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THE TRUST FOR DREP1 MONA VALE SUB TRUST

Geotechnical Investigation

159-167 Darley Street West, Mona Vale NSW

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Revision	Details	Date	Amended By
	Original	17 February 2025	
Rev1	SSDA amendments	10 September 2025	JB
Rev2	Minor amendments	5 November 2025	JB
Rev3	Minor amendments	19 November 2025	JB

The following document provides background for the Darley Street West State Significant Development Application (SSD-91496958). Consultants should include the following information (or components of it) as they see fit within each technical report, where relevant.

Table of Contents

Schedule of Plates

Schedule of Tables

Appendices

1. Introduction

1.1 Background

This Geotechnical Investigation (GI) report, prepared by EI Australia Pty Ltd (EI), is submitted to the Department of Planning, Housing and Infrastructure (DPHI) on behalf of The Trustee for DREP1 Mona Vale Sub Trust (the Applicant) in support of a State Significant Development Application (SSDA), identified as SSD-91496958, for in-fill affordable housing at 159-167 Darley Street West, Mona Vale (the Site).

On 22 August 2025, DPHI issued Secretary's Environmental Assessment Requirements (SEARs) to the Applicant for the preparation of an Environmental Impact Statement (EIS) for the proposed development. This report has been prepared to respond to the relevant SEARs summarised in **Table 1-1** below.

Table 1-1 SEARs Requirements Addressed

Requirement	Response
12. Ground and Water Conditions *(Partial)* • Assess potential impacts on soil resources and related infrastructure and riparian lands on and near the site and including soil erosion. • Where required provide a Groundwater Impact Assessment in accordance with relevant Groundwater Guidelines. If the proposed development is on land identified as having high salinity or acid sulfate soil potential in an EPI provide a Salinity Management Plan or Acid Sulfate Soil Management Plan that includes appropriate management measures and strategies.	Refer to **Section 4**

1.2 Proposed Development

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

- Architectural drawings prepared by PBD Architects – Project No. 2435, latest revision A, dwgs last dated 5 November 2025; and
- Site survey plan prepared by LTS Lockley – Referenced 52336 001_DT, latest revision A, dated 29 August 2024. The datum in the survey plan is in Australian Height Datum (AHD), hence all Reduced Levels (RL) mentioned in this report are henceforth in AHD.

This SSDA seeks consent for the design and construction of a new residential flat development comprising:

- Site preparation works including demolition, excavation and tree removal;
- Construction of three (3) x 6-storey residential flat buildings, comprising:
  - 82 apartments, including:
    - 72 market apartments;
    - 10 affordable apartments (10.5% of GFA);
  - Separate residential lobbies;
  - Communal open space;
- Construction of 1-3 storeys of basement parking, comprising:
  - 164 car parking spaces, including:
    - 156 residential spaces;

  - 8 accessible residential spaces;
- 27 bicycle parking spaces;
- Two (2) motorcycle parking spaces;
- Waste and storage facilities;

- Associated landscaping, including transplanting of two (2) trees and planting of new trees and vegetation.

Full details of the proposed development are set out in the accompanying Architectural Drawings and Landscape Drawings prepared by PBD Architects and Arcadia, respectively.

Based on the provided documents, EI understands that the lowest basement level is proposed to have a Finished Floor Level (FFL) of RL 1.42m AHD. A Bulk Excavation Level (BEL) of approximately RL 1.10m AHD is assumed, which includes allowance for the construction of the basement slab and drainage layers.

To achieve excavation to BEL, excavation depths up to 11.0m Below Existing Ground Level (BEGL) are expected. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches. The proposed basement is set back approximately 6m from the north-western boundary, 6.5m from the north-eastern boundary, 2.5m from the south-eastern boundary and 13 to 27m from the south-western boundary, see **Figure 2**.

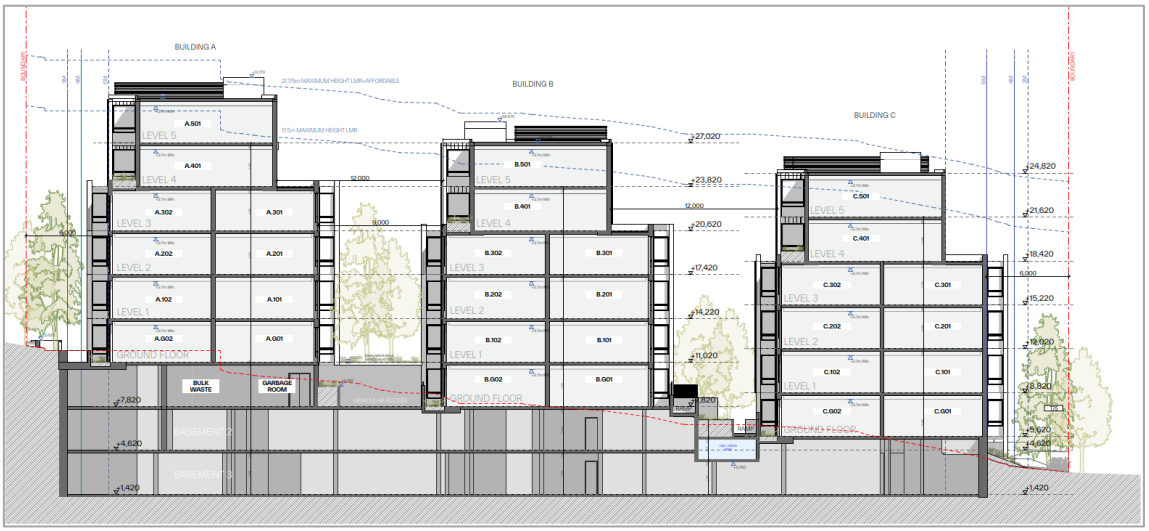


Plate 1 Extract of basement section (source: PBD Architects, dated November 2025)

1.3 Objectives

The objective of the GI was to assess site surface and subsurface conditions at five borehole locations, and to provide 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:

- 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;
- Mechanical auger drilling of three boreholes (BH1M, BH2M and BH3M) total. BH1 and BH2 were drilled using a track-mounted drill rig while BH3 was drilled using a ute-mounted drilling rig. Both drilling rigs utilised solid flight augers equipped with 'Tungsten-Carbide' (T-C) bits. The boreholes were auger drilled to depths as shown in **Table 1-2** below:

Table 1-2 Augering and Rock Coring Depths

Borehole ID	Surface RL (m AHD)	Augering		Rock Coring	
		Depth (m)	RL (m AHD)	Depth (m)	RL (m AHD)
BH1M	8.85	7.32	1.53	15.0	-6.15
BH2M	8.00	3.42	4.58	14.0	-6.0
BH3M	3.14	13.8	-10.70	N/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 BH1M and BH2M using NMLC diamond coring techniques to termination depths shown above in **Table 1-2**. The rock core photographs are presented in **Appendix A**;
- Hand auger drilling of two boreholes (BH4 and BH5) within grassy areas at the rear of the site to a refusal depth of 0.5m (RL 9.15m) and 0.8m BEGL (RL 3.80m), respectively;
- Three Dynamic Cone Penetrometer (DCP) tests were carried out adjacent to BH3, BH4 and BH5. DCP tests were carried out to assess soil strength/relative densities in the absence of SPT testing;
- Construction of groundwater wells within BH1M, BH2M and BH3M to allow for accurate groundwater measurements and future long-term groundwater monitoring. Groundwater levels are presented in **Table 3-3**, and well construction details are presented in the borehole logs in **Appendix A**;
- Boreholes BH4 and BH5 were backfilled with drilling spoils and capped 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; and
- 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 intended to assist in the preparation of final designs for the proposed development. Further geotechnical inspections should be carried out during construction to confirm the geotechnical and groundwater models, and the design parameters provided in this report.

2. Site Description

2.1 Site Description and Identification

The site is located at 159-167 Darley Street West, Mona Vale within the Northern Beaches Council Local Government Area (LGA). It is legally described as Lots 1-5 of DP11109 and owned by Darleydev Pty Ltd. The site has an area of approximately 6,122m^2, with a 76m frontage to Darley Street West to the northeast.

The Site locality is shown on **Figure 1.** An aerial photograph of the site is presented in **1.1 below**.

Plate 2 Aerial photograph of the site (source: Nearmap, edits by Ethos Urban)

2.2 Local Land Use

The site is situated within an area of residential use. Current uses on surrounding land at the time of our presence on site are described in **Table 2-1** below.

Table 2-1 Summary of Local Land Use

Direction Relative to Site	Land Use Description
Northwest	Properties at 6 to 10 Kunari Place, comprising of three one to two-storey brick residential dwellings.
Northeast	Darley Street West, a two-lane asphalt-paved road.
Southeast	Property at 155-157 Darley Street West, comprising of multiple rendered town houses.
Southwest	Properties at 86-94 Park Street, comprising of clad and brick residential dwellings.

2.3 Regional Setting

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

Table 2-2 Topographic and Geological Information

Attribute	Description
Topography	The site is located on the western side of Darley Street West, site grade dipping towards north-northwest at approximately 7° with site levels varying from RL 12.5m AHD at the southern site corner to RL 3.1m AHD at the northern site corner.
Regional Geology	Information on regional sub-surface conditions, referenced from the Department of Mineral Resources Geological Map Sydney 1:100,000 Geological Series Sheet 9130 (DMR 1983) indicates the site is close to the boundary between Holocene deposits of the Quaternary Period (Qha) and Sandstone of the Terrigal Formation (Rnn). Qha Holocene deposits consists of silty to peaty quartz sand, silt and clay with ferruginous and humic cementation in places and common shell layers. Rnn Sandstone consists of interbedded laminate, shale, and quartz to lithic-quartz sandstone; minor red claystones.
Soil Landscape	Information of local soil conditions, referenced from the Department of Environment, Climate Change and Water 1:100,000 Soils Landscapes Series Sydney Sheet 9130 (4th edition) indicates that the landscape at the site likely comprises the Erina Landscape. This landscape type typically includes undulating to rolling rises and low hills in fine grained sandstones & claystones of the Narrabeen Group, with slopes of less than 20 %. Soil are typically moderately deep (1.0 to >2.0 m) yellow podsolic soils on sandstone crests, and deep (>2.0 m) yellow podsolic soils on shale lower slopes. These soils present very high soil erosion hazard, impermeable plastic low wet-strength subsoil, localised run-on, and seasonal waterlogging of footslopes.

Plate 3 Excerpt of geological map showing location of site.

3. Investigation Results

3.1 Stratigraphy

For the development of a site-specific geotechnical model, the stratigraphy observed in the GI has been grouped into four geotechnical units. A summary of the subsurface conditions across the site, interpreted from the assessment results, is presented in **Table 3-1** and **Table 3-2**. 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 3-1 Summary of Subsurface Conditions

Unit	Material [2]	Depth to Top of Unit (m BEGL) [1]	RL of Top of Unit (m AHD) [1]	Observed Thickness (m)	Comments
1	Fill	Surface	3.1 to 9.65	0.4 to 0.6	Fill, generally Silty SAND, SAND and/or Gravelly SAND, fine to medium grained, comprising some rootlets. Fill is inferred to be uncontrolled and poorly compacted. Thickness of Unit 1 was observed within BH1M to BH3M and BH5.
2	Residual Soil	0.4 to 0.6	2.50 to 8.35	2.92 to 5.50	Generally Silty CLAY, medium to high plasticity, comprising some gravel. Unit 2 soils generally grade into Sandy CLAY/Clayey SAND with depth, low plasticity, and increase in stiffness. Unit 2 comprised bands of XW sandstone within BH2M. Unit 2 base observed to range from stiff to hard based on SPT N-values and DCP blowcounts; Thickness of Unit 2 was observed within BH1M to BH3M only.
3	Weathered Bedrock	3.42 to 6.0	2.85 to 4.58	5.53 to 7.79	SANDSTONE and CLAYSTONE, extremely to distinctly weathered, extremely low to low strength, comprising of clay seams, and fragmented rock. Core loss was observed within BH1M and BH2M, and was observed to be up to 1.28 m thick. Core loss is inferred to be bands of decomposed or highly fractured material. Unit 3 was observed within BH1M and BH2M only.
4	Low Strength Sandstone	11.21 to 11.53	-3.21 to -2.68	- [3]	SANDSTONE, distinctly weathered, low strength.

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 BH1M and BH2M.

Table 3-2 Depths to Top of Units in Boreholes (mBEGL)

Unit	Material	BH1M	BH2M	BH3M	BH4	BH5
Surface RL (m AHD)		***8.85***	***8.00***	***3.10***	***9.65***	***4.60***
1	Fill	0	0	0	0	0
2	Residual Soil	0.5	0.5	0.6	-	0.4
3	Weathered Bedrock	6.0	3.42	NE	NE	NE
4	L Str SS	11.53	11.21	NE	NE	NE

Note 1 NE = Not encountered within the borehole

The depth to bedrock appears to fall significantly (>13.8m BEGL) to the north, where bedrock was not encountered in BH3M. See **Figure 3** for a cross section showing the change in bedrock depth from south to north.

3.2 Groundwater Observations

Following completion of auger drilling, the boreholes were left open and free standing groundwater levels were then measured within the boreholes after a period of time. No groundwater or significant seepage was observed during or after auger drilling of the boreholes. Water circulation due to coring within the boreholes prevented further observations of groundwater levels within BH1M and BH2M. We note that the groundwater levels may not have become evident or stabilised in the augered boreholes within the limited observation period.

Following their completion, groundwater monitoring wells were installed in BH1M, BH2M and BH3M and bailed dry. The groundwater levels were then measured within the monitoring wells as per **Table 3-3** below. EI also revisited the site on 14 January and 13 June 2025 to carry out measurement of groundwater levels in the boreholes.

Table 3-3 Groundwater Measurements within the Monitoring Wells

Borehole ID	Surface Level (m AHD)	Groundwater Levels		
		Measurement Date	Depth (m BEGL)	RL (m AHD)
BH1M	8.85	14/01/2025	3.28	5.57
		13/06/2025	2.26	6.59
BH2M	8.00	14/01/2025	3.76	4.24
		13/06/2025	3.29	4.72
BH3M	3.10	14/01/2025	3.25	-0.15
		13/06/2025	0.44	2.47

3.3 Test Results

Three soil 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).

A summary of the soil test results is provided in **Table 3-4** below. Laboratory test certificates are presented in **Appendix B**.

Table 3-4 Summary of Soil Laboratory Test Results

Test / Sample ID	BH1M_6.9-7.0	BH2M_3.0-3.17	BH3M_0.8-0.9	BH2M_1.5-1.95
Borehole ID	BH1M	BH2M	BH3M	BH2M
Sample Depth (m BEGL)	6.9-7.0	3.0-3.17	0.8-0.9	1.5-1.95
Unit	2	2	2	2
Material[1]	Residual Soil	Residual Soil	Residual Soil	Residual Soil
USCS Description	Silty CLAY	Silty CLAY	Sandy CLAY	Sandy CLAY
Aggressivity				
Chloride Cl (ppm)	74	610	11	-
Sulfate SO_4 (ppm)	110	150	8.4	-
pH	4.5	4.3	6.0	-
Electrical Conductivity (µS/cm)	110	460	24	-
Atterberg Limits				
Moisture Content (%)	11.4	4.5	10.2	-
Liquid Limit (%)	-	-	-	40
Plastic Limit (%)	-	-	-	19
Plasticity Index (%)	-	-	-	21
Linear Shrinkage (%)	-	-	-	10

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 result on the selected clay sample indicated clays to be of medium plasticity and of moderate shrink-swell potential

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:

- '**Moderate'** for buried concrete structural elements; and
- **'Non-Aggressive'** for buried steel structural elements.

Eighteen (18) selected rock core samples were tested by STS Geotechnics Pty Ltd to estimate the Point Load Strength Index (Is_{50}) 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.

4. Recommendations

4.1 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;
- Groundwater within the depth of the excavation;
- Variable depth to bedrock;
- Reactivity of the underlying natural clays;
- Foundation design for building loads.

4.2 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 of twice the total depth of the excavation. The reports 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 owner who should be asked to confirm that it represents a fair assessment of existing conditions. The reports should be carefully reviewed prior to demolition and construction.

4.3 Site Preparation

Following removal of all vegetation and trees (including their root balls), demolition of the existing sheds, slabs and pavements, all grass, topsoil, root affected soils and any deleterious fill or contaminated soil should be stripped. Based on the results of the investigation, topsoil/root affected soil should be stripped to a nominal depth.

We note that it is difficult to accurately assess the depth of topsoil and root affected soils in a 100mm diameter borehole. If considered to be an important contractual issue, we recommend that a number of shallow test pits be excavated across the site to more accurately confirm the topsoil/root affected soil stripping depth or alternatively a geotechnical inspection could be carried out after initial stripping to confirm the depth. Stripped topsoil and root affected soils should be stockpiled separately as they are considered unsuitable for reuse as engineered fill.

All existing fill will need to be stripped down to the surface of the underlying natural soils and stockpiled should it be considered for reuse on site as engineered fill, subject to contamination status and conformance to the fill specification provided in section below.

4.4 Excavation Methodology

4.4.1 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 1.10m for the basement, or an excavation extent up to 11.0m BEGL. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.

Based on the borehole logs, the proposed basement excavation is expected to extend through Unit 1 (Fill), Unit 2 (Residual Soil) and Unit 3 (Weathered Bedrock). As such, an engineered shoring wall must be installed prior to excavation commencing to support the full excavation depth.

Units 1 and 2 may be excavated using buckets of large earthmoving Hydraulic Excavators. Unit 3 may be excavated using moderate ripping. Unit 4 (L Str Sandstone) (where encountered) may be excavated using hard or heavy ripping. Ripping may require a high capacity and heavy bulldozer for effective production. Wear and tear should 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. Where medium strength sandstone is encountered within Unit 4, hydraulic rock breakers and rock saws could be used, though productivity would be lower and equipment wear increased, and this should be allowed for. Should rock hammering be required for the excavation of higher strength bands of rock, then further advice should be sought from EI regarding vibration mitigation and monitoring.

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.

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.

4.4.2 Excavation Monitoring

Consideration should be made to the impact of the proposed development upon neighbouring structures, roadways and services. Basement shoring wall 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. It is recommended that a Geotechnical Monitoring Plan (GMP) is prepared for the site to provide detailed criteria for vibration and deflection monitoring of the basement shoring walls.

4.5 Groundwater Considerations

Groundwater was observed in all monitoring wells, presented in **Table 3-3**. Groundwater levels within BH1M & BH2M were observed to be above the assumed BEL RL of 1.10m AHD, whereas the groundwater level falls towards the north to levels below BEL within BH3M.

Based on the groundwater levels being within the residual clays and expected low permeability of the soil and bedrock profile, we expect that 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. However, we expect that some groundwater inflows into the excavation along the soil/rock interface and through any defects within the sandstone bedrock

(such as jointing, and bedding planes, etc.) particularly following a period of heavy rainfall. 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. 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.

Monitoring and analysis of the ground water have been completed, including the installation of monitoring wells, long-term groundwater monitoring and a preliminary groundwater seepage analysis (GSA). Based on the results of the modelling, a tanked basement is not warranted.

At the time of writing this revision, additional investigations, monitoring and analysis have been completed including groundwater seepage analysis (GSA), the installation of additional monitoring wells, further long-term groundwater monitoring, and laboratory testing have been completed.

The groundwater monitoring and analysis outlined above is consistent with geotechnical SEARs requirements for a Groundwater Impact Assessment.

Reference should be made to Department of Planning and Environment (DPE) guidelines “Minimum requirements for building site groundwater investigation and reporting”, dated October 2022. The Department of Climate Change, Energy, the Environment and Water (DCCEEW) will be the approval authority for Council with regards to development applications for a drained basement, with WaterNSW acting as an intermediary between the two entities.

4.6 Excavation Retention

4.6.1 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 architectural drawings provided, the basement is shown to extend approximately 14m from the north-western boundary, 7m from the north-eastern boundary, 3m from the south-eastern boundary and 31m from the south-western boundary, see **Figure 2**.

Based on the depth of the excavation, encountered subsurface conditions and setbacks, temporary batters may be feasible in the shallower portions of the excavation to the northwest. Temporary batters of no steeper than a safe angle of 1 Vertical (V) to 1 Horizontal (H) may be feasible where space allows for the fill and residual soil profile. The above temporary batters should remain stable provided that all surcharge loads, including construction loads, are kept at a distance of at least 2h (where ‘h’ is the height of the batter in metres) from the crest of the batter. If steeper batters are to be used, then these must be supported by shotcrete and soil nail system designed by a suitable structural or geotechnical engineer. The stability of these batters can be assessed using computer slope stability analysis software such as Slope/W. we can complete such analysis, if commissioned to do so.

Where batters are used, the space between the batters and the permanent retaining walls will need to be carefully backfilled to reduce future settlement of the backfill. Only light compaction equipment should be used for compaction behind retaining walls so that excessive lateral pressures are not placed on the walls. This will require the backfill to be placed in thin layers,

say 100mm loose thickness, appropriate to the compaction equipment being used. The compaction specification for the backfill will depend on whether paving or structures are to be supported on the fill. If the fill is to support paved areas it should be compacted to a density of at least 98% of Standard Maximum Dry Density (SMDD) for granular fill materials, but if it is only to support landscaped areas of lower compaction specification, say 95% of SMDD, may be appropriate, provided the risk of future settlement and maintenance can be accepted. An alternative for backfill would also be to use a uniform granular material, wrapped in a geofabric.

Where temporary batters are not feasible, or alternatively, a suitable full length shoring wall should be designed for the proposed basement. The shoring wall is expected to support the overburden material, comprising Unit 1 (Fill) and Unit 2 (Residual Soil), and Unit 3 (EL Str Sandstone) in some locations. For this site, we consider that a cantilevered and/or anchored/propped soldier pile wall with reinforces concrete panels in between the piles installed to below BEL to be the most suitable. Anchors/props and reinforces panels concrete must be installed progressively as excavation proceeds.

Further geotechnical investigations should be carried out across the site to collect additional information on subsurface conditions around the site and to further refine the structural design of the basement shoring walls. Further advice should be sought from prospective piling contractors who should be provided with a copy of this report.

4.6.2 Retaining Wall Design Parameters

The following parameters may be used for static design of the basement shoring walls at the site. EI note that the below 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.

- Conventional free-standing cantilever walls which support areas where movement is of little concern (i.e. where only gardens or open areas are to be retained), may be designed using a triangular lateral earth pressure distribution and an ‘active’ earth pressure coefficient, Ka, as shown in **Table 4-1**;
- Cantilevered walls, where the tops of which are restrained by the floor slabs of the permanent structure or which support movement sensitive elements, should be designed using a triangular lateral earth pressure distribution and an ‘at rest’ earth pressure coefficient, Ko, as shown in **Table 4-1** below;
- 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;
- 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_o;
- The lateral toe resistance of the retention system can be achieved by sufficient embedment below the ground in front of the wall. For embedment depth design, a triangular lateral earth pressure distribution should be adopted, with a ‘passive’ earth pressure coefficient, Kp, as shown in **Table 4-1** below, for soil, assuming horizontal ground in front of the wall. The effect of the groundwater must also be taken into account. We note that significant deflection is required in order to mobilise the full ‘passive’ pressure of a soil, and therefore a

factor of safety of at least 2.0 should be adopted. The 'passive' pressure due to the upper 0.5 m below bulk excavation level should be ignored in the analysis to take excavation tolerances into account. All localised excavations in front of the wall (such as pile rig working platform, buried services, footings, lift overrun pits, etc.) should also be taken into account in the wall design;

- For piles embedded into Unit 3 (EL Str Sandstone) or better, the allowable lateral toe resistance values outlined in **Table 4-1** below may be adopted. 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. The presence of neighbouring basements and/or services and their levels must be confirmed prior to finalising the anchor design; and
- Temporary anchors should have their bond length within Unit 3 (EL Str Sandstone) or better. For the design of temporary anchors bonded into Unit 3 or better, the allowable bond stress value outlined in **Table 4-1** below may be used, subject to the following conditions:
  - Temporary anchor bond lengths of at least 3m behind the 'active' zone of the excavation (taken as a 45° zone above the base of the excavation) is provided;
  - Overall stability, including anchor group interaction, is satisfied; and
  - All temporary anchors should be proof loaded to at least 1.33 times the design working load before locking off at the working load. Inspections of drilling and proof loading of anchors should be carried out by a suitable qualified geotechnical engineer. We recommend that only experienced contractors be considered for anchor design, specification and installation with appropriate insurances.

Table 4-1 Geotechnical Design Parameters

Material [1]	Unit 1 Fill	Unit 2 Residual Soil	Unit 3 Weathered Bedrock	Unit 4 Low Strength Sandstone
Bulk Unit Weight (kN/m^3)	18	19	23	24
Friction Angle, ϕ' (°)	25	26	30	33
Undrained Cohesion, C_u (kPa)	-	50	-	-
Young's Modulus, E' (MPa)	5	15	50	120
Earth Pressure at rest, K_o [2]	0.58	0.56	0.50	0.46
Active Earth Pressure, K_a [2]	0.41	0.39	0.33	0.29
Passive Earth Pressure, K_p [2]	-	2.56	3.00	3.39
Allowable Bearing Pressure (kPa) [4,5]	-	100	600	1000
Ultimate Bearing Pressure (kPa) [4]	-	300	1800	3000
Ultimate Shaft Adhesion in Compression (kPa) [3, 4]	-	15	50	75
Ultimate Shaft Adhesion in Uplift (kPa) [3, 4]	-	7.5	25	37.5
Allowable Toe Resistance (kPa)	-	-	300	500
Allowable Bond Stress (kPa)	-	-	50	75
Earthquake Site Risk Classification	AS 1170.4:2007 indicates earthquake subsoil Class C_e.(Shallow Soil)			

Material [1]	Unit 1 Fill	Unit 2 Residual Soil	Unit 3 Weathered Bedrock	Unit 4 Low Strength Sandstone
	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 Earth pressures are provided on the assumption that the ground behind the retaining walls is horizontal.

Note 3 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 liftout' mechanics in accordance with AS4678-2002 Earth Retaining Structures.

Note 4 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 1 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).

4.7 Foundations

It is anticipated that Unit 3 (Weathered bedrock) will be encountered at or near BEL in the southern region of the site. Towards the center and north, Unit 2 (Residual Soil) will be expected at BEL and Unit 3 is expected to be encountered well below BEL. Design of foundations for the site should consider the risk of adverse differential settlement between shallow and deeper footings. Unless an allowance for such movement is considered, then foundations should be designed to found on material with comparable bearing capacities and elastic moduli.

Hence, it is recommended that the design of footings for the proposed development comprises a combination of shallow footings and foundation piles extended to Unit 3 or better material. It is recommended that further geotechnical investigations in the form of four cored boreholes are carried out to provide information on depths and quality of Unit 3 & Unit 4 (L Str Sandstone) across the basement footprint.

During construction stage, geotechnical inspections should be carried out by suitably qualified geotechnical professional to confirm that the required bearing capacities have been achieved, and to determine any variations that may occur between borehole/inspection locations. Where groundwater ingress is encountered during detailed excavation of shallow footings, concrete is to be placed as soon as possible upon completion of such detailed excavations.

Further Geotechnical Inputs

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

- Additional Geotechnical Investigation in the form of at least four cored boreholes across the site to confirm the depth and quality of bedrock across the site;
- Preparation of a Geotechnical Monitoring Plan (GMP) for vibration & deflection monitoring of the shoring wall;
- Dilapidation surveys of surrounding properties prior to bulk excavation works;
- Design of working platforms (if required) for construction plant by an experienced and qualified geotechnical engineer;
- Geotechnical inspections of the shoring pile installation by an experienced geotechnical professional prior to placement of any concrete or steel to verify the adequacy socket material;
- Classification of all excavated material transported off site;
- Witnessing drilling and installation of support measures and proof-testing of any temporary anchors.
- Geotechnical inspections of all new shallow footings and foundation piles by an experienced geotechnical professional prior to placement of concrete or steel to verify the bearing capacity of founding material; and
- Ongoing monitoring of groundwater inflows into the bulk excavation during excavation works.

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.

5. Statement of Limitations

This report has been prepared for the exclusive use of The Trust for Drep1 Mona Vale Sub Trust 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 The Trust for Drep1 Mona Vale Sub Trust

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.

AS3600:2018, *Concrete Structures,* Standards Australia

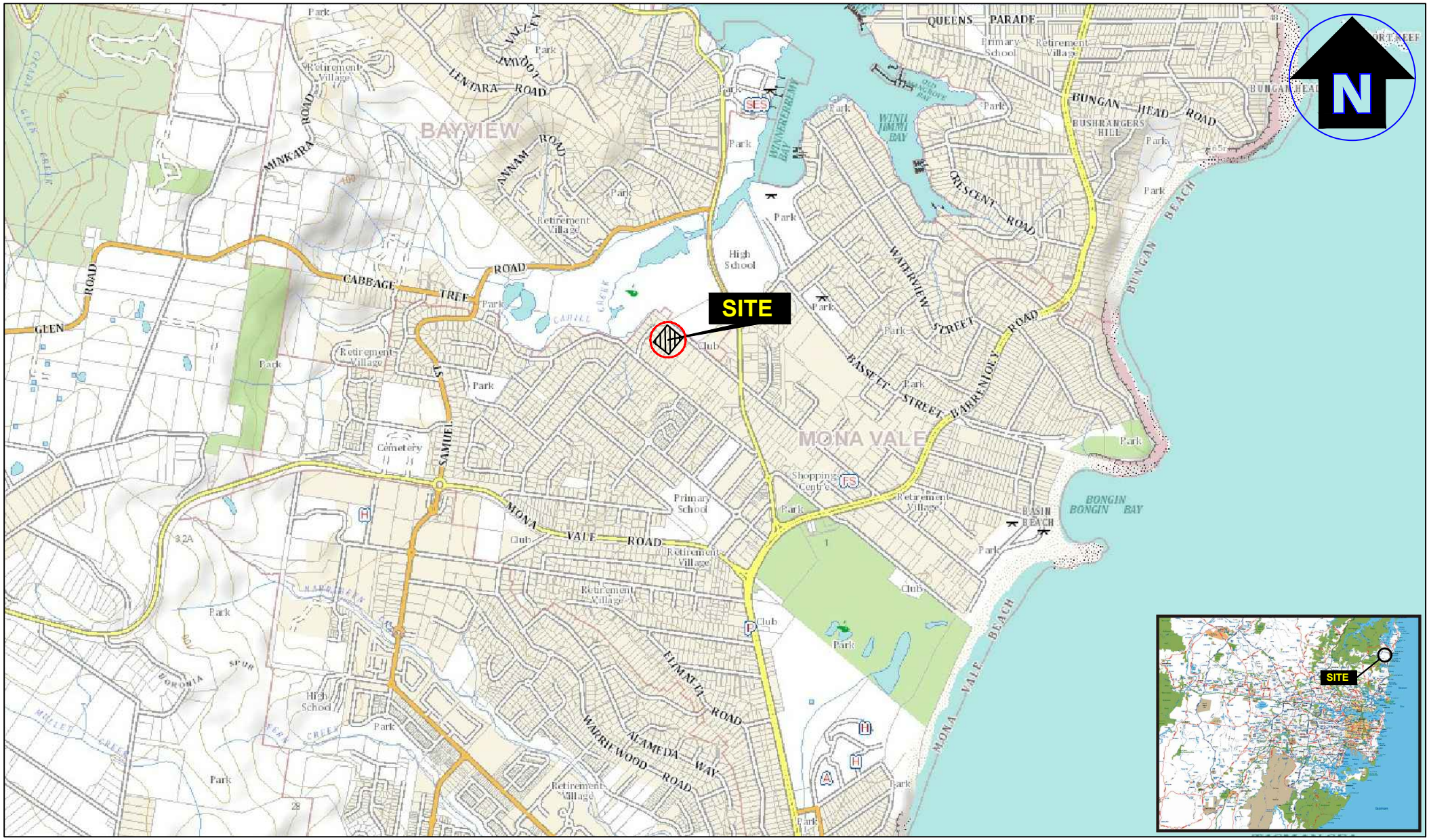
Safe Work Australia Excavation Work Code of Practice, dated January 2020 – WorkCover NSW

NSW Department of Mineral Resources (1983) Sydney 1:100,000 Geological Series Sheet 9130 (Edition 1). Geological Survey of New South Wales, Department of Mineral Resources.

Abbreviations

AHD	Australian Height Datum
AS	Australian Standard
BEL	Bulk Excavation Level
BEGL	Below Existing Ground Level
BH	Borehole
DBYD	Dial Before You Dig
DCP	Dynamic Cone Penetrometer
DP	Deposited Plan
EI	EI Australia
GI	Geotechnical Investigation
GSA	Groundwater Seepage Analysis
NATA	National Association of Testing Authorities, Australia
RL	Reduced Level
SPT	Standard Penetration Test
T-C	Tungsten-Carbide

Figures



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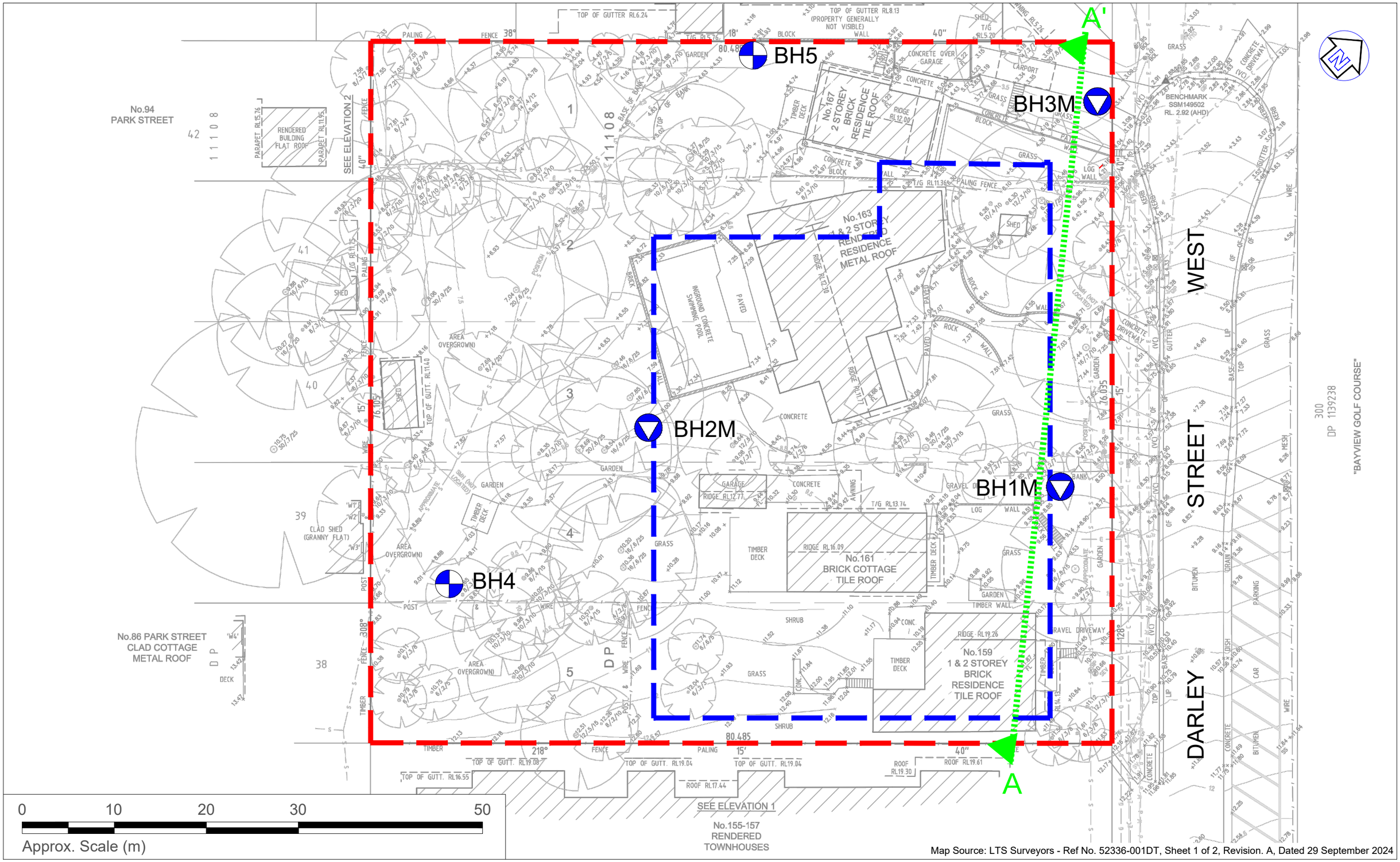
Drawn:	J.O.
Approved:	S.K.
Date:	18-02-24
Scale:	Not To Scale

Darley Services Pty Ltd
Geotechnical Investigation
159-167 Darley Street West, Mona Vale NSW
Site Locality Plan

Figure:
1

Project: E26489.G03



LEGEND *All location are in approximation

- Proposed site boundary
- Proposed basement boundary
- Borehole Locations
- Monitoring Well Locations
- Cross Section A-A' (Figure 3)

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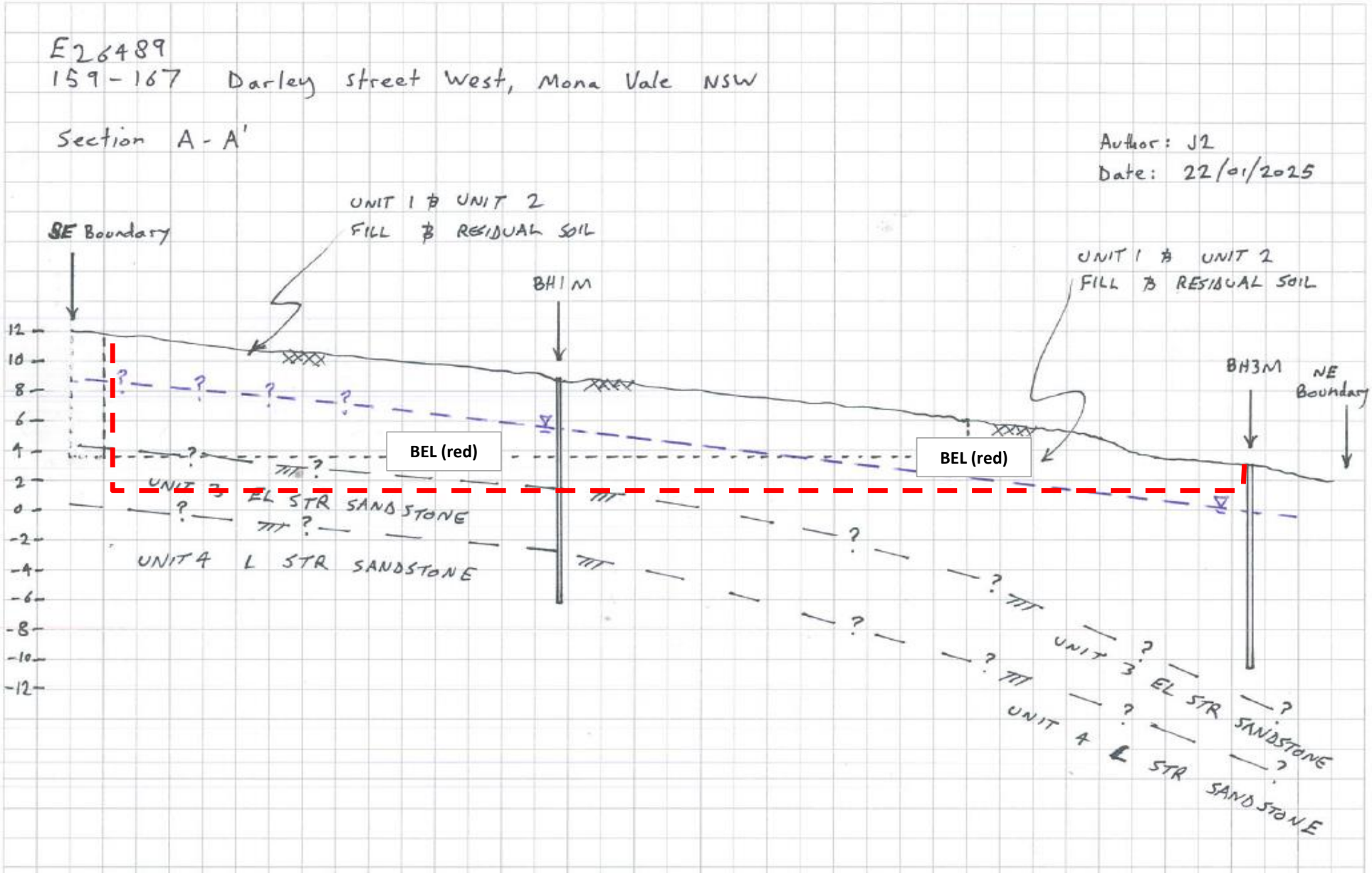
Drawn:	J.O.	
Approved:	S.K.	
Date:	18-02-24	

Darley Services Pty Ltd
Geotechnical Investigation
159-167 Darley Street West, Mona Vale

Borehole Location Plan

Figure: 2

Project: E26489.G03



eiaustralia Contamination | Remediation | Geotechnical Suite 6.01, 55 Miller Street, PYRMONT 2009 Ph. (02) 9516 0722 Fax (02) 9518 5088	Drawn:	J2	**IPM Property Pty Ltd** Geotechnical Investigation 159-167 Darley Street West, Mona Vale Section A-A'	Figure: **3** Project: E26489.G03_Rev2
	Approved:	SK		
	Date:	4/11/2025		

Appendix A Borehole Logs And Explanatory Notes

BOREHOLE LOG

BH ID: BH1M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	03 December 2024	
Client	Darley Services Pty Ltd			**Completed**	03 December 2024	
Job No.	E26489.G03			**Logged By**	JO	**Date**	03 December 2024
Sheets	1 of 3			**Review By**	JB	**Date**	10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.85 m (AHD)	**Northing**	6273033.1481 (MGA 2020 Zone 56)	
Plant	Massenza M13	**Inclination**	90°	**Easting**	342370.7022 (MGA 2020 Zone 56)	

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH1M_0.10-0.20		0.00		8.85	FILL: Silty SAND: fine to medium grained, dark brown trace rootlets with angular to sub-angular gravels	M	-	FILL
		BH1M_0.50-0.60 BH1M_0.50-0.95 SPT 0.50-0.95 7,12,12 N=24 BH1M_1.00-1.10		0.50 1		8.35	Silty CLAY: medium plasticity, brown-red		VSt	RESIDUAL SOIL
		BH1M_1.50-1.60 BH1M_1.50-1.93 SPT 1.50-1.93 10,15,18/130 mm HB N=R BH1M_2.00-2.10		1.95		6.90	From 1.95m, grey-brown	M ≈ PL		
		BH1M_2.50-2.60								
		BH1M_3.00-3.10 BH1M_3.00-3.45 SPT 3.00-3.45 6,12,12 N=24 BH1M_3.50-3.60 BH1M_3.50-3.60		3					VSt - H	
		BH1M_4.00-4.10		4						
		BH1M_4.50-4.60 BH1M_4.50-4.95 SPT 4.50-4.95 14,24,24 N=48		4.80		4.05		M < PL		
		BH1M_5.00-5.10		5			Sandy CLAY: low to medium plasticity, red-orange			
		BH1M_5.50-5.60								
		BH1M_6.00-6.10 BH1M_6.00-6.22 SPT 6.00-6.22 7,8/75 mm HB N=R BH1M_6.50-6.60		6.00		2.85	SANDSTONE: fine to medium grained, red-orange, DW, VL Strength	-	-	WEATHERED ROCK
		BH1M_6.90-7.00 SPT 6.90-7.00 5/100 mm HB N=R		7						
				7.32		1.53	*Log continued on next page.*			
				8						
				9						
				10						

BOREHOLE CORE LOG

BH ID: BH1M

Location	159-167 Darley Street West, Mona Vale NSW	**Started**	03 December 2024
Client	Darley Services Pty Ltd	**Completed**	03 December 2024
Job No.	E26489.G03	**Logged By**	JO **Date** 03 December 2024
Sheets	2 of 3	**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.85 m (AHD)
Plant	Massenza M13	**Inclination**	90°
Northing	6273033.1481 (MGA 2020 Zone 56)		
Easting	342370.7022 (MGA 2020 Zone 56)		

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				0			*Log continued from previous page.*				
				1							
				2							
				3							
				4							
				5							
				6							
				7							
	60%	100	44	8			SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining	DW	▼	7.64: JT 60° PR SM Clay VN 7.80-7.93: XWZ 8.10: JT 5° PR SM Clay VN 8.50-8.53: CS 8.74: JT 80° PR SM Clay VN 8.89-9.08: CS	
				9							
				9.08		-0.23	NO CORE: 750mm thick	-			
				9.83		-0.98	SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining				
				10							

BOREHOLE CORE LOG

BH ID: BH1M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	03 December 2024
Client	Darley Services Pty Ltd			**Completed**	03 December 2024
Job No.	E26489.G03			**Logged By**	JO **Date** 03 December 2024
Sheets	3 of 3			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.85 m (AHD)	**Northing**	6273033.1481 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342370.7022 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
NMLC	60%	68	13	11			SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining	DW		10.20: JT 60° PR SM CN 10.35: JT 45° PR SM CN 10.48: JT 30° PR SM CN 10.50: JT 70° PR SM CN 10.83-11.00: CZ 11.00-11.39: CZ	
				11.39		-2.54	NO CORE: 140mm thick	-			
		77	77	11.53		-2.68	SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded				
		97	48	12				DW		12.21-12.25: CS 12.58-12.73: CZ 12.82: JT 90° PR SM CN 13.10: JT 90° PR SM CN 13.71-13.75: CS 14.15: JT 20° PR SM CN 14.33-14.50: CZ	
				13							
				14							
				14.54		-5.69	NO CORE: 70mm thick	-			
		100	100	14.61		-5.76	SANDSTONE: fine to medium grained, grey-brown, medium bedded	DW			
				15		-6.15	Terminated at 15.00m. Target depth reached.				
				16							
				17							
				18							
				19							
				20							

MONITORING WELL LOG

BH ID: BH1M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	03 December 2024	
Client	Darley Services Pty Ltd			**Completed**	03 December 2024	
Job No.	E26489.G03			**Logged By**	JO	**Date**	03 December 2024
Sheets	1 of 2			**Review By**	JB	**Date**	10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.85 m (AHD)	**Northing**	6273033.1481 (MGA 2020 Zone 56)	
Plant	Massenza M13	**Inclination**	90°	**Easting**	342370.7022 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
GWNE	BH1M_0.10-0.20	0.00	8.85	FILL: Silty SAND: fine to medium grained, dark brown trace rootlets with angular to sub-angular gravels	M
	BH1M_0.50-0.60 BH1M_0.50-0.95 SPT 0.50-0.95 7,12,12 N=24	0.50	8.35	Silty CLAY: medium plasticity, brown-red	
	BH1M_1.00-1.10	1			
	BH1M_1.50-1.60 BH1M_1.50-1.93 SPT 1.50-1.93 10,15,18/130 mm HB N=R				M ≈ PL
	BH1M_2.00-2.10	1.95	6.90	From 1.95m, grey-brown	
	BH1M_2.50-2.60				
	BH1M_3.00-3.10 BH1M_3.00-3.45 SPT 3.00-3.45 6,12,12 N=24	3			
	BH1M_3.50-3.60 BH1M_3.50-3.60				
	BH1M_4.00-4.10	4			M < PL
	BH1M_4.50-4.60 BH1M_4.50-4.95 SPT 4.50-4.95 14,24,24 N=48	4.80	4.05	Sandy CLAY: low to medium plasticity, red-orange	
	BH1M_5.00-5.10	5			
	BH1M_5.50-5.60				
	BH1M_6.00-6.10 BH1M_6.00-6.22 SPT 6.00-6.22 7,8/75 mm HB N=R	6.00	2.85	SANDSTONE: fine to medium grained, red-orange, DW, VL Strength	-
	BH1M_6.50-6.60	6			
	BH1M_6.90-7.00 SPT 6.90-7.00 5/100 mm HB N=R	7			
60%		7.32	1.53	SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining	
		8			
		9			
		9.08	-0.23	NO CORE: 750mm thick	
		9.83	-0.98	SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining	
		10			

BACKFILL DETAILS

Steel Cover at Surface
Grout
0.00m - 0.10m

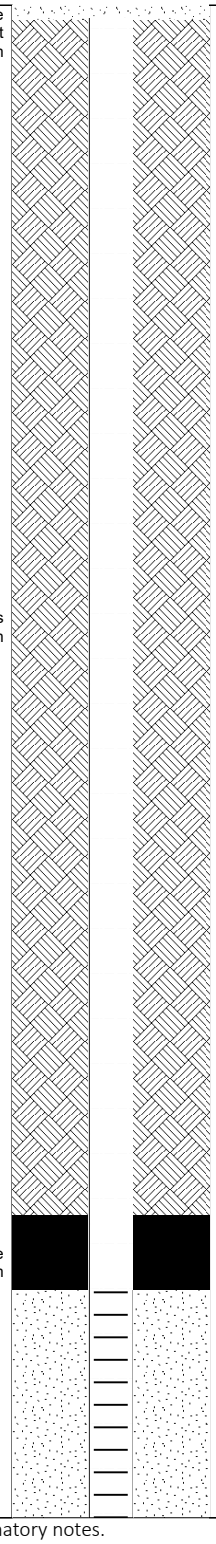
Cuttings
0.10m - 8.00m

Bentonite
8.00m - 8.50m

STANDPIPE DETAILS

Well Stickup =-0.09m
(RL 8.76m)

0.09m - 8.50m
PVC casing (50mm Ø)



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

MONITORING WELL LOG

BH ID: BH1M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	03 December 2024	
Client	Darley Services Pty Ltd			**Completed**	03 December 2024	
Job No.	E26489.G03			**Logged By**	JO	**Date**	03 December 2024
Sheets	2 of 2			**Review By**	JB	**Date**	10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.85 m (AHD)	**Northing**	6273033.1481 (MGA 2020 Zone 56)	
Plant	Massenza M13	**Inclination**	90°	**Easting**	342370.7022 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
60%		11		SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded with ironstaining			
		11.39	-2.54	NO CORE: 140mm thick			
		11.53	-2.68	SANDSTONE: fine to medium grained, pale grey-brown, thinly bedded		Sand 8.50m - 15.00m	8.50m - 15.0m PVC screen (50mm Ø)
		12					
		13					
		14					
		14.54	-5.69	NO CORE: 70mm thick			
		14.61	-5.76	SANDSTONE: fine to medium grained, grey-brown, medium bedded			
		15	-6.15	Terminated at 15.00m. Target depth reached.			
		16					
		17					
		18					
		19					
		20					

BOREHOLE LOG

BH ID: BH2M

Location	159-167 Darley Street West, Mona Vale NSW	**Started**	02 December 2024		
Client	Darley Services Pty Ltd	**Completed**	02 December 2024		
Job No.	E26489.G03	**Logged By**	JO/LH	**Date**	02 December 2024
Sheets	1 of 3	**Review By**	JB	**Date**	10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.00 m (AHD)	**Northing**	6273023.1124 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342327.0648 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE	BH2M_0.10-0.20		0.00		8.00	FILL: Silty SAND: fine to medium grained, dark brown with rootlets and gravels	-	-	FILL
		BH2M_0.50-0.60 BH2M_0.50-0.95 SPT 0.50-0.95 4,8,7 N=15 BH2M_1.00-1.10		0.50 1		7.50	Silty CLAY: medium plasticity, orange-brown	M < PL	St	RESIDUAL SOIL
		BH2M_1.50-1.60 BH2M_1.50-1.95 SPT 1.50-1.95 9,15,17 N=32 BH2M_2.00-2.10		1.50 2		6.50	From 1.50m, pale grey		VSt	
		BH2M_2.50-2.60								
		BH2M_3.00-3.10 BH2M_3.00-3.17 SPT 3.00-3.17 16,7/20 mm HB N=R		3 3.15		4.85	SANDSTONE:-plasticity, fine to medium grained, red, DW, VL-L Strength	-	-	WEATHERED ROCK
				3.42		4.58	*Log continued on next page.*			
				4						
				5						
				6						
				7						
				8						
				9						
				10						

BOREHOLE CORE LOG

BH ID: BH2M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	02 December 2024
Client	Darley Services Pty Ltd			**Completed**	02 December 2024
Job No.	E26489.G03			**Logged By**	JO/LH **Date** 02 December 2024
Sheets	2 of 3			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.00 m (AHD)	**Northing**	6273023.1124 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342327.0648 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
				0		*Log continued from previous page.*				
				1						
				2						
				3						
NMLC	60%	100	45	4		CLAYSTONE: pale grey-red, very thinly bedded, with ironstone bands	XW - DW	▼	3.58: JT 45° PR SM Clay Infilled 3.85-6.95: XWZ 4.12: JT 45° PR SM Clay Infilled	
				5					5.18: JT 30° PR SM Clay Infilled	
				6				▼		
				6.90	1.10	NO CORE: 1280mm thick	-	▼		
		54	39	8						
				8.18	-0.18	CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining	DW	▼	8.18-8.30: XWZ 8.56-8.68: XWZ	
				9						
				9.00	-1.00	NO CORE: 380mm thick	-			
		77	12	9.38	-1.38	CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining		▼	9.60-9.68: CS 9.82-10.20: CZ	
				10						

BOREHOLE CORE LOG

BH ID: BH2M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	02 December 2024
Client	Darley Services Pty Ltd			**Completed**	02 December 2024
Job No.	E26489.G03			**Logged By**	JO/LH **Date** 02 December 2024
Sheets	3 of 3			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.00 m (AHD)	**Northing**	6273023.1124 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342327.0648 (MGA 2020 Zone 56)

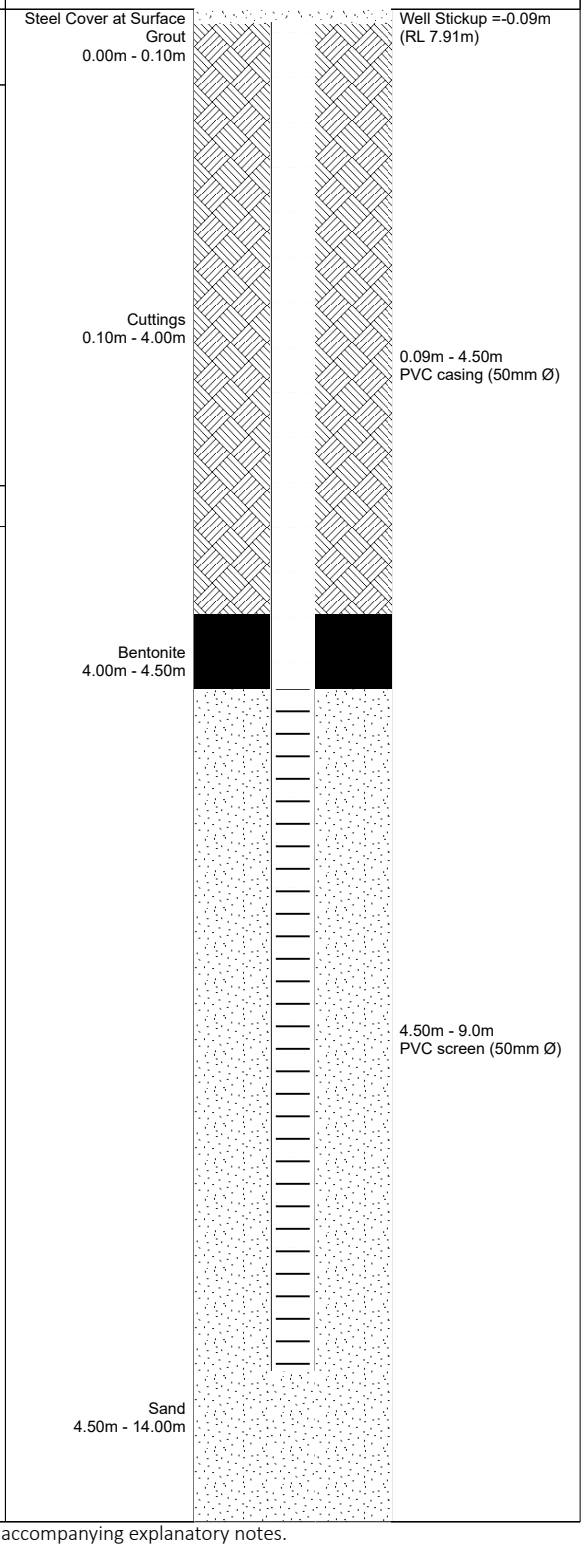
METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral (VL 0-1, L 0-3, M 1, H 3, VH 10, EH)	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING (30, 100, 300, 1000, 3000)
							CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining	DW		10.20: JT 50° PR SM Clay Infilled 10.44: JT 15° CU SM Clay CN	
				10.64		-2.64	NO CORE: 570mm thick	-			
				11.21		-3.21	SANDSTONE: fine to medium grained, pale grey with red ironstaining, thinly bedded			11.32: JT 15° CU SM CN	
	60%	81	59							12.15: JT 25° PR SM CN	
								DW		12.86-12.94: XWS	
										13.20-13.28: CS	
		100	70								
				14		-6.00	Terminated at 14.00m. Target Depth Reached.				

MONITORING WELL LOG

BH ID: BH2M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	02 December 2024
Client	Darley Services Pty Ltd			**Completed**	02 December 2024
Job No.	E26489.G03			**Logged By**	JO/LH **Date** 02 December 2024
Sheets	1 of 2			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.00 m (AHD)	**Northing**	6273023.1124 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342327.0648 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
GWNE	BH2M_0.10-0.20	0.00	8.00	FILL: Silty SAND: fine to medium grained, dark brown with rootlets and gravels	-
	BH2M_0.50-0.60 BH2M_0.50-0.95 SPT 0.50-0.95 4,8,7 N=15 BH2M_1.00-1.10	0.50 1	7.50	Silty CLAY: medium plasticity, orange-brown	
	BH2M_1.50-1.60 BH2M_1.50-1.95 SPT 1.50-1.95 9,15,17 N=32 BH2M_2.00-2.10	1.50 2	6.50	From 1.50m, pale grey	M < PL
	BH2M_2.50-2.60	3			
	BH2M_3.00-3.10 BH2M_3.00-3.17 SPT 3.00-3.17 16,7/20 mm HB	3.15	4.85	SANDSTONE:-plasticity, fine to medium grained, red, DW, VL-L Strength	-
60%	N=R	3.42	4.58	CLAYSTONE: pale grey-red, very thinly bedded, with ironstone bands	
		6.90	1.10	NO CORE: 1280mm thick	
		8.18	-0.18	CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining	
		9.00	-1.00	NO CORE: 380mm thick	
		9.38	-1.38	CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining	
		10			



MONITORING WELL LOG

BH ID: BH2M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	02 December 2024
Client	Darley Services Pty Ltd			**Completed**	02 December 2024
Job No.	E26489.G03			**Logged By**	JO/LH **Date** 02 December 2024
Sheets	2 of 2			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	Stratacore	**Surface RL**	≈8.00 m (AHD)	**Northing**	6273023.1124 (MGA 2020 Zone 56)
Plant	Massenza M13	**Inclination**	90°	**Easting**	342327.0648 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
60%		10.64	-2.64	CLAYSTONE: pale grey-brown, very thinly bedded with ironstaining			
		11		NO CORE: 570mm thick			
		11.21	-3.21	SANDSTONE: fine to medium grained, pale grey with red ironstaining, thinly bedded			
		14	-6.00	Terminated at 14.00m. Target Depth Reached.			

BOREHOLE LOG

BH ID: BH3M

Location	159-167 Darley Street West, Mona Vale NSW	**Started**	16 December 2024
Client	Darley Services Pty Ltd	**Completed**	16 December 2024
Job No.	E26489.G03	**Logged By**	DH **Date** 16 December 2024
Sheets	1 of 2	**Review By**	JB **Date** 10 February 2025
Drilling Contractor	HartGeo	**Surface RL**	≈3.10 m (AHD)
Plant	Ute Mounted Rig	**Inclination**	90°
Northing	6273068.8367 (MGA 2020 Zone 56)		
Easting	342340.6966 (MGA 2020 Zone 56)		

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE			0.00		3.10	FILL: SAND: fine grained, brown/grey-orange, trace sub-angular to sub-rounded gravels.	M	MD	6, 8, 7, 7, 5, 4	FILL
				0.30		2.80	FILL: Silty SAND: fine to medium grained, brown/grey-grey.				FILL
				0.60		2.50	Sandy CLAY: medium to high plasticity, grey/orange-grey, sand is fine to medium grained, trace sub-angular to sub-rounded gravels.	M ≈ PL	F	3, 3, 2, 2	RESIDUAL SOIL
				1					VSt	10, 9, 12, 7, 6, 6, 7, 18, 11, 9, 9	
				1.40		1.70	Sandy CLAY: medium to high plasticity, grey/orange-grey, sand is fine to medium grained.				RESIDUAL SOIL
				2					H	20, 27, 19, 16, 23, 24, 28, 26	
				3							
				3.30		-0.20	From 3.30m, red/orange-red	M < PL	-		
				4							
				5							
				6							
				7							
				8							
				9							
				10							

BOREHOLE LOG

BH ID: BH3M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	16 December 2024
Client	Darley Services Pty Ltd			**Completed**	16 December 2024
Job No.	E26489.G03			**Logged By**	DH **Date** 16 December 2024
Sheets	2 of 2			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	HartGeo	**Surface RL**	≈3.10 m (AHD)	**Northing**	6273068.8367 (MGA 2020 Zone 56)
Plant	Ute Mounted Rig	**Inclination**	90°	**Easting**	342340.6966 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS 0 5 10 15 20 25 30	MATERIAL ORIGIN & OBSERVATIONS
AD/T	GWNE			11 12 13			From 3.30m, red/orange-red	M < PL	-		
				14 15 16 17 18 19 20		10.70	Terminated at 13.80m. Target Depth Reached.				

MONITORING WELL LOG

BH ID: BH3M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	16 December 2024	
Client	Darley Services Pty Ltd			**Completed**	16 December 2024	
Job No.	E26489.G03			**Logged By**	DH	**Date**	16 December 2024
Sheets	1 of 2			**Review By**	JB	**Date**	10 February 2025
Drilling Contractor	HartGeo	**Surface RL**	≈3.10 m (AHD)	**Northing**	6273068.8367 (MGA 2020 Zone 56)	
Plant	Ute Mounted Rig	**Inclination**	90°	**Easting**	342340.6966 (MGA 2020 Zone 56)	

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION
GWNE		0.00	3.10	FILL: SAND: fine grained, brown/grey-orange, trace sub-angular to sub-rounded gravels.	M
		0.30	2.80	FILL: Silty SAND: fine to medium grained, brown/ grey-grey.	
		0.60	2.50	Sandy CLAY: medium to high plasticity, grey/orange-grey, sand is fine to medium grained, trace sub-angular to sub-rounded gravels.	M ≈ PL
		1.40	1.70	Sandy CLAY: medium to high plasticity, grey/orange-grey, sand is fine to medium grained.	
		3.30	-0.20	From 3.30m, red/orange-red	M < PL

BACKFILL DETAILS

- Steel Cover at Surface
- Grout 0.00m - 0.10m
- Bentonite 0.10m - 1.90m
- Sand 1.90m - 13.80m

STANDPIPE DETAILS

- Well Stickup =-0.10m (RL 3.0m)
- 0.10m - 2.0m PVC casing (50mm Ø)
- 2.0m - 9.50m PVC screen (50mm Ø)

MONITORING WELL LOG

BH ID: BH3M

Location	159-167 Darley Street West, Mona Vale NSW			**Started**	16 December 2024
Client	Darley Services Pty Ltd			**Completed**	16 December 2024
Job No.	E26489.G03			**Logged By**	DH **Date** 16 December 2024
Sheets	2 of 2			**Review By**	JB **Date** 10 February 2025
Drilling Contractor	HartGeo	**Surface RL**	≈3.10 m (AHD)	**Northing**	6273068.8367 (MGA 2020 Zone 56)
Plant	Ute Mounted Rig	**Inclination**	90°	**Easting**	342340.6966 (MGA 2020 Zone 56)

WATER	SAMPLES & FIELD TESTS	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	BACKFILL DETAILS	STANDPIPE DETAILS
GWNE		11			From 3.30m, red/orange-red	M < PL		
		12						
		13						
		14		~10.70	Terminated at 13.80m. Target Depth Reached.			
		15						
		16						
		17						
		18						
		19						
		20						

BOREHOLE LOG

BH ID: BH4

Location	159-167 Darley Street West, Mona Vale NSW	**Started**	02 December 2024
Client	Darley Services Pty Ltd	**Completed**	02 December 2024
Job No.	E26489.G03	**Logged By**	JO **Date** 02 December 2024
Sheets	1 of 1	**Review By**	JB **Date** 10 February 2025
Drilling Contractor	-	**Surface RL**	≈9.65 m (AHD)
Plant	-	**Inclination**	90°
		Northing	6273000.9150 (MGA 2020 Zone 56)
		Easting	342334.3488 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS (0 5 10 15 20 25 30)	MATERIAL ORIGIN & OBSERVATIONS
HA	GWNE	BH4_0.0-0.10		0.00		9.65	FILL: Silty SAND: fine grained, grey, trace rootlets, No odour	M	-	3	FILL
				0.10		9.55	Gravelly SAND: fine to medium grained, grey, with sub angular cobbles and tile pieces, No odour	M	M	8, 9, 4, 7	
		BH4_0.30-0.40									
						9.15	Terminated at 0.50m. Refusal in Fill.			14	
				1							
				2							
				3							
				4							
				5							

BOREHOLE LOG

BH ID: BH5

Location	159-167 Darley Street West, Mona Vale NSW	**Started**	02 December 2024
Client	Darley Services Pty Ltd	**Completed**	02 December 2024
Job No.	E26489.G03	**Logged By**	JO **Date** 02 December 2024
Sheets	1 of 1	**Review By**	JB **Date** 10 February 2025
Drilling Contractor	-	**Surface RL**	≈4.60 m (AHD)
Plant	-	**Inclination**	90°
		Northing	6273055.4563 (MGA 2020 Zone 56)
		Easting	342311.5264 (MGA 2020 Zone 56)

METHOD	GROUND WATER LEVELS	SAMPLES & FIELD TESTS	SAMPLE RECOVERY	DEPTH (m)	GRAPHIC LOG	RL (m AHD)	MATERIAL DESCRIPTION	MOISTURE CONDITION	CONSISTENCY / REL. DENSITY	DCP BLOWS	MATERIAL ORIGIN & OBSERVATIONS
HA	GWNE	BH5_0.20-0.30		0.00		4.60	FILL: Silty SAND: fine grained, brown/grey, with clay, trace rootlets and sub angular to sub rounded gravels, No odour	M	-	2, 2, 1, 1	FILL
		BH5_0.70-0.80		0.40		4.20	Clayey SAND: medium to coarse grained, dark brown / grey, with fine to medium grained, sub angular to sub rounded sandstone gravels, No odour	M	L - MD	2, 3, 4, 4, 4, 4, 4, 2, 6, 6, 12/50mm	RESIDUAL SOIL
				0.80		3.80	Terminated at 0.80m. Refusal in medium dense Clayey Sand.				

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

DRILLING/EXCAVATION METHOD

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

PENETRATION RESISTANCE

L	**Low Resistance**	Rapid penetration/ excavation possible with little effort from equipment used.
M	**Medium Resistance**	Penetration/ excavation possible at an acceptable rate with moderate effort from equipment used.
H	**High Resistance**	Penetration/ excavation is possible but at a slow rate and requires significant effort from equipment used.
R	**Refusal/Practical Refusal**	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

SPT	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
RW	Penetration occurred under the rod weight only, N<1
HW	Penetration occurred under the hammer and rod weight only, N<1
HB	Hammer double bouncing on anvil, N is not reported
Sampling	
DS	Disturbed Sample
ES	Sample for environmental testing
BDS	Bulk disturbed Sample
GS	Gas Sample
WS	Water Sample
U50	Thin walled tube sample - number indicates nominal sample diameter in millimetres
Testing	
FP	Field Permeability test over section noted
FVS	Field Vane Shear test expressed as uncorrected shear strength (sv= peak value, sr= residual value)
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket Penetrometer test expressed as instrument reading in kPa
WPT	Water Pressure tests
DCP	Dynamic Cone Penetrometer test
CPT	Static Cone Penetration test
CPTu	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 (%)

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

RQD = Rock Quality Designation (%)

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

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			

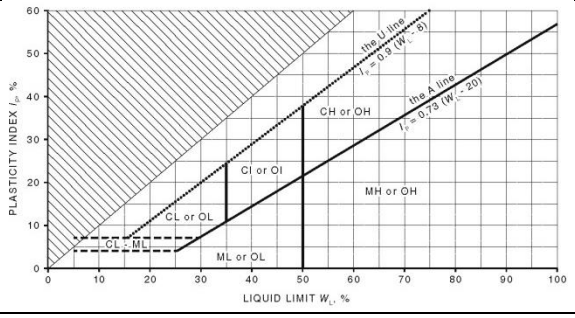
CLASSIFICATION AND INFERRED STRATIGRAPHY

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

PLASTICITY PROPERTIES



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.
		GC	Clayey gravel, gravel-sand-clay mixtures, medium to high dry strength.
	SAND More than 50% of coarse fraction is <2.36 mm	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.
		SM	Silty sand, sand-silt mixtures, zero to medium dry strength.
		SC	Clayey sand, sandy-clay mixtures, medium to high dry strength.
FINE GRAINED SOILS More than 35% of soil excluding oversized fraction is less than 0.075mm	Liquid Limit less < 50%	ML	Inorganic silts of low plasticity, very fine sands, rock flour, silty or clayey fine sands, zero to medium dry strength.
		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.
	Liquid Limit > than 50%	MH	Inorganic silts of high plasticity, high to very high dry strength.
		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.
Highly Organic soil		PT	Peat muck and other highly organic soils.

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 ≈ PL); Moist, wet of plastic limit (w < PL); Wet, near liquid limit (w ≈ LL), Wet, wet of liquid limit (w > LL),

CONSISTENCY

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

DENSITY

Symbol	Term	Density Index %	SPT "N" #
VL	Very Loose	≤ 15	0 to 4
L	Loose	>15 to ≤ 35	4 to 10
MD	Medium Dense	>35 to ≤ 65	10 to 30
D	Dense	>65 to ≤ 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: ≤ 5% Fine grained soil: ≤ 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%

TERMS FOR ROCK MATERIAL STRENGTH AND WEATHERING

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, $Is_{(50)}$ (MPa) #	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.

 # Rock Strength Test Results

▼ Point Load Strength Index, $Is_{(50)}$, Axial test (MPa)

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

Relationship between rock strength test result ($Is_{(50)}$) 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 x $Is_{(50)}$.

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	HW	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

Spacing/width (mm)	Descriptor	Symbol
<20	Extremely Close	EC
20-60	Very Close	VC
60-200	Close	C
200-600	Medium	M
600-2000	Wide	W
2000-6000	Very Wide	VW

Bedding Thickness (Stratification)

Term	Spacing (mm)
Thinly laminated	<6
Laminated	6 – 20
Very thinly bedded	20 – 60
Thinly bedded	60 – 200
Medium bedded	200 – 600
Thickly bedded	600 – 2,000
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

Coating	Abbr.	Description
Clean	CN	No visible coating or infilling
Stain	SN	No visible coating but surfaces are discoloured by staining, often limonite (orange-brown)
Veneer	VNR	A visible coating of soil or mineral substance, usually too thin to measure (< 1 mm); may be patchy

DEFECT APERTURE

Aperture	Abbr.	Description
Closed	CL	Closed.
Open	OP	Without any infill material.
Infilled	-	Soil or rock i.e. clay, silt, talc, pyrite, quartz, etc.

Appendix B Laboratory Certificates

STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

STS Geotechnics Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 | Email: enquiries@stsgeo.com.au

Atterberg Limits and Linear Shrinkage Report

Project: E26489.G03 : 159-167 Darley Street West, Mona Vale NSW — Project No.: 31380

Client: EI AUSTRALIA PTY LTD — Report No.: 25/0349

Address: Suite 6.01, 55 Miller Street, Pyrmont NSW 2009 — Report Date: 30/01/2025

Test Method: AS1289.3.3.1,3.2.1,3.4.1,3.1.2,2.1.1 — Page: 1 of 1

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

STS / Sample No.	9476D-L/1					
Sample Location	BH2M					
Material Description	Silty CLAY, grey					
Depth (m)	1.5 - 1.95					
Sample Date	2-3/12/24					
Sample History	Air Dried					
Method of Preparation	Dry Seived					
Liquid Limit (%)	**40**					
Plastic Limit (%)	**19**					
Plasticity Index	**21**					
Linear Shrinkage (%)	**10.0**					
Mould Size (mm)	127					
Crumbing	N					
Curling	N					

Remarks:

Approved Signatory..... .....

Technician: SP — Mrigesh Tamang - Manager

STS GEOTECHNICS PTY LTD
CONSULTING GEOTECHNICAL ENGINEERS

STS Geotechnics Pty Ltd
14/1 Cowpasture Place, Wetherill Park NSW 2164
Phone: (02)9756 2166 | Email: enquiries@stsgeo.com.au

NATA Accredited for Compliance with ISO/IEC 17025 - Testing No. 2750

Point Load Strength Index Report

Project: E26489.G03: 159-167 Darley Street West, Mona Vale NSW
Client: EI AUSTRALIA
Address: Suite 6.01, 55 Miller St. PYRMONT, NSW
Test Method: AS 4133.4.1
Sampling Procedure: Samples Supplied By Client (Not covered under NATA Scope of Accreditation)

Project No.: 31380
Report No.: 25/0416
Report Date: 07/02/2024
Page: 1 of 1

Borehole / Sample No.	Depth (m)	Date Sampled	Date Tested	Test Type	Is (MPa)	$Is_{(50)}$ (MPa)	Rock Type	Failure Type	Moisture
BH1M	7.39	03/12/2024	28/01/2025	A	**0.23**	**0.24**	SS	3	M
BH1M	8.36	03/12/2024	28/01/2025	A	**0.095**	**0.098**	SS	3	M
BH1M	10.30	03/12/2024	28/01/2025	A	**0.24**	**0.25**	SS	3	M
BH1M	10.77	03/12/2024	28/01/2025	A	**0.31**	**0.32**	SS	3	M
BH1M	11.74	03/12/2024	28/01/2025	A	**0.29**	**0.3**	SS	3	M
BH1M	12.39	03/12/2024	28/01/2025	A	**0.18**	**0.19**	SS	3	M
BH1M	13.68	03/12/2024	28/01/2025	A	**0.093**	**0.096**	YS	3	M
BH1M	14.65	03/12/2024	28/01/2025	A	**0.37**	**0.38**	SS	3	M
BH1M	14.73	03/12/2024	28/01/2025	A	**0.17**	**0.18**	SS	3	M
BH2M	4.76	02/12/2024	28/01/2025	A	**0.16**	**0.17**	SS	3	M
BH2M	5.65	02/12/2024	28/01/2025	A	**0.17**	**0.18**	SS	3	M
BH2M	6.31	02/12/2024	28/01/2025	A	**0.18**	**0.19**	SS	3	M
BH2M	6.75	02/12/2024	28/01/2025	A	**0.15**	**0.16**	SS	3	M
BH2M	8.40	02/12/2024	28/01/2025	A	**0.076**	**0.078**	SS	3	M
BH2M	9.48	02/12/2024	28/01/2025	A	**0.2**	**0.21**	SS	3	M
BH2M	11.43	02/12/2024	28/01/2025	A	**0.27**	**0.28**	SS	3	M
BH2M	12.56	02/12/2024	28/01/2025	A	**0.15**	**0.15**	SS	3	M
BH2M	13.49	02/12/2024	28/01/2025	A	**0.21**	**0.22**	SS/SH	2	M

Failure Type	Test Type	Moisure Condition	Rock Type
1 = Fracture through bedding or weak plane	A = Axial	W = Wet	SS = Sandstone
2 = Fracture along bedding	D = Diametrial	M = Moist	ST = Siltstone
3 = Fracture through rock mass	I = Irregular	D = Dry	SH = Shale
4 = Fracture influenced by natural defect or drilling	C = Cube		YS = Claystone
5 = Partial fracture or chip (invalid result)			IG = Igneous

Remarks:

Approved Signatory.....

Technician: NL

Mrigesh Tamang - Manager

ANALYTICAL REPORT

Accreditation No. 2562

CLIENT DETAILS

Contact	Jacky Ong
Client	EI AUSTRALIA
Address	SUITE 6.01 55 MILLER STREET PYRMONT NSW 2009
Telephone	61 2 95160722
Facsimile	(Not specified)
Email	jacky.ong@eiaustralia.com.au
Project	**E26489.G03 159-167 Darley Street West,**
Order Number	**E26489.G03**
Samples	3

LABORATORY DETAILS

Manager	Shane McDermott
Laboratory	SGS Alexandria Environmental
Address	Unit 16, 33 Maddox St Alexandria NSW 2015
Telephone	+61 2 8594 0400
Facsimile	+61 2 8594 0499
Email	au.environmental.sydney@sgs.com
SGS Reference	**SE277451 R0**
Date Received	30/1/2025
Date Reported	5/2/2025

COMMENTS

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

SIGNATORIES

Dong LIANG
Metals/Inorganics Team Leader

Ying Ying ZHANG
Laboratory Technician

pH in soil (1:5) [AN101] Tested: 3/2/2025

PARAMETER	UOM	LOR	BH1M_6.9-7 SOIL - 3/12/2024 SE277451.001	BH2M_3.0-3.17 SOIL - 2/12/2024 SE277451.002	BH3M_0.8-0.9 SOIL - 2/12/2024 SE277451.003
pH	pH Units	0.1	**4.5**	**4.3**	**6.0**

Conductivity and TDS by Calculation - Soil [AN106] Tested: 3/2/2025

PARAMETER	UOM	LOR	BH1M_6.9-7 SOIL - 3/12/2024 SE277451.001	BH2M_3.0-3.17 SOIL - 2/12/2024 SE277451.002	BH3M_0.8-0.9 SOIL - 2/12/2024 SE277451.003
Conductivity of Extract (1:5 dry sample basis)	µS/cm	1	**110**	**460**	**24**

Soluble Anions (1:5) in Soil/Solids by Ion Chromatography [AN245] Tested: 3/2/2025

PARAMETER	UOM	LOR	BH1M_6.9-7 SOIL - 3/12/2024 SE277451.001	BH2M_3.0-3.17 SOIL - 2/12/2024 SE277451.002	BH3M_0.8-0.9 SOIL - 2/12/2024 SE277451.003
Chloride	mg/kg	0.25	**74**	**610**	**11**
Sulfate	mg/kg	5	**110**	**150**	**8.4**

Moisture Content [AN002] Tested: 3/2/2025

PARAMETER	UOM	LOR	BH1M_6.9-7 SOIL - 3/12/2024 SE277451.001	BH2M_3.0-3.17 SOIL - 2/12/2024 SE277451.002	BH3M_0.8-0.9 SOIL - 2/12/2024 SE277451.003
% Moisture	%w/w	1	**11.4**	**4.5**	**10.2**

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 CaCl2) 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, NO2, NO3 and SO4 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.

Appendix C Vibration Limits

German Standard DIN 4150 – Part 3: 1999 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.

Appendix D Important Information

Important Information

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 appraised 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.

REPRODUCTION OF REPORTS

 Where information from the accompanying report is to be included in contract documents or engineering specification for the project, the entire report should be included in order to minimize the likelihood of misinterpretation from logs.

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.