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## ALTON PROPERTY GROUP PTY LTD



## Geotechnical Investigation




93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW

# Document Control

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# 1. Introduction

## 1.1 Background

At the request of Alton Property Group Pty Ltd (the Client), EI Australia (EI) has carried out a Geotechnical Investigation (GI) for the proposed development at 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW (the Site).

This GI report has been prepared to provide advice and recommendations to assist in the preparation of designs for the proposed development. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P22516.5-Rev1, dated 16 May 2025.

## 1.2 Proposed Development

The following documents, supplied by the Client, were used to assist with the preparation of this GI report:

- A+ Design Group (2025) *Architectural Drawings*, Project: a24033, Drawing No.s, A201 to A204, latest Revision C, Dated: 19/12/2025 and
- SDG Land Development Solutions (2025) *Site Survey Plan*, Reference: 6884, Sheet 1 of 6 to 6 of 6, Issue: C, Dated: 22/02/2017.

Based on the provided documents, EI understands that the proposed development involves:

- The demolition of the existing site structures and the construction of four structures Building E, S N and W.
  - › Building E is proposed to be twenty-nine storeys high
  - › Building S is proposed to be twenty-three storeys high
  - › Building N is proposed to be thirty-five storeys high
  - › Building W is proposed to be twenty-six storeys high
- All four buildings are to be built over a common split two to three-level basement.
- The lowest basement level is proposed to have a Finished Floor Level (FFL) of between RL 110.6 m AHD, whilst upper level basement is proposed to be within RL 113.80 m AHD.
- A maximum Bulk Excavation Level (BEL) ranging between RL 110.3 m AHD for the lowest basement and RL 113.5 m AHD for the upper basement is assumed, which includes allowance for the construction of the basement slab.
- Due to the existing elevation difference within the site boundary, to achieve the BEL, excavation depths from approximately 4 m to 19 m Below Existing Ground Level (BEG) is expected. Locally deeper excavations may be required for footings, lift shafts, water tanks, and service trenches.
- The lowest basement (Basement 02) is proposed to have a minimum setback of 10 m, 31 m, 31 m and 57 m approximately from the northern, southern, eastern and western site boundaries. The upper basement (Basement 01) is proposed to have a minimum setback of approximately 6 m from all the site boundaries.

## 1.3 Objectives

The objective of the GI was to assess site surface and subsurface conditions at nine borehole locations, and to provide preliminary geotechnical advice and recommendations to assist in the design of the proposed development.

## 1.4 Fieldwork Methodology

The scope of works for the GI included:

- Preparation of a Work Health and Safety Plan;
- Review of relevant geological maps for the project area;
- Site walkover inspection by a Geotechnical Engineer to assess topographical features and site conditions;
- Scanning of proposed borehole locations for buried conductive services using a licensed service locator with reference to Before You Dig Australia (BYDA) plans;
- Auger drilling of nine boreholes (BH01M, BH02, BH03M, BH04, BH05, BH06, BH07, BH08M and BH09) by a track-mounted drill rig using solid flight augers equipped with a 'Tungsten-Carbide' (T-C) bit. The boreholes were auger drilled to depths as shown in **Table 3-1**. Following refusal on/within bedrock, the boreholes were continued using NMLC diamond coring techniques to termination depths ranging between 8.10m and 22.44m BEGL, as shown in **Table 3-1**. Borehole logs and rock core photographs are presented in **Appendix A**.
  - › Standard Penetration Testing (SPT) was carried out (as per AS 1289.6.3.1-2004), where possible, during auger drilling of the boreholes to assess soil strength/relative densities.
  - › Measurements of groundwater seepage/levels, where possible, in the augered sections of the boreholes during and shortly after completion of auger drilling;
  - › The strength of the bedrock in the augered sections of the boreholes was assessed by observation of the auger penetration resistance using a T-C drill bit and examination of the recovered rock cuttings. It should be noted that rock strengths assessed from augered boreholes are approximate and strength variances can be expected.
  - › The approximate surface levels shown on the borehole logs were interpolated from spot levels shown on the supplied survey plan. Approximate borehole locations are shown on Figure 2;
  - › Northing and easting data are presented in the detailed borehole logs in **Appendix A**.
- Continuation of all boreholes using NMLC diamond coring techniques to termination depths shown above in **Table 3-1**. The rock core photographs are presented in **Appendix A**;
- Borehole BH01M, BH03M and BH08M were converted into a groundwater monitoring well with a depth ranging from 5.5m to 13.2m) to allow for long-term groundwater monitoring.
  - › A pump-out test was carried out within monitoring wells one week after installation of the monitoring well to determine the groundwater inflows of the surrounding material;
- Remaining boreholes were backfilled with drilling spoils and capped with concrete upon completion;
- Soil and rock samples were sent to STS Geotechnics Pty Ltd (STS) and SGS Australia (SGS), which are National Australian Testing Authority (NATA) accredited laboratories, for testing and storage.
- Preparation of this GI report.

EI's Geotechnical Engineer was present full-time onsite to set out the borehole locations, direct the testing and sampling, log the subsurface conditions and record groundwater levels.

## 1.5 Constraints

The GI was limited by the intent of the investigation and the presence of existing site structures. The discussions and advice presented in this report are preliminary and intended to assist in the preparation of initial designs for the proposed development.

## 2. Site Description

### 2.1 Site Description and Identification

The site identification details and associated information are presented in **Table 2-1** below while the site locality is shown on **Figure 1**. An aerial photograph of the site is presented in **Plate 1** below.

**Table 2-1 Summary of Site Information**

Information	Detail
<b>Street Address</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW
<b>Lot and Deposited Plan (DP) Identification</b>	Lot 27 in DP 15399, Lot 21 to 22 in DP778595, Lot 1 and 4 in DP 531559, Lot 5 and 6 in DP705913, Lot 1 to 4 in DP581293, Lot 1 to 2 in DP 547897, Lot 1 to 2 in DP 591676, Lot 20 in DP15399, Lot 9 and 10 in DP 29141
<b>Brief Site Description</b>	At the time of our investigation, site consisted of combination of 18 lots with one to two storey brick and rendered dwelling. Paved driveway and vegetation within.
<b>Site Area</b>	The site area is approximately 17,623.6m <sup>2</sup> (based on the provided survey plan referenced above).
<b>Current Zoning</b>	MU1: Mixed Use (Source: The Hills Local Environmental Plan 2019)
<b>Development Control Plans</b>	The site is subject to The Hills Shire Council Development Control Plan (DCP) 2012 sections: <ul style="list-style-type: none"> <li>▪ Part B Section 5 – Residential Flat Buildings</li> <li>▪ Part B Section 6 – Business</li> <li>▪ Part C Section 1 - Parking</li> <li>▪ Part C Section 2 - Signage</li> <li>▪ Part C Section 3 - Landscaping</li> <li>▪ Part C Section 4 - Heritage</li> <li>▪ Part C Section 5 - Telecommunication Facilities</li> <li>▪ Part C Section 6 – Flood Control Lots</li> <li>▪ Part D Section 21, 93-107 Cecil Avenue and 9-10 Roger Avenue, Castle Hill.</li> </ul>
<b>State Survey Marks</b> <i>(Source: SDT Explorer)</i>	Six state survey marks are situated within close proximity (<250 m) to the site: <ul style="list-style-type: none"> <li>▪ SS62146D: on the intersection between Old Northern Road and Cecil Avenue (approximately 117 m north west);</li> <li>▪ SS180250: at the eastern junction of Old Northern Road and Cecil Avenue (approximately 107 m north west);</li> <li>▪ SS68503D: on the southern side of Cecil Avenue and at the front eastern side of 89 Cecil Avenue, Castle Hill (approximately 57 m north west);</li> <li>▪ SS180254 on the southern bend of Cecil Avenue and front of 93 Cecil Avenue, Castle Hill (approximately 14 m north west);</li> <li>▪ SS49024D on the road reserve, front of 95 Cecil Avenue, Castle Hill (approximately 5 m north) and</li> <li>▪ SS68502 on Cecil Avenue, adjacent to a road reserve and front of 107 Cecil Avenue, Castle Hill (approximately 5 m north)</li> </ul>



**Plate 1** Satellite image of the site (MetroMap, image dated 28 January 2026)

## 2.2 Local Land Use

The site is situated within an area of mixed use zoning. Current uses on surrounding land at the time of our presence on site are described in **Table 2-2** below. For the sake of this report, the site boundary adjacent to Cecil Avenue shall be adopted as the northern site boundary.

**Table 2-2 Summary of Local Land Use**

Direction Relative to Site	Land Use Description
<b>North</b>	Cecil Avenue, a two lane, asphalt-paved road. Beyond this are one to two-storey brick commercial buildings with no basements. Cecil Avenue is local road and appears to be in a good condition with its elevation sloping towards the north.
<b>East</b>	Property at 109 & 109A, a single and double storey brick dwelling with paved driveway and moderate vegetation throughout. The structures appeared to be in a good condition its topography slightly higher than the site.
<b>South</b>	Consists of numerous lots with one to two storey dwelling, dense vegetation and no basement within. The neighbouring land appeared to be within a lower elevation than the site with south dipping topography.
<b>West</b>	Consists of a single storey structure toward the front, a paved carpark towards the middle and a cemetery towards the south. The neighbouring land appeared to be within a higher elevation than the site with east dipping topography.

## 2.3 Regional Setting

The site topography and geological information for the locality is summarised in **Table 2-3** below.

**Table 2-3 Topographic and Geological Information**

Attribute	Description
<b>Topography</b>	The site is located on the southern side of the road within gently (0° to 10°), to moderately (10° to 18°), south eastern dipping topography with site levels varying from R.L. 132.61 at the north western site corner to R.L. 116.92at the south eastern site corner.
<b>Drainage</b>	Site drainage is likely to consist of mostly surface runoff in a southern and south eastern, following topography, into the municipal storm water system(via pit and pipe drainage)
<b>Soil Landscape</b>	<p>Information on regional soil-landscape conditions, referenced from the eSPADE spatial viewer application (corresponding to the Sydney 9130 Soil Landscape Series Sheet), indicates the site comprises the Glenorie (gn) unit, and is in close proximity to the boundary with Hawkesbury (ha) uphill to the east.</p> <p>The Gymea (gy) unit is described as:</p> <ul style="list-style-type: none"> <li>▪ An erosional soil forming on low rolling and steep hills.</li> <li>▪ Soils are typically shallow to moderately deep (&lt;1.0m) comprising erosionally deposited to residual soils.</li> <li>▪ Relevant limitations include seasonal waterlogging, and moderate reactive soil materials.</li> </ul>
<b>Regional Geology</b>	Information on regional sub-surface conditions, referenced from the NSW Seamless Geology dataset (Colquhoun et al., 2024, corresponding to the Sydney 1:100,000 Geological Series Sheet) indicates the site to be underlain by Ashfield Shale (Twia) Black to light grey shale and laminite.
<b>Acid Sulfate Soil (ASS) Risk</b> <i>(Source: eSPADE)</i>	<p>The NSW Government Department of Planning, Industry, and Environment <i>eSPADE</i> v2.2 website indicates that the site is also situated in an area of <i>No Known Occurrence</i>.</p> <p>Given the information above, the potential presence of ASS on the site can be considered to be low. Further assessments on ASS presence were deemed unwarranted.</p>
<b>Salinity</b> <i>(Source: SEED Map)</i>	<p>Reference to the Salinity Potential Western Sydney map through SEED Map indicates the site is located in an area of 'Moderate'.</p> <p><b>Note:</b> For sites subject to The Hills DCP 2012 Part B Section 7 – Industrial, areas mapped with having a potential salinity occurrence, will require site investigations to assess the actual salinity potential, and the collation of a saline soil management plan (SSMP).</p> <p>The site is not subject to DCP2012 Part B section 7 (see <b>Table 2-1</b>), and it is understood that proposed development is currently under planning stage, saline soils investigations and the collation of a SSMP have not been carried out as part of this GI.</p>



**Plate 2** Excerpt of geological map showing location of site.

## 3. Investigation Results

### 3.1 Stratigraphy

EI undertook intrusive investigations at the site by drilling nine boreholes (BH01M, BH02, BH03M, BH04, BH05, BH06, BH07, BH08M and BH09) using a track-mounted drill rig equipped with solid flight augers and 'Tungsten-Carbide' (T-C) bit. Boreholes were extended in bedrock with NMLC rock core drilling methods. The boreholes were drilled to depths as shown in **Table 3.1** below.

**Table 3-1 Augering and Rock Coring Depths**

Borehole ID	Surface RL (m AHD)	Augering		Rock Coring	
		Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)
BH01M	130.8	4.65	126.15	22.44	108.36
BH02	127.5	3.10	124.40	20.60	106.90
BH03M	122.6	5.30	117.30	11.20	111.40
BH04	128.5	3.05	125.45	20.55	107.95
BH05	126.2	4.34	121.86	18.30	107.90
BH06	123.0	6.40	116.60	15.00	108.00
BH07	125.5	4.60	120.90	18.30	107.20
BH08M	117.5	5.55	111.95	10.00	107.50
BH09	118.0	5.10	112.90	8.10	109.90

A summary of the subsurface conditions across the site, interpreted from the assessment results, is presented in Error! Reference source not found. below

A summary of the depth and elevation of the units observed in each borehole is provided in Error! Reference source not found. below.

More detailed descriptions of subsurface conditions at each borehole location are available on the borehole logs presented in **Appendix A**. The details of the methods of soil and rock classifications, explanatory notes and abbreviations adopted on the borehole logs are also in **Appendix A**.

**Table 3-2 Summary of Subsurface Conditions**

Unit	Material <sup>2</sup>	Depth to Top of Unit (m BEGL) <sup>1</sup>	RL of Top of Unit (m AHD) <sup>1</sup>	Observed Thickness (m)	Comments
1	Topsoil/Fill	Surface	117.5 to 130.8	0.5 to 1.0	Concrete pavements of 100 mm to 200 mm thickness in some areas. Underlain by Silty SAND and Sandy CLAY fill with traces of rootlets and gravels. Fill was assessed, based on our observations during drilling and SPT N Values to be moderately compacted;
2	Residual Soil	0.5 to 1.8	117.0 to 122.2	0.4 to 2.5	Silty CLAY, low to medium plasticity, firm to hard, with trace ironstone gravels, grading into weathered shale with depth. SPT values ranged from 4 to refusal indicated by hammer bounce;
3	Extremely (XW) to Distinctly Weathered (DW) Shale	1.2 to 3.0	116.1 to 125.0	1.1 to 6.51	XW-DW SHALE, very low strength to low strength; Occasional bands of medium strength observed in BH01M. Core loss were encountered at a depth(BEGL) of; <ul style="list-style-type: none"> <li>▪ BH02 – 3.93m to 4.13m,</li> <li>▪ BH05 – 5.6m to 5.77m &amp;</li> <li>▪ BH06 – 7.3m to 7.6m.</li> </ul> Core loss is inferred to be bands of decomposed or highly fractured material.
4	Distinctly Weathered (DW) Siltstone	3.1 to 6.1	115.9 to 124.4	0.8 to 2.5	DW SILTSTONE, medium to high strength. Encountered in BH02, BH04, BH07, BH08M and BH9 only.
5	Slightly Weathered (SW) Siltstone/Laminite	5.1 to 8.8	111.95 to 125.3	-	SW SILTSTONE and LAMINITE, high strength, with fine grained pale grey sandstone. Besides BH09, encountered within all the boreholes.
6	Slightly Weathered (SW) to Fresh (FR) Siltstone/Laminite	9.2 to 17.8	110.2 to 126.2	-	SW-FR SILTSTONE and LAMINITE, high strength with fine grained pale grey sandstone. Besides BH09, encountered within all the boreholes. Very thick layer of fresh fine grained sandstone encountered towards the end depth within BH01M, BH02 and BH03M

Note 1 Approximate depth and level at the time of our assessment. Depths and levels may vary across the site.

Note 2 For more detailed descriptions of the subsurface conditions, reference should be made to the borehole logs attached to Appendix A.

Note 3 Observed up to termination depth in all boreholes.

**Table 3-3 Depths and Elevation to Top of Units in Boreholes (mB EGL(mAHD))**

Unit	Material	BH01M	BH02	BH03M	BH04	BH05	BH06	BH07	BH08M	BH09
1	Fill	0 (130.8)	0 (128.0)	0 (122.6)	0 (128.0)	0 (126.2)	0 (123.0)	0 (125.5)	0 (117.5)	0 (118.0)
2	Residual Soil	0.6 (130.2)	1.0 (127.0)	0.8 (121.8)	0.5 (127.5)	0.6 (125.6)	1.8 (122.2)	0.6 (124.9)	0.5 (117.0)	0.8 (117.2)
3	XW-DW Shale	1.6 (129.2)	1.4 (126.6)	1.95 (120.65)	3.0 (125.0)	1.2 (125.0)	1.74 (121.26)	1.2 (124.3)	1.4 (116.1)	1.3 (116.7)
4	DW Siltstone	-	3.1 (124.4)	5.7 (115.9)	4.3 (123.7)	6.1 (120.1)	-	5.4 (120.1)	-	-
5	SW Siltstone/Laminate	5.5 (125.3)	8.8 (118.7)	7.6 (115.0)	5.9 (122.1)	-	8.25 (114.75)	-	5.55 (111.95)	5.1 (112.9)
6	SW-FR Siltstone/Laminite	15.7 (115.1)	10.4 (117.1)	9.2 (113.4)	17.8 (110.2)	9.6 (126.2)	11.95 (111.05)	10.9 (114.6)	-	-

### 3.2 Groundwater Observations

Groundwater seepage was observed during auger drilling of BH01M and BH08M only. The depth of groundwater seepage during augering is noted on the borehole logs in **Appendix A**.

**Table 3-4 Groundwater Measurements Within the Monitoring Wells**

Borehole ID	Groundwater Levels		
	Measurement Date	m BEGL	RL (m AHD)
BH01M	8/07/2025	5.8	125.0
BH03M	8/07/2025	2.43	120.17
BH08M	8/07/2025	1.3	116.7

#### 3.2.1 Rising Head Test

A Rising Head Test was completed on 8 July 2025 in the monitoring well installed in BH01M, BH03M and BH08M. The following procedure was adopted:

- The groundwater level within the well was initially recorded;
- The well was purged using a PVC bailer / an electrical groundwater pump;
- The rising groundwater level within the temporary well was measured at various time intervals for 1 hour.

The results were then used to estimate the permeability of the shale, siltstone and laminitic bedrock using the Hvorslev Method based on the borehole geometry. The initial inflows were high, which then quickly tapered off to lower inflows. The estimated permeability of the bedrock is summarised in **Table 3-5** below.

**Table 3-5 Summary of Rising Head Test Results**

Borehole ID	Screened Material	Estimated Permeability (m/s)
BH01M	SW-FR Siltstone/Laminate	$1.01 \times 10^{-7}$
BH03M	DW Siltstone	$1.33 \times 10^{-7}$
BH08M	XW-DW shale	$9.40 \times 10^{-8}$

### 3.3 Geotechnical Laboratory Testing – Soil

Four soil and two bulk samples were selected for laboratory testing to assess the following:

- Atterberg Limits and Linear Shrinkage
- Soil aggressivity (pH, chloride and sulfate content and electrical conductivity).
- Moisture Content;

#### 3.3.1 Laboratory Results – Atterberg Limits and Linear Shrinkage

A summary of the Atterberg Limits and Linear Shrinkage test results is provided in **Table 3-6** below. Laboratory test certificates are presented in **Appendix B**.

**Table 3-6 Summary of Laboratory Results – Atterberg Limits & Linear Shrinkage**

Test / Sample ID	BH01M_1.5-1.95	BH03M_1.5-1.95
Borehole ID	BH01M	BH03M
Sample Depth (mBEGL)	1.5-1.95	1.5-1.95

Test / Sample ID	BH01M_1.5-1.95	BH03M_1.5-1.95
Unit	2	2
Material <sup>1</sup>	Residual Soil	Residual Soil
USCS Description	Silty CLAY	Silty CLAY
Moisture Content (%)	13.4	14.1
Liquid Limit (%)	37	38
Plastic Limit (%)	21	20
Plasticity Index (%)	16	18
Linear Shrinkage (%)	8	9

Note 1 More detailed descriptions of the subsurface conditions at each borehole location are available on the borehole logs presented in Appendix A.

The Atterberg Limits results of the selected soil samples indicated they to be 'Cl' clays i.e. low to medium plasticity.

Based on a review of the Atterberg Limits and Linear Shrinkage results we have inferred the tested Cl clays to have a low shrink-swell potential.

### 3.3.2 Laboratory Results – Aggressivity Suite

A summary of the Aggressivity Suite (Soil) test results is provided in **Table 3-7** below. Laboratory test certificates are presented in **Appendix B**.

**Table 3-7 Summary of Laboratory Results – Aggressivity Suite (Soil)**

Test / Sample ID	BH01M_3.0-3.29	BH04_0.5-0.95	BH08M_1.5-1.7	BH09_0.5-0.95
Borehole ID	BH01M	BH04	BH08M	BH09
Sample Depth (mB EGL)	3.0-3.29	0.5-0.95	1.5-1.75	0.5-0.95
Unit	2	2	2	2
Material <sup>1</sup>	Residual Soil	Residual Soil	Residual Soil	Residual Soil
USCS Description	Silty CLAY	Silty CLAY	Silty CLAY	Silty CLAY
Chloride Cl (ppm)	8.8	5.2	52	24
Sulfate SO <sub>4</sub> (ppm)	47	100	39	51
pH	5.1	4.8	4.9	5.3
Electrical Conductivity (µS/cm)	40	73	70	33
Moisture Content (%)	13.3	16.6	7.1	19.7

Note 1 More detailed descriptions of the subsurface conditions at each borehole location are available on the borehole logs presented in Appendix A.

The assessment indicated low permeability soil was present above the groundwater table. In accordance with Tables 6.4.2(C) and 6.5.2(C) of AS 2159:2009 'Piling – Design and Installation', the results of the pH, chloride and sulfate content and electrical conductivity of the soil provided the following exposure classifications:

- 'Exposure Condition B' (for low permeable soils such as clay)
- 'Mild' for buried concrete structural elements;
- 'Non-Aggressive' for buried steel structural elements; and

- 'A2' classification for concrete in sulfate soils.

### 3.4 Laboratory Test Results – Rock

Seventy three (73) selected rock core samples were tested by STS Geotechnics Pty Ltd to determine the Point Load Strength Index ( $I_{s50}$ ) values to assist with rock strength assessment. The results of the testing are presented in the laboratory test reports (**Appendix B**) and reproduced on the attached borehole logs (**Appendix A**). The point load strength index tests correlated reasonably well with our field assessments of the rock strength.

A summary of the point load results, as well as field observations of defect spacing and seam occurrence from the borehole logging are presented **Table 3-8** below.

**Table 3-8 Summary of Laboratory Results & Field Observations (Rock)**

Unit	Material	Point Load Results ( $I_{s50}$ ) (MPa)		Defecting Spacing (mm)		Maximum Allowable Seams (%)
		Min	Max	Min	Max	
3	XW-DW Shale	0.41 <sup>1</sup>	1.0 <sup>3</sup>	0	50	0.16
4	DW Siltstone	0.23 <sup>2</sup>	2.2 <sup>2</sup>	30	710	0.1
5	SW Siltstone/Laminite	0.59 <sup>1</sup>	2.7 <sup>4</sup>	40	1480	0.3
6	SW-FR Siltstone/Laminite	0.93 <sup>2</sup>	3.3 <sup>5</sup>	40	1870	0.03

Note 1 Based on point load testing for BH01

Note 2 Based on point load testing for BH07

Note 3 Based on point load testing for BH05

Note 4 Based on point load testing for BH04

Note 5 Based on point load testing for BH02

## 4. Geotechnical Model

### 4.1 Geotechnical Units

Based on the review of the available background information in **Section 2**, and the results of the intrusive investigations and laboratory testing of **Section 3**, a site specific geotechnical model has been developed for the site.

The assumed geotechnical units and associated rock mass classification for the rock units at the site are indicated in **Table 4-1** below.

**Table 4-1 Adopted Geotechnical Model and Units**

Unit No.	Unit Name	Description	Observed Locations
1	Topsoil/Fill	Sandy Clay /Silty Sand, fine to coarse grained, low to medium plasticity clay.	ALL
2	Residual Soil	Silty CLAY, low to high plasticity, firm to hard.	ALL
3	Class V/IV Shale	XW-DW SHALE, grey to brown with extremely weathered seams.	ALL
4	Class III Siltstone	SW SILTSTONE: dark grey mainly high strength	ALL
5	Class II Siltstone/Laminite	FR-SW SILTSTONE/LAMINITE: fine grained pale grey sandstone with dark grey siltstone mainly high strength	ALL
6	Class I Siltstone/Laminite	FR – SILTSTONE/LAMINITE fine grained pale grey sandstone with dark grey siltstone mainly high strength	ALL, except BH09

### 4.2 Geotechnical Design Parameters

Based on the geotechnical model presented in **Table 4-1** above, the adopted geotechnical design parameters for the site are indicated in **Table 4-2** below.

**Table 4-2 Geotechnical Design Parameters**

<b>Material <sup>1</sup></b>	<b>Unit 1 Fill</b>	<b>Unit 2 Residual Soil</b>	<b>Unit 3 Class V/IV Shale</b>	<b>Unit 4 Class III Siltstone</b>	<b>Unit 5 Class II Siltstone/Laminite</b>	<b>Unit 6 Class I Siltstone/Laminite</b>
RL of Top of Unit (m AHD) <sup>2</sup>	117.5 to 130.8	117.0 to 130.2	116.1 to 129.2	111.95 to 123.90	111.15 to 122.0	108.60 to 125.10
Bulk Unit Weight (kN/m <sup>3</sup> )	18	17	23	24	24	24
Friction Angle, $\phi'$ (°)	27	24	15	35	25	15
Undrained Cohesion, $c_u$ (kPa)	-	5	40	150	250	400
Young's Modulus, $E'$ (MPa)	5	10	15	300	1000	2000
Earth Pressure at rest, $K_o$ <sup>3</sup>	0.55	0.59	0.74	0.43	0.58	0.74
Active Earth Pressure, $K_a$ <sup>3</sup>	0.38	0.42	0.59	0.27	0.41	0.59
Passive Earth Pressure, $K_p$ <sup>3</sup>	2.66	2.37	1.7	3.69	2.46	1.7
Allowable Bearing Pressure (kPa) <sup>5</sup>	-	-	700	3500	5000	8000
Allowable Shaft Adhesion in Compression (kPa)	-	-	70	350	500	800
Allowable Shaft Adhesion in Uplift (kPa)	-	-	35	175	250	400
Allowable Toe Resistance (kPa)	-	-	-	500	1000	3000
Allowable Bond Stress (kPa)	-	-	50	250	300	500
Earthquake Site Risk Classification	AS 1170.4:2007 indicates earthquake subsoil Class $C_e$ .(Shallow Soil) AS 1170.4:2007 indicates the hazard factor (z) for Sydney is 0.08.					

Note 1 More detailed descriptions of subsurface conditions are available on the borehole logs in Appendix A.

Note 2 Approximate levels of top of unit at the time of our investigation. Levels may vary across the site.

Note 3 Earth pressures are provided on the assumption that the ground behind the retaining walls is horizontal.

Note 4 Side adhesion values given assume there is intimate contact between the pile and foundation material and should achieve a clean socket roughness category R2 or better. Design engineer to check both 'piston pull-out' and 'cone liftover' mechanics in accordance with AS4678-2002 Earth Retaining Structures.

Note 5 To adopt these parameters we have assumed that:

- a. Footings have a nominal socket of at least 0.3m, into the relevant founding material;

- b. For piles, there is intimate contact between the pile and foundation material (a clean socket roughness category of R2 or better);
- c. Potential soil and groundwater aggressivity will be considered in the design of piles and footings;
- d. Piles should be drilled in the presence of a Geotechnical Engineer prior to pile construction to verify that ground conditions meet design assumptions. Where groundwater ingress is encountered during pile excavation, concrete is to be placed as soon as possible upon completion of pile excavation. Pile excavations should be pumped dry of water prior to pouring concrete, or alternatively a tremmie system could be used;
- e. The bases of all pile, pad and strip footing excavations are cleaned of loose and softened material and water is pumped out prior to placement of concrete;
- f. The concrete is poured on the same day as drilling, inspection and cleaning.

Note 6 The allowable bearing pressures given above are based on serviceability criteria of settlements at the footing base/pile toe of less than or equal to 1% of the minimum footing dimension (or pile diameter).

## 5. Recommendations

### 5.1 Geotechnical Considerations

Based on the results of the assessment, we consider the following to be the main geotechnical issues for the proposed development:

- Basement excavation and retention;
- Presence of sensitive assets (Sydney Water);
- Rock excavation and vibration;
- Groundwater within the depth of the excavation;
- Foundation design for building loads

### 5.2 Dilapidation Surveys

Prior to excavation and construction, we recommend that detailed dilapidation surveys be carried out on all structures and infrastructures surrounding the site that falls within the zone of influence of the excavation to allow assessment of the recommended vibration limits. The zone of influence of the excavation is defined by a distance back from the excavation perimeter, is typically twice the total depth of the excavation.

With regards to the proposed development for the site where bulk excavations are up to 19 m BEGL, we note the Class III Siltstone occurs at approximately 5 m depth BEGL. Due to relatively shallow depth to shale bedrock which should limit the lateral effects of the excavation, a zone of influence of 1x the total depth of excavation of up to 19 m could be applicable.

A dilapidation survey report would provide a record of existing conditions prior to commencement of the work. A copy of each report should be provided to the adjoining property owners. The reports should be carefully reviewed prior to demolition and construction.

### 5.3 Excavation Methodology

#### 5.3.1 Excavation Assessment

Prior to any excavation commencing, we recommend that reference be made to the Safe Work Australia Excavation Work Code of Practice, dated January 2020.

EI assumes that the proposed development will require a BEL of RL 110.3 m AHD for the lowest basement and 113.5 m AHD for the upper basement is assumed, which includes allowance for the construction of the basement slab. Locally deeper excavations may be required for footings, lift shafts, water tanks, and service trenches.

Based on the borehole logs, the proposed basement excavations will therefore extend through all units as outlined in **Table 4-1 Error! Reference source not found.** As such, an engineered retention system must be installed prior to excavation commencing to support all the overburden profile.

Units 1 (Topsoil/Fill) and 2 (Residual clay) could be excavated using buckets of large earthmoving Hydraulic Excavators, particularly if fitted with 'Tiger Teeth' for excavations in Unit 3 (Class V/IV shale). Excavation of Unit 4 (Class III Siltstone) or better units may present hard or heavy ripping, or "hard rock" excavation conditions. Ripping would require a high capacity and heavy bulldozer for effective production. Wear and tear should also be allowed for. The use of a smaller size bulldozer will result in lower productivity and higher wear and tear, and this should be allowed for. Alternatively, hydraulic rock breakers, rock saws, ripping hooks or rotary grinders could be used, though productivity would be lower and equipment wear increased, and this should be allowed for.

Due to the scale of proposed excavation, rock hammers will be required for the excavation of the bedrock, excavation should commence away from the adjoining structures and the transmitted vibrations monitored to assess how close the hammer can operate to the adjoining structures while maintaining transmitted vibrations within acceptable limits. To fall within these limits, we recommend that the size of rock hammers do not exceed a medium sized rock hammer, say 900 kg, and be trialled prior to use. The transmitted vibrations from rock hammers should be measured to determine how close each individual hammer can operate to the adjoining buildings.

The vibration measurements can be carried out using either an attended or an unattended vibration monitoring system. An unattended vibration monitoring system must be fitted with an alarm in the form of a strobe light or siren or alerts sent directly to the site supervisor to make the plant operator aware immediately when the vibration limit is exceeded. The vibration monitor must be set to trigger the alarm when the overall Peak Particle Velocity (PPV) exceeds set limits outlined by a vibration monitoring plan. Reference should be made to **Appendix C** for a guide to acceptable limits of transmitted vibrations.

If it is found that the transmitted vibrations by the use of rock hammers are unacceptable, then it would be necessary to change to a smaller excavator with a smaller rock hammer, or to a rotary grinder, rock saws, jackhammers, ripping hooks, chemical rock splitting and milling machines. Although these are likely to be less productive, they would reduce or possibly eliminate risks of damage to adjoining properties through vibration effects transmitted via the ground. Such equipment would also be required for detailed excavation, such as footings or service trenches, and for trimming of faces. Final trimming of faces may also be completed using a grinder attachment rather than a rock breaker in order to assist in limiting vibrations. The use of rotary grinders generally generates dust and this may be suppressed by spraying with water.

To assist in reducing vibrations and over-break of the shale/laminite, we recommend that initial saw cutting of the excavation perimeters through the bedrock may be provided using rock saw attachments fitted to the excavator. Rock sawing of the excavation perimeter has several advantages as it often reduces the need for rock bolting as the cut faces generally remain more stable and require a lower level of rock support than hammer cut excavations, ground vibrations from rock saws are minimal and the saw cuts will provide a slight increase in buffer distance for use of rock hammers. However, the effectiveness of such approach must be confirmed by the results of vibration monitoring.

Also, there is a potential for poorly oriented defects within the excavated bedrock to result in localized rock slide/topple failure with potential impact to the work site or the adjacent structures. However through selection of suitable excavation equipment, geotechnical inspections and mapping during the excavation works along with the installation of support measures as determined necessary by the inspections, the risk from the proposed works can be maintained within 'Acceptable' levels. In addition, we recommend that only excavation contractors with appropriate insurances and experience on similar projects be used. The contractor should also be provided with a copy of this report to make his own judgement on the most appropriate excavation equipment.

Groundwater seepage monitoring should be carried out during bulk excavation works and prior to finalising the design of a pump out facility. Outlets into the stormwater system will require Council approval.

Furthermore, any existing buried services, which run below the site, will require diversion prior to the commencement of excavation or alternatively be temporarily supported during excavation, subject to permission or other instructions from the relevant service authorities. Enquiries should also be made for further information and details, such as invert levels, on the buried services.

### 5.3.2 Excavation Monitoring

Consideration should be made to the impact of the proposed development upon neighbouring structures, roadways and services. Basement excavation retention systems should be designed so as to limit lateral deflections.

Contractors should also consider the following limits associated with carrying out excavation and construction activities:

- Limit lateral deflection of temporary or permanent retaining structures;
- Limit vertical settlements of ground surface at common property boundaries and services easement; and
- Limit Peak Particle Velocities (PPV) from vibrations, caused by construction equipment or excavation, experienced by any nearby structures and services.

Monitoring of deflections of retaining structures and surface settlements should be carried out by a registered surveyor at agreed points along the excavation boundaries and along existing building foundations / services / pavements and other structures located within or near the zone of influence of the excavation. Owners of existing services adjacent to the site should be consulted to assess appropriate deflection limits for their infrastructures. Measurements should be taken in the following sequence:

- Before commencing installation of retaining structures where appropriate to determine the baseline readings. Two independent sets of measurements must be taken confirming measurement consistency;
- After installation of the retaining structures, but before commencement of excavation;
- After excavation to the first row of supports or anchors, but prior to installation of these supports or anchors;
- After excavation to any subsequent rows of supports or anchors, but prior to installation of these supports or anchors;
- After excavation to the base of the excavation;
- After de-stressing and removal of any rows of supports or anchors; and
- One month after completion of the permanent retaining structure or after three consecutive measurements not less than a week apart showing no further movements, whichever is the latter.

## 5.4 Groundwater Considerations

Groundwater was observed in all monitoring wells as detailed in **Table 3-4**, all of which are above the lowest BEL of RL 110.3 m AHD for the lowest basement (Basement 02) and RL 113.5 m AHD for the upper level basement (Basement 01).

It is noted that based on the measured water level being within the shale bedrock, this is likely to be perched groundwater. Hence, we expect that some minor seepage inflows into the excavation along the soil/rock interface and through any defects within the underlying bedrock (such as jointing, and bedding planes, etc.) particularly following a period of heavy rainfall. Any groundwater inflows into the excavation should not have an adverse impact on the proposed development or on the neighbouring sites and should be manageable (A Plaxis model should be designed to assess and confirm the total volume of water inflow into the excavation). The initial flows into the excavation may be locally high, but would be expected to decrease considerably with time as the bedding seams/joints are drained. We recommend that monitoring of seepage be implemented during the excavation works to confirm the capacity of the drainage system.

We expect that any seepage that does occur will be able to be controlled by a conventional sump and pump system. We recommend that a sump-and-pump system be used both during construction and for permanent groundwater control below the basement floor slab.

In the long term, drainage should be provided behind all basement retaining walls, around the perimeter of the basement and below the basement slab. Relieve valves in basement slab should be installed to enable relief of upward hydrostatic pressures should groundwater levels rise and connected to a pump as appropriate to remove the water. The completed excavation should be inspected by the hydraulic engineer to confirm that adequate drainage has been allowed for. Drainage should be connected to the sump-and-pump system and discharging into the stormwater system. The permanent groundwater control system should take into account any possible soluble substances in the groundwater which may dictate whether or not groundwater can be pumped into the stormwater system.

The design of drainage and pump systems should take the above issues into account along with careful ongoing inspections and maintenance programs.

Further assessment of the hydrogeological conditions at the site will be required to determine whether a drained basement or a tanked basement is to be considered for the long-term groundwater management, including: additional intrusive investigations and installation of additional monitoring wells (if required); groundwater seepage analysis (GSA); long-term groundwater monitoring (minimum three months); and groundwater laboratory testing to assess water quality. Reference should be made to Department of Planning and Environment (DPE) guidelines "Minimum requirements for building site groundwater investigation and reporting", dated October 2022 with regards to the additional investigations, monitoring, and analysis required. EI should be contacted for further advice for the approval process for a drained basement.

## 5.5 Excavation Retention

### 5.5.1 Support Systems

From a geotechnical perspective, it is critical to maintain the stability of all adjacent structures and infrastructures during demolition, excavation and construction works.

Based on the provided architectural plans, the lowest basement (Basement 02) is proposed to have a minimum setback of 10 m, 31 m, 31 m and 57 m approximately from the northern, southern, eastern and western site boundaries. The upper basement (Basement 01) is proposed to have a setback of approximately 6.0 m from all the site boundaries.

Based on the depth of the excavation, the encountered subsurface conditions and limited setbacks, temporary batters are not recommended for this site. The close proximity of the surrounding buildings, the encountered subsurface conditions, and the required excavation depth, temporary batters are not recommended for this site. Unsupported vertical cuts of the soil are not recommended for this site as these carry the risk of potential slumping/collapse especially after a period of wet weather. Slumping/collapse of the material may result in injury to personnel and/or damage to nearby structures/infrastructures and equipment.

The retention system will need to be installed to depths which satisfy stability, piping, founding and groundwater cut-off considerations. We recommend that the cut-off wall be installed to socket in to Unit 4 (Class III Siltstone). Anchors/props and shotcrete must be installed progressively as excavation proceeds.

Working platforms may also be required for the proposed development. The design of a working platform would be separate to the recommendations of the GI report, but can be commissioned with EI if required.

Appropriate subsurface drainage should be installed to mitigate against the build-up of hydrostatic pressures behind the retaining wall.

The existence of significant horizontal in-situ stresses in bedrock, particularly in the Sydney Basin, is well established. The release of such stresses during the basement excavation may cause adverse impact on the stability of the excavation faces and thus increase the movements. Monitoring of several deep excavations within sandstone and shale in the Sydney region indicates that the lateral displacement at the top of the excavation is generally between 0.5 mm

to 2 mm per meter depth of excavation. As the maximum depth of excavation into siltstone/laminate is more than 10 m, a lateral deflection at the crest of the excavation between 5 mm to 20 mm can be expected which will reduce in a stepped fashion to zero at the bulk excavation level. Monitoring of the lateral movement as the excavation progresses is recommended. An assessment of such movements and their impact can be carried out using finite element software.

Bored piles are considered to be the most suitable for this site. Tremie pumps may be required where high groundwater seepage inflows are present during the drilling of the bored piles. However, relatively large capacity piling rigs will be required for drilling through the sandstone bedrock. The proposed pile locations should take into account the presence of buried services. Further advice should be sought from prospective piling contractors who should be provided with a copy of this report.

### 5.5.2 Excavation adjacent to Sydney Water

As per Before You Dig (BYDA), Sydney Waters plans, (Job No.: 502220256, DBYD Sequence No.: 255259495), 150 mm Vitrified Clay (VC) underlies premises extending into the neighbouring properties.

Based on scale of proposed excavation, the existing assets will need to be modified; therefore Sydney Water will need to be contacted prior to any excavation work to prevent damages to the system. As part of that engagement a Specialist Engineering Assessment (SEA) may be requested by Sydney Water. The SEA will involve the development of a geotechnical subsurface model using PLAXIS 2D along the site boundary that is adjacent to the Sydney Water asset i.e. the zone of influence. The model will be used to predict the likely movements of the shoring wall and required monitoring and contingency plan.

### 5.5.3 Retaining Wall Design Parameters

Design parameters for static design of temporary and permanent retaining walls at the subject site are provided in **Table 4-2**. EI note that the parameters, particularly with determining lateral earth pressures, are for preliminary planning purposes. We recommend that detailed analysis such as the use of finite element analysis software be used to design retaining walls.

Further to the design parameters of **Table 4-2**, EI provide the following supplementary advice

- For progressively anchored or propped walls where minor movements can be tolerated (provided there are no buried movement sensitive services), we recommend the use of a trapezoidal earth pressure distribution of  $5H$  kPa for soil, where  $H$  is the retained height in meters. These pressures should be assumed to be uniform over the central 50% of the support system, tapering to nil at top and bottom;
- For progressively anchored or propped walls which support areas which are highly sensitive to movement (such as areas where movement sensitive structures or infrastructures or buried services are located in close proximity), we recommend the use of a trapezoidal earth pressure distribution of  $8H$  kPa for soil, where 'H' is the retained height in meters. These pressures should be assumed to be uniform over the central 50% of the support system, tapering to nil at top and bottom;
- For progressively anchored or propped walls where minor movements can be tolerated (provided there are no buried movement sensitive services), we recommend the use of a rectangular earth pressure distribution of  $6H$  kPa for the soil profile, where  $H$  is the retained height in meters;
- All surcharge loading affecting the walls (including from construction equipment, construction loads, adjacent high level footings, etc.) should be adopted in the retaining wall design as an additional surcharge using an 'at rest' earth pressure coefficient,  $K_0$ .
- The retaining walls should be designed as drained, and measures are to be taken to provide complete and permanent drainage behind the walls. Strip drains protected with a non-woven geotextile fabric should be used behind the reinforced shotcrete infill panels for

soldier pile walls. Alternatively, for the contiguous pile walls, weepholes comprising 20 mm diameter, slotted PVC pipes installed into holes or gaps between adjacent piles at 1.2 m centres (horizontal and vertical), may be used. The embedded pipes must, however, be wrapped with a non-woven geotextile fabric (such as Bidim A34) to act as a filter against subsoil erosion;

- For piles embedded into Unit 4 or better, the allowable lateral toe resistance values outlined in **Table 4-2** may be adopted. These values assume excavation is not carried out within the zone of influence of the wall toe and the rock does not contain adverse defects etc. The upper 0.3m depth of the socket should not be taken into account to allow for tolerance and disturbance effects during excavation.
- If temporary anchors extend beyond the site boundaries, then permission from the neighbouring properties would need to be obtained prior to installation. Also, the presence of neighbouring basements and/or services and their levels must be confirmed prior to finalising anchor design.
- Anchors should have their bond length within Unit 3 or better. For the design of anchors bonded into Unit 3 or better, the allowable bond stress value outlined in Table 4-2 may be used, subject to the following conditions:
  - › Anchor bond lengths of at least 3 m behind the 'active' zone of the excavation (taken as a 45 degree zone above the base of the excavation) is provided;
  - › Overall stability, including anchor group interaction, is satisfied;
  - › All anchors should be proof loaded to at least 1.25 times the design working load before locking off at about 80% of their working load. Such proof loading is to be witnessed by and engineer independent of the anchoring contractor.
  - › Lift-off tests should be carried out on at least 10% of the anchors 24 to 48 hours following locking off to confirm that the anchors are holding their load. Usually anchors are commissioned on design and construct basis so that failure of anchors to hold their load does not then become a contractual issue. We recommend that only experienced contractors be considered for anchor design, specification and installation with appropriate insurances;
  - › If permanent anchors are to be used, these must have appropriate corrosion provisions for longevity.

## 5.6 Foundations

Considering the scale of the proposed buildings, it is envisaged that building loads would need to be transferred to the bedrock. Bedrock will be encountered at bulk excavation levels within the building footprint, and therefore, there is a potential for shallow spread footings founded below the BEL. Deep footings may be required where bedrock of higher bearing pressures are deeper than about 1 m below the BEL.

### 5.6.1 Shallow Footings in Rock

Following bulk excavation to RL 110.3 m AHD for the lowest basement and RL 113.5 m AHD for the upper basement, we expect predominately Unit 5 (Class II Siltstone/Laminite) material to be exposed at BEL.

It is recommended that all footings for the building be founded within the siltstone/laminite bedrock of similar strength of at least Unit 5 (Class II Siltstone/Laminite) or 6 (Class I Siltstone/Laminite) to provide uniform support and reduce the potential for differential settlements. Where Unit 5 bedrock is not encountered at BEL (excavation for the upper level basement towards the eastern side of the site) the proposed development may be supported utilising wider footing extending deeper within Unit 3/4 (Class V/IV/III Siltstone/Laminite) bedrock.

Pad or strip footings founded within Unit 5 may be preliminarily designed for an allowable bearing capacity of 5,000 kPa, based on serviceability.

Geotechnical inspections of foundations are recommended to determine that the required bearing capacity has been achieved and to determine any variations that may occur between the boreholes and inspected locations.

For footings designed for higher bearing capacities of 6000 kPa/10,000 kPa or better, EI recommends that spoon tests are completed on at least 1/3 / 100% of the footings. Spoon tests involve the drilling of a small core hole through the base of the footing to a depth of 1.5 times the minimum footing width, and a spoon is used to measure the locations and thicknesses of any seams to confirm the bedrock class.

## 5.7 Basement Floor Slab

Following bulk excavations for the proposed lowest basement, siltstone/laminite bedrock is expected to be exposed at the basement floor BEL. Interpreted extremely weathered shale is expected to be encountered follow the bulk excavation of upper level basement that extends beyond the premises of lowest basement towards the east.

Following the removal of all loose and softened materials, we recommend that underfloor drainage be provided and should comprise a strong, durable, single sized washed aggregate such as 'blue metal gravel'. Joints in the concrete floor slab should be designed to accommodate shear forces but not bending moments by using dowelled and keyed joints. The basement floor slab should be isolated from columns. The completed excavation should be inspected by the hydraulic engineer to confirm the extent of the drainage required.

In addition, a system of sub-soil drains comprising a durable single sized aggregate with perforated drains/pipes leading to sumps should be provided. The basement floor slab should be isolated from columns.

Permission may need to be obtained from Council and WaterNSW for any permanent discharge of seepage into the drainage system. Given the subsurface conditions, we expect that seepage volumes would be low and within acceptable limits manageable by drainage systems. However, if permission for discharge is not obtained, the basement may need to be designed as a tanked basement.

## 6. Further Geotechnical Inputs

Below is a summary of the recommended additional work that needs to be carried out:

- Dilapidation surveys;
- Undertake a Groundwater Seepage Analysis (GSA) using Finite Element Analysis (FEA) software, such as PLAXIS, to estimate the total water flow within the proposed excavation and the settlements resulting from groundwater drawdown.
- Design of working platforms (if required) for construction plant by an experienced and qualified geotechnical engineer;
- Classification of all excavated material transported off site;
- Witnessing installation of support measures and proof-testing of anchors (if required).
- Geotechnical inspections of all new footings/piles by an experienced geotechnical professional before concrete or steel are placed to verify their bearing capacity and the in-situ nature of the founding strata; and
- Ongoing monitoring of groundwater inflows into the bulk excavation;

We recommend that a meeting be held after initial structural design has been completed to confirm that our recommendations have been correctly interpreted. We also recommend a meeting at the commencement of construction to discuss the primary geotechnical issues and inspection requirements.

## 7. Statement of Limitations

This report has been prepared for the exclusive use of Brittany Schrader and Alton Property Group Pty Ltd who is the only intended beneficiary of EI's work. The scope of the assessment carried out for the purpose of this report is limited to those agreed with Brittany Schrader and Alton Property Group Pty Ltd

No other party should rely on the document without the prior written consent of EI, and EI undertakes no duty, or accepts any responsibility or liability, to any third party who purports to rely upon this document without EI's approval.

EI has used a degree of care and skill ordinarily exercised in similar investigations by reputable members of the geotechnical industry in Australia as at the date of this document. No other warranty, expressed or implied, is made or intended. Each section of this report must be read in conjunction with the whole of this report, including its appendices and attachments.

The conclusions presented in this report are based on a limited investigation of conditions, with specific sampling and test locations chosen to be as representative as possible under the given circumstances.

EI's professional opinions are reasonable and based on its professional judgment, experience, training and results from analytical data. EI may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified by EI.

EI's professional opinions contained in this document are subject to modification if additional information is obtained through further investigation, observations, or validation testing and analysis during construction. In some cases, further testing and analysis may be required, which may result in a further report with different conclusions.

We draw your attention to the document "Important Information", which is included in **Appendix D** of this report. The statements presented in this document are intended to advise you of what your realistic expectations of this report should be. The document is not intended to reduce the level of responsibility accepted by EI, but rather to ensure that all parties who may rely on this report are aware of the responsibilities each assumes in so doing.

Should you have any queries regarding this report, please do not hesitate to contact EI.

## References

- AS1289.6.3.1:2004, Methods of Testing Soils for Engineering Purposes, Standards Australia.
- AS1726:2017, *Geotechnical Site Investigations*, Standards Australia.
- AS2159:2009, *Piling – Design and Installation*, Standards Australia.
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- Nicolson, R. (for WSROC). (2003, amended 2004). *Western Sydney Salinity Code of Practice*.
- NSW Department of Finance and Service, Spatial Information Viewer, [maps.six.nsw.gov.au](https://maps.six.nsw.gov.au).
- Safe Work Australia Excavation Work Code of Practice, dated January 2020 – WorkCover NSW
- The Hills Shire Council. (2012, amended). *The Hills Development Control Plan 2012: Part B – Section 7: Industrial. The Hills Shire Council*

## Abbreviations

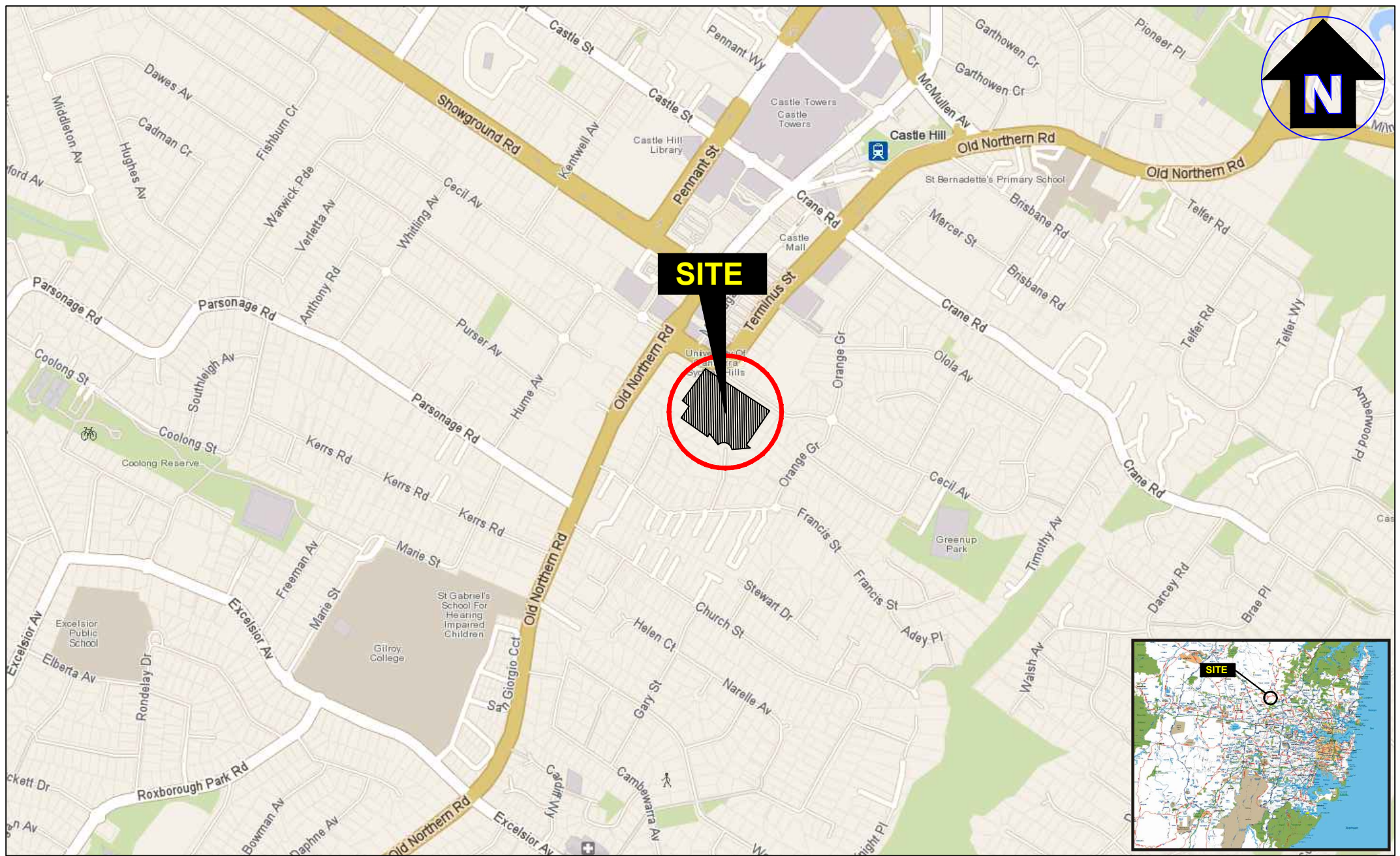
AS	Australian Standard
BEL	Bulk Excavation Level
B EGL	Below Existing Ground Level
BH	Borehole
DBYD	Dial Before You Dig
DP	Deposited Plan
EI	EI Australia
GI	Geotechnical Investigation
NATA	National Association of Testing Authorities, Australia
RL	Reduced Level
SPT	Standard Penetration Test
T-C	Tungsten-Carbide
UCS	Unconfined Compressive Strength

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## Figures

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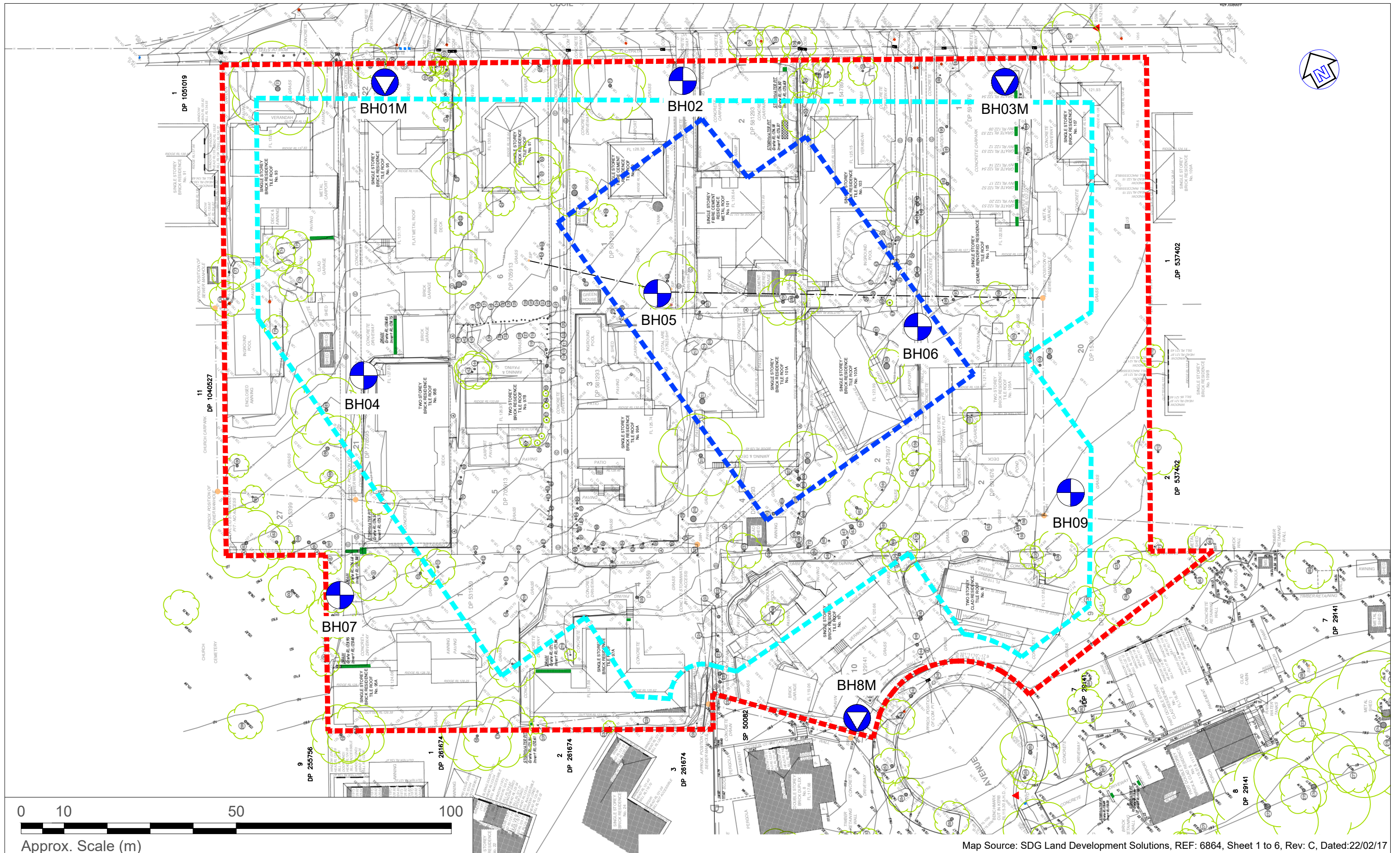
- Figure 1 Site Locality Plan
- Figure 2 Borehole Location Plan



**SITE**



Drawn:	J.O.
Approved:	J.S.
Date:	13-12-24
Scale:	Not To Scale



Map Source: SDG Land Development Solutions, REF: 6864, Sheet 1 to 6, Rev: C, Dated:22/02/17

- LEGEND (All Locations are Approximate)**
- - - Site Boundary
  - - - Proposed Basement Boundary (B2)
  - - - Proposed Basement Boundary (B1)
  - Borehole Location
  - Borehole / Monitoring Well Location



Drawn:	M.S
Approved:	G.P
Date:	28/01/26

**Alton Property Group Pty Ltd**  
 Geotechnical Investigation  
 93-107 Cecil Avenue & 9-10 Roger Avenue,  
 Castle Hill, NSW  
 Borehole Location

Figure:  
2  
 Project: E26536.G03\_Rev1

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## Appendix A      Borehole Logs And Explanatory Notes

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# BOREHOLE LOG

BH ID: BH01M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	17 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	18 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 18 June 2025
<b>Sheets</b>	1 of 4	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈130.80 m (AHD) <b>Northing</b> 6265367.8 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315105.1 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		BH01M_0.50-0.95 SPT 0.50-0.95 3,4,4 N=8		0.00		130.80	FILL: Silty SAND: medium grained, dark brown with rootlets and gravels	M	-	FILL
		BH01M_1.50-1.80 SPT 1.50-1.80 12,25/150 mm HB N=R		0.60		130.20	Silty CLAY: medium plasticity, red brown to brown	M = PL	F	RESIDUAL SOIL
		SPT 3.00-3.29 14,12/140 mm HB N=R		1.60		129.20	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			EXTREMELY WEATHERED MATERIAL
				3.00						
		BH01M_4.50-4.51 SPT 4.50-4.51 2/10 mm HB N=R		4.65		126.15				
				5.00			<i>Log continued on next page.</i>			
				6.00						
				7.00						
				8.00						
				9.00						
				10.00						

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







# BOREHOLE CORE LOG

BH ID: BH01M

<b>Location</b> 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b> 17 June 2025
<b>Client</b> Alton Property Group Pty Ltd	<b>Completed</b> 18 June 2025
<b>Job No.</b> E26536.G03	<b>Logged By</b> PS <b>Date</b> 18 June 2025
<b>Sheets</b> 4 of 4	<b>Review By</b> GB <b>Date</b> 24 July 2025

<b>Drilling Contractor</b> Geosense Drilling Engineers	<b>Surface RL</b> ≈130.80 m (AHD)	<b>Northing</b> 6265367.8 (MGA 2020 Zone 56)
<b>Plant</b> Comacchio Geo 205	<b>Inclination</b> 90°	<b>Easting</b> 315105.1 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50)						DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING				
									VL <sub>0-1</sub>	L <sub>0-3</sub>	M <sub>1</sub>	H <sub>3</sub>	VH <sub>10</sub>	EH		30	100	300	1000	3000
NMLC	90%	100	100	21		108.3	SANDSTONE: fine grained, pale grey	FR												
				22		6	Terminated at 22.44m. Target Depth Reached.													
				23																
				24																
				25																
				26																
				27																
				28																
				29																
				30																

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

# CORE PHOTOGRAPH OF BOREHOLE: BH01M

<b>Project</b>	Proposed Development	<b>East</b>	315105.13	<b>Depth Range</b>	4.65m to 22.44m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265367.78	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈130.80 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 17/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025



# CORE PHOTOGRAPH OF BOREHOLE: BH01M

<b>Project</b>	Proposed Development	<b>East</b>	315105.13	<b>Depth Range</b>	4.65m to 22.44m
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265367.78	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈130.80 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS <b>Date</b> 17/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	3 & 4 of 4	<b>Checked</b>	GP <b>Date</b> 08/08/2025





# MONITORING WELL LOG

BH ID: BH01M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	17 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	18 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 18 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈130.80 m (AHD) <b>Northing</b> 6265367.8 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315105.1 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
	BH01M_0.50-0.95 SPT 0.50-0.95 3,4,4 N=8	0.00		130.80	FILL: Silty SAND: medium grained, dark brown with rootlets and gravels	M		Well Stickup =0.0m (RL 130.80m)
	BH01M_1.50-1.80 SPT 1.50-1.80 12,25/150 mm HB N=R	0.60		130.20	Silty CLAY: medium plasticity, red brown to brown	M <sub>n</sub> PL		
	SPT 3.00-3.29 14,12/140 mm HB N=R	1.60		129.20	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			
	BH01M_4.50-4.51 SPT 4.50-4.51 2/10 mm HB N=R	4.65		126.15	SHALE: brown to grey			
		5.40		125.40	SILTSTONE: grey to dark grey with thinly bedded laminations		Cuttings 0.00m - 12.50m	0.0m - 13.20m PVC casing (50mm Ø)

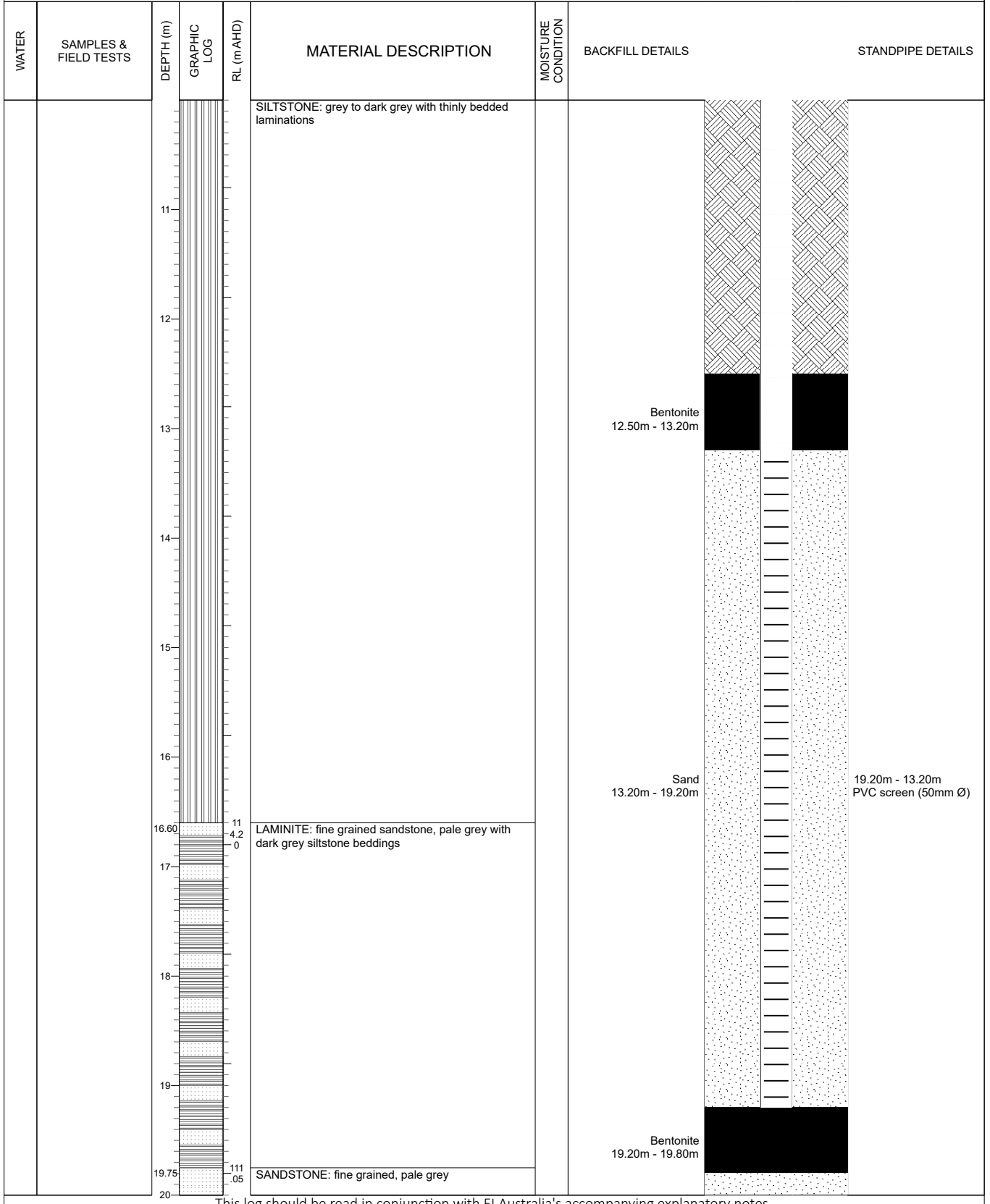
This log should be read in conjunction with EI Australia's accompanying explanatory notes.



# MONITORING WELL LOG

BH ID: BH01M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	17 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	18 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 18 June 2025
<b>Sheets</b>	2 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈130.80 m (AHD) <b>Northing</b> 6265367.8 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315105.1 (MGA 2020 Zone 56)



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



# MONITORING WELL LOG

BH ID: BH01M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	17 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	18 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 18 June 2025
<b>Sheets</b>	3 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025

<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈130.80 m (AHD)	<b>Northing</b>	6265367.8 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90°	<b>Easting</b>	315105.1 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		21			SANDSTONE: fine grained, pale grey		Sand 19.80m - 22.44m	
		22			Terminated at 22.44m. Target Depth Reached.			
		23		10 8.3 6				
		24						
		25						
		26						
		27						
		28						
		29						
		30						

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



# BOREHOLE LOG

BH ID: BH02

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	10 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	11 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 11 June 2025
<b>Sheets</b>	1 of 4	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈127.50 m (AHD) <b>Northing</b> 6265342.3 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315147.1 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T		102_0.50-0.95 SPT 0.50-0.95 3,5,6 N=11		0.00		127.50	FILL: Sandy CLAY: low to medium plasticity, dark grey transitioning to brown with rootlets and small gravels	M	-	FILL
		SPT 1.50-1.89 9,11,11/90 mm HB N=R		1.00		126.50	Silty CLAY: medium plasticity, pale brown to pale grey with iron stained gravels	M < PL	St	RESIDUAL SOIL
				1.40		126.10	Silty CLAY: becoming pale grey to grey, friable with bands and fragments of shale, similar to soil properties and grading into weathered rock with depth.	-	-	EXTREMELY WEATHERED MATERIAL
				3.10		124.40	<i>Log continued on next page.</i>			
				4						
				5						
				6						
				7						
				8						
				9						
				10						

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





# BOREHOLE CORE LOG

BH ID: BH02

**Location** 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW **Started** 10 June 2025  
**Client** Alton Property Group Pty Ltd **Completed** 11 June 2025  
**Job No.** E26536.G03 **Logged By** PS **Date** 11 June 2025  
**Sheets** 3 of 4 **Review By** GB **Date** 24 July 2025

**Drilling Contractor** Geosense Drilling Engineers **Surface RL** ≈127.50 m (AHD) **Northing** 6265342.3 (MGA 2020 Zone 56)  
**Plant** Comacchio Geo 205 **Inclination** 90° **Easting** 315147.1 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50)						DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING				
									VL <sub>0-1</sub>	L <sub>0-3</sub>	M <sub>1</sub>	H <sub>3</sub>	VH <sub>10</sub>	EH		30	100	300	1000	3000
NMLC	90%	100	95	10.60		116.90	SILTSTONE: grey to dark grey with thin red brown lamination	SW							10.00-10.20: SZ 5-90° IR VR OP					
				11.00		LAMINITE: fine grained, pale grey sandstone with dark grey siltstone beddings							10.37: JT 5° PR RO OP							
				11.07								10.64: BP SM CL 10.76: JT 2° PR SM OP								
				11.33-11.43							11.00: JT 2° PR SM OP 11.07: JT 40° PR RO OP 11.33-11.43: FZ IR VR fractured siltstone Infilled 11.53: BP PR SM CL 11.60: BP PR SM CL									
				12.74							12.74: BP PR SM CL									
		13.28							13.28: BP PR SM CL											
		13.94							13.94: BP PR SM CL											
		14.28	100	94		14.28				FR						14.28: JT 2° PR RO OP 14.32: JT 5° PR RO OP				
		14.86									14.86: JT 2° PR RO OP 14.90: JT 5° PR RO OP									
		15.21-15.23									15.21-15.23: JT PR RO OP 15.30: BP PR SM CL									
15.74								15.74: JT 10° PR RO SN												
17.51								17.51: JT 20° PR RO SN 17.58: XWS 5° PR RO OP												
18.17						18.17: JT 5° PR RO OP														
18.50						18.50: JT 5° PR RO SN														
19.16-19.32	100	79	19.16									19.16-19.32: FZ 5-20° PR RO SN								

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



<b>Project</b>	Proposed Development	<b>East</b>	315147.06	<b>Depth Range</b>	3.10m to 20.6m
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265342.26	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈127.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS <b>Date</b> 11/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 4	<b>Checked</b>	GP <b>Date</b> 08/08/2025



# CORE PHOTOGRAPH OF BOREHOLE: BH02

<b>Project</b>	Proposed Development	<b>East</b>	315147.06	<b>Depth Range</b>	3.10m to 20.6m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265342.26	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈127.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 11/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	3 & 4 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025





# BOREHOLE LOG

BH ID: BH03M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	12 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	12 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 12 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈122.60 m (AHD) <b>Northing</b> 6265307.4 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315195.0 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T				0.00		122.60	CONCRETE: 100mm thick	-	-	CONCRETE
		BH03_0.50-0.95 SPT 0.50-0.95 4,4,5 N=9		0.10		122.50	FILL: Silty SAND: medium grained, brown with rootlets and small gravels	M	-	CONCRETE FILL
		BH03_1.50-1.95 SPT 1.50-1.95 5,11,15 N=26		0.80		121.80	Silty CLAY: medium plasticity, red brown to brown trace iron stained gravels	M = PL	St	RESIDUAL SOIL
		BH03_3.00-3.02 SPT 3.00-3.02 3/15 mm HB N=R		1.95		120.65	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.	-	-	EXTREMELY WEATHERED MATERIAL
				5.30		117.30	<i>Log continued on next page.</i>			
				6						
				7						
				8						
				9						
				10						

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





# CORE PHOTOGRAPH OF BOREHOLE: BH03M

<b>Project</b>	Proposed Development	<b>East</b>	315195.03	<b>Depth Range</b>	5.30m to 11.20m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265307.38	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈122.60 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 12/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 2	<b>Checked</b>	GP	<b>Date</b> 08/08/2025

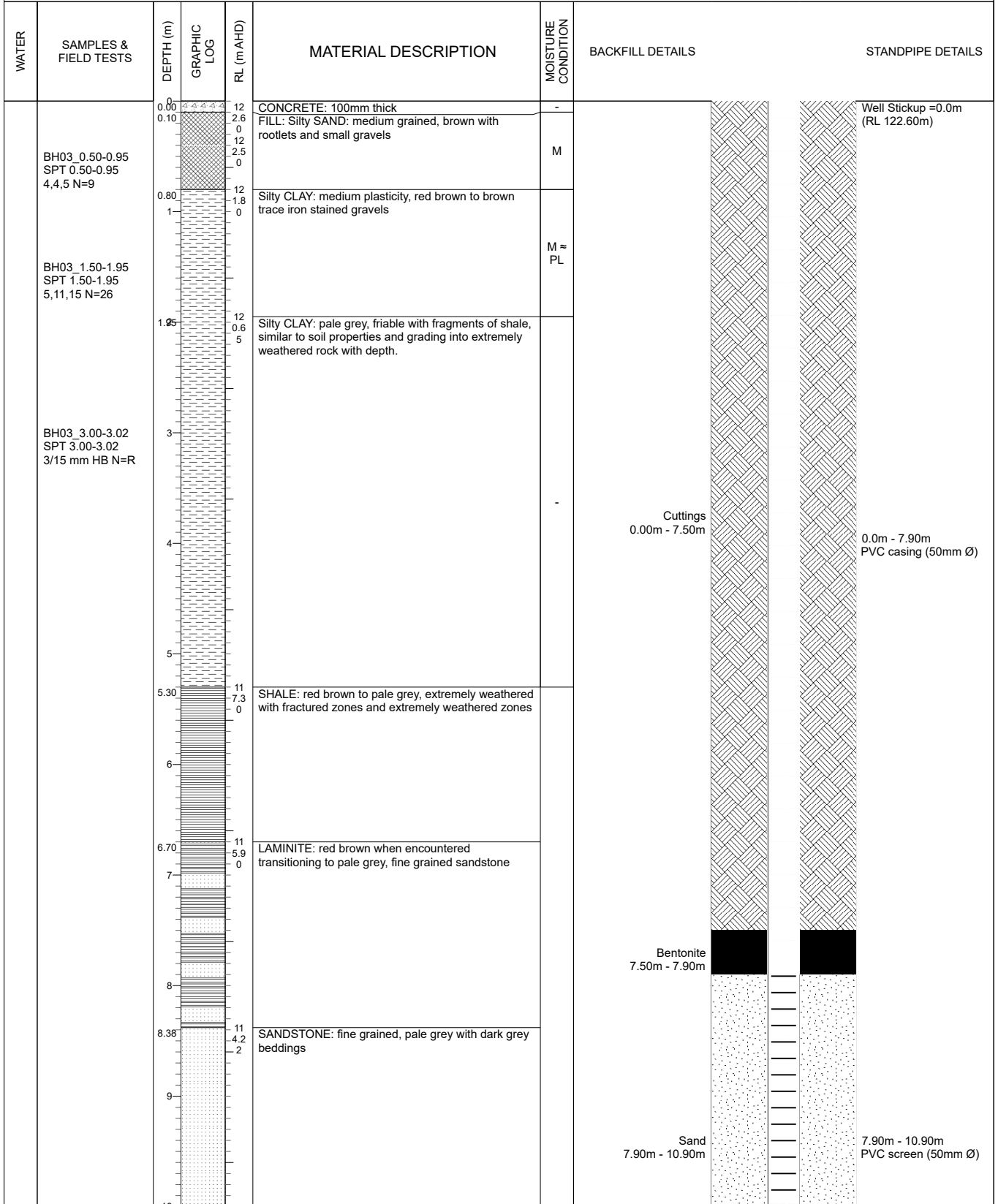




# MONITORING WELL LOG

BH ID: BH03M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	12 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	12 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 12 June 2025
<b>Sheets</b>	1 of 2	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈122.60 m (AHD) <b>Northing</b> 6265307.4 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315195.0 (MGA 2020 Zone 56)



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

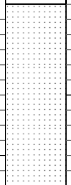
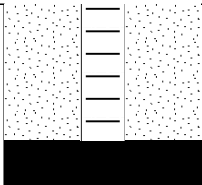


# MONITORING WELL LOG

BH ID: BH03M

<b>Location</b> 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b> 12 June 2025
<b>Client</b> Alton Property Group Pty Ltd	<b>Completed</b> 12 June 2025
<b>Job No.</b> E26536.G03	<b>Logged By</b> PS <b>Date</b> 12 June 2025
<b>Sheets</b> 2 of 2	<b>Review By</b> GB <b>Date</b> 24 July 2025

<b>Drilling Contractor</b> Geosense Drilling Engineers	<b>Surface RL</b> ≈122.60 m (AHD)	<b>Northing</b> 6265307.4 (MGA 2020 Zone 56)
<b>Plant</b> Comacchio Geo 205	<b>Inclination</b> 90°	<b>Easting</b> 315195.0 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m(AHD))	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		11		111.40	SANDSTONE: fine grained, pale grey with dark grey beddings			
		12			Terminated at 11.20m. Target Depth Reached.		Bentonite 10.90m - 11.20m	
		13						
		14						
		15						
		16						
		17						
		18						
		19						
		20						

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



# BOREHOLE LOG

BH ID: BH04

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	18 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	18 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 18 June 2025
<b>Sheets</b>	1 of 4	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈128.50 m (AHD) <b>Northing</b> 6265330.0 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315073.4 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
DT				0.00		128.50	CONCRETE: 200mm thick	-	-	CONCRETE
		BH04_0.50-0.95 SPT 0.50-0.95 3,4,4 N=8		0.20		128.30	FILL: Sandy CLAY: medium plasticity, brown to grey with fine gravels		-	FILL
				0.50		128.00	Silty CLAY: medium plasticity, red brown to grey			RESIDUAL SOIL
AD/T		BH04_1.50-1.95 SPT 1.50-1.95 7,18,25 N=43		1				M = PL	F	
				2					H	
		BH04_3.00-3.05 SPT 3.00-3.00 2/5 mm HB N=R		3.00		125.50	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			EXTREMELY WEATHERED MATERIAL
				3.05		125.45				
				4						
				5						
				6						
				7						
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Log continued on next page.







<b>Project</b>	Proposed Development	<b>East</b>	315073.37	<b>Depth Range</b>	3.05m to 20.55m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265329.98	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈128.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 18/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025



# CORE PHOTOGRAPH OF BOREHOLE: BH04

<b>Project</b>	Proposed Development	<b>East</b>	315073.37	<b>Depth Range</b>	3.05m to 20.55m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265329.98	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈128.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 18/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	3 & 4 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025





# BOREHOLE LOG

BH ID: BH05

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	16 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	16 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 16 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈126.20 m (AHD) <b>Northing</b> 6265311.0 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315125.0 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH05_0.50-0.95 SPT 0.50-0.95 3,6,8 N=14	[Sample Recovery Bar]	0.00	[Graphic Log]	126.20	FILL: Silty SAND: medium grained, brown with rootlets and gravels	M	-	FILL
		BH05_1.50-1.55 SPT 1.50-1.55 6/50 mm HB N=R	[Sample Recovery Bar]	0.60	[Graphic Log]	125.60	Silty CLAY: medium plasticity, brown to red brown	M = PL	St	RESIDUAL SOIL
		BH05_3.00-3.01 SPT 3.00-3.01 2/10 mm N=R	[Sample Recovery Bar]	1.20	[Graphic Log]	125.00	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.	-	-	EXTREMELY WEATHERED MATERIAL
				4.34		121.86	<i>Log continued on next page.</i>			
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This log should be read in conjunction with EI Australia's accompanying explanatory notes.





<b>Project</b>	Proposed Development	<b>East</b>	315125.04	<b>Depth Range</b>	4.34m to 18.30m
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265311.03	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈126.20 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS <b>Date</b> 16/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 4	<b>Checked</b>	GP <b>Date</b> 08/08/2025



# CORE PHOTOGRAPH OF BOREHOLE: BH05

<b>Project</b>	Proposed Development	<b>East</b>	315125.04	<b>Depth Range</b>	4.34m to 18.30m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265311.03	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈126.20 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 16/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	3 & 4 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025





# BOREHOLE LOG

BH ID: BH06

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	13 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	14 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 14 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈123.00 m (AHD)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90°
		<b>Northing</b>	6265300.0 (MGA 2020 Zone 56)
		<b>Easting</b>	315166.7 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH06_0.50-0.95 SPT 0.50-0.95 3.2,7 N=9	[Sample Recovery Bar]	0.00 0.10	[Graphic Log Pattern]	123.0 0 122.9 0	BRICK: 100mm thick FILL: Silty SAND: brown to red brown with rootlets and small gravels	- M	-	BRICK FILL
		SPT 1.50-1.74 6,8/90 mm HB N=R	[Sample Recovery Bar]	0.80 1	[Graphic Log Pattern]	122.2 0	Silty CLAY: medium plasticity, brown to red brown	M = PL	St	RESIDUAL SOIL
		BH06_3.00-3.02 SPT 3.00-3.02 3/20 mm HB N=R	[Sample Recovery Bar]	1.74 2	[Graphic Log Pattern]	121.2 6	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			EXTREMELY WEATHERED MATERIAL
		BH06_4.50-4.51 SPT 4.50-4.51 2/10 mm HB N=R	[Sample Recovery Bar]	3 4	[Graphic Log Pattern]					
		BH06_6.00-6.01 SPT 6.00-6.01 2/10 mm HB N=R	[Sample Recovery Bar]	5 6	[Graphic Log Pattern]					
				6.40		116.6 0	Log continued on next page.			
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This log should be read in conjunction with EI Australia's accompanying explanatory notes.





# BOREHOLE CORE LOG

BH ID: BH06

**Location** 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW **Started** 13 June 2025  
**Client** Alton Property Group Pty Ltd **Completed** 14 June 2025  
**Job No.** E26536.G03 **Logged By** PS **Date** 14 June 2025  
**Sheets** 3 of 3 **Review By** GB **Date** 24 July 2025

**Drilling Contractor** Geosense Drilling Engineers **Surface RL** ≈123.00 m (AHD) **Northing** 6265300.0 (MGA 2020 Zone 56)  
**Plant** Comacchio Geo 205 **Inclination** 90° **Easting** 315166.7 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50)						DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING						
									VL <sub>0-1</sub>	L <sub>0-3</sub>	M <sub>1</sub>	H <sub>3</sub>	VH <sub>10</sub>	EH		30	100	300	1000	3000		
NMLC		100	68	11			LAMINITE: fine grained, pale grey sandstone with dark grey siltstone bands	SW														
		100	94	12																		
		100	100	15																		
				15		108.00	Terminated at 15.00m. Target Depth Reached.															
				16																		
				17																		
				18																		
				19																		
				20																		

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

<b>Project</b>	Proposed Development	<b>East</b>	315166.65	<b>Depth Range</b>	6.40m to 15.0m
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265299.97	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈123.00 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS <b>Date</b> 13/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 2	<b>Checked</b>	GP <b>Date</b> 08/08/2025





# BOREHOLE LOG

BH ID: BH07

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	18 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	19 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 19 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈125.50 m (AHD) <b>Northing</b> 6265299.3 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315049.1 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH07_0.50-0.95 SPT 0.50-0.95 3,6.8 N=14	[Sample Recovery Bar]	0.00	[Graphic Log]	125.50	TOPSOIL: Silty SAND: fine to medium grained, brown to dark brown with rootlets and gravels	M	-	TOPSOIL
				0.60		124.90	Silty CLAY: medium plasticity, red brown to pale grey	M = PL	St	RESIDUAL SOIL
		BH07_1.50-1.65 SPT 1.50-1.65 6/150 mm N=R	[Sample Recovery Bar]	1.20		124.30	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			EXTREMELY WEATHERED MATERIAL
				4.60		120.90	<i>Log continued on next page.</i>			
				5						
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				9						
				10						

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





<b>Project</b>	Proposed Development	<b>East</b>	315049.06	<b>Depth Range</b>	4.60m to 18.30m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265299.25	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈125.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 18/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 & 2 of 4	<b>Checked</b>	GP	<b>Date</b> 08/08/2025





# BOREHOLE LOG

BH ID: BH08M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	16 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	17 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 17 June 2025
<b>Sheets</b>	1 of 3	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈117.50 m (AHD)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90°
		<b>Northing</b>	6265228.0 (MGA 2020 Zone 56)
		<b>Easting</b>	315115.8 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
DT		BH08M_0.50-0.95 SPT 0.50-0.95 4,5,6 N=11	[Solid black bar]	0.00	[Brick pattern]	117.50	BRICK: 100mm thick	-	-	BRICK
				0.10	[Concrete pattern]	117.40	CONCRETE: 100mm thick	-	-	CONCRETE
				0.20	[Sandy clay pattern]	117.30	FILL: Sandy CLAY: low to medium plasticity, brown with gravels	M	-	CONCRETE FILL
				0.50	[Silty clay pattern]	117.00	Silty CLAY: medium plasticity, red brown to pale grey	M = PL	St	RESIDUAL SOIL
ADT		BH08M_1.50-1.70 SPT 1.50-1.70 7,11/50 mm N=R	[Solid black bar]	1.40	[Silty clay pattern]	116.10	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.			EXTREMELY WEATHERED MATERIAL
		BH08M_3.00-3.01 SPT 3.00-3.01 2/10 mm HB N=R	[Solid black bar]	3.00	[Silty clay pattern]					
		BH08M_4.50-4.51 SPT 4.50-4.51 3/10 mm HB N=R	[Solid black bar]	4.50	[Silty clay pattern]					
				5.55		111.95	<i>Log continued on next page.</i>			
				6						
				7						
				8						
				9						
				10						

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





# BOREHOLE CORE LOG

BH ID: BH08M

<b>Location</b> 93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b> 16 June 2025
<b>Client</b> Alton Property Group Pty Ltd	<b>Completed</b> 17 June 2025
<b>Job No.</b> E26536.G03	<b>Logged By</b> PS <b>Date</b> 17 June 2025
<b>Sheets</b> 3 of 3	<b>Review By</b> GB <b>Date</b> 24 July 2025

<b>Drilling Contractor</b> Geosense Drilling Engineers	<b>Surface RL</b> ≈117.50 m (AHD)	<b>Northing</b> 6265228.0 (MGA 2020 Zone 56)
<b>Plant</b> Comacchio Geo 205	<b>Inclination</b> 90°	<b>Easting</b> 315115.8 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
									VL <sub>0-1</sub> L <sub>0-3</sub> M <sub>1</sub> H <sub>3</sub> VH <sub>10</sub> EH		30 100 300 1000 3000
				107.50		107.50	Terminated at 10.00m. Target Depth Reached.				
				11							
				12							
				13							
				14							
				15							
				16							
				17							
				18							
				19							
				20							

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

# CORE PHOTOGRAPH OF BOREHOLE: BH08M

<b>Project</b>	Proposed Development	<b>East</b>	315115.79	<b>Depth Range</b>	5.55m to 10.0m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265228.01	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈117.50 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 16/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 of 1	<b>Checked</b>	GP	<b>Date</b> 08/08/2025

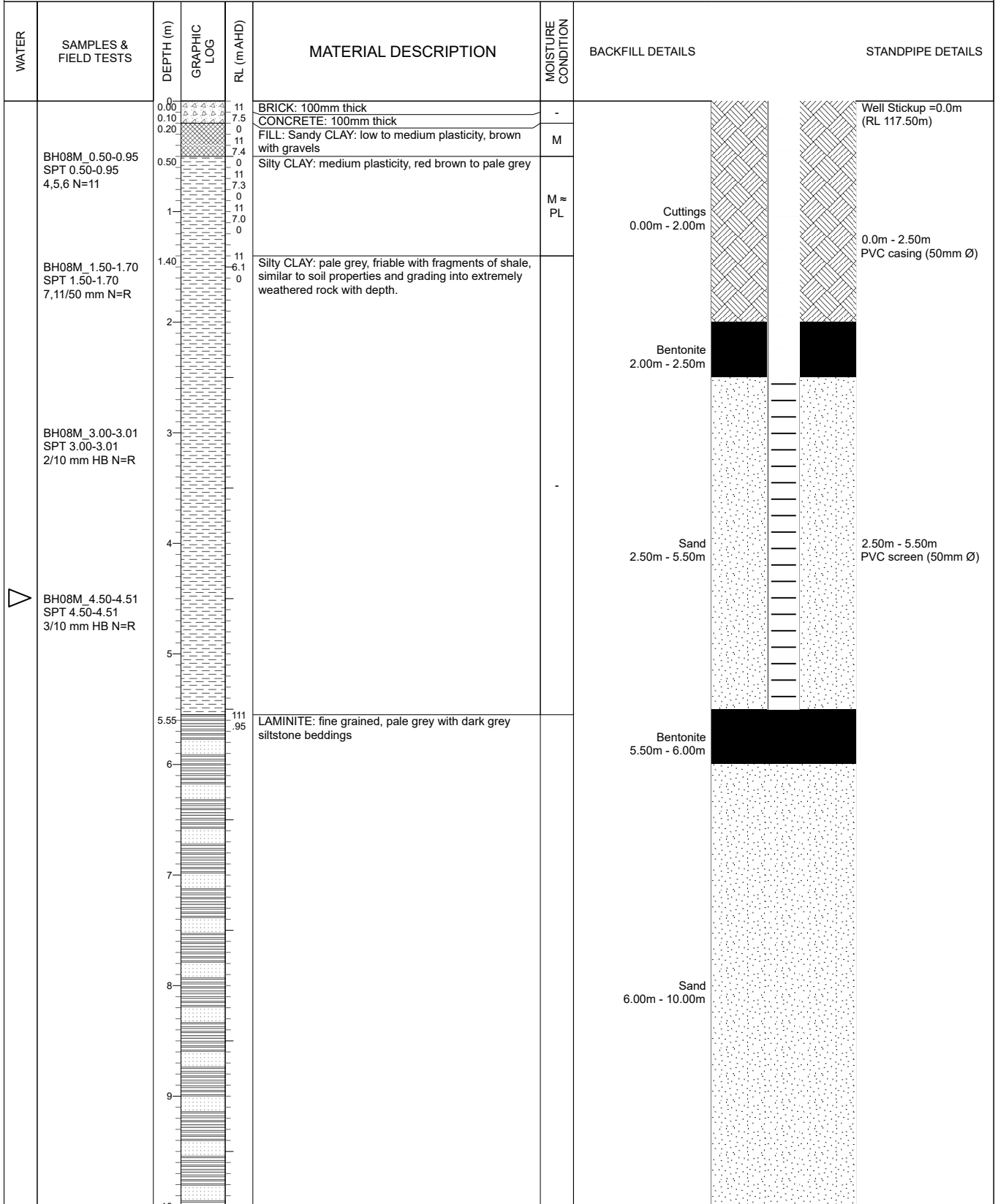




# MONITORING WELL LOG

BH ID: BH08M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	16 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	17 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 17 June 2025
<b>Sheets</b>	1 of 2	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈117.50 m (AHD) <b>Northing</b> 6265228.0 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315115.8 (MGA 2020 Zone 56)



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



# MONITORING WELL LOG

BH ID: BH08M

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	16 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	17 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 17 June 2025
<b>Sheets</b>	2 of 2	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈117.50 m (AHD) <b>Northing</b> 6265228.0 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315115.8 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
		10		7.5	Terminated at 10.00m. Target Depth Reached.			
		11						
		12						
		13						
		14						
		15						
		16						
		17						
		18						
		19						
		20						

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



# BOREHOLE LOG

BH ID: BH09

<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>Started</b>	11 June 2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Completed</b>	11 June 2025
<b>Job No.</b>	E26536.G03	<b>Logged By</b>	PS <b>Date</b> 11 June 2025
<b>Sheets</b>	1 of 2	<b>Review By</b>	GB <b>Date</b> 24 July 2025
<b>Drilling Contractor</b>	Geosense Drilling Engineers	<b>Surface RL</b>	≈118.00 m (AHD) <b>Northing</b> 6265237.9 (MGA 2020 Zone 56)
<b>Plant</b>	Comacchio Geo 205	<b>Inclination</b>	90° <b>Easting</b> 315160.5 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (mAHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH09_0.50-0.95 SPT 0.50-0.95 3.5,6 N=11		0.00		118.00	TOPSOIL: Silty SAND: fine grained, dark grey with rootlets and small gravels	M	-	TOPSOIL
		BH09_1.50-1.53 SPT 1.50-1.53 3/30 mm HB N=R		0.80		117.20	Silty CLAY: medium to high plasticity, red brown transitioning to pale grey	M = PL	St	RESIDUAL SOIL
		BH09_3.00-3.01 SPT 3.00-3.01 2/10 mm HB N=R		1.30		116.70	Silty CLAY: pale grey, friable with fragments of shale, similar to soil properties and grading into extremely weathered rock with depth.	-	-	EXTREMELY WEATHERED MATERIAL
		BH09_4.50-4.51 SPT 4.50-4.51 2/10 mm HB N=R		4.50		112.90				
				5.10			Log continued on next page.			
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				10						

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



<b>Project</b>	Proposed Development	<b>East</b>	315160.45	<b>Depth Range</b>	5.10m to 8.10m	
<b>Location</b>	93-107 Cecil Avenue & 9-10 Roger Avenue, Castle Hill, NSW	<b>North</b>	6265237.85	<b>Contractor</b>	Geosense Drilling Engineers Pty Ltd	
<b>Position</b>	See Figure 2	<b>Surface RL</b>	≈118.00 m (AHD)	<b>Drill Rig</b>	Comacchio Geo 205	
<b>Job No.</b>	E26536.G03	<b>Inclination</b>	90°	<b>Logged</b>	PS	<b>Date</b> 11/06/2025
<b>Client</b>	Alton Property Group Pty Ltd	<b>Box</b>	1 of 1	<b>Checked</b>	GP	<b>Date</b> 08/08/2025



## EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT LOGS

### DRILLING/EXCAVATION METHOD

<b>HA</b>	Hand Auger	<b>ADH</b>	Hollow Auger	<b>NQ</b>	Diamond Core - 47 mm
<b>DT</b>	Diatube Coring	<b>RT</b>	Rotary Tricone bit	<b>NMLC</b>	Diamond Core - 52 mm
<b>NDD</b>	Non-destructive digging	<b>RAB</b>	Rotary Air Blast	<b>HQ</b>	Diamond Core - 63 mm
<b>AD*</b>	Auger Drilling	<b>RC</b>	Reverse Circulation	<b>HMLC</b>	Diamond Core - 63 mm
<b>*V</b>	V-Bit	<b>PT</b>	Push Tube	<b>EX</b>	Tracked Hydraulic Excavator
<b>*T</b>	TC-Bit, e.g. AD/T	<b>WB</b>	Washbore	<b>HAND</b>	Excavated by Hand Methods

### PENETRATION RESISTANCE

<b>L</b>	<b>Low Resistance</b>	Rapid penetration/ excavation possible with little effort from equipment used.
<b>M</b>	<b>Medium Resistance</b>	Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
<b>H</b>	<b>High Resistance</b>	Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
<b>R</b>	<b>Refusal/Practical Refusal</b>	No further progress possible without risk of damage or unacceptable wear to equipment used.

These assessments are subjective and are dependent on many factors, including equipment power and weight, condition of excavation or drilling tools and experience of the operator.

### WATER

▽ Standing Water Level

◁ Partial water loss

▷ Water Seepage

◀ Complete Water Loss

**GWNO** GROUNDWATER NOT OBSERVED - Observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave-in of the borehole/ test pit.

**GWNE** GROUNDWATER NOT ENCOUNTERED - Borehole/ test pit was dry soon after excavation. However, groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/ test pit been left open for a longer period.

### SAMPLING AND TESTING

<b>SPT</b>	Standard Penetration Test to AS1289.6.3.1-2004
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following a 150mm seating drive
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported, N is not reported
<b>RW</b>	Penetration occurred under the rod weight only, N<1
<b>HW</b>	Penetration occurred under the hammer and rod weight only, N<1
<b>HB</b>	Hammer double bouncing on anvil, N is not reported

#### Sampling

<b>DS</b>	Disturbed Sample
<b>ES</b>	Sample for environmental testing
<b>BDS</b>	Bulk disturbed Sample
<b>GS</b>	Gas Sample
<b>WS</b>	Water Sample
<b>U50</b>	Thin walled tube sample - number indicates nominal sample diameter in millimetres

#### Testing

<b>FP</b>	Field Permeability test over section noted
<b>FVS</b>	Field Vane Shear test expressed as uncorrected shear strength (sv= peak value, sr= residual value)
<b>PID</b>	Photoionisation Detector reading in ppm
<b>PM</b>	Pressuremeter test over section noted
<b>PP</b>	Pocket Penetrometer test expressed as instrument reading in kPa
<b>WPT</b>	Water Pressure tests
<b>DCP</b>	Dynamic Cone Penetrometer test
<b>CPT</b>	Static Cone Penetration test
<b>CPTu</b>	Static Cone Penetration test with pore pressure (u) measurement

### GEOLOGICAL BOUNDARIES

———— = Observed Boundary (position known)      - - - - - = Observed Boundary (position approximate)      - - ? - - ? - - ? - - = Boundary (interpreted or inferred)

### ROCK CORE RECOVERY








TCR=Total Core Recovery (%)

RQD = Rock Quality Designation (%)

$$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100$$

$$= \frac{\sum \text{Axial lengths of core} > 100\text{mm}}{\text{Length of core run}} \times 100$$

# METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT LOGS

	FILL		ORGANIC SOILS (OL, OH or Pt)		CLAY (CL, CI or CH)
	COUBLES or BOULDERS		SILT (ML or MH)		SAND (SP or SW)
	GRAVEL (GP or GW)	Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay			

## CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS 1726:2017, Section 6.1 – Soil description and classification.

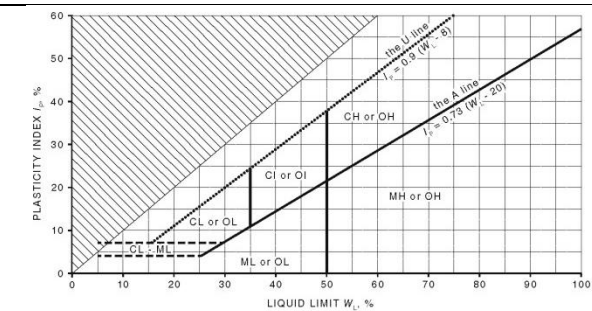
### PARTICLE SIZE CHARACTERISTICS

Fraction	Components	Sub Division	Size mm
Oversize	BOULDERS		>200
	COBBLES		63 to 200
Coarse grained soil	GRAVEL	Coarse	19 to 63
		Medium	6.7 to 19
		Fine	2.36 to 6.7
	SAND	Coarse	0.6 to 2.36
		Medium	0.21 to 0.6
		Fine	0.075 to 0.21
Fine grained soil	SILT		0.002 to 0.075
	CLAY		<0.002

### GROUP SYMBOLS

Major Divisions	Symbol	Description	
COARSE GRAINED SOILS More than 65% of soil excluding oversize fraction is greater than 0.075mm	GRAVEL More than 50% of coarse fraction is >2.36mm	GW	Well graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GP	Poorly graded gravel and gravel-sand mixtures, little or no fines, no dry strength.
		GM	Silty gravel, gravel-sand-silt mixtures, zero to medium dry strength.
	SAND More than 50% of coarse fraction is <2.36 mm	GC	Clayey gravel, gravel-sand-clay mixtures, medium to high dry strength.
		SW	Well graded sand and gravelly sand, little or no fines, no dry strength.
		SP	Poorly graded sand and gravelly sand, little or no fines, no dry strength.
FINE GRAINED SOILS More than 35% of soil excluding oversized fraction is less than 0.075mm	Liquid Limit less < 50%	SM	Silty sand, sand-silt mixtures, zero to medium dry strength.
		SC	Clayey sand, sandy-clay mixtures, medium to high dry strength.
		ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands, zero to medium dry strength.
	Liquid Limit > 50%	CL, CI	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, medium to high dry strength.
		OL	Organic silts and organic silty clays of low plasticity, low to medium dry strength.
		MH	Inorganic silts of high plasticity, high to very high dry strength.
Highly Organic soil	PT	CH	Inorganic clays of high plasticity, high to very high dry strength.
		OH	Organic clays of medium to high plasticity, medium to high dry strength.
		PT	Peat muck and other highly organic soils.

### PLASTICITY PROPERTIES



### MOISTURE CONDITION

Symbol	Term	Description
D	Dry	Non-cohesive and free-running.
M	Moist	Soils feel cool, darkened in colour. Soil tends to stick together.
W	Wet	Soils feel cool, darkened in colour. Soil tends to stick together, free water forms when handling.

Moisture content of cohesive soils shall be described in relation to plastic limit (PL) or liquid limit (LL) for soils with higher moisture content as follows: Moist, dry of plastic limit ( $w < PL$ ); Moist, near plastic limit ( $w \approx PL$ ); Moist, wet of plastic limit ( $w < PL$ ); Wet, near liquid limit ( $w \approx LL$ ); Wet, wet of liquid limit ( $w > LL$ ).

### CONSISTENCY

Symbol	Term	Undrained Shear Strength (kPa)	SPT "N" #
VS	Very Soft	$\leq 12$	$\leq 2$
S	Soft	$>12$ to $\leq 25$	$>2$ to $\leq 4$
F	Firm	$>25$ to $\leq 50$	$>4$ to $\leq 8$
St	Stiff	$>50$ to $\leq 100$	$>8$ to $\leq 15$
VSt	Very Stiff	$>100$ to $\leq 200$	$>15$ to $\leq 30$
H	Hard	$>200$	$>30$
Fr	Friable	-	-

### DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	$\leq 15$	0 to 4
L	Loose	$>15$ to $\leq 35$	4 to 10
MD	Medium Dense	$>35$ to $\leq 65$	10 to 30
D	Dense	$>65$ to $\leq 85$	30 to 50
VD	Very Dense	$>85$	Above 50

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material. # SPT correlations are not stated in AS1726:2017, and may be subject to corrections for overburden pressure, moisture content of the soil, and equipment type.

### MINOR COMPONENTS

Term	Assessment Guide	Proportion by Mass
Add 'Trace'	Presence just detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: $\leq 5\%$ Fine grained soil: $\leq 15\%$
Add 'With'	Presence easily detectable by feel or eye but soil properties little or no different to general properties of primary component	Coarse grained soils: 5 - 12% Fine grained soil: 15 - 30%
Prefix soil name	Presence easily detectable by feel or eye in conjunction with the general properties of primary component	Coarse grained soils: $>12\%$ Fine grained soil: $>30\%$

### CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

### ROCK MATERIAL STRENGTH CLASSIFICATION

Symbol	Term	Point Load Index, $I_{s(50)}$ (MPa) <sup>#</sup>	Field Guide
VL	Very Low	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 30 mm can be broken by finger pressure.
L	Low	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of pick point; has dull sound under hammer. A piece of core 150 mm long by 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken with pick with a single firm blow; rock rings under hammer.
VH	Very High	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	>10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

<sup>#</sup> **Rock Strength Test Results** ▼ Point Load Strength Index,  $I_{s(50)}$ , Axial test (MPa)

● Point Load Strength Index,  $I_{s(50)}$ , Diametral test (MPa)

Relationship between rock strength test result ( $I_{s(50)}$ ) and unconfined compressive strength (UCS) will vary with rock type and strength, and should be determined on a site-specific basis. However UCS is typically  $20 \times I_{s(50)}$ .

### ROCK MATERIAL WEATHERING CLASSIFICATION

Symbol	Term	Field Guide
RS	Residual Soil	Soil developed on extremely weathered rock; the mass structure and substance fabric are no longer evident; there is a large change in volume but the soil has not been significantly transported.
XW	Extremely Weathered	Rock is weathered to such an extent that it has soil properties - i.e. it either disintegrates or can be remoulded, in water.
DW	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 weathering products in pores. In some environments it is convenient to subdivide into Highly Weathered and Moderately Weathered, with the degree of alteration typically less for MW.
	MW	
SW	Slightly Weathered	Rock slightly discoloured but shows little or no change of strength relative to fresh rock.
FR	Fresh	Rock shows no sign of decomposition or staining.

## ABBREVIATIONS AND DESCRIPTIONS FOR ROCK MATERIAL AND DEFECTS

### CLASSIFICATION AND INFERRED STRATIGRAPHY

Rock is broadly classified and described in Borehole and Test Pit Logs using the preferred method given in AS1726 – 2017, Section 6.2 – Rock identification, description and classification.

### DETAILED ROCK DEFECT SPACING

Defect Spacing			Bedding Thickness (Stratification)	
Spacing/width (mm)	Descriptor	Symbol	Term	Spacing (mm)
<20	Extremely Close	EC	Thinly laminated	<6
			Laminated	6 – 20
20-60	Very Close	VC	Very thinly bedded	20 – 60
60-200	Close	C	Thinly bedded	60 – 200
200-600	Medium	M	Medium bedded	200 – 600
600-2000	Wide	W	Thickly bedded	600 – 2,000
2000-6000	Very Wide	VW	Very thickly bedded	> 2,000

### ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT TYPES

Defect Type	Abbr.	Description
Joint	JT	Surface of a fracture or parting, formed without displacement, across which the rock has little or no tensile strength. May be closed or filled by air, water or soil or rock substance, which acts as cement.
Bedding Parting	BP	Surface of fracture or parting, across which the rock has little or no tensile strength, parallel or sub-parallel to layering/ bedding. Bedding refers to the layering or stratification of a rock, indicating orientation during deposition, resulting in planar anisotropy in the rock material.
Contact	CO	The surface between two types or ages of rock.
Sheared Surface	SSU	A near planar, curved or undulating surface which is usually smooth, polished or slickensided.
Sheared Seam/ Zone (Fault)	SS/SZ	Seam or zone with roughly parallel almost planar boundaries of rock substance cut by closely spaced (often <50 mm) parallel and usually smooth or slickensided joints or cleavage planes.
Crushed Seam/ Zone (Fault)	CS/CZ	Seam or zone composed of disoriented usually angular fragments of the host rock substance, with roughly parallel near-planar boundaries. The brecciated fragments may be of clay, silt, sand or gravel sizes or mixtures of these.
Extremely Weathered Seam/ Zone	XWS/XWZ	Seam of soil substance, often with gradational boundaries, formed by weathering of the rock material in places.
Infilled Seam	IS	Seam of soil substance, usually clay or clayey, with very distinct roughly parallel boundaries, formed by soil migrating into joint or open cavity.
Vein	VN	Distinct sheet-like body of minerals crystallised within rock through typically open-space filling or crack-seal growth.

NOTE: Defects size of <100mm SS, CS and XWS. Defects size of >100mm SZ, CZ and XWZ.

### ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT SHAPE AND ROUGHNESS

Shape	Abbr.	Description	Roughness	Abbr.	Description
Planar	PR	Consistent orientation	Polished	POL	Shiny smooth surface
Curved	CU	Gradual change in orientation	Slickensided	SL	Grooved or striated surface, usually polished
Undulating	UN	Wavy surface	Smooth	SM	Smooth to touch. Few or no surface irregularities
Stepped	ST	One or more well defined steps	Rough	RO	Many small surface irregularities (amplitude generally <1mm). Feels like fine to coarse sandpaper
Irregular	IR	Many sharp changes in orientation	Very Rough	VR	Many large surface irregularities, amplitude generally >1mm. Feels like very coarse sandpaper

#### Orientation:

**Vertical Boreholes** – The dip (inclination from horizontal) of the defect.

**Inclined Boreholes** – The inclination is measured as the acute angle to the core axis.

### ABBREVIATIONS AND DESCRIPTIONS FOR DEFECT COATING

DEFECT COATING			DEFECT APERTURE		
Coating	Abbr.	Description	Aperture	Abbr.	Description
Clean	CN	No visible coating or infilling	Closed	CL	Closed.
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)	Open	OP	Without any infill material.
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy	Infilled	-	Soil or rock i.e. clay, silt, talc, pyrite, quartz, etc.

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# Appendix B      Laboratory Certificates

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### Point Load Strength Index Report

Project: E26536.G03: 93-107 CECIL AVENUE & 9-10 ROGER AVENUE, CASTLE HILL, NSW

Project No.: 31380/9832D-L

Client: EI AUSTRALIA PTY LTD

Report No.: 25/1739

Address: SUITE 6.01, 55 MILLER STREET, PYRMONT NSW 2009

Report Date: 24/06/2025

Test Method: AS 4133.4.1

Page: 1 of 3

Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	Is(50) (MPa)	Rock Type	Failure Type	Moisture
BH01M	4.88	17/06/2025	24/06/2025	A	1.00	1.00	SS	3	M
BH01M	7.06	17/06/2025	24/06/2025	A	2.50	2.50	SS	3	M
BH01M	8.37	17/06/2025	24/06/2025	A	1.20	1.20	ST/SH	3	M
BH01M	9.59	17/06/2025	24/06/2025	A	1.60	1.50	ST/SH	3	M
BH01M	11.16	17/06/2025	24/06/2025	A	2.00	2.00	ST/SH	3	M
BH01M	13.51	17/06/2025	24/06/2025	A	0.85	0.86	ST/SH	3	M
BH01M	15.49	17/06/2025	24/06/2025	A	0.58	0.59	ST/SS	3	M
BH01M	16.87	17/06/2025	24/06/2025	A	3.30	3.40	ST/SS	3	M
BH01M	17.56	17/06/2025	24/06/2025	A	1.50	1.50	SS	3	M
BH01M	19.52	17/06/2025	24/06/2025	A	2.40	2.40	SS	3	M
BH01M	20.82	17/06/2025	24/06/2025	A	1.90	1.90	SS	3	M
BH01M	22.30	17/06/2025	24/06/2025	A	1.9	1.9	SS	3	M
BH02	4.66	10/06/2025	24/06/2025	A	0.33	0.33	ST/SS	1	M
BH02	6.55	10/06/2025	24/06/2025	A	1.9	1.9	ST/SS	1	M
BH02	7.83	10/06/2025	24/06/2025	A	1.4	1.4	ST/SS	1	M
BH02	9.45	10/06/2025	24/06/2025	A	1.1	1.1	ST/SS	1	M
BH02	12.16	10/06/2025	24/06/2025	A	2.8	2.8	ST/SS	3	M
BH02	12.90	10/06/2025	24/06/2025	A	3.1	3	ST/SS	3	M
BH02	13.53	10/06/2025	24/06/2025	A	3.3	3.3	ST/SS	3	M
BH02	15.61	10/06/2025	24/06/2025	A	1.7	1.7	ST/SS	3	M
BH02	17.26	10/06/2025	24/06/2025	A	1.6	1.7	SS	3	M
BH02	18.72	10/06/2025	24/06/2025	A	1.3	1.3	SS	3	M
BH02	19.44	10/06/2025	24/06/2025	A	1.3	1.3	SS	3	M
BH03	6.82	12/06/2025	24/06/2025	A	1.2	1.2	SS	3	M
BH03	7.63	12/06/2025	24/06/2025	A	1.6	1.6	SS	3	M
BH03	8.79	12/06/2025	24/06/2025	A	2	2	SS	3	M
BH03	9.60	12/06/2025	24/06/2025	A	2	2	SS	3	M

**Failure Type**  
1 = Fracture through bedding or weak plane  
2 = Fracture along bedding  
3 = Fracture through rock mass  
4 = Fracture influenced by natural defect or drilling  
5 = Partial fracture or chip (invalid result)

**Test Type**  
A = Axial  
D = Diametrial  
I = Irregular  
C = Cube

**Moisture Condition**  
W = Wet  
M = Moist  
D = Dry

**Rock Type**  
SS = Sandstone  
ST = Siltstone  
SH = Shale  
YS = Claystone  
IG = Igneous

Remarks:



Approved Signatory.....

Technician: NL

Bala Velupillai - Laboratory Supervisor

### Point Load Strength Index Report

Project: E26536.G03: 93-107 CECIL AVENUE & 9-10 ROGER AVENUE, CASTLE HILL, NSW

Project No.: 31380/9832D-L

Client: EI AUSTRALIA PTY LTD

Report No.: 25/1739

Address: SUITE 6.01, 55 MILLER STREET, PYRMONT NSW 2009

Report Date: 24/06/2025

Test Method: AS 4133.4.1

Page: 2 of 3

Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	Is(50) (MPa)	Rock Type	Failure Type	Moisture
BH03M	10.24	12/06/2025	23/06/2025	A	1.70	1.70	SS	3	M
BH04	4.42	18/06/2025	23/06/2025	A	0.25	0.25	SH/ST	3	M
BH04	6.15	18/06/2025	23/06/2025	A	2.30	2.30	SH/ST	3	M
BH04	7.34	18/06/2025	23/06/2025	A	2.20	2.10	SH/ST	3	M
BH04	8.90	18/06/2025	23/06/2025	A	2.10	2.10	SH/ST	3	M
BH04	10.60	18/06/2025	23/06/2025	A	1.60	1.60	SH/ST	3	M
BH04	12.40	18/06/2025	23/06/2025	A	1.40	1.40	SH	3	M
BH04	15.46	18/06/2025	23/06/2025	A	2.60	2.70	ST/SS	3	M
BH04	17.15	18/06/2025	23/06/2025	A	4.00	4.00	SS	3	M
BH04	18.50	18/06/2025	23/06/2025	A	2.10	2.10	SS	3	M
BH04	19.94	18/06/2025	23/06/2025	A	2.1	2.1	SS	3	M
BH05	5.16	16/06/2025	24/06/2025	A	0.41	0.41	ST/SS	3	M
BH05	6.67	16/06/2025	24/06/2025	A	1.1	1.1	ST/SH	3	M
BH05	8.35	16/06/2025	24/06/2025	A	1.1	1.1	ST/SH	3	M
BH05	10.43	16/06/2025	24/06/2025	A	1	1	ST/SH	3	M
BH05	11.73	16/06/2025	24/06/2025	A	2.5	2.5	ST/SH	3	M
BH05	13.18	16/06/2025	24/06/2025	A	1.5	1.5	SS	3	M
BH05	15.33	16/06/2025	24/06/2025	A	1.6	1.6	SS	3	M
BH05	16.55	16/06/2025	24/06/2025	A	1.6	1.6	SS	3	M
BH05	17.84	16/06/2025	24/06/2025	A	2	2	SS	3	M
BH06	8.39	13/06/2025	24/06/2025	A	1.9	1.9	SH/ST	3	M
BH06	9.61	13/06/2025	24/06/2025	A	2.2	2.3	SS/ST	3	M
BH06	10.56	13/06/2025	24/06/2025	A	2.4	2.4	SS	3	M
BH06	11.84	13/06/2025	24/06/2025	A	1.4	1.4	SS	3	M
BH06	12.51	13/06/2025	24/06/2025	A	2.2	2.2	SS	3	M
BH06	13.75	13/06/2025	24/06/2025	A	1.6	1.7	SS	3	M

**Failure Type**  
1 = Fracture through bedding or weak plane  
2 = Fracture along bedding  
3 = Fracture through rock mass  
4 = Fracture influenced by natural defect or drilling  
5 = Partial fracture or chip (invalid result)

**Test Type**  
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IG = Igneous

Remarks:

Approved Signatory.....



Technician: NL

Bala Velupillai - Laboratory Supervisor

**Point Load Strength Index Report**

Project: E26536.G03: 93-107 CECIL AVENUE & 9-10 ROGER AVENUE, CASTLE HILL, NSW

Project No.: 31380/9832D-L

Client: **EI AUSTRALIA PTY LTD**

Report No.: 25/1739

Address: SUITE 6.01, 55 MILLER STREET, PYRMONT NSW 2009

Report Date: 24/06/2025

Test Method: AS 4133.4.1

Page: 3 of 3

Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	Is(50) (MPa)	Rock Type	Failure Type	Moisture
BH06	14.45	13/06/2025	24/06/2025	A	1.50	1.50	SS	3	M
BH07	5.43	18/06/2025	23/06/2025	A	0.23	0.23	SH	3	M
BH07	7.35	18/06/2025	23/06/2025	A	2.10	2.20	SH	3	M
BH07	8.89	18/06/2025	23/06/2025	A	1.70	1.70	SH	3	M
BH07	10.40	18/06/2025	23/06/2025	A	1.60	1.60	SH	3	M
BH07	11.76	18/06/2025	23/06/2025	A	1.20	1.20	SH	3	M
BH07	13.25	18/06/2025	23/06/2025	A	0.92	0.93	SH	3	M
BH07	14.51	18/06/2025	23/06/2025	A	2.00	2.10	ST/SS	3	M
BH07	15.71	18/06/2025	23/06/2025	A	2.50	2.60	SS	3	M
BH07	17.51	18/06/2025	23/06/2025	A	1.30	1.30	ST/SS	3	M
BH08M	5.64	16/06/2025	24/06/2025	A	1.9	1.9	SS	3	M
BH08M	6.20	16/06/2025	24/06/2025	A	0.96	0.95	SS	3	M
BH08M	6.94	16/06/2025	24/06/2025	A	1.4	1.4	SS	3	M
BH08M	7.50	16/06/2025	24/06/2025	A	2.4	2.4	SS	3	M
BH08M	8.75	16/06/2025	24/06/2025	A	1.4	1.4	SS	3	M
BH08M	9.42	16/06/2025	24/06/2025	A	1.6	1.6	SS	3	M
BH09	6.11	11/06/2025	24/06/2025	A	2.1	2.1	SS	3	M
BH09	6.88	11/06/2025	24/06/2025	A	2.2	2.2	SS	3	M
BH09	7.18	11/06/2025	24/06/2025	A	1.4	1.4	SS	3	M
BH09	7.64	11/06/2025	24/06/2025	A	2.5	2.6	SS	3	M

**Failure Type**  
1 = Fracture through bedding or weak plane  
2 = Fracture along bedding  
3 = Fracture through rock mass  
4 = Fracture influenced by natural defect or drilling  
5 = Partial fracture or chip (invalid result)

**Test Type**  
A = Axial  
D = Diametrial  
I = Irregular  
C = Cube

**Moisture Condition**  
W = Wet  
M = Moist  
D = Dry

**Rock Type**  
SS = Sandstone  
ST = Siltstone  
SH = Shale  
YS = Claystone  
IG = Igneous

Remarks:



Approved Signatory.....

Technician: NL

Bala Velupillai - Laboratory Supervisor

## Atterberg Limits and Linear Shrinkage Report

Project: E26536.G03: 93-107 CECIL AVENUE & 9-10 ROGER AVENUE, CASTLE HILL, NSW

Project No.: 31380

Client: EI AUSTRALIA PTY LTD

Report No.: 25/1813

Address: SUITE 6.01, 55 MILLER STREET, PYRMONT NSW 2009

Report Date: 3/07/2025

Test Method: AS 1289.3.3.1, 3.2.1, 3.1.2, 3.4.1

Page: 1 of 1

Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

STS / Sample No.	9932D-L/1	9932D-L/2				
Sample Location	BH01M	BH03M				
Material Description	Silty Gravelly CLAY, grey brown	Silty CLAY, grey brown, with Gravel				
Depth (m)	1.5- 1.95	1.5- 1.95				
Sample Date	17/06/2025	12/06/2025				
Sample History	Oven Dried	Oven Dried				
Method of Preparation	Dry Sieved	Dry Sieved				
<b>Liquid Limit (%)</b>	<b>37</b>	<b>38</b>				
<b>Plastic Limit (%)</b>	<b>21</b>	<b>20</b>				
<b>Plasticity Index</b>	<b>16</b>	<b>18</b>				
<b>Linear Shrinkage (%)</b>	<b>8</b>	<b>9</b>				
Mould Size (mm)	127	150				
Crumbing	N	N				
Curling	N	N				

Remarks:



Approved Signatory.....

Technician: CK

Dilan Wijegunawardana - Senior Laboratory Technician

### Moisture Content of Soil and Aggregate Samples

Project: E26536.G03: 93-107 CECIL AVENUE & 9-10 ROGER AVENUE, CASTLE HILL, NSW      Project No.: 31380  
**Client: EI AUSTRALIA PTY LTD**      Report No.: 25/1814  
 Address: SUITE 6.01, 55 MILLER STREET, PYRMONT NSW 2009      Report Date: 3/07/2025  
 Test Method: AS1289.2.1.1      Page: 1 of 1

Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

STS / Sample No.	9932D-L/1	9932D-L/2				
Sample Location	BH01M	BH03M				
Material Description	Silty Gravelly CLAY, grey brown	Silty CLAY, grey brown, with Gravel				
Depth (mm)	1.5- 1.95	1.5- 1.95				
Sample Date	17/06/2025	12/06/2025				
<b>Moisture Content (%)</b>	<b>13.4</b>	<b>14.1</b>				

Remarks:



Approved Signatory.....

Technician: SP

Bala Velupillai - Laboratory Supervisor

CLIENT DETAILS

Contact Prince Shrestha  
 Client EI AUSTRALIA  
 Address SUITE 6.01  
 55 MILLER STREET  
 PYRMONT NSW 2009

Telephone 61 2 95160722  
 Facsimile (Not specified)  
 Email prince.shrestha@eiaustralia.com.au

Project **E26536.G03 Cecil&Roger Aves Castle Hill**  
 Order Number **E26536.G03**  
 Samples 4

LABORATORY DETAILS

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 Laboratory SGS Alexandria Environmental  
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 Alexandria NSW 2015

Telephone +61 2 8594 0400  
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SGS Reference **SE285434 R0**  
 Date Received 30/6/2025  
 Date Reported 3/7/2025

COMMENTS

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

SIGNATORIES



**Dong LIANG**  
 Metals/Inorganics Team Leader



**Shane MCDERMOTT**  
 Laboratory Manager



**Ying Ying ZHANG**  
 Laboratory Technician

pH in soil (1:5) [AN101] Tested: 1/7/2025

			BH01M_3.0-3.29	BH04_0.5-0.95	BH08M_1.5-1.7	BH09_0.5-0.95
			SOIL	SOIL	SOIL	SOIL
			-	-	-	-
			30/6/2025	30/6/2025	30/6/2025	30/6/2025
PARAMETER	UOM	LOR	SE285434.001	SE285434.002	SE285434.003	SE285434.004
pH	pH Units	0.1	<b>5.1</b>	<b>4.8</b>	<b>4.9</b>	<b>5.3</b>

Conductivity and TDS by Calculation - Soil [AN106] Tested: 1/7/2025

			BH01M_3.0-3.29	BH04_0.5-0.95	BH08M_1.5-1.7	BH09_0.5-0.95
			SOIL	SOIL	SOIL	SOIL
			-	-	-	-
			30/6/2025	30/6/2025	30/6/2025	30/6/2025
PARAMETER	UOM	LOR	SE285434.001	SE285434.002	SE285434.003	SE285434.004
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	<b>40</b>	<b>73</b>	<b>70</b>	<b>33</b>

Soluble Anions (1:5) in Soil/Solids by Ion Chromatography [AN245] Tested: 1/7/2025

PARAMETER	UOM	LOR	BH01M_3.0-3.29	BH04_0.5-0.95	BH08M_1.5-1.7	BH09_0.5-0.95
			SOIL - 30/6/2025 SE285434.001	SOIL - 30/6/2025 SE285434.002	SOIL - 30/6/2025 SE285434.003	SOIL - 30/6/2025 SE285434.004
Chloride	mg/kg	0.25	<b>8.8</b>	<b>5.2</b>	<b>52</b>	<b>24</b>
Sulfate	mg/kg	5	<b>47</b>	<b>100</b>	<b>39</b>	<b>51</b>

Moisture Content [AN002] Tested: 30/6/2025

			BH01M_3.0-3.29	BH04_0.5-0.95	BH08M_1.5-1.7	BH09_0.5-0.95
			SOIL	SOIL	SOIL	SOIL
			-	-	-	-
			30/6/2025	30/6/2025	30/6/2025	30/6/2025
PARAMETER	UOM	LOR	SE285434.001	SE285434.002	SE285434.003	SE285434.004
% Moisture	%w/w	1	<b>13.3</b>	<b>16.6</b>	<b>7.1</b>	<b>19.7</b>

METHOD

METHODOLOGY SUMMARY

**AN002**

The test is carried out by drying (at either 40°C or 105°C) a known mass of sample in a weighed evaporating basin. After fully dry the sample is re-weighed. Samples such as sludge and sediment having high percentages of moisture will take some time in a drying oven for complete removal of water.

**AN101**

pH in Soil Sludge Sediment and Water: pH is measured electrometrically using a combination electrode and is calibrated against 3 buffers purchased commercially. For soils, sediments and sludges, an extract with water (or 0.01M CaCl<sub>2</sub>) is made at a ratio of 1:5 and the pH determined and reported on the extract. Reference APHA 4500-H+.

**AN106**

Conductivity and TDS by Calculation: Conductivity is measured by meter with temperature compensation and is calibrated against a standard solution of potassium chloride. Conductivity is generally reported as µmhos/cm or µS/cm @ 25°C. For soils, an extract of as received sample with water is made at a ratio of 1:5 and the EC determined and reported on the extract, or calculated back to the as-received sample. Salinity can be estimated from conductivity using a conversion factor, which for natural waters, is in the range 0.55 to 0.75. Reference APHA 2510 B.

**AN245**

Anions by Ion Chromatography: A water sample is injected into an eluent stream that passes through the ion chromatographic system where the anions of interest ie Br, Cl, NO<sub>2</sub>, NO<sub>3</sub> and SO<sub>4</sub> are separated on their relative affinities for the active sites on the column packing material. Changes to the conductivity and the UV-visible absorbance of the eluent enable identification and quantitation of the anions based on their retention time and peak height or area. APHA 4110 B

FOOTNOTES

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

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

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

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

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

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

Note that in terms of units of radioactivity:

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

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

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

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## Appendix C Vibration Limits

German Standard DIN 4150 – Part 3: 2016-12 provides guideline levels of vibration velocity for evaluating the effects of vibration in structures. The limits presented in this standard are generally considered to be conservative.

The DIN 4150 values (maximum levels measured in any direction at the foundation, OR, maximum levels measured in (x) or (y) directions, in the plane of the uppermost floor), are summarised in **Table A** below.

It should be noted that peak vibration velocities higher than the minimum figures in Table A for low frequencies may be quite ‘safe’, depending on the frequency content of the vibration and the actual conditions of the structures.

It should also be noted that these levels are ‘safe limits’, up to which no damage due to vibration effects has been observed for the particular class of building. ‘Damage’ is defined by DIN 4150 to include even minor non-structural cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load bearing walls. Should damage be observed at vibration levels lower than the ‘safe limits’, then it may be attributed to other causes. DIN 4150 also states that when vibration levels higher than the ‘safe limits’ are present, it does not necessarily follow that damage will occur. Values given are only a broad guide.

**Table A** DIN 4150 – Structural Damage – Safe Limits for Building Vibration

Group	Type of Structure	Peak Vibration Velocity (mm/s)			
		At Foundation Level at a Frequency of:			Plane of Floor of Uppermost Storey
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 and 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

Note: For frequencies above 100 Hz, the higher values in the 50 Hz to 100 Hz column should be used.

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# Appendix D      Important Information

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## **SCOPE OF SERVICES**

The geotechnical report (“the report”) has been prepared in accordance with the scope of services as set out in the contract, or as otherwise agreed, between the Client And EI Australia (“EI”). The scope of work may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

## **RELIANCE ON DATA**

EI has relied on data provided by the Client and other individuals and organizations, to prepare the report. Such data may include surveys, analyses, designs, maps and plans. EI has not verified the accuracy or completeness of the data except as stated in the report. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations (“conclusions”) are based in whole or part on the data, EI will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to EI.

## **GEOTECHNICAL ENGINEERING**

Geotechnical engineering is based extensively on judgment and opinion. It is far less exact than other engineering disciplines. Geotechnical engineering reports are prepared for a specific client, for a specific project and to meet specific needs, and may not be adequate for other clients or other purposes (e.g. a report prepared for a consulting civil engineer may not be adequate for a construction contractor). The report should not be used for other than its intended purpose without seeking additional geotechnical advice. Also, unless further geotechnical advice is obtained, the report cannot be used where the nature and/or details of the proposed development are changed.

## **LIMITATIONS OF SITE INVESTIGATION**

The investigation programme undertaken is a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation programme and subsequent laboratory testing are extrapolated across the site to form an inferred geological model, and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite investigation, the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. The engineering logs are the subjective interpretation of subsurface conditions at a particular location and time, made by trained personnel. The actual interface between materials may be more gradual or abrupt than a report indicates.

## **SUBSURFACE CONDITIONS ARE TIME DEPENDENT**

Subsurface conditions can be modified by changing natural forces or man-made influences. The report is based on conditions that existed at the time of subsurface exploration. Construction operations adjacent to the site, and natural events such as floods, or ground water fluctuations, may also affect subsurface conditions, and thus the continuing adequacy of a geotechnical report. EI should be kept apprised of any such events, and should be consulted to determine if any additional tests are necessary.

## **VERIFICATION OF SITE CONDITIONS**

Where ground conditions encountered at the site differ significantly from those anticipated in the report, either due to natural variability of subsurface conditions or construction activities, it is a condition of the report that EI be notified of any variations and be provided with an opportunity to review the recommendations of this report. Recognition of change of soil and rock conditions requires experience and it is recommended that a suitably experienced geotechnical engineer be engaged to visit the site with sufficient frequency to detect if conditions have changed significantly.

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## **REPORT FOR BENEFIT OF CLIENT**

The report has been prepared for the benefit of the Client and no other party. EI assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of EI or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own inquiries and obtain independent advice in relation to such matters.

## **OTHER LIMITATIONS**

EI will not be liable to update or revise the report to take into account any events or emergent circumstances or fact occurring or becoming apparent after the date of the report.