No.: 00000
Dwg No.: DA-310-301
Drawn by: PS/CC
Rev: 02
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Nominated Architect: Nicholas Turner 6695, ABN 86 064 084 911

CLIENT

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Sydney NSW 2000
Australia

Rev	Date	Approved by	Notes
01	9/9/25	JMC	For Information
02	9/22/25	JMC	For Information

Project Title

Berry Holdsworth
12-20 Berry Road, St Leonards NSW 2065, Australia

Drawing Title

GA Sections
Section DD

Scale
1:200 @A1, 50%@A3

Status
For Information

Project No.
00000

Dwg No.
DA-310-401

Drawn by
PS/CC

Rev
02

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Appendix C

Survey Drawings



LEGEND

- BUILDING/STRUCTURE
- BENCH MARK
- BOUNDARY
- FENCE
- GARDEN
- OVERHEAD CABLES
- POWER POLE
- RIDGE — R
- TOP OF GUTTER — TG
- WATER METER — WM
- SHRUB/SMALL PLANT
- STORMWATER PIT
- SEWER MANHOLE
- SEWER INSPECTION OPENING
- TELSTRA PIT
- HYDRANT
- GAS
- FL=FLOOR LEVEL GF=GROUND FLOOR FF=FIRST FLOOR
- GL=GROUND LEVEL D=DIAMETER S=SPREAD H=HEIGHT
- H=WINDOW HEAD S=WINDOW SILL
- UNDERGROUND ELECTRICAL CALBES
- UNDERGROUND GAS PIPES
- UNDERGROUND SEWER PIPES
- UNDERGROUND TELSTRA CABLES
- UNDERGROUND WATER PIPES

I, Aaron Fleury, a surveyor registered under the Surveying and Spatial Information Act 2002, certify that this plan, report or diagram has been prepared in accordance with the Surveying and Spatial Information Regulation 2024, section 45.

Signature

Dated:
Address: 26/35 Old Northern Road, Baulkham Hills NSW 2153
Name of firm: Pinnacle Land Surveyors
Surveyor identification no 8770

Total Site Area: 5015.6m²

NOTES:

0.5m AND 1m CONTOURS SHOWN.

THIS PLAN IS PREPARED FOR DETAIL AND LEVEL PURPOSES ONLY AND THE INFORMATION SHOWN ON THIS PLAN MUST NOT BE USED FOR CONSTRUCTION SETOUT.

BOUNDARIES OF THE SITE HAVE BEEN IDENTIFIED (OR DEFINED) BY SURVEY

THIS SURVEY IS LIMITED TO THOSE PARTS OF THE SUBJECT BUILDING AND OTHER IMPROVEMENTS THAT WERE VISIBLE AND ACCESSIBLE AT THE TIME OF SURVEY.

ANY STRUCTURES RELATED TO PHYSICAL FEATURES SUCH AS BUILDINGS, POOLS, DRIVEWAYS, TREES, WALLS AND STAIRS MUST BE CONFIRMED PRIOR TO FINAL DESIGN.

ONLY VISIBLE SERVICES HAVE BEEN LOCATED AND NO DBYD INFORMATION HAS BEEN INVESTIGATED, ALL SERVICES MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

NEIGHBOURING HOUSES, ROOF POSITIONS, RIDGE POSITIONS AND WINDOW DETAILS ARE APPROXIMATE ONLY.

ORIGIN OF RL'S: SSM 74341 - RL 76.44 (AHD)

PINNACLE LAND SURVEYORS

PINNACLE LAND SURVEYORS PTY LTD
MAIL: PO Box 112 Baulkham Hills NSW 2153
ADDRESS: Suite 26, Level 1 35 Old Northern Road, Baulkham Hills NSW 2153
PHONE: (02) 9686 2548
FAX: (02) 9844 5445
EMAIL: office@pinnaclesurveyors.com.au
VISIT US AT: www.pinnaclesurveyors.com.au
ABN 59607099534

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PROJECT : DETAIL AND LEVEL SURVEY AT No. 12-20 BERRY RD AND, 11-19 HOLDSWORTH AVE, ST LEONARDS

CLIENT : BARINGS C/O ESSENCE

SHEET 1 OF 2

DRAWING No. : 1920DET

JOB REF : 1920

DATE : 20 June 2025



LEGEND

- BUILDING/STRUCTURE
- BENCH MARK
- BOUNDARY
- FENCE
- GARDEN
- OVERHEAD CABLES
- POWER POLE
- RIDGE — R
- TOP OF GUTTER — TG
- WATER METER — WM
- SHRUB/SMALL PLANT
- STORMWATER PIT
- SEWER MANHOLE
- SEWER INSPECTION OPENING — S
- TELSTRA PIT
- HYDRANT
- GAS
- FL=FLOOR LEVEL GF=GROUND FLOOR FF=FIRST FLOOR
- GL=GROUND LEVEL D=DIAMETER S=SPREAD H=HEIGHT
- H=WINDOW HEAD S=WINDOW SILL
- UNDERGROUND ELECTRICAL CALBES — E — E — E —
- UNDERGROUND GAS PIPES — GAS — GAS —
- UNDERGROUND SEWER PIPES — S — S — S —
- UNDERGROUND TELSTRA CABLES — T — T — T —
- UNDERGROUND WATER PIPES — W — W —

I, Aaron Fleury, a surveyor registered under the Surveying and Spatial Information Act 2002, certify that this plan, report or diagram has been prepared in accordance with the Surveying and Spatial Information Regulation 2024, section 45.

Signature

Dated:
Address: 26/35 Old Northern Road, Baulkham Hills NSW 2153
Name of firm: Pinnacle Land Surveyors
Surveyor identification no 8770

NOTES:

0.5m AND 1m CONTOURS SHOWN.

THIS PLAN IS PREPARED FOR DETAIL AND LEVEL PURPOSES ONLY AND THE INFORMATION SHOWN ON THIS PLAN MUST NOT BE USED FOR CONSTRUCTION SETOUT.

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ONLY VISIBLE SERVICES HAVE BEEN LOCATED AND NO DBYD INFORMATION HAS BEEN INVESTIGATED, ALL SERVICES MUST BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

NEIGHBOURING HOUSES, ROOF POSITIONS, RIDGE POSITIONS AND WINDOW DETAILS ARE APPROXIMATE ONLY.

ORIGIN OF RL'S: SSM 74341 - RL 76.44 (AHD)

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PROJECT : DETAIL AND LEVEL SURVEY AT No. 12-20 BERRY RD AND, 11-19 HOLDSWORTH AVE, ST LEONARDS

CLIENT : BARINGS C/O ESSENCE

SHEET 2 OF 2

DRAWING No. : 1920DET

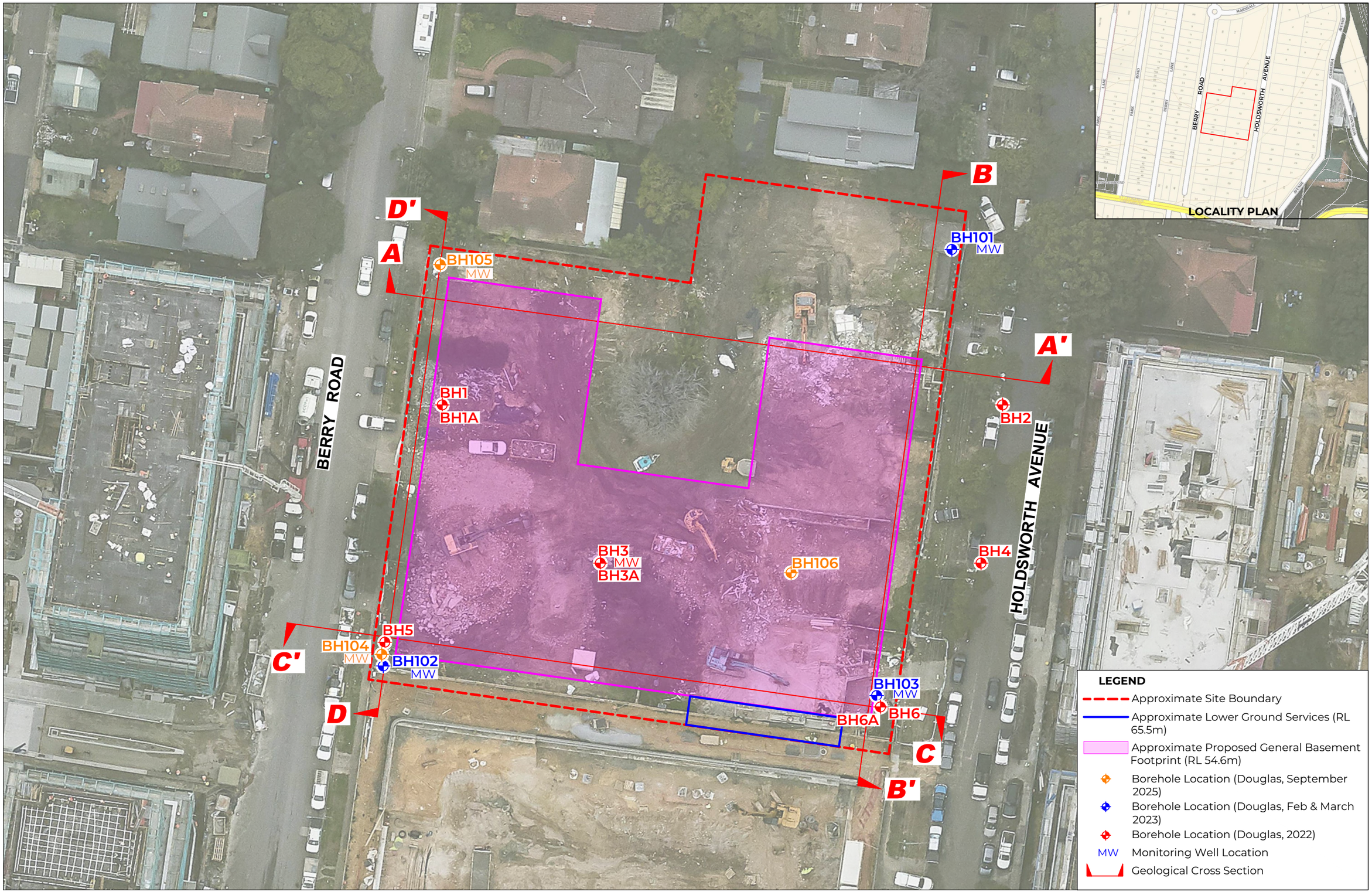
JOB REF : 1920

DATE : 20 June 2025

SCALE 1:200 @ A1
SCALE 1:400 @ A3

Appendix D

Douglas Borehole Location and Sections



REV	DESCRIPTION/COMMENT	DATE	DRAWN BY
4	UPDATED BASEMENTS	13.10.2025	EC

SCALE: 0 5 10 15 20
1:500 @ A3

Douglas PARTNERS
OFFICE: SYDNEY
96-98 Hermitage Rd, West Ryde NSW 2114
(02) 9809 0666

CLIENT:
Altis Property Partners Pty Ltd

NOTE:
1: Base image from MetroMap (Dated 04.09.2025)
2: Proposed Basement and Building Footprints from Turner, Project No.22050, Drawing No. DA-110-004 and 007 ,Revision D (Dated 22.09.2025)

COORDINATE REFERENCE SYSTEM: GDA2020 / MGA ZONE 56

PROJECT NAME:
Proposed Residential Development
PROJECT ADDRESS:
12-20 Berry Road and 11-19 Holdsworth Avenue, St Leonards

DRAWING TITLE:
Test Location Plan

PROJECT No: **210589.01**
DRAWING No: **1**
REVISION: **4**

\\dpsydnas02\Projects\210589.01 - ST LEONARDS, Berry & Holdsworth St\7.0 Drawings\7.2 Out\Rev4\210589.01.D.001.Rev4_Test_Location Plan.dwg

A

A'

ELEVATION (AHD)

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH105
Offset - 3.0m

BH1A
Offset - 14.5m

BH1
Offset - 1.5m

BH101
Offset - 16.1m

BH2
Offset - 3.8m

N = 48
refusal

UNIT 1 - FILLING/RESIDUAL SOIL

UNIT 2 - VERY LOW TO LOW STRENGTH SANDSTONE

UNIT 1 - FILLING/RESIDUAL SOIL

UNIT 3 - MEDIUM AND HIGH STRENGTH SANDSTONE

BULK EXCAVATION LEVEL BEL ≈ 54.3m AHD
(ASSUMING FFL ≈ 54.6m AHD)

BULK EXCAVATION LEVEL BEL ≈ 54.3m AHD
(ASSUMING FFL ≈ 54.6m AHD)

UNIT 4 - MEDIUM STRENGTH SILTSTONE

UNIT 3 - MEDIUM AND HIGH STRENGTH SANDSTONE

Bottom Depth 24.13 m

Bottom Depth 24 m

Bottom Depth 20.5 m

Bottom Depth 15 m

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Asphaltic Concrete
- Topsoil
- Clay
- Concrete
- Filling
- Sandstone
- Sandy Clay
- Silty Clay

NOTES:
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

TESTS / OTHER
N - Standard penetration test value
— ? — — - Interpreted geotechnical boundary
- Groundwater level

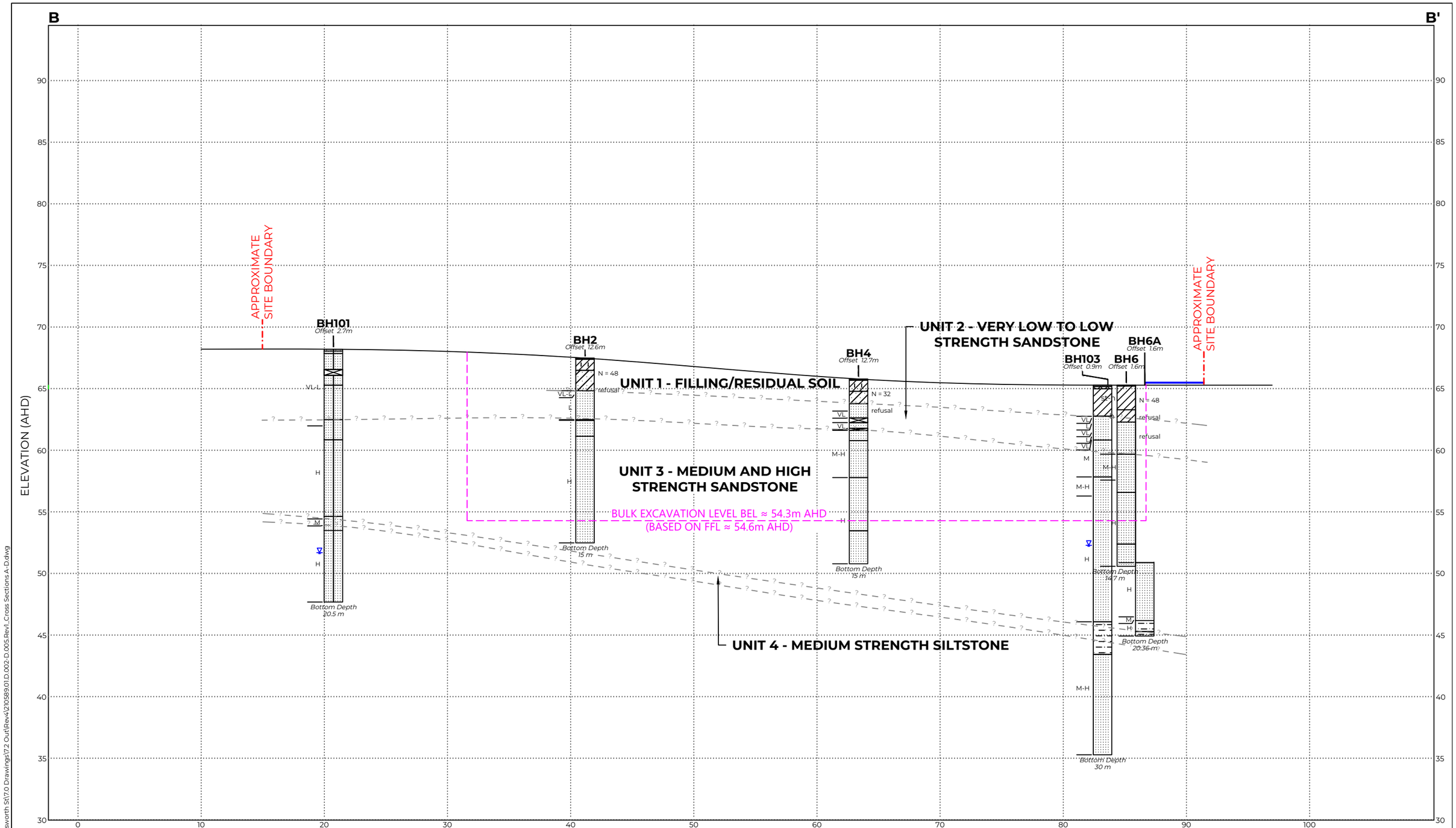
0 6
Horizontal Scale (metres)
Natural Scale

Douglas PARTNERS

CLIENT: Altis Property Partners Pty Ltd		TITLE: **Geological Cross-Section A-A'** **Proposed Residential Development** **12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards**
OFFICE: Sydney	DRAWN BY: MN/EC	
SCALE: 1:300 (H) 1:300 (V) @ A3	DATE: 15.10.2025	

PROJECT No: 210589.01
DRAWING No: 2
REVISION: 4

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LEGEND

- Core Loss
- Asphaltic Concrete
- Silty Clay
- Clay
- Concrete
- Filling
- Pavers
- Sandstone
- Sandy Clay
- Siltstone

NOTES:

1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH

- EL - Extremely Low
- VL - Very Low
- L - Low
- M - Medium
- H - High
- VH - Very High

TESTS / OTHER

- N - Standard penetration test value
- — ? — — - Interpreted geotechnical boundary
- ▽ - Groundwater level
- — — - Approximate Lower Ground Services FFL (RL 65.5m)

0 6
Horizontal Scale (metres)
Natural Scale

Douglas PARTNERS

CLIENT: Altis Property Partners Pty Ltd		TITLE: **Geological Cross-Section B-B'**	PROJECT No: 210589.01
OFFICE: Sydney	DRAWN BY: MN/EC	**Proposed Residential Development**	DRAWING No: 3
SCALE: 1:300 (H) 1:300 (V) @ A3	DATE: 15.10.2025	**12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards**	REVISION: 4

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C

C'

ELEVATION (AHD)

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

BH6A **BH6** *Offset - 0.1m*

BH103 *Offset - 1.6m*

BH102 *Offset 4.0m*

BH104 *Offset 0.6m*

UNIT 1 - FILLING/RESIDUAL SOIL

UNIT 2 - VERY LOW TO LOW STRENGTH SANDSTONE

BULK EXCAVATION LEVEL BEL ≈ 54.3m AHD
(BASED ON FFL ≈ 54.6m AHD)

UNIT 3 - MEDIUM AND HIGH STRENGTH SANDSTONE

UNIT 4 - MEDIUM STRENGTH SILTSTONE

st-h
h
M-H
H
H
H
M
M-H
M
VL
VL-L
M
H
M
H
N = 48
refusal
refusal

Bottom Depth 14.7 m

Bottom Depth 20.36 m

Bottom Depth 30 m

Bottom Depth 19.64 m

Bottom Depth 24.13 m

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Clay
- Concrete
- Topsoil
- Filling
- Pavers
- Sandstone
- Siltstone

NOTES:
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

TESTS / OTHER
N - Standard penetration test value
— ? — — - Interpreted geotechnical boundary
- Groundwater level

0 6
Horizontal Scale (metres)
Natural Scale

Douglas PARTNERS

CLIENT: Altis Property Partners Pty Ltd		TITLE: **Geological Cross-Section C-C'**	PROJECT No: 210589.01
OFFICE: Sydney	DRAWN BY: MN/EC	**Proposed Residential Development**	DRAWING No: 4
SCALE: 1:300 (H) 1:300 (V) @ A3	DATE: 15.10.2025	**12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards**	REVISION: 4

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D

D'

ELEVATION (AHD)

APPROXIMATE SITE BOUNDARY

APPROXIMATE SITE BOUNDARY

UNIT 1 - FILLING/RESIDUAL SOIL

UNIT 2 - VERY LOW TO LOW STRENGTH SANDSTONE

UNIT 3 - MEDIUM AND HIGH STRENGTH SANDSTONE

UNIT 4 - MEDIUM STRENGTH SILTSTONE

UNIT 4 - MEDIUM STRENGTH SILTSTONE

BULK EXCAVATION LEVEL BEL ≈ 54.3m AHD
(BASED ON FFL ≈ 54.6m AHD)

BH102
Offset 0.2m
Bottom Depth 19.64 m

BH104
Offset 0.6m
Bottom Depth 24.13 m

BH1A
Offset - 3.0m

BH1
Offset - 3.0m
refusal
Bottom Depth 24 m

BH105
Offset - 3.0m
Bottom Depth 24.13 m

DISTANCE ALONG PROFILE (m)

LEGEND

- Core Loss
- Topsoil
- Clay
- Concrete
- Filling
- Sandstone
- Siltstone

NOTES:
1. Subsurface conditions are accurate at the borehole locations only. Variations in subsurface conditions may occur between borehole locations. Interpreted strata boundaries are approximate and should be used as a guide only.
2. Summary logs only and should be read in conjunction with detailed logs.
3. Horizontal and vertical scales are not equal.

ROCK STRENGTH
EL - Extremely Low
VL - Very Low
L - Low
M - Medium
H - High
VH - Very High

TESTS / OTHER
N - Standard penetration test value
— ? — — - Interpreted geotechnical boundary
- Groundwater level

0 6
Horizontal Scale (metres)
Natural Scale

Douglas PARTNERS

CLIENT: Altis Property Partners Pty Ltd		PROJECT No: 210589.01
OFFICE: Sydney	DRAWN BY: MN/EC	DRAWING No: 5
SCALE: 1:300 (H) 1:300 (V) @ A3	DATE: 15.10.2025	REVISION: 4

TITLE: **Geological Cross-Section D-D'**
Proposed Residential Development
12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

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Appendix E

Borehole logs, Photographs and Field Work Results

Terminology, Symbols and Abbreviations

November 2023

Introduction to Terminology, Symbols and Abbreviations

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

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

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

Abbreviation Codes

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

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

Data Integrity Codes

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

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

Graphic Symbols

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

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Soil Descriptions

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Introduction

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



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

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

Particle size designation and Behaviour Model

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

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

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

[1] – refer grain size subdivision descriptions below

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

Component proportions

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

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

[1] As defined in AS1726-2017 6.1.4.4

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

Composite Materials

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

Classification

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

Soil Name

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

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

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

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

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

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

Identification of minor components

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

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

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

Soil Composition

Plasticity

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

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

Grain Size

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

Grading

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

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

Soil Condition

Moisture

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

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

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

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

Consistency/Density/Compaction/Cementation/Extremely Weathered Material

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

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

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

Consistency (fine grained soils)

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

Relative Density (coarse grained soils)

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

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

Compaction (anthropogenically modified soil)

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

Cementation (natural and anthropogenic)

Cementation Term	Abbreviation Code
Moderately cemented	MOD
Weakly cemented	WEK

Extremely Weathered Material

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

Soil Origin

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

Cobbles and Boulders

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

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

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Rock Strength

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

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

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

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

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

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

Degree of Weathering

The degree of weathering of rock is classified as follows:

Weathering Term	Description	Abbreviation Code
Residual Soil[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.	RS
Extremely weathered[1]	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible	XW
Highly weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable. Rock strength is significantly changed by weathering. Some primary minerals have weathered to clay minerals. Porosity may be increased by leaching or may be decreased due to deposition of weathering products in pores.	HW
Moderately weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognisable but shows little or no change of strength from fresh rock.	MW
Slightly weathered	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.	SW
Fresh	No signs of decomposition or staining.	FR
Note: If HW and MW cannot be differentiated use DW (see below)		
Distinctly weathered	Rock strength usually changed by weathering. The rock may be highly discoloured, usually by iron staining. Porosity may be increased by leaching or may be decreased due to deposition of weathered products in pores.	DW

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

Degree of Alteration

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

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

Degree of Fracturing

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

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

Rock Quality Designation

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

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

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

Stratification Spacing

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

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

Defect Descriptions

Defect Type

Term	Abbreviation Code
Bedding plane	B
Infilled seam	IS
Cleavage	CV
Crushed zone	CZ
Decomposed seam	DS
Fault	F
Joint	JT
Lamination	LAM
Parting	P
Shear zone	SZ
Vein	VN
Drilling/handling break	DB , HB
Fracture	FC

Rock Defect Orientation

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

Rock Defect Coating

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

Rock Defect Infill

Term	Abbreviation Code
Calcite	CA
Carbonaceous	CBS
Clay	CLAY
Iron oxide	FE
Manganese	MN

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Rock Defect Shape/Planarity

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

Rock Defect Roughness

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

Defect Orientation

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

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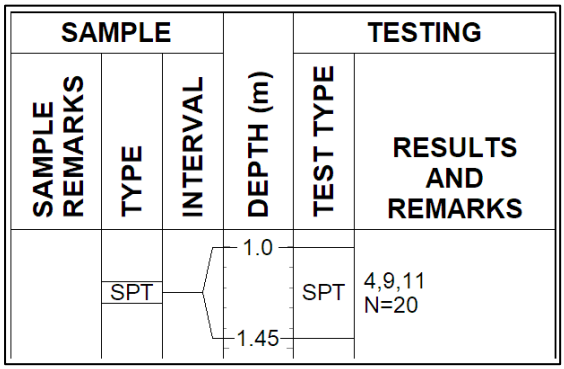
Sampling, Testing and Excavation Methodology

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Sampling and Testing

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



Sampling

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

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

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

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

Field and Laboratory Testing

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

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

Field and laboratory testing (continued)

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

Groundwater Observations

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

Drilling or Excavation Methods/Tools

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

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

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

Douglas PARTNERS

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 210589.01
DATE: 17/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
73	0.3	TOPSOIL/Silty CLAY: low to medium plasticity, brown, trace of rootlets and fine sand							A			
	1.0	CLAY CI-CH: medium to high plastcity, brown to orange brown, trace of silt and ironstone gravel, w<PL, firm to stiff, residual						Unless stated otherwise defects are: B0-15°, pl, ro, cly vn or cln or fe st	A			
	1.2	SANDSTONE: fine to medium grained, pale grey to pale brown, very low strength, with some red-brown iron indurated bands, Hawkesbury Sandstone							A S			15,24/80 refusal
72	2	SANDSTONE: fine to medium grained, grey-brown to brown with some dark grey interbedded siltstone, low strength with some hard clay and high strength iron indurated bands, highly weathered, highly fractured, Hawkesbury Sandstone						1.74m: B0-10°, pl, ro cly 10mm 1.78-2.00m: Cz 2m: CORE LOSS: 430mm	C	85	0	PL(A) = 2.1
	2.43							2.44m: Cs, 70mm 2.51m: Cz, 80mm				
71	3							2.77m: Cz, 20mm 2.83m: Ds, 70mm 2.94m: B0°, pl, ro, cly vn 3.11m: Ds, 30mm 3.23m: DS, 120mm	C	83	0	PL(A) = 0.05
								3.51m: B0-10°, pl, ro cly 40mm				PL(A) = 0.2
70	4							3.68m: Ds, 40mm 3.78m: CORE LOSS: 220mm				
	4.0	SANDSTONE: fine to medium grained, orange brown to pale brown, medium strength with some hard clay bands, slightly weathered, fractured, Hawkesbury Sandstone						4m: B0-10°, pl, ro cly 20mm 4.25m: J10°, pl, ro, cln	C	100	40	PL(A) = 0.97
69	5							4.84-4.94m Bx3,20°, pl, ro, cly vn 5.27m: Cs, 150mm				
												PL(A) = 0.91
68	6							5.8m: J90°, st, ro, fe st 5.86m: B5°, irr, ro, cly vn 5.94m: B5°, irr, ro, cln 6.06m: J40°, st, ro, cly vn 6.1m: J0°-75°, st, ro, fe st 6.18m: B0°, pl, ro, cly vn 6.28m: J30°, pl, ro, fe st 6.61m: Ds, 70mm	C	100	18	PL(A) = 0.15
67	7							7.12 - 7.84 Bx11, 0°, pl , ro, fe st				
												PL(A) = 0.52
66	8											
	8.0	SANDSTONE: fine to medium grained, pale brown and pale grey, medium strength, moderately weathered to slightly weathered, fractured, Hawkesbury Sandstone										PL(A) = 0.35
65	9								C	100	65	
												PL(A) = 0.49
64												

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 1.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.2m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 210589.01
DATE: 17/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
63	11	SANDSTONE: fine to medium grained, pale brown and pale grey, medium strength, moderately weathered to slightly weathered, fractured, Hawkesbury Sandstone *(continued)*						10.91m: Ds, 50mm 11.13m: J30°, pl, ro, cln 11.57m: J50, pl, ro, cly co	C	100	73	PL(A) = 0.77 PL(A) = 0.86
62	12 12.0	SANDSTONE: fine to coarse grained, pale brown to pale grey, high strengthfresh, slightly fractured, Hawkesbury Sandstone						12.06m: B0°, pl, ro, cly co 2mm 12.35m: B0°, pl, ro, cly co 2mm 12.44m: B5°, pl, ro, cly vn 12.55m: B0°, pl, ro, cly 20mm 12.96m: J15°, un, ro, sandy cly co				PL(A) = 2.5
61	13											
60	14								C	100	100	PL(A) = 1.7 PL(A) = 1
59	15 15.0	Bore discontinued at 15.0m										
58	16											
57	17											
56	18											
55	19											
54												

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 1.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.2m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 210589.00
DATE: 17/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
73	0.3	TOPSOIL/Silty CLAY: low to medium plasticity, brown, trace of rootlets and fine sand		A	0.1				Gatic Cover
					0.2				Blank pipe 0.0-7.5m
		CLAY CI-CH: medium to high plastcity, brown to orange brown, trace of silt and ironstone gravel, w<PL, firm to stiff, residual		A	0.4				
					0.5				
					0.9				
	1.0			A	1.0		15,24/80 refusal		
	1.2	SANDSTONE: fine to medium grained, pale grey to pale brown, very low strength, with some red-brown iron indurated bands, Hawkesbury Sandstone		S	1.2				
72		SANDSTONE: fine to medium grained, grey-brown to brown with some dark grey interbedded siltstone, low strength with some hard clay and high strength iron indurated bands, highly weathered, highly fractured, Hawkesbury Sandstone		C	1.63		PL(A) = 2.1		
	2.43				2.15				
71				C	2.7		PL(A) = 0.05		
					3.64		PL(A) = 0.2		Bentonite 0.1-7.0m
70	4.0				3.78				
		SANDSTONE: fine to medium grained, orange brown to pale brown, medium strength with some hard clay bands, slightly weathered, fractured, Hawkesbury Sandstone		C	4.69		PL(A) = 0.97		
69					5.34				
				C	5.66		PL(A) = 0.91		
68					6.51		PL(A) = 0.15		
67					7.2				
				C	7.52		PL(A) = 0.52		
66	8.0	SANDSTONE: fine to medium grained, pale brown and pale grey, medium strength, moderately weathered to slightly weathered, fractured, Hawkesbury Sandstone			8.39		PL(A) = 0.35		
65				C	9.46		PL(A) = 0.49		
64					10.0				

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 1.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.2m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1
PROJECT No: 210589.00
DATE: 17/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
63	11	SANDSTONE: fine to medium grained, pale brown and pale grey, medium strength, moderately weathered to slightly weathered, fractured, Hawkesbury Sandstone *(continued)*			10.0				Machine slotted PVC screen 7.5-13.5m
					10.75		PL(A) = 0.77		
				C	11.43		PL(A) = 0.86		Gravel 7.0-15.0m
62	12 12.0	SANDSTONE: fine to coarse grained, pale brown to pale grey, high strengthfresh, slightly fractured, Hawkesbury Sandstone			12.42		PL(A) = 2.5		
61	13				13.05				
				C	13.27		PL(A) = 1.7		End cap
60	14				14.28		PL(A) = 1		
59	15 15.0	Bore discontinued at 15.0m			15.0				
58	16								
57	17								
56	18								
55	19								
54									

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 1.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.2m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH1 PROJECT: ST LEONARDS DECEMBER 2021



1.20 – 5.00m

BORE: BH1 PROJECT: ST LEONARDS DECEMBER 2021



5.00 – 10.00m

BORE: BH1 PROJECT: ST LEONARDS DECEMBER 2021



10.00 –15.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.01
DATE: 24/3/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
73	1	PCD to 14.83m depth										
72	2											
71	3											
70	4											
69	5											
68	6											
67	7											
66	8											
65	9											
64												

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.01
DATE: 24/3/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
		PCD to 14.83m depth *(continued)*										
63	11											
62	12											
61	13											
60	14											
59	14.83	SANDSTONE: fine to medium grained, pale grey, distinct bedding and cross bedding dipping 0°-10°, high strength with some medium strength bands, fresh slightly fractured						15.34-15.35m: Cs 10mm	C	100	100	PL(A) = 1.57
58	15							15.85m: B0°, pl, ro, cln				PL(A) = 1.84
57	16							16.24m: B5°, pl, rou, cln				
56	17							17m: B10°, pl, ro, cln				PL(A) = 1.6
55	18							17.41m: B5°, pl, ro, cly co 4mm	C	100	95	
54	19							18.15m: B0°, pl, cly co 2mm 18.21m: B0°, pl, ro, cly vn 18.3m: B0°, pl, ro, cly vn 18.6m: B0°, pl, ro, cly vn 18.76m: B10°, pl, ro, cly vn 19.15m: J35°, pl, ro, patchy cly vn 19.31-19.33m: Ds 20mm 19.36-19.39m: Ds 30mm 19.45-19.48m: Cs 30mm	C	100	92	PL(A) = 1.2 PL(A) = 0.71
	20.0											PL(A) = 1.6

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.01
DATE: 24/3/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
53	21	SANDSTONE: fine to medium grained, pale grey, distinct bedding and cross bedding dipping 0°-10°, high strength with some medium strength bands, fresh slightly fractured						19.54m: cbs seam 19.66-19.67m: Cs 10mm 19.9m: B5°, pl, ro, cly vn 20.22m: J25°, pl, ro, cly vn 20.44m: B10°, pl, ro, cly vn	C	100	92	PL(A) = 2.3
52	22							21.26m: B5°, pl, ro, sandy cly co 2mm 21.4m: B15°, pl, ro, cln				PL(A) = 1.8
51	23							22.37m: J20°, pl, ro, cbs	C	100	97	PL(A) = 0.8
50	24 24.0							23.22m: J20°, pl, ro, cln 23.34m: B5°, pl, ro, cly vn 23.41m: B10°, pl, ro, sandy cly co 1mm 23.73m: J30°, pl, ro, cbs				PL(A) = 2.51
49	25	Bore discontinued at 24.0m - Target depth reached										
48	26											
47	27											
46	28											
45	29											
44												

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.00
DATE: 24/3/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
73	1	PCD to 14.83m depth							Gatic cover; Cement 0.0-0.5m
72	2								
71	3								
70	4								
69	5								
68	6								
67	7								
66	8								Backfill 0.5-16.5m
65	9								Blank pipe 0.0-18.0m
64									

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.00
DATE: 24/3/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
		PCD to 14.83m depth *(continued)*							
63	11								11
62	12								12
61	13								13
60	14								14
59	14.83				14.83				
	15	SANDSTONE: fine to medium grained, pale grey, distinct bedding and cross bedding dipping 0°-10°, high strength with some medium strength bands, fresh slightly fractured		C	14.95		PL(A) = 1.57		15
58	16				15.95 16.0		PL(A) = 1.84		16
57	17			C	16.96		PL(A) = 1.6		17 Bentonite 16.5-17.5m
56	18				17.95		PL(A) = 1.2		18
55	19				18.96 19.0		PL(A) = 0.71		19
				C					
54	20.0				19.9		PL(A) = 1.6		

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 73.9 AHD
EASTING: 332701
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH1A
PROJECT No: 210589.00
DATE: 24/3/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
53	21	SANDSTONE: fine to medium grained, pale grey, distinct bedding and cross bedding dipping 0°-10°, high strength with some medium strength bands, fresh slightly fractured		C	20.95		PL(A) = 2.3		Gravel 17.5-24.0m Machine slotted PVC screen 18.0-24.0m
52	22				21.95 22.0		PL(A) = 1.8		
51	23			C	22.94		PL(A) = 0.8		
50	24 24.0				23.94 24.0		PL(A) = 2.51		End cap
49	25	Bore discontinued at 24.0m - Target depth reached							
48	26								
47	27								
46	28								
45	29								
44									

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HWT to 1.0m, HQ to 14.8m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.83m, NMLC Coring to 24.00m

WATER OBSERVATIONS: Approximately 30-40% water loss between 19.0-21.04m

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 24.0m (screen 18.0m-24.0m, PVC 0.0m-18.0m, Gravel 17.5m-24.0m, Bentonite 16.5m-17.5m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH1A PROJECT: ST LEONARDS MARCH 2022



14.83 – 19.00m

BORE: BH1A PROJECT: ST LEONARDS MARCH 2022



19.00 – 24.0m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 67.5 AHD
EASTING: 332779
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 210589.01
DATE: 16/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
67	0.04	ASPHALTIC CONCRETE							A			
	0.1	FILLING/Gravelly SAND: grey to grey-brown, igneous and concrete gravel, dry							A			
	1	Silty CLAY CI: medium plasticty, pale grey to brown, trace sand and ironstone gravel, w<PL, stiff to very stiff							S			15,25,23 N = 48
66	1.0	Sandy CLAY CL-CI: low to medium plasticity, pale brown to pale red-brown, with ironstone gravels, very stiff to hard, weathered bedrock.						Unless stated otherwise defects are: B0-15°, pl, ro, cly vn or cln or fe st				
	2											
65	2.65								S			24,20/10 refusal
	3	SANDSTONE: medium grained, pale brown-grey to orange-brown, low strength with some hard clay bands, moderately weathered, fractured to slightly fractured, Hawkesbury Sandstone						2.97m: B0°, pl, ro, cly 30mm	C	80	50	PL(A) = 0.26
64												PL(A) = 0.2
	4							3.8m: J20°, pl, ro, stn, cly, vn 3.89m: J35°, pl, ro, stn, cly co				
63									C	99	99	PL(A) = 0.29
	5							5m: CORE LOSS: 50mm				
	5.05	SANDSTONE: fine to medium grained, pale brown with some grey interbedded siltstone, high strength, fresh, slightly fractured, Hawkesbury Sandstone										PL(A) = 2.1
62	6								C	98	94	
	6.35	SANDSTONE: medium to coarse grained, pale brown to pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 1.5
61	7											
60												PL(A) = 1.6
	8								C	100	97	
59												PL(A) = 1.5
	9											
58												PL(A) = 1.7

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.65m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 67.5 AHD
EASTING: 332779
NORTHING: 6255642
DIP/AZIMUTH: 90°/--

BORE No: BH2
PROJECT No: 210589.01
DATE: 16/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
57	11	SANDSTONE: medium to coarse grained, pale brown to pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*										PL(A) = 1.6
56	12								C	100	100	PL(A) = 1.4
55	13											PL(A) = 1.4
54	14								C	100	100	PL(A) = 1.47
53	15 15.0											PL(A) = 1.7
52	16	Bore discontinued at 15.0m										
51	17											
50	18											
49	19											
48												

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.65m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH2 PROJECT: ST LEONARDS DECEMBER 2021



2.65 – 7.00m

BORE: BH2 PROJECT: ST LEONARDS DECEMBER 2021



7.00 – 12.00m

BORE: BH2 PROJECT: ST LEONARDS DECEMBER 2021



12.00 – 15.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 210589.01
DATE: 2/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
71	0.03	BRICK PAVER							D			
	0.2	FILL/Silty CLAY: low plasticity, dark grey, with ripped, iron-stained sandstone gravel, w<PL							D			
	1	CLAY CI-CH: medium to high plasticity, mottled orange-dark grey, w~PL, stiff to very stiff, residual							S			11,25/140 refusal
70	1.5	Sandy CLAY CL-CI: low to medium plasticity, orange brown to red-brown, with ironstone gravel, w<PL, hard, weathered Hawkesbury Sandstone						Unless stated otherwise defects are: B0-15°, pl, ro, cly vn or cln or fe st	D			
	2											
69	2.0	SANDSTONE: fine to medium grained, pale grey-brown and red-brown, very low to low strength with some hard clay bands and high strength iron indurated bands, extremely to highly weathered, fractured, Hawkesbury Sandstone						2.6m: J40-50°, pl, ro cln				
	3							3.4m: B0-10°, pl, ro, cly 10mm				
68	4							4m: CORE LOSS: 230mm	C	90	0	PL(A) = 0.88
67	4.23											
	4.6	SANDSTONE: fine to medium grained, red-brown, medium strength with some hard clay bands and high strength iron indurated bands, highly to moderately weathered, fractured, Hawkesbury Sandstone						4.54m: B0-10°, pl, ro, cly 10mm 4.55m: CORE LOSS: 50mm 4.75m: J40-50°, pl, ro, cly co 4.8m: B0-10°, pl, ro, cly 10mm 5.06m: B0-10°, pl, ro, cly 10mm 5.2m: J50°, pl, ro, healed 5.55-6.50m Jx5, 70°, pl, ro, healed				PL(A) = 0.58
66	5											
	6											PL(A) = 3.9
65	6.6	SANDSTONE: medium grained, pale grey to brown, low to medium strength, slightly weathered, fractured to slightly fractured, Hawkesbury Sandstone						6.8m: J70°, pl, ro, cly co 7.15-7.90m Jx3, 70°, pl, ro, healed	C	100	65	PL(A) = 0.4
64	7											
	8											PL(A) = 0.26
63	8.1	SANDSTONE: medium grained, pale brown to grey, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone						8.1m: B0-10°, pl, ro, cly co 8.57m: B0-10°, pl, ro, cly co				
	9							9.23m: B0-10°, pl, ro, cly co 9.5m: B0-10°, pl, ro, cly co	C	100	99	PL(A) = 1.3
62												PL(A) = 1.3

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.4m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 210589.01
DATE: 2/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
61		SANDSTONE: medium grained, pale brown to grey, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone *(continued)*							C	100	99	
	11 11.0							10.9m: B0-10°, pl, ro, cly co				PL(A) = 2
60		SANDSTONE: medium grained, pale brown to pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone						11.5m: J30°, pl, ro, cly co				
	12											PL(A) = 1.3
59												PL(A) = 0.95
	13							12.9m: B0-10°, pl, ro, cly co	C	100	99	PL(A) = 1.1
58												
	14											PL(A) = 1.6
57									C	100	100	
	15 15.0											PL(A) = 1.9
		Bore discontinued at 15.0m										
56												
	16											
55												
	17											
54												
	18											
53												
	19											
52												

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.4m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 210589.00
DATE: 2/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
71	0.03	BRICK PAVER		D	0.0				Gatic Cover
	0.2	FILL/Silty CLAY: low plasticity, dark grey, with ripped, iron-stained sandstone gravel, w<PL			0.1				Blank pipe 0.0-9.0m
				D	0.4				
		CLAY CI-CH: medium to high plasticity, mottled orange-dark grey, w~PL, stiff to very stiff, residual			0.5				
1				S	1.0		11,25/140 refusal		1
70	1.5				1.45				
		Sandy CLAY CL-CI: low to medium plasticity, orange brown to red-brown, with ironstone gravel, w<PL, hard, weathered Hawkesbury Sandstone		D	1.8				
2	2.0				1.9				2
		SANDSTONE: fine to medium grained, pale grey-brown and red-brown, very low to low strength with some hard clay bands and high strength iron indurated bands, extremely to highly weathered, fractured, Hawkesbury Sandstone			2.4				
69									
3									3
68									Bentonite 0.1-7.0m
4				C	3.95		PL(A) = 0.88		4
	4.23								
67	4.6								
		SANDSTONE: fine to medium grained, red-brown, medium strength with some hard clay bands and high strength iron indurated bands, highly to moderately weathered, fractured, Hawkesbury Sandstone			4.95		PL(A) = 0.58		
5									5
66					5.5				
6					5.95		PL(A) = 3.9		6
65	6.6								
		SANDSTONE: medium grained, pale grey to brown, low to medium strength, slightly weathered, fractured to slightly fractured, Hawkesbury Sandstone		C	6.95		PL(A) = 0.4		
7									7
64					7.95		PL(A) = 0.26		
8	8.1								8
		SANDSTONE: medium grained, pale brown to grey, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone			8.5				
63									
9					8.95		PL(A) = 1.3		9
				C					
62									
					9.95		PL(A) = 1.3		

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.4m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3
PROJECT No: 210589.00
DATE: 2/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
61		SANDSTONE: medium grained, pale brown to grey, high strength, slightly weathered, slightly fractured, Hawkesbury Sandstone *(continued)*		C	10.95		PL(A) = 2		
11	11.0	SANDSTONE: medium grained, pale brown to pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone			11.5				11 Gravel 7.0-15.0m
60					11.95		PL(A) = 1.3		
12					12.5		PL(A) = 0.95		12 Machine slotted PVC screen 9.0-15.0m
59				C	12.95		PL(A) = 1.1		
13									13
58					13.95		PL(A) = 1.6		
14					14.5				14
57				C	14.95		PL(A) = 1.9		
15	15.0	Bore discontinued at 15.0m			15.0				15 End cap
56									
16									16
55									
17									17
54									
18									18
53									
19									19
52									

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.4m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH3 PROJECT: ST LEONARDS DECEMBER 2021



2.40– 7.00m

BORE: BH3 PROJECT: ST LEONARDS DECEMBER 2021



7.00 – 12.00m

BORE: BH3 PROJECT: ST LEONARDS DECEMBER 2021



12.00 – 15.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.01
DATE: 28/3/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
71	0	PCD to 15.0m depth										
70	1											
69	2											
68	3											
67	4											
66	5											
65	6											
64	7											
63	8											
62	9											

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.01
DATE: 28/3/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
		PCD to 15.0m depth *(continued)*										
61	11											
60	12											
59	13											
58	14											
57	15 15.0	SANDSTONE: fine to medium grained, pale grey, cross bedding dipping 0°-10°, thinly bedded, high strength, fresh, fractured						15.84m: B5°, pl, ro, patchy cly vn 15.91m: B0°, pl, ro, cln 16.2m: B0°, pl, ro, cln 16.21m: B0°, pl, ro, cln	C	100	97	PL(A) = 1.1 PL(A) = 2.5
56	16											
55	17							17.09m: B10°, pl, ro, cly vn 17.26m: B10°, pl, ro, cly vn 17.48m: B10°, pl, ro, patchy cly vn				PL(A) = 2.2
54	18							18.08-18.12m: Ds 40mm				PL(A) = 1.94 PL(A) = 1.7
53	19							18.75m: B20°, pl, ro, cln 18.83-18.88m: Ds 50mm 19.22m: B0°, pl, ro, cbs	C	100	91	PL(A) = 1.3 PL(A) = 1
52	20.0											PL(A) = 1.4

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.01
DATE: 28/3/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
51		as above						20.04m: J30°, pl, ro, cly vn	C	100	91	PL(A) = 2.1
	20.87	Bore discontinued at 20.87m - Target depth reached										
50	21											
49	22											
48	23											
47	24											
46	25											
45	26											
44	27											
43	28											
42	29											

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.00
DATE: 28/3/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
71	0	PCD to 15.0m depth							Gatic cover
	1								
70	2								
69	3								
68	4								
67	5								
66	6								
65									Backfill 0.0-12.9m
64	7								
63	8								
62	9								Blank pipe 0.0-14.87m

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.00
DATE: 28/3/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
61	11	PCD to 15.0m depth *(continued)*							11
60	12								12
59	13								13
58	14								14
57	15 15.0	SANDSTONE: fine to medium grained, pale grey, cross bedding dipping 0°-10°, thinly bedded, high strength, fresh, fractured			15.0				15
56	16				15.79		PL(A) = 1.1		16
					15.95		PL(A) = 2.5		
55				C					
54	17				16.95		PL(A) = 2.2		17
					17.84		PL(A) = 1.94		
	18				17.95		PL(A) = 1.7		18
53					18.0				
					18.57		PL(A) = 1.3		
					18.81		PL(A) = 1		
	19			C					19
52	20.0				19.95		PL(A) = 1.4		

Bentonite 12.9-14.0m

Gravel 14.0-20.87m

Machine slotted PVC screen 14.87-20.87m

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

GROUNDWATER WELL LOG

CLIENT: Aqualand Projects Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332723
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH3A
PROJECT No: 210589.00
DATE: 28/3/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	VWP Construction Details
51		as above		C	20.82		PL(A) = 2.1		End cap
	20.87	Bore discontinued at 20.87m - Target depth reached			20.87				
50	21								21
	22								22
49									
	23								23
48									
	24								24
47									
	25								25
46									
	26								26
45									
	27								27
44									
	28								28
43									
	29								29
42									

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.75m, HQ to 15.0m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.1m, PCD to 15.0, NMLC Coring to 20.87m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.87m (screen 14.87m-20.87m, PVC 0.0m-14.87m, Gravel 14.00m-20.87m, Bentonite 12.90m-14.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH3A PROJECT: ST LEONARDS MARCH 2022



15.00 – 20.00m

BORE: BH3A PROJECT: ST LEONARDS MARCH 2022



20.00 – 20.87m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.8 AHD
EASTING: 332776
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 210589.01
DATE: 16/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
65	0.04	ASPHALTIC CONCRETE										
	0.1	FILLING/Gravelly SAND: medium to coarse, grey to grey-brown, dark grey igneous and concrete gravels, dry to moist, apparently well compacted							A			
	1								A			
	1.0	Silty CLAY CI: medium plasticity, pale grey to brown, trace sand and ironstone gravel, w<PL, appears stiff to very stiff							S			13,15,17 N = 32
64	2											
	2.0	Sandy CLAY CL-CI: low to medium plasticity, pale brown to pale red-brown, with ironstone gravels, very stiff to hard, weathered bedrock.						Unless stated otherwise defects are: B0-15°, pl, ro, cly vn or cln or fe st				
		SANDSTONE: medium grained, pale grey and pale brown to red-brown, very low strength with some hard clay and medium strength iron indurated bands, highly to moderately weathered, highly fractured, Hawkesbury Sandstone							S			20/100 refusal
63	3											PL(A) = 0.06
	3.16							3.16m: CORE LOSS: 380mm				
	3.54								C	74	53	PL(A) = 0.08
62	4											
	4.17	SANDSTONE: fine to medium grained, pale grey to grey, medium to high strength, slightly weathered, fractured, Hawkesbury Sandstone						4m: CORE LOSS: 170mm 4.17m: B0-10°, pl, ro, cly 30mm 4.26m: B0-10°, pl, ro, cly 15mm 4.34m: B0-10°, pl, ro, cly co 4.66m: B0-10°, pl, ro, cly 15mm 4.73m: B0-10°, pl, ro, cly co 4.78m: B0-10°, pl, ro, cly co				PL(A) = 0.9
61	5											PL(A) = 1.3
	5.0	SANDSTONE: fine to medium grained, pale brown and grey, medium to high strength, fresh, unbroken, Hawkesbury Sandstone							C	100	96	PL(A) = 0.88
60	6											PL(A) = 1.2
59	7							6.96m: B0-10°, pl, ro, cly 20mm				
58	8											PL(A) = 0.92
	8.0	SANDSTONE: fine to medium grained, pale grey and pale brown, high strength, fresh, unbroken, Hawkesbury Sandstone							C	100	100	
57	9											PL(A) = 1.4
56												PL(A) = 1

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.5m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.8 AHD
EASTING: 332776
NORTHING: 6255620
DIP/AZIMUTH: 90°/--

BORE No: BH4
PROJECT No: 210589.01
DATE: 16/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
55	11	SANDSTONE: fine to medium grained, pale grey and pale brown, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*										PL(A) = 1.5
54	12								C	100	100	PL(A) = 1.2
	12.32	SANDSTONE: medium to coarse grained, pale grey to pale brown, massive, high strength, fresh, unbroken, Hawkesbury Sandstone										
53	13											PL(A) = 1.2
52	14								C	100	100	PL(A) = 1
51	15											PL(A) = 1.1
	15.0	Bore discontinued at 15.0m										
50	16											
49	17											
48	18											
47	19											
46												

RIG: Bobcat **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.5m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH4 PROJECT: ST LEONARDS DECEMBER 2021



2.60 – 5.00m

BORE: BH4 PROJECT: ST LEONARDS DECEMBER 2021



5.00 – 10.00m

BORE: BH4 PROJECT: ST LEONARDS DECEMBER 2021



10.00 – 15.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332693
NORTHING: 6255609
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
71	0.25	TOPSOIL/Silty CLAY: low to medium plasticity, dark grey to brown, trace rootlets and sand							A			
		CLAY CI-CH: medium to high plasticity, brown mottled pale grey, w<PL, firm to stiff, residual							A			
70	1	below 1.0m: becoming stiff to very stiff, w~PL							S			3,7,10 N = 17
	2.0	CLAY CI-CH: medium to high plasticity, pale brown and pale grey, trace ironstone gravel, w<PL, hard, weathered Hawkesbury Sandstone, residual						Unless stated otherwise defects are: B0-15°, pl, ro, cly vn or cln or fe st				
69	2.4								S			9,12,20/80 refusal
	3	SANDSTONE: fine to medium grained, pale grey and red-brown, very low strength with hard clay and medium strength iron indurated bands, highly weathered, highly fractured, Hawkesbury Sandstone							C	91	0	PL(A) = 0.22
	4											
	4.22	SANDSTONE: fine to medium grained, red-brown to grey-brown, medium strength with hard clay and low to high strength iron indurated bands, highly to moderately weathered, highly fractured, Hawkesbury Sandstone						4.07m: CORE LOSS: 150mm				PL(A) = 0.89
67	5								C	100	72	PL(A) = 0.56
66	6											
	6.2	SANDSTONE: fine to medium grained, pale grey and pale brown, medium strength, slightly weathered, fractured to highly fractured, Hawkesbury Sandstone										PL(A) = 0.33
65	7											
64								7.53m: J60°, pl, ro, fe stn,				PL(A) = 0.3
	8							8.17m: J50-80°, pl, ro, fe stn, 8.47m: J70°, pl, ro, fe stn, 8.7m: Cs, 70mm	C	100	96	
63	8.8	SANDSTONE: fine to medium grained, pale brown and pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 1.3
	9											
62												PL(A) = 1

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.6m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 71.5 AHD
EASTING: 332693
NORTHING: 6255609
DIP/AZIMUTH: 90°/--

BORE No: BH5
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding, J - Joint, S - Shear, F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
61	11	SANDSTONE: fine to medium grained, pale brown and pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*						11.05m: B0-10°, pl, ro, cly 20mm	C	100	100	PL(A) = 1.6
60	12											PL(A) = 2.1
59	13							12.91m: B0-10°, pl, ro, cly 2mm				PL(A) = 1.3
58	14								C	100	100	PL(A) = 1.9
57	15											PL(A) = 1.7
	15.0	Bore discontinued at 15.0m										
56	16											
55	17											
54	18											
53	19											
52												

RIG: GT205 **DRILLER:** GT **LOGGED:** AN **CASING:** HW to 1.0m, HQ to 2.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 2.6m, NMLC to 15.0m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH5 PROJECT: ST LEONARDS DECEMBER 2021



2.80 – 7.00m

BORE: BH5 PROJECT: ST LEONARDS DECEMBER 2021



7.00 – 12.00m

BORE: BH5 PROJECT: ST LEONARDS DECEMBER 2021



12.00 – 15.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
65	0.07	CONCRETE PAVERS							D			
		Silty CLAY CI-CH: medium to high plasticity, red-brown, trace sand, w<PL, stiff to hard, residual							D			
64	1								D			
									S			9,17,31 N = 48
63	2											
	2.0	CLAY CL-CI: low to medium plasticity, red - pale grey mottled, trace of silt, wtih ironstone bands, w<PL, hard, residual							D			14,21/60 refusal
									S			
62	3											
	3.0	SANDSTONE: fine to medium grained, red brown and pale grey, with hard clay and medium to high strength iron indurated bands, Hawkesbury Sandstone										
	4								D			9,18,20/20 refusal
61									S			
	5											
60									D			
	5.6	SANDSTONE: fine to medium grained, pale grey-brown to grey, medium to high strength, fresh, slightly fractured, Hawkesbury Sandstone						5.6m: Cs, 100mm				PL(A) = 1.5
	6							6.37m: B5°, cly co, 2mm				
59								6.89m: B0-10°, pl, ro, cly 5mm	C	100	96	PL(A) = 0.88
	7							7.63m: B0-10°, pl, ro, cly 3mm				PL(A) = 1.4
58	8							8.5m: B0-10°, pl, ro, cly co				
	8.7	SANDSTONE: fine to medium grained, pale grey-brown and grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone							C	100	98	PL(A) = 1.6
57	9											
56												PL(A) = 1.2

RIG: TT305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HQ to 5.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 5.5m, NMLC to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
55	11	SANDSTONE: fine to medium grained, pale grey-brown and grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*						11.16m: B0-10°, pl, ro, cly 5mm	C	100	98	PL(A) = 1.2
54	12											PL(A) = 1.4
53	12.9							>>				
52	13	SANDSTONE: fine to medium grained, pale grey, massvive with dark grey siltstone flecks, fresh, unbroken, Hawkesbury Sandstone				▼			C	100	99	PL(A) = 1.5
51	14											PL(A) = 2.8
	14.7	Bore discontinued at 14.7m						14.5m: J40-50°, pl, ro, cly co				
50	15											
49	16											
48	17											
47	18											
46	19											

RIG: TT305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HQ to 5.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 5.5m, NMLC to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
65	0.07	CONCRETE PAVERS		D	0.1–0.2				Gatic Cover
		Silty CLAY CI-CH: medium to high plasticity, red-brown, trace sand, w<PL, stiff to hard, residual		D	0.4–0.5				Blank pipe 0.0-7.5m
				D	0.9–1.0				
64	1			S	1.45		9,17,31 N = 48		
63	2.0	CLAY CL-CI: low to medium plasticity, red - pale grey mottled, trace of silt, wtih ironstone bands, w<PL, hard, residual		D	2.4–2.5				
	2			S	2.71		14,21/60 refusal		
62	3.0	SANDSTONE: fine to medium grained, red brown and pale grey, with hard clay and medium to high strength iron indurated bands, Hawkesbury Sandstone							Bentonite 0.1-7.0m
	3			D	3.9–4.0				
61	4			S	4.32		9,18,20/20 refusal		
	5			D	5.4–5.6				
60	5.6	SANDSTONE: fine to medium grained, pale grey-brown to grey, medium to high strength, fresh, slightly fractured, Hawkesbury Sandstone			5.95		PL(A) = 1.5		
59	6			C	6.95		PL(A) = 0.88		
58	7				7.95		PL(A) = 1.4		
57	8				8.7				
	8.7	SANDSTONE: fine to medium grained, pale grey-brown and grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone			8.95		PL(A) = 1.6		
56	9			C	9.95		PL(A) = 1.2		

RIG: TT305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HQ to 5.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 5.5m, NMLC to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6
PROJECT No: 210589.01
DATE: 3/12/2021
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
55		SANDSTONE: fine to medium grained, pale grey-brown and grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*		C	10.95		PL(A) = 1.2		Machine slotted PVC screen 7.5-13.5m
54	11				11.7				11 Gravel 7.0-15.0m
53	12				11.95		PL(A) = 1.4		12
52	12.9 13	SANDSTONE: fine to medium grained, pale grey, massvive with dark grey siltstone flecks, fresh, unbroken, Hawkesbury Sandstone		C	12.95		PL(A) = 1.5	▼	13 End cap
51	14				13.95		PL(A) = 2.8		14
	14.7	Bore discontinued at 14.7m			14.7				
50	15								15
49	16								16
48	17								17
47	18								18
46	19								19

RIG: TT305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HQ to 5.5m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 5.5m, NMLC to 14.7m

WATER OBSERVATIONS: No free groundwater observed whilst augering

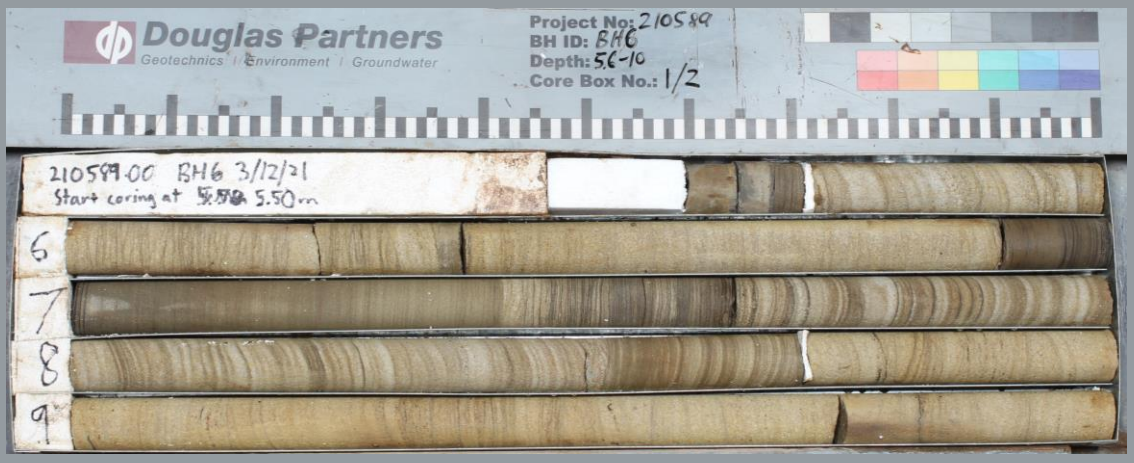
REMARKS: Location coordinates are in MGA94 Zone 56.

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH6 PROJECT: ST LEONARDS DECEMBER 2021



5.50 – 10.00m

BORE: BH6 PROJECT: ST LEONARDS DECEMBER 2021



7.00 – 12.00m

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
65	0	PCD to 14.4m										
64	1											
63	2											
62	3											
61	4											
60	5											
59	6											
58	7											
57	8											
56	9											

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
55	11	PCD to 14.4m *(continued)*										
54	12											
53	13											
52	14					▼						
51	14.4	SANDSTONE: medium to coarse, pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone										PL(A) = 0.98
50	15							15.2m: B10, Pl, ro, cly 1mm				PL(A) = 1.2
49	16								C	100	100	PL(A) = 1.3
48	17							16.8m: B10, pl, ro, cly 2mm 17.27m: J60, pl, ro, cln				PL(A) = 1.7
47	18	Below 17.9m: with some siltstone clasts and laminations										PL(A) = 1.5
46	19								C	100	98	PL(A) = 0.59
	19.1	SILTSTONE: grey to dark grey, with 5% fine grained pale grey sandstone laminations, high strength, fresh, slightly fractured, Ashfield Shale						19.08m: Cs 20mm 19.25m: J70, pl, ti 19.48m: Cs Ds 30mm				PL(A) = 1.2
	20.0											

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
45		as above							C	100	98	PL(A) = 1.7
	20.36	Bore discontinued at 20.36m - Target depth reached										
44	21											
43	22											
42	23											
41	24											
40	25											
39	26											
38	27											
37	28											
36	29											

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
65	0	PCD to 14.4m							Gatic cover; Cement 0.0-0.5m
64	1								
63	2								
62	3								
61	4								
60	5								
59	6								Backfill 0.5-12.0m
58	7								
57	8								
56	9								Blank pipe 0.0-14.36m

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		PCD to 14.4m *(continued)*							
51	14.4	SANDSTONE: medium to coarse, pale grey, high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone			14.4				
					14.6		PL(A) = 0.98		
					15.0		PL(A) = 1.2		
50				C					
					16.0		PL(A) = 1.3		
49									Gravel 13.0-20.36m
					17.0		PL(A) = 1.7		
48					17.4				Machine slotted PVC screen 14.36-20.36m
		Below 17.9m: with some siltstone clasts and laminations			18.0		PL(A) = 1.5		
47				C					
					19.0		PL(A) = 0.59		
46	19.1	SILTSTONE: grey to dark grey, with 5% fine grained pale grey sandstone laminations, high strength, fresh, slightly fractured, Ashfield Shale			19.4		PL(A) = 1.2		
	20.0								

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Property Partners Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 12-20 Berry Rd & 11-19 Holdsworth Ave, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332762
NORTHING: 6255600
DIP/AZIMUTH: 90°/--

BORE No: BH6A
PROJECT No: 210589.01
DATE: 12/4/2022
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
45		as above		C	20.2		PL(A) = 1.7		
	20.36	Bore discontinued at 20.36m - Target depth reached			20.36				End cap
44	21								
43	22								
42	23								
41	24								
40	25								
39	26								
38	27								
37	28								
36	29								

RIG: GT205 **DRILLER:** GT **LOGGED:** TM **CASING:** HWT to 1.0m, HQ to 14.4m

TYPE OF BORING: Solid Flight Auger (TC-bit) to 1.0m, PCD to 14.4m, NMLC Coring to 20.36m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Location coordinates are in MGA94 Zone 56. Standpipe installed to 20.36m (screen 14.36m-20.36m, PVC 0.0m-14.36m, Gravel 13.00m-20.36m, Bentonite 12.00m-13.00m, Spoil to 0.5m, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BORE: BH6A PROJECT: ST LEONARDS MARCH 2022



14.40 – 18.00m

BORE: BH6A PROJECT: ST LEONARDS MARCH 2022



18.00 – 20.36m

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
68	0.13	CONCRETE SLAB: 130 mm slab										
	0.33	SANDSTONE: fine to medium grained, dark orange-brown, inferred low to medium strength, extremely weathered, fractured, Mittagong Formation						Unless otherwise stated, discontinuities comprise B 0-10° pl, ro/he, cln or fe stn, cly vnr or cbs vnr 0.42m: J45°, pl, ro, cly vnr 0.5m: CS 160mm 0.58m: B0°, cly 10mm 0.63m: B0°, cly 10mm 0.8m: J70-80°, pl, ro, cly vnr 0.84-1.03m: J70-80°, pl, ro, fe stn/cly vnr 1.03m: B0°, cly 10mm 1.13m: Cs, 60mm 1.23m: J60°, pl, he, fe stn 1.20-1.32m: B0-5°(x12), pl, he, fe stn 1.32m: B0°, cly 5mm 1.34m: B0°, cly 5mm 1.39m: J70-80°, un, ro, fe stn/cly vnr 1.48m: Cs, 10mm 1.61m: Cs, 20mm 1.63m: CORE LOSS: 470mm 2.2m: B0-5°, he 2.3m: J10-45°, cu, he, fe stn 2.4m: J30°, un, ro, fe stn 2.55m: J30°, pl, ro, fe stn 2.85m: J20°, pl, he, fe stn 3.16m: J45°, pl, he, fe stn 3.2m: J45°, pl, ro, fe stn 4.10-4.12m: J30°(x3), pl, he, fe stn 4.2m: J60°, pl, he, fe stn 4.62m: J60°, un, he, fe stn 4.65m: Ds5°, 20mm 4.77m: J40°, un, he, fe stn 5.05-5.17m: J60°(x2), pl, ro, fe stn 5.39m: J40°, pl, ro, fe stn 5.39-5.46m: J40°(x3), pl, ro, fe stn 5.76m: J0-80°(x2), cu, he, cln 5.78m: Cs, 10mm 6.22m: B0°, pl, ro, cbs inf 5mm 6.33m: J20°, pl, ro, cln 7.73m: J20°, pl, ro, cln 7.75m: J20°, pl, he, cln	C	100	16	PL(A) = 2
67	1	SANDSTONE: fine to medium grained, dark orange-brown, high strength with very low to low strength bands, moderately weathered with extremely weathered bands, highly fractured, Mittagong Formation							C	66	14	PL(A) = 1.7
	1.63											
66	2											
	2.1	SANDSTONE: fine to medium grained, dark orange-brown, high strength, moderately weathered, slightly fractured, Mittagong Formation							C	100	93	PL(A) = 0.2
	2.9	SANDSTONE: medium grained, pale yellow-grey and grey, with distinct and indistinct beddings at 0-10°, low strength, fresh stained, slightly fractured, possible Mittagong Formation							C	100	83	PL(A) = 0.3
65	3											
64	4											
	5								C	100	86	PL(A) = 0.1
63												
	5.7	SANDSTONE: fine to medium grained, pale grey, with siltstone laminations, medium then high strength, fresh, unbroken, Hawkesbury Sandstone 5.88-6.00m: siltstone band/clasts										PL(A) = 0.4
62	6											
	7								C	100	99	PL(A) = 1.2
61												
	7.33	SANDSTONE: medium to coarse grained, pale grey, with distinct and indistinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone										PL(A) = 1.5
60	8											
59	9								C	100	100	PL(A) = 1
									C	100	100	PL(A) = 1.4

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
58		SANDSTONE: medium to coarse grained, pale grey, with distinct and indistinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*						10.62m: B0°, un, ro, cly vnr	C	100	100	PL(A) = 1.3
57	11											
56	12								C	100	100	PL(A) = 1.4
55	13					15-03-23			C	100	99	PL(A) = 1.7
	13.55	SANDSTONE: fine grained, pale grey, distinct and indistinct beddings at 0-10°, medium and high strength, fresh, unbroken, Hawkesbury Sandstone 13.76-14.30m: siltstone band						13.5m: Ds0°, 20mm				PL(A) = 0.8
54	14							14.11m: B5°, un, sm, cly vnr 14.47m: B5°, un, ro, cbs vnr 14.69m: Cs10°, 30mm	C	100	94	PL(A) = 1.4
	14.7	SANDSTONE: medium to coarse grained, pale grey, with carbonaceous laminations and distinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone						15.56m: B5°, un, he, cbs vnr 15.79m: B5°, un, he, cbs vnr 15.83-15.87m: B5°(x4), un, he, cbs vnr 16.25m: B5°, pl, ro, cly inf 5mm				PL(A) = 1.1
53	15											
52	16								C	100	100	PL(A) = 2.3
51	17							17.24m: B5°, un, ro, cbs vnr				
50	18							18.35m: B5°, un, ro, cbs vnr	C	100	100	PL(A) = 1
49	19							19.67m: B5°, un, ro, cbs vnr	C	100	100	PL(A) = 1.7

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
48		Sandstone- as above						19.89m: B5°, un, ro, cbs vnr	C	100	100	PL(A) = 2.1
	20.5	Bore discontinued at 20.5m										
47	21											
46	22											
45	23											
44	24											
43	25											
42	26											
41	27											
40	28											
39	29											

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
68	0.13	CONCRETE SLAB: 130 mm slab							Gatic cover
	0.33	SANDSTONE: fine to medium grained, dark orange-brown, inferred low to medium strength, extremely weathered, fractured, Mittagong Formation		C	0.33 0.4		PL(A) = 2		
					0.7				
67	1	SANDSTONE: fine to medium grained, dark orange-brown, high strength with very low to low strength bands, moderately weathered with extremely weathered bands, highly fractured, Mittagong Formation		C	1.43		PL(A) = 1.7		1 Blank pipe 12.0-0.1m
	1.63								
66	2								2
	2.1	SANDSTONE: fine to medium grained, dark orange-brown, high strength, moderately weathered, slightly fractured, Mittagong Formation		C	2.1				
	2.9								
65	3	SANDSTONE: medium grained, pale yellow-grey and grey, with distinct and indistinct beddings at 0-10°, low strength, fresh stained, slightly fractured, possible Mittagong Formation			2.94		PL(A) = 0.2		3 Backfill 6.0-0.1m
				C	3.35				
64	4				3.96		PL(A) = 0.3		4
				C					
63	5				4.85		PL(A) = 0.1		5
				C					
	5.7								
62	6	SANDSTONE: fine to medium grained, pale grey, with siltstone laminations, medium then high strength, fresh, unbroken, Hawkesbury Sandstone 5.88-6.00m: siltstone band/clasts			5.8		PL(A) = 0.4		6
				C	6.47				
61	7				6.95		PL(A) = 1.2		7
	7.33								
		SANDSTONE: medium to coarse grained, pale grey, with distinct and indistinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone		C	7.95		PL(A) = 1.5		
60	8				8.05				8 Bentonite 10.0-6.0m
				C	8.92		PL(A) = 1		
59	9								9
				C	9.89		PL(A) = 1.4		

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
58		SANDSTONE: medium to coarse grained, pale grey, with distinct and indistinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*			9.9				
				C					
	11				10.96		PL(A) = 1.3		11
57					11.26				
	12			C	11.96		PL(A) = 1.4		12
56					12.84				
	13				12.96		PL(A) = 1.7	▼ 15-03-23	13
55	13.55			C					
		SANDSTONE: fine grained, pale grey, distinct and indistinct beddings at 0-10°, medium and high strength, fresh, unbroken, Hawkesbury Sandstone			13.97		PL(A) = 0.8		
	14	13.76-14.30m: siltstone band							14
54					14.39				
	14.7								
		SANDSTONE: medium to coarse grained, pale grey, with carbonaceous laminations and distinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone			14.96		PL(A) = 1.4		
	15			C					15
53									Gravel 20.5-10.0m
					15.95		PL(A) = 1.1		
	16				15.97				16
52				C					Slotted PVC screen 20.5-12.0m
	17				16.96		PL(A) = 2.3		17
51					17.4				
	18				17.97		PL(A) = 2		18
50				C					
	19				18.97		PL(A) = 1		19
49					19.0				
				C					
					19.9		PL(A) = 1.7		

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 68.2 AHD
EASTING: 332699.255
NORTHING: 6255659.584
DIP/AZIMUTH: 90°/--

BORE No: BH101
PROJECT No: 210589.01
DATE: 13 - 14/3/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
48		SANDSTONE: medium to coarse grained, pale grey, with carbonaceous laminations and distinct beddings at 0-20°, high strength, fresh, unbroken, Hawkesbury Sandstone *(continued)*		C	20.4		PL(A) = 2.1		End Cap
	20.5	Sandstone- as above			20.5				
		Bore discontinued at 20.5m							
47	21								21
46	22								22
45	23								23
44	24								24
43	25								25
42	26								26
41	27								27
40	28								28
39	29								29

RIG: Proline **DRILLER:** Tight Site **LOGGED:** YB **CASING:** HQ to 0.33 m

TYPE OF BORING: Concrete core 0 - 0.13 m. Hand excavted 0.13 - 0.33 m. NMLC coring 0.33 - 20.50 m.

WATER OBSERVATIONS: Water observations obscured by drilling fluids. Water level recorded at 8.5m bgl on 15/03/2023

REMARKS: UCS Sample taken at 18.00-18.30 m. Standpipe installed to 20.5m (screen: 20.5m to 12.0m, PVC 12.0m to 0.1m, Gravel 20.5m to 10.0m, Bentonite Backfill 10.0m to 6.00m, Backfill to 0.1m, Gatic at top)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH101 PROJECT: 210589.01 MARCH 2023



0.33 – 4.00m

BORE: BH101 PROJECT: 210589.01 MARCH 2023



4.00m – 9.00m

BORE: BH101 PROJECT: 210589.01 MARCH 2023



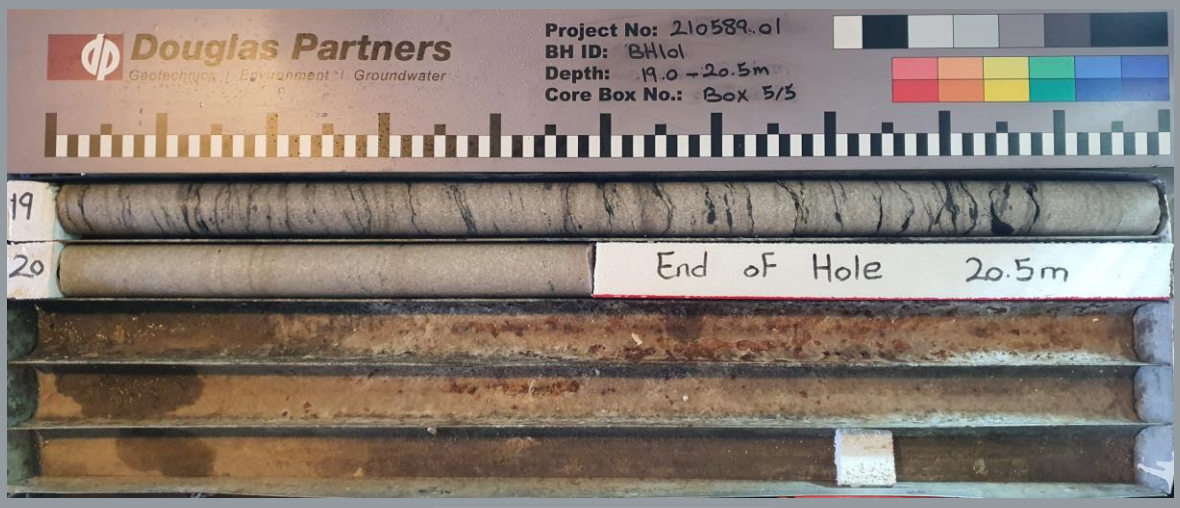
9.00m – 14.00m

BORE: BH101 PROJECT: 210589.01 MARCH 2023



14.00m – 19.00m

BORE: BH101 PROJECT: 210589.01 MARCH 2023



19.00m – 20.5m

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	22.5.25
Location:	St Leonards	Tested by:	CLB

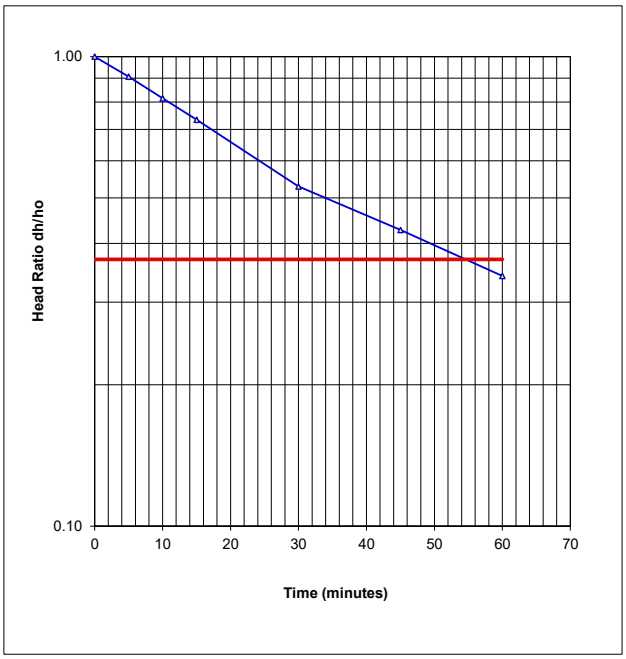
Test Location		**Test No.**	BH101	
Description:	Standpipe in Borehole	Easting:	332699	m
Material type:	Clay over Sandstone	Northing	6255689	m
		Surface Level:	68.2	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	16.54	m
borehole diameter (2R)	76	mm	Depth to water at start of test	0.3	m
Effective Length of well screen (Le)	8.50	m	Depth to top of gravel pack	12.00	m
			Depth of base of PVC standpipe	20.50	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	0.30	16.24	1.000
5	1.82	14.72	0.906
10	3.3	13.24	0.815
15	4.62	11.92	0.734
30	7.95	8.59	0.529
45	9.6	6.94	0.427
60	11	5.54	0.341



To = 55.0 mins
3299 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**1.4E-07**	m/sec
	=	**0.012**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	23.5.25
Location:	St Leonards	Tested by:	CLB

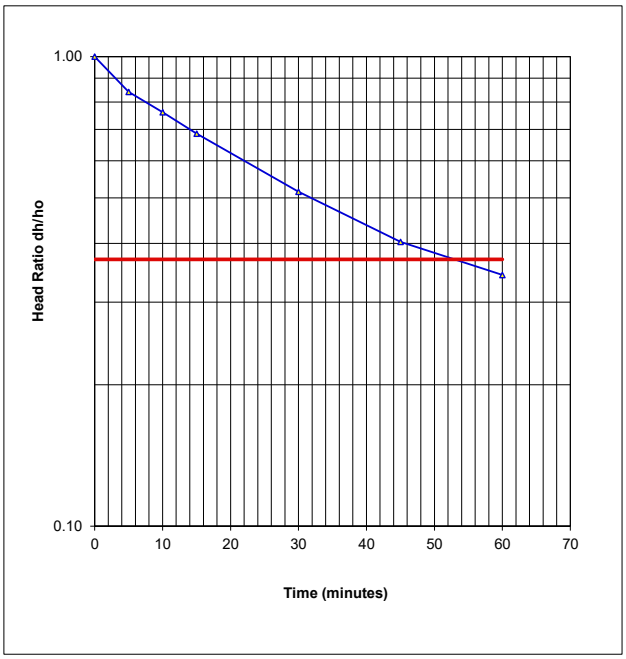
Test Location		**Test No.**	BH101	
Description:	Standpipe in Borehole	Easting:	332699	m
Material type:	Clay over Sandstone	Northing	6255689	m
		Surface Level:	68.2	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	16.45	m
borehole diameter (2R)	76	mm	Depth to water at start of test	0	m
Effective Length of well screen (Le)	8.50	m	Depth to top of gravel pack	12.00	m
			Depth of base of PVC standpipe	20.50	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	0.00	16.45	1.000
5	2.61	13.84	0.841
10	3.93	12.52	0.761
15	5.17	11.28	0.686
30	7.97	8.48	0.516
45	9.82	6.63	0.403
60	10.81	5.64	0.343



To = 53.2 mins
3194 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**1.4E-07**	m/sec
	=	**0.012**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	26.5.25
Location:	St Leonards	Tested by:	CLB

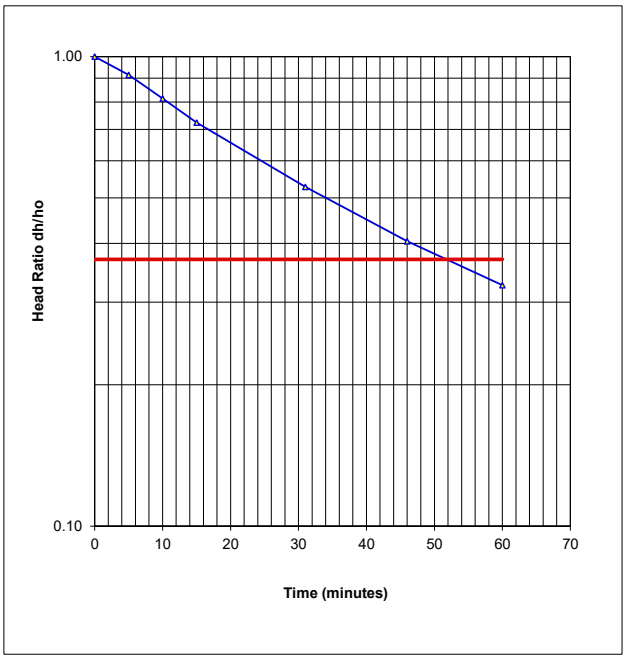
Test Location		**Test No.**	BH101	
Description:	Standpipe in Borehole	Easting:	332699	m
Material type:	Clay over Sandstone	Northing	6255689	m
		Surface Level:	68.2	m AHD

Details of Well Installation

Effective diameter (2re)	76	mm	Depth to water before test	16.56	m
borehole diameter (2R)	76	mm	Depth to water at start of test	0	m
Effective Length of well screen (Le)	8.50	m	Depth to top of gravel pack	12.00	m
			Depth of base of PVC standpipe	20.50	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	0.00	16.56	1.000
5	1.41	15.15	0.915
10	3.08	13.48	0.814
15	4.58	11.98	0.723
31	7.82	8.74	0.528
46	9.86	6.70	0.405
60	11.16	5.40	0.326



To = 52.2 mins
3130 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **1.5E-07** m/sec
= **0.013** m/day

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 70.6 AHD
EASTING: 332692.791
NORTHING: 6255605.695
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 210589.01
DATE: 17 - 20/2/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Type	Core Rec. %	RQD %	Test Results & Comments
70	0.05	PAVERS (BRICK)										
	0.1	FILL/Gravelly SAND: roadbase										
	0.21	CONCRETE: 5-15mm thick aggregate, no reinforcement										
	0.35	FILL/CLAY: medium plasticity, dark grey, w > PL, appears soft, trace brick fragments and sandstone gravel						Unless otherwise stated, discontinuities comprise B 0-5° pl, ro, cln or fe stn or cly vnr	C	0	0	
1	1.31											PL(A) = 1.3
	1.5	SANDSTONE: fine to medium grained, orange, red and white, very low strength, extremely weathered, highly fractured, Mittagong Formation							C	100	74	PL(A) = 0.4
69												PL(A) = 0
2		SANDSTONE: fine to medium grained, pale grey and orange-brown, high strength, slightly weathered, slightly fractured, Mittagong Formation										
68								2.58m: Cs 20mm 2.63m: Cs 20mm 2.72m: Cs 70mm 2.87m: Cs 30mm 3.1m: J50°, pl, ro, cly ct 3.22m: J50°, pl, ro, cln	C	100	36	
3		SANDSTONE: fine to medium grained, red-brown and pale grey, very low strength to low strength, highly weathered, highly fractured, Mittagong Formation										PL(A) = 0.2
67								3.62m: Cs 100mm 3.7m: fg 30mm				
4	4.04	SANDSTONE: fine to medium grained, pale grey and red-brown, medium strength with low strength bands, moderately then slightly weathered, fractured then slightly fractured, 10-20% siltstone lamination, possible Mittagong Formation						4m: Cs 100mm 4.06m: Cs 30mm 4.12m: B5°, cly 2mm 4.23m: B0°, cly 5mm 4.32m: B0°, cly 2mm 4.61m: B0°, cly 2mm	C	100	22	PL(A) = 1
66												PL(A) = 0.6
5												PL(A) = 0.4
65								5.3m: J50-80°, cu, he, cln 5.5m: J0-60°, st, ro, cln 5.62m: Cs 50mm 5.67m: J60°, un, ro, cln 5.76m: B0°, pl, ro, cly 5mm 6m: Cs 300mm	C	100	47	
6												PL(A) = 0.4
64								6.5m: B60-80°, cu, he, fe stn				PL(A) = 0.1
7								7.03m: B0-10°, st, ro, fe stn 7.17m: B15°, pl, ro, fe stn 7.42m: J50°, pl, he, fe stn	C	100	91	PL(A) = 0.4
63												PL(A) = 0.1
8												PL(A) = 0
	8.3	SANDSTONE: fine to medium grained, pale grey and dark grey, high strength, 30% siltstone laminations, slightly weathered to fresh, slightly fractured to unbroken, Hawkesbury Sandstone						8.23m: Cs 30mm 8.37m: fg 20mm 8.43m: B5°, pl, ro, cbs vnr	C	100	90	PL(A) = 1.5
62												PL(A) = 2.8
9												PL(A) = 1.9
61								9.75m: B5°, pl, ro, cbs	C	100	100	

RIG: XC **DRILLER:** Terratest **LOGGED:** AN/ECB **CASING:** HWT to 1.31m

TYPE OF BORING: Hand tools to 0.1m, Diatube to 0.21m, Solid Flight Auger (TC-bit) to 0.7m, PCD to 1.31m, NMLC to 19.64m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 19.45m (screen 11.45m-19.45m, PVC 0.0m-11.45m, Gravel 11.15m-19.45m, Bentonite 8.3m-11.15m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 70.6 AHD
EASTING: 332692.791
NORTHING: 6255605.695
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 210589.01
DATE: 17 - 20/2/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
60		SANDSTONE: as above						vnr	C	100	100	PL(A) = 0.8
	10.56	SANDSTONE: coarse grained, red and pale red, high strength with low strength clay bands and decomposed seams, slightly weathered, unbroken, Hawkesbury Sandstone										PL(A) = 1.2
	11							10.76m: B20°, pl, ro, cln	C	100	100	
59	11.67	SANDSTONE: medum grained, pale grey, 20% siltstone laminations, lightly cross-bedded, high strength, fresh, slightly fractured to unbroken										PL(A) = 1.5
	12								C	100	100	
58												PL(A) = 1.3
	13											
57												PL(A) = 1.6
	14								C	100	100	
56												PL(A) = 1.4
	15											
55								15.57m: B0°, ir, ro, cbs vnr	C	100	100	PL(A) = 1.2
	16											
54												PL(A) = 1.6
	17								C	100	100	
53												PL(A) = 1.1
	18											
52								18.45m: B0°, pl, ro, cly 2mm				PL(A) = 1.4
	19								C	100	100	PL(A) = 1.3
51		Below 19.37m: medium strength						19.35m: Cs 20mm				PL(A) = 0.6
	19.66	Bore discontinued at 19.64m										

RIG: XC **DRILLER:** Terratest **LOGGED:** AN/ECB **CASING:** HWT to 1.31m

TYPE OF BORING: Hand tools to 0.1m, Diatube to 0.21m, Solid Flight Auger (TC-bit) to 0.7m, PCD to 1.31m, NMLC to 19.64m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 19.45m (screen 11.45m-19.45m, PVC 0.0m-11.45m, Gravel 11.15m-19.45m, Bentonite 8.3m-11.15m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 70.6 AHD
EASTING: 332692.791
NORTHING: 6255605.695
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 210589.01
DATE: 17 - 20/2/2023
SHEET 1 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
70	0.05	PAVERS (BRICK)							Gatic cover
	0.1								
	0.21	FILL/Gravelly SAND: roadbase							
	0.35	CONCRETE: 5-15mm thick aggregate, no reinforcement			0.35				
		FILL/CLAY: medium plasticity, dark grey, w > PL, appears soft, trace brick fragments and sandstone gravel		C					Blank pipe 0.0-11.45m
1									1
	1.31	SANDSTONE: fine to medium grained, orange, red and white, very low strength, extremely weathered, highly fractured, Mittagong Formation			1.31		PL(A) = 1.3		
69	1.5	SANDSTONE: fine to medium grained, pale grey and orange-brown, high strength, slightly weathered, slightly fractured, Mittagong Formation		C	1.72		PL(A) = 0.4		
2					2.0		PL(A) = 0		2
		SANDSTONE: fine to medium grained, red-brown and pale grey, very low strength to low strength, highly weathered, highly fractured, Mittagong Formation			2.05				
68				C					
3					2.96		PL(A) = 0.2		3
					3.41				
67									
4	4.04	SANDSTONE: fine to medium grained, pale grey and red-brown, medium strength with low strength bands, moderately then slightly weathered, fractured then slightly fractured, 10-20% siltstone lamination, possible Mittagong Formation		C	4.23		PL(A) = 1		4 Backfill 0.0-8.1m
66					4.78				
					4.89		PL(A) = 0.6		
5					5.04		PL(A) = 0.4		5
65				C					
6					6.21		PL(A) = 0.4		6
					6.26				
64					6.72		PL(A) = 0.1		
7				C	7.0		PL(A) = 0.4		7
63					7.75		PL(A) = 0.1		
					7.8				
8					8.0		PL(A) = 0		8
	8.3				8.28		PL(A) = 1.5		
62		SANDSTONE: fine to medium grained, pale grey and dark grey, high strength, 30% siltstone laminations, slightly weathered to fresh, slightly fractured to unbroken, Hawkesbury Sandstone		C					
					8.79		PL(A) = 2.8		
9									9
					9.17		PL(A) = 1.9		
					9.2				
61				C					Bentonite 8.1-11.15m

RIG: XC **DRILLER:** Terratest **LOGGED:** AN/ECB **CASING:** HWT to 1.31m

TYPE OF BORING: Hand tools to 0.1m, Diatube to 0.21m, Solid Flight Auger (TC-bit) to 0.7m, PCD to 1.31m, NMLC to 19.64m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 19.45m (screen 11.45m-19.45m, PVC 0.0m-11.45m, Gravel 11.15m-19.45m, Bentonite 8.3m-11.15m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 70.6 AHD
EASTING: 332692.791
NORTHING: 6255605.695
DIP/AZIMUTH: 90°/--

BORE No: BH102
PROJECT No: 210589.01
DATE: 17 - 20/2/2023
SHEET 2 OF 2

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
		SANDSTONE: as above		C	10.22		PL(A) = 0.8		
60	10.56				10.6		PL(A) = 1.2		
		SANDSTONE: coarse grained, red and pale red, high strength with low strength clay bands and decomposed seams, slightly weathered, unbroken, Hawkesbury Sandstone			10.63				
11				C					11
59	11.67								
		SANDSTONE: medum grained, pale grey, 20% siltstone laminations, lightly cross-bedded, high strength, fresh, slightly fractured to unbroken			11.96		PL(A) = 1.5		
12					12.15				12
58				C	12.95		PL(A) = 1.3		
13									13
57					13.64				
					13.9		PL(A) = 1.6		
14				C					14
56									
15					14.95		PL(A) = 1.4		15
					15.15				Gravel 11.15-19.45m Machine slotted PVC screen 11.45-19.45m
55				C	15.96		PL(A) = 1.2		
16									16
54					16.66				
17					16.96		PL(A) = 1.6		17
				C					
53									
18					17.96		PL(A) = 1.1		18
					18.07				
52					18.39		PL(A) = 1.4		
				C					
19					18.96		PL(A) = 1.3		19
		Below 19.37m: medium strength							End cap
51	19.66				19.54		PL(A) = 0.6		
		Bore discontinued at 19.64m			19.64				

RIG: XC **DRILLER:** Terratest **LOGGED:** AN/ECB **CASING:** HWT to 1.31m

TYPE OF BORING: Hand tools to 0.1m, Diatube to 0.21m, Solid Flight Auger (TC-bit) to 0.7m, PCD to 1.31m, NMLC to 19.64m

WATER OBSERVATIONS: No free groundwater observed whilst augering

REMARKS: Standpipe installed to 19.45m (screen 11.45m-19.45m, PVC 0.0m-11.45m, Gravel 11.15m-19.45m, Bentonite 8.3m-11.15m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH102 PROJECT: 210589.01 MARCH 2023



1.3m – 6.00m

BORE: BH102 PROJECT: 210589.01 MARCH 2023



6.00m – 11.00m

BORE: BH102 PROJECT: 210589.01 MARCH 2023



11.00m – 16.00m

BORE: BH102 PROJECT: 210589.01 MARCH 2023



16.00m – 19.64m

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	23.5.25
Location:	St Leonards	Tested by:	CLB

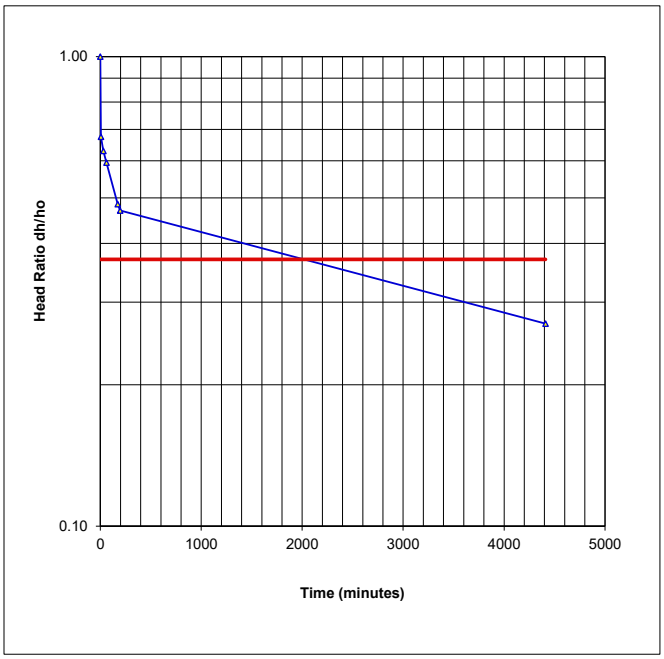
Test Location		**Test No.**	BH102	
Description:	Standpipe in Borehole	Easting:	332692	m
Material type:	Clay over Sandstone	Northing	6255605	m
		Surface Level:	70.6	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	17.8	m
borehole diameter (2R)	96	mm	Depth to water at start of test	19.8	m
Effective Length of well screen (Le)	1.65	m	Depth to top of gravel pack	11.15	m
			Depth of base of PVC standpipe	19.45	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	19.80	2.00	1.000
5	19.15	1.35	0.675
30	19.06	1.26	0.630
60	18.99	1.19	0.595
171	18.77	0.97	0.485
197	18.74	0.94	0.470
4410	18.34	0.54	0.270



To = 2303.5 mins
138210 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **1.8E-08** m/sec
= **0.002** m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	26.5.25
Location:	St Leonards	Tested by:	CLB

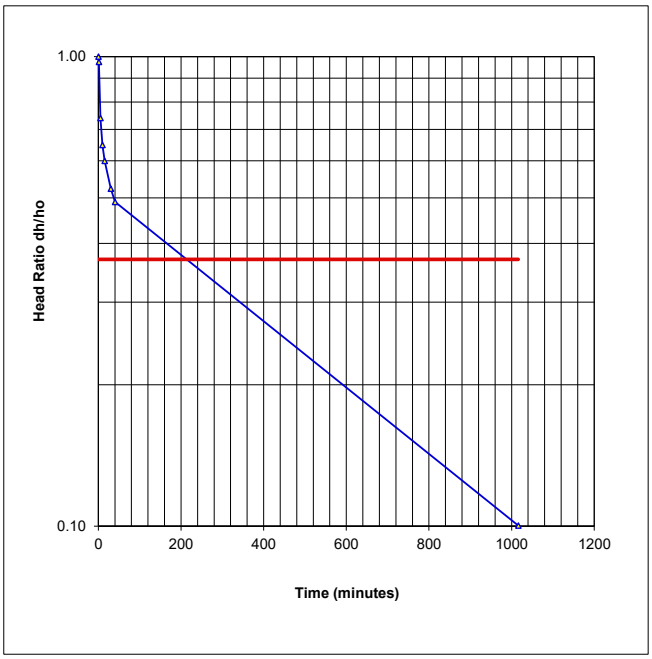
Test Location		**Test No.**	BH102	
Description:	Standpipe in Borehole	Easting:	332692	m
Material type:	Clay over Sandstone	Northing	6255605	m
		Surface Level:	70.6	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	18.34	m
borehole diameter (2R)	96	mm	Depth to water at start of test	0	m
Effective Length of well screen (Le)	1.11	m	Depth to top of gravel pack	11.15	m
			Depth of base of PVC standpipe	19.45	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	0.00	18.34	1.000
1	0.46	17.88	0.975
5	4.76	13.58	0.740
10	6.44	11.90	0.649
15	7.33	11.01	0.600
30	8.74	9.60	0.523
40	9.34	9.00	0.491
1016	16.5	1.84	0.100



To = 341.8 mins
20509 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity **k =** **1.6E-07** m/sec
= **0.014** m/day

Douglas Partners Pty Ltd
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Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	27.5.25
Location:	St Leonards	Tested by:	CLB

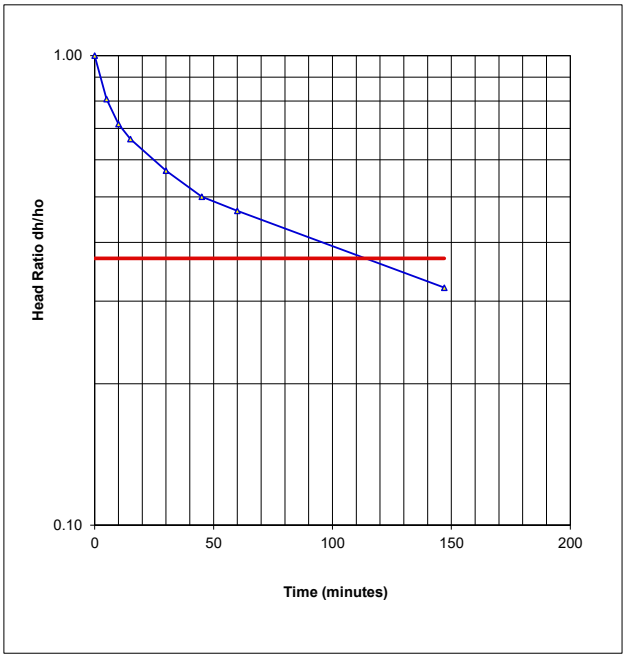
Test Location		**Test No.**	BH102	
Description:	Standpipe in Borehole	Easting:	332692	m
Material type:	Clay over Sandstone	Northing	6255605	m
		Surface Level:	70.6	m AHD

Details of Well Installation

Effective diameter (2re)	96	mm	Depth to water before test	16.5	m
borehole diameter (2R)	96	mm	Depth to water at start of test	0	m
Effective Length of well screen (Le)	2.95	m	Depth to top of gravel pack	11.15	m
			Depth of base of PVC standpipe	19.45	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	0.00	16.50	1.000
5	3.16	13.34	0.808
10	4.7	11.80	0.715
15	5.54	10.96	0.664
30	7.111	9.39	0.569
45	8.24	8.26	0.501
60	8.79	7.71	0.467
147	11.21	5.29	0.321



To = 117.7 mins
7062 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**2.3E-07**	m/sec
	=	**0.020**	m/day

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low, Very Low, Low, Medium, High, Very High, Ex High)	Water	Fracture Spacing (m) (0.01, 0.05, 0.10, 0.50, 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
65	0.11	CONCRETE: concrete slab 5-15mm aggregate, no reinforcement										
	0.3	FILL/SAND: yellow-brown, fine to medium, moist, trace sandstone gravel							A			
64	1	CLAY CL-CI: low plasticity, red, w < PL, very stiff, residual Below 1.0m: red mottled pale grey							A S			10,14,16 N = 30
63	2							Unless otherwise stated, discontinuities comprise B 0-5° pl, ro, cln or fe stn or cly vnr	A			
	2.5	SANDSTONE: fine to medium grained, pale grey and red-brown, low strength with very low strength clay bands, extremely weathered, slightly fractured, Mittagong Formation Between 3.24m and 3.69m: very low strength						2.53m: Cs 150mm 3.17m: Cs 50mm 3.76m: J50°, pl, ro, cln	C	100	63	PL(A) = 0.2 PL(A) = 0.2 PL(A) = 0.2
62	3											
61	4							4.25m: Cs 70mm				
	4.45	SANDSTONE: fine to medium grained, pale grey, with 20% siltstone laminations, medium strength, slightly weathered to fresh, slightly fractured, possible Mittagong Formation							C	100	100	PL(A) = 0.6 PL(A) = 0.8 PL(A) = 1.3
60	5											
59	6											
58	7							6.72m: B0°, cly 10mm				PL(A) = 1.1
	7.45	SANDSTONE: fine to medium grained, pale grey, medium then high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone						7.45m: B0°, cly 2mm	C	100	97	PL(A) = 0.7 PL(A) = 0.7
57	8											
56	9							8.92m: B10°, un, ro, cbs vnr				PL(A) = 0.8
									C	100	100	PL(A) = 1.2

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

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BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
55		SANDSTONE: fine to medium grained, pale grey, medium then high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*										
	11								C	100	100	PL(A) = 1.1
54						▼ 16-02-23		11.36m: B20°, pl, ro, cln 11.41m: B20°, pl, ro, cln				
	12											PL(A) = 1.4
53		Between 12.85m to 14.45m: massive										
	13											PL(A) = 1.6
52									C	100	100	
	14											PL(A) = 1.2
51												PL(A) = 0.9
	15	Below 14.9m: fractured										
50								15.45m: B20°, pl, ro, cln				
		Below 17.5m: with siltstone flecks										
	16											PL(A) = 1.3
49									C	100	88	PL(A) = 1.5
	17							16.85m: B0°, cly 5mm 16.9m: J60°, pl, ro, cln 16.9-17.45m: J60° (x5), pl, ro, cln				
48								17.52m: B0°, cly 2mm				
	18											PL(A) = 1.4
47								18.48m: B0-5°, ir, ro, cbs vnr				PL(A) = 0.6
		Between 18.72m to 18.80m: siltstone clast						18.72m: B10-20°, ir, ro, cbs vnr 18.8m: B0-5°, ir, ro, cbs vnr 18.97m: B0-5°, ir, ro, cbs vnr 19.05m: B0-5°, ir, ro, cbs vnr	C	100	100	
	19											
46	19.2	SILTSTONE: dark grey, with 20% pale grey sandstone lamination, medium strength, fresh, slighlty fractured, massive, Hawkesbury Sandstone						19.1m: B0-5°, ir, ro, cbs	C	100	100	PL(A) = 0.9

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Degree of Weathering (EW HW MW SW FS FR)	Graphic Log	Rock Strength (Ex Low / Very Low / Low / Medium / High / Very High / Ex High)	Water	Fracture Spacing (m) (0.01 / 0.05 / 0.10 / 0.50 / 1.00)	Discontinuities (B - Bedding J - Joint S - Shear F - Fault)	Sampling & In Situ Testing: Type	Core Rec. %	RQD %	Test Results & Comments
45	21	SILTSTONE: dark grey, with 20% pale grey sandstone lamination, medium strength, fresh, slighlty fractured, massive, Hawkesbury Sandstone *(continued)*						vnr 19.2m: B0-5°, cu, ro, cbs vnr 20.02m: Ds 40mm	C	100	100	PL(A) = 1.1
44												
	21.85											PL(A) = 0.7
43	22	SANDSTONE: fine to medium grained, pale grey, medium to high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone							C	100	100	
42	23											PL(A) = 0.9
41	24	Below 24.0m: with 0-10% siltstone laminations										PL(A) = 1
40	25											PL(A) = 0.9
39	26								C	100	100	PL(A) = 0.9
38	27	Below 27.0m: with 10-20% siltstone laminations Below 27.6m: massive										PL(A) = 1
37	28											PL(A) = 0.9
36	29							29.45m: J70°, pl, ro, cln	C	100	100	PL(A) = 1 PL(A) = 0.8
	30.0	Bore discontinued at 30.0m										

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 1 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
65	0.11	CONCRETE: concrete slab 5-15mm aggregate, no reinforcement							Gatic cover
	0.3	FILL/SAND: yellow-brown, fine to medium, moist, trace sandstone gravel		A	0.4				
		CLAY CL-CI: low plasticity, red, w < PL, very stiff, residual		A	0.9 1.0				Blank pipe 0.0-12.0m
64	1	Below 1.0m: red mottled pale grey		S			10,14,16 N = 30		
					1.45				
	2			A	1.9 2.0				
63	2.5	SANDSTONE: fine to medium grained, pale grey and red-brown, low strength with very low strength clay bands, extremely weathered, slightly fractured, Mittagong Formation			2.53				
	3	Between 3.24m and 3.69m: very low strength		C	2.95		PL(A) = 0.2		
62					3.95		PL(A) = 0.2		
	4				4.05		PL(A) = 0.2		
61					4.23				Backfill 0.0-8.5m
	4.45	SANDSTONE: fine to medium grained, pale grey, with 20% siltstone laminations, medium strength, slightly weathered to fresh, slightly fractured, possible Mittagong Formation			4.95		PL(A) = 0.6		
60	5			C	5.0		PL(A) = 0.8		
	6				5.95		PL(A) = 1.3		
59					6.23				
	7				6.95		PL(A) = 1.1		
58	7.45	SANDSTONE: fine to medium grained, pale grey, medium then high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone			7.43		PL(A) = 0.7		
	8			C	7.93		PL(A) = 0.7		
57									
	9				8.86		PL(A) = 0.8		
56					9.2				
				C					
					9.95		PL(A) = 1.2		

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 2 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
55		SANDSTONE: fine to medium grained, pale grey, medium then high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone *(continued)*							Bentonite 8.5-11.5m
	11			C	10.94		PL(A) = 1.1		
54								16-02-23	
	12				11.94		PL(A) = 1.4		
53		Between 12.85m to 14.45m: massive			12.23				
	13				12.94		PL(A) = 1.6		
52				C					
	14				13.95		PL(A) = 1.2		
51					14.76		PL(A) = 0.9		
	15	Below 14.9m: fractured			15.22				
50									
		Below 17.5m: with siltstone flecks							
	16				15.95		PL(A) = 1.3		
49				C					
	17				16.79		PL(A) = 1.5		
48									
	18				17.88		PL(A) = 1.4		
47					18.21				
					18.65		PL(A) = 0.6		
	19	Between 18.72m to 18.80m: siltstone clast		C					
46	19.2	SILTSTONE: dark grey, with 20% pale grey sandstone lamination, medium strength, fresh, slighlty fractured, massive, Hawkesbury Sandstone			19.75		PL(A) = 0.9		
				C	19.8				

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Altis Bulky Retail Pty Ltd
PROJECT: Proposed Residential Development
LOCATION: 11 Holdsworth Street, St Leonards

SURFACE LEVEL: 65.3 AHD
EASTING: 332761.475
NORTHING: 6255601.582
DIP/AZIMUTH: 90°/--

BORE No: BH103
PROJECT No: 210589.01
DATE: 13 - 16/2/2023
SHEET 3 OF 3

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Well Construction Details
45		SILTSTONE: dark grey, with 20% pale grey sandstone lamination, medium strength, fresh, slighlty fractured, massive, Hawkesbury Sandstone *(continued)*		C					
	21				20.9		PL(A) = 1.1		Gravel 11.5-30.0m
44					21.23				
	21.85	SANDSTONE: fine to medium grained, pale grey, medium to high strength, fresh, slightly fractured to unbroken, Hawkesbury Sandstone			21.85		PL(A) = 0.7		
	22								
43				C					
	23				22.95		PL(A) = 0.9		
42									
	24	Below 24.0m: with 0-10% siltstone laminations			23.94		PL(A) = 1		Machine slotted PVC screen 12.0-30.0m
41					24.3				
	25				24.94		PL(A) = 0.9		
40				C					
	26				25.9		PL(A) = 0.9		
39									
	27	Below 27.0m: with 10-20% siltstone laminations			26.85		PL(A) = 1		
38					27.3				
		Below 27.6m: massive							
	28				27.94		PL(A) = 0.9		
37				C					
	29				28.9		PL(A) = 1		
36					29.4		PL(A) = 0.8		
	30.0	Bore discontinued at 30.0m			30.0				End cap

RIG: Geo 305 **DRILLER:** Terratest **LOGGED:** AN **CASING:** HWT to 2.7m

TYPE OF BORING: Diatube to 0.11m, Solid Flight Auger (TC-bit) to 2.53m, HQ coring 2.53 to 30.0m

WATER OBSERVATIONS: Water level recorded at 8.6m bgl (16/02/23) and 8.7m bgl (17/02/23)

REMARKS: Standpipe installed to 30.0m (screen 12.0m-30.0m, PVC 0.0m-12.0m, Gravel 11.5m-30.0m, Bentonite 8.5m-11.5m, Backfill to 0.0, cement and gatic cover at top)

SAMPLING & IN SITU TESTING LEGEND

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

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BORE: BH103 PROJECT: 210589.01 MARCH 2023



2.53m – 6.00m

BORE: BH103 PROJECT: 210589.01 MARCH 2023



6.00m – 10.00m

BORE: BH103 PROJECT: 210589.01 MARCH 2023



10.00m – 14.00m

BORE: BH103 PROJECT: 210589.01 MARCH 2023



14.00m – 18.00m

BORE: BH103 PROJECT: 210589.01 MARCH 2023



18.00m – 22.00m

BORE: BH103 PROJECT: 210589.01 MARCH 2023



22.00m – 26.00m

BORE: BH103 **PROJECT: 210589.01** **MARCH 2023**



26.00m – 30.00m

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	22.5.25
Location:	St Leonards	Tested by:	CLB

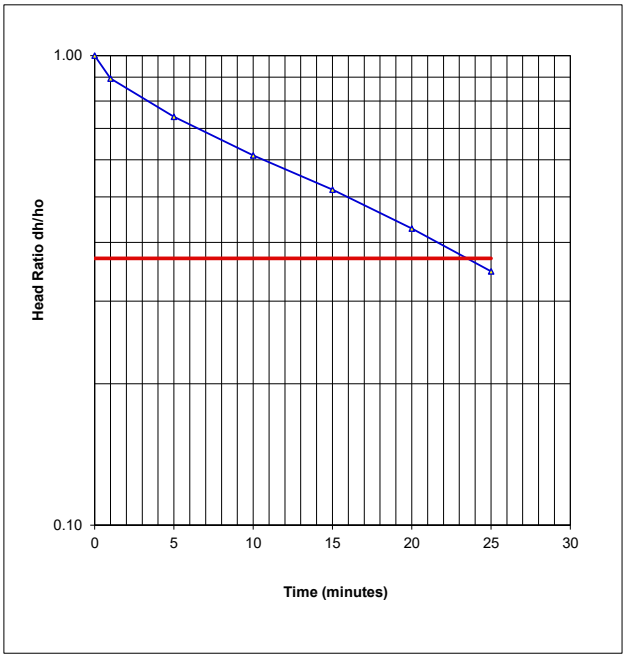
Test Location		**Test No.**	BH103	
Description:	Standpipe in Borehole	Easting:	332761	m
Material type:	Clay over Sandstone	Northing	6255601	m
		Surface Level:	65.3	m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	13.3	m
borehole diameter (2R)	96	mm	Depth to water at start of test	17.62	m
Effective Length of well screen (Le)	16.70	m	Depth to top of gravel pack	11.50	m
			Depth of base of PVC standpipe	30.00	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	17.62	4.32	1.000
1	17.16	3.86	0.894
5	16.5	3.20	0.741
10	15.95	2.65	0.613
15	15.54	2.24	0.519
20	15.15	1.85	0.428
25	14.8	1.50	0.347



To = 23.6 mins
1416 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**7.7E-08**	m/sec
	=	**0.007**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	23.5.25
Location:	St Leonards	Tested by:	CLB

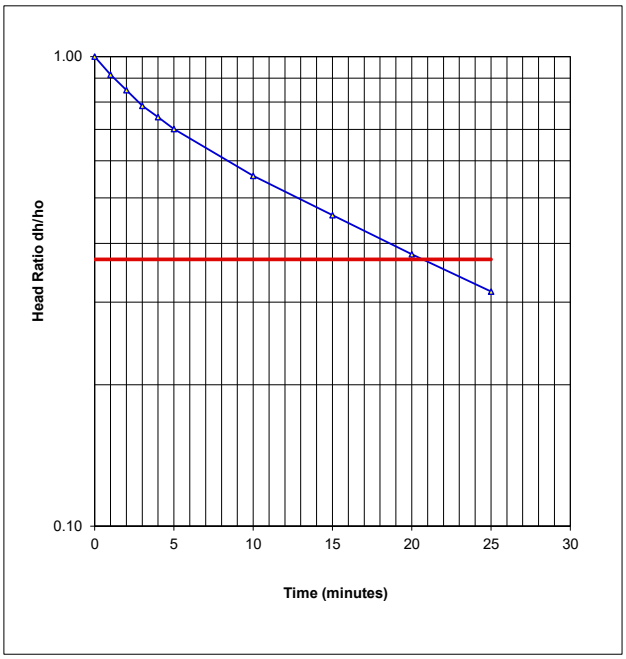
Test Location		**Test No.**	BH103	
Description:	Standpipe in Borehole	Easting:	332761	m
Material type:	Clay over Sandstone	Northing	6255601	m
		Surface Level:	65.3	m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	13.12	m
borehole diameter (2R)	96	mm	Depth to water at start of test	18.34	m
Effective Length of well screen (Le)	16.70	m	Depth to top of gravel pack	11.50	m
			Depth of base of PVC standpipe	30.00	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	18.34	5.22	1.000
1	17.9	4.78	0.916
2	17.55	4.43	0.849
3	17.22	4.10	0.785
4	17	3.88	0.743
5	16.78	3.66	0.701
10	16.03	2.91	0.557
15	15.52	2.40	0.460
20.00	15.1	1.98	0.379
25	14.77	1.65	0.316



To = 20.7 mins
1244 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**8.8E-08**	m/sec
	=	**0.008**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.03
Project:	Proposed residential Development	Test date:	26.5.25
Location:	St Leonards	Tested by:	CLB

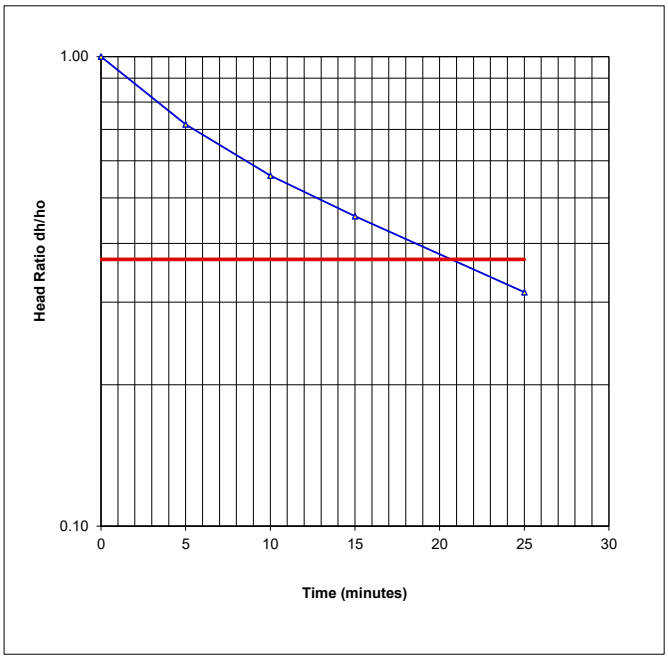
Test Location		**Test No.**	BH103	
Description:	Standpipe in Borehole	Easting:	332761	m
Material type:	Clay over Sandstone	Northing	6255601	m
		Surface Level:	65.3	m AHD

Details of Well Installation

Effective diameter (2re)	50	mm	Depth to water before test	13.21	m
borehole diameter (2R)	96	mm	Depth to water at start of test	17.78	m
Effective Length of well screen (Le)	16.70	m	Depth to top of gravel pack	11.50	m
			Depth of base of PVC standpipe	30.00	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	17.78	4.57	1.000
5	16.49	3.28	0.718
10	15.76	2.55	0.558
15	15.3	2.09	0.457
25	14.65	1.44	0.315



To = 21.1 mins
1268.4 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**8.6E-08**	m/sec
	=	**0.007**	m/day

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 70.9 AHD
COORDINATE: E:332694.3, N:6255607.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 210589.01
DATE: 04/09/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (<0.06, 0.06-0.2, 0.2-0.6, 0.6-2, >2)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	70	1													1				
	69	2													2				
	68	3													3				
	67	4													4				
	66	5													5			Sand	
	65	6													6				
	64	7													7				
	63	8													8				
	62	9													9				
	61																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: DT to 0.14m, then HA to 0.7m, then WB to 14m, then HQ3 to 24.13m
CASING: HQ to 0.7m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 70.9 AHD
COORDINATE: E:332694.3, N:6255607.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 210589.01
DATE: 04/09/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, HW, DW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	60	11														11				
	59	12														12				
	58	13														13				
	57	14.00	SANDSTONE: pale grey, medium grained, distinct, bedded, 0 to 20°, medium bedded to thinly bedded, trace carbonaceous laminations; slightly fractured. Hawkesbury Sandstone.		FR	14.00	H	100	100		14.51m: B, 0°, PR, CN, RF				14	PLT	PL(A)=1.2MPa	Bentonite	
	56	15														15	PLT	PL(A)=1.2MPa		
	55	16						100	98		15.87m: B, 0°, PR, CT Clay 5mm, + CBS VNR				16	PLT	PL(A)=0.64MPa PL(A)=1.4MPa		
	54	17									16.67m: B, 20°, PR, VNR Clay, RF 16.83m: B, 0°, UN, VNR Clay 16.90m: B, 0°, UN, VNR Clay, RF 17.32m: B, 20°, PR, CN, RF				17	PLT	PL(A)=1.5MPa	Sand	
	53	18	18.00m-18.70m: Thinly bedded, interbedded siltstone and sandstone					100	90		17.66m: B, 20°, PR, CN, RF 17.68m: B, 20°, PR, CT Clay 2mm, RF 17.69m: JT, 40°, PR, TI 18.04m: B, 0°, PR, CT CBS, RF 18.05m: EW, 20mm 18.17m: B, 10°, PR, CN, RF				18	PLT	PL(A)=1.0MPa		
	52	19						100	75		18.72m: B, 20°, PR, CN, RF 18.74m: B, 20°, PR, CT Clay 2mm, RF 19.54m: B, 20°, UN, CN, RF 19.66m: JT, 80°, UN, CN, RF 19.70m: EW, Clay 30mm				19	PLT	PL(A)=0.89MPa		
	51																			

05/09/25

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Rock Log

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: DT to 0.14m, then HA to 0.7m, then WB to 14m, then HQ3 to 24.13m
CASING: HQ to 0.7m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 70.9 AHD
COORDINATE: E:332694.3, N:6255607.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 210589.01
DATE: 04/09/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (DW: PS, XW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	50	20.00	SANDSTONE: pale grey, medium grained, distinct, bedded, 0 to 20°, medium bedded to thinly bedded, carbonaceous laminations and siltstone flecks; slightly fractured to unbroken. Hawkesbury Sandstone.				H	100	100		19.81m: B x2, 0°, UN, CT Clay, RF 19.90m: JT, 60°, ST, CN, RF 19.95m: B, 0°, PR, CT Clay 3mm, RF 19.97m: B, 0°, UN, TI		UCS		20.86	PLT	PL(A)=0.82MPa		
	49	21.66	SILTSTONE: dark grey, with 20% sandstone laminations, 0 to 30°; slightly fractured to unbroken. Hawkesbury Sandstone.		FR	21.66	M	100	100		21.12m: B, 20°, UN, CT CBS, RF 21.33m: B, 20°, UN, CT CBS, RF 21.66m: B, 0°, PR, CN, RF 22.10m: B, 30°, PR, CN, SM		UCS		21.00	PLT	PL(A)=1.6MPa	Sand	
	48	22.70	SANDSTONE: pale grey, coarse grained, indistinct, bedded, 0 to 20°; unbroken. Hawkesbury Sandstone.			22.70	H	100	100		22.59m: B, 0°, PR, CN, SM 22.70m: B, 0°, PR, CT Clay, RF 23.20m: B, 20°, PR, VNR Clay, RF				21.86	PLT	PL(A)=1.6MPa		
	47	24	Borehole discontinued at 24.13m depth. Target Depth Reached.												22.00	PLT	PL(A)=0.38MPa		
	46	25													23	PLT	PL(A)=1.0MPa	Bentonite	
	45	26														PLT	PL(A)=2.6MPa		
	44	27														PLT	PL(A)=1.4MPa		
	43	28																	
	42	29																	
	41																		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: DT to 0.14m, then HA to 0.7m, then WB to 14m, then HQ3 to 24.13m
CASING: HQ to 0.7m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Generated with CORE-GS by Geroc - Rock Log

Douglas PARTNERS

CORE PHOTO LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 70.9 AHD
COORDINATE: E:332694.3, N:6255607.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 210589.01
DATE: 04/09/25
SHEET: 1 of 2



14.00-17.00 m depth



17.00-21.00 m depth

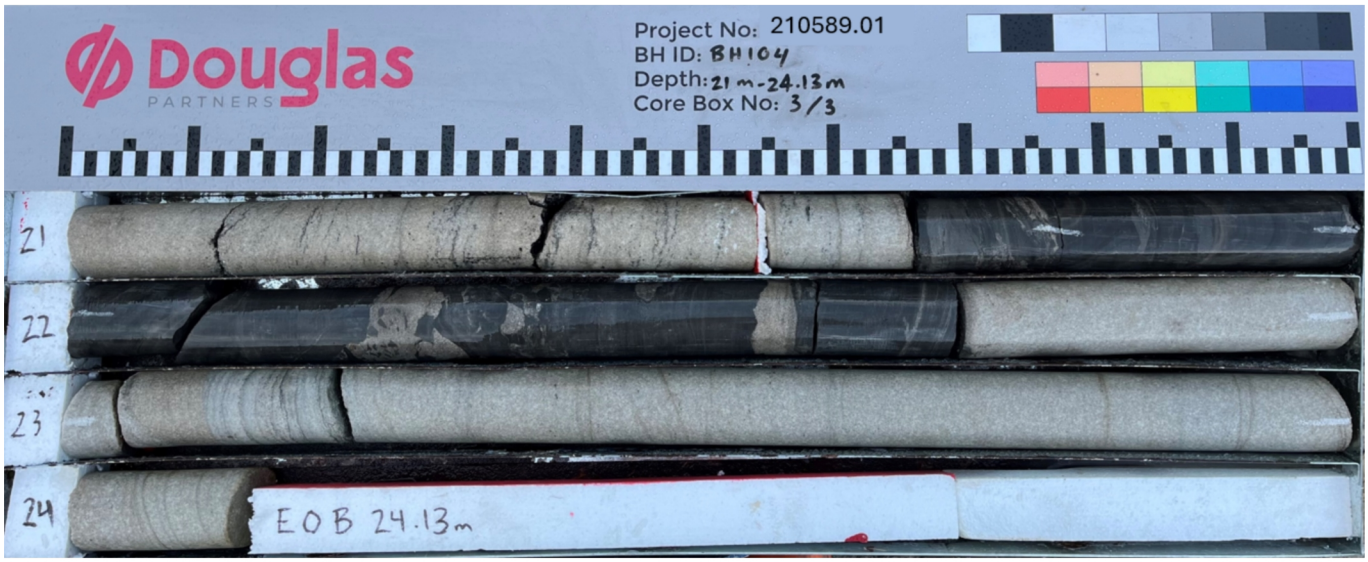
Generated with CORE-GS by Geroc - Rock Log

CORE PHOTO LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 70.9 AHD
COORDINATE: E:332694.3, N:6255607.1
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH104
PROJECT No: 210589.01
DATE: 04/09/25
SHEET: 2 of 2



21.00-24.13 m depth

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BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 75.1 AHD
COORDINATE: E:332702.3, N:6255662.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 210589.01
DATE: 02/09/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (<0.06, 0.06–0.2, 0.2–0.6, 0.6–2, >2)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	75	0																			
	74	1																			
	73	2																			
	72	3																			
	71	4																			
	70	5																		Sand	
	69	6																			
	68	7																			
	67	8																			
	66	9																			

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: AD/T to 1.1m, then WB to 17.53m, then HQ3 to 28m
CASING: HQ to 1.1m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Refer to explanatory notes for symbol and abbreviation definitions

Generated with CORE-GS by Geroc - Rock Log

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 75.1 AHD
COORDINATE: E:332702.3, N:6255662.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 210589.01
DATE: 02/09/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED															SAMPLE				TESTING			
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW [HW, MW], SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 1.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	65																					
	64	11														11						
	63	12														12						
	62	13														13			Sand			
	61	14														14						
	60	15														15						
	59	16														16						
	58	17														17						
	57	17.53 18	SANDSTONE: pale grey, medium and coarse grained, distinct, bedded, 0 to 20°, thickly bedded to medium bedded, trace carbonaceous laminations; slightly fractured. Hawkesbury Sandstone.		FR	17.53	H	100	100		18.31m: B, 0°, PR, CN, RF				18	PLT	PL(A)=0.66MPa	Bentonite	
	56	18.34 19.02	SILTSTONE: dark grey, indistinct, bedded, 0°, thinly laminated; unbroken.			18.34	M	100	100		18.80m: EW, Clay 10mm					PLT	PL(A)=0.94MPa		
		19.75 19.84	From 20.00m: slightly fractured to unbroken			18.82	H	93	90		19.20-19.24m: SZ, 20°, CT Clay, TI 19.45m: JT, 30°, PR, CN, RF 19.60m: B, 10°, PR, TI 19.68m: EW, Clay 20mm					PLT	PL(A)=0.38MPa		
																PLT	PL(A)=1.6MPa	Sand	
								100	100							PLT	PL(A)=1.1MPa		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

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PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: AD/T to 1.1m, then WB to 17.53m, then HQ3 to 28m
CASING: HQ to 1.1m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 75.1 AHD
COORDINATE: E:332702.3, N:6255662.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 210589.01
DATE: 02/09/25
SHEET: 3 of 3

GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS	BACKFILL	WELL PIPE
	55																		
	54	21	SANDSTONE: pale grey, medium and coarse grained, distinct, bedded, 0 to 20°, thickly bedded to medium bedded, trace carbonaceous laminations; slightly fractured. Hawkesbury Sandstone.					100	100		20.22m: B, 0°, PR, CN, RF 20.40m: B, 0°, UN, CT CBS, RF 20.83m: B, 20°, PR, CN, RF				21	PLT	PL(A)=0.85MPa		
	53	22						100	100		21.47m: B, 20°, PR, VNR Clay, RF 21.56m: B, 20°, PR, VNR Clay, RF				22	PLT	PL(A)=1.8MPa		
04/09/25	52	23						100	100		23.48m: B, 0°, PR, VNR Clay, TI				23	PLT	PL(A)=2.0MPa	Sand	
	51	24	From 23.50m: Trace siltstone clasts and laminations		FR		H	100	100		23.92m: B, 20°, UN, TI 23.98m: B, 0°, UN, TI 24.19m: B, 0°, UN, CT CBS, RF		UCS		24.00 24.14	PLT	PL(A)=1.0MPa		
	50	25	24.80m-25.50m: Frequent carbonaceous laminations, trace sub-rounded, siltstone clasts up to 40mm					100	88		24.89m: B, 0°, UN, VNR CBS, RF 25.13m: B, 0°, UN, CN, RF 25.20m: B, 20°, UN, CN, RF 25.37m: B, 20°, UN, VNR CBS, RF 25.45m: B, 0°, IR, CN, RF				25	PLT	PL(A)=2.0MPa		
	49	26						100	100		26.16m: B, 20°, PR, CN, RF		UCS		26.17 26.30	PLT	PL(A)=1.3MPa		
	48	27						100	100		27.06m: B, 20°, PR, CN, RF				27	PLT	PL(A)=1.2MPa	Bentonite	
	47	28	Borehole discontinued at 28.00m depth. Target Depth Reached.					100	100										
	46	29																	

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: AD/T to 1.1m, then WB to 17.53m, then HQ3 to 28m
CASING: HQ to 1.1m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Refer to explanatory notes for symbol and abbreviation definitions

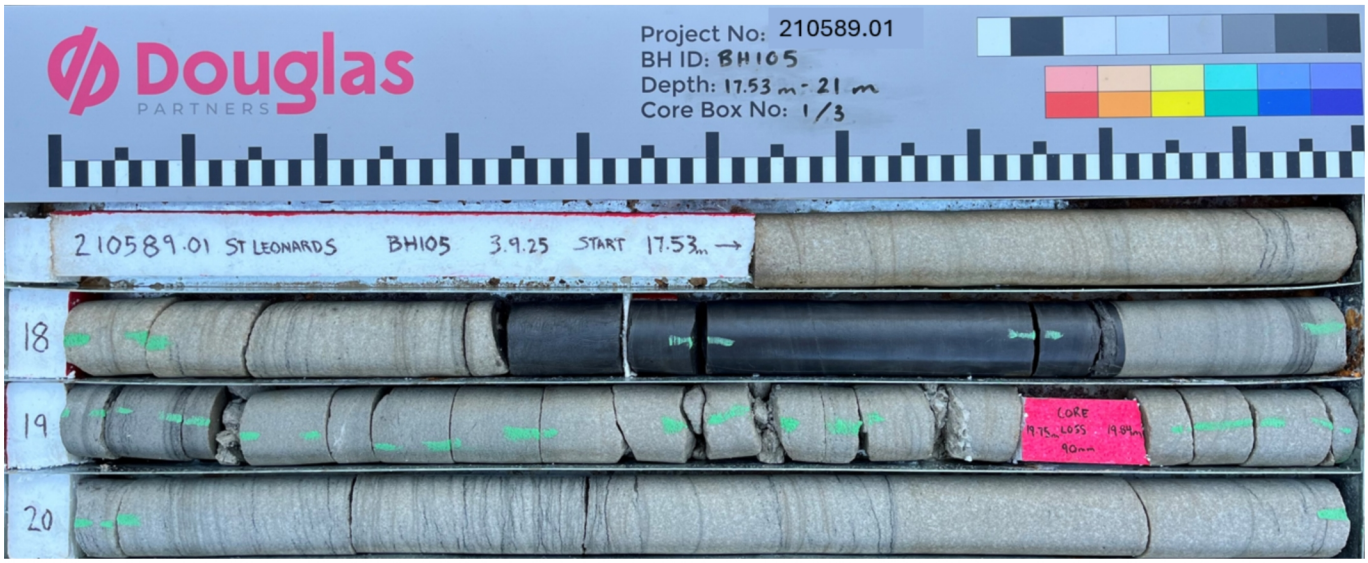
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CORE PHOTO LOG

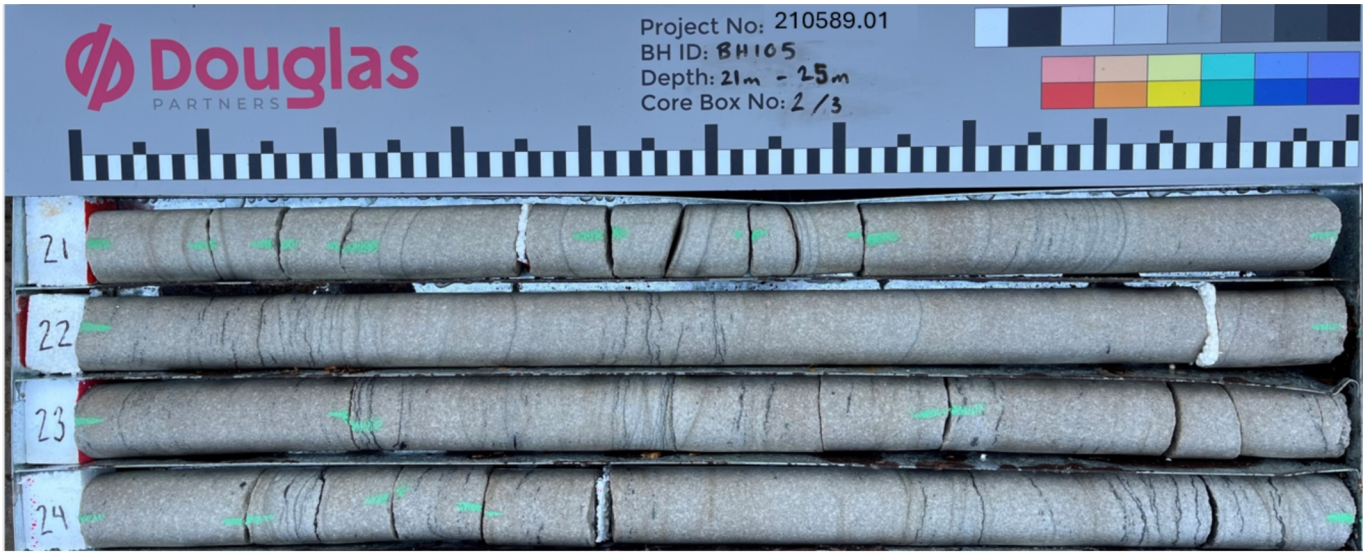
CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 75.1 AHD
COORDINATE: E:332702.3, N:6255662.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 210589.01
DATE: 02/09/25
SHEET: 1 of 2



17.53-21.00 m depth



21.00-25.00 m depth

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CORE PHOTO LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 75.1 AHD
COORDINATE: E:332702.3, N:6255662.4
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH105
PROJECT No: 210589.01
DATE: 02/09/25
SHEET: 2 of 2



25.00-28.00 m depth

Generated with CORE-GS by Geroc - Rock Log

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 69.0 AHD
COORDINATE: E:332752.3, N:6255616.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 210589.01
DATE: 05/09/25
SHEET: 1 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW, HW, MW, SW, FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.06, 0.2, 0.6, 2.0, >2.0)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
05/09/25 No Free Groundwater Observed While Augering	68	1													1		
	67	2													2		
	66	3													3		
	65	4													4		
	64	5													5		
	63	6													6		
	62	7													7		
	61	8													8		
	60	9													9		

NOTES: [a] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: AD/T to 0.8m, then WB to 13m, then HQ3 to 26.19m
CASING: HQ to 0.8m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Generated with CORE-GS by Geroc - Rock Log

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 69.0 AHD
COORDINATE: E:332752.3, N:6255616.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 210589.01
DATE: 05/09/25
SHEET: 2 of 3

CONDITIONS ENCOUNTERED														SAMPLE				TESTING	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA (SOIL STRENGTH (where encountered) / SOIL MOISTURE)	GRAPHIC	WEATH. (PS, XW, DW [HW, MW, SW], FR)	DEPTH (m)	STRENGTH (VL, L, M, H, VH, EH)	RECOVERY (%)	RQD	FRACTURE SPACING (m) (0.03, 0.06, 0.20, 0.60, 2.00, >2.00)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	58	11													11		
	57	12													12		
	56	13.00	SANDSTONE: pale grey, medium grained, distinct, bedded, 0 to 20°, thinly bedded to medium bedded; slightly fractured and unbroken. Hawkesbury Sandstone.			13.00					13.07m: B, 20°, PR, CN, RF				13	PLT	PL(A)=1.8MPa
								100	100		13.72m: B, 20°, PR, CN, RF						
	55	14	14.16m-14.50m: Trace carbonaceous laminations, trace sub-angular siltstone clasts up to 20mm, trace siltstone laminations								13.73m: B, 20°, PR, CT Clay 4mm, RF 14.16m: B, 0°, UN, CT CBS, RF				14	PLT	PL(A)=1.0MPa
								100	100		14.50m: B, 0°, PR, CT Clay, RF						
	54	15	14.50m-15.50m: massive, fine grained												15	PLT	PL(A)=1.2MPa
	53	16	15.85m-18.80m: Distinctly bedded		FR		H	100	98		16.32m: B, 0°, PR, CT Clay 3mm, RF 16.54m: B, 0°, UN, CT CBS, RF 16.62m: B, 20°, UN, TI 16.65m: B, 0°, PR, CT Clay, RF, CBS VNR				16	PLT	PL(A)=1.2MPa
	52	17	16.32m-16.65m: Frequent carbonaceous and siltstone laminations and flecks								16.70m: B, 20°, PR, VNR Py, RF				17	PLT	PL(A)=1.4MPa
								100	98								
	51	18									18.36m: B, 0°, UN, CT CBS, RF 18.39-18.40m: SZ, 0°, CT CBS, RF				18	PLT	PL(A)=1.6MPa
	50	19						100	94		19.13m: B, 0°, UN, CT CBS, RF 19.24m: JT, 90°, PR, CN, RF 19.29m: B, 0°, PR, CN, RF				19	PLT	PL(A)=1.0MPa

NOTES: [a] Soil origin is "probable" unless otherwise stated.

Generated with CORE-GS by Geroc - Rock Log

PLANT: Comacchio Geo 205
OPERATOR: Ground Test (GM)
LOGGED: C. Lambert-Bridges
METHOD: AD/T to 0.8m, then WB to 13m, then HQ3 to 26.19m
CASING: HQ to 0.8m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

Douglas PARTNERS

BOREHOLE LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 69.0 AHD
COORDINATE: E:332752.3, N:6255616.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 210589.01
DATE: 05/09/25
SHEET: 3 of 3

CONDITIONS ENCOUNTERED															SAMPLE				TESTING	
GROUNDWATER	RL (m)	DEPTH (m)	DESCRIPTION OF STRATA	SOIL STRENGTH (where encountered) / SOIL MOISTURE	GRAPHIC	WEATH.	DEPTH (m)	STRENGTH	RECOVERY (%)	RQD	FRACTURE SPACING (m)	DEFECTS & REMARKS	SAMPLE REMARKS	TYPE	INTERVAL	DEPTH (m)	TEST TYPE	RESULTS AND REMARKS
	48	21	[CONT] SANDSTONE: pale grey, medium grained, distinct, bedded, 0 to 20°, thinly bedded to medium bedded; slightly fractured and unbroken. Hawkesbury Sandstone. From 20.00m: Frequent sub-angular siltstone clasts up to 10mm, frequent siltstone laminations					H	100	94		20.54m: B, 0°, PR, CN, RF				21	PLT	PL(A)=1.9MPa
									100	100		21.35m: B, 20°, UN, CN, RF 21.42m: B, 0°, UN, CN, SM 21.47m: B, 0°, UN, CN, RF						
	47	22										22.20m: B, 0°, PR, CT Clay, SM				22	PLT	PL(A)=1.2MPa
		22.32	SILTSTONE: dark grey, with 20% sandstone laminations, 0 to 30°; slightly fractured to unbroken. Hawkesbury Sandstone.						100	100		22.54m: B, 0°, PR, CN, RF		UCS		22.32 22.55	PLT	PL(A)=1.1MPa
	46	23				FR	23.20									23	PLT	PL(A)=1.2MPa
			From 23.60m: interbedded and interlaminated siltstone 50% and sandstone 50%									23.52m: B, 0°, PR, CN, RF					PLT	PL(A)=0.58MPa
	45	24						M	100	95		24.03m: JT, 90°, IR, CN, RF 24.04m: EW, Clay 10mm 24.14m: B, 0°, PR, CN, RF 24.27m: B, 0°, PR, CN, RF 24.32m: JT, 80°, PR, CN, RF, (25.23-25.45m) 24.45m: SS, CT Clay 5mm				24	PLT PLT	PL(A)=1.3MPa PL(A)=1.1MPa
		24.71	SANDSTONE: pale grey, medium grained, 0 to 20°, medium bedded to thinly bedded, distinct and indistinct; unbroken. Hawkesbury Sandstone.														PLT	PL(A)=0.47MPa
	44	25							100	98		24.55m: B, 0°, PR, CN, RF 24.68m: EW, 30mm				25	PLT	PL(A)=1.0MPa
							25.71	H										
	43	26										25.95m: B, 0°, PR, CN, RF 26.00m: B, 0°, PR, CN, RF				26	PLT	PL(A)=1.0MPa
			Borehole discontinued at 26.19m depth. Target Depth Reached.															
	42	27																
	41	28																
	40	29																

NOTES: [H] Soil origin is "probable" unless otherwise stated.

PLANT: Comacchio Geo 205
METHOD: AD/T to 0.8m, then WB to 13m, then HQ3 to 26.19m
REMARKS: Proposed basement excavation level at RL 52.1m. Borehole level from survey drawing

OPERATOR: Ground Test (GM)

LOGGED: C. Lambert-Bridges
CASING: HQ to 0.8m

Refer to explanatory notes for symbol and abbreviation definitions

Douglas PARTNERS

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CORE PHOTO LOG

CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 69.0 AHD
COORDINATE: E:332752.3, N:6255616.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 210589.01
DATE: 05/09/25
SHEET: 1 of 2



13.00-17.00 m depth



17.00-21.00 m depth

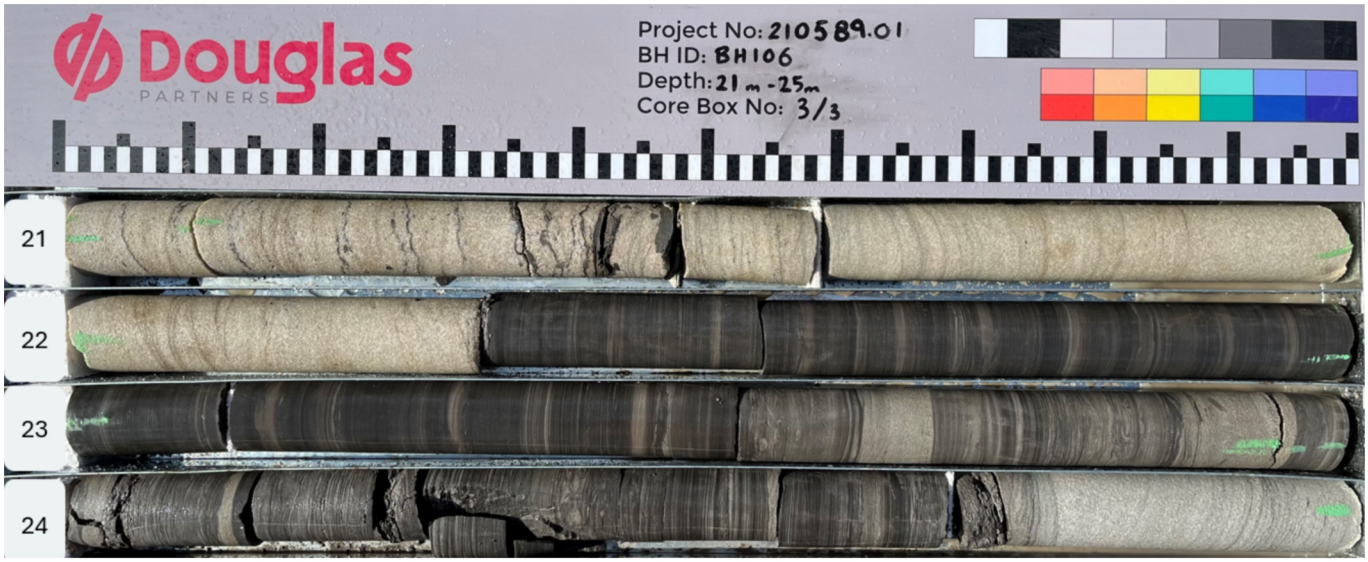
Generated with CORE-GS by Geroc - Rock Log

CORE PHOTO LOG

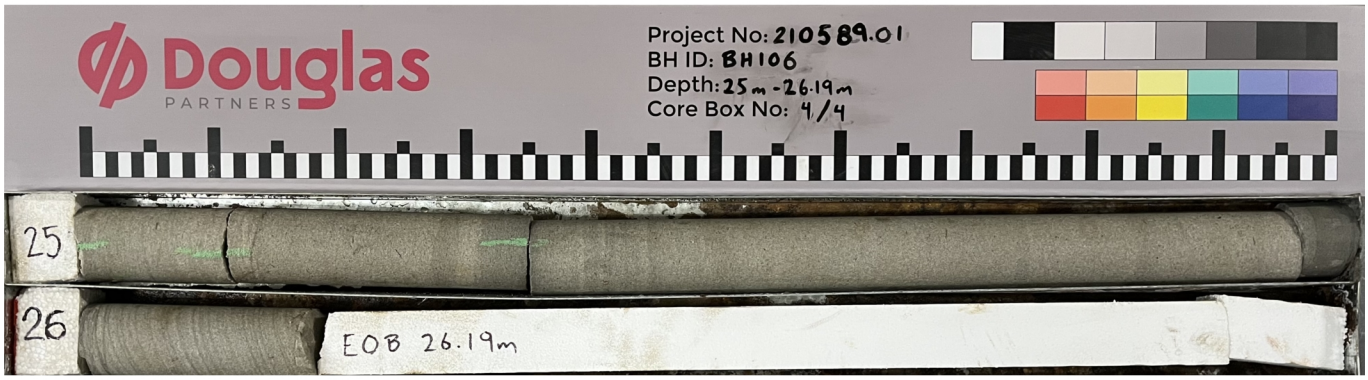
CLIENT: The Trustee for Altis ARET Sub Trust 22
PROJECT: ST LEONARDS, Berry & Holdsworth St
LOCATION: Crn of Berry and Holdsworth Street, St Leonards

SURFACE LEVEL: 69.0 AHD
COORDINATE: E:332752.3, N:6255616.0
DATUM/GRID: MGA2020 Zone 56
DIP/AZIMUTH: 90°/---°

LOCATION ID: BH106
PROJECT No: 210589.01
DATE: 05/09/25
SHEET: 2 of 2



21.00-25.00 m depth



25.00-26.19 m depth

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Douglas PARTNERS

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.01
Project:	Berry and Holdsworth street	Test date:	4.9.25
Location:	St Leonards	Tested by:	CLB

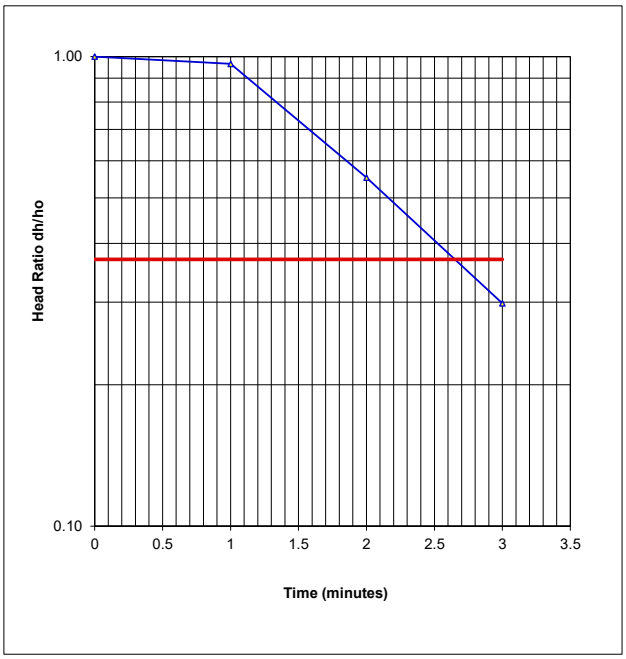
Test Location		**Test No.**	BH105 test 1	
Description:	standpipe in borehole	Easting:	332703.48	m
Material type:	sandstone	Northing	6255659.511	m
		Surface Level:	75	m AHD

Details of Well Installation

Effective diameter (2re)	120	mm	Depth to water before test	22.44	m
borehole diameter (2R)	120	mm	Depth to water at start of test	18.35	m
Effective Length of well screen (Le)	7.90	m	Depth to top of gravel pack	18.50	m
			Depth of base of PVC standpipe	26.40	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	18.35	4.09	1.000
1	18.49	3.95	0.966
2	20.18	2.26	0.553
3	21.22	1.22	0.298



To = 2.7 mins
163 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**6.8E-06**	m/sec
	=	**0.589**	m/day

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ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.01
Project:	Berry and Holdsworth street	Test date:	4.9.25
Location:	St Leonards	Tested by:	CLB

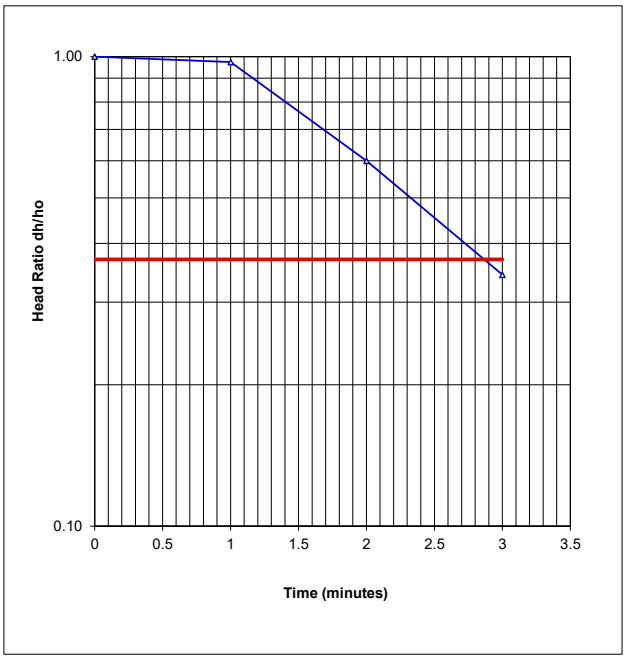
Test Location		**Test No.**	BH105 test 2	
Description:	standpipe in borehole	Easting:	332703.48	m
Material type:	sandstone	Northing	6255659.511	m
		Surface Level:	75	m AHD

Details of Well Installation

Effective diameter (2re)	120	mm	Depth to water before test	22.47	m
borehole diameter (2R)	120	mm	Depth to water at start of test	9.74	m
Effective Length of well screen (Le)	7.90	m	Depth to top of gravel pack	18.50	m
			Depth of base of PVC standpipe	26.40	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	9.74	12.73	1.000
1	10.07	12.40	0.974
2	14.83	7.64	0.600
3	18.1	4.37	0.343



To = 2.9 mins
174 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**6.4E-06**	m/sec
	=	**0.553**	m/day

Douglas Partners Pty Ltd
ABN 75 053 980 117
www.douglaspartners.com.au

Permeability Testing - Rising or Falling Head Test Report

Client:	Altis Property Partners	Project No:	210589.01
Project:	Berry and Holdsworth street	Test date:	4.9.25
Location:	St Leonards	Tested by:	CLB

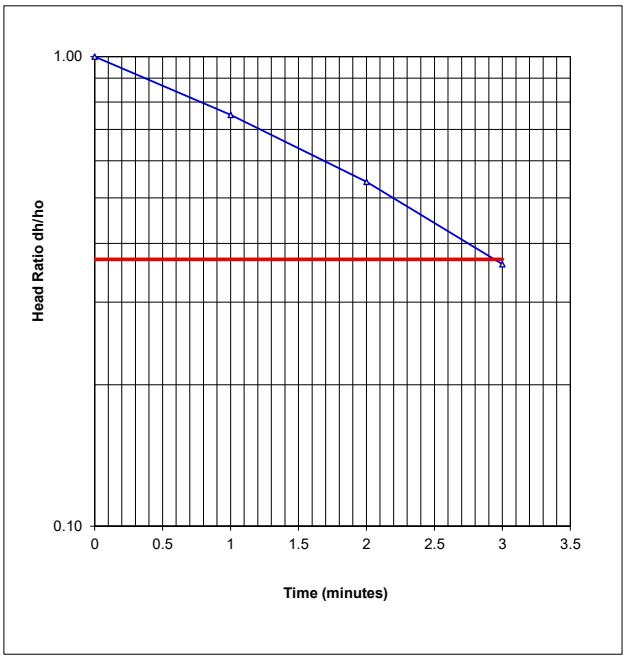
Test Location		**Test No.**	BH105 test 3	
Description:	standpipe in borehole	Easting:	332703.48	m
Material type:	sandstone	Northing	6255659.511	m
		Surface Level:	75	m AHD

Details of Well Installation

Effective diameter (2re)	120	mm	Depth to water before test	22.2	m
borehole diameter (2R)	120	mm	Depth to water at start of test	1.45	m
Effective Length of well screen (Le)	7.90	m	Depth to top of gravel pack	18.50	m
			Depth of base of PVC standpipe	26.40	m

Test Results

Time (min)	Depth (m)	Change in Head δH (m)	δH/Ho
0	1.45	20.75	1.000
1	6.61	15.59	0.751
2	10.97	11.23	0.541
3	14.7	7.50	0.361



To = 3.0 mins
177 secs

Theory: Falling Head Permeability calculated using equation by Hvorslev

$k = [r^2 \ln(Le/R)]/2Le\ To$

where r = radius of casing
R = radius of well screen
Le = length of well screen
To = time taken to rise or fall to 37% of initial change

Hydraulic Conductivity	**k =**	**6.3E-06**	m/sec
	=	**0.542**	m/day

Appendix F

Laboratory Test Results

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 286395

Client Details

Client	Douglas Partners Pty Ltd
Attention	Adam Teoh
Address	96 Hermitage Rd, West Ryde, NSW, 2114

Sample Details

Your Reference	**210589, St Leonards**
Number of Samples	6 Soil
Date samples received	10/01/2022
Date completed instructions received	10/01/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

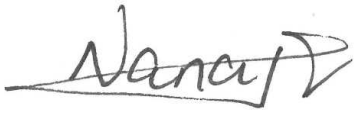
Date results requested by	17/01/2022
Date of Issue	17/01/2022

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Results Approved By
Priya Samarawickrama, Senior Chemist

Authorised By



Nancy Zhang, Laboratory Manager

Soil Aggressivity						
Our Reference		286395-1	286395-2	286395-3	286395-4	286395-5
Your Reference	UNITS	BH1	BH2	BH3	BH4	BH5
Depth		0.9-1.0	0.4-0.5	0.4-0.5	2.4-2.5	1.0-1.45
Type of sample		Soil	Soil	Soil	Soil	Soil
pH 1:5 soil:water	pH Units	5.5	4.7	6.0	5.0	5.4
Electrical Conductivity 1:5 soil:water	µS/cm	100	32	28	25	19
Chloride, Cl 1:5 soil:water	mg/kg	<10	<10	10	<10	<10
Sulphate, SO4 1:5 soil:water	mg/kg	170	34	<10	23	20

Soil Aggressivity		
Our Reference		286395-6
Your Reference	UNITS	BH6
Depth		4.0-4.3
Type of sample		Soil
pH 1:5 soil:water	pH Units	5.0
Electrical Conductivity 1:5 soil:water	µS/cm	53
Chloride, Cl 1:5 soil:water	mg/kg	21
Sulphate, SO4 1:5 soil:water	mg/kg	58

Method ID	Methodology Summary
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Inorg-002	Conductivity and Salinity - measured using a conductivity cell at 25°C in accordance with APHA latest edition 2510 and Rayment & Lyons.
Inorg-081	Anions - a range of Anions are determined by Ion Chromatography, in accordance with APHA latest edition, 4110-B. Waters samples are filtered on receipt prior to analysis. Alternatively determined by colourimetry/turbidity using Discrete Analyser.

QUALITY CONTROL: Soil Aggressivity						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	286395-2
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	1	5.5	5.5	0	101	[NT]
Electrical Conductivity 1:5 soil:water	µS/cm	1	Inorg-002	<1	1	100	94	6	100	[NT]
Chloride, Cl 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	<10	<10	0	105	98
Sulphate, SO4 1:5 soil:water	mg/kg	10	Inorg-081	<10	1	170	160	6	92	118

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

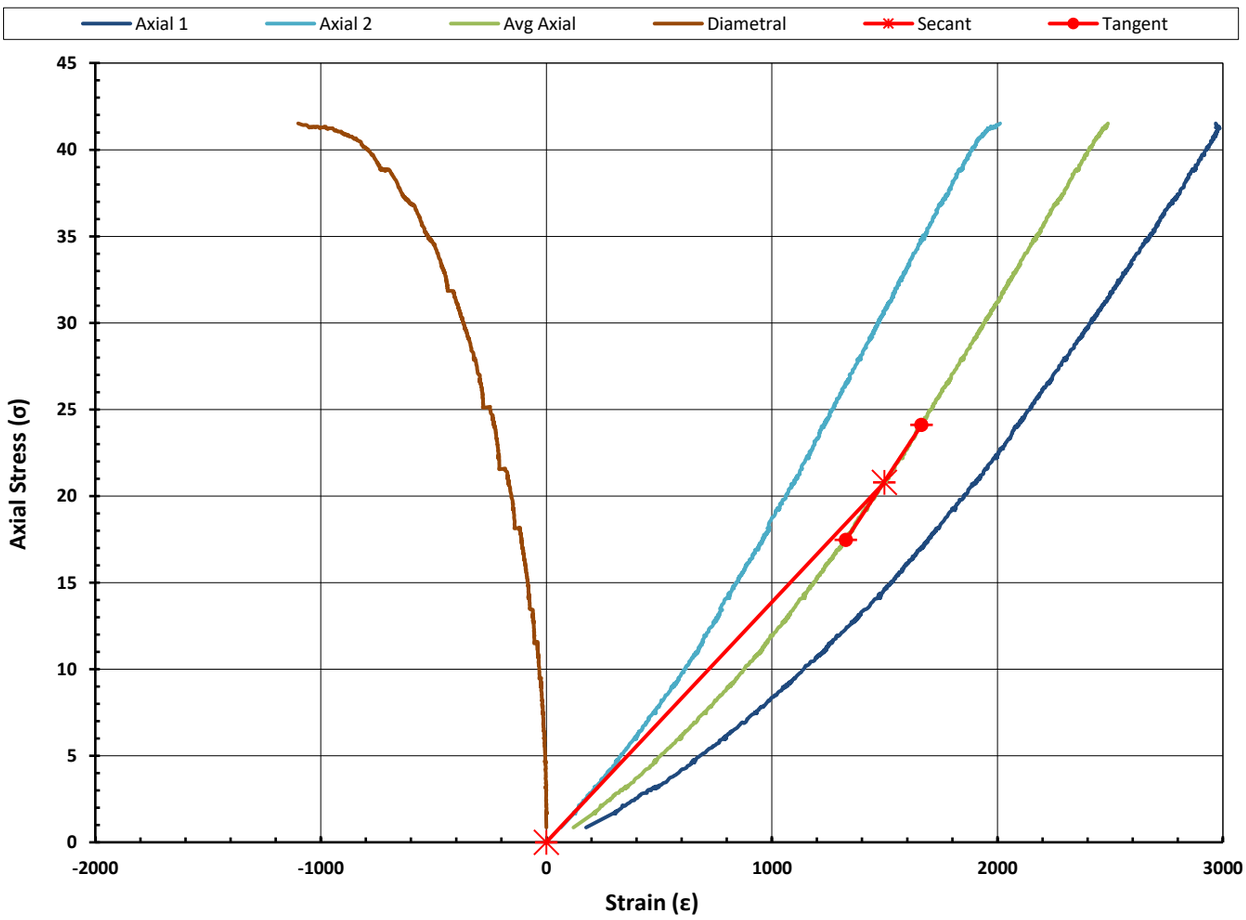
Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	**Sample Source**	BH101 18.00-18.35m
Address	PO Box 472 West Ryde NSW 1685	**Sample Description**	Sandstone
Project	Proposed Residential Development (210589 01)	**Report #**	S84854-MOD
Job #	S23098-1	**Sample #**	S84854

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	14/03/2023
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Axial Stress vs Strain Plots



Uniaxial Compressive Strength **42** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	20 GPa	0.14	from 42 % to 58 % of Max UCS
Secant	14 GPa	0.11	from 0 % to 50 % of Max UCS

Notes

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
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Results relate only to the samples tested.
NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 24/03/2023

MACQUARIE GEOTECH
Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	**Sample Source**	BH101 18.00-18.35m
Address	PO Box 472 West Ryde NSW 1685	**Sample Description**	Sandstone
Project	Proposed Residential Development (210589 01)	**Report #**	S84854-MOD
Job #	S23098-1	**Sample #**	S84854

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	14/03/2023
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Average Specimen Diameter (mm)	51.8	**Moisture Content (%)**	7.4
Average Specimen Height (mm)	149.9	**Wet Density (t/m^3)**	2.36
Length to Diameter Ratio	2.9	**Dry Density (t/m^3)**	2.20
Duration of Test (min)	14.07	**Rate of Displacement (mm/min):**	< 0.1
Date of Test:	22/3/23	**Specimen Curing**	-
Mode of Failure	Mixed mode	**Test Apparatus**	Matest Compression Machine with Axial and Circumferential Extensometers.



Before Test



After Test

Uniaxial Compressive Strength **42** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	20 GPa	0.14	from 42 % to 58 % of Max UCS
Secant	14 GPa	0.11	from 0 % to 50 % of Max UCS

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The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
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Results relate only to the samples tested.
NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 24/03/2023

Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Newcastle
15 Callistemon Close
Warabrook NSW 2310
Ph: (02) 4960 9600
ABN 75 053 980 117

RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: Altis Bulky Retail Pty Ltd
Project: Residential Development
Location: Cnr Berry & Holdsworth St, St Leonards

Project No: 210589.01
Report No: 210589.01_9712
Report Date: 10.03.2023
Date of Testing: 28.02.2023
Date Sampled: 20.02.2023

Approved Signatory:

Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (<50 MPa) AS 4133.4.3.2

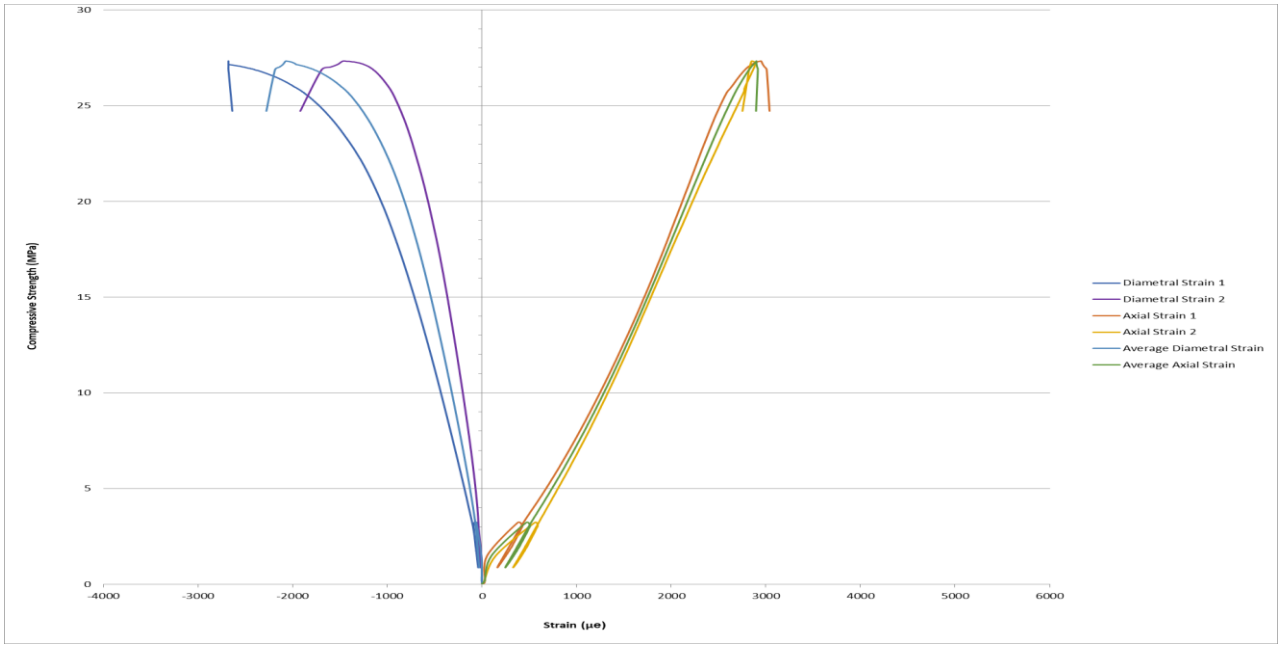
Sample Number	NC-9712A	
Sample Location	BH102	
Depth (m)	18.7 - 18.96	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	51.9	138.0
Height to Diameter Ratio	2.7 : 1	
Moisture Content (%)	7.3	
Wet Mass / Unit Volume (t/m3)	2.32	
Dry Mass / Unit Volume (t/m3)	2.16	
Test Duraton (sec)	561	
Load Rate - kN/sec	0.09	
Failure Mode	Axial	
Uniaxial Compressive Strength (MPa)	**27.11**	
SECANT MODULUS (50% load)		
Young's modulus (Gpa)	**8.358**	
Poisson's ratio	**0.29**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (Gpa)	**11.088**	
Poisson's ratio	**0.37**	

Before



After



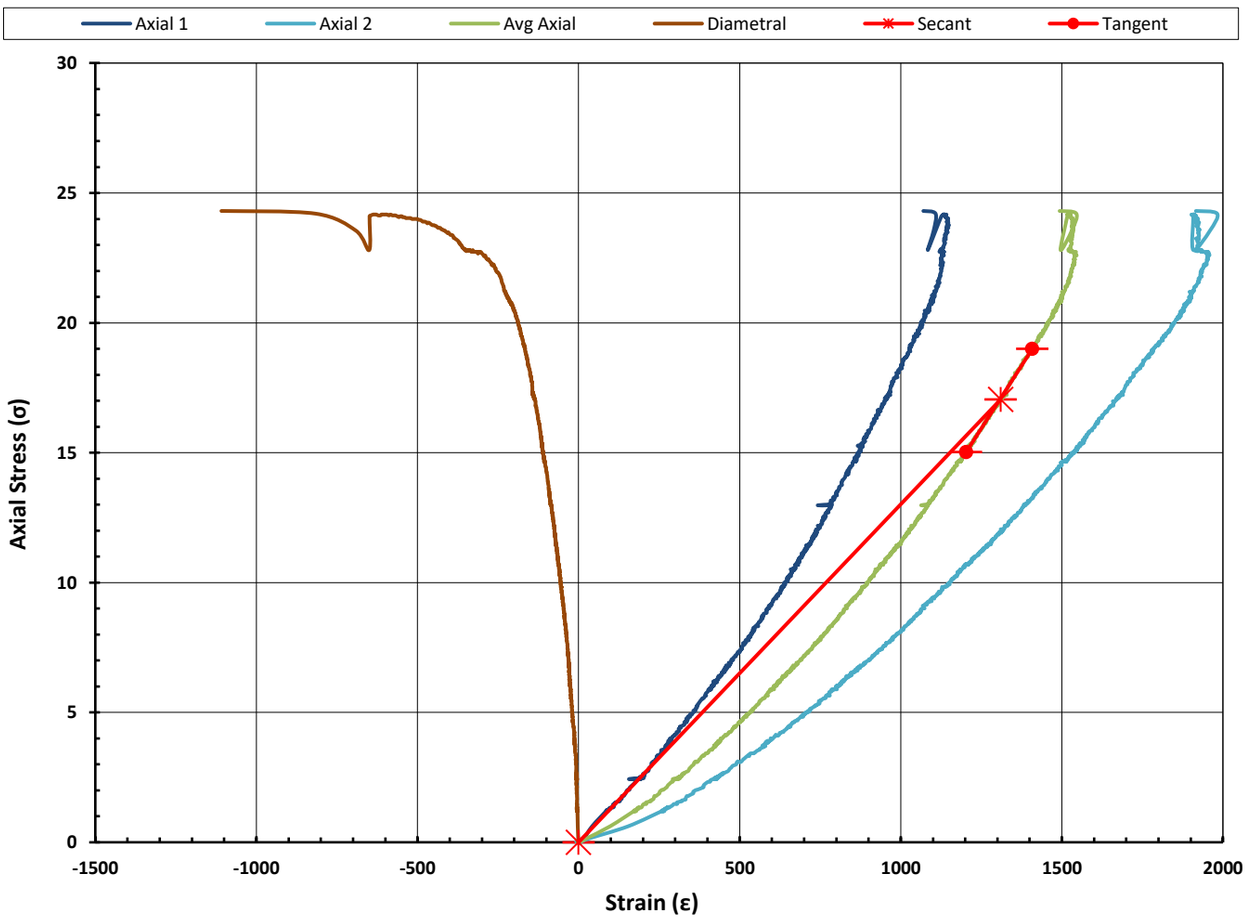


Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	**Sample Source**	BH103 18.29-18.50m
Address	PO Box 472 West Ryde NSW 1685	**Sample Description**	Sandstone
Project	Berry & Holdsworth St St Leonards (210589 01)	**Report #**	S85430-MOD
Job #	S23137-1	**Sample #**	S85430

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/04/2023
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Axial Stress vs Strain Plots



Uniaxial Compressive Strength **24** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	19 GPa	0.12	from 62 % to 78 % of Max UCS
Secant	13.0 GPa	0.10	from 0 % to 70 % of Max UCS

Notes

Accredited for compliance with ISO/IEC 17025 - Testing.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.
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Results relate only to the samples tested.
NATA Accredited Laboratory Number: 14874

Authorised Signatory:

Chris Lloyd

Date: 24/04/2023

MACQUARIE GEOTECH
Macquarie Geotechnical
14 Carter Street
Lidcombe NSW 2141

Deformability of Rock Materials in Uniaxial Compression

Client	Douglas Partners	**Sample Source**	BH103 18.29-18.50m
Address	PO Box 472 West Ryde NSW 1685	**Sample Description**	Sandstone
Project	Berry & Holdsworth St St Leonards (210589 01)	**Report #**	S85430-MOD
Job #	S23137-1	**Sample #**	S85430

Test Procedure	AS 4133.4.3.2 Deformability of rock materials in uniaxial compression-Rock strength less than 50 MPa		
Sampling	Sampled by Client - results apply to the sample as received	**Date Sampled**	17/04/2023
Storage History	Sealed	**Storage Environment**	Sealed at as received moisture condition

Average Specimen Diameter (mm)	61.0	**Moisture Content (%)**	2.0
Average Specimen Height (mm)	170.0	**Wet Density (t/m^3)**	2.29
Length to Diameter Ratio	2.8	**Dry Density (t/m^3)**	2.24
Duration of Test (min)	11.33	**Rate of Displacement (mm/min):**	< 0.1
Date of Test:	21/4/23	**Specimen Curing**	-
Mode of Failure	Mixed mode	**Test Apparatus**	Matest Compression Machine with Axial and Circumferential Extensometers.



Before Test



After Test

Uniaxial Compressive Strength **24** **MPa**

	Young's Modulus	Poisson's Ratio	
Tangent	19 GPa	0.12	from 62 % to 78 % of Max UCS
Secant	13.0 GPa	0.10	from 0 % to 70 % of Max UCS

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Douglas Partners Pty Ltd
Newcastle Laboratory
15 Callistemon Close Warabrook NSW 2304
Ph: (02) 4960 9600

RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: The Trustee for Altis ARET Sub Trust 22
Project: ST LEONARDS, Berry & Holsworth St
Location: Crn Berry and Holsworth Street, St Leonards NSW

Project No: 210589.01
Report No: 210589.01_13644
Report Date: 26.09.2025
Date of Testing: 15.09.2025
Date Sampled: -

Approved Signatory: Peter Gorseski
peter.gorseski@douglaspartners.com.au

Accredited for Compliance with ISOIEC 17025 - Testing
NATA Accredited Laboratory Number: 828

Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

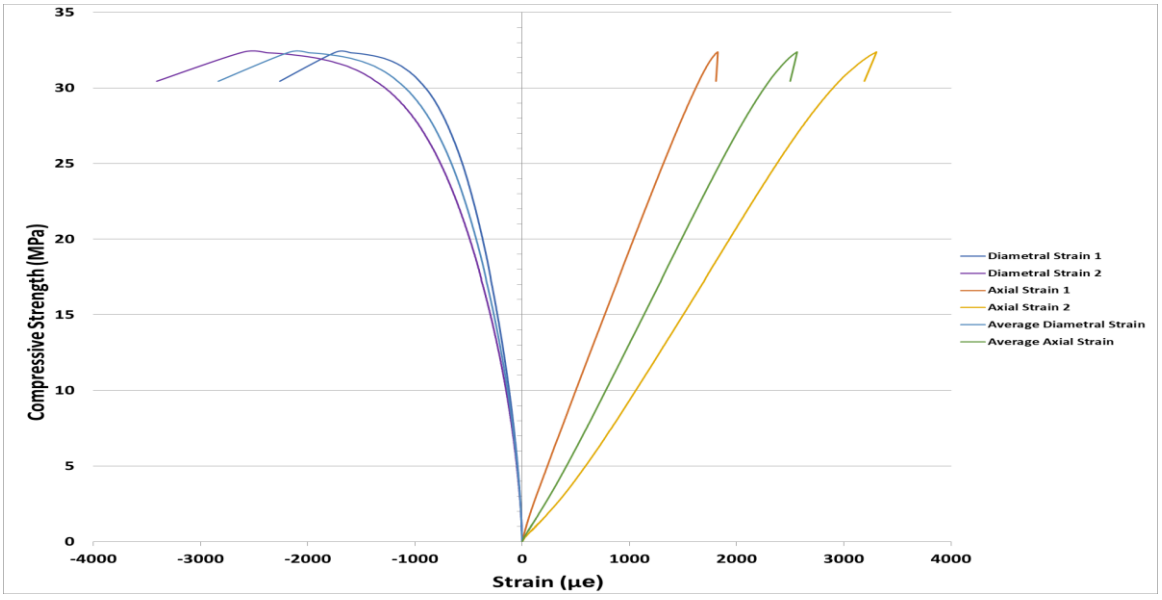
Lab Sample Number	NC-13644B	
Sample Location	BH104	
Depth (m)	20.86 - 21.00	
Rock Description	Sandstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	60.9	134
Height to Diameter Ratio	2.2 : 1	
Moisture Content (%)	6.2	
Wet Mass / Unit Volume (t/m3)	2.33	
Dry Mass / Unit Volume (t/m3)	2.19	
Test Duraton (sec)	777	
Rate of Displacement (kN/sec)	0.12	
Failure Mode	Mixed	
Uniaxial Compressive Strength (MPa)	**32.3**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**10.1**	
Poisson's ratio	**0.19**	
TANGENT MODULUS (35 - 65% load)		
Young's modulus (GPa)	**11.5**	
Poisson's ratio	**0.36**	

Before



After





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RESULTS OF UNIAXIAL COMPRESSIVE STRENGTH OF ROCK CORES YOUNG'S MODULUS AND POISSON'S RATIO

Client: The Trustee for Altis ARET Sub Trust 22
Project: ST LEONARDS, Berry & Holsworth St
Location: Crn Berry and Holsworth Street, St Leonards NSW

Project No: 210589.01
Report No: 210589.01_13644
Report Date: 26.09.2025
Date of Testing: 15.09.2025
Date Sampled: -

Approved Signatory: Peter Gorseski
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Accredited for Compliance with ISOIEC 17025 - Testing
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Young's Modulus + Poisson Ratio and UCS (< 50 MPa) AS 4133.4.3.2

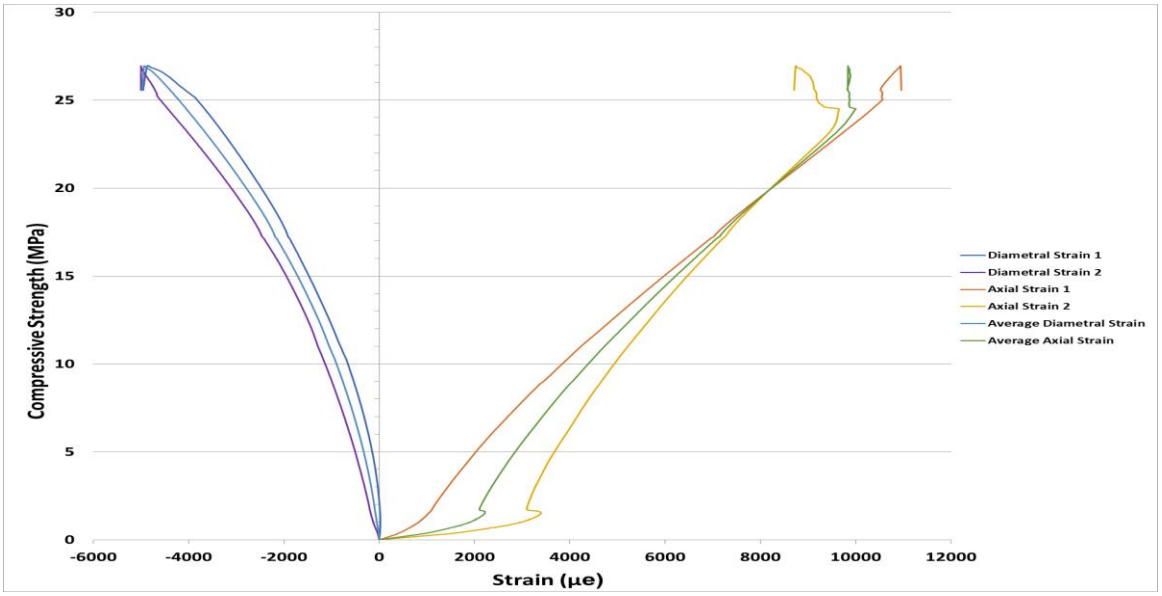
Lab Sample Number	NC-13644E	
Sample Location	BH106	
Depth (m)	22.32 - 22.55	
Rock Description	Siltstone	
Storage History	Wrapped in Plastic	
Conditioning	Tested as Received	
Compression Machine	Automax Multitest	
Measurement	Electric Strain Gauges	
Specimen Diameter / Height (mm)	60.8	159
Height to Diameter Ratio	2.6 : 1	
Moisture Content (%)	2.5	
Wet Mass / Unit Volume (t/m3)	2.58	
Dry Mass / Unit Volume (t/m3)	2.52	
Test Duraton (sec)	699	
Rate of Displacement (kN/sec)	0.11	
Failure Mode	Mixed	
Uniaxial Compressive Strength (MPa)	**26.9**	
SECANT MODULUS (50% load)		
Young's modulus (GPa)	**2.5**	
Poisson's ratio	**0.27**	
TANGENT MODULUS (25 - 55% load)		
Young's modulus (GPa)	**2.5**	
Poisson's ratio	**0.36**	

Before



After





Uniaxial Compressive Strength

Client:	The Trustee for Altis ARET Sub Trust 22
Project:	ST LEONARDS, Berry & Holsworth St
Location:	Crn Berry and Holsworth Street, St Leonards
Project No:	210589.01
Report No:	210589.01_13644
Report Date:	26.09.2025
Date of Testing:	15.09.2025
Date Sampled:	-
Sampling Method:	Sampled by Client

The results apply to the sample as received

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Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50 Mpa

Lab Sample Number	NC-13644A
Sample Location	BH104
Depth (m)	21.86 - 22.00
Rock Description	Siltstone
Storage History and Environment	Tested as Received
Failure Mode	Shear
Compression Machine	Automax Multitest
Duration of Test (seconds)	412
Average Diameter (mm)	60.8
Average Height (mm)	98.8
Height to Diameter Ratio	1.6 : 1
Rate of Displacement (kn/sec)	0.04
Moisture Content (%)	3.8
Wet Mass / Unit Volume (t/m^3)	2.56
Dry Mass / Unit Volume (t/m^3)	2.47
Uniaxial Compressive Strength (MPa)	**5.2**
Comments	

Before **After**



Uniaxial Compressive Strength

Client:	The Trustee for Altis ARET Sub Trust 22
Project:	ST LEONARDS, Berry & Holsworth St
Location:	Crn Berry and Holsworth Street, St Leonards
Project No:	210589.01
Report No:	210589.01_13644
Report Date:	26.09.2025
Date of Testing:	15.09.2025
Date Sampled:	-
Sampling Method:	Sampled by Client

The results apply to the sample as received

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Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50 Mpa

Lab Sample Number	NC-13644C
Sample Location	BH105
Depth (m)	26.17 - 26.30
Rock Description	Sandstone
Storage History and Environment	Tested as Received
Failure Mode	Shear
Compression Machine	Automax Multitest
Duration of Test (seconds)	775
Average Diameter (mm)	60.9
Average Height (mm)	135.1
Height to Diameter Ratio	2.2 : 1
Rate of Displacement (kn/sec)	0.12
Moisture Content (%)	6.1
Wet Mass / Unit Volume (t/m^3)	2.31
Dry Mass / Unit Volume (t/m^3)	2.18
Uniaxial Compressive Strength (MPa)	**32.2**
Comments	

Before **After**



Uniaxial Compressive Strength

Client:	The Trustee for Altis ARET Sub Trust 22
Project:	ST LEONARDS, Berry & Holsworth St
Location:	Crn Berry and Holsworth Street, St Leonards
Project No:	210589.01
Report No:	210589.01_13644
Report Date:	26.09.2025
Date of Testing:	15.09.2025
Date Sampled:	-
Sampling Method:	Sampled by Client

The results apply to the sample as received

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Uniaxial Compressive Strength of Rock Core AS 4133.4.2.2 < 50 Mpa

Lab Sample Number	NC-13644D
Sample Location	BH105
Depth (m)	24.00- 24.14
Rock Description	Sandstone
Storage History and Environment	Tested as Received
Failure Mode	Mixed
Compression Machine	Automax Multitest
Duration of Test (seconds)	450
Average Diameter (mm)	60.9
Average Height (mm)	114.5
Height to Diameter Ratio	1.9 : 1
Rate of Displacement (kn/sec)	0.25
Moisture Content (%)	4.5
Wet Mass / Unit Volume (t/m^3)	2.31
Dry Mass / Unit Volume (t/m^3)	2.21
Uniaxial Compressive Strength (MPa)	**38.8**
Comments	

Before **After**

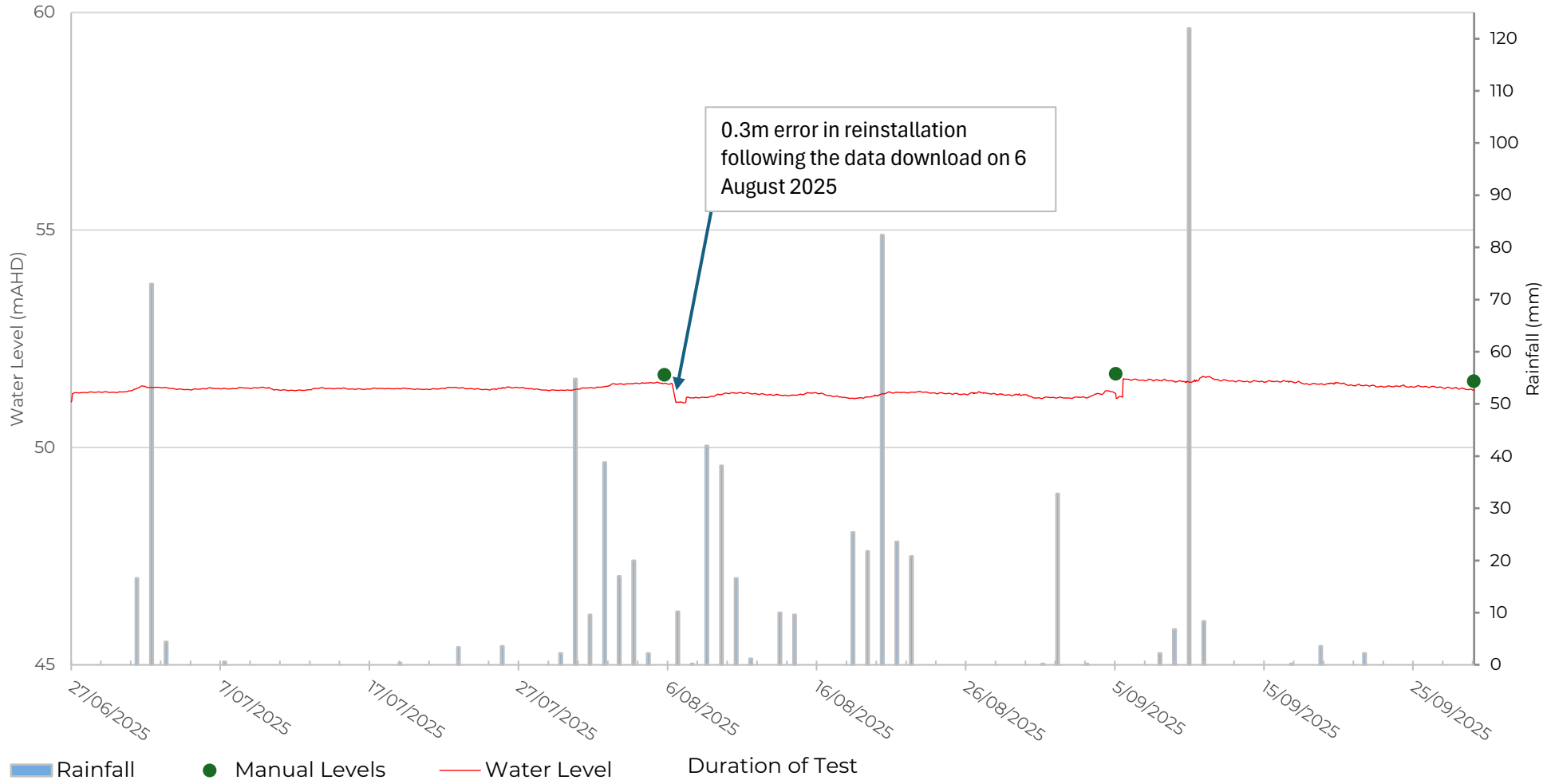




Appendix G

Groundwater Monitoring

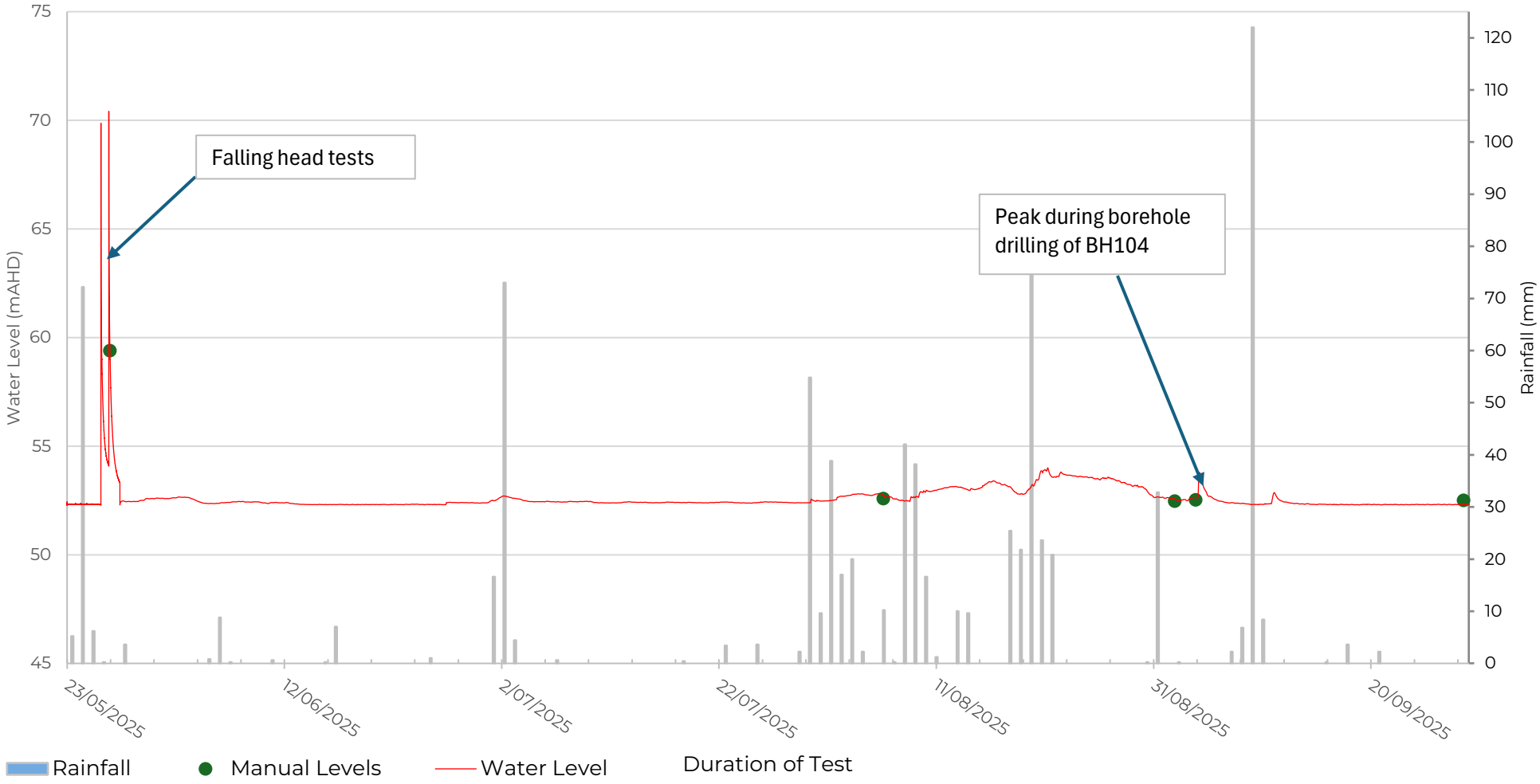
BH101 Groundwater Monitoring



Douglas PARTNERS | GROUNDED EXPERTISE

Borehole:	Well Depth: (mBGL)	From:	Drawn:
BH101	20.5	27/06/2025	CLB / ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
210589.01	68.2	29/09/2025	JCP

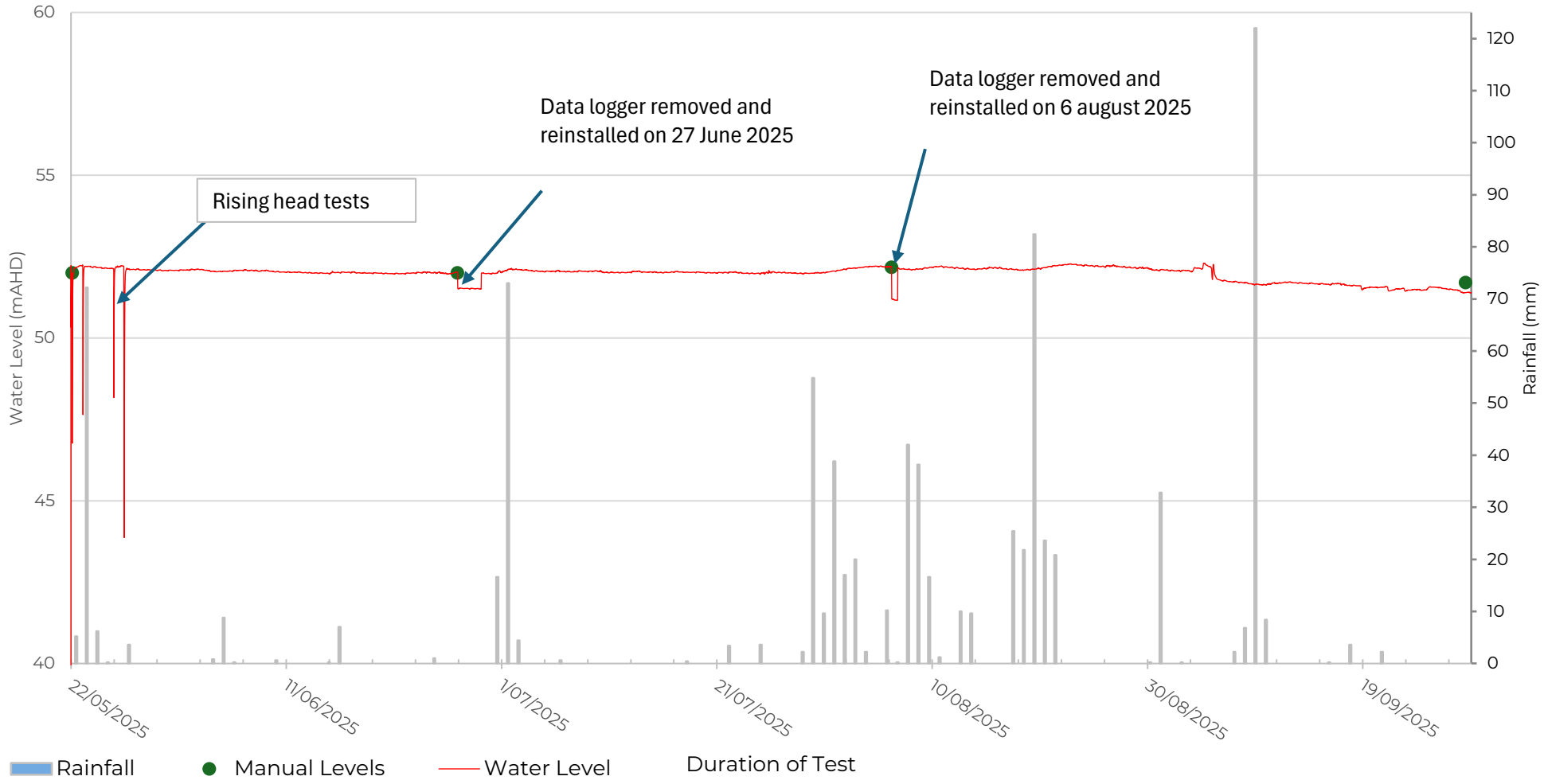
BH102 Groundwater Monitoring



Borehole:	Well Depth: (mBGL)	From:	Drawn:
BH102	19.45	22/05/2025	CLB / ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
210589.01	70.6	29/09/2025	JCP

Douglas PARTNERS | GROUNDED EXPERTISE

BH103 Groundwater Monitoring



Borehole:	Well Depth: (mBGL)	From:	Drawn:
BH103	30	22/05/2025	CLB / ECB
Project:	**Surface RL: (mAHD)**	**To:**	**Checked:**
210589.01	65.3	29/09/2025	JCP

Douglas PARTNERS | GROUNDED EXPERTISE