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BELLEVUE CO (MONA VALE) PTY LTD



Preliminary Geotechnical Assessment

1749-1753 Pittwater Road, Mona Vale NSW

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1. Introduction

1.1 Background

At the request of Bellevue Co (Mona Vale) Pty Ltd (the Client), EI Australia (EI) has carried out a Preliminary Geotechnical Assessment (PGA) for the proposed development at 1749-1753 Pittwater Road, Mona Vale NSW (the Site).

This PGA report has been prepared to assess the likely site surface and subsurface conditions and anticipated geotechnical factors associated with the proposed development, in support of a Development Application to the Local Council, and the preparation of the initial design of the proposed development.

1.2 Proposed Development

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

- Architectural drawings prepared by Gartner Trovato Architects Studio – Project No. 2401, Drawing Nos. 00 to 13, revision P12, dated 2 September 2024;
- Two Survey drawings for properties 1753 and 1749 Pittwater Road – by Land and Engineering Surveyors, Refs: 895 and 3164, dated 10 May 2016 and 19 September 2018, respectively.

Based on the provided documents, EI understands that the proposed development involves the demolition of the existing site structure and the construction of a five-storey shop top housing development over a two-level basement.

Basement level 2 is proposed to have a Finished Floor Level (FFL) of RL 1.4m Australian Height Datum (AHD). A Bulk Excavation Level (BEL) of RL 1.1m AHD is assumed, which includes allowance for construction for the construction of the basement slab. To achieve the BEL, excavation depths from 5.3m to 8.8m Below Existing Ground Level (BEGl) have been estimated. Locally deeper excavations may be required for footings, lift shafts, crane pads, water tanks, and services trenches.

The proposed basement extends up to the site boundary on each side.

1.3 Assessment Objectives

This PGA report aims to evaluate the anticipated site surface and subsurface conditions for the development of a preliminary conceptual ground model of soil, rock and groundwater conditions beneath the site based on our experience and previous investigations within the vicinity of the site. This model is to assist in providing preliminary geotechnical advice and recommendations for consideration in the preparation of concept designs and construction methodologies for the proposed development, which include:

- Dilapidation surveys;
- Excavation assessment;
- Excavation retention;
- Groundwater considerations;
- Preliminary building foundation options including preliminary design parameters; and
- The requirement for specific geotechnical investigations for detailed design post-DA and following site clearance.

2. Site Description

2.1 Site Description and Identification

The site identification details and associated information are presented in **Table 2-1**, while the site locality is shown on the attached **Figure 1**.

Table 2-1 Summary of Site Information

Information	Detail
Street Address	1749-1753 Pittwater Road, Mona Vale NSW
Lot and Deposited Plan (DP) Identification	Lot 1 DP715158 and Lot 2 DP412869
Brief Site Description	A site inspection was conducted on 28 October 2024 by a geotechnical engineer from EI to inspect the current site conditions of the structure on site and the neighbouring properties. According to our observations on site both 1749 and 1753 Pittwater Road were two storey commercial buildings. Property at No. 1753 appeared to be rendered and No. 1749 appeared to be a brick building. An existing asphalt paved car park, located at No. 1753 Pittwater Road, was observed on the north western portion of our site and medium sized trees were observed along both common site boundary along the car park. Both structures appeared to be in good conditions based on our cursory inspection.
Site Area	The site area is approximately 1524.8m ² (based on the survey plans referenced above).
Acid Sulphate Soil (ASS) Risk & Soil Landscape	The site is located in a low-lying, Warriewood (wa), headland/ rugged coastal landscape. The natural materials include acidic, yellow leached earths and hard acidic, yellow and red mottled soils. The site overlies an interface of Class 4 (eastern portion) and Class 5 (centre and western portions) ASS risk areas.



Plate 1 Aerial photograph of the site (source: Metro Maps, image dated 7 October 2024)

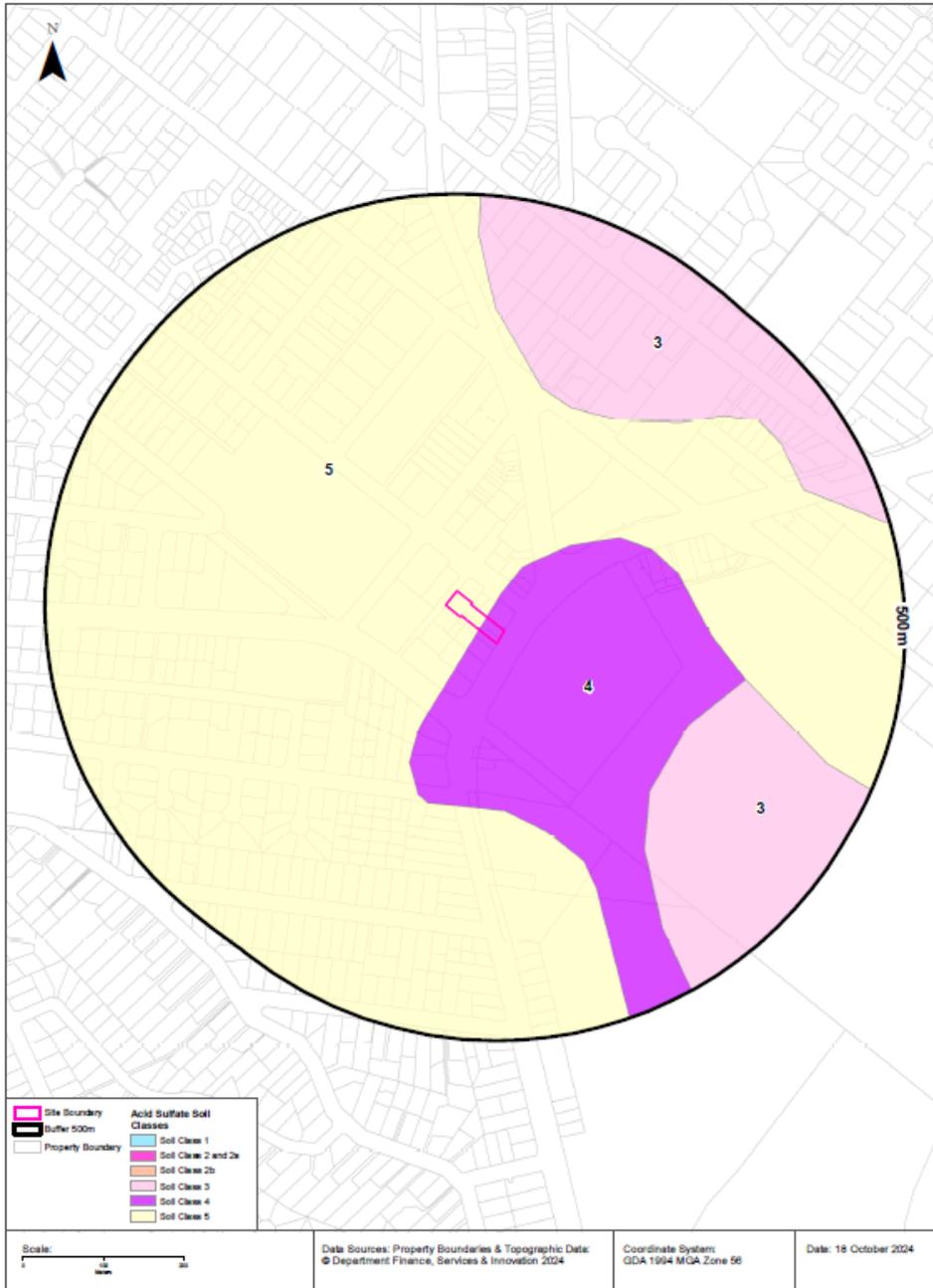


Plate 2 ASS site risk area

2.2 Local Land Use

The site is situated within an area of commercial and residential use. Current uses on surrounding land at the time of our presence on site are described in **Table 2-2**. For the purpose of this report, the site boundary adjacent to Pittwater Road shall be adopted as the eastern site boundary.

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
North	Properties No. 1751 Pittwater Road and No. 1 to 9 Waratah Street, similar two to three storey commercial buildings abutting the site boundary. The buildings are typically brick construction. Beyond is Waratah Street, with similar one to two storey commercial buildings opposite.
East	Pittwater Road, a six lane, asphalt-paved road. Pittwater Road is a TfNSW asset. Beyond is Kitchener Park, with a parking lot and scattered trees adjacent the road.
South	Property at No. 1747 Pittwater Road, a two-storey brick residential building with an offset of about 2.0m from the southern site boundary, and No. 4 Bungan Lane, a three-storey rendered building abutting the site boundary, used as a parking lot. Beyond lies similar two to three storey commercial buildings before Mona Vale Road.
West	Bungan Lane, an unmarked two lane, asphalt-paved road. Beyond is No. 11 Waratah Street, a two storey brick commercial building, with open car parking covering half the site, with similar retail and commercial buildings surrounding.

2.3 Regional Setting

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

Table 2-3 Topographic and Geological Information

Attribute	Description
Topography	The site is located on the west side of Pittwater Road, with gently (0-5°) east dipping topography with site levels varying from RL. 9.7 to RL 6.4 at the north western corner to RL 6.4 at the south eastern corner.
Regional Geology	Information on regional sub-surface conditions, referenced from the NSW Seamless Geology dataset (Colquhoun et al., 2024, corresponding to the Sydney 1:100,000 Geological Series Sheet) indicates the site to be underlain by Newport Formation (Tngn), which typically comprises interbedded laminite, shale, and quartz, to lithic-quartz sandstone, with clay pellet sandstone south of Hawkesbury River. The east and south-east of the site Quaternary alluvial deposits (Q_avf) and reclaimed land (Q_h) which overlies further Quaternary alluvial or marine deposits.

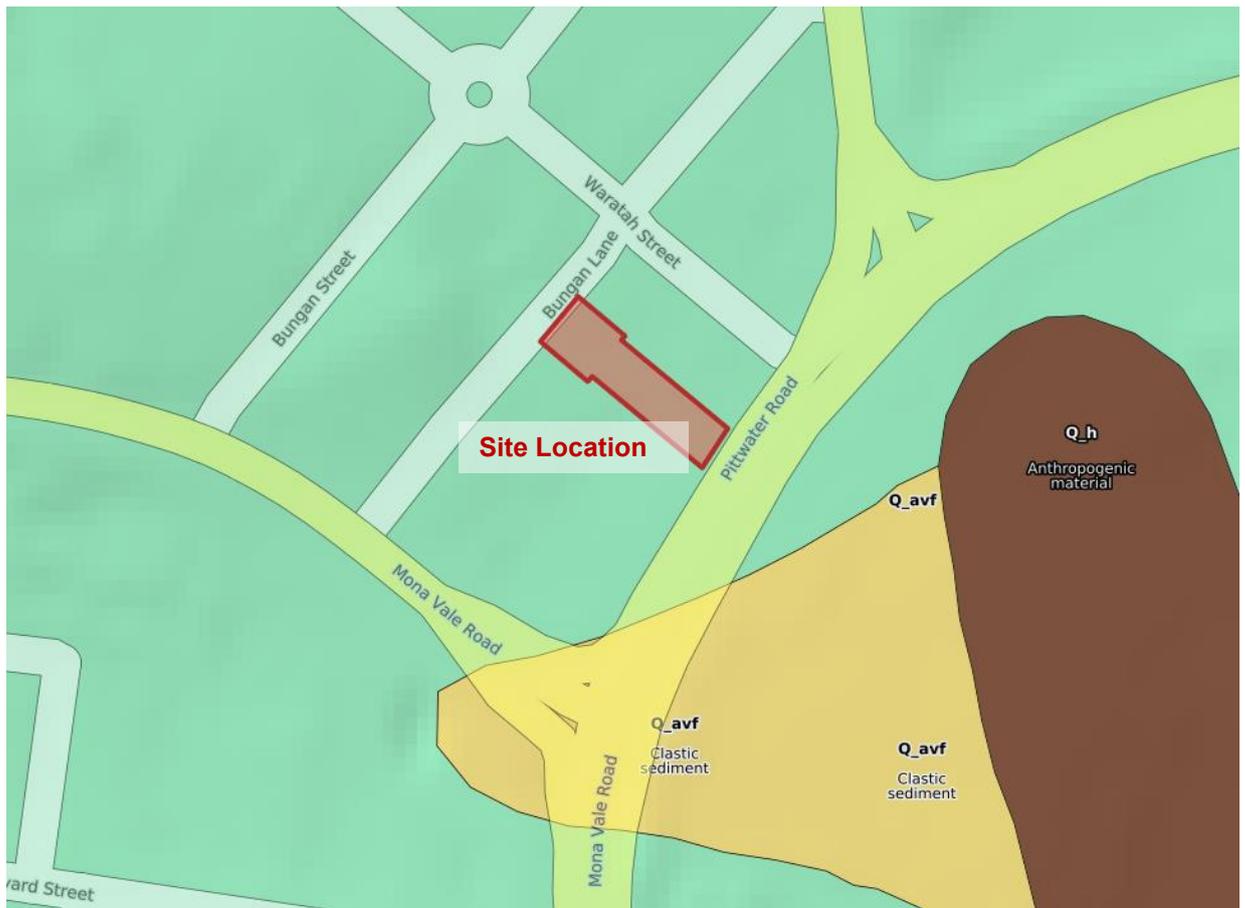


Plate 3 Excerpt of geological map showing location of site. Newport Formation (Tn_{gn}) shown in pale green, alluvial deposits (Q_{avf}) in yellow, and reclaimed land (Q_h) in brown.

2.4 Conceptual Ground Model

A summary of subsurface ground conditions likely to be encountered at the Site is presented in **Table 2-4**. The information presented below is inferred from a review of our in-house database and our knowledge of the area. Based on regional information, the subsurface conditions around the site are likely comprised of fill and natural soils overlying weathered sandstone bedrock.

Table 2-4 Conceptual Ground Model

Unit	Material	Comment
1	Fill	Fill material is inferred to be uncontrolled and poorly compacted. Filling may be deeper beneath existing structures and in landscaped areas of the site. Asphalt pavements cover the surface across the open areas of the site.
2	Residual Soil	Medium to high plasticity, firm to hard Sandy Clay or fine to medium grained, dense to very dense Clayey Sand, grading into extremely weathered material with ironstone gravel or bands at depth.
3	Weathered Sandstone	Sandstone is expected to be initially of extremely to very low strength and extremely to distinctly weathered. The strength generally increases and weathering generally decreases with depth. The sandstone bedrock is expected to be iron stained or indurated, with frequent extremely weathered bands between. Based on our in-house database, the depth to bedrock is highly variable and can be expected to range between 4m and 6m BEGL, depending on the local degree of weathering.

Based on the limited in-house information available for the area, the depth to groundwater is likely to be at shallow depths within the Residual Soil/Weathered Sandstone. The inferred estimation ranges between 3m to 5m BEGL.

Groundwater may also be encountered as perched surfaces at the fill/natural soil or soil/bedrock interfaces, or through any defects within the bedrock (such as jointing, and bedding planes etc.).

3. Recommendations

3.1 Overview

Considering the proposed development and likely subsurface conditions that may be encountered, we consider the following to be the main geotechnical issues for the proposed development:

- Neighbouring buildings and foundations;
- Basement Excavatability;
- Excavation Retention;
- Depth of groundwater;
- Depth to rock and rock quality for foundation design; and
- Excavation adjacent to TfNSW assets.

3.2 Dilapidation Surveys

Dilapidation surveys should be carried out on the adjoining structures and infrastructures that fall within the zone of influence of the excavation. The zone of influence of the excavation can be defined as a horizontal distance back from the edge of the excavation of at least twice the excavation depth. The reports should be carefully reviewed prior to demolition and construction.

3.3 Excavation Methodology

3.3.1 Preliminary Excavation Assessment

In order to achieve the proposed two-level basement, excavation depths of 5.3m to 8.8m BEGL are assumed. It is likely that the proposed development will therefore extend through all Units as described in **Table 2-4** above.

Prior to any excavation commencing:

- Due to the limited setbacks, and low bedrock strength expected, an appropriate full depth retention system will likely need to be installed; and
- Reference must be made to the Safe Work Australia Excavation Work Code of Practice – January 2020.

Fill materials (Unit 1) and Residual Soils (Unit 2) could be readily excavated by buckets of standard hydraulic excavators, although saws or hammers may be required to first break up pavement (ie asphalt) layers. Excavation of Weathered Sandstone (Unit 3) may present hard or heavy ripping, or “hard rock” excavation conditions due to the iron induration or relict higher strength zones. Ripping would require a high capacity and heavy excavator for effective production. Where the bedrock is found to be more weathered, it may be possible to excavated using buckets if fitted with ‘Tiger Teeth’. Further Geotechnical Investigation in the form of cored boreholes should be undertaken on the site, to confirm the quality of bedrock within the excavation depth.

Should rock breakers be used, vibration monitoring must be carried out and further advice must be sought from the geotechnical engineer.

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

Furthermore, any existing buried services which run below the site may 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. Enquires should be made for further information and details, such as invert levels, on the buried services.

3.3.2 Excavation Monitoring

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

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

- Limit lateral deflection of temporary or permanent retaining structures; and
- Limit vertical settlements of ground surface at common property boundaries and services easement.
- 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 infrastructure. Measurements should be taken:

- Prior to commencement of excavations;
- Immediately after installation of any temporary or permanent retaining structures;
- Immediately after the excavation has reached a depth of 1.5 m, and each 1.5 m depth increment thereafter;
- Immediately after the excavation has reached bulk excavation level; and
- Immediately after backfilling behind retaining structures.

3.3.3 Site Preparation and Earthworks

Working platforms for construction plant, placed on in-situ materials or on new fill, may be required and should be designed by a geotechnical engineer.

3.4 Excavation Retention

From a geotechnical perspective, it is critical to maintain the stability of the adjacent structures and infrastructures during demolition and excavation works. Excavations and retention systems will need to take into consideration the stability of adjoining structures so as not to have any adverse effects on the buildings and structures adjoining the excavation.

Based on the provided architectural drawings, the basement is proposed to abut site boundaries on each side, with a negligible setback on the eastern boundary.

Based on the limited setback and presence of adjacent structures, temporary batters are not recommended for this site. Hence, a suitable full depth retention system will be required for the support of the entire excavation. The retention system must be installed to below Bulk Excavation Level (BEL) (including footings, service trenches, and lift overrun pits) and socketed into low strength bedrock or better.

We recommend that information regarding the depth of the adjacent basements (if any) and founding materials of the adjacent footings be sought, to determine the requirement of underpinning of these structures.

3.4.1 Excavation Adjacent to TfNSW Assets

Reference should be made to the Transport for NSW (TfNSW) Technical Direction – Geotechnology GTD 2020/001, Version No. 01, dated on 2 July 2020, with regards to excavation/shoring adjacent to Pittwater Road. This document outlines requirements for excavations adjacent to TfNSW infrastructure and includes the level of geotechnical investigation required, dilapidation surveying, instrumentation and monitoring during construction, trigger levels and contingency plans.

Instrumentation (e.g. inclinometers) and monitoring is typically required where the excavation exceeds 3 m in height (for cantilevered shoring walls) or 6 m in height (for anchored or propped shoring walls). A geotechnical monitoring plan may be required by TfNSW prior to construction for this site.

As the site of the proposed development lies adjacent TfNSW assets, they may require further assessment of the potential impact of the proposed development on their assets. In order to assess the latter, a 2D numerical model using a commercially available computer program, such as PLAXIS, will be required. This model will enable the assessment of the potential impact of the proposed development on the TfNSW assets and predict the likely movements in the shoring wall. EI can provide such a service if commissioned to do so.

3.5 Groundwater and acid sulphate Considerations

Based on the limited in-house information available for the area, the depth to groundwater is inferred to be between 3 to 5m BEGL. Notwithstanding, we recommend that a minimum of at least three groundwater wells be installed for long-term monitoring of the groundwater levels and completion of permeability (pump-out) tests at the site. The purpose of the groundwater monitoring and testing is to estimate the groundwater seepage into the excavation.

Reference should be made to the Department of Planning and Environment (DPE) guidelines “Minimum requirements for building site groundwater investigation and reporting”, dated October 2022. EI should be contacted for further advice for the approval process should a drained basement be desired.

Groundwater aggressivity towards steel and concrete should also be assessed against the criteria set out in AS 2159:2009, which gives guidelines for steel and concrete foundation susceptibility to soil and groundwater aggressivity.

3.6 Acid Sulphate Soil and Salinity

As per the ASSMAC Assessment Guidelines 1998, acid sulphate soils are formed due to the oxidation of iron sulphide sediments and can be classified into five different classes.

Table 2.1 Classification scheme in the Acid Sulfate Soils Planning Maps

<i>Class of land as shown on Acid Sulfate Soils Planning Maps</i>	<i>Works</i>
1	Any works
2	Works below natural ground surface Works by which the watertable is likely to be lowered
3	Works beyond 1 metre below natural ground surface Works by which the watertable is likely to be lowered beyond 1 metre below natural ground surface
4	Works beyond 2 metres below natural ground surface Works by which the watertable is likely to be lowered beyond 2 metres below natural ground surface
5	Works within 500 metres of adjacent Class 1, 2, 3, or 4 land which are likely to lower the watertable below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land.

Plate 4 - Table extracted from ASSMAC Assessment Guidline 1998

As per the site investigations for urban salinity document, a saline soil is defined as a soil that contains a sufficient soluble salt to adversely affect plant growth and/or lands use and can be measured by electrical conductivity (ECe) as soil separates into positively and negative ions when dissolved in water.

Class	ECe (dS/m)	Comments
Non – saline	<2	Salinity effects mostly negligible
Slightly saline	2-4	Yields of very sensitive crops may be affected
Moderately saline	4-8	Yields of many crops affected
Very Saline	8-16	Only tolerant crops yield satisfactorily
Highly saline	>16	Only a few very tolerant crops yield satisfactorily

Plate 5 – Values of soil salinity classes, extracted from site investigation for urban salinity

The potential for acid sulphate and saline soils to exist on the site are low due to the local groundwater table is likely to be shallow. However, to confirm the expected acid sulphate and salinity index mentioned above, an intrusive soil investigation would need to be conducted.

3.7 Foundation Options

Following the completion of bulk excavations, Residual Soil (Unit 2) or Weathered Sandstone bedrock (Unit 3) is expected to be exposed at the base. We recommend that all footings be founded on similar material to provide uniform support and reduce the potential for differential settlements.

Pads/strip footings and/or bored piers founded within Unit 3 Sandstone bedrock may be preliminarily designed for a maximum allowable bearing capacity of 600 kPa. For piles, an allowable shaft adhesion equal to 10% of the allowable bearing pressure in compression may also be used.

EI recommends a geotechnical investigation to be carried out, involving at least four cored boreholes drilled to a minimum of 3m below final BEL to determine the depth and quality of bedrock to ascertain our assumptions and optimise the bearing pressures.

Design of piles should consider the aggressivity of the soil and groundwater in accordance with Sections 6.4 and 6.5 of AS2159-2009.

4. Conclusions

This PGA report provides preliminary advice for construction at the site based on available information prior to intrusive geotechnical investigations. Geotechnical factors which may influence development of the site include:

- Neighbouring buildings and foundations;
- Basement Excavatability;
- Excavation Retention;
- Depth of groundwater; and
- Depth to rock and rock quality for foundation design;
- Excavation adjacent to TfNSW assets.
- Acid Sulphate Soil and Salinity

Further geotechnical investigation and design input are required during the detailed design phase prior to and during construction. These are detailed further in **Section 5** below.

5. Further Geotechnical Inputs

Detailed geotechnical subsurface investigation prior to final design is recommended, to determine the site specific subsurface profile and geotechnical parameters for design of footings, and undertake hydrogeological assessment.

The geotechnical investigation should involve:

- At least four (4) cored boreholes drilled within the site to 3m below BEL or into bedrock of sufficient quality, with at least one (1) borehole extended to the depth requirements in accordance with DPIE;
- At least three (3) groundwater wells installed within the site for long-term monitoring of the groundwater levels and to complete permeability (pump-out) tests for seepage analysis.

From the site inspection conducted on the 28 October 2024, the geotechnical investigation may require a tight access portable drill rig to complete the recommended number of boreholes.

We do not recommend that the final design be carried out based on this PGA report. The PGA report must be reviewed following the completion of the intrusive geotechnical investigation.

In addition, geotechnical footing inspections should be carried out during the construction stage (if new footings are necessary) to check initial assumptions about foundations conditions and likely variations that may occur between borehole locations and to provide additional advice.

6. Statement of Limitations

This report has been prepared for the exclusive use of and Bellevue Co (Mona Vale) Pty Ltd who is the only intended beneficiary of EI's work. The scope of the assessment carried out for the purpose of this report is limited to those agreed with Bellevue Co (Mona Vale) Pty Ltd

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

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

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

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

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

We draw your attention to the document "Important Information", which is included in **Appendix A** 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

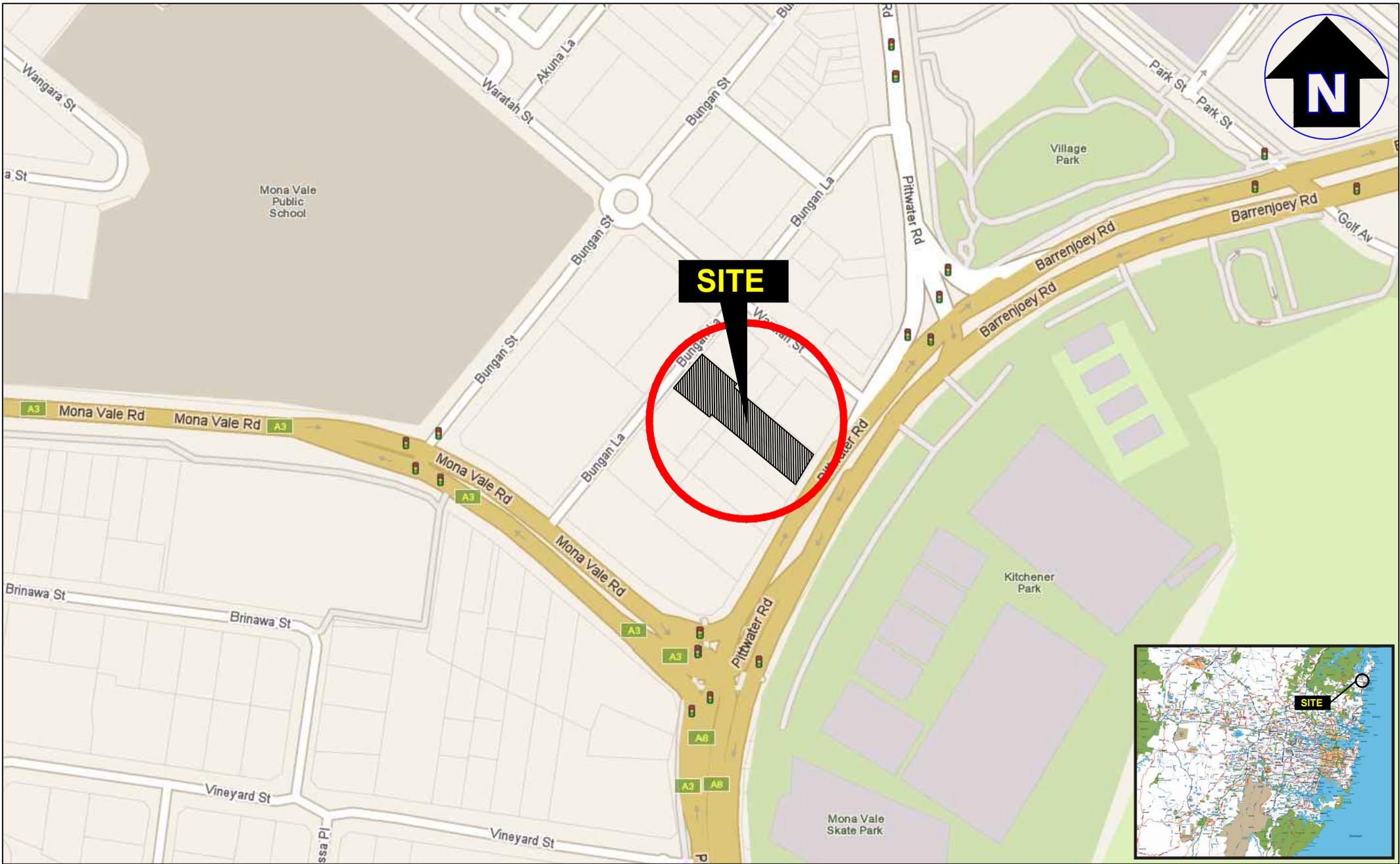
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- AS1726:2017, *Geotechnical Site Investigations*, Standards Australia.
- AS2159:2009, *Piling – Design and Installation*, Standards Australia.
- AS3600:2018, *Concrete Structures*, Standards Australia
- Safe Work Australia Excavation Work Code of Practice, dated January 2020 – WorkCover NSW
- Colquhoun G.P., et al., (2024) New South Wales Seamless Geology dataset, Version 2.4 [Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW

Abbreviations

AHD	Australian Height Datum
AS	Australian Standard
BEL	Bulk Excavation Level
B EGL	Below Existing Ground Level
DP	Deposited Plan
EI	EI Australia
FFL	Finished Floor Level
PGA	Preliminary Geotechnical Assessment
PPV	Peak Particle Velocity
RL	Reduced Level
TfNSW	Transport for NSW

Figures

Figure 1 Site Locality Plan



Drawn:	S.K.
Approved:	G.B.
Date:	12-11-24
Scale:	Not To Scale

Appendix A 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 apprised of any such events, and should be consulted to determine if any additional tests are necessary.

VERIFICATION OF SITE CONDITIONS

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

REPRODUCTION OF REPORTS

This report is the subject of copyright and shall not be reproduced either totally or in part without the express permission of this Company. 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.