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LEPPINGTON (1) 88 DEVELOPMENT PTY LTD

Preliminary Geotechnical Investigation

173-183 Rickard Road, Leppington NSW
SSD-99319962

E27124.G03
29 May 2026

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Revision	Details	Date	Amended By
	Draft	28 May 2026	
	Final	29 May 2026	

I Stephen Kim, confirm this Preliminary Geotechnical Investigation addresses the requirement of SEAR No. SSD-99319962 – Leppington Civic Centre-183 Rickard Road and relevant State and local legislation, policies, and guidelines. I further confirm that none of the information contained in the Preliminary Geotechnical Investigaiton is false or misleading.

SEARS Item	Report Reference
12. Ground and Groundwater Conditions ▪ 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.	▪ Ground conditions are summarised in Section 3.1 of this report. ▪ Recommendations on excavation retention to prevent adverse impacts on neighbouring soil and infrastructure provided in Section 4.5. ▪ Groundwater results to be provided in final Geotechnical Investigation report. This is a preliminary geotechnical investigation for the purposes of a ToA submission. Groundwater Impact Assessment to be provided by others. ▪ Site salinity and acid sulfate soil potential provided in Section 2.3 of the report. As potential is not high, a salinity management plan or acid sulfate soil management plan is not required.

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1. Introduction

1.1 Background

This Preliminary Geotechnical Investigation (PGI) has been prepared by EI Australia (EI) on behalf of Leppington (1) 88 Development Pty Ltd (the Applicant/Client) to address the project-specific Secretary's Environmental Assessment Requirements (SEARs) issued the proposed State Significant Development Application (SSDA) SSD-99319962. The development is located at 173-183 Rickard Road, Leppington (the Site) and is located within the South West Growth Area (SWGA) within the Camden Local Government Area (LGA).

The project seeks detailed development consent for the construction of a mixed-use development to deliver Leppington Civic Centre, comprising shop top housing to support residential development and commercial land uses at 173-183 Rickard Road, Leppington.

Specifically, the SSDA seeks consent for:

- Demolition and earthworks to prepare the site for future development.
- Delivery of new roads and approximately 6,500 sqm of open space.
- Delivery of 8 residential buildings to accommodate a total of 1493 units, comprising of:
  - Build to Sell Apartments: 864
  - Build to Rent Apartments: 412
  - Affordable Apartments 217 (representing circa 15% of total residential yield)
- Delivery of a 156-key hotel (non-residential).
- Approximately 40,500 sqm of non-residential Gross Floor Area (GFA).
- Loading and car parking facilities on the lower ground and basement levels.

The proposed development is supported by concurrent rezoning application to seek amendments to Appendix 5 Camden Growth Centres Precinct Plan within the *State Environmental Planning Policy (Precincts – Western Parkland City) 2021* pursuant to the concurrent rezoning process through the Housing Delivery Authority (HDA) planning pathway. This concurrent rezoning will provide the rezoning and variations to development standards required to facilitate the delivery of the Leppington Civic Centre and Leppington Town Centre, generally in accordance with the Leppington Town Centre State-Assessed Rezoning Proposal (SARP).

This PGI report has been prepared to provide advice and recommendations to assist in the preparation of designs for the proposed development. The investigation has been carried out in accordance with the agreed scope of works outlined in EI's proposal referenced P24295.1-Rev1, dated 11 May 2026.

1.2 Proposed Development

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

- DKO (2026) *Architectural Drawings*, Issue P3, 22 May 2026.
- Telford Civil (2026) *Civil Engineering Plans,* Project No. 23629, Issue A, dated 19 May 2026.
- SDG (2026) *Detail and Level Survey*, Reference No.: 8581, Issue C, dated 11 March 2026.

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.

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

- The demolition of the existing site structures and the construction of eight mixed-use retail and residential towers overlying a common seven-level basement.
- The lowest basement level is proposed to have a Finished Floor Level (FFL) of RL 64.0m. A Bulk Excavation Level (BEL) of RL 63.7m is assumed, which includes allowance for the construction of the basement slab.
- To achieve the BEL, excavation depths from 23 m to 32 m Below Existing Ground Level (BEGL) have been estimated. Locally deeper excavations may be required for footings, lift overrun pits, crane pads, and service trenches.
- New local roads and road extensions are proposed to surround the new basement.

1.3 Objectives

The objective of the PGI was to obtain information on ground conditions at the site, and to provide preliminary geotechnical comment in support of a Test of Adequacy (TOA) of the proposed development.

A follow-up investigation comprising of additional boreholes will be completed after the submission to produce a full Geotechnical Investigation report with recommendations to assist in design.

1.4 Methodology and Scope of Works

The scope of works and methodology for the investigation comprised:

- Drilling of two boreholes (BH1M, BH2) to depths of approximately 29.6m to 31.1m BEGL.
  - Boreholes were drilled with a track-mounted drill rig using solid flight augers fitted with a 'Tungsten-Carbide' (T-C) bit in soils, then NMLC sized core drilling into the bedrock to termination depth.
  - Standard Penetration Testing (SPT) was carried out in the boreholes during auger drilling to assess soil strength/relative densities.
  - EI's Geotechnical Engineer was present full-time onsite to set out the borehole locations, direct the testing and sampling, and log the encountered subsurface conditions.
  - The resulting borehole logs and rock core photographs are attached as **Appendix A**, together with EI Australia's Soil and Rock Description Explanation Sheets that define the descriptions and terminology used on the borehole logs.
  - 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**;
- On completion of drilling, a groundwater standpipe was installed in one borehole (BH1M) to enable subsequent water level observation, sampling, and testing of groundwater at the site.
  - The standpipes comprise a PVC pipe with a machine slotted screen and sand filter. Standpipe installation logs are included with the borehole logs in **Appendix A**.
  - On installation the standpipes were the developed.
- Rock samples were sent to STS Geotechnics Pty Ltd (STS) and SGS Australia (SGS), which are National Australian Testing Authority (NATA) accredited laboratories, for testing and storage.
- Preparation of this PGI report.

2. Site Description

2.1 Site Description and Identification

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

Table 2-1 Summary of Site Information

Information	Detail
Street Address	173-183 Rickard Road, Leppington NSW
Lot and Deposited Plan (DP)	Lot 1 and 2 in DP 812366
Site Area	The site area is approximately 3.24ha (based on the provided survey plan referenced above).
LGA	Camden Council
Site Description and Observations	At the time of our investigation, the site was occupied by a two residential dwellings and associated sheds. The majority of the site was vacant and covered with grass. Some medium to large trees are located around the perimeter of the site.

Plate 1 Aerial image of the site (Source: MetroMap, accessed 27 May 2026)

2.2 Local Land Use

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

Table 2-2 Summary of Local Land Use

Direction Relative to Site	Land Use Description
North	Parking lot for Leppington Station, located further north.
East	Rickard Road, a two-lane road, followed by rural residential properties beyond.
South	Property at 163 Rickard Road, which is a vacant rural property.
West	The rear of rural properties, largely vacant.

2.3 Regional Setting

The regional setting information for the locality is summarised in **Table 2-3** below.

Table 2-3 Summary of Reginal Setting Information

Attribute	Description
Topography	The site is located within gently (0° to 5°), west dipping topography with site levels varying from R.L. 95.3 m at the south-eastern site corner to R.L. 85.0 at the north-eastern site corner.
Drainage	Site drainage is likely to consist of mostly surface runoff in a westerly direction, following topography.
Regional Geology *(Source: MinView)*	Reference to the NSW Seamless Geology by the Geological Survey of New South Wales, version 2.5 indicates that the site overlies Bringelly Shale (Twib), which comprises of shale, carbonaceous claystone, laminite, lithic sandstone, and rare coal.
Soil Landscape *(Source: eSPADE)*	The NSW Government Department of Planning, Industry, and Environment *eSPADE v2.2* website (DCCEEW, 2025) indicates that the site overlain by the *Blacktown landscape (bt)* ▪ *Landscape* are described as gently undulating rises on Wianamatta Group shales. Local relief to 30 m, slopes usually >5%. Broad rounded crests and ridges with gently inclined slopes. Cleared Eucalypt woodland and tall open-forest (dry schlerophyll forest) ▪ *Soils* are identified as shallow to moderately deep (>100 cm) hardsetting mottled texture contrast soils, Red and Brown Podzolic Soils on crests grading to Yellow Podzolic Soils on lower slopes and in drainage lines. ▪ *Limitations* are identified as localised seasonal waterlogging, localised water erosion hazard, moderately reactive highly plastic subsoil, localised surface movement potential.
Acid Sulfate Soil (ASS) Risk *(Source: eSPADE)*	The NSW Government Department of Planning, Industry, and Environment *eSPADE v2.2* website (DCCEEW, 2025) indicates that the site is situated in an area of *No Known Occurrence.* Given the information above, it was concluded that the potential for the presence of ASS is nil to low.
Salinity Potential (Source: *SEED Map*)	Reference to the '*Salinity Potential of Western Sydney*' map from the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), indicates the site to have a 'Moderate' salinity potential.
Groundwater Bore Search *(Source: MinView)*	An online search for groundwater bores registered in the region was conducted on 22 October 2025 via MinView and the WaterNSW portal (*Real-time water data*). There were no registered bores within a 500 m radius of the site.

Plate 2 Excerpt of NSW Seamless Geology with site indicated (Source: MinView)

3. Investigation Results

3.1 Stratigraphy

For a detailed description of subsurface conditions at each borehole location, reference should be made to the borehole logs presented in **Appendix A**.

In summary, ground conditions for the site comprised of:

- Relatively shallow Fill and Residual Silty Clays grading into extremely weathered material to depths of 1.7 to 2.7 m BEGL, over shale and laminite bedrock (Bringelly Shale).
- The shale bedrock was initially of very low to low strength, grading into medium to high strength shale with sandstone laminations.

Based on the observed ground conditions, the site was characterised into the four general geological units, as presented in **Table 3-1** below.

Table 3-1 Summary of Subsurface Conditions

Material[2]	Depth to Top of Unit (m BEGL)[1]	RL of Top of Unit (m AHD)[1]	Comments
Topsoil	0.00	88 to 95.2	Silty clay fill of low to medium plasticity, with trace roots, ash and gravel. Fill was assessed, based on our observations during drilling and SPT N Values to be variably compacted and uncontrolled.
Residual Soil	0.4 to 0.9	87.6 to 94.3	Silty CLAY, high plasticity, grey and orange-red-brown with trace rootlets, ironstone gravels, very stiff to hard, grading into weathered shale with depth. SPT values ranged from 25 to 28.
Moderately to Highly Weathered (MW-HW) Shale	1.70 to 2.4	93.50 to 85.6	MW-HW SHALE, dark grey to orange-brown, very low to medium strength. Occasional bands of sandstone Defects are very closely to moderately spaced and generally consisted of bedding partings, extremely weathered seams, and gentle to sub-vertical joints.
Slightly Weathered to Fresh (SW-FR) Shale	8.3 to 9.3	85.9 to 79.7 [3]	SW-FR SHALE, dark grey, with grey sandstone laminations, medium to high strength, becoming laminite with depth. Defects are moderately to widely spaced and generally consisted of bedding partings, and occasional gentle to sub-vertical joints.

Note 1 Approximate depth and level at the time of our assessment. Depths and levels may vary across the site.
Note 2 For more detailed descriptions of the subsurface conditions, reference should be made to the borehole logs attached to Appendix A.
Note 3 Observed up to termination depth in all boreholes.

3.2 Groundwater Observations

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 BH2. We note that the groundwater levels may not have become evident or stabilised in the augered boreholes within the limited observation period. No long term groundwater monitoring was carried out.

3.3 Geotechnical Laboratory Testing

56 selected rock core samples were sent to Geotech Testing (GT) for Point Load Strength Index to inform the strength assessment of the rock encountered at the site.

At the time of this report the results were not available, and will be updated once received.

4. Preliminary Geotechnical Discussions and 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;
- Rock excavation and vibration;
- Groundwater management;
- 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 or minimum buffer of the excavation is defined by a distance back from the excavation perimeter of twice the total depth of the excavation.

The dilapidation survey reports (one for each neighbouring property) would provide a record of existing conditions prior to commencement of the work. A copy of each report should be provided to the respective 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 Basement Excavation

Prior to any excavation commencing, we recommend that reference be made to the Safe Work Australia Excavation Work Code of Practice, dated January 2020. Excavation contractors should also review the attached borehole logs to make their own assessment of excavation plant suitability and production rates.

EI assumes that the proposed development will require a BEL of RL 60.3m for the basement, or an excavation depth of between about 26 m and 35 m BEGL. Based on the borehole logs, the proposed basement excavations will therefore extend through all geotechnical units as outlined in **Table 3-1.**

Units 1 and 2 could be excavated using buckets of large earthmoving Hydraulic Excavators, particularly if fitted with ‘Tiger Teeth’ for excavations in weathered shale. Excavation of Units 3 and 4 may present hard or heavy ripping, or “hard rock” excavation conditions. Ripping would require a high capacity and heavy bulldozer for effective production. Wear and tear should also be allowed for. The use of a smaller size bulldozer will result in lower productivity and higher wear and tear, and this should be allowed for. Alternatively, hydraulic rock breakers, rock saws, ripping hooks or rotary grinders could be used, though productivity would be lower and equipment wear increased, and this should be allowed for.

Should rock hammers be required for the excavation of the bedrock, further advice should be sought from EI regarding vibration mitigation and monitoring.

4.4 Groundwater Considerations

Groundwater was not observed during this initial investigation period.

Based on experience, EI note that perched groundwater with the soil/rock interface and within defects of the bedrock will be present. Hence, we expect some minor seepage inflows into the excavation along the soil/rock interface and through any defects within the shale bedrock (such as jointing, and bedding planes, etc.) particularly following a period of heavy rainfall.

Due to the low permeability of the soil and bedrock profile any groundwater inflows into the excavation should not have any adverse impact on the proposed development or on the neighbouring sites and should be manageable. 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.

Seepage encountered during excavation will be able to be controlled by a conventional sump and pump system.

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. On-going maintenance of the drainage and pump systems should be allowed for.

It will be both Council and WaterNSW's preference for the basement to be a tanked structure to prevent any groundwater extraction and discharge to the stormwater system. Should a drained basement be desired, additional investigations, monitoring and analysis will be required including seepage analysis, the installation of additional monitoring wells, long-term groundwater monitoring, and laboratory testing. 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 basements, with WaterNSW acting as an intermediary between the two entities. EI note that in some recent instances the hydrogeological assessment requirements outlined above have been requested for some tanked basements, and will be dependent on the identified groundwater conditions and regional aquifer setting.

4.5 Excavation Retention

4.5.1 Temporary Batters

Given the depth of excavation, temporary batters are not recommended for the basement excavation.

For any other excavation, temporary batters may be considered where: room for full batter excavation exists; batter heights are kept to less than 3.0 m; and surface water is diverted away from batter faces. Safe batter angles for each unit are presented in **Table 4-1** below, where batters are kept above the groundwater table and where all surcharge loads, including construction loads are kept at least 2h (where 'h' is the batter height) away from batter crests.

Steeper batters, where required, must be adequately supported by engineered support measures, such as a shotcrete & soil nail system. Such support measures must be designed by a suitably qualified structural or geotechnical engineer, and must consider a drainage solution.

The stability of these batters can be assessed using computer slope stability analysis software such as Slope/W or PLAXIS.

Table 4-1 Batter Angles

Unit Name	Temporary Batter
Fill	1V:1H
Residual Soil	1V:1H
HW-MW Shale	1V:1H or 2V:1H [1]
SW-FR Shale	2V:1H or vertical [1]

Note 1 Rock faces steeper that 1V:1H must be inspected by a suitably qualified geotechnical professional at 1.5 m intervals to verify that no adverse jointing or rock exists

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 100 mm 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.
- If the fill is to support landscaped areas, a 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. Appropriate subsurface drainage should be installed to mitigate against the build-up of hydrostatic pressures behind the retaining wall.

4.5.2 Shoring Systems

For this site, EI recommends a soldier pile wall with reinforced shotcrete panels in between the piles or contiguous pile walls founded into medium strength shale or better below BEL. Anchors/props and reinforced shotcrete must be installed progressively as excavation proceeds.

If additional lateral stability/restraint is necessary, then this could be provided by using temporary ground anchors or internal propping installed progressively as the excavation proceeds, with the walls to then be permanently propped by the basement and ground floor slabs. Permission from adjacent property owners and Council would also be required to install anchors that extend beneath the adjacent properties and the roads. Where the use of anchors is not possible, then internal bracing would be required.

EI do not recommend unsupported vertical excavation within shale, as when the shale is exposed and weathers, it tends to spall and fall into the deep excavation resulting in a safety risk. Furthermore, without the presence of soldier piles, remediating the presence of any wedges formed by smooth angled joints intersecting with regular bedding planes is difficult in shale without extensive inspections. The presence of piles helps reduce the risk of large, potentially unstable wedges which may daylight into the excavation from forming.

The existence of significant horizontal in-situ stresses in bedrock, particularly in the Sydney basin, is well established. The release of such stresses during the basement excavation may cause adverse impact on the stability of the excavation faces and thus increase the movements. Monitoring of several deep excavations within sandstone and shale in the Sydney region indicates that the lateral displacement at the top of the excavation is generally between 0.5 mm to 2 mm per meter depth of excavation. As the maximum depth of excavation into shale is of about 30 m, a lateral deflection at the crest of the excavation between 15 mm to 60 mm can be expected which will reduce in a stepped fashion to zero at the bulk excavation level. Monitoring

of the lateral movement as the excavation progresses is recommended. An assessment of such movements and their impact can be carried out using finite element software such as PLAXIS.

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

Working platforms may also be required. We can complete the design of the working platform, if commissioned to do so.

The relative stiffness of the wall and support system, i.e. whether it is cantilevered or propped, will also determine the design earth pressure magnitude and distribution. Additionally, the earth pressure coefficients adopted for design will also depend on the analytical tools utilised in the design. Geotechnical design parameters will be provided in the updated final Geotechnical Investigation report.

Retaining wall analyses will also need to consider surcharges, footing loads from adjacent buildings, existing in ground services, and hydrostatic pressure.

If drained walls are to be used then adequate permanent drainage will need to be provided behind the walls, with a water collection system that can periodically be flushed for drainage system maintenance. Even with permanent drainage, an allowance of potential water pressure build-up equivalent to one-third the wall height is recommended for design.

Anchor designs should be based on allowing effective anchorage to be developed by locating the bond length behind an 'active zone', determined by drawing a line at 45° from the base of the wall up to the ground surface behind the excavated face. Anchor design parameters will be provided in the updated final Geotechnical Investigation report.

4.6 Building Footings

Following bulk excavation, we expect SW-FR, Class III to II Shale to be exposed.

It is recommended that all footings for the building be founded within the shale bedrock of similar strength to provide uniform support and reduce the potential for differential settlements.

Pad or strip footings founded within Unit 4 may be preliminarily designed for an allowable bearing capacity of 3500 to 6000kPa. This bearing capacity is subject to additional boreholes and laboratory testing.

The recommended design parameters for footings assume that the bearing surfaces are clean and free from spoil, other soft and loose material, and water at the time of concrete placement. Concrete should be poured as soon as possible to prevent and degradation of the exposed rock surface and to ensure the concrete has a clean contact with rock.

During construction, geotechnical inspections of footing excavations are recommended to confirm that the required bearing strata has been reached, and to assess whether any variations that may occur between the boreholes and inspected locations.

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

4.7 Basement Floor Slab

Following bulk excavations for the proposed basement, shale bedrock is expected to be exposed at the basement floor BEL.

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

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

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

4.8 Pavement Design Advice

The design of new pavements will depend on subgrade preparation, subgrade drainage, the nature and composition of fill excavated or imported to the site, as well as vehicle loadings and use. Various alternative types of construction could be used for the pavements. Concrete construction would undoubtedly be the best in areas where heavy vehicles manoeuvre such as trucks turning and manoeuvring. Flexible pavements may have a lower initial cost, but maintenance will be higher. These factors should be considered when making the final choice.

4.8.1 Subgrade Assessment

CBR testing should be completed to assist in pavement thickness design. this was not completed as part of the scope of this PGI.

However, based on the observed subsurface conditions, we conservatively recommend that pavement design may be preliminarily based on the CBR value of 3.0 % for the residual soil.

Alternatively, an appropriate select fill layer comprising of good quality, well graded granular material (such as unbound base or ripped, crushed sandstone with CBR greater than 10 %, a maximum particle size of 60 mm, well graded and Plastic Index less than 10, compacted to at least 98 % of SMDD) may be used below the pavement.

CBR tests must be carried out on representative samples of the subgrade to obtain a large population of values to enable a proper statistical analysis to be performed and possibly an increase in the design CBR value. However, it should be borne in mind that even with more test values being obtained there will still be isolated pavement areas where the risk of potential failure and higher maintenance will occur due to the subgrade having a lower CBR value than the statistical characteristic value opted for design purposes.

We recommend that in situ density tests be completed on the proof rolled and prepared subgrade to confirm that at least 98% Standard Maximum Dry Density (SMDD) has been achieved. If the existing fill is removed and replaced with imported fill, the CBR of the imported material may be taken into account. These design values should be confirmed by inspection and Dynamic Cone Penetration (DCP) testing of the subgrade following proof rolling.

4.8.2 Preliminary Pavement Design

All upper (base) course should be crushed rock to RMS QA specification 3051 (2013) unbound base and compacted to at least 100 % of SMDD. All lower (sub-base) course should be crushed rock to RMS QA specification 3051 (2013) unbound base or ripped/crushed sandstone with

CBR greater than 40 %, maximum particle size of 60 mm, well graded and Plastic Index less than 10. All lower course material should be compacted to an average of no less than 100 % of SMDD, but with a minimum acceptance value of 98 % of SMDD.

Concrete pavements should have a sub-base layer of at least 100 mm thickness of crushed rock to RMS QA specification 3051 (2013) unbound base material (or equivalent good quality and durable fine crushed rock) which is compacted to at least 100 % SMDD. Concrete pavements should be designed with an effective shear transmission of all joints by way of either doweled or keyed joints.

4.8.3 Drainage

Careful attention to subsurface and surface drainage is required in view of the effect of moisture on the clay soils. Pavement levels will need to be graded to promote rapid removal of surface water so ponding does not occur on the surface of pavements. The drainage trenches should be excavated with a uniform longitudinal fall to appropriate discharge points so as to reduce the risk of water ponding. The capacity of the stormwater collection system from the pavement should be checked and upgraded if necessary. In order to protect the pavement edge, subsoil drains should be provided along the perimeter of all proposed new external pavement areas, particularly in those areas of cut, with invert levels of at least 200 mm below subgrade level.

4.8.4 Other Considerations

The long-term successful performance of the pavements is dependent on the satisfactory completion of the earthworks. In order to achieve this, the quality assurance programme should not be limited to routine compaction density testing only. Other important factors associated with the earthworks includes subgrade preparation, selection of fill materials, control of moisture content and drainage, etc.

4.9 Soil and Groundwater Aggressivity

Aggressivity testing results are not yet available at the time of this PGI.

5. Further Geotechnical Inputs and Conclusion

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

- Detailed groundwater investigation, testing, long term water levels monitoring, and an inflow seepage analysis will be required to assess the feasibility for the use of a partially tanked basement structure and support the approvals process, with reference to the Department of Planning and Environment (DPIE) guidelines *"Minimum requirements for building site groundwater investigation and reporting"*, dated October 2022.
- Additional Geotechnical Investigation in the form of cored boreholes to confirm the depth and quality of shale bedrock across the site (planned);
- Aggressivity testing for buried concrete and steel structures;
- Geotechnical design, stability, and possibly ground deformation assessments for excavation and/or retaining structure design.
- Stability assessment of temporary batters using computer modelling, if required;
- Dilapidation surveys;
- Design of working platforms (if required) for construction plant by an experienced and qualified geotechnical engineer;
- Spoil Waste Classification of all excavated material transported off site.
- Witnessing installation of support measures and proof-testing of anchors (if required).
- Construction stage geotechnical inspections of footing excavations.
- Possibly construction stage excavation deformation and/or vibration monitoring.
- We also 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.

Based on the findings from this GI, and with consideration of the Statement of Limitations, EI conclude that the site is suitable for the proposed development from a geotechnical engineering perspective, provided that the additional investigation be completed and recommendations detailed in this report are implemented

6. Statement of Limitations

This report has been prepared for the exclusive use of Mr. Michael Duncan and Leppington (1) 88 Development 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 Mr. Michael Duncan and Leppington (1) 88 Development Pty Ltd

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

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

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

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

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

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

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

References

AS1289.6.3.1:2004, Methods of Testing Soils for Engineering Purposes, Standards Australia.

AS1726:2017, *Geotechnical Site Investigations*, Standards Australia.

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NSW Department of Planning, Industry, and Environment (2025) ***eSPADE*** web portal

NSW Department of Primary Industries and Regional Development (2025) ***MinView*** web portal

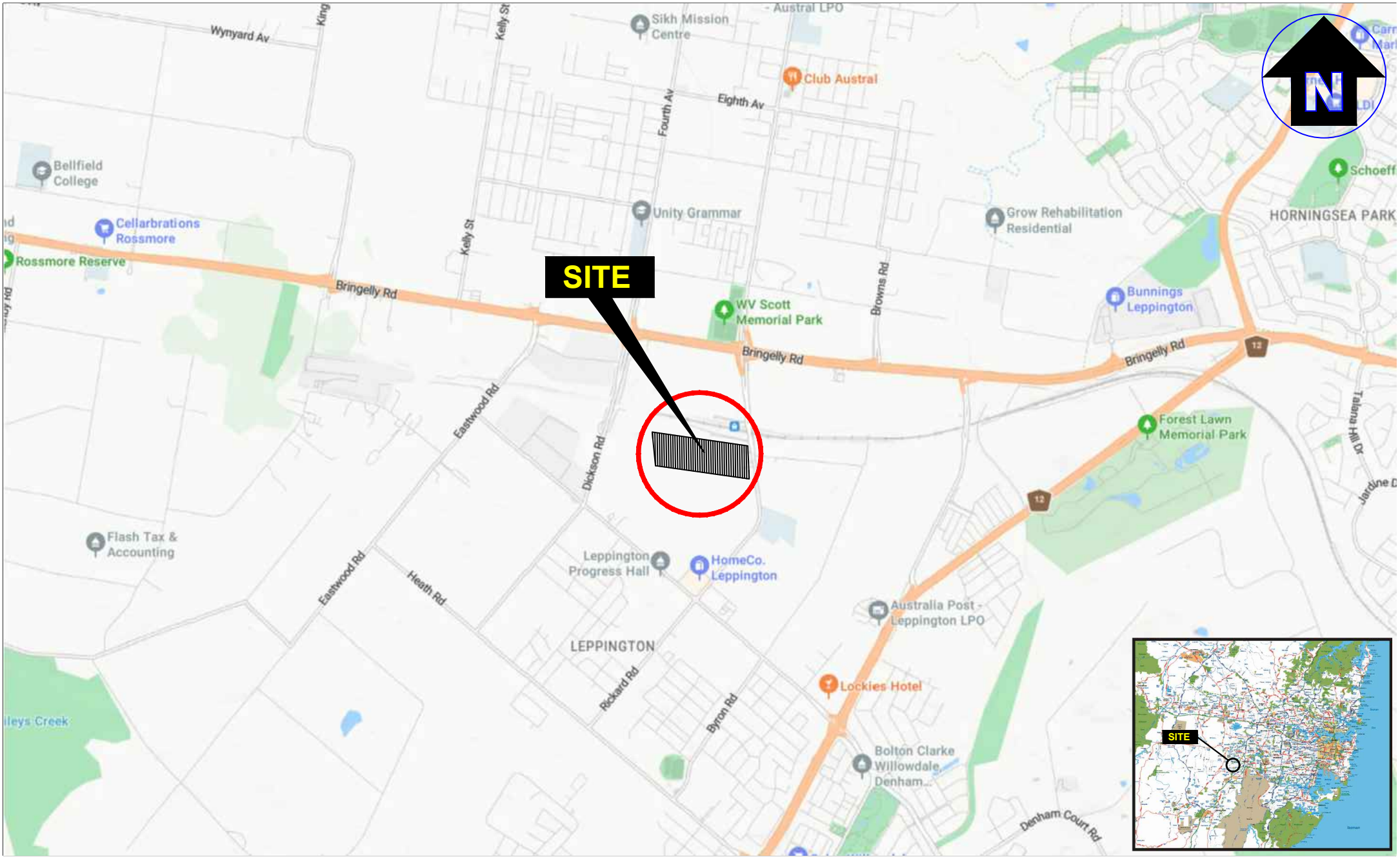
NSW Government (2025) ***SEED Map*** web portal

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

Abbreviations

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

Figures



eiaustralia
Practical Solutions for Built Environments
Suite 6.01, 55 Miller Street, PYRMONT 2009
Ph (02) 9516 0722 Fax (02) 9518 5088

Drawn:	L.L.
Approved:	S.K.
Date:	28-5-2026
Scale:	Not To Scale

Aland Pty Ltd

Geotechnical Investigation
173-183 Rickard Road, Leppington, NSW

Site Locality Plan

Figure: 1

Project: E27124.G03

LEGEND Note: Areas are approximate

Site Boundary Boreholes

Groundwater Monitoring Well

eiaustralia
Practical Solutions for Built Environments
Suite 6.01, 55 Miller Street, PYRMONT 2009
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Drawn:	J.F.
Approved:	
Date:	22/05/2026

Client Name Pty Ltd

Geotechnical Investigation

173-183 Rickard Road, Leppington NSW

Borehole Location Plan

Figure: 2

Project: E27124.G03

Appendix A Borehole Logs And Explanatory Notes

BOREHOLE LOG

BH ID: BH1M

Location	173-183 Rickard Road, Leppington NSW			**Started**	12 May 2026
Client	Aland			**Completed**	13 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 13 May 2026
Sheets	1 of 4			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈95.20 m (AHD)	**Northing**	6240470.1 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297543.7 (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_0.50-0.90 SPT 0.50-0.95 12,16,17 N=33 BH1M_0.90-0.95		0.00		95.20	FILL: Silty CLAY: low to medium plasticity, dark grey, trace of root fibres and fine to medium igneous gravel	M < PL	-	FILL
		BH1M_1.50-1.70 SPT 1.50-1.78 12,21/130 mm HB N=R BH1M_1.70-1.78		0.90		94.30	Silty CLAY: high plasticity, light grey and red brown	M ≈ PL	H	RESIDUAL SOIL
				1.70		93.50	SHALE: grey and red brown, distinctly weathered, very low strength	-	-	WEATHERED ROCK
				2.80		92.40	From 2.80m, low strength			
		BH1M_3.00-3.05 SPT 3.00-3.05 7/50 mm HB N=R		3.05		92.15	*Log continued on next page.*			

BOREHOLE CORE LOG

BH ID: BH1M

Location	173-183 Rickard Road, Leppington NSW			**Started**	12 May 2026
Client	Aland			**Completed**	13 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 13 May 2026
Sheets	2 of 4			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈95.20 m (AHD)	**Northing**	6240470.1 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297543.7 (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.*				
NMLC	95%	100	71	3			SHALE: grey with red brown bands and laminae, indistinctly laminated at 0°-10°	HW		3.08: BP 0° PR SM Clay VN 3.17: BP 0° PR SM Fe SN 3.24: BP 0° PR SM Clay VN 3.27-3.29: XWS 3.42: BP 0° PR SM Fe SN 3.58: BP 0° PR SM Fe SN 3.60: BP 10° PR SM Fe SN 3.79: BP 10° PR SM Fe SN 3.81: BP 10° PR SM Fe SN 3.88-4.00: XWZ 4.10-4.12: XWS 4.19-4.23: XWS 4.44: JT 25° PR SM Fe SN 4.68: BP 10° PR SM Fe SN 4.79: BP 5° PR SM Fe SN 4.91: JT 90° PR SM Fe SN 4.93: BP 5° PR SM Fe SN 5.08-5.10: FS 5.23: BP 10° IR RO Fe SN 5.26-5.28: XWS 5.27: JT 65° PR SM Fe SN 5.33: BP 10° IR RO Clay VN 5.50: JT 70° PR SM Fe SN 5.81: BP 5° UN SM Fe SN 5.92: BP 5° PR SM Fe SN 6.06: JT 45° PR SM CN	
				4.32		90.88	From 4.32m, grey to dark grey with red brown bands	MW			
		98	94	7.00		88.20	From 7.00m, grey to dark grey	HW		6.44: JT 80° PR SM Fe SN 6.45-6.48: CS 6.56-6.57: XWS 6.59: BP 0° PR SM Clay Infilled 6.61: BP 0° PR SM Fe SN 7.13: BP 0° PR SM Clay VN 7.15: JT 40° ST SM Clay VN 7.50-7.51: XWS	
				8.12		87.08	NO CORE: 40mm thick	-		8.18-8.22: XWS	
				8.16		87.04	SHALE: dark grey with grey laminae, indistinctly laminated at 0°-5°	MW		8.52: BP 5° PR SM Clay Infilled 8.79-8.81: CS 8.84: BP 0° PR RO Clay Infilled 8.95: BP 5° PR SM Clay Infilled	
				9.07		86.13	NO CORE: 120mm thick	-		9.19-9.29: FZ	
				9.19		86.01	SHALE: dark grey, with grey and light grey laminae, distinctly laminated at 0°-5°	SW		9.36: BP 0° PR SM Clay VN 9.65: BP 0° PR SM Clay VN	
				10							

BOREHOLE CORE LOG

BH ID: BH1M

Location	173-183 Rickard Road, Leppington NSW			**Started**	12 May 2026
Client	Aland			**Completed**	13 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 13 May 2026
Sheets	3 of 4			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈95.20 m (AHD)	**Northing**	6240470.1 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297543.7 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
NMLC	95%	96	89	11		SHALE: dark grey, with grey and light grey laminae, distinctly laminated at 0°-5°	SW		10.42: BP 0° PR SM Clay VN 11.32-11.34: CS 11.52: BP 0° PR SM Clay VN 12.17: JT 90° PR SM Clay VN	
		100	100	12 12.33	82.87	LAMINITE: 70% Siltstone, dark grey, and 30% Sandstone, fine to medium grained, grey and light grey, distinctly laminated at 0°-5°			12.49: JT 80° PR RO CN	
				13						
				14					14.37: BP 5° PR RO Clay VN	
		100	94	15			FR		15.25: BP 8° PR SM Clay VN 15.27: BP 8° PR SM Clay VN 15.43: BP 0° PR SM Clay VN 15.66-15.71: CS 15.73: BP 0° PR SM Clay VN 15.94: JT 85° PR SM CN 16.10: BP 0° PR SM Clay VN	
				16 16.68	78.52	SANDSTONE: fine grained, grey, indistinctly cross bedded at 0°-10°			16.59: BP 0° IR SM Clay VN 16.66-16.68: CS	
				17					17.04-17.05: XWS	
				17.32	77.88	LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, indistinctly laminated at 0°-5°				
		100	96	18					18.06-18.04: CS 18.09: BP 0° PR SM Clay Infilled 18.23: BP 0° PR SM Clay Infilled	
				19						
				20						

BOREHOLE CORE LOG

BH ID: BH1M

Location	173-183 Rickard Road, Leppington NSW			**Started**	12 May 2026
Client	Aland			**Completed**	13 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 13 May 2026
Sheets	4 of 4			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈95.20 m (AHD)	**Northing**	6240470.1 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297543.7 (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	95%	100	88	21			LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, indistinctly laminated at 0°-5°			20.01: JT 80° UN SM CN 20.13: JT 70° PR SM CN 20.49-20.52: CS 20.64-20.66: CS 20.69: BP 0° PR SM Clay Infilled 20.82: BP 0° PR SM Clay VN 20.98-21.02: CS 21.11-21.13: CS 21.19: BP 0° PR SM Clay VN	
				22						22.41: JT 80-90° PR SM CN	
				23				FR		23.27: JT 90° PR SM CN	
		95	86	24						23.53-23.55: CS 23.55: JT 90° PR SM Clay VN 23.62: JT 35° PR SM Clay Infilled 23.84: JT 45-75° IR SM CN	
				25						24.38-24.40: CS 24.41: JT 70° PR SM Clay VN 24.52: JT 60° PR SM Clay VN 24.57-24.58: CS	
				26		69.20				25.18-25.20: CS 25.20: JT 90° PR SM CN 25.24: JT 90° PR SM CN	
				26.00			NO CORE: 160mm thick	-		25.93: JT 65° PR SM CN	
				26.16		69.04	LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, indistinctly laminated at 0°-5°				
		100	89	27						26.60: BP 0° IR SM Clay VN 26.69: BP 0° PR SM Clay VN 26.83: BP 0° PR SM Clay VN 26.95: BP 5° IR SM Clay VN 27.03-27.10: XWS 27.14-27.18: XWS 27.30-27.35: CS 27.43-27.48: CS	
				28				FR			
				29						29.30: JT 70-90° IR SM CN	
						65.57	Terminated at 29.63m. Target Depth Reached.				
				30							

CORE PHOTOGRAPH OF BOREHOLE: BH1M

Project	Proposed Development	**East**	297543.7 (MGA 56)	**Depth Range**	3.05m to 29.63m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240470.1 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	95.20m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	12/05/2026
Client	Aland Pty Ltd	**Box**	1-2 of 6	**Checked**	SK	**Date**	28/05/2026

CORE PHOTOGRAPH OF BOREHOLE: BH1M

Project	Proposed Development	**East**	297543.7 (MGA 56)	**Depth Range**	3.05m to 29.63m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240470.1 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	95.20m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	12/05/2026
Client	Aland Pty Ltd	**Box**	3-4 of 6	**Checked**	SK	**Date**	28/05/2026

CORE PHOTOGRAPH OF BOREHOLE: BH1M

Project	Proposed Development	**East**	297543.7 (MGA 56)	**Depth Range**	3.05m to 29.63m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240470.1 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	95.20m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	12/05/2026
Client	Aland Pty Ltd	**Box**	5-6 of 6	**Checked**	SK	**Date**	28/05/2026

BOREHOLE LOG

BH ID: BH2

Location	173-183 Rickard Road, Leppington NSW			**Started**	13 May 2026	
Client	Aland			**Completed**	14 May 2026	
Job No.	E27124.G03			**Logged By**	JF	**Date**	14 May 2026
Sheets	1 of 5			**Review By**	SK	**Date**	28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈88.00 m (AHD)	**Northing**	6240528.9 (MGA 2020 Zone 56)	
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297369.5 (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_0.50-0.95 SPT 0.50-0.95 6,10,15 N=25		0.00		88.00	FILL: Silty CLAY: low plasticity, dark grey, with rootlets and ash	M > PL	-	FILL
				0.40		87.60	Silty CLAY: high plasticity, red brown mottled light grey, with rootlets and fine to medium ironstone gravel	M ≈ PL	VSt	RESIDUAL SOIL
		BH2M_1.50-1.95 SPT 1.50-1.95 10,13,15 N=28		1.30		86.70	Silty CLAY: medium to high plasticity, light grey mottled orange brown and dark grey, grading into extremely weathered material	M < PL		
				2.70		85.30	SHALE: dark grey and orange brown, distinctly weathered, low strength	-	-	WEATHERED ROCK
		BH2M_3.00-3.05 SPT 3.00-3.05 6/50 mm HB N=R		3.09		84.91	*Log continued on next page.*			

BOREHOLE CORE LOG

BH ID: BH2

Location	173-183 Rickard Road, Leppington NSW			**Started**	13 May 2026
Client	Aland			**Completed**	14 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 14 May 2026
Sheets	2 of 5			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈88.00 m (AHD)	**Northing**	6240528.9 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297369.5 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
				0		*Log continued from previous page.*				
				1						
				2						
				3						
NMLC	95%	100	88	4		SHALE: grey and red brown, with some sandstone bands, indistinctly laminated at 0°-10°	MW		3.16: BP 10° PR SM Clay VN 3.29: BP 10° PR SM Fe SN 3.32: BP 0° PR SM Fe SN 3.35: BP 0° PR SM Fe SN 3.46: BP 0° PR SM Clay VN 3.62: BP 0° PR SM CN 3.68: BP 0° PR SM Fe SN 3.72: BP 0° PR SM Fe SN 4.02: JT 80° PR SM Fe SN	
				4.64	83.36	SANDSTONE: fine grained, light brown, indistinctly cross bedded at 0°-20°	HW		4.12: BP 0° PR RO Fe Infilled 4.21-4.26: XWS 4.43: BP 0° PR SM Clay VN 4.52-4.55: XWS	
				5					4.81: JT 25° PR SM Fe SN 4.92: BP 0° PR SM Fe SN	
				5.25	82.75	LAMINITE: 60% Sandstone, fine grained, grey and 40% Siltstone, dark grey, with red brown bands, indistinctly laminated at 0°-5°				
		100	66	6					5.44: BP 0° PR SM Fe SN 5.45: BP 0° PR SM Fe SN 5.49-5.52: CS 5.58: JT 90° PR SM Fe SN 5.60: BP 0° PR SM Fe SN 5.64-5.66: XWS 5.74: BP 0° PR SM Fe SN	
				6.27	81.73	SHALE: dark grey with red brown and grey and light grey laminae, with some sandstone bands, indistinctly laminated at 0°-5°	MW		5.77: BP 0° PR SM Clay VN 5.87-5.88: CS 5.90: BP 0° PR SM Fe SN 5.95-6.00: XWS 6.04-6.05: XWS 6.19-6.28: XWS 6.37-6.41: XWS 6.46-6.47: XWS 6.67: BP 5° PR SM Fe SN 6.70: BP 0° PR SM Fe SN 6.74: JT 75° PR SM healed joint Fe SN 6.86: BP 0° PR SM Fe SN	
				7					6.91: BP 0° PR SM Fe SN 6.97: JT 85° PR SM healed joint Fe SN 7.31-7.32: XWS 7.40: BP 0° PR SM Clay Infilled 7.68: BP 0° PR SM Fe SN	
				8					7.69: BP 0° PR SM Fe SN 8.07-8.09: XWS 8.14: BP 0° PR SM Fe SN 8.20: BP 0° PR SM Fe SN	
		94	81	8.30	79.70	From 8.30m, grey to dark grey	SW		8.27: JT 70° PR SM healed joint Fe SN 8.80-8.83: CS 8.85-8.88: CS 8.96: JT 30° PR SM healed joint Fe SN 9.03: BP 0° PR SM Fe SN 9.05: BP 0° PR SM Clay VN 9.07: BP 0° PR SM Fe SN	
				9					9.74: JT 80-90° PR SM healed joint Fe SN 9.86: JT 90° PR SM CN	
				10						

BOREHOLE CORE LOG

BH ID: BH2M

Location	173-183 Rickard Road, Leppington NSW			**Started**	13 May 2026
Client	Aland			**Completed**	14 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 14 May 2026
Sheets	3 of 5			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈88.00 m (AHD)	**Northing**	6240528.9 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297369.5 (MGA 2020 Zone 56)

METHOD	Flush Return	TCR %	RQD %	DEPTH (m)	RL (m AHD)	MATERIAL DESCRIPTION	WEATHERING	ESTIMATED STRENGTH Is(50) ▼ - Axial ▽ - Diametral	DISCONTINUITIES & ADDITIONAL DATA	FRACTURE SPACING
NMLC	95%			10.48	77.52	From 8.30m, grey to dark grey	SW		9.93-9.95: CS 10.02: JT 75-90° PR SM healed joint CN 10.37-10.48: XWZ	
				10.64	77.36	NO CORE: 160mm thick	-			
				11		SHALE: dark grey, with grey bands, indistinctly laminated at 0°-5°	FR		10.79: BP 0° PR SM Clay VN 11.10: BP 0° PR SM Clay VN	
				11.45	76.55	NO CORE: 120mm thick	-			
				11.57	76.43	LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, indistinctly laminated at 0°-5°				
	90%	97	92	12						
				13					13.10: BP 0° PR SM Clay VN 13.26: BP 0° PR SM Clay VN 13.27: BP 0° PR SM Clay VN 13.29: JT 40° PR SM healed joint Clay VN 13.50: BP 0° PR SM Clay VN 13.52: BP 0° PR SM Clay VN 13.55: BP 0° PR SM Clay VN 13.59: BP 0° PR SM Clay VN 13.61: BP 0° PR SM Clay VN 13.63: BP 0° PR SM Clay VN 13.64: BP 0° PR SM Clay VN 13.65: BP 0° PR SM Clay VN	
				14						
		100	100	15			FR			
				16						
				17						
	95%	100	99	18					17.78-17.80: CS	
				19						
				19.17	68.83	From 19.17m, As above, but indistinctly laminated at 0°-15°			19.48: JT 90° PR RO CN	
				20						

BOREHOLE CORE LOG

BH ID: BH2

Location	173-183 Rickard Road, Leppington NSW			**Started**	13 May 2026
Client	Aland			**Completed**	14 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 14 May 2026
Sheets	4 of 5			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈88.00 m (AHD)	**Northing**	6240528.9 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297369.5 (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	95%	100	100	21			From 19.17m, As above, but indistinctly laminated at 0°-15°				
				22							
				23							
				24				FR		23.96-24.00: CS	
	90%	100	99	25						24.82: JT 85° PR SM CN	
				26						25.26: BP 0° PR SM Clay VN	
				27						26.16: JT 70° PR SM CN 26.30: BP 0° IR SM Clay VN 26.49: JT 30° PR SM Clay VN	
				27.81		60.19	NO CORE: 170mm thick	-		27.12: JT 80-90° CU SM CN 27.35: JT 70° PR SM CN	
		94	94	28		60.02	LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, distinctly laminated at 0°-5°			28.63: BP 0° PR SM Clay VN	
				29				FR		29.69: BP 0° PR SM Clay VN	
				30							

BOREHOLE CORE LOG

BH ID: BH2

Location	173-183 Rickard Road, Leppington NSW			**Started**	13 May 2026
Client	Aland			**Completed**	14 May 2026
Job No.	E27124.G03			**Logged By**	JF **Date** 14 May 2026
Sheets	5 of 5			**Review By**	SK **Date** 28 May 2026
Drilling Contractor	Sytech Drilling	**Surface RL**	≈88.00 m (AHD)	**Northing**	6240528.9 (MGA 2020 Zone 56)
Plant	Hanjin D&B 8-D	**Inclination**	90°	**Easting**	297369.5 (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	90%	100	100	31		56.86	LAMINITE: 60% Siltstone, dark grey, and 40% Sandstone, fine grained, grey and light grey, distinctly laminated at 0°-5°	FR	H		1000
							Terminated at 31.14m. Target Depth Reached.				
				32							
				33							
				34							
				35							
				36							
				37							
				38							
				39							
				40							

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

CORE PHOTOGRAPH OF BOREHOLE: BH2

Project	Proposed Development	**East**	297369.5 (MGA 56)	**Depth Range**	3.09m to 31.14m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240528.90 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	RL 88.80m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	13/05/2026
Client	Aland Pty Ltd	**Box**	1-2 of 6	**Checked**	SK	**Date**	28/05/2026

CORE PHOTOGRAPH OF BOREHOLE: BH2

Project	Proposed Development	**East**	297369.5 (MGA 56)	**Depth Range**	3.09m to 31.14m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240528.90 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	RL 88.80m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	13/05/2026
Client	Aland Pty Ltd	**Box**	3-4 of 6	**Checked**	SK	**Date**	28/05/2026

CORE PHOTOGRAPH OF BOREHOLE: BH2

Project	Proposed Development	**East**	297369.5 (MGA 56)	**Depth Range**	3.09m to 31.14m		
Location	173-183 Rickard Road, Leppington, NSW	**North**	6240528.90 (MGA 56)	**Contractor**	Geosense Drilling Engineers Pty Ltd		
Position	See Figure 2	**Surface RL**	RL 88.80m	**Drill Rig**	Hanjin D&B 8D		
Job No.	E27124.G03	**Inclination**	90°	**Logged**	JF	**Date**	13/05/2026
Client	Aland Pty Ltd	**Box**	5-6 of 6	**Checked**	SK	**Date**	28/05/2026

Appendix B Laboratory Certificates

Appendix C Vibration Limits

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

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

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

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

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

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

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

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.